to 10 gallons per square yard with an average of 6.7 gallons per square yard; for block sodding, 5 to 18 gallons per square yard with an average of 13.2 gallons per square yard; for mulch sodding, 30 to 200 gallons per cubic yard with an average of 76 gallons per cubic yard; for grass retards, 30 to 300 gallons per cubic yard with an average of 81 gallons per cubic yard.

It will be noted that there is a great variation in the amount of sprinkling estimated. In normal seasons, two inches of rainfall is ample to support grass provided it comes at the proper season. As sprinkling may be done when desired, it is suggested that the quantity be estimated on the basis of a two-inch application which is approximately 11.5 gallons per square yard.

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DISTRICT 14 GROUP MEETING – SPARTANBURG, SOUTH CAROLINA

F. H. BRANT, *Coordinator*

(North Carolina, South Carolina, Virginia, West Virginia)

MARCH 25-26

1. ROADSIDE GUTTERS - Because of ease of construction with modern equipment, it is more feasible to design a *V*-type roadside gutter (ditch) instead of showing a flat-bottomed or rounded gutter on project plant. Although thus constructed, angular and with sharp lines of demarcation between the shoulder, gutter, and backslope, the entire cross section can be "rounded" by harrowing and dragging during subsequent seeding operations without any additional excavation being involved. That is, provided the proper class of *V*-type gutter is originally constructed. From the standpoint of erosion control there are three classes of *V*-type gutters.

(a) *Having an angle of less than approximately 120 degrees.* With an angle this sharp there is little use in attempting the establishment of grass cover. It should either be maintained as a bare, machine maintained ditch, or improved by some method of paving.

(b) *Having an angle of approximately 120 to 145 degrees.* A transition class where grass cover might be accomplished under favorable conditions. A frequent type of section which would fall in this class is the case of a relatively flat slope from shoulder to gutter, say 4:1, on which grass cover is possible, and a steep backslope, say 1:1, where vegetative cover is generally difficult and, if established, could not be mowed.

(c) *Having an angle of more than approximately 145 degrees.* This class is adaptable to being made into a rounded gutter

on which it is possible to obtain, maintain, and mow a grass cover throughout front slope, gutter, and backslope. (Both sides 3:1 or flatter.)

Therefore, although a *V*-type gutter is recommended because of ease of construction, it should be clearly understood that class "b" is necessary for partial grass cover and class "c" is necessary for complete grass cover.

It was brought out in the discussion that, if it is planned to round out the point of the "V" and not maintain it as a bare ditch, care must be taken to see that tne original design of the "V" ditch is deep enough to allow for this rounding so that when the rounded gutter has been completed and covered with vegetation it will still have sufficient depth to properly drain the roadbed.

2. CLASSIFICATION OF CUT SLOPES - In discussing vegetative treatment of cut slopes, it is desirable to divide such slopes into three classes.

(a) *Light cuts up to 10 feet,* where a backslope of 3:1 or flatter is possible, and where the cut is through soils of *A* or *B* horizon. In cuts of this class it is possible to establish and maintain shallow-rooted pasture-type or lawn-type grasses and legumes.

(b) *Heavy cuts more than 10 feet,* where the backslope is 2:1 or steeper, and where the majority of the soil of the cut is of *C* horizon. In cuts of this class, shallow-rooted grasses and legumes can seldom be maintained, even if established. Deep-rooted plants are needed to stand up under frost action and scarcity of plant food and moisture. The "naturalization" of such cut slopes by means of mulching, seeding, and volunteer growth of indigenous plants is recommended. Such treatment is particularly simple and economical in undeveloped wooded areas, where natural seeding and volunteer growth results from the abundance of existing plant growth above the cut slope.

(c) *Mixed cuts of 5 feet to 30 feet,* where soil is predominately *C* horizon, or where backslopes must be kept steep because of local conditions. In this composite class, as in the "heavy cut" class, deep-rooted plants are needed. In this class are frequently found moderately high, steep cut slopes in cultivated areas where "naturalization" is not possible or feasible. In such situations, deep-rooted legumes such as kudzu, sericea Lespedeza, and white sweet clover are desirable. These, of course, do not constitute a complete list but are indicative of the type of ground cover suggested.

