EFFECTS OF ROADSIDE DEVELOPMENT ON HIGHWAY MAINTENANCE COSTS

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We are all fully conscious of the critical financial situation faced by all the states in attempting to provide more adequate highway facilities and to maintain the present ones. Funds have not become available as rapidly as the demands of highway transportation and basic prices have increased. And because maintenance costs, along with everything else, have continued to increase and take greater and greater portions of the total highway funds, it is quite natural that each of our highway activities affecting maintenance costs comes in for a searching review. First, is the activity essential? If it is, is it being performed in the most economical manner from the standpoint of both initial and continuing costs? These are questions which must be answered by all of us; and those responsible for roadside development activities will have to present the picture for that phase of the total job.

You can be sure that any roadside development activity which can be shown to promise greater efficiency and economy in the total highway maintenance will be enthusiastically received by the administrative heads of highway departments. Conversely, such activities as tend to increase the cost of maintenance are bound to be subject to careful scrutiny to determine their necessity from the standpoint of safety, efficiency and driver service before they are accepted as component parts of the highway program.

Unquestionably, there are a number of roadside development practices which fall within the first category, as well as others which may be classified in the second.

As one greatly concerned with out financial situation and tremendously interested in every possibility for increasing the efficient and economical execution of a highway program, I shall review briefly some of the major phases of roadside development, primarily in the light of their effect on highway maintenance, and try to raise some questions.

Roadside Elements in the Modern Streamlined Highway

Quite properly, great credit is given to the landscape engineer for his contribution to the design of the modern highway. Through his efforts, in part, have evolved the wider rights-of-way allowing for streamlined cross-sections with flat, well-rounded slopes; wide, shallow drainage ditches; and carefully graded roadsides--certainly vast improvements over the designs of former years from the standpoint of safety, increased driver service, and appearance.

As a result of the streamlined cross-sections, roadsides can be readily established in turf or other ground cover, thus immediately eliminating or greatly

reducing erosion. In some sections of the country this kind of highway acts as a deterrent to drifting of snow. And with flat slopes, much of the need for guide rail is eliminated. It is recognized that these items are factors in lower maintenance costs. However, wider rights-of-way and flatter slopes may increase the initial cost materially. And there may be increases as well as reductions in maintenance costs. Wider rights-of-way increase the acreage to be maintained. Unless the unit cost can be sharply reduced, the total roadside maintenance will be greater. What, in the end, are the monetary values associated with the roadside elements in the streamlined highway--both savings in maintenance and increased initial cost? Do these values justify the greater capital investment which goes into the modern highway?

Wider rights-of-way have led to the development of highway refinements and even the provision of recreational facilities. Turnouts, picnic areas, and extensive plantings appear to be logical components of the modern highway. We know they represent contributions to the safety, convenience, and pleasure of the motorists. Nevertheless, they most certainly increase the overall maintenance cost appreciably. Just what are they costing us in relation to the service provided? Can we demonstrate positive safety values? Can you show off-setting savings in other maintenance operations because of these so-called refinements?

Progress in Mechanization of Operations

A fine job is done in establishing turf on roadsides and slopes, but what about its cost? Excellent progress has been made in the development of machines for turfing operations to eliminate costly hand labor. But there is, no doubt, more to be done in mechanization. And what about the choice of seed mixtures? Could different mixtures produce a satisfactory turf which would require less mowing? What about seed rates? Could we get by with less seed? Are the rates for both initial and subsequent applications the most productive and economical? Are the mulching materials and methods unnecessarily costly?

Is there any practical alternative to turf as a ground cover? Mowing has become a very sizeable item in our maintenance budget. And even though extensive use is made of power equipment, increased areas, subject to mowing, work against such efficiencies as have been developed. Are there experimental roadside developments which use other plant materials than grass for ground cover? What are the limitations on other materials that have deterred usage, and can these be overcome?

It appears to be common practice to locate isolated shrub plantings along the roadsides and median strips. Presumably, these plantings are functional--possibly installed to denote the approaches to intersections, block out opposing headlight glare, or screen unsightly objects from the highways. If so, they are certainly justified. Nevertheless, such scattered plantings do impede mowing operations. What can be done to remedy this? Is it possible so to group the plantings that, for the most part, they will not interfere with the continuity of mowing?

There likely is no one opposed to trees along our highways. They are essential in most areas if our highways are to have beauty as well as utility. But

here again, isolated trees impede mowing operations, and their planting must be well justified for some important function, and the choice of varieties such as to minimize subsequent maintenance. On many of our rural highways, nature has generously endowed our roadsides, and the problem becomes one of restrained tree care to preserve aesthetic value and insure safety.

Savings in Maintenance and Overall Highway Economy

Associated with mowing is the disposal of cut material. This may be just as big an item as the mowing. And, to me it appears there are great possibilities for increased efficiencies in this phase of roadside maintenance. Can hand raking and loading of cut material be eliminated?

One more point--could there be a further contribution to overall highway economy if more roadside work is tied into construction operations? Possibly costly plantings could be eliminated by careful preservation of existing growth during the course of construction. If all plans for slope and roadside grading are a part of the original design, this work can be machine-done as a part of the construction at less cost.

