INTRODUCTION

This notebook is intended to be a working tool that provides a readily available compilation of current FHWA policy and guidance on pavements. Users are encouraged to add material as they see fit.

The notebook is composed of:

(1) Reference to appropriate Federal-aid Highway Program Manual directives;

(2) Other issuances, such as Technical Advisories and Notices which present short-term instructions or interim policy;

(3) FHWA memorandums clarifying policy or providing technical guidance;

(4) Discussions reflecting current state-of-the-art or philosophy;

(5) Material on developmental and research areas related to pavements.

The material is arranged by subject into chapters and sections. The Table of Contents shows current date for each document.

Any comments, suggested additions, or revisions to the notebook should be directed to the Federal Highway Administration, Attn: Mr. Peter J. Serrano, Pavement Division, HNG-46, 400 Seventh St., S.W., Washington, D.C.; Telephone number 202366.1341 or email at *Peter.J.Serrano@fhwa.dot.gov.*

Enclosed is the second revision to the *Pavement Notebook* for *FH* WA *Engineers.* Please make the changes contained in the attachment. Submit the attached form on the following page so that we can include your name and address on our mailing list. For further information or additional copies of the notebook contact Mr. Peter J. Serrano at *202.366.1341* or *Peter.J.Serrano@fhwa.dot.gov*.

Refer to: HNG-40

Chief, Pavement Division
Federal Highway Administration
400 Seventh Street, SW., Room 3118
Washington, D.C. 20590-0001

Attn: Mr. Peter J. Serrano, P.E.

Dear Sir:

I have received a copy of the ***Pavement Notebook for FHWA Engineers*** and would like to be on your distribution list for future updates and/or additions to the notebook.

Request for additional copies should be addressed to:

Federal Highway Administration
Pavement Division - Attn: Mr. Peter J. Serrano, P.E..
Pavement Design and Rehabilitation Branch (HNG-42)
400 Seventh Street, S.W.
Washington, D.C 20590

Please mail or fax the form below.

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Name: _____

Title: _____

Agency: _____

Address: _____

_____

Telephone Number: _____

Federal Highway Administration - Pavement Division
Attn: Mr. Peter J. Serrano, P.E. (HNG-42);
Fax number: 202.366.3713

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Chapter 1

Pavement Policy

AP-2 1 Geotechnical Microcomputer Programs

DESCRIPTION : This project has involved the development of several geotechnical programs under contract with geotechnicai microcomputer programming firms. These programs have been made available to the States by the OTA.

BACKGROUND : The microcomputer industry has undergone rapid changes in recent years. New developments in hardware and software make the use of the microcomputer in civil engineering applications more feasible, practical, and almost indispensable.

The microcomputer can be used to solve many geotechnical problems that need repetitive and yet complicated calculations, such as analyzing embankment and foundation deformations, estimating pile behavior under static and dynamic forces, and calculating foundation settlements. Five of the microcomputer programs developed or under development are:

COM624P: Analyzes the behavior of piles or drilled shafts, subjected to lateral loads using the p-y method.

EMBANK: Determines one-dimensional compression settlement because of embankment loads.

SPILE: Calculates the ultimate static pile capacity in cohesive and cohesionless soils.

RSS: Analyzes stability of slopes that contain soil reinforcement. The analysis is performed using a two-dimensional limiting equilibrium method,

MSEW: Designs and/or analyzes required reinforcement for mechanically stabilized retaining walls, which does not consider specific facing configurations.

DRIVEN: This program is the updated version of the SPILE Program.

PILE FOUNDATION : This program will be developed based on the University of Florida program - LPGSTAN which is capable of analyzing bridge foundations subject to extreme events (hurricanes, ship and ice imports). The program will extend its capabilities to include the analysis and design of sound walls, retaining walls, signs and high mast lighting structures.

PROJECT **MANAGER** : Chien-Tan Chang, HTA-22, (202) 366-6749

STATUS: The SPILE Program has been upgraded, the new program is called Driven. This program is estimated to be completed by the end of 1995. RSS Program has been completed. It will be tested for about 2 months and will be distributed early December 1995. Contracts are being negotiated to develop a new version of MSEW program and a multiple faceted program called Pile Foundations.

CHAPTER 1

PAVEMENT POLICY

1.1 Pavement Design and Management Requirements

- Pavement Management System, 23 CFR 500, Subpart B, April 22, 1994.
  - 500.201, Purpose
  - 500.203, PMS deiinition
  - 500.205, PMS general requirements
  - 500.207, PMS components
  - 500.209, PMS compliance scheduling
- Non-Regulatory Supplement, October 05, 1995.
  - 500,205, General Pavement Design Considerations

1.2 ISTEA Pavement Management Systems

- Action: ISTEA Pavement Management Systems, November 4, 1994
  - Technical Guidance

1.3 Cost Comparison of Asphalt versus Concrete Pavement, OIG Final Report, July 26, 1994.

1.4 Proposed Final Interstate Maintance Fund Transfer Policy, September 21, 1994).

- Transfer of Interstate Maintance Program Funds, Proposed Final Policy Statement, Federal Register, September 02, 1994).
- Transfer of Interstate Maintance Program Funds, Interim Policy Statement, Federal Register, March 03, 1993).

SUBCHAPTER F - TRANSPORTATION INFRASTRUCTURE MANAGEMENT

PART 500 - MANAGEMENT AND MONITORING SYSTEMS

Subpart B - Pavement Management System

Sec.

Authority: 23 U.S.C. 134, 135, 303 and 315; 49 U.S.C. app. 1607;
'23 CFR 1.32; and 49 CFR 1.48 and 1.51.

Source: 58 FR 63475, Dec. 1, 1993 [Effective Jan. 3, 1994] .

Sec. 500.201 Purpose.

The purpose of this subpart is to set forth requirements for development, establishment, implementation, and continued operation of a pavement management system (PMS) for Federal-aid highways in each State in accordance with the provisions of 23 U.S.C. 303 and subpart A of this part.

Sec. 500.203 PMS definitions.

Unless otherwise specified in this part, the definitions in 23 U.S.C. 101(a) and Sec. 500.103 are applicable to this subpart. As used in this part:

Pavement design means a project level activity where detailed engineering and economic considerations are given to alternative combinations of subbase, base, and surf ace materials which will provide adequate load carrying capacity. Factors which are considered include: materials, traffic, climate, maintenance, drainage, and life-cycle costs.

Pavement management system (PMS) means a systematic'process that provides, analyzes, and summarizes pavement information for use in selecting and implementing cost-effective pavement construction, rehabilitation, and maintenance programs.

Sec. 500.205 PMS general requirements.

(a) Each State shall have a PMS for Federal-aid highways that meets the requirements of Sec. 500.207 of this subpart.

(b) The State is responsible for assuring that all Federal-aid highways in the State, except those that are federally owned, are covered by a PMS. Coverage of federally owned public roads shall be determined cooperatively by the State, the FHWA, and the agencies that own the roads.

(c) PMSs should be based on the concepts described in the "AASHTO Guidelines for Pavement Management Systems." [AASHTO Guidelines for Pavement Management Systems, July 1990, can be purchased from the American Association of State Highway and Transportation Officials, 444 N. Capitol Street, NW., suite 225, Washington, DC 20001. Available for inspection as prescribed in 49 CFR part 7, appendix D.]

(d) Pavements shall be designed to accommodate current and predicted traffic needs in a safe, durable, and cost-effective manner.

Sec. 500.207 PMS components.

(a) The PMS for the National Highway System (NHS) shall, as a minimum, consist of the following components:

(1) Data collection and management.

(i) An inventory of physical pavement features including the number of lanes, length, width, surface type, functional classification, and shoulder information.

(ii) A history of project dates and types of construction, reconstruction, rehabilitation, and preventive maintenance.

(iii) Condition surveys that include ride, distress, rutting, and surface friction.

(iv) Traffic information including volumes, classification, and load data.

(v) A data base that links all data files related to the PMS. The data base shall be the source of pavement related information reported to the FHWA for the HPMS in accordance with the HPMS Field Manual. [Highway Performance Monitoring System (HPMS) Field Manual for the Continuing Analytical and Statistical Data Base, DOT/FHWA, August 30, 1993, (FHWA Order M5600.1B). Available for inspection and copying as prescribed in 49 CFR part 7, appendix D.]

(2) Analyses, at a frequency established by the State consistent with its PMS objectives.

(i) A pavement condition analysis that includes ride, distress, rutting, and surface friction.

(ii) A pavement performance analysis that ipcludes an estimate of present and predicted performance of specific pavement types and an estimate of the remaining service life of all pavements on the network.

(iii) An investment analysis that includes:

(A) A network-level analysis that estimates total costs for present and projected conditions across the network.

(B) A project level analysis that determines investment strategies including a prioritized list of recommended candidate projects with recommended preservation treatments that span single-year and multi-year periods using life-cycle cost analysis.

(C) Appropriate horizons, as determined by the State, for these investment analyses.

(iv) For appropriate sections, an engineering analysis that includes evaluation of design, construction, rehabilitation, materials, mix designs, and preventive maintenance as they relate to the performance of pavements.

(3) Update. The PMS shall be evaluated annually, based on the agency's current policies, engineering criteria, practices, and experience, and updated as necessary.

