

HIGHWAY RESEARCH BOARD  
REPORT OF THE COMMITTEE ON ROADSIDE DEVELOPMENT

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"Roadside development must conserve, enhance and effectively display the natural beauty of the landscape through which the highway passes, as well as provide safety, utility, economy and recreation facilities by means of proper location, construction, and maintenance of the highways." That statement was made by the first Committee on Roadside Development in 1932. For eighteen years, your Committee has endeavored to mold its program on this premise.

The reports of the annual and special meetings of the Committee, as well as those of Coordinators' Meetings, portray the constantly increasing and widespread interest in, and appreciation of, well-organized Roadside Development programs. These programs cannot be confined to the highway, but must reach out as far as the eye sees from the road.

The "complete highway," as outlined by the Committee in 1943, requires the integration of every phase of Roadside Development into highway construction, from the original reconnaissance and location, through the design, construction, and maintenance.

Although our reports may seem complete, we have reached very few conclusions. In 1939, for example, we published what was termed a final report on erosion. Since that time, we have learned more on this subject and are continuing to add to our knowledge. We now feel that the time has come for us to condense all of the material in our reports covering nearly two decades of activity. Some of this data may seem outmoded, due to changing conditions brought about by mechanical processes made possible by modern equipment. The principles of good roadside development still hold. For example, the flattening and rounding of slopes once involved high cost hand labor. Today, slopes are rounded with motor-operated grading equipment at much lower costs per yard.

These streamlined cross sections permit great savings in costs of mowing, erosion control, snow removal and other maintenance. Easy side slopes and rounded gutters also prevent many accidents, when vehicles are forced to leave the roadbed. The old steep slopes and V-ditches are by comparison a hazard to traffic.

Today these roadside improvements are part of the design of primary highways in every State, wherever adequate right-of-way for streamlined cross-section grading can be obtained.

In order to bring together and condense our reports and experience gained in all areas through recommended roadside practices, the Committee has instituted a Five-Year Program, which we hope and expect will culminate in the preparation of a Manual on Roadside Development. In this we need the cooperation of everyone engaged in highway operations. Every highway engineer naturally feels that his particular field is the most important. But a highway is like a machine -- each part is dependent upon every other part if it is to function properly. Some parts may not seem absolutely essential. Paint will not make the machine run

better, but it will lengthen its life. A good lawn does not make the home warm or furnish any food, but it helps to make the house a home. So it is with developed roadsides, waysides, and other items included in a roadside development program that go to make up the "complete highway." Wherever roadside development practices will reduce maintenance operations and costs, the highway dollar can do more to improve and develop both the Primary and Secondary Highway Systems. It is with this thought in mind that we appeal to each and everyone to lend us a helping hand during this five-year period, in order that the proposed Manual may be as sound and complete as possible.

**TURF SHOULDERS.** Last year we devoted our attention primarily to the subject of stabilized earth shoulders with turf cover. A separate report was published, furnishing reference material on this subject. We know that turf checks erosion on shoulders and presents a pleasing roadside effect. But we do not want to camouflage with turf a soft earth shoulder that is not stable enough to safely support the traffic using it in emergencies. We have found that turf can be established on stabilized shoulders. But we need more data on what is required from the standpoint of shoulder stability. This is a matter for the Soils Department to determine. We also need more data on the maximum allowable pitch or cross slope on a shoulder, a subject for review by the Traffic Department.

Another problem involves the treatment of that portion of the shoulder adjacent to rigid and non-rigid pavements. Where traffic lanes are narrower than 12 feet, turf will not stand up under heavy use by traffic of the shoulder area next to the pavement. Surface water tends on grades to flow down the side of the pavement and form ruts in unprotected earth surfaces. We feel that project committees dealing with pavement design, especially that of rigid pavement, should give serious consideration to protecting the edge of the pavement with a stable but flexible surface material that will carry the water from the pavement to the turf without erosion damage. Whether this would be six inches or two feet wide may depend on the width of the pavement and the grade. We will continue our research on this subject with progress reports each year through 1952, and devote our section in 1953 to the final discussion of the material for the Manual.

