Thoroughfare-Other, Auxiliary and Local. For each classification we have developed a basic unit mile cost which is the combination of the unit mile cost of each major activity of maintaining and operating the highway. In addition, a unit cost has been developed for the upkeep of buildings based on the square foot area, plus a unit cost for the maintenance and operation of each type of the various pieces of equipment. To these costs we add a programmed amount for minor improvements and betterments and an additional amount for emergencies.

To develop the unit cost necessary for the budget preparation it was necessary to revise our cost accounting system to provide the information required. Inasmuch as the new budget system and the new cost accounting methods were put into effect at the same time, we are using estimated costs in our budget until sufficient information is available to develop accurate unit costs.

## BUDGETING VIA WORK LOADS

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Maintenance budgeting has traditionally been based upon two or three rather arbitrary factors, Some of them have been touched on here this evening, and I think we are all familiar with them. Historical records certainly are one of the prime sources of many maintenance budgets, even today. A per mile assignment of costs based in part, perhaps, on historical records has been utilized to allocate funds for new mileage added to the highway system. But some new and fresh approaches to maintenance budgeting also have been attempted.

One of these involves the analyses of specific operations and the computation of costs for the various increments of the specific operation, such as Bill Cheatham has just discussed in the program currently underway in Ohio. A similar program is now underway in the State of New Jersey Highway Department and, presumably, will be discussed later by Mr. Stelljes from the Highway Department. Other trends in maintenance budgeting involve the allocation of maintenance funds by formula and we have had presentations dealing with that also. Similar programs are being followed in Louisiana, and presumably will be reported on by Mr. Edwards.

Well, there is at least one other attempt being made to develop a basis for maintenance budgeting through the study of maintenance work loads. This study, which our firm is carrying on, deals specifically with the interstate system and the impact that it may have on the national, as well as the local, budget requirements. While the study deals with a rather specialized and specific segment of the highway system, there may well be procedures and applications that are meaningful to the total highway system as well. The project is based upon the measurement of actual maintenance operations on selected test sections of interstate highways located in five states throughout the major regional subdivisions of the country. These measurements are being made in terms of units of

manpower, equipment and materials. Historical records, in this instance, are not being used as a basis for the evaluation.

Concurrently other evaluations are being made of the test sections to determine the standard or level of maintenance being achieved by the maintenance investment that is currently being made by the state highway departments. A physical inventory has been taken of each of the test sections so that maintenance requirements can be related to the measurement of the physical facility involved.

Detailed records also are being obtained of the design criteria, the climatic and other environmental factors, and the traffic and usage data, which have a significant bearing on the work load that these miles of interstate highway generate. Observations and records are being kept for a 15-month period, after which analyses will be made to relate the various factors to the maintenance work load on the interstate highway system.

There are still a number of other problem areas dealing with the development of maintenance budgets. Most of the studies that we have discussed here this evening have been predicated, in some degree, upon existing maintenance organizations and the maintenance program which these organizations have, or can perform. This results in fixed maintenance costs, or maintenance budgets, simply to meet the payroll, the housing, transportation, administration, and services required by this existing maintenance organization. The budgeting problem then becomes one of finding the optimum program for this basic crew, and determining the cost of this program. I would suggest that perhaps this process might be reversed by an analysis of the basic program required and a determination of the optimum crew required to perform this basic program.

Such a basic program level would require, of course, an evaluation of the optimum size of the proposed full-time crew within the organization. Also, it would necessitate the determination of those temporary crews needed for seasonable programs and the selection of those activities which could better be assigned to contract performance rather than force account. Now, all of these supplemental arrangements are a basic part of most highway programs to one degree or another, but only infrequently are they predicated on an evaluation of the optimum maintenance program in a given state, district, region or maintenance organization. Regardless, however, of the technique used for maintenance budgeting, maintenance must become an objective, technically-documented science if maintenance programs are to be successfully financed in the inevitable competition for the highway dollar that all of our organizations face today.

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