(b) The PMS for Federal-aid highways that are not on the NHS shall be modeled on the components described in paragraph (a) of this section, but may be tailored to meet State and local needs. These components shall incorporate the use of the international roughness index or the pavement serviceability rating data as specified in Chapter IV of the HPMS Field Manual.

Sec. 500.209 PMS compliance schedule.

(a) By **October** 1, 1994, the State shall develop a work plan that identifies major activities and responsibilities and includes a schedule that demonstrates full operation and use of the PMS on the NHS by October 1, 1995, and on non-NHS Federal-aid highways by October 1, 1997.

(b) By October 1, 1995:

(1) The PMS for the NHS shall be fully operational and shall provide projects and programs for consideration in developing metropolitan and statewide transportation plans and improvement programs; and

(2) PMS design for non-NHS Federal-aid highways shall be completed or underway in accordance with the State's work plan.

(c) By October 1, 1997, the PMS for non-NHS Federal-aid highways shall be fully operational and shall provide projects and programs for consideration in developing metropolitan and statewide transportation plans and improvement programs.

U. S. Department of Transportation

Federal Highway Administration

Federal-Aid Policy Guide

Subject

FEDERAL-AID POLICY GUIDE - CHANGE

Date **Transmittal Number**

1-4

1. PURPOSE. To transmit new and revised pages to the Federal-Aid Policy Guide (FAPG).

2. COMMENTS. The FAPG is being updated to include the following items.

   a. Federal-aid regulations previously published in the Federal Register.

      (1) Revised sections: (a) 23 CFR Part 630, Preconstruction Procedures, (b) 23 CFR Part 637, Construction Inspection and Approval, (c) 23 CFR Part 645, Utilities, and (d) 49 CFR Part 18, Grants and Cooperative Agreements to State and Local Governments.

      (2) Removed section: 23 CFR Part 1204, Uniform Guidelines for State Highway Safety Programs.

   b. Supplemental sections NS 23 CFR 140G, NS 23 CFR Part 500, NS 23 CFR Part 635D, NS 23 CFR Parr 645A and NS 23 CFR Part 660A have been revised.

   c. Revised pages to the Table of Contents art also included with this transmittal.

3. REGULATORY MATERIAL. The regulatory material contained in this directive has been published in the Federal Register and will be codified in Title 23, Code of Federal Regulations.

4. ACTION. Each recipient office is responsible for filing the attached FAPG pages into the binders provided.

George S. Moore, Jr.
Associate Administrator
for Administration

DISTRIBUTION: **OPI:**

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INTENTIONALLY

NON-REGULATORY SUPPLEMENT

OPI: HNG-42

1 GENERAL PAVEMENT DESIGN CONSIDERATIONS (23 CFR 500.205(d))

Title 23 CFR 500.205(d) establishes the following requirement: *"Pavements shall be designed to accommodate current and predicted traffic needs in a safe, durable, and cost-effective* manner." The regulations do not specify the procedures to be followed to meet this requirement. Rather each State Highway Agency (SHA) is expected to use a design procedure which is appropriate for their conditions. The SHA may use the design procedures outlined in the AASHTO Guide for Design of Pavement Structures or they may use other pavement design procedures that, based on past performance cr research, are expected to produce satisfactory pavement designs.

a. FHWA Evaluation of Pavement Design Procedures

(1) Consistent with FHWA's Operational Philosophy on process review/product evaluation (PR/PE) attached to Executive Director Carlson's November 12, 1991 memorandum, the FHWA field offices will conduct periodic reviews of the SHA's pavement design process. As part of the review, FHWA field offices will sample a sufficient number of projects to determine that the pavement design process is being followed and the process provides reasonable engineering results. If the reviews show that the SHAs have and are following an acceptable pavement design process, routine pavement design reviews of individual projects will not be required.

(2) The FHWA encourages the development of mechanistic pavement design procedures. *To* promote consistency in application of mechanistic related design procedures,

the Pavement Division will participate with the Region and Division offices in reviewing and discussing these procedures with the State during their development.

b. Factors to Consider in Pavement Design.

Highway agencies should pay particular attention to the following items in designing pavements.

(1) Traffic. Pavement designers should work closely with the SHA component responsible for the development of the Traffic Monitoring System for Highways (TMS/H) required under 23 CFR 500.801. The TMS/H should reflect the accuracy of traffic volume, classification, and truck weight data required for pavement design.

(a) Accurate cumulative load (normally expressed as 18 kip equivalent single axle loads or ESALs) estimates are extremely important to structural pavement design. Load estimates should be based cn representative current vehicle classification and truck weight data and anticipated growth in heavy truck volumes and weights. Representative current traffic data should be obtained using statistically valid procedures for obtaining count, classification, and weight data based on the concepts described in the FHWA "Traffic Monitoring Guide" and the "AASHTO Guidelines for Traffic Data Programs."

(b) Accurate vehicle classification data on the number and types cf trucks is essential to estimating cumulative loads during the design period and should be given special emphasis. Weight information should be obtained using weigh-in-

motion (WIM) equipment since this data is more representative than data obtained using static enforcement scales which are plagued with avoidance problems. States should continue to automate their monitoring program through installation of strategically placed automatic vehicle classification and WIM systems as soon as possible to improve the current base traffic data used to forecast future truck volumes and loads.

(c) The SHA's forecasts of future loadings should, as a minimum, be based on two truck classes: trucks up to 4-axle combination and trucks with 5-axles or more. Changes in load factors should also be monitored and forecasted. The forecasting procedures should consider past trends and future economic activity in the area. A traffic data collection and forecasting program that identifies the most important truck types and the changes in numbers and weights of these truck types during the design period should provide realistic load estimates.

(2) Roadbed So- Both the 1986 and 1993 versions of the "AASHTO Guide For Design of Pavement Structures" require the use of -the Resilient Modulus (M_R) (a measure of the elastic property of soils) in lieu of soil support value as the basic materials value to characterize roadbed soils for flexible pavements. The AASHTO Guide strongly recommends that SHAs acquire the necessary equipment to measure M_R. SHAs who use M_R values converted from CBR and R-value should conduct correlation studies using a range of soil types, saturation levels, and densities to determine realistic input values. For rigid pavements, the

use of a k-value is required. NCHRP Report 372, Support Under Portland Cement Concrete Pavements, provides improved guidance on selecting appropriate values for this factor. Proper roadbed soil support is needed for longer pavement service lives and more cost-effective pavement design.

(3) Drainage

(a) Drainage is one of the more important factors in pavement design, yet inadequate subsurface drainage continues to be a significant cause of pavement distress, particularly in portiand cement concrete pavements. During the last 10 years significant strides have been made in the development of positive drainage systems for new and reconstructed pavements. There have also been major developments in products and materials which can be used for retrofit longitudinal edgedrains.

(b) The developments in permeable base technology and longitudinal edgedrains make positive pavement drainage possible and affordable. Accordingly, pavement design procedures need to consider the effects of moisture on the performance of the pavement. Where the drainage analysis or past performance indicates the potential for reduced service life due to saturated structural layers or pumping, the design needs to include positive measures to minimize that potential.

(4) Shoulder Structure

(a) Recent studies demonstrate that full structural shoulders improve both mainline pavement and shoulder performance. Research results have

shown that widening the right pavement lane and placing the edge stripe 0.5 m from the outside pavement edge significantly improves pavement performance.

(b) The SHAs are encouraged to use paved shoulders where conditions warrant. Shoulders should be structurally capable of withstanding wheel loadings from encroaching truck traffic. On urban freeways or expressways, strong consideration should be given to constructing the shoulder to the same structural section as the mainline pavement. This will allow the shoulder to be used as a temporary detour lane during future rehabilitation or reconstruction.

(c) On new and reconstructed pavement projects, the SHAs are encouraged to investigate the advantage of specifying that the shoulder be constructed of the same materiais as the mainline, particularly on high-volume roadways. Constructing shoulders of the same materials as the mainline facilitates construction, reduces maintenance costs, improves mainline pavement performance, and provides additional flexibility for future rehabilitation.

(5) Engineering and Economic Analy.

The design of both new and rehabilitated pavements should include an engineering and economic evaluation of alternative strategies and materials. The project specific analysis should be evaluated in light of the needs of the entire system. Appendix B of the 1993 "AASHTO Guide for Design of Pavement Structures," and the "FHWA Pavement Rehabilitation Manual," provide guidance on engineering considerations. The Engineering

evaluation should include consideration of the use of recycled materials or pavement recycling techniques where feasible. Economic considerations include an economic analysis based on Life Cycle Costs (LCC). The FHWA interim policy statement on LCC analysis published in the July 11, 1994 Federal Resister provides guidance on LCC Analysis.

(a) Pavements are long term public investments and all the costs (both agency and user) that occur throughout their lives shouid be considered. LCCA identifies the long term economic efficiency of competing pavement designs. However, the resulting numbers themselves are less important than the logical analysis framework fostered by LCCA in which the consequences of competing alternatives are evaluated. When performing LCCA for pavement design, the variability of input parameters needs to be considered. The results of LCCA should be evaluated to determine whether differences in costs between competing alternatives are statistically significant. This evaluation is particularly important when the LCC analysis reflects relatively small economic differences between alternatives.

(b) The FHWA's policy on alternate bids, which would include bids for alternate pavement types, is addressed in 23 CFR 635.411(b). This section requires the use of alternate bid items "When . . . more than one... product... will fulfill the requirements... and these . . . products are judged... equally acceptable on the basis of engineering analysis and the

anticipated prices... are estimated to be approximately the same.

