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*UNITED STATES
GENERAL ACCOUNTING OFFICE*

Improving And Maintaining
Federal-Aid Roads--
Department Of Transportation
Action Needed

The backbone of the Nation's highway transportation network--the Federal-aid highway systems, representing an investment of about \$76 billion--is deteriorating. The States should be encouraged to use Federal highway funds on improvement projects to protect these systems.

Although responsible for making sure States properly maintain Federal highways, the Federal Highway Administration does not promote uniform procedures for field engineers to use when appraising State maintenance. Two things are needed:

- Federally prescribed highway maintenance standards and guides for the States.
- Criteria for Highway Administration engineers to use when inspecting the adequacy of that maintenance.



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

COMMUNITY AND ECONOMIC
DEVELOPMENT DIVISION

B-164497(3)

The Honorable
The Secretary of Transportation

Dear Mr. Secretary:

We have surveyed the Federal Highway Administration's process for assuring that the Federal-aid highways are being properly maintained. Our observations and recommendations, if implemented, should help to insure that States properly maintain highway projects constructed under Federal highway legislation.

Our work was conducted at the Highway Administration's headquarters, Washington, D.C., its regional and divisional offices responsible for assuring proper maintenance of completed Federal-aid highway projects in Georgia and South Carolina, and the highway departments in these States. We reviewed (1) applicable Federal highway laws and regulations, (2) Highway Administration policies and procedures for inspecting and reporting on maintenance of Federal-aid highways, and (3) Highway Administration guidance to its field offices for resurfacing, restoration, and rehabilitation (RRR) highway projects. We also interviewed Highway Administration and State highway officials and reviewed their records and reports.

We observed a need to:

- Encourage States to give high priority to RRR projects in their Federal highway construction programs.
- Prescribe maintenance standards and guides for highways and bridges.
- Prescribe criteria for appraising State highway maintenance activities.
- Issue guidance for determining overall quality levels of State maintenance efforts.

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HIGHWAY ADMINISTRATION'S AND STATES' RESPONSIBILITY
FOR MAINTAINING FEDERAL-AID HIGHWAYS

The United States highway transportation network is comprised of 3.8 million miles of highways, of which about 929,000 miles are on Federal-aid systems. Highway Administration statistics show that 1.29 trillion vehicle miles were traveled in 1974 on these highways, with three-fourths on the Federal-aid highways. Federal, State, and local Governments spent \$7.07 billion in 1975 to maintain the network, a \$500 million, 8 percent, increase over 1974. Maintenance and traffic services represent about one-fourth of all highway expenditures.

The Highway Act of 1976 clarified State use of Federal construction funds for betterment-type work on already constructed Federal-aid roads and highways other than Interstate. This action, confirming Highway Administration policy, broadened the definition of construction in Title 23, U.S.C., to include RRR-type work.

The act also authorized \$175 million for each of fiscal years 1978 and 1979 for RRR projects on Interstate highways which have been in use for more than 5 years and are not toll roads. This action represents a major philosophical change in Federal responsibility for the Interstate highways.

Responsibilities and definitions

Responsibility under 23 U.S.C. 116 for maintaining the Federal-aid highways belongs to State highway departments. The law requires the Secretary of Transportation to notify a State highway department of any highway project, constructed under Federal highway legislation, which has not been properly maintained. If within 90 days after receipt of such a notice, the project has not been repaired, the Secretary is required to withhold approval of all projects in the State. The responsibility to make sure that the States are providing proper maintenance has been delegated to the Federal Highway Administrator. His representative in each State--the division administrator--annually certifies to headquarters that the State is adequately maintaining the highways.

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The building, improving, and maintaining of highways is classified into two general categories of work-- construction and maintenance. Construction is subdivided into (1) construction and reconstruction and (2) betterments. Betterments include such RRR work as resurfacing--placing additional pavement layers over existing road or bridge deck surfaces to provide additional strength or to improve serviceability, and restoration and rehabilitation includes work that is required to return the road or bridge deck to a condition suitable for placement of an additional pavement layer. Maintenance is usually defined as the preservation of the entire highway, including surface, shoulders, roadsides, structures, and any traffic control devices that are necessary for its safe and efficient utilization. While these terms generally are in use among States, there is considerable variation in meaning.