I am sure that the technicians in the roadside development field did not expect me to come up with answers, but rather to raise some questions to which they might be expected to provide answers. This is what I have done up to this point. I should like to take a little time now to indicate first how I think the answers to these immediate questions should be presented, and then to discuss briefly the all-out effort we are presently making in Connecticut to get basic data on all maintenance operations as a means of getting greater efficiency in the various activities involved.

Design and Maintenance Correlation

At the Highway Research Board Meeting in 1949, Mr. Radzikowski presented a progress report for the Project Committee on Maintenance Costs. Among other things, he presented average costs for certain maintenance operations in different areas of the country, and pointed out that "cost can be lowered through design and maintenance correlation." He took ditch cleaning and indicated how wider and deeper ditches reduced the requirements for this operation. And what he then said applies to every phase of our highway maintenance: "The rising cost of ditch cleaning makes it more necessary to balance at the design stage the annual cost of ditch maintenance against the initial cost of wider and deeper ditches, so that the greatest economy can be obtained."

Mr. Radzikowski indicated how we must develop factual answers to such questions as I am raising. But, for these answers we must not stop with ditch cleaning or any other single operation, but must combine the benefits to all maintenance activities that accrue under alternative designs. Ditch cleaning alone may not have to balance the cost of wider and deeper ditches. For example, if there are changes in the annual cost of roadside mowing with wider and deeper ditches, because power equipment can be used where the alternative design requires a hand job, savings

resulting therefrom should be added to the ditch cleaning item. So, just as the roadside development technicians have quite properly emphasized the complete highway approach to planning and design, now in evaluating the influences of roadside development on maintenance costs we must include all items affected--all items connected with the initial construction and all items tied up with the total maintenance job.

Maintenance Production Study in Connecticut

So much for answers based on what we are presently doing. The big overall question, then, is how can we do it just as well but cheaper? This is what our Connecticut time and production study of maintenance operations is intended to provide.

Most of you are probably familiar with the production studies that have been made on contract construction by the United States Bureau of Public Roads. Correlation service bulletins have reported on these, indicating production rates obtained on items of construction with different types of equipment. These studies provide norms which are very helpful for estimating purposes and for selecting types of equipment and methods to fit conditions. Further, because the studies break down operations into significant segments and record delays for various reasons, the results permit and encourage more effective scheduling of the total job operation.

The maintenance production study was undertaken in Connecticut in cooperation with the Bureau of Public Roads to give for maintenance operations the kind of data the Bureau has been getting on construction jobs. It was recognized from the start that units of production on maintenance operations would be more difficult to define than they are for most construction items. And, since this is the first study of this kind, considerable "cut and try" is necessary.

A representative sub-district of the state was selected for the study. It includes slightly less than 10 percent of the total state highway mileage, and has varying topographic and land development conditions. The actual study operations commenced on August 14 and will run for a year to cover all seasonal activities. Overall labor and equipment control is obtained by time reports for labor and Servis-Recorders for equipment. The Servis-Recorders are timing devices which automatically record working time and idle time. To obtain the necessary detailed picture of each maintenance operation, stop-watch studies are conducted during the performance of specific work items. Some of the items covered by these detailed studies to date are: armor-coat surfacing, bituminous patching, joint and crack sealing, tractor mowing, hand mowing, picking up cut material, mulching, cleaning picnic areas, cleaning drainage ditches, cleaning grates and gutters, guide rail repair, guide rail elimination, and erecting snow fence.

While the study has not progressed to the point where we have final data for any work item, there is a clear indication of the kind of data we will get and of its potentialities for review of our methods. For example, detailed stop-watch studies of bituminous patching show labor distribution as follows:

Element	Percent of time	
TRAVEL		
To and from garage	10	
Major moves ahead	4	
Subtotal		14
PRODUCTIVE WORK ITEMS		
Sweeping	2	
Spreading	13	
Leveling	5	
Rolling	2	
Subtotal		22
RELATED OPERATIONS		
Inspection, supervision, instructions	2	
Placing signs, flagging traffic	4	
To and from stockpile	12	
Load, unload, handle tools & material	8	
Minor moves ahead	8	
Cleaning and care of tools	4	
Other work	3	
Subtotal		41
WAITS, RESTS, & PERSONAL DELAYS	23	23
Total		100

The detailed stop-watch studies similarly provide distribution of equipment time by significant elements. This I shall not take time to present here.

During the period of any detailed study the work accomplished is measured and related to the time to obtain production rates. In the case above described, for example, bituminous patch was placed at an average rate of 108 square yards per 9-hour day for a crew of three men and one truck. Other items of work are expressed in similarly significant ways. For example, sealing cracks and joints in lineal feet of cracks and joints per day, tractor mowing in both acreage and roadway distance per mower day, etc.

With the kind of data being produced by the production study and with continuing studies as new procedures are developed, it is apparent that we shall be in much better position than we now are to evaluate the effect of any item on maintenance costs and to appraise the desirability of modifications of procedures.

Need for Complete Cost and Production Data

In conclusion, let me say that we should not allow ourselves to be improperly influenced by the critical shortage of funds. Let us not ruthlessly cut items from the budget and curtail operations without knowing what we are doing to the complete highway operation. The way to forestall such action is through the provision of complete cost and production data and, to the extent possible, significant information on traffic service and safety values not convertible to dollars and cents.