(1) The FHWA does not encourage the use of alternate bids to derermine the mainline pavement type, primarily due to the difficulties in developing truly equivalent pavement designs.

(2) In those rare instances where the use of alternate bids is considered, the SHA's engineering and economic analysis of the pavement type selection process should clearly demonstrate that there is no clear cut choice between two or more alternatives having equivalent designs. Equivalent design implies that each alternative will be designed to perform equally over the same performance period and have similar life-cycle costs.

c. Rehabilitation Pavement Design. It is essential that rehabilitation projects be properly engineered to achieve the best return possible for the money expended. When an existing pavement structure is sound and the cost *to* restore serviceability is minor when compared to the cost of a new pavement structure or major rehabilitation, an engineering and economic analysis of alternative actions may not be necessary. In general, for all major rehabilitation projects, each-of the following steps should be followed to properly analyze and design the project.

(1) Project Evaluation

(a) Obtain the necessary information to evaluate the performance and establish the condition of the in-place pavement with regard to traffic loading, environmental conditions, material strength, and quality. Historical pavement condition data, obtained from the Pavement Management System (PMS), can provide good initial information.

(b) Identify the types of pavement distresses and the factors causing the distresses before developing appropriate rehabilitation alternatives. The tools necessary to analyze pavement failures, such as coring, boring, trenching, and deflection measurements, are well known, and need to be employed more often.

(c) Evaluate the array of feasible alternatives in terms of how well they address the causes of the deterioration, repair the existing distress, and prevent the premature reoccurrence, of the distress.

(2) Project Analysis

(a) Perform an engineering and economic analysis of candidate strategies. The engineering analysis should consider the traffic loads, climate, materials, construction practices, and expected performance. The economic analysis should be based on life cycle cost and consider service life, initial cost, maintenance costs, user costs, and future rehabilitation requirements, including maintenance of traffic.

(b) Select the rehabilitation alternative which best satisfies the needs of a particular project considering economics, budget constraints, traffic service, climate, and engineering judgment.

(3) Project Design

(a) Conduct sufficient testing, both destructive and non-destructive, to verify the assumptions made during the alternative evaluation phase. The SHAs should consider a new distress survey if the original

condition survey was sample based or if the survey is not current in terms of the time the project is scheduled to go to contract.

(b) Consider and address all factors causing the distress in addition to the surface indicators in the finai design. Such factors as structural capacity, subgrade support, surface and subsurface drainage characteristics need to be considered and provided for in the final design.

(c) Once a rehabilitation alternative is selected, design the project using appropriate engineering techniques. A number of publications are available to guide the selection of these engineering techniques. The FHWA's "Pavement Rehabilitation Manual," and training course "Techniques for Pavement Rehabilitation" provide excellent guidelines. There are also a number of excellent guides available from the asphalt and concrete industries.

(4) Project Implementation

(a) Document the intent of the design in the project plans and specifications to provide both the contractor and the construction engineering personnel a clear and concise project proposal. In addition, maintain adequate communication between the design and construction engineers. This will reinforce the intent of the design and provide feedback on project constructability and performance to aid timely evaluation of the selected rehabilitation alternative.

(b) The performance information should also be included as a part of the SHA's PMS. The lack of good performance data on pavement rehabilitation techniques is one of the weaker points in the rehabilitation process. Increased emphasis should be placed cn developing basic performance and maintenance cost data on rehabilitation techniques where performance data is not presently available.

2 SAFETY (23 CFR 500.205d)

a. The SHAs should provide skid resistant surfaces on all projects, regardless of funding source. New pavement surfaces constructed with Federal funds must have skid resistant properties suitable for the needs of the traffic. New pavement surfaces on projects where a skid resistant surface was previously constructed with Federal funds must have skid resistant properties suitable for the needs of the traffic even if not now financed with Federal-aid funds.

b. The SHAs should analyze pavement performance histories and existing skid data to ensure that the materials, mix designs, and construction techniques used are capable of providing a satisfactory skid resistant surface over the expected performance period of the pavement. Each SHA's skid accident reduction program should include a systematic process to identify, analyze, and correct hazardous skid locations. The SHA's should use the same ccastruction procedures and quality standar is used in constructing new pavements in pa- ement maintenance operations.

c. Plans and specifications for proposed pavement rehabilitation and reconstruction projects should include items to minimize disruption and ensure adequate protection Of the motorists and workers within the

construction work zone in accordance with the provisions of 23 CFR 630, subpart J and 23 CFR 635, subpart A.

NOV 04 1994

ACTION: ISTEA Pavement Management Systems

Director, Office of Engineering HNG-41

Regional Administrators

We are approaching the first bench mark in implementing the Pavement Management System (PMS) provisions in ISTEA. By January 1, 1995, each State is required to submit to the division office the certification statement, work plan, and status for implementing its PMS. The division office should review the submission and forward its comments and a copy of the documents to the region. The regional office has the responsibility to review and accept the submission and notify the division office accordingly.

The purpose of this memorandum is twofold. First, we want to provide technical guidance and criteria in order to implement the PMS provisions in ISTEA in a complete and consistent manner. Secondly, we request your cooperation and assistance in providing us with PMS information, to we can continue to monitor the States' progress in developing and implementing their PMS's.

1. During the past months, we have assisted several field offices in reviewing draft work plans and noted some deficiencies and inconsistencies that warrant attention. Presently, we need to focus on four technical items: (1) multi-year prioritization, (2) life-cycle cost analysis, (3) condition survey distresses, and (4) condition survey samples. Attached is technical guidance on these four items for your use. We have reiterated some of the fundamentals of PMS for the benefit of the States and divisions who are experiencing a high turnover and influx of engineers and managers who are new to PMS.

2. For the past 8 years the Pavement Management Branch has maintained a national database on the status of the States' PMS's that is used to assess and guide the national PMS program. With the advent of the ISTEA certification process, the information in the database will continue to play an important role in managing the national program. As you know, the information has always been collected and reported by the FHUA staff. We are requesting your cooperation and assistance to have the division office PMS specialists update this information when they concurrently review the States' PMS certifications and work plans. Please send the completed PMS Survey form (copy attached) to the Pavement Management Branch, HNG-41 by January 17, 1995.

Implementing the PMS provisions in ISTEA is of vital importance to FHWA. The key to success is a strong joint effort between Headquarters and the field offices. We will continue to provide technical guidance and direction as needed to help achieve a comprehensive and consistent PMS program. If you have any questions, or need technical assistance, please contact Mr. Frank Botelho at 202-366-1336.

William A. Weseman

William A. Weseman

TECHNICAL GUIDANCE

1. Multf-Year Prioritization. Multi-year prioritization is the heart of a PMS. It provides a prioritized listing of projects for which rehabilitation/preservation actions are recommended for each year of the planning horizon. The multi-year prioritized list of candidate projects and treatments is a "first cut" list that is normally produced by the Pavement Management Engineer(s) and submitted to the appropriate offices in the Agency to be used as input in developing the statewide pavement preservation program. The prioritization is based on priority factors, predicted performance, and economic analysis relative to the goals set by the State for its network. The candidate projects should have a high benefit cost ratio based on life-cycle cost analysis. The prioritization process must be objective, analytical, formalized, and automated (computerized for State and large local networks) in order to be stable and repeatable with time and changing of personnel. Its established engineering criteria and analytical methodology are the basis and means of producing and documenting an accountable and justifiable pavement preservation program.

   Many States have not yet established or utilized the above criteria for multi-year prioritization. Rather, they are prioritizing projects solely on a subjective, manual, and "worst first' basis. The field offices need to promote and support major efforts by the State highway agencies (SHA's) to satisfy the intent of our regulation on multi-year prioritization.

2. Life-Cycle Cost Analysis. The need and purpose for life-cycle cost analysis is strongly emphasized in ISTEA. The FHWA issued an interim policy statement on life-cycle cost on July 11, 1994. This policy statementshould be used by the field when evaluating the States' life-cycle cost analysis procedures. Prioritization and life-cycle cost analysis are the analytical basis for demonstrating that the expenditure of Federal-aid funds are justifiable and cost effective.

   A State PMS wst include a life-cycle cost analysis (that is commensurate with the level of investment and types of preservation treatments) for candidate projects in order to compare alternative treatments and strategies to product a cost effective preservation program that satisfies the goals of the Agency. The lift-cycle cost analysis should be based on the performance prediction and economic models used in multi-year prioritization. Lift-cycle cost analysis of specific project treatments should consider future treatments required to maintain the pavement until reconstruction. Life-cycle cost analysis of network-level strategies requires an analysis period of at least one complete cycle in the life of the network, which should be at least 35 years.

3. Condition Survey Distresses. Pavement condition data are the foundation for measuring and monitoring: the "health" of the network: the current and predicted performance of pavements; and the remaining service life of the network. A PMS condition survey bridges the "information gap" between general planning data and detailed design data. Condition data are combined with performance data, life-cycle cost analysis, and priority factors to develop the multi-year list of prioritized projects. The type, extent, and severity of the individual distresses are also used to determine viable preservation treatments.

   The types of distresses that are measured in a pavement condition survey should be chosen on the basis that they support the decisions on where, when, and how to preserve the network. A "sufficiency rating" (commonly used for planning purposes) or a single distress survey do not constitute a PWS condition survey. The premise of using either one as a "common denominator" does not provide the engineering detail needed in PMS's.