RECENT PROBLEMS INHIBITING STATES
FROM CARRYING OUT MAINTENANCE RESPONSIBILITIES

State maintenance and RRR work will play a more important role in the future highway transportation picture for several reasons. These include (1) a decline in new highway construction programs due to the anticipated completion of the Interstate System and the need for upgrading Federal-aid highways not on the Interstate System, (2) rising traffic volumes and more extensive traffic services that will increase demands on maintenance operations, and (3) Federal-aid highway surfaces, including bridge surfaces, are deteriorating faster than anticipated. While the States are faced with greater maintenance and RRR efforts, they are having financial problems and are cutting back highway maintenance budgets and staffs.

Deteriorating highways

Federal-aid highway surfaces, including bridge surfaces, are deteriorating faster than the Highway Administration had anticipated. Recently, it reported that highways are wearing out 50 percent faster than they are being replaced.

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The Department of Transportation's Office of Audits reported in July 1976 that, although the highways were generally well maintained, it found a number of highway segments on the Interstate System which appeared to be inadequately maintained. These included:

--Interstate 80 in Iowa (between State Route 25 and Stuart interchange) had shoulder dropoffs as much as 8 inches in certain areas.

--Interstate 35 in Iowa (1 mile south of New Virginia) had transverse cracking from the shoulder edge to the driving surface.

--Interstate 90 in Washington (Spokane to the Idaho State line) had continued longitudinal and transverse cracking for the entire 17-mile length.

The Highway Administration, recognizing the deterioration problem, intensified its research efforts to determine why highways have been deteriorating so fast. (See p. 10.)

States' deteriorating financial condition

Along with the deteriorating condition of the highways, we found the States' highway financial picture is also deteriorating because recent highway revenues are lower than had been projected. As a result of energy conservation efforts, States are generating fewer fuel tax dollars than expected. While highway tax revenues have increased, they have not kept pace with inflation. The following table compares the rate of highway revenue increases to the national inflation rate for the two States we visited.

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<u>State</u>	<u>Year</u> <u>(note a)</u>	<u>Annual percent</u> <u>increase in</u> <u>highway revenues</u>	<u>Inflation</u> <u>percent rate</u> <u>(note b)</u>
South			
Carolina	1976	3.9	4.5
	1975	1.5	9.3
	1974	5.7	10.0
Georgia	1976	3.4	4.5
	1975	6.4	9.3
	1974	7.5	10.0

a/ Revenue data for fiscal years, inflation rate for calendar years.

b/ Figures based on data from "Survey of Current Business," U.S. Department of Commerce, Bureau of Economic Analysis, September 1976.

To compensate for this reduction in rate of revenue growth and loss of purchasing power, many States are cutting back on highway budgets and staffing. For example, Georgia reduced its highway staff 20 percent, from 9,000 to 7,200 personnel; Utah reduced its maintenance budget by 20 percent; Washington cut \$7.8 million from its budget for routine maintenance; and New York has only 5,200 maintenance employees doing a job that officials claim requires 7,730.

Further, while Nation-wide maintenance expenditures have risen from \$3.06 billion in 1964 to \$6.36 billion in 1974, the value of the dollar over that decade has decreased 50 percent. In terms of comparative purchasing power, only \$3.18 billion was spent for maintenance activities in 1974. Thus, only about 4 percent more maintenance work was purchased in 1974 than in 1964, even though the number of registered vehicles increased 51 percent, vehicle miles traveled increased 52 percent, and the number of miles of highway increased by about 172,000. In addition, although our highways are getting older, recent Federal legislation increased the maximum allowable weight for trucks on Interstate highways.

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The Highway Administration has estimated an annual maintenance expenditure increase of about \$100 million for the maintenance of all streets and highways due to the heavier allowable truck weights.

MAINTENANCE STANDARDS AND
INSPECTION CRITERIA NEEDED

Although Highway Administration officials acknowledge the deteriorating condition of the Nation's highways, Federal funds have never been withheld from a State for inadequate or improper maintenance. The Highway Administration has responsibility for insuring proper maintenance of Federal-aid highway projects; however, it has not prescribed standards or guides for the States' use in maintaining those highways, nor has it provided criteria for field engineers to use in determining the adequacy of State maintenance. Thus, there is little uniformity among field engineers when appraising the adequacy of States' maintenance efforts, and the division administrator must base his annual certification that the highways are properly maintained on the subjective judgments of many engineers who inspect in a variety of ways.

