

PAVEMENT PRESERVATION TECHNICAL APPRAISAL HAWAII EXECUTIVE SUMMARY

The Federal Highway Administration (FHWA) and the National Center for Pavement Preservation (NCP) would like to thank the Hawaii Department of Transportation (HDOT) for their cooperation and assistance in producing this report. Interviews with HDOT headquarters and district staff were conducted during the week of 31 March 2008, by a team consisting of: JoAnne Nakamura, Pavement Preservation Task Force, Hawaii DOT; Loy Kuo, Head, Pavement Design and Pavement Management System Unit, Hawaii DOT; Pat Phung, FHWA Hawaii Division Office, Honolulu; Christopher Newman, FHWA Office of Asset Management, Washington, DC; and, Larry Galehouse, Director, National Center for Pavement Preservation. (A complete list of participants is included in Appendix A).

We conducted technical interviews with Headquarters staff in the HDOT headquarters at Honolulu, staff from the Materials Testing & Research Branch, and staff from the Oahu District and Maui District to gain insight into current preservation practices. We met with managers, engineers, administrators, technicians, and maintenance supervisors, to develop an understanding of best practices employed by HDOT. These meetings established excellent dialog and proved very beneficial in identifying areas where further actions could improve an existing pavement preservation program.

It is imperative that DOTs use the principles of transportation asset management (TAM), including pavement preservation, to help address the issues of an aging transportation infrastructure facing the nation today and to manage and allocate resources to improve our nation's transportation system performance. TAM is a strategic approach that strives to provide the best return for each dollar invested by maximizing system performance, improving customer satisfaction, and minimizing life-cycle costs. We hope that the discussions conducted during this program appraisal have been constructive in helping to apply TAM principles to improve pavement performance in Hawaii.

Observations and Recommendations

We have summarized below our observations and their associated recommendations. These are based on information we gained from headquarters meetings, district meetings, and field observations of current practices at HDOT. We also made other observations which did not prompt recommendations. These supplemental observations are contained in Appendix I.

Major Recommendations

1. Pavement Management System (PMS)

We make the following observations and recommendations.

Observation 1.1

- Hawaii’s current pavement management system (PMS) was developed “in-house” using an Excel spreadsheet. The scope of the spreadsheet is limited.

Recommendation 1.1

- *The uses and capabilities of modern pavement management systems far exceed the capabilities of spreadsheet programs. While it is understandable and normal that an Excel spreadsheet would be useful to introduce a department to pavement management at the project level, the scope and complexity of managing a large highway network require a more sophisticated system. Such a system needs to be able to act as an efficient database and be able to generate optimal, long-term network strategies.*

While a spreadsheet may provide a usable inventory and condition listing, it has no capability for network level forecasting and strategy development. Replace the Excel spreadsheet with a modern commercial PMS. The FHWA, with its ready access to experts and the national knowledge base would be in a good position to assist the Department in this area.

Observation 1.2

- Currently pavement data are collected and stored in the Planning Branch and the in Pavement Design Section of the Materials Testing and Research (MT&R) Branch. Planning staff collects and stores automated (or at least semi-automated) ride (IRI¹) and rut data (3-point scan). Pavement Design and PMS staff collect and store distress information, all of which is obtained visually (windshield surveys). The distress data are measured by type, severity, and extent.

Staff estimated that pavement condition ratings were only about 50% reliable, and that the problem was more apparent on multi-lane facilities. The Department’s PMS is managed by the MT&R Branch and the data are one dimensional and collected by one person. The PMS contains a duplicate copy of Planning’s rut information which is qualitative only (rut depth is not recorded), and does not contain ride information. The database is structured to equate the condition of rigid pavement to flexible pavement². The districts also believe that they should have input in the ratings.

Recommendation 1.2

- *Consolidate all functions of data collections and PMS in one location. Storing the same data in different locations is inefficient, making updating difficult, and can easily lead to “data corruption” where different databases contain different versions of the same information. Replace the subjective windshield surveys with objective, quantitative data whose collection can be automated or semi-automated. This change should also increase the accuracy of the data, thereby increasing staff confidence and promoting use of the*

¹ IRI = International Roughness Index

² See “Pavement Condition Survey - 2006 - Statewide”, July 2007, Page 5.

collected data. Further, consolidating the PMS functions will provide staff efficiencies, cost savings and greater accountability for Department decisions.

Observation 1.3

- Materials Testing and Research Branch staff told us that pavement information data are available to anyone who requests the information. The data are compiled and made available in a computerized spreadsheet.

Recommendation 1.3

- *Improve data access by including the option of presenting data to the user in a “Windows-based” format on a read-only basis. This would permit data searches and benefit everyone, particularly the districts where project programming / scheduling decisions need to be made.*

Observation 1.4

- The pavement management system is unable to account for pavement preservation strategies in terms of extended pavement life and the Department’s experience in this area tends to be largely anecdotal.

Recommendation 1.4

- *Track the life extending benefits of pavement preservation treatments. Life extension expectations for pavement preservation treatments are essential when considering alternative network strategies.*

Observation 1.5

- Although the Materials Testing and Research Branch staff tries to track pavement deterioration within the pavement management system, this is a weak area that should be improved.

Recommendation 1.5

- *A PMS must have capabilities to track deterioration rates for all segments and use the PMS to derive “Deterioration versus Time” relationships that are location / treatment specific. Accurate pavement condition forecasting, which is essential for developing long-term strategies, can only be accomplished if rates of pavement deterioration can be accurately determined. Knowledge of deterioration rates will allow the Department to assess pavement preservation strategies in terms of extended pavement life. This is the key element for deriving Remaining Service Life (RSL).*

Introduce the Remaining Service Life (RSL) concept to cover all roadway segments. RSL is an easily understood concept and is ideal for use in communicating with the public and elected officials. This measure also effectively allows the Department to develop realistic long-term network strategies³ based on the life extensions and pavement longevities that could reasonably be expected for any pavement action.

³ FHWA’s NHI Course # 131104A, “Integrating Pavement Preservation and Pavement Management” is available to address this more fully.

Observation 1.6

- The Department’s preservation strategies are not developed to the extent that they include “mixes of fixes”. As such, the pavement management system has only a very limited pavement condition forecasting ability, and not with any degree of confidence.

Recommendation 1.6

- *Pavement preservation strategies should use a spectrum of different treatments within the toolbox. Using a mix of fixes means allocating reconstruction, rehabilitation and pavement preservation work in proportions that best meet network needs. For HDOT to generate statewide optimal network condition strategies, it must first start at the network level. Using this approach, known as the “mixes of fixes,” is the most cost-effective means of improving the network condition. By initially working at the network level, the department can devise an optimal long-term strategy, within which district-specific guidelines can be devised to assist the districts in generating their individual programs and projects. This is a win-win arrangement because it allows divisions to choose and schedule their own projects while still implementing the statewide optimal strategy.*

The mix of fixes concept is described in detail in Appendix D.

2. Champion

Observation 2.1

The Hawaii DOT needs a dedicated champion to guide the development of a consolidated pavement management system (PMS) that meets the future needs of the Department. The Department is fortunate to have Loy Kuo working in the PMS arena and possessing critical knowledge necessary to successfully deploy a new robust system.

Recommendation 2.1

We have found Loy Kuo to have a strong understanding and desire to improve the PMS area. His talents serve the Department well in leading a combined initiative to expand the uses and capabilities of a new system. We believe that the Hawaii DOT will gain considerable advantages by appointing Loy Kuo as champion of this effort.

Observation 2.2

The Hawaii DOT is fortunate to have JoAnne Nakamura coordinating the preservation effort for the Department. She has the drive, enthusiasm and interest to propel the program forward and make it successful. We were pleased to note that the Hawaii DOT will soon make a commitment to appoint a permanent pavement preservation program manager to champion the preservation effort.

Recommendation 2.2

Our experience has taught us that the most successful pavement preservation programs are viewed as Department-owned and are the result of significant contributions by planning, finance, design, materials, construction, maintenance,

and research. Each entity makes continuous contributions to the program, thereby achieving synergy and ensuring success. Several state transportation agencies, including California, Michigan, Minnesota and North Carolina have established full time positions to lead their pavement preservation programs. We acknowledge that in Hawaii, a pavement preservation engineer could also effectively perform in a part-time position. The position functions at both a policy level as an advocate and at the operational level as a facilitator. We believe that the Hawaii DOT would gain considerable advantages by appointing JoAnne Nakamura to facilitate the establishment and growth of its pavement preservation program.

3. Project Selection

We made the following specific observations and recommendations:

Observation 3.1

- The Department lacks program guidelines to direct project selection and the Maintenance Group staff believes such guidelines would be useful.

Recommendation 3.1

- *Develop a unified, comprehensive set of project selection guidelines that can be objectively applied statewide⁴. Without these guidelines, Districts will continue to select projects using unlike criteria for treatment selection in particular situations. The guidelines will enable district engineering to establish the essential linkages between choosing appropriate treatments for specific pavement conditions and knowing what life extensions to reasonably expect from those treatments. Of comparable importance are the notions of statewide uniformity and objectivity which are necessary for accurately projecting future pavement condition and performance. The guidelines should link appropriate PMS measures to potential treatments.*

Observation 3.2

- After health and safety considerations have been accommodated, pavement preservation project priorities are heavily dependent on bid readiness and least cost. For example, assuming a preventive maintenance budget of \$2M, Projects 2, 4, and 5 would be selected from the following candidate list.

Project	1	2	3	4	5
Cost	\$5.00M	\$0.25M	\$4.00M	\$0.50M	\$1.00M

Recommendation 3.2

⁴ Model program guidelines and technical information from 8 states have been collected and are available on a CD entitled "Pavement Preservation 2: State of the Practice". This CD is available from the Federal Highway Administration, Office of Asset Management, 1200 New Jersey Avenue, Washington, DC 20590, Telephone 202-366-1557.