4. Condition Survey Samples. The reliability of condition data is crucial to the credibility of a PMS. The least amount of error will occur if 100 percent of the pavement is sampled. The viability of sampling 100 percent is only possible when using automated survey equipment, such as the equipment that is currently used to measure roughness, rutting, and faulting. In the absence of automated equipment, SHA's customarily measure distress data using an approximate 10 percent representative sample. That is, a 10 percent sample on each and every mile of the network. This may somewhat increase or decrease depending on the variability in pavement candltion.

   Because of the expanded network coverage of ISTEA (i.e., a total of 936,000 centerline miles of Federal-aid highway), some SHA's are exploring cost cutting measures to reduce the added burden of collecting pavement condition data. Generally, reducing the number of distresses or reducing the sample size does not result in real cost savings because of the increased risk of errors in PMS. However, SHA's can achieve real cost savings by reducing the frequency of the condition surveys. Condition surveys can be conducted every 2 years instead of every year. Biennial surveys should be supplemented with annual updates for newly improved sections and when unexpected changes occur caused by either the environment, loading, premature failures, or accelerated deterioration.

While these fundamental criteria apply to all Federal-aid highways, we want t prevent unnecessary data collection and analysis burdens, so please remind PM practitioners that the level of effort needed to do items 1, 2, and 3 is far less for lower order roads than for the proposed National Highway System.

Date _____

NHS PMS SURVEY

(Question ii(A) applies to both the NHS and Non-NHS)

I. ORGANIZATION

A. State _____

B. FHwA Region ___

C. State Staffing Resources

The following staffing information pertains only to the staff at the central office. It does not apply to district staff or field data collection crews.

1. Does the SHA have a person who is designated as the State's PMS Engineer'? Yes No___ (If no. still provide a name. address. etc. for the point of contact).

Name _____
Address _____
_____
_____
City _____ ST __ Zipcode_____ PlusFour _____
Phone _____ FAX _____

2. Does the PMS Engineer work full time on PMS? Yes_____ No If part-time. what percentage is spent on PMS? Part-Time Percentage____.

3. Does the PMS Engineer have the full responsibility and author? ty to lead the development. implementation. and operation of PMS? Yes___ No___.

4. If NO. how is PMS managed?

_____
_____

5. If the PMS engineer has an assistant(s). staff. or in-house support: indicate each position(person's name). percent time spent on PMS. and a brief description of their primary function(s). This pertains only to the central office and excludes condition survey crews. (Add additional names on separate sheet.)

	Name	Percent Time	Primary Function(s)
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____

[1]PMS Engineer is the person who is in charge of leading and working on developing, implementing, and operating the PMS on a day-to-day basis.

Revised 10/20/94

D. Does the State have an active PMS committee(s) or group(s) that guide and update the PMS? Yes_____ No ____ Provide the positions(i.e.pavement design. materials.etc.) of PMS committee(s) members on an attached sheet.

II. PMS DATABASE

A. PMS Coverage

	Federal-aid Highway Mileage (Centerline)				
	Covered		Not Covered		
	NHS	Non NHS	NHS	Non NHS	Total
State					
Local					
Total Roads					

B. Inventory Data

	Yes	Under Development	Considering In Future	No
1. Pavement type	—	—	—	
2. Pavement width	—	—	—	
3. Shoulder type	—	—	—	
4. Shoulder width	—	—		
5. Number of lanes	—	—		—
6. Layer thicknesses	—	—		
7. Joint spacing	—	—	—	—
8. Load transfer		—	—	
9. Subgrade classification	—	—	—	—
10. Material properties	—	—		—
11. Resilient modulus	—	—		
12. Drainage		—		
13. Other (specify) _____				

C. Project History

	Yes	Under Development	No
1. Construction			
2. Rehabilitation			
3. Maintenance[2]			

[2]"Maintenance" refers to preventive maintenance notcorrective maintenance. Corrective maintenance refers to pot hole repair. etc.

Revised 10/20.

D. Condition Survey

	Yes	Under Development	Considering In Future	No	Equipment
1. Ride	___		___	___	_____
2. Rutting	___		___	___	_____
3. Faulting	___		___	___	_____
4. Cracking	___		___	___	
5. Surface Friction	___		___	___	_____
6. Network-level Deflection	___		___	___	_____

E. Distress

	Yes	Under Development	Considering In Future	No
1. High speed windshield survey at 30 to 55 mph.	___	___	___	___
2. Lcw speed survey at 0 to 10 mph.	___	___	___	___
3. Combination of high and low speed.	- -	___	___	___
4. 35mm film viewed at a workstation.	___	___	___	___
5. Video tape viewed at a workstation.		___	___	___
6. Distress Identification.- Manual with pictorial references used to calibrate extent and severity.	___	___	___	___
7. Fully automated.		___	___	___
Specify equipment: --				

F. What is the frequency of condition data collection on the NHS? _____

G. How does the State collect their condition data?
In House _____ Contractor(specify) _____

H. Traffic/Load Data

1. Does the PMS database contain:

	Yes	Under Development	Considering In Future	No
a. Annual ESAL's		___	___	
b. Forecast ESAL's		___	___	
c. Cumulative ESAL's		___	___	

2. Does the PMS have an ESAL flow map that is route specific?

Yes ___ Under Development ___ Considering in Future ___ No

I. Does the PMS provide IRI or PSR(circle one) to FHWA HQ for the HPMS sample sites?

Yes ___ Under Development ___ No ___

Revised 10/20/94

J. Does the PMS have a relational database?

Yes ___ Under Development ___ No ___

K. How much work has been completed in developing the PMS database? Development work would include: establishing data files. collecting data, loading data.writing application programs for analysis. etc..

0-25% ___ 25-50% ___ 50-753 ___ 75-100% ___

III. INVESTMENT ANALYSES

A. Prioritization

1. Does the PMS office/unit produce a multi-year prioritized list of recommended candidate projects (this is considered a "first cut" list)?

   Yes ___ Under Development ___ No ___

2. What method does the PMS use to produce the multi-year prioritized list of projects?

	Yes	Under Development	Considering In Future	No
a. Subjective[3]	___	___	___	___
b. Objective[4]				
1. Priority Model	___	___	___	___
2. Incremental Benefit Cost	___	___	___	___
3. Marginal Cost Effectiveness	___	___	___	___
4. Optimization				

	Yes	Under Development	Considering In Future	No
a. Linear Programming	___	___	___	___
b. Non-Linear Programming	___	___	___	___
c. Integer Programming	___	___	___	___
d. Dynamic Programming	___	___	___	___
e. Other (Specify) _____	___	___	___	___

[3] "Subjective" indicates that the projects were prioritized by individuals using only personal knowledge of the roads.

[4] "Objective" means that the projects were prioritized using a repeatable analytical process.

3. If the answer to question2(b) is Yes or Under Development, who developed tne softwaree? In House _____ Contractor(specify) _____

4. Check the factors used to prioritize projects:

	Yes	Under Development	Considering In Future	No
a. Distress				
b. Ride				
c. Traffic				
a. Functional class				
e. Skid				
f. Structural adequacy				
g. Other (Specify) _____				

B. Preservation Treatment

1. Does the PMS assign a preservation treatment to a candidate project?

Yes ___ Under Development ___ No ___

2. If the answer to question I is Yes or Under Development, which groups of treatments does the PMS cover?

	Yes	Under Development	No
a. Reconstruction			
b. Rehabilitation		---	
c. Maintenance'			

3. What method is used to assign a preservation treatment to a candidate project.

	Yes	Under Development	Considering In Future	No
a. Subjective[6]				
b. Objective'				
1. Matrix				
2. Decision tree				
3. Cost Benefit				
4: Optimization Methoa listed previously.				
5:- Other (Specify) _____		--		

'"Maintenance" refers to preventive maintenance not corrective maintenance. Corrective maintenance refers to pothole repair, etc.

'"Subjective" indicates that the projects were prioritized by individuals using only personal knowledge of the roads.

'"Objective" means that the projects were prioritized using a repeatable analytical process.

4. If the answer to question 3(b) is Yes or Under Development, who developed t. software? In House ____ Contractor(specify) _____

5. Does the PMS do a life-cycle cost analysis for the recommended preservation treatments?

Yes ____ Under Cevelopment ____ NO

6. If the answer to question 5 is Yes or Under Development, who developed the software? In House ____ Contractor(specify) _____

C. Pavement Performance Monitoring and Projection

1. Does the PMS monitor pavement performance?

Yes ____ Under Development ____ No ____

2. Check all the pavement indices used to monitor pavement performance:

	Yes	Under Development	Considering In Future	No
a. Ride	___	- -	___	___
b. Distress	___	___	___	___
c. Combined Index	___		L	___
e. Other (Specify)		- -		

3. Is load data (cumulative ESAL's) used to monitor pavement performance?

Yes ____ Under Development ____ Considering in Future ____ No

4. Does the PMS generate pavement performance curves?

Yes ____ Under Development ____ Considering in-future ____ No

5. Are the curves developed for?

	Yes	Under Development	Considering In Future	No
Family of pavements	___	___	___	___
Each pavement	___	___		___

6. Does the PMS monitor and predict performance using?

	Yes	Under Develooment	Considering In Future	No
Markov Transition		___	___	___
Semi-Markov Transition	--	___	___	___

7. Does the PMS monitor pavement performance using another method? (specify). _____

_____

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8. Does the PMS compute the Remaining Service Life of the network?