**ROADSIDE DRAINAGE AND GRADING.** This year our main topic of discussion is "Roadside Drainage and Grading." We are most concerned with the adaptation of graded earth slope and gutter sections to local conditions of climate, soil, and topography. The States of every region are beginning to evolve typical graded cross sections to meet such conditions. We feel that special studies are necessary to determine the value of rapid run-off of surface water as compared with retaining and conserving the water on road slopes. In some cases, rapid run-off without adequate protected gutters and drainageways causes damage to the highway as well as properties below it. Retarding the water and allowing it to seep into the soil should encourage rapid growth of vegetation. With the present water crisis more consideration must be given to the retention of ground water and the maintaining of a normal water table, which, in many cases, is lowered through the development of steep roadside cuts. These subjects will be given further study by the special committee appointed to handle the roadside drainage problems.

**ROADSIDES.** Our second session consisted of a panel discussion on the subject of development of the area between the drainageway and the right-of-way line, as well as medians in divided highways. This will be the chief topic of discussion at our next Annual Meeting in 1950.

Erosion control is the most important phase of this subject. Methods of establishing vegetative covering on cut and fill slopes have been improved in the last few years. It has been found that mulching slopes immediately after grading prevents surface erosion and keeps the soil from drying out. Modern methods of spraying seed and fertilizer under or over mulch have been one means of eliminating costly topsoil. They have reduced the cost of seeding and fertilizing operations on slopes where normal vegetative cover is so essential. Further research will be made in selections of better grass and legume seeds, mulches, topsoils, fertilizers, and ground covers.

Another subject of vital importance at this time is the elimination of headlight glare by improved grading design of median strips in divided highways and by appropriate planting of trees or shrubs in medians. In medians narrower than about 25 feet this problem of glare may be acute. In wider medians and where opposing traffic lanes are on different levels, headlight glare is largely eliminated. Safety, economic and aesthetic problems are involved here.

A problem of growing importance concerns the effects of herbicides or weed killers used to eliminate noxious weeds or undesirable roadside vegetation. Damage to crops and gardens has resulted where herbicides were used by inexperienced operators. The Committee recommends that State Agricultural Experiment Stations be consulted before too general use is made of these materials. New types of insect sprays containing DDT fall into the same category. Some of these herbicides and insecticides are deadly to domestic stock and to wild life.

The selective thinning of roadside trees, together with the care and planting of trees for shade and protection from sun glare, for the framing of views, for traffic guidance at interchanges, traffic circles, et cetera, will be given special attention. Consideration will also be given to tree clearance for public utility pole lines along and bordering highways. An endeavor will be made to develop basic principles of grading and planting design to meet various regional and traffic requirements. This panel will be handled in the form of general discussions on the various subjects. An endeavor will be made to find out what is being done in various sections of the country, and to what extent our previous reports are fulfilling the requirements or what further research is important at this time.

**REST AREAS AND TURNOUTS.** At another panel discussion, we covered the questions involved in development of wayside or roadside parks, roadside parking, wayside springs, historical markers, et cetera, and other elements of roadside design that promote the safety and comfort of the traveller.

**BORDER CONTROL.** At a joint session with the Committee on Land Acquisition and Control of Highway Access and Adjacent Areas, border control measures were discussed. This subject will be given priority during the fifth session

The committee is still undecided as to whether to recommend rolling as a means of controlling shoulder build-up. It was pointed out at yesterday's business meeting that Ohio, Kentucky and New Jersey have rolled soil shoulders to put them back in shape after heaving by frost or swelling by moisture. We are withholding recommendations of this practice until more is known concerning the effect of rolling on all types of shoulder soils and under varying highway traffic conditions.

The question of where to use stabilized earth shoulders with turf cover is properly a problem for the Project Committee on the "Influence of Shoulders on Traffic Operations" of the Department of Traffic and Operations. A progress report is being given to the Highway Research Board by that committee this year.

Mr. Steele of the Civil Aeronautics Administration in Seattle, has sent the committee a paper in which he states that the C.A.A. has recently issued orders that runway and taxiway pavement be omitted where soil conditions and turfed surfaces will permit safe operation of planes without such paving. He quotes the following information:

Construction costs are much less for turf surfaces—\$50 to \$75 per acre for turf establishment, whereas bituminous surfacing would run from \$4,000 to \$15,000 per acre. Maintenance costs of turf are only a fraction of the cost of maintaining and repairing bituminous surfaces.

Mr. Deakin of New Jersey tells us of contracts for construction of 10 miles of stabilized soil shoulders with turf cover, similar to those reported the past two years in that State. We do not have the specifications but prices on some 72,000 square yards of shoulders of stabilized soil with an established turf varied on three contracts between \$1.06 and \$1.70 per square yard.

The value of our committee's work will be significantly increased by contributions of reports from the important soil and climatic regions of the United States. The committee hopes to obtain such reports and by integrating them with reports already made produce a final report within three years.

