REPORT OF WASHINGTON MEETING

COORDINATING EXECUTIVE COMMITTEE ON ROADSIDE DEVELOPMENT

HELD IN WILLARD BUILDING - JULY 28, 1941 -- 2:00 P.M.
Attendance of representatives at meeting

JULY 27, 28, 29
Semi-annual meeting

H. J. Neale, Virginia - *Chairman*
John L. Wright, Connecticut - *Co-chairman*
Frank H. Brant, North Carolina - *Member* — Executive Committee [1]
Wilbur H. Simonson - *Secretary*

Henry Aaron - *Assistant Highway Engineer* - Public Roads Administration - Soils (for Mr. Hogentogler)
S. W. Baumiller - *Landscape Engineer* - Maryland State Roads Commission
Fred Burggraf - *Assistant Director* - Highway Research Board
C. N. Conner - *Senior Highway Engineer* - Public Roads Administration (*Chairman*, Department of Design, HRB)
Dallas D. Dupre - *Landscape Architect* - Ohio Department of Highways (*Coordinator* - D. 10)
George B. Gordon - *Landscape Architect* - Public Roads Administration
George G. Holley - *Landscape Architect* - Public Roads Administration
Wesley L. Hottenstein - *Chief Highway Forester* - Pennsylvania Department of Highways
Carl Izzord - *Associate Highway Engineer* - Public Roads Administration - D. 10
Dr. John Monteith, Jr. - *Committee Consultant* - Agriculture (United States Department of Agriculture)
C. E. Swain - *District Engineer* - Public Roads Administration - D. 10

RESUME OF INFORMAL DISCUSSION

The *acting chairman* (Mr. Neale) outlined in brief the high points of the technical discussion held at the meetings of State highway officials of twelve of the fourteen Public Roads Administration Districts, briefly as follows:

*Cross section:* The present objective of the roadside development program, in all regions continues to be the integration of basic rounded cross-section grading methods, as demonstrated by use of the special 1-percent fund into regular contract construction practice.

In several district meetings the point was made that proper rounded cross-section grading can be economically performed as a part of original construction contracts. As an afterthought to regular construction, such basic grading improvement is costly and often unsatisfactory.

1. J. V. McManmon - member - not present at executive sessions held at Hardman Park Hotel on July 27, 28, and 29, 1941.

The many advantages of flatter, well-rounded shoulder slopes are being recognized in all regions. The streamlining of the cross section is making possible the elimination of guardrail on lower fills, with attendant convenience in power mowing, snow removal, and other maintenance operations. A major result of removing guardrails also lies in increased traffic safety.

The key to successful rounded cross-section improvement lies in variation of slope ratios with changes in heights of cut and fill slopes. Original construction plans should provide for ground surfaces warped to increasingly moderate slope ratios at the lower points of cut and fill. (See *Typical Grading Cross Section*, sheet No. 1).[1]

The streamlined cross section is perhaps most valuable (in terms of dollars of maintenance funds saved per year) in regions of heavy snowfall. In States of the northern prairie region, as the Dakotas, Minnesota, Wisconsin, and Wyoming, for example, the streamlining of the cross section on the great part of primary highway mileage has resulted in estimated savings of thousands of dollars in a single season. A long mileage of highways formerly required heavy snow-plowing operations after every storm. With the rounded cross section and relatively flat slopes, little snow plowing is necessary because almost all drifting snow is blown clear of the traveled way.

Adequate cross-section rounding depends upon adequate right-of-way to meet design requirements. Adequate right-of-way can usually be secured at reasonable cost where the public understands the need for, and advantages of, the rounded cross section.

The need for conservation of topsoil during original construction operations was stressed in several district meetings. The chief value of such topsoil, it was said, may sometimes lie not in the high quality of such salvaged materials, but in the roots and seeds of native ground cover plants contained in such salvaged topsoils. Good loam from recently plowed fields usually lacks these valuable native plants.

It was believed that preliminary survey or field inspection by the landscape engineers is necessary before new highway plans are drawn up - if topsoil is to be salvaged; scenic values are to be protected by changes in alinement; appropriate parking or turn-out areas are to be selected; and if provision is to be made for advantageous disposal of surplus earth and topsoil during construction contracts.

No attempt should be made to obtain a grass sod cover under semi-arid climatic conditions, unless sod-forming grasses already exist in the locality. In fact, working with, rather than against, nature, is axiomatic.

Discussion of planting in median strips of divided highways brought out the fact that few types of ground cover plants, carried in stock by nurseries in the southwestern region, are considered suitable for such planting. (It

1. Page 62 - May 1941, Report by the Committee on Roadside Development, HRB.

is worthy of note that many of the native cactus, sagebrush, and rabbit-brush types should be ideal for low ground covers in divided highways and elsewhere provided that methods of transplanting or seeding these drought-resistant plants can be worked out by State highway departments of the Southwest.)