Yes ___ Under Development ___ No

9 If the answer to question 8 is Yes or Under Development, who developed the software? In House ___ Contractor(specify)_____

IV. ENGINEERING ANALYSIS

A. Is the performance data in the PMS database used to evaluate either the accuracy. quality. or the cost effectiveness for:

	Yes	Under Development	Considering In Future	No
1. New pavement design procedures	___	___	___	___
2. Overlay design procedures	___	___	-	-
3. Rehabilitation techniques	___	___	-	-
4. Materials	___	___	-	-
5. Construction	___	___	-	-
6. Preventive maintenance	___	___	-	-
7. Mix designs	___	___	-	-
8. Other (Specify)	___	___	-	-

V.. PRODUCTS

A. Is the PMS's multi-year prioritized list of recommended projects used as input in the development of the State's:

	Yes	Under Development	No
1. Pavement Preservation Program	___	___	___
2. Statewide Transportation Improvement Program(STIP)	___	___	___
3. Transportation Improvement Program(TIP)	___	___	___

B Is the PMS's multi-year prioritized list(first cut) compared to the final approved list of pavement preservation projects for reasonableness?

Yes ___ Under Development ___ Considering in Future ___ No ___

VI. UPDATE

Does the SHA annually evaluate and update 'the PMS relative to the agency's policies. engineering criteria. practices. experience, and current information?

Yes ___ Under Development ___ No ___

Revised 10/20/94.

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **INFORMATION:** OIG Final Report on the Audit of Cost Comparison of Asphalt Versus Concrete Pavement

Date: July 26, 1994

From: Rodney E. Slater
Administrator

Reply to Attn. of: HMS-11

To: The Honorable **A. Mary Schiavo**
Inspector *General* **(JA-1)**

We have completed our review of the final report on the Audit of Cost Comparison of Asphalt Versus Concrete Pavement in Region 4. Your transmittal memorandum requested that we reconsider our nonconcurrences with your recommendations and provide specific target dates and further clarification where we have agreed to corrective actions.

Our specific comments relative to each recommendation are contained in the attachment to this memorandum. For clarification, we have included our responses to the draft report, as well as a summary of the OIG comments on those responses in the attachment.

Our further review of the report reveals a fundamental philosophical difference in our approach to administering the Federal-aid highway program. This difference is specifically stated in the report's synopsis, alluded to in the report itself, and incorporated into many of the report's recommendations.

The philosophical difference is clearly articulated in the statement on page iv which reads as follows: "**. . . the continuing problem with FHWA's traditional strategy of facilitating, rather than mandating . . . .**" The report suggests that the FHWA needs to alter its operational relationship with State highway agencies (SHA) and adopt, as we interpret it, a strategy that is inconsistent with this Administration's approach toward customer service and minimizing mandates. We find this to be totally unacceptable and continue to nonconcur with that premise and in all recommendations in the report that would lead the FHWA in that direction.

The FHWA's basic philosophy of **"facilitating, rather than mandating"** is based upon the fact that the Federal-aid highway program is a federally assisted State program. The FHWA must administer it in that light. The Federal-aid highway program is fundamentally a formula allocated program. With finite

allocations, SHAs are independently under intense fiscal pressure to assure the most efficient use of all highway dollars, whether they are Federal, State, or local dollars.

The FHWA's fostering of a cooperative partnership approach has served FHWA, the States, and the Nation well since its inception. This partnership approach was strengthened by the passage of the Intermodal Surface Transportation Efficiency Act of 1991. The FHWA continues to look toward bettering, not dismantling, this relationship in the future.

In response to the specific recommendations contained in the report, among other things, we have attached specific clarification and timetables for life-cycle cost analysis (LCCA) and pavement design activities as you requested. The FHWA believes that it is important to note that we have made significant progress over the last few years in both of these areas.

In the area of LCCA, we have reviewed the recent 1993 American Association of State Highway and Transportation Officials (AASHTO) survey of SHA applications of LCCA, conducted an FHWA/AASHTO symposium on LCCA in December 1993, and plan to publish an interim policy statement on LCCA. This policy statement will include recommendations on minimum analysis periods to be used and references Office of Management and Budget Circular A-94 for guidance on the selection of appropriate discount rates. The goal of this policy statement is to clearly define the FHWA's position on some of the more important components of LCCA, including analysis period, discount rate, and user costs. We intend to publish this policy statement in early summer.

It is important to note that we are making significant progress in this area and will be in a better position to further determine our course as current efforts evolve.

The same is true in the area of assuring high quality, cost-effective highway pavement design, construction, maintenance, and preservation. The new December 1993 Pavement Management System (PMS) regulation requires SHAs to develop comprehensive coordinated systems to effectively manage pavement to address current and evolving long-term pavement needs. It also broadens the pavement design requirements to include an analysis of the entire pavement structure (subgrade, subbase, base, and pavement). The regulation specifically requires that pavement design analysis consider life-cycle costs.

The FHWA intends to rewrite its Federal-Aid Policy Guide (FAPG) on pavement design to better track with the recently revised PWS regulation by the end of this calendar year. The revised FAPG, in conjunction with the new PMS regulation, will provide

significantly more definitive guidance on pavement design. As noted in our earlier response, the FHWA agreed to direct its regional pavement engineers to participate with the divisions in pavement design and management reviews in each State during the next 2 years. Headquarters pavement engineers will participate in at least one of these reviews per region.

Further, we continue to stand by our original position, as stated in our September 2 memorandum, that the audit report does not support a finding of a material internal control weakness.

We appreciate the opportunity to comment on this draft report concerning the Audit of Cost Comparison of Asphalt Versus Concrete Pavement in Region 4.

2 Attachments

New Jersey reported the performance of their experimental permeable base pavement sections constructed in 1979-1980 at the 1988 Transportation Research Board Meeting. Their initial observations/findings on the AC sections were that the thinner sections were performing as well as the thicker sections with rutting being about the same. On PCC pavement sections, there was less deflection, no faulting or pumping. and substantially reduced frost penetration.

Pennsylvania rated the performance of their experimental permeable base sections constructed in 1980 much better than dense-graded aggregate base sections. Based on the positive interim results of these sections, a permeable base layer between the PCC pavement and dense-graded aggregate subbase became the State standard in 1983.(3)

Rideability

All of the States indicated that the rideability of permeable base pavements was no different than that on dense-graded bases. This was substantiated in California and North Carolina (asphalt cement treated1 and Michigan (untreated). The rideability of some recently constructed PCC pavements in these States had been measured using the California and Rainhart profilographs at 0-5 inches per mile. In general, those States using a stringline for both horizontal and vertical control had a substantially better ride quality than those that did not. Also, those States that had incentives/disincentives for rideability had projects with *very good* ride quality.

Cost

Bids for permeable base materials were generally found to have slightly higher costs per unit weight than the impermeable dense-graded materials they replaced. Five of the seven States that used an untreated permeable base found that they were slightly more costly per unit measure than conventional dense-graded aggregate bases while two States. Iowa and Michigan. indicated that the unit costs for their permeable base material were the same or sometimes less.

As expected, the treated permeable base materials were two to three times more costly per unit measure than conventional dense-graded aggregate bases. However. all three States that predominantly used treated permeable base material found that the unit costs for it were about the same as those for dense-graded AC base. In addition. all three noted that because of the higher void content of the permeable material, the yield was 15-30 percent higher than dense-graded AC. California found that asphalt cement treated permeable base was generally less costly per unit measure than cement treated base (CTB) and lean concrete base (LCB). The material unit costs were the same. or slightly more than asphalt concrete base but because of the large void content the yield was 20 percent higher. Kentucky, which had used some asphalt treated permeable base within the past year. also found that its

Memorandum

U.S. Department of Transportation
Federal Highway Administration

Subject **INFORMATION:** Proposed Final Interstate Maintenance Fund Transfer Policy

Date SEP 2 1 1994

From Director, Office of Engineering

Reply to Attn of: HNG-42

To Regional Administrators

Attached is a copy of the **FHWA's** proposed final policy statement on Interstate Maintenance Fund Transfers, which was published in the Federal Resister on Friday, September 2. It addresses criteria relating to the decisions on adequate maintenance of the Interstate System for purposes of the Interstate Maintenance Program Transfer provisions of Title 23, United States Code, Section 119(f) (1). It is a **proposed** replacement for the Interim Maintenance Fund Transfer Policy, published at 58 Federal Reaister 12229, on March 3, 1993.

The proposed final policy statement would add safety and geometric criteria not originally proposed in the interim policy, and modify the existing criteria for pavements. Modifications-to the pavement criteria would change the IRI criteria from 240 cm/km (150 inches/mile) to 200 cm/km (127 inches/mile), modify the faulting criteria to reflect a faulting rate of 525 **mm/km** (33 inches/mile) for both plain and reinforced jointed concrete pavements, and add a surface friction related criteria.

We have reopened the docket and will be accepting written public comments until November 1, 1994. We would appreciate it if FHWA field offices would adhere to that date in submitting any **comments.** Please note, that until we publish a final policy **statement,** the interim Interstate fund Transfer Policy, published in the **Federa Reegsteer** on **March** 3, 1993, **1s** still in effect and governs Interstate Maintenance Fund Transfer requests.

