

There are so many culverts built that it is probably impractical to make a detailed study for each one, but records from such a program as that in Ohio will furnish a means for developing graphs and tables that can be used to determine with acceptable accuracy proper design discharges for practically any stream. Measurements of discharge, rainfall amount and intensities, and topographic features will allow for a more accurate evaluation of widely used methods of design.

Peak discharges have been compiled for all floods above a selected base for all gaging stations in Ohio where a record of 15 yr or more is available, except for those stations seriously affected by artificial storage. A flood frequency analysis has been made for each of these stations. Base records and results of analyses will be published as a state report.

Mr. Tate Dalrymple, who is now spearheading the coordination of the type of investigation in which highway departments are principally interested, will work closely with representatives of the Public Roads Administration in the formulation of policy and the adoption of methods of approach to the highway problems. His paper in this Volume<sup>1</sup> describes somewhat in detail some of the things that may be done with the basic records collected by the Geological Survey in connection with the hydraulic problems such as those often facing the highway engineer. Mr. Carl Izzard, chairman of the Highway Research Board Committee on Surface Drainage of Highways, has already been of considerable help to us in this work.

<sup>1</sup> *The Use of Stream Flow Records in the Design of Bridge Waterways*, p. 163.

## REPORT OF COMMITTEE ON ROADSIDE DEVELOPMENT

II. J. NEALE, *Chairman*

### SYNOPSIS

The death toll on our highways makes us conscious of the need for increased safety measures. This points up the need for complete highway design with roadbed and roadside in balance in order to build a full measure of safety into the highways of the future. Complete coordinated development of highways and adjacent areas is a site planning problem.

One prominent cause of highway accidents is fatigue. Well designed waysides offer an ideal solution to the fatigue problem. The importance of this should be recognized by designers in order that sites for waysides and turnouts may be selected and acquired in the early stages of highway location.

Where turf is desirable on shoulders it must not be a mask for soft, wet or otherwise unstable soils. Michigan and New York and a number of other States are making tests for the development of turf shoulders designed to support occasional standing vehicles safely in all weather and seasons of the year.

The hazards of earth slides, erosion of slopes, blocking of drainageways, and interference of pole lines and trees stress the need for more liberal right-of-way widths and improved cross section grading and slope protection measures. The use of mulches, including asphalt, sawdust, various grain straws and roadside mowings containing mature seed, and the various methods of holding these in place will be the subject of a project outline for the coming year.

In-service training, short courses, and other university programs will continue to be encouraged to aid in training young engineers and to inform the public regarding latest methods used in the development of complete highways. Complete cooperation of highway staffs is the only path to the common goal of safer highway service to the public.

The increasing toll of deaths on highways indicates the need for increased safety measures. Safer highways require the integrated design and development of roadbed, roadside and adjacent land areas. Increased safety features

to improve traffic and driver services, as well as appearance of the highway, are obtained in the "Complete Highway," the objective study of this Committee.

Although no definite conclusions were reached during the sessions of the Committee at the 26th Annual Meeting of the Highway Research Board, progressive developments in various project studies were reported. Brief reviews of the reports presented at the meeting are embodied in this report. The factual data developed to date on the various projects will be made a part of a separate mimeographed report, which will also include an outline of the research objectives for the current year. As in previous meetings, the sessions of the Committee were covered under three divisions:

**DIVISION I—DESIGN, RIGHT-OF-WAY AND BORDER CONTROL, W. H. SIMONSON, HEAD,  
PUBLIC ROADS ADMINISTRATION**

*Site Planning*

Highway location and design are largely controlled by:

- (1) Traffic volume and character as evidenced by origin and destination surveys;
- (2) Topography, climate, and soil; and
- (3) Land use as indicated by existing and potential development of areas adjacent to the highway.

As indicated in previous reports, aerial photographs offer the best tool for determining facts about topography and land use. Data obtained by trial line survey are necessarily limited in scope because they are confined to a narrow strip near the proposed centerline. Such limiting survey data are reduced in large measure to the judgment of the individual making the survey and the topography portrayed.