- *The Department should eventually be able to customize treatments based on actual need and achieve better predictability of system condition. This becomes essential in the analysis of alternative network strategies.*

Observation 3.3

- District staff told us that pavement preservation treatments had not been used on Interstate highways due to the perceived risks of trying treatments for the first time. Staff predicted that as more experience is gained with the new or less familiar preservation treatments, they will find more widespread usage, including on the Interstates.

Recommendation 3.3

- *Preservation is appropriate for all roadways, from the busiest Interstates carrying high commercial traffic to rural 2-lane roads. Obviously, not all pavement preservation treatments are applicable to all roads, but if the application of a particular treatment can cost-effectively extend a roadway's life, it should be used. We encourage the Department to slowly gain experience with some of the less familiar pavement preservation treatments on lower volume roads until a greater comfort level is achieved.*

Observation 3.4

- District staff told us that the elapsed time between project selection and treatment application varies and could be less than 9 months. However, if funding is unavailable, design may be suspended which sometimes leads to the necessity of reprogramming the project as rehabilitation due to increased deterioration.

Recommendation 3.4

- *Strive to minimize the elapsed time between project selection and implementation because a pavement's continued deterioration may render it an unsuitable candidate for the selected treatment.*

4. Performance Monitoring

Observation 4.1

- The Department does not track the performance of constructed and rehabilitated projects to assure that anticipated pavement life expectancies are met. Materials, Testing & Research (MT&R) staff told us that a 20-year pavement design may only last on average about 10 years, based on an anecdotal estimate.

Furthermore, staff told us that they do not presently track the performance of pavement preservation projects to determine the life extensions attributable to the pavement preservation treatments. Currently, the Department determines the duration of a treatment's effectiveness by visual monitoring.

Recommendation 4.1

- *Begin to formally track long-term performance of reconstruction, rehabilitation and preservation projects and begin to measure the life-extending benefits of pavement preservation treatments. Make sure that actual Hawaii experience is routinely entered into the PMS. As the Department builds and refines the database, it will be able to replace initial assumptions with actual data. (Although the existing PMS may be incapable of effectively measuring this information, an upgraded PMS should have this capability. The PMS must be a transparent working tool with the goal of transforming data into usable parameters for strategic decision making.)*

5. Pavement Preservation Assistance

Observation 5.1

- The FHWA Hawaii Division Office has partnered with the Hawaii DOT to implement its pavement preservation program. Specific assistance provided by the FHWA Office includes:
 - Funding for the 2006 pavement preservation tour,
 - Working with HDOT leadership in understanding the benefits of a working preventive maintenance program,
 - Limited network evaluations, and
 - Assistance in developing strategic plans.

Furthermore, the Division Office has established a partnership with the Department and industry that has yielded quantifiable benefits despite the state's isolated location. For example, the 2006 Scanning Tour provided an opportunity to educate the Department on ways to develop a successful pavement preservation program.

Recommendation 5.1

- *We commend the FHWA Hawaii Division Office for continuing its proactive approach and “value added” involvement with the Hawaii DOT by providing policy and technical information. The efforts of the Division Office have been outstanding in encouraging, guiding, and engaging the DOT to take advantage of opportunities for implementing its pavement preservation program. The Division has been critical in moving preservation forward and providing this critical assistance.*

6. Training

Training is necessary to understand pavement condition, treatment selection, and proper timing, i.e., using the “*right* treatment on the *right* road at the *right* time.” We have the following observations and recommendations:

Observation 6.1

- District staff told us that the Department's most immediate pavement preservation training needs were:
 - Pavement Management Systems,
 - Understanding the various preservation treatments and their expected performance,

- Inspector training for preservation treatments, such as slurry seals and micro-surfacing (for consultants and “in-house” staff),
- Project selection,
- Developing long-term pavement preservation strategies, and
- Specifications training for engineers.

Staff also informed us that training is needed for all employee disciplines from the top on down and persuading the Department’s leadership of the necessity of pavement preservation⁵ will be an important indicator of future success.

Recommendation 6.1

We recommend that pavement preservation training be given to selected field and office employees in the following areas:

- *Pavement Management Systems - This type of training is essential if the Department expects to use the PMS to do strategic planning and assist with project selection. Training should be provided for all users of pavement management information.*
- *Basic Pavement Preservation Concepts – This training should include basic concepts, terminology, procedures, etc. and would be suitable for all employees.*
- *Pavement Preservation for Maintenance and Construction Personnel – As the name implies, this training should be directed at Maintenance and Consultants, contractors, and construction personnel and would focus on project selection and related field aspects of pavement preservation.*
- *Treatments – This training should cover the technical aspects of various pavement preservation treatments such as slurry seals, chip seals, asphalt overlays, crack sealing, etc. As with all treatments, the training should be project-related and aimed at guiding the choice of appropriate techniques in specific instances. Staff benefiting from this training includes designers, project and construction engineers, materials and laboratory staff, managers, and consultants.*
- *Inspector Training – This training should be for field employees having to inspect treatments, e.g. chip seals, crack sealing, etc.*
- *Preservation Strategy Development – This training should instruct headquarters and district decision-makers in network and project level strategic analysis and strategy development. Training should be made available to District engineers, planners, and leadership positions.*

(Appendix E contains a list of available training courses.)

The National Center for Pavement Preservation will be available to assist the Hawaii Department of Transportation with training options and developing a framework for a future pavement preservation program.

7. Preservation Treatments

We made the following specific observations and recommendations:

⁵ Employees generally accept pavement preservation, but seem to have difficulty implementing it.

Observation 7.1

- District staff told us that Hawaii's preservation toolbox includes:
 - Crack filling,
 - Slurry seals,
 - 1½" HMA overlays,
 - 1½" mill and fill, and
 - Ultra-thin white-topping (4").

Recommendation 7.1

- *We recommend that the Hawaii DOT broaden its maintenance treatments to include various preservation techniques and to apply the treatments to correct specific pavement conditions. By expanding its range of maintenance techniques to include more preservation treatments, the Department should be able to achieve a higher degree of cost-effectiveness and improve pavement conditions statewide. Examples of some additional treatments that Hawaii DOT should actively consider for flexible and rigid pavements include:*

Flexible

- *Crack sealing*
- *Fog seals*
- *Micro-surfacing*
- *Hot-in-place recycling (HIR)*
- *Cold-in-place recycling (CIR)*

Rigid

- *Dowel bar retrofit*
- *Cross stitching*
- *Spall repair*
- *Partial depth repairs*
- *Undersealing*
- *Full depth repairs*
- *Slab replacement (Pre-cast)*

While these treatments/repairs do not increase structural strength beyond the original design, they do extend the effective life period of pavements in good condition.

General Observations and Recommendations

8. Program Implementation

We make the following observations and recommendations:

Observation 8.1

- Past stewardship agreements have not been updated to include pavement preservation activities. Currently, the FHWA Hawaii Division does not require pavement preservation projects to include safety upgrades provided

minor deficiencies are identified and thoroughly discussed with the Division. In certain cases a safety improvement plan may be formulated.

Recommendation 8.1

- *Revise the old stewardship agreements to clarify what is meant by “safety deficiencies”. Safety upgrades such as geometric corrections, adjustments to or provision of super-elevations, improved railroad crossings, etc. are not pavement preservation and are more appropriately addressed in other programs. A revised agreement would also give Hawaii DOT the flexibility to use federal aid for preservation on a program basis.*

Also, we have included copies of the ADA guidance and action memoranda as Appendices B and C.

Observation 8.2

- The Department’s Planning Branch may make recommendations and projections for the Statewide Plan by using a \$5M place-holder in the STIP.

Recommendation 8.2

- *Formulate network level, pavement condition goals and establish comprehensive long-term strategies to achieve them. A long-term planning horizon of at least 10 years should be developed with annual budgets as part of the plan. Eventually, the plan should become an optimal, derived, network-level strategy that includes reconstruction, rehabilitation, and preservation treatments. At the network level, the strategic plan will not be site-specific, but will prescribe broad changes in network components by improving their condition (extending remaining service life) resulting from planned preservation activities. In a subsequent step, the broad network prescription will become site-specific and treatment-specific, while still remaining within the overall guidelines to achieve statewide goals.*

As the above transition is critically dependent on the Department’s PMS, it is important to build a sound underlying foundation to enable the PMS to derive realistic long-term strategies based on Hawaii’s actual experience.

Observation 8.3

- Materials, Testing & Research (MT&R) staff told us that recently, the Department had sought to stimulate competition by discussing with industry, new ways of doing business.

Recommendation 8.3

- *Consider taking steps that could make Hawaii a more attractive location for prospective preservation contractors. For example, consolidate several smaller projects to enlarge the pool of contractors and use island-wide contracts for accomplishing pavement preservation.*

9. Public / Political Relations

We commend the Department for its efforts to spread the preservation message by educating the public through the 32 “Neighborhood Boards” and citing the preservation advantage in responding to public inquiries. We make the following observations and recommendations:

Observation 9.1

- District staff told us that the public did not have an adverse reaction to the proactive pavement preservation approach, although the program was still very new. Staff told us that the Hawaii public appears to be more concerned with having potholes filled and believes that the only solution is paving. Legislators appear to have similar concerns.