The need for a commercial supply of seed of drought-resistant native grasses for roadside seeding is emphasized. Many of our lawn types of grasses such as Kentucky bluegrass, red fescue, and the like are not well-adapted for turf production in dry regions, except for limited local areas and on dry, relatively sterile soils, in humid regions. The Soil Conservation Service is perfecting methods of harvesting some of these native grass seeds.

The whole problem of proper highway design depends for practical solution upon an intelligent policy of public education on the part of State highway departments. The 1-percent fund for roadside improvement must be considered as an important means of educating the public toward and appreciation of better highway design.

*Open discussion:* During the open discussion of important roadside development problems, the following points were brought out, indicating the interrelationship of turf and sub-base requirements. Mr. Aaron of the Division of Tests, Public Roads Administration, remarked concerning *soil tests*, that:

(1) The Division of Tests classifies soils mainly on the basis of a mechanical analysis as to the texture and size of particles. Such classification may have little or no relation to the ability of a soil to produce grasses or other vegetation.

(2) The Bureau of Agricultural Chemistry and Engineering, (formerly the Bureau of Chemistry and Soils) U. S. Department of Agriculture, classifies soils in accordance with texture as determined in the field. Each soil horizon or stratum is included in the analysis and classification system. The *A* or surface horizon is also analyzed chemically to determine inorganic and organic content. Chemical tests are difficult and time consuming. Tests for organic content are particularly so.

*Dr. Monteith:* The usual tests of agricultural soils involve determination of organic and inorganic chemical content. The objective of such tests is the finding of the element or elements which limit plant growth by their absence or possible overabundance in a given soil. The success of a test depends as much upon interpretation of information as upon the accumulated data.

Many of our present tests are only partially reliable, and there is very little correlation between the results of any one test and the ability of a given soil to support plant growth. More research is needed in this field.

The relation between a plant and the soil in which it grows can be compared to an assembly line in an automobile factory. A perfect car cannot be built if a single part is missing as the car moves down the belt line. If a single operation is retarded, production is delayed. In the same way if a slow-acting fertilizer is used in which nitrogen is not quickly available, turf production or plant growth is delayed.

To illustrate our lack of correlated knowledge, we added lime to the soil of a bent grass lawn in California. Bent grass is an acid-loving plant usually requiring (so we thought) a pH of 6 or less. But in this case, the lime increased bent grass growth even though the original soil had an 8 pH content. It is obvious that in this case soil acidity was not the controlling factor. The unknown factors keep the problem from being a simple one.

*Mr. Izzard:* In roadside seeding and sodding operations, there seems to be much less difficulty in growing grass in sandy soils than in loam or clay soils. Have we not made a mistake in using uniform seeding and fertilizer formulas? Should we not secure soil texture and soil fertility data and vary seed and fertilizer formulas accordingly?

With many grasses, soil texture alone is the limiting factor. Thus, for example, beach grass grows in sand dunes along salt water and will grow apparently anywhere inland where pure sand soils are found.

*Dr. Monteith:* Observation of local grasses and other vegetation will tell you what kinds of grasses you will have to use if you are to get good turf. Near Columbus, Ohio, for example, attempts to establish a fescue turf were unsuccessful. Columbus is in a bluegrass area. A formula of 70-percent fescue and 20-percent bluegrass, for example, resulted in a 90-percent bluegrass turf. The use of fescue seed under these conditions is a waste of time and money. We must work with nature. If we are breaking her principles, we are certain to fail.

In each locality there exists limiting factors which result in a predominance of certain grasses over others.

*Mr. Aaron:* The Division of Tests will be glad to cooperate with the State highway departments in grass seeding research. The Division is equipped for any standard soil testing likely to be needed. What we will want to know is what the landscape engineers are looking for as regards soil information. If you want to improve soil texture, we can tell you how to do that. If you want tests of soil pH content, we can give you these with recommendation regarding the correction of acidity.

Above all, we must know what soils and other materials are easily available in a locality, if our recommendations are to have practical value for application in the field.

*Mr. Hottenstein:* The accepted principle in roadside seeding is to work with nature in selecting grasses suited to existing raw soils. We cannot change the character of existing soil in a long mileage of roadside, but must select the right grass seed with a minimum of adjustment in soils for the sake of economy.

*Mr. Neale:* We find in Virginia that in each locality, no matter what combination of seed and fertilizer we use, certain native grasses tend to eventually take over the roadside. If we had proper soil analysis, we might add fertilizer and omit seeding altogether and still get a good native grass cover. The point is that without careful analysis of the relationships between soil, seed, and fertilizer, the existing species of grass may come in and take possession of the area, regardless of what measures we take. This existing native grass may or may not be of the type needed for a specific erosion control purpose.

*Mr. Simonson:* In our analysis of the roadside in terms of the different uses served by each part of the right-of-way cross section, we must begin with the surfaced road in the center and go outward toward the property line. The surfaced roadbed, the shoulder, the gutter or drainage area, and the cut and fill slopes are each separate and distinct but interrelated parts of the highway landscape development problem. Our research will proceed by trial and error to find out what soil changes or improvements and what seeds and fertilizers will be desirable, first on the shoulder, then on the gutter area, and finally on the backslopes. On much of our highway mileage in humid regions, the roadside from edge of surfaced highway to right-of-way line will be grass covered. It is logical that we start with the most intensively used area (the road shoulder at the edge of the surfacing) and work outward to the right-of-way line.