Field inspection criteria

The Highway Administration's Federal-Aid Highway Program Manual (vol. 6, ch. 4, sec. 3, subsec. 1) contains the policy and procedures for appraising the adequacy of maintenance and taking the necessary action to effect compliance with provisions of 23 U.S.C. 116.

The manual instructs the engineers to make sufficient maintenance inspections of completed highway projects constructed with Federal funds to assure that the States are fulfilling the law's maintenance requirements. The how, when, and where of inspection is left to the discretion of the regional and divisional offices.

Each division performs an annual maintenance inspection program to determine whether or not the States are meeting maintenance requirements of Federal highway legislation. Neither headquarters nor the field offices

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have prescribed any criteria for these engineers to apply in making the determination that highways are properly maintained. As a result, each engineer must rely on his subjective judgment when evaluating the adequacy of that maintenance.

Further complicating the engineers' job is the fact that the Highway Administration has not prescribed any standards or guides to the States for required maintenance work. But, they have prescribed standards, specifications, and guides to the States for the design of Federal-aid highways. In lieu of Federal maintenance standards, the Highway Administration has encouraged States to use the "AASHTO¹/ Maintenance Manual" in addition to any State-established standards.

There is little uniformity in the procedures field engineers use to appraise State maintenance efforts. For example, in South Carolina, highway design features and construction practices were inspected to identify items for improvements, thereby hoping to reduce future maintenance costs; in Ohio, an engineer conducted a maintenance inspection of selected high-accident locations and road segments; and in South Dakota, an engineer conducted a maintenance review by merely driving over various highways.

The Highway Administration is planning to prepare a field engineers' inspection manual to use in conjunction with the "AASHTO Maintenance Manual." Highway Administration officials anticipate the inspection guidelines will define various conditions that occur in highway maintenance work, show probable cause of deficiencies and recommend necessary corrective actions.

Division administrator's annual
maintenance certification

After the division completes its annual maintenance inspection program, the division administrator submits to headquarters an annual maintenance report certifying that all Federal-aid highway sections inspected in the State were found to be in proper condition of maintenance.

¹/ American Association of State Highway and Transportation Officials.

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Highway Administration's guidance to the division administrator, concerning improper or unsatisfactory maintenance (1) cautions about the serious consequences of failing to certify that all Federal-aid highways are properly maintained, (2) suggests assurance that the unsatisfactory maintenance is not due to factors or conditions "beyond maintenance," and (3) suggests every reasonable effort be made to secure corrective action before submitting a recommendation for official notification of unsatisfactory maintenance.

The manual further states:

"When the Division Engineer (administrator) has determined that a completed Federal-aid project is not being properly maintained, and the deficiency is of sufficient magnitude to warrant the withholding of approval of further Federal-aid projects, he shall submit to the Office of Highway Operations, through the regional office, his recommendations for issuing an official notification to the State.*** Further action will be taken, or directed by the Federal Highway Administrator."

In the past, divisions have issued oral and written warnings to some State highway departments to obtain corrective action. The Highway Administration, however, has never seen the need to issue an official notification.

Since the Highway Administration has not established any criteria for inspecting engineers, the division administrator must base the annual certification on the combined subjective judgments of many engineers who inspect in a variety of ways. Although the overall quality of satisfactory maintenance could vary from adequate to excellent, the division administrators do not determine the overall quality level of States' highway maintenance efforts. According to Highway Administration officials, determining specific overall State maintenance levels would be difficult

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and could result in problems because of a tendency to make comparisons among States and this would create more administrative work and redtape.

RRR WORK

Before the 1976 Highway Act, the Highway Administration had a policy that included betterment-type work (RRR) in the definition of construction or reconstruction for federally aided highway projects other than the Interstate System. The States make the decision as to how much of their Federal funds will be allocated for RRR-type work and how much will be used for new construction. In addition, the States make the surveys and plans, award the contracts, and supervise the construction after approval from and in consultation with the Highway Administration.

