WHAT THE FUTURE HOLDS FOR MAINTENANCE

Remarks by Francis C. Turner, Director of Public Roads, Federal Highway Administration, U.S. Department of Transportation, prepared for delivery at a North Carolina State Highway Conference, Raleigh, N.C., January 30, 1969

One of the reassuring signs I see in the highway program these days is the increasing attention which the State highway departments and other highway-related agencies -- both public and private -- are giving to highway maintenance. Some of you at this Conference attended the Maintenance Management Workshop held in Columbus, Ohio last July under the auspices of the Highway Research Board and Ohio State University. I'm sure that those who did attend share my view that the Workshop was both productive and stimulating, and it seemed to signal the coming of age of highway maintenance.

I congratulate Bill Babcock and the North Carolina State Highway Commission for devoting this entire Highway Conference to the complex problem of maintenance, which is certainly among the very top priority functions of highway department personnel from the chief Administrator right down to the flagman at the work site. There was a time, and not too long ago, when maintenance was often a kind of stepchild of the highway program -- something to be done on a catch-as-catch-can basis with whatever small change might be left after provision had been made for all construction needs.

Today highway maintenance is big business by any standards and it requires top talent, sound management, imagination, ingenuity and constant attention. Maintenance is important from many aspects, principally of course in the protection of the tremendous investment we have made and are

making in our highway plant. Even though the Federal government does not contribute to maintenance costs, the Bureau of Public Roads has a statutory and moral responsibility to see that the Federal-aid highway systems are properly maintained for the safe and efficient movement of people and goods.

In assessing what the future holds for maintenance, which is the topic assigned me, we have to forecast what the future holds for the highway program generally. First, we expect the Interstate System to be in operation throughout its length sometime around the middle of the next decade. That very likely will terminate the Interstate program as we know it under the ground rules and financing arrangements set up in the Federal-aid highway legislation of 1956 and subsequent acts.

However, this does not mean that the need for additional freeways will end with the completion of the presently designated Interstate System. The current estimates by the States include some 53,000 miles of needed freeway improvements on systems other than the Interstate. These are the miles needing improvement, but they may be considered as roughly indicating the total miles of additional freeways that will need to be in service in 1985. In other words, additional mileage of the freeway kind at least equal to the present 42,500 mile Interstate System will be needed.

I point this out because we will be doing two mammoth jobs at once during the 70's -- maintaining the Interstate System throughout its length, as well as the more traditional networks, while advancing the "new" construction program which we expect will follow the Interstate program. I stress the freeway part of the present and probable future program because freeways of the Interstate System type pose the toughest challenges for State

maintenance forces. Freeway maintenance, particularly in the urban areas, involves a different set of standards and more complex problems than most maintenance organizations have dealt with historically.

Maintenance operations on freeways, especially in urban areas, frequently must be performed under heavy traffic conditions, even when the work is done at night and during daytime non-rush hours. This type of operation obviously poses greater difficulties for the maintenance crews as well as a greater hazard potential for both workmen and the traveling public. Extensive landscaping and scenic enhancement go hand-in-hand with modern expressways, and systematic mowing is a basic maintenance operation. Mammoth directional signs and safety rest areas must be kept functional and attractive. The motoring public demands a snow-free and ice-free pavement all year round on high speed highways and it is necessary to meet this demand as far as possible if only on the one ground of traffic safety.

All of these elements add up to the need for a more than "business as usual" approach to highway maintenance. Maintenance in this decade and even more so in the next means more and better equipment, more and better personnel and more effective utilization of both. It means more and better materials and, wherever possible, materials which are as near to being maintenance-free as ingenuity, science, research and development can make them.

In talking about what the future holds for maintenance it is necessary to talk first about the need for a great deal more money than is now committed to it. In 1968 the nationwide cost trend figure for highway maintenance and operation was some 41 percent greater than the figure for the 1957-59 base period.