Recommendation 9.1

- *Notwithstanding the successes achieved at meetings of Neighborhood Boards, the Department still needs to make greater efforts to educate the public and use the media for this purpose. It is vitally important that the public understand the value of being proactive. (Suggested news release formats are shown in Appendix F.)*

Legislators are concerned with providing benefits (good roads) to their constituents and finding the needed resources. Preservation has two important benefits for Legislators. First, it provides a cost-effective way to keep good roads good, and second, it allows budget needs to be accurately predicted, both by location (actual planned projects) and year of implementation. The Department should aggressively promote the concept among Legislators, emphasizing the long-term social and economic benefits to be gained. A powerful tool for gaining strong legislative support is network simulation which should be possible using a comprehensive PMS. Legislators could be introduced to “hands-on” demonstrations of the long-term changes in network performance (e.g., average RSL) resulting from alternative preservation strategies.

Observation 9.2

- In district offices and in most other locations, staff understands and endorses the value of pavement preservation. However, the pavement preservation message has not yet permeated to all levels in the Department.

Recommendation 9.2

- *Work toward changing the entire organization’s culture to understand the preservation concept. Reinforce the value of the preservation concept at all levels. Staff are more likely to accept and support preservation if they see a solid commitment from the Department’s upper management. Internal understanding and acceptance by the staff will also make it easier to successfully convey the preservation message to the motoring public. Consider broad on-going training to program staff in the principles of asset management and pavement preservation.*

Observation 9.3

- Staff told us that although “engineering” stories are difficult to sell to the media, they do try to disseminate as much information as possible.

Recommendation 9.3

- *Use the media proactively, especially in mass markets such as Honolulu, to disseminate the “preservation message” to the public. It is vitally important that the public understand the value of being proactive and that a policy of “worst first” will eventually end in failure to raise the quality of the system without a massive increase in resources. Establish standard messages promoting pavement preservation and educate staff to use the messages proactively when dealing with the public. (Suggested news release formats are shown in Appendix F.)*

10. Terminology

We make the following observation and recommendation:

Observation 10.1

- In an effort to address pavement preservation terminology, nomenclature and definitions, the Department has been collecting information from various NHI classes and the National Center for Pavement Preservation (NCPP) website. Consistent definitions do exist, but we found an uncertain understanding of pavement preservation terminology and definitions and not everyone had a uniform understanding.

Recommendation 10.1

- *Define, document, and distribute common terms throughout the Department to assure a consistent vocabulary for understanding, describing, and communicating concepts, particularly terms associated with pavement management. Incorporate the revised definitions into Hawaii DOT’s manuals as soon as possible rather than waiting for planned revisions to occur over the next several years. One of the most important definitions is that of “Pavement Preservation” and we recommend that the Department adopt a definition consistent with that used by AASHTO and FHWA. (Further information is contained in Appendices G and H.) Both the FHWA and the AASHTO Subcommittee on Maintenance also stand ready to assist the Department achieve consistency in this area.*

The use of a consistent and accurate terminology will yield clear benefits such as improved communication between employees, other state DOTs, and a better understanding of both operational processes and the Pavement Management System (PMS). The Department should use the commonly accepted definitions as a framework upon which to re-classify its existing processes.

11. Business Process

Observations

We made the following specific observations and recommendations:

Observation 11.1

- All preliminary engineering (PE) is charged to a single account and not tracked by project.

Recommendation 11.1

- *Although charging projects to a single account is acceptable, start tracking PE costs by individual project. Later, when calculating the cost-effectiveness of various preservation treatments, it will be necessary to have accurate, fully allocated costs by project.*

Observation 11.2

- The Department does not have a specific warranty⁶ policy. In the absence of competition, District staff told us that the industry would not support the warranty concept.

Recommendation 11.2

- *Do not give up on warranties. Follow-up with the City and County of Honolulu and learn from their warranty experience. States with successful warranty programs have started with experimental short-duration warranties. Consider experimenting with a short-term warranty (1 – 2 years) for a single project. It will take time for both the Department and industry to become comfortable with the warranty approach and the experiment will enable small problems to be identified and corrected without disrupting the preservation program.*

12. Quality Control and Quality Assurance

We make the following observation and recommendation:

Observation 12.1

- MT&R staff told us that maintenance does not follow the same quality control and quality assurance practices as the rest of the Department.

Recommendation 12.1

- *We recommend that maintenance forces follow the same QC / QA standards as the rest of the Department. Adherence to common standards results in dividends to the Department, such as uniform performance and better predictability. The consequences of not following mutual quality standards will usually result in greater long-term costs to a Department.*

13. Materials

Observation 13.1

- The Department is trying to determine whether or not it has a stripping problem, although after conducting some tests on the Island of Hawaii, Federal Lands concluded that it did have a stripping problem. The potential

⁶ The City and County of Honolulu use 1-year warranties because they do not sample or test materials.

problem has only recently been discovered, and to date, the DOT has not used lime or anti-stripping agents.

Recommendation 13.1

- *Consider a study to determine if a problem exists. If it is determined that stripping is a problem use lime or a good quality liquid anti-stripping agent.*

14. Research and Development

We have the following specific observations and recommendations:

Observation 14.1

- Staff told us that their most immediate research need in pavement preservation was an understanding of the cost effectiveness of the preservation process, and particularly the cost effectiveness of the various pavement preservation treatments. This will be especially important as the Department builds and refines its database and begins long-term strategic planning.

Recommendation 14.1

- *We recommend that the Hawaii DOT undertake or sponsor research to determine the expected performance and cost-effectiveness of various preservation treatments. Specific areas where research would be beneficial include:*
 - *Treatment guides for the pavement management system (PMS) matching treatments with pavement conditions,*
 - *Identifying conditions when specific treatments are most cost-effective,*
 - *Optimal timing for selecting treatments,*
 - *Replacing method specifications with performance specifications where appropriate,*
 - *Analysis of successful projects to determine critical success factors.*

Appendix A – List of Participants

Name		Affiliation
Abe	Casey C.	MT&R Engineering Program Manager
Cajigal	Ferdinand M.	D2, Maui, District Engineer
Carnate	Gerry	Civil Engineer
Chu	Herbert Y.F.	Geotechnical Engineer
Daguimol	Arthur P.	Resident Engineer
Ege	Steven T.	Engineer
Fischer	Elizabeth E.	FHWA, Hawaii Division
Fronda	Julius B.	Head, Highway Design Section
Ho	Jamie H.	HQ, Construction & Maintenance Program Manager
Ishikawa	Scott	HQ, Community Development Specialist
Kinimaka	Pratt M.	D1, Oahu, District Engineer
Kuo	Loy	Pavement Design and Pavement Management System Unit
Morioka	Brennon T.	HQ, Director
Nakamura	JoAnne M.	Pavement Preservation Coordinator
Newman	Christopher	FHWA, Office of Asset Management, Washington, DC
Phung	Pat V.	Transportation Engineer
Spilker	Robert	D2, Maui, Project Engineer
Sulijoapikusumo	Goro	Civil Engineer VI
Sun	Robert	Design Project Manager
Tatsuguchi	Ken	HQ, Planning Program Manager
Trier	Richard	Highway Construction Inspector IV
Uechi	Steven M.S.	HQ, Civil Engineer
Williams	John	HQ, Maintenance Engineer
Wong	Abraham	Division Administrator
Yamasaki	Christine M.	Design Project Manager
Yasui	Glenn M.	HQ, Highways Administrator
Galehouse	Larry	NCPP, Director

Geographic Districts	
District	Location
1	Oahu
2	Maui
3	Kauai
4	Hawaii

Appendix B – Informational Memorandum for ADA



Memorandum

U.S. Department of Transportation

Federal Highway Administration

Subject: INFORMATION: Clarification of FHWA's Oversight Role in Accessibility **Date:** 9-12-06

From: J. Richard Capka
Administrator

Reply to Attn of: HCR-1
HIF-1

To: Associate Administrators
Chief Counsel
Chief Financial Officer
Directors of Field Services
Resource Center Director and Operations Managers
Division Administrators
Federal Lands Highway Division Engineers

The Federal Highway Administration (FHWA) announces consolidating guidance to clarify and address ongoing issues concerning FHWA's oversight of States' and localities' compliance with the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act (Section 504).

Based on the work of an ADA and Section 504 working group, the Associate Administrators for Civil Rights and Infrastructure present the attached clarification Memo to FHWA offices to explain how the FHWA is to oversee States' and localities' efforts to meet ADA and Section 504 obligations. In detailed Questions and Answers, FHWA provides further details on FHWA oversight and the actions required by the States and localities to meet ADA and Section 504 requirements. The Memo and the Questions and Answers will be posted on the Civil Rights Web site. Both of these documents clarify existing FHWA policies on issues including FHWA ADA and Section 504 oversight responsibilities, and appropriate actions by States and localities to meet the requirements of ADA and Section 504.

Through the actions detailed above, the FHWA continues to work with States and localities to ensure that persons with disabilities may access the public right of way without discrimination. Attachment



Appendix C – Action Memorandum for ADA



Memorandum

U.S. Department of Transportation

Federal Highway Administration

Subject: **ACTION:** Clarification of FHWA's Oversight Role in Accessibility **Date:** 9-12-06

From: Frederick D. Isler
Associate Administrator for Civil Rights
King W. Gee
Associate Administrator for Infrastructure

Reply to Attn of: HCR-1
HIF-1

To: Associate Administrators
Chief Counsel
Chief Financial Officer
Directors of Field Services
Resource Center Director and Operations Managers
Division Administrators
Federal Lands Highway Division Engineers

The Federal Highway Administration (FHWA) recognizes the need for the transportation system to be accessible to all users. The purpose of this memorandum is to clarify FHWA's role and responsibility to oversee compliance on pedestrian access required by the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973 (Section 504). Since 1978, FHWA has promoted accessible transportation systems through technical assistance and guidance on ADA and Section 504. In addition, accessibility improvements are eligible for Federal-aid funding.

The FHWA is responsible for implementation of pedestrian access requirements from the ADA and Section 504. This is accomplished through stewardship and oversight over all Federal, State, and local governmental agencies ("public agencies") that build and maintain highways and roadways, whether or not they use Federal funds on a particular project.