3. TOPSOIL - It was the unanimous opinion of the group that much money has been and is being wasted for so-called "topsoil" which has no value for

establishing vegetative cover. Much of this is subsoil, although considered suitable because it has a "topsoil" color or because it is the type of soil which engineers would consider as suitable for topsoil surface courses. In many other cases topsoil is obtained from worn-out cultivated fields. Emphasis should be placed on the need for soil containing numerous seeds and roots and which is biologically active. There is much more value in a thin layer of this soil, plus proper mulch, than in 3 inches or more of sterile topsoil which must be treated and improved just as thoroughly as subsoil in order to be of value in the establishment of vegetative cover. Even mulch alone is preferable to some of the so-called "topsoil" being used. It is to be clearly understood that the practice of using topsoil is not being condemned. It is not abandoning the idea of using topsoil to aid in establishment of vegetative cover where the proper type of topsoil is economically available; however, more care should be taken in the selection of topsoil, and if the proper kind is not available, the existing soil should be "built up" into topsoil by means of fertilizer and organic amendments.

4. "SLICKING" OF SLOPES - There was unanimous objection to the slicking or sandpapering of slopes during original construction. On an area as large as the usual cut slope there is a difference between it being uniform and being smooth. The slope should, of course, be uniform, but the slope surface should be left in a rough condition and not shaved and patted with hand tools to a slick surface, which not only costs more but also aggravates erosion and makes the establishment of vegetative cover more difficult. For ordinary seeding, the slope area must be loosened up into a satisfactory seedbed anyway, and if topsoil is applied it is necessary to have a roughened surface to which the topsoil will bond. In "naturalization" the rougher the surface of the slope the more chance there is for natural seed to lodge and grow on the slope. Therefore, both the cost of construction and cost of vegetative treatment can be reduced by putting a stop to the slicking of slopes.

5. GRASS SHOULDERS - Grass shoulders that are equal to grass covered backslopes cannot be obtained, or at least cannot be maintained, in many locations. On backslopes it is just a question of learning and using the proper methods of establishing vegetative cover. On shoulders, however, there are many additional factors involved, some of them working at cross purposes. Traffic on shoulders frequently tears up established grass cover. Grass shoulders require moisture and yet on the other hand moisture is not desired so close to the paved surface, and ditches and gutters are used to drain moisture from the roadbed area. A tendency for grass shoulders to "build up" over a period of years frequently interferes with proper drainage of water from the paved surface to the ditches or gutters. As the practice of subgrade stabilization becomes more widespread, there is a question as to whether it will be possible at all to obtain grass on the porous type of material which would be used for subgrade reinforcement. There are probably many places in which grass shoulders can be economically established and maintained, but it should be realized that if grass shoulders are desired it will be necessary to have optimum

conditions of soil, moisture, and maintenance before grass shoulders can be fully satisfactory.

6. EQUIPMENT - In the discussion of maintenance of roadside vegetative cover by mowing, it was pointed out that there was no need to base methods of establishing vegetative cover upon equipment now available for proper maintenance. In other words, if the most effective methods receive widespread use, it is almost a certainty that equipment will be changed to meet new mowing problems as soon as the demand is great enough.

7. SEEDING EXPERIMENTS ON SUBSOIL - In discussing some experimental work on seeding and fertilizing on subsoil, it was pointed out that there is considerable difference between raw subsoil that has been excavated and placed in a fill and raw subsoil that remains in its original location on a cut slope. Experiments may more easily be conducted on the raw subsoil in a fill, but the results of these experiments should be checked on undisturbed raw soil on cut slopes before they are finally recommended as the best solution for the particular type of raw subsoil.

8. FERTILIZER - There is a large field for improvement of fertilizing, varied to meet the variable conditions of roadside soils and subsoils. It is thought that landscape engineers should make more use of the services of soil testing laboratories in their States to determine the exact analysis of fertilizer that is best suited to varying soil conditions. It seems that there is also much chance for improvement in checking upon the origin of fertilizer ingredients and obtaining fertilizers which have as great a percentage of organic sources of ingredients as is economically feasible.

ADMINISTRATIVE PROBLEMS

1. DEFENSE NEEDS - It was pointed out that in addition to the increased need for wider shoulders for parking, particularly on highways of the Strategic Defense Network, there is equal need from a defense standpoint for making it easy for military traffic to get off of the highway entirely. This defense need fits in perfectly with the roadside development principle that front slopes and backslopes be flat and the gutter area rounded. Such a section, while being safe, attractive, and easy to maintain, now can serve an additional purpose of allowing free movement of military traffic from the highways to adjacent lands. The increased shoulder traffic predicted for defense highways is another reason, in addition to those discussed in paragraph 5 above, for giving careful consideration to all factors before attempting to establish and maintain grass shoulders universally.