Most of you are familiar by now with NCHRP Report 42 on Interstate Highway Maintenance Requirements. This placed the cost of maintaining the completed Interstate System at $261 million per year or about $6,400 per centerline mile. The report concedes that this estimate is probably conservative and it is more than likely that $10,000 per centerline mile will be a more realistic figure for large portions of the Interstate mileage. And this estimate could be used as a rough approximation of the cost of maintaining Interstate-type mileage not on the System.

The Bureau of Public Roads, in a report to Congress, has estimated that an annual average of $5.8 billion will be spent on maintenance during the years 1973-85, which is the period covered by the report. It has also been estimated that maintenance needs will rise about 60 percent during this period. Better management is one of the ways available to us to offset this rise in maintenance expenditures and that is the reason why conferences such as these have such great value, providing as they do an open forum for the mutual exchange of individual views and experiences which can be of benefit to all.

Maintenance costs amount to close to half the total outlay for highways in some States, especially those States where snow and ice control may take as much as half of the total maintenance budget. In North Carolina I am told that of the $214.4 million collected in State highway use taxes during 1967, a total of $77.4 million or 36 percent went for maintenance. So maintenance is an expensive operation but not nearly so expensive as the lack of it is -- not only in terms of dollars, but in terms of safety for the traveling public and the intangible attribute of good will which

is essential to the successful operation of a State highway department or any other public or private organization.

The average highway traveler doesn't know much about highway design, engineering and construction and -- in the idiom of the day -- he couldn't care less. He is interested in the net result which means to him a reasonably fast, direct and safe route from where he is to where he wants to go; and whether the pavement that takes him there is black, white or grey is a matter of little interest. But he is acutely aware of rough pavement, potholes, ragged shoulders, poor signing, and snow and ice on the roadway. He also is likely to let his neighbors and his legislators know about his displeasure - sometimes before he lets you know.

Maintenance operations result in good or bad public relations for a highway department in proportion to the effort and intelligence that go into them. These are the operations most visible and comprehensible to the traveling public and, though the phrase is overworked, the maintenance man is the front line ambassador of the highway department, its direct contact with the public it serves. It follows that maintenance personnel capable of performing the various types of duties required today and even moreso in the years ahead must be chosen with great care to ensure that their capabilities are equal to their assigned tasks.

Modern maintenance falls into two categories. One is physical or general maintenance; the other is traffic services. Although we are necessarily preoccupied with freeways at conferences such as these, basic maintenance activities have not gone out of style. Of our main State system of roads and streets, 15 percent is still unpaved. Most of such mileage

is surfaced with soil, clay, gravel or stone, but not concrete or asphalt. These older roads and streets need widening, resurfacing, additional lanes, frequently complete reconstruction. Everyday maintenance needs are always with us on all roads -- such routine activities as striping, mowing, cleaning up litter, patching, signing, ditch cleaning, shoulder work, joint sealing and upkeep of guard rail.

Despite the recent and current emphasis on urban freeways, urban arterial streets and highways still must carry tremendous traffic loads, often exceeding those on the freeways. We expect that TOPICS program projects will help to relieve some of the congestion on these. Much can be done by maintenance operations to improve capacity by merely striping left turn lanes and minor channelization.

Routine maintenance operations on urban roads and streets with heavy volume, high-speed traffic will necessarily have to be done to a great extent during off-peak hours. This will frequently involve extra pay but even then there is a problem of getting personnel to work during night hours or hours outside the normal working day. And sometimes in our larger urban areas there is really no such thing as an off-peak traffic flow. This puts a heavy premium on building facilities that are as maintenance-free as possible.

I might inject here that the Michigan State Highway Department has been conducting some interesting and helpful experiments in nighttime maintenance with total closure on sections of its metropolitan freeway sections. A report of these experiments, presented at the last AASHO meeting in Minneapolis, found that this type of nighttime maintenance "is not only feasible but is definitely more economical than trying to perform these

operations under normal traffic conditions on metropolitan freeways." While the problems of Detroit may be different from those of Raleigh or Greensboro or Winston-Salem, there may be either now or in the future some application of Michigan's experience in this field to the problems of maintenance in North Carolina.