Policy

In February 2000, the FHWA issued a policy providing technical guidance to integrate facilities for pedestrians, including persons with disabilities, into the transportation infrastructure. The guidance can be found at www.fhwa.dot.gov/environment/bikeped/design.htm#d4.

The ADA and Section 504 do not require public agencies to provide pedestrian facilities. However, where pedestrian facilities exist they must be accessible. Furthermore, when public agencies construct improvements providing access for pedestrians, the completed project also must meet accessibility requirements for persons with disabilities to the maximum extent feasible.

Planning

Title 23 requires that long-range transportation plans and transportation improvement programs, in both statewide and metropolitan planning processes, provide for the development and integrated management and operation of accessible transportation systems and facilities.

Additionally, State DOTs and Metropolitan Planning Organizations (MPOs) must certify (at least biennially for State DOTs and annually for MPOs) that the transportation planning process is being carried out or conducted in accordance with all FHWA, Federal Transit Administration and other applicable Federal statutory and regulatory requirements [see 23 CFR 450.220 and 23 CFR 450.334, respectively]. Further, 23 CFR 450.316(b)(3) requires the metropolitan planning process to identify actions necessary to comply with the ADA and Section 504.

Transition Plans

The ADA and Section 504 require State and local governments with 50 or more employees to perform a self-evaluation of their current services, policies, and practices that do not or may not meet ADA requirements. The public agency must develop a Transition Plan addressing these deficiencies. This plan assesses the needs of persons with disabilities, and then schedules the required pedestrian accessibility upgrades. The Transition Plan is to be updated periodically, with its needs reflected in the processes utilized by State DOTs, MPOs, and transit agencies to develop the Statewide Transportation Improvement Programs and metropolitan Transportation Improvement Programs.

Projects

Public agencies should work to meet accessibility requirements throughout the project delivery process. Issues surrounding pedestrian accessibility should be addressed at the earliest stage possible to reduce or prevent conflicts with other right-of-way, planning, environmental, and design considerations. This could include the acquisition of right-of-way and use of special plan details for specific locations to remove barriers. Projects requiring pedestrian accessibility include projects for new construction and projects altering existing street and highway facilities.

New Construction

All projects for new construction that provide pedestrian facilities must incorporate accessible pedestrian features to the extent technically feasible, without regard to cost. The development process should ensure accessibility requirements are incorporated in the project.

Alterations

Alterations shall incorporate accessibility improvements to existing pedestrian facilities to the extent that those improvements are in the scope of the project and are technically feasible, without regard to cost. Projects altering the usability of the roadway must incorporate accessible pedestrian improvements at the same time as the alterations to the roadway occur. See **Kinney v. Yerusalem**, 9 F.3d 1067 (3d Cir. 1993), cert. denied, 511 U.S.C. 1033 (1994). Alterations are changes to a facility in the public right-of-way that affect or could affect access, circulation, or use by persons with disabilities.

The FHWA has determined that alterations are projects that could affect the structure, grade, function, and use of the roadway. Alteration projects include reconstruction, major rehabilitation, structural resurfacing, widening, signal installation, pedestrian signal installation, and projects of similar scale and effect.

Maintenance

Maintenance activities are not considered alterations. Therefore, maintenance projects do not require simultaneous improvements to pedestrian accessibility under the ADA and Section 504. The U.S. Department of Justice (DOJ) and the courts consider maintenance activities to include filling potholes. The FHWA has determined that maintenance activities include actions that are intended to preserve the system, retard future deterioration, and maintain the functional condition of the roadway without increasing the structural capacity. Maintenance activities include, but are not limited to, thin surface overlays (nonstructural), joint repair, pavement patching (filling potholes), shoulder repair, signing, striping, minor signal upgrades,

and repairs to drainage systems.

As part of maintenance operations, public agencies' standards and practices must ensure that the day-to-day operations keep the path of travel open and usable for persons with disabilities, throughout the year. This includes snow and debris removal, maintenance of pedestrian traffic in work zones, and correction of other disruptions. Identified accessibility needs should be noted and incorporated into the transition plan.

Accessibility Design Criteria for Sidewalks, Street Crossings, and Trails

Sidewalks and Street Crossings

Where sidewalks are provided, public agencies shall provide pedestrian access features such as continuous, unobstructed sidewalks, and curb cuts with detectable warnings at highway and street crossings. 28 CFR 35.151(c), referencing 28 CFR Part 36, App. A, ADA Accessibility Guidelines (ADAAG). The FHWA encourages the use of ADAAG standards. If pedestrian signals are provided, they must have a reasonable and consistent plan to be accessible to persons with visual disabilities.

Sidewalks and street crossings generally should use the guidelines the Access Board is proposing for public rights-of-way. The FHWA distributed an information memorandum on November 20, 2001, stating that ***Designing Sidewalks and Trails, Part II, Best Practices Design Guide*** can be used to design and construct accessible pedestrian facilities. This report provides information on how to implement the requirements of Title II of the ADA.

Designing Sidewalks and Trails for Access is the most comprehensive report available for designing sidewalks and street crossings and contains compatible information on providing accessibility with information published by the Access Board in the ADAAG. This report can be found at www.fhwa.dot.gov/environment/sidewalk2.

When the Access Board completes guidelines for public rights-of-way and they are adopted by the United States Department of Transportation and DOJ as standards under the ADA and Section 504, they will supersede the currently used standards and criteria.

When Federal-aid highway program funds are used for parking facilities, or buildings such as transit facilities, rest areas, information centers, transportation museums, historic preservation projects, or other projects where pedestrians are expected, the project must meet the current applicable accessibility standards, whether or not the project is within the public right-of-way. The ADAAG includes special provisions for building alterations and for historic preservation projects.

Shared Use Paths and Trails

The design standards for shared use paths and trails are specific to the function of the path or trail:

- Shared use paths and pedestrian trails that function as sidewalks shall meet the same requirements as sidewalks. Where shared use paths and pedestrian trails cross highways or streets, the crossing also shall meet the same requirements as street crossings, including the provision of detectable warnings.
- Shared use paths and pedestrian trails that function as trails should meet the accessibility guidelines proposed in the Access Board's *Regulatory Negotiation Committee on Accessibility for Outdoor Developed Areas Final Report* found at www.access-board.gov/outdoor/outdoor-rec-rpt.htm. This report also has guidelines for Outdoor Recreation Access Routes (routes connecting accessible elements within a picnic area, camping area, or a designated trailhead).
- Recreational trails primarily designed and constructed for use by equestrians, mountain bicyclists, snowmobile users, or off-highway vehicle users, are exempt from accessibility requirements even though they have occasional pedestrian use.

Most trailside and trailhead structural facilities (parking areas, restrooms) must meet the

ADAAG standards.

Technical Feasibility and Cost

When constructing a new transportation facility or altering an existing transportation facility, a public agency should consider what is included within the scope of the project. For elements that are within the scope of the project, the ADAAG provides that “Any features of a...facility that are being altered and can be made accessible shall be made accessible [i.e., made to conform with ADAAG] within the scope of the alteration.” ADAAG 4.1.6(j). The only exception to this rule is where conformity with ADAAG is “technically infeasible,” meaning that “existing structural conditions would require removing or altering a load-bearing member which is an essential part of the structural frame [e.g., in the case of a highway project, a bridge support]; or because other existing physical or site constraints prohibit modification of addition of elements, spaces, or features which are in full and strict compliance with the minimum requirements for new construction and which are necessary to provide accessibility.” ADAAG 4.1.6(j).

Where making an alteration that meets accessibility requirements is technically infeasible, the public agency must ensure that the alteration provides accessibility to the “maximum extent feasible.” If a public agency believes that full ADAAG compliance is technically infeasible, the public agency should document that the proposed solution to the problem meets the “maximum extent feasible” test. With respect to any element of an alteration that is within the scope of the project and is not technically infeasible, DOJ guidance provides that under ADAAG standards “cost is not a factor.” DOJ Technical Assistance Manual for Title II of the ADA, II-6.3100(4). Consequently, if the accessibility improvement is technically feasible, the public agency must bear the cost of fully meeting ADAAG standards.

However, cost may be a factor in determining whether to undertake a stand-alone accessibility improvement identified in a Transition Plan. For example, if an existing highway, not scheduled for an alteration, is listed in the public agency’s Transition Plan as needing curb cuts, the public agency may consider costs that are “unduly burdensome.” The test for being unduly burdensome is the proportion of the cost for accessibility improvements compared to the agency’s overall budget, not simply the project cost.

If the project alters any aspect of the pedestrian route, it must be replaced with accessible facilities. Additional work outside of the scope and limits of the project altering a facility is at the discretion of the agency. However, any features not conforming to ADA requirements outside the project scope should be added to the Transition Plan.

FHWA Responsibilities

The FHWA is responsible for ensuring public agencies meet the requirements of the ADA and Section 504 for pedestrian access for persons with disabilities. Under DOJ regulations, FHWA divisions must work with their State DOTs, MPOs, and local public agencies to ensure ADA and Section 504 requirements are incorporated in all program activities for all projects within the public right-of-way regardless of funding source. Program activities include project planning, design, construction, and maintenance. Furthermore, FHWA is responsible for ensuring accessibility requirements for projects that are not within public right-of-way, but use funding through FHWA. This includes parking areas, information centers, buildings, shared use paths, and trails. Divisions have a legal responsibility to work with State agencies or other recipients to ensure ADA and Section 504 requirements are incorporated into all projects using funding through FHWA.

For all projects that use Federal funds as part of the financing arrangements, the division offices need to periodically:

- Review those projects, where they have oversight responsibilities, for accommodation of pedestrians. The divisions shall not approve Federal funding for projects that do not adequately provide pedestrian access for persons with disabilities where the project scope and limits include pedestrian facilities in the public right-of-way.
- Review the Stewardship Agreement to ensure pedestrian accessibility

requirements are included, as appropriate.