The Pavement Division continues to coordinate this effort for the Office of Engineering. Please direct any questions relating to this policy and/or its implementation to Mr. John **Hallin.** He can be reached at (202) 366-1323.

F1& Willia A. Sem

Attachment

NOTE : The proposed final policy statement proposes changes to agency policy and has been published to gather public comment. Until the statement becomes **final** the interim policy statement will prevail for transfer of interstate maintenance program **funds**.

NOTE: The proposed final policy statement proposes changes to agency policy and has been published to gather public comment. Until the statement becomes final the interim policy statement will prevail for transfer of interstate maintenance program funds.

Federal Highway Administration

[FHWA Docket No. 93–10]

Transfer of Interstate Maintenance Program Funds

AGENCY: Federal Highway Administration (FKWA). DOT.

ACTION: Proposed final policy statement; requests for comments.

SUMMARY: This proposed final policy statement sets forth the FHWA's policy for addressing the interstate maintenance program funds transfer provisions of 23 U.S.C. 119(f)(1). The criteria for determining what constitutes adequate maintenance, which are included in this policy, are associated with only the transfer of Interstate Maintenance (IM) funds and am not related to the State's responsibility to properly maintain projects constructed with Federal-aid funds outlined in 23 U.S.C. 116, Maintenance.

DATES: Comments must be received on or before November 1.1994.

ADDRESSES: Submit written, signed comments concerning this policy statement to FHWA Docket No. 93-h. Federal Highway Administration, Room 4232. HCC–10, Office of the Chief counsel. 400 Seventh Street, SW.. Washington, DC 20590. All comments received will be available for examination at the above address between 8:30 a.m. and 3:30 p.m., e.t., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Mr. John Hallin, Chief, Pavement Design and Rehabilitation Branch, (202) 366–1323, or Ms. Vivian Philbin, Attorney-Advisor. Office of Chief Counsel, General Law Branch, (202) 366–0780, *Federal* Highway Administration. 400 Seventh Street SW., Washington, DC 20590.

SUPPLEMENTARY INFORMATION:

Background

On March 3, 1993, the FHWA published an interim policy statement on the transfer of Interstate maintenance program funds at 58 FR 12299, and provided a 60-day public comment period which closed on May 3, 1993. During the intervening period, FHWA has evaluated the comments and reconsidered its initial position. As a result, the FHWA is proposing to modify the pavement roughness and faulting criteria and to add additional criteria that were not proposed in the interim policy.

A total of 18 State highway agencies (SHAs) and the Highway User Federation for Safety and Mobility (HUFSAM), a public interest group, provided written comments to the docket established for the interim policy statement.

The SHA comments ranged from administrative type questions, such as requests for clarification of measurement procedures and use of existing pavement management system data. to fundamental positions on the individual indicators and the specific established criteria. Some SHAs endorsed various portions of the criteria established. while othen took exception to part or ail of the criteria.

The HUFSAM strongly endorsed the interim policy. It stressed the need to assure that the Interstate System be maintained at a very high level and noted that. from its studies, nationwide, the Interstate maintenance funding levels are inadequate.

After evaluating the comments received, the FHWA continues to believe that transfers of apportioned IM funds specifically earmarked for Interstate maintenance to other designated programs should be permitted only when the Interstate System routes are in a physical, operational, and safe condition and perform at or near the level for which they mm designed, and constructed. Because pavement and bridge activities constitute the major cost items of IM eligible activities, the interim policy focused on pavement and bridge condition indicators as the determining factors fix eligibility to transfer IM funds. Other essential elements. necessary to maintain the physical and operational integrity of the Interstate. must also be considered in transportation decisions. Responses to the interim policy, however. indicate a concern that other essential elements need not be consider4 in transfer decisions. This war not the intent of the interim policy statement.

Section 101(a) of Title 23 U.S.C. defines "maintenance" to mean the preservation of the entire highway, including surface, shoulders, roadside, structures, and such traffic control devices as are necessary for its safe and efficient utilization. As the IM program now provides the major resources for rehabilitation, restoring, and restoration (3R) work on the Interstate System, extending the service life of all major components and enhancing highway safety on the system should receive first priority for IM fund use. For example, over 25 percent of the projects and approximately 10 percent of funds from the IM program are currently being expended on traffic and safety improvement projects. The FHWA

supports a continued strong emphasis on safety.

In a sampling of SHA pavement management systems conducted during the past year. the FHWA found that the pavement condition indicators established in the interim policy are generally collected and used by the States in evaluating the condition of the Interstate for their own management purposes. While the data collection and reporting procedures differ somewhat. the fundamental indicators are consistently used by the SHA's to manage their Interstate pavements.

The proposed final policy includes the original pavement and bridge condition indicators established in the interim policy and adds pavement surface friction as a fourth pavement condition indicator. However, the roughness criteria has been modified and the separate faulting criteria for jointed plain and joint reinforced concrete pavement (JPCP and JRCP) has been replaced with a single criterion of 525 mm/km (33 inches/mile) for both jointed pavement types.

In addition to these interim factors, this proposed final policy statement adds criteria *for* the additional traffic and safety dated indicators of (1) safety appurtenances, (2) traffic control devices, and (3) geometric elements. These indicators are equally critical to the Interstate System which relies heavily on the availability of IM funds for continued adequacy. Maintenance of the Interstate System's operational as well as physical characteristics in a satisfactory manner remains the first priority for the use of these fun&.

Comments Received

This section addresses specific SHA comments organized around the criteria established for each of the individual condition indicators.

Pavement Roughness

Three SHAs suggested that the International Roughness Index (IRI), developed at the International Road Roughness Experiment. is not the appropriate measure of rideability. The FHWA recognizes that IRI does have some limitations. It doss, however, provide a common quantitative basis with which to reference the different measures of roughness. Further, it is currently collected by SHAs and provided to FHWA under the Highway Performance Monitoring System (HPMS) submission requirements. Although the FHWA is open to use of improved pavement surface rideability measures. until such time that improved measures and equipment to measure them are accepted and readily available to SHA's, the FHWA will continue to rely on IRI as the ride indicator.

Four SHAs commented that the specific IRI criteria of 240 cm/km (150 inches/mile) was too severe. The FHWA disagrees. The selection of the 240 cm/km upper limit criteria on pavement roughness was directly tied to the FHWA's desire to require Interstate pavement to be in fair or better condition. The interim policy noted that initial IRI to pavement serviceability rating [1] (PSR) conversion studies [2] indicated a 240 cm/km IN is equivalent to a PSR range of 3.0 to 3.5. Pavements within this range am classified as fair in the FHWA's "1992 Highway Statistics" [3] report. Subsequent additional analysis of the IRI/PSR correlation indicates that a 240 cm/km IRI more accurately reflects a much lower PSR range of 2.5 lo 2.8 (pavements in this range are classified as being in poor to mediocre condition [4]). Based on this further analysis, the FHWA has established an upper limit of allowable IRI of 200 cd km (127"/mile). This converts to a PSR of between 2.8 and 3.2 which is mom consistent with the FHWA's original objective that pavements be in fair or better condition [5].

Rutting

Rutting comments were limited to data collection difficulties and refl ected a degree of uncertainty about what data collection equipment and procedure would be considered acceptable. No comments were received concerning the appropriateness of the rutting indicator or the established criteria. Therefore the FHWA has retained 15 mm (5/8 inch) as the upper allowable limit of rutting. Concerns related to data collection equipment and procedures am addreaaed under "Pavement Data Collection," later in the preamble.

Faulting

The SHA comments on the faulting criteria were split evenly: five SHAs thought that the faulting criteria were too restrictive. while five SHAs 'commented that the criteria were acceptable. In addition. the HUFSAM found the criteria acceptable.

One SHA recommended simplifying the policy by replacing the separate faulting criteria for jointed plain and jointed reinforced concrete pavement (JPCP and JRCP) with a single faulting criterion in mm/km (inches/mile) for both pavement types. A mm/km based criteria would eliminate the need to take joint frequency into account, as the average allowable faulting per joint would be directly related to the number of joints/mile. The FHWA recognizes the merit in this recommendation and has replaced the separate faulting criteria of 3 mm on JPCP and 6 mm on JRCP with an equivalent maximum faulting rate of 525 mm/km (33 inches/mile) for both. This faulting rate is equivalent to 3 mm per joint on typical JPCP with 6 meter (20 foot) joint spacing and 6 mm per joint on JRCP with 12 meter (40 foot] joint spacing. Because joint spacing varies between States, the allowable faulting per joint will differ from State lo State. even though the faulting rate per km remains constant.

Administrative—Procedural Tolerance Limits

The most common comment, received from seven SHAs, was that the scope of the application of the criteria was too stringent. The crux of the argument was that some tolerance limit should be established to allow a SHA in substantial compliance to transfer funds. A common suggestion was that the FHWA only require that 90 to 95 percent of the Interstate System meet the criteria before allowing transfer.

The FHWA recognizes that there are continually evolving pavement and bridge needs and, at any one point in time. even SHAs with exceptionally good pavements might not meet the criteria on 100 percent of their Interstate system. The FHWA has already provided relief for this situation. The interim policy specifically allows *transfer* when all criteria am not met on the Interstate if the work necessary to correct any deficient segments is included in the approved State Transportation Improvement Program, required by 23 U.S.C. 135(f). This relief is included in the final policy. The FHWA believes that allowing a 5 to 10 percent exemption or tolerance would be unwise, as it would allow transfer money necessary to maintain the Interstate highway system-

[1] The PSR concept was developed at the 1956 American Association of State Highway Officials (AASHO) road test to relate the pavement serviceability index (PSI). computed from objectively measured pavement distress. with subjective serviceability ratings by panels of road users.