Maintenance, of course, is closely tied in with esthetics in the best sense of the term. Trees, shrubs and plantings will require personnel especially trained in all of the landscaping techniques -- pruning, fertilization, watering, weeding, grafting, replacement of materials, thinning and other allied activities. The control and pickup of litter is a routine maintenance operation but it is one of the most important as well as one of the most costly and time-consuming. It costs the American taxpayer something like $100 million a year to pick up highway trash. State highway agencies alone spend at least one-fourth of this amount. The indirect cost is incalculable, in punctures and blowouts, and even in crashes caused when a driver swerves suddenly to avoid objects discarded on the roadway.

Then, in the nebulous field of intangibles again, litter is repugnant to the vast majority of our motor travelers but the conscientious and law-abiding must pay in reduced driving and recreational pleasure for the carelessness and vandalism of a few. Our highway network is a national asset, like our mountains, forests, streams and other resources and it should be treated as such. Human nature being what it is though, it is largely up to maintenance forces to apply the treatment. On the more practical side, it has been estimated that at least one-half of all automobile travel in the United States is for social and recreational purposes. Half of the States consider tourism to be one of their major sources of revenue. And

without having figures to back me, I would guess that the protection of that source of revenue depends to a large extent on proper maintenance, including litter pickup. We don't have very good answers to this problem yet except manpower and more manpower. New types of equipment are needed to mechanize some portions of the trash pickup problem. And herein lies a challenge to American innovativeness and "can-do" -- the development of new maintenance hardware as well as methods. In the meantime we must continue to pull maintenance forces away from the more constructive work they should be doing to cope with the problem of litter.

Bridge maintenance is probably the most difficult and troublesome problem today and as far as we can see into the future. This activity is of tremendous importance and demands highly qualified personnel. The Bureau of Public Roads last year issued new bridge inspection guidelines to our field offices and the Federal-aid Highway Act of 1968 carries statutory requirements for a special effort in this direction. Bridge deck scaling and sometimes even heavier types of deterioration are causing extra maintenance problems. We need to develop ways of constructing more durable decks and to find more effective ways to maintain them.

The collapse of the Silver Bridge over the Ohio River in December 1967 brought the hazard of bridge deterioration to public and Congressional attention. Fortunately very few bridge failures are so disastrous but still about 150 of them fail for various reasons every year. A very large percentage of the highway bridges in the United States are more than 30 years old and were not designed for today's traffic loads. Much deterioration in older bridges is undoubtedly due to overloading or frequently repeated

heavy loadings. However, adequate and regular inspections of bridges are maintenance activities and if done properly will detect some of the conditions -- but not all -- which may signal a possible collapse. Bridge maintenance techniques must be vastly improved and new maintenance practices developed which do not in themselves contribute to deterioration. Deicing techniques are needed, for example, which do not corrode the floor system of the bridge or its supports.

In the field of traffic services we are into a new era entirely. We now have nearly 7,000 safety rest areas, 1,200 of which have been constructed during the past three years. Rest area maintenance requires a full-time maintenance man 24 hours a day in the larger rest areas having all of the facilities. Constant manning of these actually requires 5 employees per area. And personnel chosen for these duties must be more than cleanup men. They will be required to furnish information on routes, roadway conditions, historical features and other questions which arise in the minds of the traveling public.

Emergency aid to the stranded motorist is a new field and one requiring a great deal of attention today. Public Roads has issued an Instructional Memorandum (IM 60-1-66, dated October 18, 1966) on this subject and Federal-aid is participating in experiments with this activity in a number of States. Reports on two different types of emergency services were reported at the last AASHO meeting. New York State installed an emergency call system on its Northway, a 178-mile section of Interstate 87 between Albany and the Canadian border. The installation cost was $693,000 or about $975 per call box. The recurring maintenance cost is about $16 per call box per month.

West Virginia has had what it considers to be very successful experience with its Safety Patrol. This patrol furnishes gasoline and water, assists in minor tire and motor troubles, helps extinguish fires, assists the police in directing traffic, gives tourist information and administers first aid. The State reports: "We feel that one big advantage of the Safety Patrol over Emergency Telephones or Radio is that after a motorist has walked to a phone and made his call, he still must wait for assistance to come to him. Also, as the Safety Patrol driver stops at every stopped vehicle along the Interstate there is no need for a distress signal."