- Review the State DOT, MPO, and/or local jurisdiction processes, procedures, guidelines, and/or policies that address ADA in transportation planning and programming processes and how accessibility commitments are addressed in transportation investment decisions.
- Assist transportation agencies in updating their Transition Plans. The United States Department of Transportation Section 504 regulation requires FHWA to monitor the compliance of the self-evaluation and Transition Plan of Federal-aid recipients (49 CFR 27.11). The ADA deadline for completing the accessibility improvements within the Transition Plan was in 1995. For those State and local governments that have not performed the self-evaluation and prepared a plan, it is critical that they complete the process.
- Encourage and facilitate training for FHWA personnel on accessible pedestrian features.
- Ensure pedestrian accessibility compliance through periodic program reviews of recipients' highway planning, design, and construction activities.
- In addition, the Federal Lands Highway Divisions should ensure that each direct Federal construction project fulfills both policy guidance on pedestrian access and meets the minimum ADA and Section 504 accessibility requirements.

For all highway, street and trail facilities, regardless of whether Federal funds are involved, the division offices need to:

- Perform onsite review of complaints about accessibility and report the findings of the review to HCR-1.
- Make presentations and offer training on pedestrian accessibility at meetings, conferences, etc.
- In contacts with State and local officials, encourage them to develop procedures for incorporating pedestrian accessibility into their projects.

Additional Information and Resources

A [Web site with questions and answers](#) concerning recurring issues, training opportunities, and background legal information on FHWA's responsibilities under the ADA and Section 504 is located at <http://www.fhwa.dot.gov/civilrights/index.htm>. This memorandum has been reviewed and approved by the U.S. Department of Transportation General Counsel as consistent with applicable disability law.

Questions concerning these obligations may be directed to:

- For Accessibility Policy: [Candace Groudine](#), [Bob Cosgrove](#), Office of Civil Rights
- For Design Standards: [William A. Prosser](#), Office of Program Administration
- For Trails: [Christopher Douwes](#), Office of Natural and Human Environment
- For Construction and Maintenance: [Christopher Newman](#), Office of Asset Management
- For Legal: [Lisa MacPhee](#), Office of the Chief Counsel



Appendix D – Network Pavement Preservation

In network-level analysis, it is essential to know whether present and / or planned program actions (preservation, resurfacing, rehabilitation, reconstruction) will produce net improvements in the aggregate condition of the network as measured by average remaining service life (RSL). Consider the network whose current condition is shown in Figure 1.

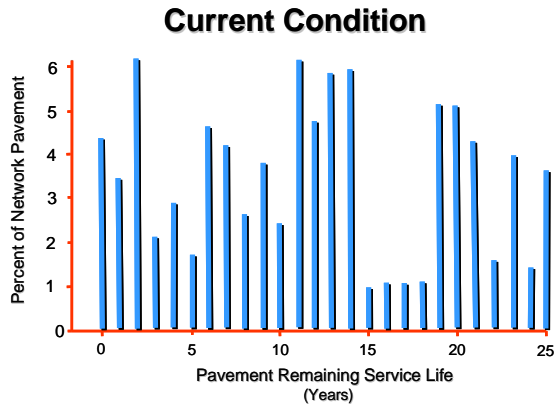


Figure 1 – Current Condition

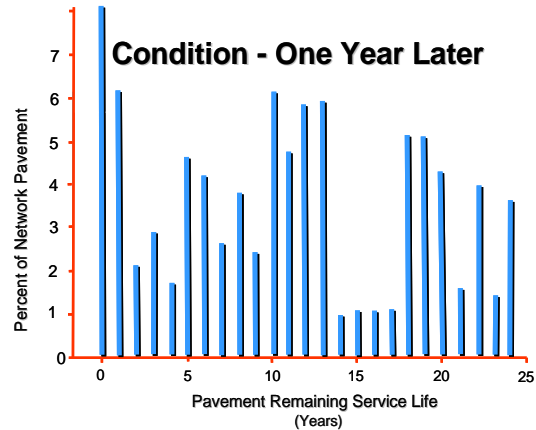


Figure 2 – Condition 1 Year Later

If no improvements are made for one year, the entire network will age one year to the condition shown in Figure 2.

The deterioration can be thought of as the total lane-miles multiplied by 1 year, or one *lane-mile-year*. To offset deterioration over the entire network, the agency would need to annually perform a quantity of work equal to the total number of system-wide lane-mile-years just to maintain the status quo. Performing less work would result in a net decline of the network, while more work would result in a net improvement of the network.

Consider a small quantitative example. Suppose your agency’s highway network consisted of 38,500 lane-miles. Figure 3 declares that without intervention, it will lose 38,500 lane-mile-years per year.

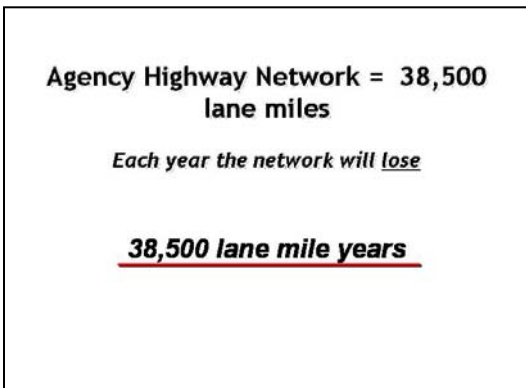


Figure 3 – Network Lane-Miles

Network Needs Summary	
<i>Required: 38,500 lane mile years</i>	
Programmed Activity	Lane Mile Years
Reconstruction <i>(175 lane miles X 25 yrs)</i>	4,375
Major Rehabilitation <i>(300 lane miles X 15 yrs)</i>	4,500
Resurfacing <i>(700 lane miles X 12 yrs)</i>	8,400
Pavement Preservation <i>(500 lane miles X 5 yrs)</i>	2,500
Total =	19,775

Figure 4 – Network Needs Summary

Figure 4 displays the agency's programmed activities of reconstruction, rehabilitation, resurfacing, and preservation that would restore only 19,775 lane-mile-years to the network in that year. This quantity of added life consists of 4,375 lane-mile-years which come from reconstruction; 4,500 lane-mile-years from rehabilitation; 8,400 lane-mile-years from resurfacing; and 2,500 lane-mile-years from pavement preservation. These programmed activities fall short of the required 38,500 lane-mile-years to maintain the status quo, and hence would contribute to a net one year loss in network pavement condition of 18,725 lane-mile-years.

This exercise can be performed for any pavement network to benchmark the current trend.

Appendix E – List of Training Courses

National Center for Pavement Preservation (NCP)

Pavement Preservation: Applied Asset Management

This is a 2-day course for policy-level administrators, planners, and economists focusing on pavements viewed as a system; and also for engineers and technicians interested in applying preservation techniques at the project level. The course presents cost-effective strategies for planning and managing highway and street networks and is useful for budget planning and resource allocation. At the project level, participants will gain a practical understanding of pavement distresses and the appropriateness of various preservation techniques used to treat those distresses. The second day features a “hands-on” network simulation exercise where the participant develops an integrated long-term pavement strategy.

Understanding Chip Seals: Theory and Practice

This is a 1-day course for highway agency field managers, engineers, technicians, and industry representatives. The course traces the evolution of the art of chip sealing and includes the latest technological advances. Participants are introduced to the concepts and taught how to design chip seals. The course then covers contracting, materials selection, equipment and construction practices, and chip seal performance measures.

Pavement Preservation: Slurry Seal and Micro-Surfacing

This one-day course is intended to provide participants with a comprehensive understanding of slurry seal and micro-surfacing systems. The principal focus is to offer pavement practitioners the essential skills for selecting good candidate pavements, designing and estimating projects, and gaining awareness of good construction practices. Upon the conclusion of the course the participants will possess the necessary knowledge to achieve excellent success with slurry seals and micro-surfacing projects.

National Highway Institute (NHI)

131054A Pavement Preservation: The Preventive Maintenance Concept

This is a 2-day introductory course for highway agency upper management and policy makers. The course provides a conceptual introduction to pavement preventive maintenance and a description of current preventive maintenance treatments and technology. It also presents information needed to develop or improve a preventive maintenance program by illustrating the experiences of 5 states which have established preventive maintenance programs.

List of Training Courses (continued)

- 131058A** **Pavement Preservation: Selecting Pavements for Preventive Maintenance**
This is a 2-day, project-level technical course for highway agency field managers / practitioners and industry representatives. The course focuses on selecting appropriate preservation treatments for pavements based on actual field conditions. The subject matter includes detailed illustrations of pavement evaluation, project selection, and materials considerations for various preventive maintenance applications.
- 131103A** **Pavement Preservation: Design and Construction of Quality Preventive Maintenance Treatments**
This is a 3-day technical course for construction foremen and agency construction inspectors. The course contains modules covering all generally used preventive maintenance treatments and focuses on the best design and construction practices for those treatments. It also addresses troubleshooting construction practices to enable participants to identify the results of poor construction practices.
- 131104A** **Pavement Preservation: Integrating Pavement Preservation and Pavement Management**
This is a 2-day continuation course for pavement management engineers, region / district maintenance engineers, local agency engineers, maintenance management engineers, and planning and programming personnel. The course presents several ways in which pavement management tools can support a pavement preservation program at the project, network, and strategic analysis levels. It also presents reasons why agencies should integrate pavement preservation into their pavement management activities and advice on how to recognize and overcome obstacles to successful integration.

Appendix F – Press Release Formats

Suggested press releases could be patterned after the following examples.