[2] Bashar Al-Omari and Michael I. Darter. "Relationships between IRI and PSR: A Report of the Findings of Pavement Model Enhancements for the Highway Performance Monitoring System (HPMS)." Transportation Engineering Series No. 69. University of Illinois at Urbana Champaign. Report No. UILU-ENG-92-2013. September 1992. This document is available for inspection in FHWA Docket No. 93-10.

[3] FHWA. "Highway Statistics 1992." FHWA-PL-93-023. A copy of this document is available for inspection in FHWA Docket No. 93-10.

[4] Ibid.

[5] Ibid.

Pavement Data Collection

Several SHAs posed comments and questions on data collection and reporting procedures. The primary concern appeared to be whether FHWA would require a specific data collection effort using some standardized equipment and procedures that would be different from what is currently used by the individual SHAs. Further, the comments included request for flexibility in summarizing the data. Several suggested that FHWA should use whatever SHA PMS data was available to determine the acceptability of a certification accompanying a transfer request.

The FHWA intends to rely primarily on current surface roughness. rutting, and faulting information contained in SHAs PMS database(s) and from information reported in HPMS in evaluating the pavement component of State certifications accompanying Interstate maintenance fund transfer requests.

The FHWA recognizes the uniqueness of each SHA's PMS and the diversity of equipment and procedures used by the SHAs to meet their particular pavement management needs. The FHWA is not prescribing new specific uniform data collection equipment, procedures, sampling. or data reduction techniques to determine compliance with the pavement Interstate maintenance transfer criteria.

Bridges

Only two SHA's commented on the bridge section of the policy. Both endorsed the use of the current National Bridge Inventory (NBI) bridge deck condition rating (Item 58) as an indicator and supported the criteria requirement that bridge decks have a condition rating of 5 or better. This is consistent with the long standing use of a deck rating of less than 5 to determine a structurally deficient bridge.

Both States also recommended that FHWA include the NBI ratings for superstructure and substructure in the policy and delete the load posting requirement contained in the interim policy.

The FHWA originally considered using superstructure and substructure ratings as specific criteria when it initially developed the interim policy. Upon further consideration. FHWA still supports "load posting" criterion which reflects superstructure and substructure condition ratings and is also a measure of potential safety concern.

The need for load posting is an end result of applying superstructure and substructure conditions. along with other factors. in making load carrying capacity calculations. Changes in condition ratings, and therefore. the load posting. are affected by a reduced maintenance effon which eventually leads to continual and long-term deterioration of bridge elements.

One of the SHAs further recommended that the FHWA incorporate failure susceptibility as an indicator. Failure susceptibility is not required nor normally assessed by States in the course of inspecting bridges to meet national bridge inspection standards. As a result. the FHWA believes it would be inappropriate to use failure susceptibility as a nationwide criterion in the IM fund transfer policy. and has not included it.

Finally. one SHA recommended that bndge railing adequacy should be included in the decision factors. The FHWA considered including bridge railing adequacy as indicated by NBI Item 36 in the early development of policy criteria. The NBI Item 38 is a four segment item that rates bridge railings for adequate impact strength, and approach guardrail for adequate vehicle safety and protection.

The adequacy of bridge railings and approach guardrail is a serious safety. concern and should be considered in the States' maintenance program as well as in developing highway safety projects.

Bridge Data Collection

The NBI ratings are determined in accordance with the "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges" (Coding Guide) U.S. DOT/ FHWA, December 1988.

Policy

For the purpose of 23 U.S.C. 119(f)(1), which provides for transfer of State apportioned IM funds that are in excess of a State's need to the State's NHS and STP apportionment. the FHWA will accept a State's certification if the State's Interstate routes meet the followingcriteria:

Pavement:

(1) An IRI of 200 cm per km (127 inches par mile) or less;

(2) Rutting of 15 mm (5/8 inch) or less on flexible pavements;

(3) Cumulative faulting of 525 mm per km (33 inches/mile) or less on jointed rigid pavements; and

(4) Surfaces have adequate surface friction and drainage, based oa the State accidents record system not identifying any locations with a high incidence of wet weather accidents.

Bridges:

(1) Bridge decks in "fair condition" or better (Coding Guide item 58 rated 5 or better); and

(2) No load posting required (Coding Guide item 70 rated 5).

Safety Appurtenances:

Guardrail. bridge rails, safety barriers, and Other safety features including the upstream ends of all traffic barriers meet (a) tne performance criteria of 23 CFR 625. (b) acceptable use warrants. and (c) installation requirements per State standard plans.

Traffic Control Devices:

All major guide. regulatory. and warning signs meet the minimum size, shape. color, format, and message requirements as well as the day and night legibility and visibility requirements of the MUTCD and amendments.

Geometric Elements:

(1) The horizontal and vertical alignment. and widths of median, traveled wry. and shoulders mat the AASHTO Interstate Standards, as incorporated in 23 CFR 625, in effect either at the time of original construction, major reconstruction, or inclusion into the Interstate system, whichever was the latest; and

(2) Hazardous features (fixed objects, steep sideslopes, etc.) within the clear zone are either eliminated, corrected, or adequately shielded.

In the event that the condition, as reflected by current databases, does. not meet the required criteria, for any segment of Interstate, the State's request for funding transfer may. not be approved unless the Stats certifies that the deficient segments have either been subsequently upgraded to meet the required criteria or that the work necessary to correct any such deficient segments is included in the approved State Transportation Improvement Program, required by 23 U.S.C. 135(f).

Section 119(f)(2) of Title 23, U.S.C., allows the States to transfer up to 20 percent of the apportioned IM funds to the NHS and STP apportionment based solely on the request of the States.

(23 U.S.C. 119 and 315; 49 CFR 1.48(b))

Issued on: August 29, 1994.

Rodney E. Slater,

Federal Highway Administrator.

[FR Doc. 94-21757 Filed 9-1-94; 8:45 am]

BILLING CODE 4910-22-P

NOTE : The-proposed final policy statement proposes changes to agency policy and has been published to gather public comment. Until the statement becomes final the interim policy statement will prevail for transfer of interstate maintenance program funds.

Federal Highway Administration

[FHWA Docket Mo. 93–10]

Transfer of Interstate Maintenance Program Funds

AGENCY: Federal Highway Administration (FHEA), DOT.

ACTION: Interim policy statement.

SUMMARY: This interim Policy statement establishes the FHWA's policy for addressing the interstate maintenance program funds transfer provisions of section 119(f)(1) of title 23, United States Code (U.S.C.), which was amended by Section 1009 of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. By publishing this interim policy statement the FHWA seeks to advise States of the criteria the agency will use in evaluating a State's request to transfer interstate maintenance funds, while providing the opportunity for public comment prior to issuing a final policy statement

DATES: Comments must he received on or before May 3, 1993.

ADDRESSES: Submit written, signed comments concerning thia policy statement to FHWA Docket No. 93–10, Federal Highway Administration, room 4232. HCC–10, Office of the Chief Counsel, 400 Seventh Street, SW., Washington, DC 20590. All comments received will be available for examination at the a&w address between 8:30 a.m. and 3:30 p.m. ct., Monday through Friday, except legal Federal holidays.

FOR FURTHER INFORMATION CONTACT: Mr. Louis Papet, Chief, Pavement Division, (202) 366–1324, or Mrs. Vivian Philbin, Attorney Advisor, Office of Chief Counsel, General Law Branch, (302) 366–0780, Federal Highway Administration, 400 Seventh Street SW., Washington DC 20590.

SUPPLEMENTARY INFORMATION:

Backgroumd

Section 1009 of the ISTEA amended 23 U.S.C. 119 by replacing "Interstate System resurfacing" with the "Interstate maintenance program" (IM) Public Law 102–240, section 1009, 105 Stat. 1914, 1933. Section 1009 also established [illegible] constraints affecting the States' options for transferring a portion of these funds to the Slates' apportionments for other Federal-aid programs.

Section 119(f)(1), as amended. allows the transfer of IM funds to other Federal-aid highway programs provided the State certifies to the Secretary that: (1) Any part of the IM funds are in excess of the needs of the State for resurfacing, restoring, *or* rehabilitating Interstate System routes and (2) that it is adequately maintaining the Interstate System. and the Secretary accepts such certification. Notwithstanding section 119(f)(1), section 119((f)(2), as amended, allows the States to "unconditionally" transfer up to 20 percent of unobligated IM apportioned funds based soiely on the request *of the* States.

Further, section 1009(c)(2) of the ISTEA requires the Secretary to develop and make available to *the* States *criteria* for determining what constitutes adequate maintenance of the Interstate System for the purposes of section 119(f)(1) of *tit18* 23, United States Code. The criteria for determining what constitutes adequate maintenance, which are included in this policy, am associated with only the transfer of IM funds and are not related to the State's responsibility to properly maintain projects constructed with Federal-aid funds outlined in *23* U.S.C. 116, Maintenance.

