Hawaiian Connections

The Hawai'i Local Technical Assistance Program

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In This Issue

State Department of Transportation Projects Focus on Kauai

By Glenn Okimoto, Director, Hawaii Dept. of Transportation

As part of the Hawaii Department of Transportation's ongoing series of articles on improving the state's infrastructure, we take a look at the island of Kauai. Kauai currently has several active surface transportation initiatives, part of Gov. Neil Abercrombie's New Day Work initiatives. These include design for the widening of Kuhio Highway from the South End of the Kapaa Temporary Bypass to Kuamoo Road; the newly established Kapaa Circulation Study, which will help identify much needed congestion relief projects throughout Kapaa; and the design of the four-lane widening of Kaumualii Highway from Anonui Street to Maluhia Road. In addition several resurfacing project designs are underway; these include Kuhio Highway between Hanamaulu and North Leho Drive, the resurfacing of two miles of Kuhio Highway near Mile Marker 16.9 and numerous smaller preservation and safety improvement projects.

Key projects that are currently under construction include the widening of Kaumualii Highway from the Vicinity of the Lihue Mill Bridge to Anonui Street, the four-lane widening of Kaumualii Highway from the Lihue Mill Bridge to Rice Street, and our newest project which is the reconstruction of Nawiliwili Road from Kaumualii Highway to Kanani Street.

Kaumualii Highway from the Vicinity of Lihue Mill Bridge to Anonui Street began in February 2010. The work is currently winding down and the project is expected to be completed by the end of calendar year 2013. The length of the project is approximately two miles with a total construction cost of about $40 million dollars. The project includes the four-lane widening of the highway and the first usage of full-depth concrete for a highway on the island of Kauai. The new roadway section includes four eleven-foot travel lanes with five-foot wide bicycle lanes in both directions of the highway as well as eight-foot wide sidewalks on both sides of the highway. The new concrete highway

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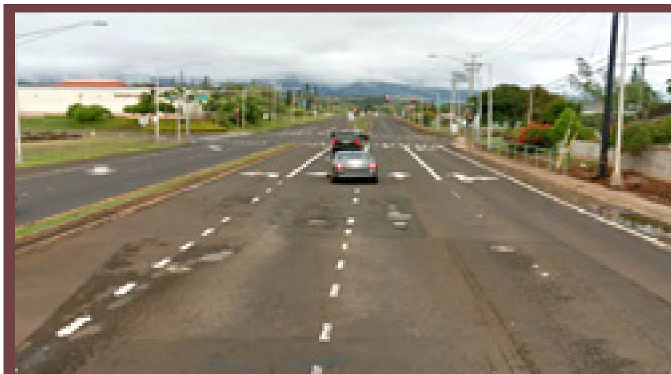
is projected to last at least fifty years without any major reconstruction. The concrete is approximately ten inches thick. The highway project included the reconstruction of several highly congested intersections. Although the new section of highway is just one phase of a larger four lane widening project that will end at Maluhia Road, the public has been complimentary of the fact that traffic is flowing much better through the area. Much of the traffic flow improvements can be attributed to the improved intersections where there are more turn lanes that relieved the traffic back-up at the intersections.

The improved Kaumualii Highway section features eleven-foot travel lanes, five-foot bicycle lanes and eight-foot sidewalks in both directions.

Kaumualii Highway from Lihue Mill Bridge to Rice Street is a design build project. The design build process was selected in order to expedite the construction using Federal Stimulus funds. The project includes the realignment of one county roadway, Hoomana Road, the reconstruction of one historic two lane bridge, and the new construction of a pre-stressed concrete bridge alongside the historic bridge. This project will widen the highway from two to four lanes and it is the next phase of the previous project. The highway will be constructed of concrete, the total cost of the project is approximately forty million dollars and when it is complete, there will be four travel lanes, bicycle lanes, and sidewalks on both sides of the highway. The project is scheduled for completion in March of 2015, however, there is high probability that it will be completed ahead of time.

The Nawiliwili Road reconstruction project is another design build project for Kauai, this is actually our third design build project and we have seen community support for the design build process because it shortens the amount of time from design through construction. The selection of the winning project team has been completed and they should be on board before the end of calendar year 2013 with construction to follow in 2014 and 2015. This project presents multiple challenges for the design build team because the section of highway under construction is in front of the Kauai's only shopping mall. With business down, there are major concerns that a highway project in this area can lead to a loss of business for the already financially strapped stores. There will be need for considerable coordination between the HDOT, the design build team, and the shopping mall. The cost of this approximately one-mile project will be about ten million dollars. The project will reconstruct the current four-lane highway using full depth concrete, it will add sidewalks on both sides of the highway, and it will include bicycle lanes. The anticipated construction time for this project will be approximately 12 months once it is started.