Example 1

The Department of Transportation today announced it will be investing \$80.0 million in 260 projects statewide next year through its Preventive Preservation Program.

The Program is designed to reduce normal wear and tear on the roads, and extend its service life by several years. In 2003, the DOT will be using the program to maintain 1,100 miles of roadway. "This is akin to taking care of your car – from changing the oil to rotating the tires," said State Transportation Director Tom Smith. "Everyone knows your vehicle will last much longer with a little routine maintenance. Roads and bridges are no different."

Research shows that for every \$1 spent on pavement preservation, the state can save at least \$6 in road rehabilitation and reconstruction. DOT's goal is to have 90 percent of state roads in good condition by 2010. Achieving this goal would not be possible without the Pavement Preservation Program. "Pavement preservation helps keep good roads in good condition," Smith said. "You can't continually make improvements without taking care of the investments you have already made. To do so would be a waste of time and money – and both are precious commodities."

Example 2

Pavement Preservation project extends life of roadway. The Department of Transportation (DOT) will begin resurfacing more than 11 miles of southbound US-26 from Normandy Road to Johnston Street starting July 5, 2006.

Southbound US-26 will have one lane of traffic maintained at all times. Northbound traffic will be unaffected. "Pavement preservation projects allow us to come in and fix a roadway before it falls into poor condition. The fixes that we do now may prevent the need to come in sooner to do a complete reconstruction of the roadway," said State Transportation Director Tom Smith.

The project entails the resurfacing of 11.1 miles of roadway and is scheduled for completion in late August 2005. "Our goal is to preserve the existing roadway while also preserving the ability of motorists to get through. It's a tough but necessary balancing act," said DOT's District Engineer Angus McTaggart.

More than \$1 million project is being funded through the passage of Governor Brooks' Build Main Roads II plan and TEA-21. It will preserve this section of roadway for approximately five years.

Example 3

July 31, 2006--The Department of Transportation today announced more than 13 miles of US-121 near Wildwood will be resurfaced beginning Wednesday, Aug. 2.

"This project will continue to preserve our existing system by improving the ride quality of US-

121 and extending the service life of the pavement for years to come," said Fred Niemeyer, manager of the DOT's local field office in Junction City. "All work will be performed using single lane closures, leaving one lane open to traffic throughout the project limits."

Crews will place a thin one-course overlay of asphalt on north- and southbound US-121 from the southern McClain county line to 47 Mile Road.

"Work will be done around-the-clock in an effort to expedite the project, allowing completion by early-October," Niemeyer said. "The contractor has agreed to pave at night, which will reduce the impact on motorists."

This \$2.2 million project continues Gov. Dallas Brooks' commitment to preserving and improving the state's transportation network.

Protect our families: Please slow down in work zones. - A message from the DOT and the Bring 'em Home Alive safety coalition.

Appendix G – Pavement Preservation Definitions



Memorandum

Subject: **ACTION**: Pavement Preservation Definitions

Date: September 12, 2005

(Original Signed by David R. Geiger, P.E.)

From: David R. Geiger, P.E.
Director, Office of Asset Management

Reply to
Attn. of: HIAM-20

To: Associate Administrators
Directors of Field Services
Resource Center Director and Operations Manager
Division Administrators
Federal Lands Highway Division Engineers

As a follow-up to our Preventive Maintenance memorandum of October 8, 2004, it has come to our attention that there are differences about how pavement preservation terminology is being interpreted among local and State transportation agencies (STAs). This can cause inconsistency relating to how the preservation programs are applied and their effectiveness measured. Based on those questions and a review of literature, we are issuing this guidance to provide clarification to pavement preservation definitions.

Pavement preservation represents a proactive approach in maintaining our existing highways. It enables STAs to reduce costly, time consuming rehabilitation and reconstruction projects and the associated traffic disruptions. With timely preservation we can provide the traveling public with improved safety and mobility, reduced congestion, and smoother, longer lasting pavements. This is the true goal of pavement preservation, a goal in which the FHWA, through its partnership with States, local agencies, industry organizations, and other interested stakeholders, is committed to achieve.

A Pavement Preservation program consists primarily of three components: preventive maintenance, minor rehabilitation (non structural), and some routine maintenance activities as seen in figure 1.

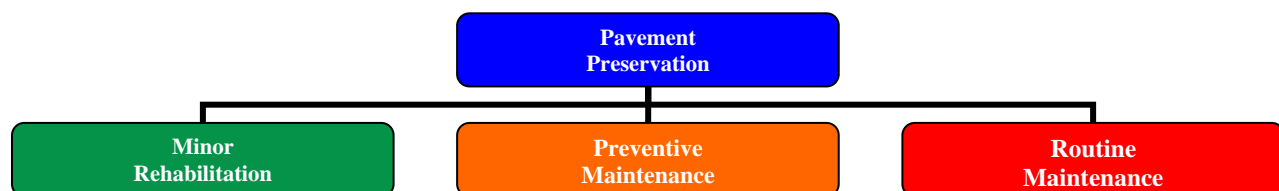


Figure 1: Components of Pavement Preservation

An effective pavement preservation program can benefit STAs by preserving investment on the NHS and other Federal-aid roadways, enhancing pavement performance, ensuring cost-effectiveness, extending pavement life, reducing user delays, and providing improved safety and mobility.

It is FHWA's goal to support the development and conduct of effective pavement preservation programs. As indicated above, pavement preservation is a combination of different strategies which, when taken together, achieve a single goal. It is useful to clarify the distinctions between the various types of maintenance activities, especially in the sense of why they would or would not be considered preservation.

For a treatment to be considered pavement preservation, one must consider its intended purpose. As shown in Table 1 below, the distinctive characteristics of pavement preservation activities are that they restore the function of the existing system and extend its service life, not increase its capacity or strength.

Pavement Preservation Guidelines					
	Type of Activity	Increase Capacity	Increase Strength	Reduce Aging	Restore Serviceability
	New Construction	X	X	X	X
	Reconstruction	X	X	X	X
	Major (Heavy) Rehabilitation		X	X	X
	Structural Overlay		X	X	X
	Minor (Light) Rehabilitation			X	X
Pavement Preservation	Preventive Maintenance			X	X
	Routine Maintenance				X
	Corrective (Reactive) Maintenance				X
	Catastrophic Maintenance				X

Table 1- Pavement Preservation Guidelines

Definitions for Pavement Maintenance Terminology

Pavement Preservation is “a program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations.”

Source: FHWA Pavement Preservation Expert Task Group

An effective pavement preservation program will address pavements while they are still in good condition and before the onset of serious damage. By applying a cost-effective treatment at the right time, the pavement is restored almost to its original condition. The cumulative effect of systematic, successive preservation treatments is to postpone costly rehabilitation and reconstruction. During the life of a pavement, the cumulative discount value of the series of pavement preservation treatments is substantially less than the discounted value of the more extensive, higher cost of reconstruction and generally more economical than the cost of major rehabilitation. Additionally, performing a series of successive pavement preservation treatments during the life of a pavement is less disruptive to uniform traffic flow than the long closures normally associated with reconstruction projects.

Preventive Maintenance is “a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity).” *Source: AASHTO Standing Committee on Highways, 1997*

Preventive maintenance is typically applied to pavements in good condition having significant remaining service life. As a major component of pavement preservation, preventive maintenance is a strategy of extending the service life by applying cost-effective treatments to the surface or near-surface of structurally sound pavements. Examples of preventive treatments include asphalt crack sealing, chip sealing, slurry or micro-surfacing, thin and ultra-thin hot-mix asphalt overlay, concrete joint sealing, diamond grinding, dowel-bar retrofit, and isolated, partial and/or full-depth concrete repairs to restore functionality of the slab; e.g., edge spalls, or corner breaks.

Pavement Rehabilitation consists of “structural enhancements that extend the service life of an existing pavement and/or improve its load carrying capacity. Rehabilitation techniques include restoration treatments and structural overlays.” *Source: AASHTO Highway Subcommittee on Maintenance*

Rehabilitation projects extend the life of existing pavement structures either by restoring existing structural capacity through the elimination of age-related, environmental cracking of embrittled pavement surface or by increasing pavement thickness to strengthen existing pavement sections to accommodate existing or projected traffic loading conditions. Two sub-categories result from these distinctions, which are directly related to the restoration or increase of structural capacity.

Minor rehabilitation consists of non-structural enhancements made to the existing pavement sections to eliminate age-related, top-down surface cracking that develop in flexible pavements due to environmental exposure. Because of the non-structural nature of minor rehabilitation techniques, these types of rehabilitation techniques are placed in the category of pavement preservation.

Major rehabilitation “consists of structural enhancements that both extend the service life of an existing pavement and/or improve its load-carrying capability.” *Source: AASHTO Highway Subcommittee on Maintenance Definition*

Routine Maintenance “consists of work that is planned and performed on a routine basis to maintain and preserve the condition of the highway system or to respond to specific conditions

and events that restore the highway system to an adequate level of service.” *Source: AASHTO Highway Subcommittee on Maintenance*

Routine maintenance consists of day-to-day activities that are scheduled by maintenance personnel to maintain and preserve the condition of the highway system at a satisfactory level of service. Examples of pavement-related routine maintenance activities include cleaning of roadside ditches and structures, maintenance of pavement markings and crack filling, pothole patching and isolated overlays. Crack filling is another routine maintenance activity which consists of placing a generally, bituminous material into “non-working” cracks to substantially reduce water infiltration and reinforce adjacent top-down cracks. Depending on the timing of application, the nature of the distress, and the type of activity, certain routine maintenance activities may be classified as preservation. Routine Maintenance activities are often “in-house” or agency-performed and are not normally eligible for Federal-aid funding.