In approaching the location and design of the complete highway as a site planning problem, highway officials responsible for sound solutions must have complete information on topography and land use in the form of a comprehensive survey of the area and its development. An illustration of the overall advantages to be gained by the use of aerial survey procedures in the solution of highway location and site planning and design problems will be found in the paper on "Highway Location as a Site Planning Problem" by A. R. Nichols (see page 269).

*Wayside Areas*

Provision of rest and incidental recreation on primary highways in rural areas is urgently needed. One prominent cause of highway accidents is fatigue. This prevails with drivers of commercial as well as pleasure vehicles. In general, it is difficult to find pleas-

ant wayside rest areas at regular intervals on most primary highways. Well designed waysides with simple water supply and sanitary facilities offer an ideal solution to the fatigue problem. The importance of this should be recognized by designers in order that sites for waysides and turnouts may be selected and acquired in the early stages of highway location. Otherwise, these areas may be lost to public use because of subsequent rises in costs of land due to highway development.

Parking retreats may be:

- (1) Wide shoulders for emergencies;
- (2) Parking units in scenic areas designed to accommodate several vehicles with a protective island to assure safety. Entrances and exits must be located with maximum sight distance.
- (3) Waysides or larger areas that offer opportunities for picnicking, rest and recreation. These should have pure drinking water and sanitary facilities as well as fireplaces and picnic tables.

The design should be simple but commensurate with the use in order to insure economical maintenance.

The Committee adopted a resolution offering to cooperate with the Massachusetts Department of Public Works in the selection, design and development of a memorial wayside to Theodore Reed Kendall, late Editor of the *Contractors and Engineers Monthly*. Mr. Kendall was for years an exponent of developed roadsides and waysides, as evidenced by his valuable contribution to the work of the Committee as a collaborator and constant adviser.

**DIVISION II—CONSTRUCTION AND MAINTENANCE, J. L. WRIGHT, HEAD, CONNECTICUT  
HIGHWAY DEPARTMENT**

*Turf Shoulders*

The Committee devoted an entire session to the continuing study of the development

of turf on selected and stabilized earth shoulders, as outlined in the 1945 Report. The Chairman of the Project Committee outlined research procedure which will be made available to all states that desire to cooperate in this study. A series of field tests begun on Long Island by the New York State Department of Public Works in 1945 are reported in "Interim Report on Construction of Stabilized Shoulders Which Will Support Vegetation," by H. H. Iurka (see page 258). Michigan is another State that has established experimental shoulder plots and is studying turf shoulders on existing highways.

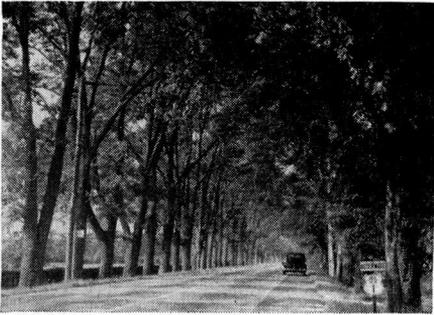


Figure 1. Highway right-of-way taking should consider need for future pole lines and shade trees. Roadside tree planting like this causes unnecessary conflict with utility pole lines. Trees lacking space for growth must be sacrificed when pavements are widened and utility lines constructed.

#### *Roadside Trees and Public Utilities*

Continuing study is being made on the care of roadside trees, especially in connection with public utility line operation. The prevailing procedures in vogue in Michigan were presented. Under existing law the highway commission controls all cutting or pruning of trees within the right-of-way of trunk line highways. Tree trimming for wire clearance is confined to that absolutely necessary for effective utility operation. Cross arms and poles may be shifted to clear existing trees. "Tree wire" with heavy insulation is used where necessary to pass wires close to branches. Topping of trees in wire clearance is not permitted because it ruins the appearance of trees and increases the need for frequent tree trimming. The general discussion brought out the point that pole lines and trees are both essen-

tial on the roadsides, and, as such, should be located so as not to interfere with each other (Figures 1, 2, 3).