2. EXPERIMENTS - There was a discussion of the desirability of leaving P. S. & E. for roadside development projects flexible enough to permit changes in seeding and fertilizing and other erosion control measures even after P. S. & E. had been approved and construction work started. In this way

roadside development projects could take full advantage of new ideas and experiment with a large number of erosion control practices which might be found desirable during construction but which had not been anticipated at the time plans were prepared. It was concluded that such relatively mfnor changes in plans and specifications could be handled without individual approval by the Public Roads Administration provided that the plans as originally submitted indicated that such experimental work was to be done and provided that a very complete and accurate record be kept of the changes that were made and of the reasons for such changes.

3. MAINTENANCE OF PLANTINGS - Again this year it was pointed out that there is still considerable room for improvement in the maintenance of roadside projects, particularly plantings that have been made. If the plantings were worth making in the first place they certainly are worth maintaining, and more attention should be given to proper care of plantings, as well as proper maintenance of roadside ground cover.

4. FEDERAL-AID ROADSIDE IMPROVEMENT FUNDS - There was considerable discussion, without definite conclusions, of the proper use of the 1-percent roadside improvement funds. Originally, because roadside work was new and there was need for purely demonstration projects, these funds were used for moving considerable quantities of earth without question, since it was necessary to demonstrate a proper cross section as well as demonstrate erosion control and planting. Maintenance cost largely determines the selection and use of plant materials and roadside practices.

The summary of the 1940 group meeting reported the consensus of the group to be as follows:

"While construction and roadside improvement work should be very closely integrated, it is impossible to draw a hard and fast line as to what is construction and what is roadside improvement. However, it can be stated in a very general way that moving of large quantities of earth for the primary purpose of shifting the ditch line or flattening cut slopes is not a proper use of the 1-percent roadside improvement funds. This very definitely does not mean that no excavation should be handled with roadside improvement funds, because there are many cases where transition of slopes at grade points and additional rounding of the top edges of cut slopes are highly desirable and not easily obtained by contract methods at the present time. Another general separation can be made on the basis of seasonal and nonseasonal operations: the nonseasonal operations being construction and the seasonal operations (concerned principally with vegetative treatment) being considered roadside improvement."

At the present time there still remains some question as to the exact uses to which this special 1-percent fund may be put and since there seems to be a variation in practice in the various States it would be highly desirable to clear up this situation as soon as possible.

SOIL CLASSIFICATION

There was not sufficient time at the meeting to enter into a discussion of a soil classification that would be particularly applicable to highway erosion control work. This subject will be fully discussed at a later meeting, but since there is a divergence of opinion concerning the basis for such a classification, a brief description of each of the two points of view are given below. These descriptions are of course the brief summary of the problem as seen by the coordinator alone, and are not to be considered a consensus of any group or committee. The two points of view are included here merely to facilitate later discussion.

CLASSIFICATION 1 - The basic consideration would be soil texture, similar to the ten classes (sand, sandy loam, loam, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, clay, silty clay) forming the Classification for Subgrade Soils. Then into such a basic classification would be incorporated the factors or erodibility, productivity, and organic content of soils.

CLASSIFICATION 2 - For topsoil and immediate subsoil (horizons *A* and *B*) the usual classification by soil type would be used. For "raw-soils" (horizon *C*) the basic consideration would be climate; divided into dry, cool humid, and warm humid climates.

Under each of these climate groups would be three general texture classes; clay raw-soil, loamy raw-soil, and sandy raw-soil. If necessary, a further breakdown would be made on the basis of soil origin, such as limestone clay raw-soil or shale clay raw-soil.

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PROGRESS RECORD OF 1941 PROGRAM FOR DISTRICT MEETINGS, MIMEOGRAPHED COPIES OF 10-PAGE REPORT, WERE DISTRIBUTED TO ALL COORDINATORS AND TO ALL DISTRICT ENGINEERS OF THE PUBLIC ROADS ADMINISTRATION FOR THEIR USE AND CONVENIENCE IN FURTHERING THE CURRENT PROGRAM OF THE COMMITTEE.

APRIL 25

This memorandum was a report of progress for the first quarter containing summaries of district meetings reported to that date. Also included were references on safety turn-outs, with Committee recommendations that roadside turnout facilities generally be limited in size for simple wayside development at selected spots as may best be indicated by the particular local site conditions and traffic requirements. For detailed information refer to the 1938 Report (issued January 1939) by the Joint Committee on Roadside Development (HRB and AASHO). In the *Appendix to the Report of Subcommittee on Highway Types and Roadside Areas* (pp. 39 to 44) a digest regarding "safety turn-out" areas is summarized.

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