In recent years, the States have allocated about 10 percent of their Federal funds to RRR-type projects. In 1974 the States spent about \$90 million of \$1.1 billion of Federal money for these types of projects. The resurfacing expenditures increased in 1975 to about \$222 million out of a total construction expenditure of about \$1.7 billion. Despite this increasing level of expenditures for highway resurfacing and substantial maintenance expenditures as discussed earlier, the highways are deteriorating faster than expected.

Responding to the Highway Act of 1976 concerning the use of Federal highway funds for RRR projects, Highway Administration headquarters provided interim guidance to its field offices on June 28, 1976, to be used until development and issuance of formal instructions. The notice states that RRR projects "apply to improvements on main roads, shoulders, ramps, frontage roads and bridge decks and incidental work connected therewith." Referring to State maintenance responsibility, it states:

"RRR projects are not intended to include maintenance type work such as work primarily for rejuvenation or protection of existing surfaces; resurfacing of less than 3/4 inch minimum thickness or of short length; patching and repair of minor failures; and undersealing of concrete slabs other than essential as a part of restoration for resurfacing."

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The guidelines, despite the need as evidenced by the rapid deterioration of the highways, do not instruct field personnel to encourage States to include RRR projects when States are formulating their annual Federal-aid highway construction programs.

Because the highways, representing a total Federal investment of about \$76 billion since 1956, are deteriorating faster than they are being replaced, we asked Highway Administration officials why the guidelines did not contain some instructions for encouraging States to give RRR projects a high priority. We were told that this would place another administrative burden on field offices, we were also told that States have the right to decide on specific highway projects and, since the RRR needs are great, special encouragement of State RRR projects is not necessary.

HIGHWAY ADMINISTRATION PROJECTS THAT
ADDRESS THE ISSUES OF HIGHWAY
DETERIORATION AND MAINTENANCE

Faced with problems of highways deteriorating faster than they can be replaced and lower than anticipated State highway revenue growth rates, the Highway Administration has taken some actions to intensify research efforts into the highway deterioration problem. In July 1976 the Highway Administration initiated a national survey to determine the principal causes of the construction quality problem that has developed regarding the deteriorating highway pavements and bridge decks. The survey covers (1) recently completed projects, (2) ongoing construction projects, and (3) current construction project staffing practices for inspection and testing activities.

When completed, the survey should provide data to allow an assessment of the contributing factors to the pavement deterioration problem and identify areas of need.

The Highway Administration's research activities in maintenance-related areas have been generally fragmented and unorganized and are considered to have a relatively low research priority. However, one area, maintenance management, was researched in depth. The result, according to the Highway Administration, has been cost reductions in the millions of dollars and increased quantity and quality of maintenance activities.

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The Highway Administration, recognizing the increased importance of maintenance in future highway transportation, established an organized research attack on maintenance problems affecting the State highway departments with the objectives of improving management, augmenting the use of resources, and increasing efficiency and safety in maintaining the highways.

In addition to the maintenance areas, the Highway Administration is conducting research projects to improve highway pavements, and thereby, reduce overall maintenance and RRR costs. Current projects include:

- Developing a system to evaluate pavement structure and methods of predicting remaining service life and rehabilitation needs.
- Establishing new methods for the design and construction of overlays.
- Determining the effects of weight and axle configuration on pavement performance.
- Upgrading conventional pavement designs to approach "zero maintenance" conditions.

CONCLUSIONS

The highway transportation network is a key element in the transportation of the Nation's goods and services and, therefore, is essential to a sound and healthy national economy. The backbone of this network is the Federal-aid highway system which represents an investment of about \$76 billion since 1956. Responsibility for the maintenance of the system has been left with the individual States while much of the construction capital has been furnished by the Federal Government.

Recently, mainly due to a reduction in the rate of highway revenue growth and loss of purchasing power, many States are faced with a deteriorating financial picture. As a result, they have reduced both their budgets and staffing in the highway maintenance area.

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The highways are now deteriorating 50 percent faster than they are being replaced. Segments of the Interstate highway system appear to have been inadequately maintained. We believe the deterioration of the highway system will continue unless the revenue situation improves or the States increase the past percentage of highway construction funds used to improve the highways.