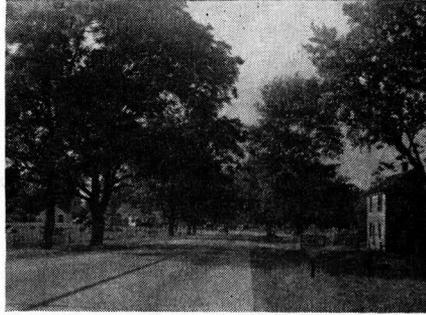


Figure 2. This type of shade tree arrangement on adequate widths of right-of-way permits growth of shade trees to large size with the least possible conflict with pole lines placed along the property line behind the trees. Trees should not, of course, be planted closer than about 15 ft. from the edge of pavements.



Figure 3. Trees must be provided with adequate space for both root and top growth in original lay-out of roads and streets. Note interference of utility lines and trees at right.

#### *Mulches and Ground Covers*

Establishing and maintaining vegetative protection on roadsides following new construction presents many problems. The removal of topsoil in grading operations results in unfavorable soil conditions for the establishment of vegetation. It is difficult to hold seed, soil, and vegetation on steep slopes. The time of seeding most favorable for the contractor is often an unfavorable season for plant establishment. The use of mulches, including asphalt, sawdust, various grain straws, and roadside mowings containing mature seed, and the various methods of

holding these in place will be the subject of a project outline for the current year.

DIVISION III—EDUCATION, SPECIFICATIONS,  
AND PUBLIC RELATIONS, P. H. ELWOOD,  
HEAD, IOWA STATE COLLEGE

The need for a course of study for in-service-training of employees of the several highway departments, especially as it relates to roadside divisions, was stressed. The value of regional courses at state universities was forcibly portrayed and a furtherance of this procedure was heartily recommended. Such a short course on highway development is now an annual feature at Ohio State University with the cooperation of the State highway department. Sixteen neighboring states were represented at the Sixth Annual Short Course. The University is planning to combine the Seventh Annual Short Course with the Road School to form a cooperative Highway Engineering and Development Conference.

In order to expedite the handling of various projects contemplated for the current year, the Committee hopes to be able to reorganize the regional coordinating organization similar

to the operation before the War. This offers an ideal clearing house for both this Committee and the Committee on Roadside Development of the American Association of State Highway Officials.

#### *Organization of Personnel*

The typical state, municipal, and federal qualifications for professional grades of landscape engineers, landscape architects, supervisors, foremen, et cetera, as outlined in the 1943 Report of the Committee, is offered as a basis for continuing study, as well as for organization procedure in the various states, especially those engaged in forming new organizations.

In conclusion, the Committee re-emphasizes the belief that no one group of engineering specialists or technicians can solve the many inter-related problems involved in "Complete Highway" design. This calls for complete cooperation between all members of the staffs of the several state and federal highway organizations. This is the only path to the common goal of safer highway service to the public.

## STABILIZED SHOULDERS WHICH WILL SUPPORT VEGETATION

Progress Report

By HARRY H. IURKA

*Landscape Architect, New York Department of Public Works*

### SYNOPSIS

Stabilized shoulders were built on four projects on Long Island in 1945 and 1946, and seeded with about 50 different kinds of grasses, grains, legumes and other plants to investigate the feasibility of growing vegetation on such shoulders.

Details of the construction are given and the results to date are discussed. It is indicated that vegetation can be grown on mechanically stabilized shoulders, which will support occasional use by traffic.

The plants rated best after two seasons are Red Fescue, Smooth Brome, Orchard Grass, Redtop, Perennial Rye, Wild White Clover, Birdsfoot Trefoil, Grim Alfalfa and Yarrow.

An interesting observation is that many practices such as rolling and raking, usually considered essential, may be eliminated in this shoulder work.

The soil was sandy with approximately less than 5 percent passing the No. 100 sieve. The stabilizing process consisted generally in adding about 1 in. of binder soil containing approximately 10 percent passing the No. 200 sieve and mixing with 6 in. of the soil in place. Average dry densities in the top-6 in. ranged approximately from 116 to 132 lb per cu ft.