Nawiliwili Road pavement reconstruction, sidewalks and bike lanes will help residents to safely reach Kauai's only major shopping mall.

As you can see, much work in underway and in the near term pipeline for Kauai as we work to improve the state's highway infrastructure. In the next issue of the LTAP newsletter we will highlight our Hawaii Island projects.

News From Our Partners

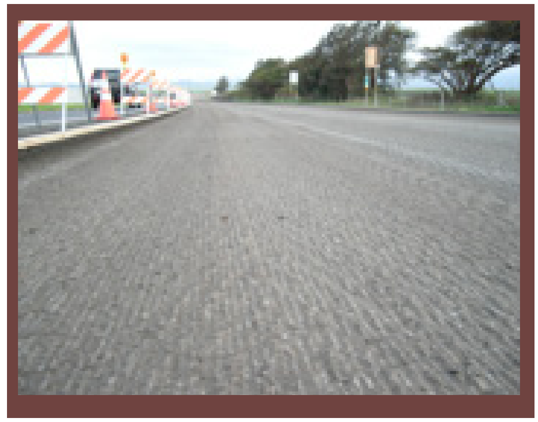
Selection and Use of Bonded Concrete Overlays (Part II)

By Wayne Kawano, CCPI President

Bonded concrete overlays are a cost effective solution to increase the structural capacity of an existing pavement or to eliminate the need for frequent repairs of asphalt pavement. Bonded concrete overlays placed on distressed asphalt pavements have been used successfully on Oahu, Maui, and Kauai with a number of projects planned in the near future. Bonded overlay performance is significantly affected by the design, materials and construction practices (particularly ensuring the bond and proper saw cutting techniques). Attention to detail and realistic specifications are required for acceptable performance and service life.

Surface preparation to achieve adequate bond is one of the most critical and least understood construction factors. When bonding to an existing concrete pavement, surface preparation may utilize shot-blasting, sandblasting or carbide milling. In the case of an existing asphalt pavement, milling is the most widely used technique to achieve an acceptable bond. The goal is to produce a macro and micro rough surface for good mechanical bonding of the layers. Following any of the recommended surface preparation procedures, it is important that dust and loose particles be removed by sweeping or water blasting prior to placement of the concrete. Note that other surface preparation techniques have also been used with success.

Following surface preparation, it is important to keep the pavement clean and free of contamination until the concrete has been placed. Note also that the surface of the existing roadway must not have excess moisture present prior to concrete placement. However, lightly misting the surface with water is sometimes allowed to promote evaporative cooling (during hot weather placement) and to minimize the risk of desiccating the concrete at the interface.



As previously stated, bonded concrete overlays can be placed on existing concrete, asphalt or composite pavements provided there is minimal structural damage. In regards to asphalt and composite pavements, the asphalt layer should not exhibit stripping or raveling or other materials-related issues.

Thin bonded concrete overlays can be placed on existing asphalt pavements with as little as 3 inches of asphalt remaining after the milling operation. The expected life of the overlay is dependent on the stiffness of the asphalt layer, the residual asphalt thickness, the concrete thickness and jointing pattern, concrete properties and numerous other factors.

Key Elements in Bonded Concrete Overlays of Existing Concrete Pavements

•The coefficient of thermal expansion of the overlay should closely match that of the existing concrete. Note that the CTE is most influenced by aggregate type.

Concrete Overlays continued from page 8

•The existing pavement surface must be adequately prepared to enhance bonding to the overlay.

•“Working cracks” in the existing pavement should be repaired (or the overlay should be sawed over the crack) to prevent the crack from reflecting through the overlay.

•Existing joints must be in fair or better condition or repaired.

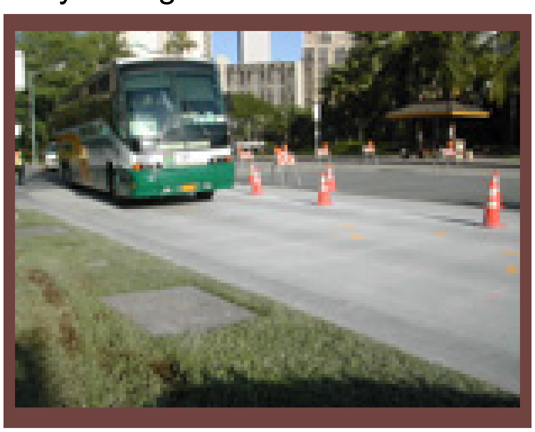
•Thin overlays may reduce the allowable time for saw cutting joints prior to the onset of random cracking.