The Federal-aid highway system is essential to the Nation and should be fully protected through maintenance and improvements. Although the States have been spending about 10 percent of their Federal funds for resurfacing improvement-type projects in recent years, the highways are continuing to deteriorate faster than they can be replaced. The Highway Administration should make a substantial effort to halt the deterioration of the highways. We also recognize that the States are in the best position to set priorities for their highway expenditures. Therefore, we believe the States should be encouraged to give a high priority to RRR projects in their Federal highway construction programs.

The States are required by law to provide adequate maintenance to the Federal-aid highways. However, the Highway Administration has not prescribed any maintenance standards or guides for the States to use. Without Highway Administration prescribed standards and guides, the States do not know what is required to comply with Federal highway maintenance legislation. In addition, the Administration's field engineers must rely on subjective judgment when appraising the States' maintenance activities. Standards and guides for attaining good highway and bridge maintenance would assist the States in determining what maintenance is required.

While the adoption of maintenance guidelines will go a long way towards insuring adequate and uniform maintenance on the Federal-aid highways, it will not bring more uniformity to the Highway Administration's inspection procedures. The field engineers' maintenance inspection manual which the Highway Administration is planning to issue in the future will be a positive step forward. The manual should include criteria for field engineers to use in evaluating the adequacy of the States' maintenance

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efforts. Without such criteria the inspectors will still have to rely on their individual subjective judgments.

Furthermore, since the Highway Administration has not established any criteria for the inspecting engineer, the division administrator, when annually certifying that all Federal-aid highway sections inspected in the State were properly maintained, must base his certification on the combined subjective judgments of many engineers who inspect in a variety of ways. Thus, the division administrator cannot determine, in the annual certification, an overall quality level of the State's maintenance effort.

Since the overall quality of satisfactory maintenance could vary from barely adequate to excellent, and in view of the deteriorating highways, we believe it would be beneficial to know the trend of each State's maintenance efforts. Although not required by Federal highway legislation, we believe this information would allow the Highway Administration to compare the maintenance effort of an individual State on a year-to-year basis, and assist the Highway Administration in its endeavors to make sure that each State maintains its Federal-aid highway projects.

RECOMMENDATIONS

We recommend that you:

- Encourage States to give a high priority to RRR projects in their Federal highway construction programs.

We recommend that you require the Federal Highway Administrator to:

- Prescribe standards and guides for attaining good highway and bridge maintenance from the States.
- Include in the planned engineers' maintenance inspection manual criteria for appraising the adequacy of individual State maintenance activities.
- Provide guidance to division administrators which would allow a year-to-year comparison of the quality of a State's maintenance efforts during the annual certification process.

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We discussed the report contents with Highway Administration officials and considered their views in preparing this report. The officials agreed that maintenance guidelines and inspection criteria would be beneficial. However, they disagreed with the need to encourage States to give a high priority to RRR projects in their Federal highway construction programs. The officials were concerned about infringing on the States' right to select specific highway projects and thought that encouraging States to give "appropriate" priority to RRR projects in their highway programs would be sufficient. However, the guidance to the Federal highway field offices has not instructed them to provide any kind of encouragement to the States in establishing the priority of RRR work.

We agree the States have a right to select individual highway projects. However, in view of the deteriorating condition of the Nation's highways and the reduced State highway staffs and budgets, we believe that the States should be encouraged to give a high priority to RRR type projects in their Federal highway construction programs.

The officials also disagreed with the need for determining overall quality levels of State maintenance efforts. They were concerned that such determination would be used to compare maintenance efforts among the States. Our intent, however, is to enable the Highway Administration to compare an individual State's maintenance effort on a year-to-year basis. Such comparisons would show the quality trend of that State's maintenance efforts.

As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House and Senate Committees on Government Operations no later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for

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appropriations made more than 60 days after the date of the report. We appreciate the cooperation received during our survey and would like to be informed of any actions taken on our recommendations.

Sincerely yours,

A handwritten signature in cursive script that reads "Henry Eschwege". The signature is written in dark ink and is positioned above the typed name and title.

Henry Eschwege
Director