#### DISCUSSION

Mr. Simonson: Mr. Iurka, in your collaboration with the Traffic Safety Committee, has there been any discussion or question as to the one-inch pitch of the shoulders which the committee has generally considered desirable for the turf type of shoulder?

Mr. Iurka: We have nothing further to report on that question. Those of you who have shoulders that are steeper than that could help by giving us that information.

Mr. Brant of North Carolina: It seems strange to me but recently most comments that come to me are about turf shoulders and are on the matter of build-up rather than stability. You would think people would be more interested in stability but it doesn't seem

to work that way in our State and they are very much concerned about the effect of build-up or drainage and moisture on pavements. From my standpoint, that matter of build-up which your committee is handling is quite important at the moment.

Mr. Iurka: I think, Mr. Brant, you stated that originally as being one of the important problems and we recognize it as such.

Mr. Garmhausen, I should like to know from you whether your treatment of rolling is used in Ohio, throughout, regardless of soil type.

Mr. Garmhausen: I should say "no." It depends upon the soil. Where we have build-up not correctible by rolling, we do not roll. We try to overcome the build-up by having a drop in the grade of one inch at the edge of pavement hoping that will be enough so that over a period of years the build-up will not be higher than the road itself. We have tried various ways of getting away from build-up and one of the successful ways has been by using a rotary broom on the sod to remove sand and cinders applied under pavement icing conditions in winter.

Mr. Iurka: We do not have answers yet as to what causes shoulder build-up although Mr. Deakin's report last year has indicated the major cause of the build-up of some soils of New Jersey. What is the weight of the rollers that you use, Mr. Garmhausen?

Mr. Garmhausen: Two to five tons -- width is from 4 ft. upwards.

Mr. Iurka: Can anyone add information on this?

Mr. Slack: Mr. Chairman, about rolling I cannot add anything, but we have a one-inch drop on our pavement and we have not found it hazardous. Our shoulders are cut down by disc and drag, a method we use to keep from destroying the present Bermuda grass. This is followed by a light rolling to make the shoulder smooth and safe to use. If the build-up is very high, however, the turf is bladed off to edge of shoulder, the shoulder graded, and the turf then bladed back onto the shoulder and rolled.

Mr. Iurka: Mr. Mott last year, and Dr. Skrdla this year, reported good turf at soil densities up to 152 lbs. per cubic foot. If turf can grow at that density, you in the field ought to be able to grow turf at a density generally obtained in practice, that in turn may present certain maintenance problems, that may increase costs, and it may come to the point of comparing maintenance costs with desirability of rolling as maintenance practice.

Mr. Gordon: You may recall in Mr. Finney's report of last year he said that in parts of Michigan where they have granular type of soil the problem was to build up the shoulders after they had subsided. In other words, it was a reverse of the usual problem of build-up on shoulders with fine type of soil (clays, silts, etc.)

Mr. Iurka: One of the gentlemen from Michigan at the meeting yesterday reported that in the fall there was ...that problem of subsidence of some materials, that this may be related to gradation of the material. Mr. Finney's report next year will include a study of this problem.

Mr. Gordon: We noted in Maine where we had gravel shoulders there was always the problem of shoulders subsiding rather than building up.

Mr. Iurka: Has subsidence of the shoulder been noted in Indiana where crushed limestone has been used in shoulder stabilization?

Mr. Skrdla: We have seen no record of it.

Mr. Wray: The Design Department has committees on both rigid and flexible pavement design. They should be asked to cooperate in study of the relationship between road pavements and the shoulder. Some form of transition other than stabilized soil may be of advantage as a safety measure. Anything your committee can do to improve the safety of this zone where pavement and shoulder join will have great value. You have heard of Dean Marston's death caused by a shoulder rut. These rutted shoulders next to the concrete slab seem to be the most dangerous thing along our highways. Do you want the two pavement committees to investigate and find ways to fit the slab and shoulder together?

Mr. Iurka: That is an excellent suggestion. We need the cooperation of the other Departments of the Highway Research Board. We have had the cooperation of the Department of Soils through Mr. Allen and of the Department of Traffic and Operations through Mr. Taragin. We would appreciate the cooperation of the two pavement committees.

Mr. Taragin of the Committee on Influence of Shoulders on Traffic Operation pointed out yesterday that 50 percent of our pavements are of such a narrow width that vehicles, particularly trucks, of necessity run off on shoulders. Where that occurs we cannot have the turf shoulder, because as you know, it is for occasional use only. Michigan has volunteered to carry on a study this coming year to offer some answer to that problem which will involve a transition strip.