Other activities in pavement repair are an important aspect of a STA’s construction and maintenance program, although they are outside the realm of pavement preservation:

Corrective Maintenance activities are performed in response to the development of a deficiency or deficiencies that negatively impact the safe, efficient operations of the facility and future integrity of the pavement section. Corrective maintenance activities are generally reactive, not proactive, and performed to restore a pavement to an acceptable level of service due to unforeseen conditions. Activities such as pothole repair, patching of localized pavement deterioration, e.g. edge failures and/or grade separations along the shoulders, are considered examples of corrective maintenance of flexible pavements. Examples for rigid pavements might consist of joint replacement or full width and depth slab replacement at isolated locations.

Catastrophic Maintenance describes work activities generally necessary to return a roadway facility back to a minimum level of service while a permanent restoration is being designed and scheduled. Examples of situations requiring catastrophic pavement maintenance activities include concrete pavement blow-ups, road washouts, avalanches, or rockslides.

Pavement Reconstruction is the replacement of the entire existing pavement structure by the placement of the equivalent or increased pavement structure. Reconstruction usually requires the complete removal and replacement of the existing pavement structure. Reconstruction may utilize either new or recycled materials incorporated into the materials used for the reconstruction of the complete pavement section. Reconstruction is required when a pavement has either failed or has become functionally obsolete.

If you need technical support or further guidance in the pavement preservation area, please contact Christopher Newman in the FHWA Office of Asset Management at (202) 366-2023 or via e-mail at Christopher.Newman@fhwa.dot.gov.

Appendix H – Suggested Pavement Management Terms

Threshold Distress Index

A pavement condition indicator when a rehabilitation or reconstruction should be considered. The threshold distress index is arbitrarily set to some value, e.g. 50.

Remaining Service Life, RSL (Distress)

The estimated number of years, from a specified date, until a pavement section reaches the threshold distress index. RSL is a function of the distress level and rate of deterioration.

Ride Index, International Ride Index (IRI)

An index created that quantifies the user's perception of pavement ride quality. IRI is usually reported in inches per mile and increases as ride quality deteriorates.

Threshold Ride Quality Index

An index that establishes the beginning of poor ride quality on pavements; e.g. 120.

Fix Life

The anticipated life provided by the pavement fix, excluding any future pavement treatments.

Design Life

The number of years anticipated for a pavement section at the time of initial construction. Design life does not include any additional life estimates provided by anticipated future preventive maintenance.

Service Life (Analysis Period)

The anticipated life of a rehabilitation or new/reconstruction, including additional pavement life provided by anticipated future preventive maintenance. This term is used to describe the number of years from the initial new construction, reconstruction or rehabilitation of a pavement to a subsequent rehabilitation or reconstruction. A service life or analysis period equals the sum of the original design/fix life plus any additional pavement life provided by future anticipated preventive maintenance. Analysis period is the term typically used to describe the time used in a life cycle cost analysis.

Appendix I Supplemental Observations

1. Pavement Management System

- In 1962, the Department began using pavement service ratings (PSRs) and by 1970, had begun to collect pavement profile information using the “CHLOE⁷” Profilometer. In 1984, the DOT began using a visual distress system, and in 2006, began to use pavement condition indices (PCIs).
- Staff told us that before 2006, the data were unreliable, but after 2006, the data became reliable. The Department does not tie pavement preservation treatment selections to the pavement management system which is currently used principally for network-level analysis. The PMS generates candidate project lists which are sent to the districts and the Planning Office.
- Staff told us that they aim for a complete data (ride, rutting, distress) collection every 2 years. In fact, it takes 6 months to collect the data and a further 6 months to reduce it. There is duplication of effort.
- Materials, Testing & Research (MT&R) staff told us that for the previous 2 years, PMS data have been collected annually for a total cost of approximately \$60,000 per year.
- Planning data are also collected annually by Mandli Communications, Inc., of Madison, Wisconsin for a total cost of approximately \$520,000⁸ per year.
- For semi-automated data collection, the shortest segment length is 0.1 mile (network level). For visual data collection, segments may be of various lengths based on the rater’s subjectivity.
- As its location referencing system, the Department uses control sections which are identified by route number and milepost. Control sections are less than 20 miles long, but may be of various lengths based on traffic characteristics, pavement structure, microclimate, and construction and maintenance history⁹.
- The PMS focuses on levels of expenditure (preventive maintenance, rehabilitation, and reconstruction).
- The pavement preservation program has only very limited integration with the Department’s pavement management system such that when pavements are treated, they do appear in the condition survey. Beyond this approach, no other integration occurs.
- The PMS is entirely focused on network-level analysis and does not do analysis at the project level. Project-level managers will need to do analysis on the various treatments.
- Currently, all new bituminous treatments such as slurry seals are tracked by the materials staff and to a lesser extent by the districts.
- From a statewide perspective, estimated design lives are as follows:

⁷ CHLOE = A profilometer developed by Carey, Huckins, Leathers, and Other Engineers of the AASHO Road Test Staff.

⁸ \$20,000 for rut and IRI data collection; \$500,000 for video log data.

⁹ Control section criteria are contained in “Pavement Condition Survey - 2006 - Statewide”, July 2007, Pages 4 and 5.

- o Reconstruction 20 years
- o Rehabilitation (3R) 10 years
- o Resurfacing (1 ½" HMA thin lifts) 10 years
- o Slurry seals 7 years.
- The Department's pavement preservation program had an indeterminate effect on the pavement condition of the network. Insufficient work has been done to be able to discern a quantifiable improvement.
- District 2 staff told us that although the PMS survey had changed often in the past 10 years, it had not received much use. Today, the PMS is meeting the Department's needs and is being used in the development of the 6-year plan.
- District 2 has not yet determined actual areas to be tracked (measured) for performance.

2. Champion

- District staff told us that they endorse JoAnne Nakamura efforts to advance pavement preservation in Hawaii.
- District staff informed us that the pavement management system is in need of serious alterations lead by a knowledgeable individual.

3. Project Selection

- The Department does not have written program guidelines.
- Hawaii's pavement preservation program is included as a line item in the STIP. However, 1½" HMA projects, some of which are quite large, are programmed individually to avoid excessive draw downs on available pavement preservation funding.
- With the present pavement preservation program in its infancy, the DOT is still educating the districts on the value of preservation. As the program becomes established, staff told us they anticipate that funding will be distributed by some formulation that includes lane-miles.
- District 1 staff told us that project selection is the prerogative of district engineers or their delegated staff, although the pavement experts¹⁰ compete for the work. District engineers make the final decisions.
- District 1 staff told us that pavement preservation treatments are used to improve friction and occasionally, raveling. They have also been used to arrest / retard oxidation.
- District 1 staff told us that there are sketchy guidelines for pavement preservation that do not cover project selection and that additional work is needed on the guidelines. Each district has its own way of selecting projects. Of the \$50M available statewide for Special Maintenance Projects (SMPs), District 1 receives about \$20.8M, although this amount varies and could be as low as \$14.7M. SMP includes resurfacing, culvert repair, retaining walls, etc.

¹⁰ Note: On Oahu, the pavement designers are located at Headquarters, while on the other islands, they are located in the districts.

- District 1 staff told us that pavement preservation projects are generally proactive, although occasionally, DOT administrators require reactive work on pavements that are less suitable for preservation treatments.
- District 1 staff told us that traffic volumes had influenced the selection of certain pavement preservation treatments and that they had been limited to low-volume roads.
- District 1 staff told us that the monetary value of avoided traffic delays associated with reduced work zone requirements for preservation projects is not considered when evaluating the cost effectiveness of pavement preservation treatments, although much of the pavement preservation work is done at night to minimize disruption to traffic.
- District 2 staff told us that as the pavement preservation program is in its infancy, it is inconsequential in influencing project priorities, which depend more on AADT and the condition of pavement markings. If a pavement needs to be re-painted, the District is likely to schedule a pavement preservation project.

4. Performance Monitoring

- Headquarters staff told us that a 20-year pavement design will last between 12 and 15 years.
- District 1 staff told us that a 20-year pavement design will last approximately 12 years.
- District 2 staff told us that, if left unattended, a 20-year pavement design should last approximately 15 to 20 years, but they were unsure of the life expectancy, particularly in view of the substantial increases in Maui's traffic volumes in recent years.

5. Pavement Preservation Assistance

- The FHWA Hawaii Division Office has provided the Department pavement preservation assistance, mainly in the form of research and publications about pavement preservation and management. The Office did not report how much financial assistance for pavement preservation had been made available to the Department.

6. Training

- Engineers need training in available preservation treatments, while planners and budget staff need strategy training. In the districts, designers, maintenance crew supervisors, materials and laboratory staff need training.
- District staff told us that pavement preservation training has rarely been offered. Recent training examples include:
 - General Concepts Course 131054 offered in 2000
 - NHI Course 131115 offered in August 2007
 - Vendor's "Seal Master" Demonstration offered in 2007.
- Some district staff told us that one district employee had attended NHI training in August 2007. Staff felt that they would need more advanced training due to their longer experience with preventive maintenance.

- The Hawaii Asphalt Paving Industry¹¹ (HAPI) plans to present 3 courses, viz., Asphalt 101, Pavement Preservation 101, and Asset Management at its workshop in September, 2008. In addition, HAPI plans to sponsor a joint meeting in October 2008 and has planned 3 or 4 additional meetings and an annual meeting.
- District 1 staff told us that training is needed by inspectors, construction project engineers, and design engineers.
- District 1 staff told us that very little training is done with universities. The University of Hawaii has the state's only engineering school. Hawaii does not require Continuing Education Units (CEUs) or Professional Development Hours (PDHs) to maintain engineering registration.
- The Hawaii Local Technical Assistance Program (LTAP) assists by arranging for trainers to be brought in.
- The Department makes no direct use of Hawaii's Local Technical Assistance Program (LTAP) which is located at the University of Hawaii. The Hawaii Asphalt Paving Association does use the LTAP, although no pavement preservation training is available through LTAP. Hawaii does not have a University Transportation Center (UTC).
- The next step in Hawaii's pavement preservation "learning process" is to understand what distresses are addressed by the various preservation treatments. Although the maintenance approach is to be proactive, a strong training effort will also be critical.