In developing the specific criteria, the FHWA believes that transfers of apportioned IM funds specifically earmarked for Interstate maintenance to *other* designated programs should only be allowed when the Interstate System routes are in a physical condition to perform at or near the level for which they were designed and intended.

Pavement and bridge activities constitute the majority of IM [illegible] Ug&& activities. The FHWA has focused on pawmmt and bridge condition indicators as determining factors for eligibility to transfer IM funds.

The FHWA has selected Interstate pavement condition indicators (surface roughness, rutting, and faulting) and bridge condition indicators (bridge deck condition and the need for tad posting) for evaluating State's requests to transfer IM funds under the provisions of 23 U.S.C 119(f)(1). These indicators are collected and used by the States in evaluating the condition of the Interstate for their own management purposes. They are generally incorporated into State pavement and bridge management systems and the national bridge inventory and highway performance monitoring system.

Pavement Condition Indicators

Roughness

The FHWA will use the International Roughness Index (IRI) to evaluate roadway roughness. and has set an upper IRI limit of 240 cm per km (150 inches per mile) for surface roughness.

The IRI wan developed at the International Road Roughness Experiment sponsored by the World Bank and several countries, including the United States. in Brazil in 1982. It is designed to provide a common quantitative basis with which lo reference the different measures of roughness. It summarizes the longitudinal surface profile in the wheel track and simulates the response of one wheel of a typical passenger car traveling 80 km per hour (50 miles per hour) to road roughness.

The IRI upper limi of 240 cm per km, selected by the FHWA, is based on consideration of research efforts that relate actual roadways with a known IRI with the public's perception of ride quality. A recant study [1] conducted for th8 FHWA indicated that objectively developed IRI numbers could be mathematically correlated with subjectively developed pavement serviceability ratings [2] (PSR) generated by panels of road users. This work included mathematical formulas that allow *conversions* between IRI readings and anticipated road user evaluation of pavement performance (*i.e.*, PSR).

Conversion formulas [3] indicate that an IRI of 240 cm per km correlates to a PSR range of between 3.0 and 3.5, which is slightly greater than the 2.S to 3.0 PSR range associated with terminal serviceability for Interstate highway pavements.[4]

[1] Basbar Al-Omari and Michael I. Darter, "Relationships between IRI and PSR: A Report of the Findings of Pavement Model Enhancements for the Highway Performance Monitoring System (HPMS)," Transportation Engineering Series No. 89, University of Illinois at Urbana Champaign, Report No. UILU–ENG–92–2013, September 1992. This document is available for inspection in FHWA Docket No. 93–10.

[2] The PSR concept was developed at the 1956 American Association of State highway Officials (AASHO) road test to relate the pavement serviceability index (PSI), computed from objectively measured pavement distress, with subjective serviceability ratings by panels of road users.

[3] Includes conversion formulas developed inhouse by the State of Maine, for the South Carolina pavement management system by PMS inc. and the previously mentioned Al-Omari and Darter research cited in footnote No. 1..

[4] The "AASHTO Guide for Design of Pavement Structures", AASHTO, 1986 (page I–6) defines terminal serviceability index as the lowest acceptable level before resurfacing or reconstruction becomes necessary for the particular class of highway. The AASHTO Guide goes on to note that

Continued

Rutting

The FHWA has established 15 mm (5/8 inch) as the upper allowable limit of rutting.

The American Association of State Highway and Tmnsponation *Officials* (AASHTO) Highway Subcommittee on Construction surveyed State highway agencies in 1988 on rutting. The survey revealed that for State maintained *mads*, ½ inch rutting would initiate rehabilitation in about 35 percent of the States. An additional 35 percent of the States indicated that ⅝ inch of rutting would initiate rehabilitation. The "Highway Pavement Distress Identification Manual" (HPDIM) [3] classifies ½ to 1 inch of rutting as moderate severity.

The FHWA 15 mm (⅝ inch) criterion is consistent with the performance levels expected on the Interstate System.

Faulting

The FHWA has established two levels of faulting criteria that am related to pavement type. The FHWA has established an upper limit on faulting of 3 mm (⅛ inch) on Jointed plain concrete pavements (JPCP). and an upper limit on faulting of 6 mm (¼ inch) on jointed reinforced concrete pavements (JRCP).

Generally. State highway agencies consider faulting to be objectionable in the ⅛ to ½ inch range. The HPDIM classifies faulting between 1/16 and ⅛ inch as moderate severity. The "Pavement end Shoulder Maintenance Performance Guides." August 1984. FHWA publication number TS–84–208. indicates faulting should he repaired at ¼ inch. A copy of TS–84–208 is available for inspection in FHWA Docket No. 93–10.

FHWA selected a lower level of faulting for JPCP than for JRCP because JPCP joints occur mom frequently. The levels selected are consistent with the higher expectation the traveling public associates with Interstate highways.

Pavement Data

Procedures for developing IRI arm currently well defined in the guidance provided in the "Highway Performance Monitoring System (HPMS) Field Manual," Appendix J "Roughness Equipment. Calibration and Data Collection." This document is widely available in planning sections of State highway agencies and the FHWA division offices and a copy of this publication is available for inspection in FHWA Docket No. 93-10. IRI data are collected annually and reported to the FHWA under the HPMS program.

The FHWA pavement policy. (23 CFR part 6261 requires each State to have an operational pavement management. system (PMS) for principal arterials (which includes the Interstate system) in place by January 13.1993.

The FHWA envisions that the States will assemble necessary pavement surface roughness, rutting, and faulting information from data currently available in the States' PMS database(r) and from information reported in HPMS.

The FHWA division offices will work with the States in identifying acceptable procedures for measuring and compiling the data available from the States' PMS. Data supporting each State's IM transfer request will be made available *for* inspection by the MWA.

Bridge Condition Indicators

The FHWA will use the current national bridge inventory (NBI) bridge deck condition rating (item 58) and the rating indicating whether the bridge requires load posting (item 70) as indicators of Interstate bridge condition for purposes of valuntlng States' requests for IM transfer. The NBI ratings are determined in accordanw with the "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges" (Coding Guide) US DOT/FHWA, December 1988. A copy of this publication is available for inspection in FHWA Docket No. 93–10.

Bridge Decks

The FHWA will require that bridge decks have a condition rating (item 58) of 5 or better.

Bridge decks are rated in item 58 on a scale of 0 to 9 with a rating of 9 representing a bridge deck iii excellent condition. *A* Coding Guide dak rating of less than 5 indicates a poor condition with the deck showing deterioration and apalling. In relation to pavement roughness. a deck with a rating leas than 5 is considered a rough deck that would not provide a reasonably smooth ride. A deck rating of less than 5 is a long-standing condition rating used to determine a structurally deficient bridge.

Posting

The FHWA will require that NBI item 70. for load posting. must be a rating of 5.

The National Bridge Inspection Standards (23 CFR Part 650, subpart C) require the posting of load limits only if the maximum legal load in a State producer stresses in excess of the operating stress levels. The operating stress level will result from the absolute maximum permissible load to which a bridge may be subjected. Coding Guide item 70 of the NBI is the item for bridge posting, and a State's rating of 5 indicates that no posting is required at the operating level.

Load posting of a bridge reducer the level of service of the system of which the bridge is an integral part and can potentially disrupt interstate and intrastate commerce. Heavy vehicles may be required to take long detour mutes thereby indirectly adding to the costs the public must bear for goods and services. Load posting of a bridge may also be an indicator of a bridge's superstructure *or* substructure capacity that may have been affected by continual and *long term* deterioration of the bridge's elements and which could have been prevented or abated by adequate preventive maintenance.

Policy

For the purpose of 23 U.S.C. 119(f)(1), which provides for transfer of IM funds apportioned to the States, the FHWA will accept a State's certification if the State's Interstate routes meet the following criteria:

Pavement

(1) An IRI of 240 cm per km (150 inches per mile) or lea;

(2) Rutting of 15 mm (5/8 inch) or less; and

(3) Faulting of 3 mm (⅛ inch) or less on JPCP and 6 mm (1/4 inch) or less on JRCP.

Bridges

(1) Bridge decks in "[illegible]dition" or better (Coding Cuidr i[illegible]ated 5 or better'); and

(2) No load porting re[illegible]. Coding Guide item 70 rated 5).

In the event that the condition. is reflected by current condition data bases, for any segment of Interstate pavement or bridge does not meet the required criteria, the State's request for funding transfer may later he approved only if the State certifies that the deficient segments have been subsequently upgraded to meet the required criteria or that the work necessary to correct any such deficient segments is included in the approved State Transportation Improvement Program, required by 23 U.S.C. 135(f).

Section 119(f)(2) of title 23 U.S.C. allowa the States to "unconditionally" transfer up to *20* percent of unobligated IM funds based solely on the request of the States.

Authority: 23 U.S.C. 119 and 315; 49 CFR 1.48(b).

Issued on: February 24, 1993.

E. Dean Carlson,

Executive Director, Federal Highway Administration.

[FR Doc. 93–4809 Filed 3–2–93; 8:45 am]

BILLING CODE 4910–22–M

a terminal serviceability index of 2.5 to 3.0 is often suggested for use in the design of major highways. A copy of this publication is available for inspection in FHWA Docket No. 93–10.

[3] The "Highway Pavement Distress Identification Manual", US DOT/FHWA. DOT–FH–11–9175/ NCHRP 1–19. March. 1979 reprinted February 1984. This Publication is available for inspection in FHWA Docket No. 93–10.