Mr. Simonson: I was shocked when I learned of Professor Emeritus Marston's death from that accident. Possibly Mr. Wray can answer this point, which is very pertinent to a clear understanding of the shoulder problem. He just hinted upon it but I think it could be emphasized a little more. Mr. Wray, in the accident where the rutting occurred, do you happen to have a record of the width of the pavement, whether it was of adequate width or limited width of old section of highway?

Mr. Wray: I haven't seen the detailed reports on that, only a newspaper account and it was an earth shoulder and concrete pavement 18 ft. or 20 ft, probably.

Mr. Simonson: For our modern traffic needs we now recommend traffic lanes to be 12 to 11 minimums with 10-ft. lanes on secondary roads. When shoulders are discussed are we talking of the pavement or of the shoulder? I believe this committee, Mr. Iurka, has always held that when we are thinking in terms of turf shoulders it is assumed that there is an adequate width of pavement. That leads to the second point, the point you asked about. The transition idea toward a surfaced type of shoulder is naturally in order. You are actually developing a composite design. It is for the purpose of serving traffic movement adequately. The specific definition of the purpose of a shoulder is for occasional traffic and emergency use only. This must be made clear to everyone giving thought to the shoulder problem. I think we have a great deal of confusion from the articles we read and opinions expressed because the purposes of shoulders are not made clear. When engineers say that turf shoulders have no real value compared with surfaced shoulders they may be thinking in terms of the system as a whole where they now have 95 percent of the mileage built with inadequate widths of pavements. As the records show, much of the State highway surfacing is inadequate in width for travel today. Therefore, this is not a shoulder problem in such cases, but is really a pavement-widening problem.

Mr. Conner: Mr. Simonson has advanced the point that our objective is this: We have a lot of highways on our hands that are inadequate as to width of pavement and shoulders.

Some highways have narrow shoulders, others have shoulders at intervals, and still others have no shoulders at all. There should be more study on all types of shoulders including turf shoulders, soil shoulders, gravel shoulders and paved shoulders. There is also need for more information on the geometrics of shoulders, including those on large viaducts and expensive expressways or parkways such as the Henry Hudson Parkway in New York. On that parkway no shoulders were constructed originally but they have recently been added at intervals, to provide parking space for disabled vehicles off the traveled way. Until this was done disabled vehicles frequently stopped on the traveled lanes with resulting serious congestions and attendant hazards.

Mr. Neale: Mr. Iurka, for the benefit of those who were not here when we started, the committee deals entirely with turf shoulders. We started with a study of the specifications of the various States to find out to what extent earth shoulder material was specified. From what little indication was given the shoulders seem to be the "no-man's land" for the contractors to fill up the shoulders with concrete left over and then the engineer says "put a little grass seed and some fertilizer out there and we will have a good looking roadside." Well, we did that in placed to our sorrow and found that it just didn't work. We got neither a firm shoulder nor a good turf cover. We want the Design Department, the Soils Department, the Traffic Department, and the Operations Department to tell us what basic things they want on the shoulder for stability and safety and then

let us work out the problem of getting turf on the shoulder. We do not want to be a party to camouflaged shoulders. It is on that plan we are making this study.

Mr. Simonson: Mr. Iurka, on that point that Mr. Wray mentioned about transition, Mr. Deakin last year described a transition type of shoulder on the New Jersey test project on which the bituminous surfaced transition strip was 3 or 4 feet wide.

Mr. Iurka: Of course, that is a matter of economics. On the lower capacity roads perhaps we will never get that transition strip. However, as the gentleman from Michigan pointed out, use is the real indicator.

Now I wish to introduce Dr. Willis Skrdla who has recently completed his thesis "The Establishment and Maintenance of Turf on Stabilized Granular Materials". We must watch for publication as the part you will hear now is just about half of the entire paper.\*

\*Dr. Skrdla read his paper, using colored slide illustrations during the discussion.

Mr. Neale: Thank you very much for this presentation, Mr. Iurka, and also Dr. Skrdla. There has been one question put up here that I would like to have the committee consider. That is the edge of the shoulder of descending grade on rigid-type pavement where the water wears away a rut which is a problem in many States. We are a bit over our time but I think our discussion has been well worth while.

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\*Thesis was published by Purdue University, West Lafayette, Indiana.