7. Preservation Treatments

- Staff told us that the industry expects a steady stream of work to support its maintenance of a skilled labor force, and appears open to new treatments provided they can be applied profitably.
- District 1 staff told us that they had greater success with crack filling.
- District 1 staff told us that crack filling was less disruptive to traffic, required minimal effort, and generally involved simple projects.
- District 1 staff told us that they had less success with slurry seals.
- When determining when to place a pavement preservation treatment, District 1 staff told us that they consider surface age and compare actual distress with the distresses collected in pavement surveys and stored in the PMS. Designers try to match treatments with maintenance indicators such as oxidation, raveling, etc.
- District 1 staff told us that with present preservation treatments, they do not experience difficulty in obtaining suitable quality materials. However, if new treatments were to be introduced, it may take time to develop new materials sources.
- District 1 staff told us that the HMA company serving Hawaii is Grace Pacific Corporation, and that their position is to stay with hot mix.
- District 1 staff told us that on some islands, the Department has experienced difficulty attracting quality contractors for preservation work as there are no work crews permanently stationed on those islands.

¹¹ Three hot mix companies, viz., Grace Pacific Corporation, James W. Glover, Ltd., and Yamada & Sons, Inc., serve Hawaii.

- District 2 staff told us that they lacked knowledge and had less experience with slurry seal.

8. Program Implementation

- Materials, Testing & Research (MT&R) staff told us that the Department is operating under an ADA consent decree that binds the State of Hawaii and its counties. Under the consent decree, the State has developed an ADA transition plan and established an office to help manage the program.
- Materials, Testing & Research (MT&R) staff told us that since the Department lacks an environmental branch, no criteria for environmental categorical exclusion have been developed. There is also a current understanding that although a State Program exists, pavement preservation projects are exempt from environmental requirements.
- To date, the Planning Branch has only been involved with the STIP process. However, Planning's goal is to provide direction and priorities for programs with limited funding.
- The Department is attempting to integrate pavement preservation into a comprehensive network strategy that includes major rehabilitation and reconstruction projects by increasing the pavement preservation budget each year and using the PMS to help define an appropriate balance between reconstruction and rehabilitation (R & R) expenditures on the one hand, and preventive maintenance (PM) expenditures¹².
- Materials, Testing & Research (MT&R) staff told us that they had developed a slurry seal specification expressly for the pavement preservation program.
- Although a certain amount of pavement preservation treatments could be applied by Department forces, this would be limited and difficult to increase due to maintenance worker classifications and work rules.
- Materials, Testing & Research (MT&R) staff told us that less than 5 percent of pavement preservation treatments is applied by Department forces¹³.
- Materials, Testing & Research (MT&R) staff told us that the Department's pavement preservation program is restricted to the pavement and past projects have focused solely on the actual pavement.
- The Hawaii DOT has a preservation maximum thickness of 1½" and is ahead of other states in this respect.

9. Public / Political Relations

- When a pavement preservation project is undertaken, the Department's Public Affairs Office promotes the value of being proactive.
- In general, the Department's management has a good understanding of pavement preservation.

¹² Hawaii has two principal resource accounts. The first is the Capital Improvement Projects (CIP) account which is used for expansion and reconstruction. The Legislature picks the CIP projects from a list of candidates submitted by the Department. Second is the Operations & Maintenance account which is used for reconstruction, rehabilitation, pavement preservation, and reactive work. The Department receives a budget allocation for O & M projects whose strategy is heavily influenced by Annual Average Daily Traffic (AADT).

¹³ With crack filling by contract costing \$8.00 per lineal foot, the Department is considering buying a kettle and placing crack fill material with in-house forces.

- After the pavement preservation concept is clearly explained, the public appears to be satisfied. There are 32 “Neighborhood Boards” on the island (Oahu) and the Public Affairs Director has given the preservation message to 29 of them.
- When asked working on good roads when roads in poor condition do not receive similar priority, staff told us that they refer the inquiry to the Public Affairs Office which explains to the caller that preservation treatments will prevent his road from resembling the Nimitz Highway (poor, full of potholes).
- Some complaints were received in District 2 about the perceived roughness of the texture of a slurry seal that had been applied. The initial placement had left a coarse texture which later became smoother. The texture appears to have been generally acceptable as no complaint was received from the Mayor of Maui who lives along the road.
- District 2 staff felt that Maui news media would be receptive to bringing the pavement preservation message to the public.

10. Terminology

- Staff on the islands of Hawaii and Kauai do not have a clear understanding of pavement preservation.
- District 2 staff does not have a consistent understanding of pavement preservation terminology. Although some employees have an understanding, most do not.

11. Business Process

- The amounts designated for PE and CE are sufficient to cover these costs and money not used for PE is returned to the districts before the end of each fiscal year to be used for other purposes.
- District 1 staff estimated average PE costs to be between 2% and 3%.
- District 1 staff told us that CE costs are established at 15% plus contingency. These costs are trackable by the districts.
- District 1 staff told us that pavement preservation projects¹⁴ use the same pay items as traditional projects.
- District 1 staff told us that preservation projects are prepared for bidding in the same manner as traditional construction projects. Urban areas need more detail for items such as loop detectors. Traffic control is paid as a lump sum.
- District 1 staff told us that the typical advertising lead time for bidders of pavement preservation projects is 3 weeks. Within the advertising period, a pre-bid meeting is always required for projects estimated to cost more than \$500K. Following each pre-bid meeting, the meeting’s proceedings are issued as an addendum to the solicitation documents.
- Pavement preservation plan documents are subjected to the Department’s normal review process. With the exception of the island of Hawaii (which has its own review process), plans are sent to the Highway Design Section for review.

¹⁴ Occasionally, preventive maintenance projects require change orders, e.g., HMA pay items may be either “Lump Sum” or “Tonnage”.

- While the DOT does not have any pre-qualification requirement, contractors must be licensed to do the work. The issuance of contractor licenses is the responsibility of the Hawaii Department of Commerce and Consumer Affairs.
- Currently, treatment costs for bituminous materials sections are being charged to collected project costs¹⁵. Although project designers are responsible for collecting project costs, they do not specifically collect them by pavement preservation category.
- District 2 staff told us that Maui had only one paving contractor and that the District had not yet started to track pavement preservation treatment costs. Whereas in the past, it relied almost exclusively on resurfacing, the District is now starting to undertake pavement preservation projects.
- Materials, Testing & Research (MT&R) staff told us that the Department was not measuring the “cost-effectiveness” of pavement preservation treatments over multi-year periods.
- Although Life Cycle Cost Analysis (LCCA) is used, it is not necessarily based on real data and there is some disagreement about the objectivity of the data.
- Currently, the data used by the Department to estimate cost-effectiveness are not correlated with pavement condition. Instead, they compare actual expenditures by the districts.

12. Quality Control & Quality Assurance

- Staff told us that the Department assures the placement of a good product by a combination of inspection, equipment checks, and product testing. On pavement preservation projects, inspectors check emulsions and the gradations of aggregates.
- Materials, Testing & Research (MT&R) staff told us that for concrete projects, contractors furnish documentation related to mix design, placement procedures, materials sources, joint plans, and types of saws to be used. For asphalt projects, contractors supply mix designs, and Certificates of Compliance¹⁶ (COCs).
- Materials, Testing & Research (MT&R) staff told us that they insure that materials used on preservation projects meet specifications by requiring contractors to furnish Certificates of Compliance (COCs).

13. Materials

- Most of Hawaii’s aggregate is basalt with some carbonate sands used for mix designs and some corals used for sub-bases. A small amount of granite used in HMA is imported from Canada.
- The Department prefers “basalt”, the local aggregate. The best “most durable” and “most desirable” aggregate is found further down the island chain. Hawaii has the best aggregates, while the Oahu aggregates are good. Staff told us that absorption was the biggest problem with aggregates.
- District 2 staff was unsure whether or not an asphalt stripping problem existed in their district. They stated their intention to launch a probe to determine if a problem existed.

¹⁵ Collected by Joanne only.

¹⁶ COCs are generally not very effective to insure quality.

- Materials, Testing & Research (MT&R) staff told us that the Department did not have any problems with alkali-silica reaction (ASR) or alkali-carbonate reaction (ACR) aggregates.
- The Department has three types of emulsion available:
 - SS-1 Tack coats
 - CSS Tack coats (not being used), and
 - CQS Slurry seals.
- In specifying the residual asphalt percentage in emulsions, the Department follows AASHTO requirements.
- Materials, Testing & Research (MT&R) staff told us that polymers in asphalt binders are used only on special projects such as stone mastic asphalt (SMA). The only performance grade binder available is PG 64-16 (Neat asphalt).
- Materials, Testing & Research (MT&R) staff told us that the CQS was latex-modified, although they were not sure whether the latex was pre- or post-blended.
- Maintenance and construction forces do not routinely use the same materials - maintenance uses only whatever pothole patching material is available (HMA or cold mix).

14. Research and Development

- Each year, the Department issues a call for research projects, in response to which any entity (public agency, county, university, consultant) may submit a project statement. Each submitted statement must have a DOT or county sponsor who undertakes to deliver the implemented research. Although the DOT could possibly perform its own research, it chooses not to due to the type of work required. Most research must be done within the state, although collaborative efforts with other universities or consultants are acceptable.
- Within Hawaii, university research is available at the University of Hawaii, which has the state's only engineering school. A typical overhead rate of 3½% is available for research.