The shoulder-treatment problem will be solved first by securing a stable well-drained soil (by the use of available soil-amending materials). Where a grass sod is economical and practicable we shall want a turf covered shoulder.

*Mr. Aaron:* It is now regular highway construction practice, where necessary to mix in place whatever clayey, gravelly, and sandy soils are locally available in order to secure a stable subgrade and shoulder. The State highway departments could experiment with addition of fertilizers to these approved soil combinations as these are mixed in place. Our present soil surveys give us information on the relation between existing soils and the development of a stable subgrade and cut and fill slopes. At present, we receive no information which would give us a relationship between soils or soil mixtures and their ability to produce grass turf with or without the addition of fertilizers.

*Mr. Brant:* Experience so far indicates that a very simple soil classification would meet our requirements for roadside improvement. The 10 texture classes used by the soils engineers is something like what our needs require.

Mr. Levandowsky, a member of the Slope Erosion Subcommittee, tells us that climate is the main factor in soil classification. For practical final application, a simple classification of soils as clays, loams, or sands for each of the 3 main climatic regions, (cool humid, warm humid, and dry) may be sufficient.

What we need most is a simple classification of site conditions, which will include all factors such as climate, topography, soil, slope aspect, and the like. The landscape engineer is not equipped to make soil analysis, and we will have to show the soils engineer what we require. We must classify existing native grasses on each type of site. With such analysis of existing site and common existing vegetation, we will know what we are after.

*Mr. Dupre* pointed out that in lieu of such definite analysis the tendency in current practice is to seed very heavily as a precautionary insurance measure. Research here may make possible some real economies in present seeding rates.

*Mr. Izzard* stated that the type of grass cover needed depends somewhat on the portion of the cross section to be sodded. For example, a type of grass of great value in gutters or other channels is a tall growing sod-forming species that will bend over to form a sort of thatched soil covering. The stiff-growing bunch grasses are not as effective in preventing channel erosion. The low sod-forming grasses such as Bermuda grass or bluegrass are also effective channel surfaces, especially when they are green. This is an important consideration because most of the rapid storm water run-off that is most damaging occurs during late spring and summer months when vegetation is growing. In general, rainfall during fall and winter months in the North is no where near as intense. In northern climates, snow and frozen soil also tend to reduce erosion.

A sod gutter lining is very beneficial in holding down rate of run-off. The gradient of the gutter is also a most important factor in the control of water velocity.

The design of gutter cross section, should be controlled by the total area of ground surface from which run-off will reach the road and other factors influencing run-off. The amount of run-off from the highway area proper, is usually relatively small. The area of land off the highway from which run-off takes place is by contrast usually very large.

Experience indicates that the type of ground cover on these lands off the highway has an important effect on the design requirements of the gutter. Forested areas may have practically no run-off at all. Run-off from pastures or brush land is very moderate. From grass lands run-off is somewhat greater. Run-off from cultivated fields is much higher than from grass lands. In other words, gutters through forested lands will only have to carry surface water from the actual right-of-way. Gutters or roads through cultivated fields

require a larger cross section area since run-off will be many times greater, other conditions being equal.

*Mr. Conner:* On steep grades, gutters may require special erosion control treatment. Concrete and masonry ditch checks have been used but are difficult to build and maintain. Sodded mound ditch checks are usually preferable. Use natural methods as far as possible. Sod in gutters tends to reduce the velocity of water and very wide, shallow gutter design may obviate the need for ditch checks. General rule adopted is that structural methods of soil erosion control should only be used as a last resort.

*Dr. Monteith:* Answering questions regarding the effect of mulching on various types of soils said:

> "The practice of mulching is quite important in handling raw soils. For instance, heavy clay soil with a well-developed structure can be worked up with plow or harrow much better than soil with poor structural development. Similarly, mulching makes a soil much more tillable or workable.
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> "Surface water running over bare clays and other (sandy-clay) soils tends to seal the natural pores in soil surfaces, producing a 100-percent run-off. Mulching stops this sealing action and retains soil porosity, allowing water to penetrate.
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> "Mulching reduces surface evaporation and keeps soil moist and pliable.
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> "Mulches retard freezing and thawing.
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> "Mulching stops run-off by absorbing surface water."

Dr. Monteith concluded that simple tests should be made on different types of subsoils to see how much we have to do in the way of working in organic materials as a soil corrective to promote grass development. Tests are needed also to determine organic plant nutrient requirements.

Different grass species and mixtures, with different kinds and amounts of fertilizers could be tested out on each typical soil problem. Where soils of favorable texture are available, the building up of plant nutrients is comparatively low in cost. A field test method of determining minimum seed and fertilizer requirements in each soil type should promote more efficient roadside practices in each State. A cooperative research demonstration program should aid in the continual improvement of highway specifications covering these purposes.