One of the growing problems of safety in the maintenance field is the disabled vehicle in the high speed lane or middle lane of a multi-laned facility. Some type of arrangement will have to be developed which can remove it from the traffic stream without causing an accident hazard. It is entirely possible that helicopters may be used for this purpose, and it has been suggested also that a heavy crane traveling on tracks located in the center median could lift the stalled vehicle out of the traveled way with a minimum of disruption.

There are other problems of greater urgency. Sign replacement and maintenance of large directional units will require a great deal of planning. The average life of the facing material in some cases has been estimated to be from 7 to 10 years after which fading and deterioration will occur, requiring major replacements. Signals require specially trained personnel to maintain electrical circuits, clean fixtures, replace bulbs and perform other similar operations in increasing amounts.

Snow and ice removal is not such a problem in North Carolina as it is in the snow belt States but it is still a necessary and expensive maintenance item. Possibly we can cut costs by a judicious mix of imagination, research and development. Snow removal methods are essentially the same today as they were 20 or 30 years ago, but this doesn't mean that progress is at an end. A massive effort must be made, I believe, to develop new varieties of equipment, new weapons, even new materials to meet the special snow and ice control problems of the Interstate and other high speed roadways carrying heavy mixed traffic.

In the field of highway safety, maintenance personnel have great responsibilities, as do their superiors. Crewmen must be trained in procedures for summoning aid, protecting others from hazards at traffic crash sites, and removing debris quickly and efficiently. Programs must be developed for preventive maintenance, repair, and daytime and nightime inspection of traffic control devices. Safety equipment on maintenance vehicles is of increasing importance. Roll-over bars, for example, on tractors and mowers are being used today in some States. Seat belts and effective warning signs and lights on vehicles are also items of importance. Proper control of the movement of traffic through maintenance project worksites is a field in which considerable improvement is necessary.

I have mentioned several times the need for research, development and imagination in planning and carrying out our maintenance programs for the future. Let me mention these needs again and underscore them. The Highway Research Board, in a 1967 report, tallied some 5,000 research projects in progress as of then. Of these only 152, or about three percent, were

maintenance research projects. It would seem, then, that the maintenance program has not yet progressed very far beyond its status as unwanted step-child.

There is need for much development and improvement of maintenance management. As the maintenance operation becomes more complex, so does the need for strict control of the highway dollar. As in the past, there will in the future be just so much money available for highway purposes and any dollar wasted on inefficient maintenance practices is a dollar deducted from the funds available for new facilities.

Maintenance management is a field which is only now beginning to get the recognition it deserves in the highway program. It grew up sort of haphazardly through a process of evolution, through intuition, trial-and-error, pragmatic considerations and just about everything except factual knowledge and scientific management principles. It has made great strides in recent times and the general belief is that the next five years will show a widespread and quite dramatic improvement in maintenance management in this country. I sincerely hope so; otherwise we will be in a position somewhat like a man trying to maintain a new Cadillac or Lincoln Continental without an owner's guide or a shop manual. Maintenance management is the key which unlocks the door leading to the ultimate goal, which is the most efficient maintenance possible for the Nation's highway system.

In closing I want to make one more point. We have become almost obsessed in recent years with the term "preventive maintenance" and properly so. Preventive maintenance is like taking vitamin tablets to ward off illness rather than calling the ambulance when illness occurs. On the other

hand, I think we are getting into a period when an even stronger term is needed and I noted with interest that one of the toll road authorities has adopted the term "aggressive maintenance." This involves looking for trouble, or laying in more vitamins than you think you possibly could use. I commend the term, or the concept, to your attention.

It is time that we gave substantial and appropriate attention to the maintenance sphere of our responsibilities. That is why I am greatly encouraged by meetings such as this which are pointing the way toward a true appreciation by all concerned of the vital importance of highway maintenance in the total highway program.