•Transverse joints in the overlay must be sawed full depth plus ½ in. Longitudinal joints must be sawed at least ½ of the slab depth.

•Joints in the overlay must align with those of existing pavement.

•The width of sawed transverse joints in the overlay must be equal to or greater than the underlying crack width at the bottom of the existing transverse joint.

•Application of curing compound or other curing methods must be timely and thorough, especially at edges.



Key Elements of Bonded Concrete Overlays of Existing Asphalt and Composite Pavements

•Milling of existing asphalt may be required to eliminate surface distortions of 2 in. or more and to provide an adequate mechanical bond.

•Isolated repairs may be required to restore structural integrity.

•Asphalt surface temperature must be maintained below 120ºF when placing overlay.

•Joints in the overlay should be sawed in relatively small, square panels related to the overlay thickness.
•Transverse joints must be sawed 1/3 the slab thickness.

•Joints in the overlay should not be placed in wheel paths, if possible.

•Thinner overlays may shorten the sawing window.

•Application of curing compound or other curing methods must be timely and thorough, especially at the edges.

• Repairs may be necessary in composite pavements if the existing pavement profile indicates isolated areas of vertical distortion in the underlying concrete pavement.

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News From Our Partners

Modern Asphalt Binders

By Jon Young, Executive Director, Hawaii Asphalt Paving Industry

In September of this year, construction will start on what's dubbed the H-1 Rehabilitation Project which includes repaving a 3.5-mile stretch between Ward Avenue and Middle Street. Stone Matrix Asphalt (SMA), a gap-graded hot mix asphalt (HMA), will be a used for the wearing surface. It is designed to maximize deformation (rutting) resistance and durability by using a structural basis of stone-on-stone contact and a modified asphalt binder.

In general, an asphalt binder is modified to achieve the following types of improvements:

•Lower stiffness (or viscosity) at the high temperatures associated with construction, which facilitates pumping of the liquid asphalt binder as well as mixing and compaction of HMA.

•Higher stiffness at high service temperatures, which reduces rutting and shoving.

•Lower stiffness and faster relaxation properties at low service temperatures, which reduces thermal cracking.

•Increased adhesion between the asphalt binder and the aggregate in the presence of moisture, which reduces the likelihood of stripping.

•Extend the pavement's service life.

"The modification of neat (unmodified) asphalt binder to enhance its performance characteristics has occurred in the United States for more than 50 years. In a recent survey of 20 experts representing 18 states, 70 percent responded that there is a definite benefit in using polymer-modified asphalt mixtures to extend the pavement's service life. Nearly 60 percent of those experts also responded that the use of polymer-modified asphalt mixtures significantly reduced maintenance costs, but there has been insufficient performance data to quantify that benefit or enhancement.

The survey also indicated that the primary reason why users choose to use polymer-modified asphalt is to increase the mixture's resistance to rutting. Secondary reasons are to increase resistance to thermal cracking and to increase durability of the mixture.

It is important to note that while some user agencies have indicated a willingness to increase service life or reduce the risk of early distresses through the use of modified asphalt binders (and their higher initial construction costs), not all asphalt pavements need to be constructed using modified asphalt mixtures. Each project should be evaluated to determine if the environmental conditions, traffic loading, expected service life, and performance warrant the use of modified asphalt materials" .1

There are several types of modifiers available such as elastomers, plastomers, crumb rubber, polyphosphoric acid (PPA), fibers, antistrips and extenders.

One of the most widely-used modifiers for asphalt pavement binders, and the one that will be used in Hawaii, is styrene-butadiene-styrene (SBS) polymer, a synthetic rubber granulate which is a thermoplastic elastomer that can be shaped by heat. This polymer technology was developed in the 1970s by Houston-based Kraton Performance Inc. Locally, the polymer and asphalt will be pre-blended at the Asphalt Hawaii Terminal and then transported to the asphalt plant. SBS modified binders for asphalt paving are less brittle in cold temperatures and less soft in hot temperatures than binders that are not modified.

Modified asphalt binder is tentatively scheduled for availability locally from the first half of 2014 for the production of SMA mixes as well as for other types of projects. The Department of Transportation, Airports Division, NAVFAC Hawaii, and U.S. Army Corps of Engineers are already considering modified asphalt binders for airfield pavements. Open-graded mixes, such as open-graded friction course (OGFC) and porous asphalt, which have been produced with neat asphalt binder, would benefit from the use of a modified asphalt binder.

For the right project, improvement to pavements with modified asphalt binders can soon be realized in Hawaii.

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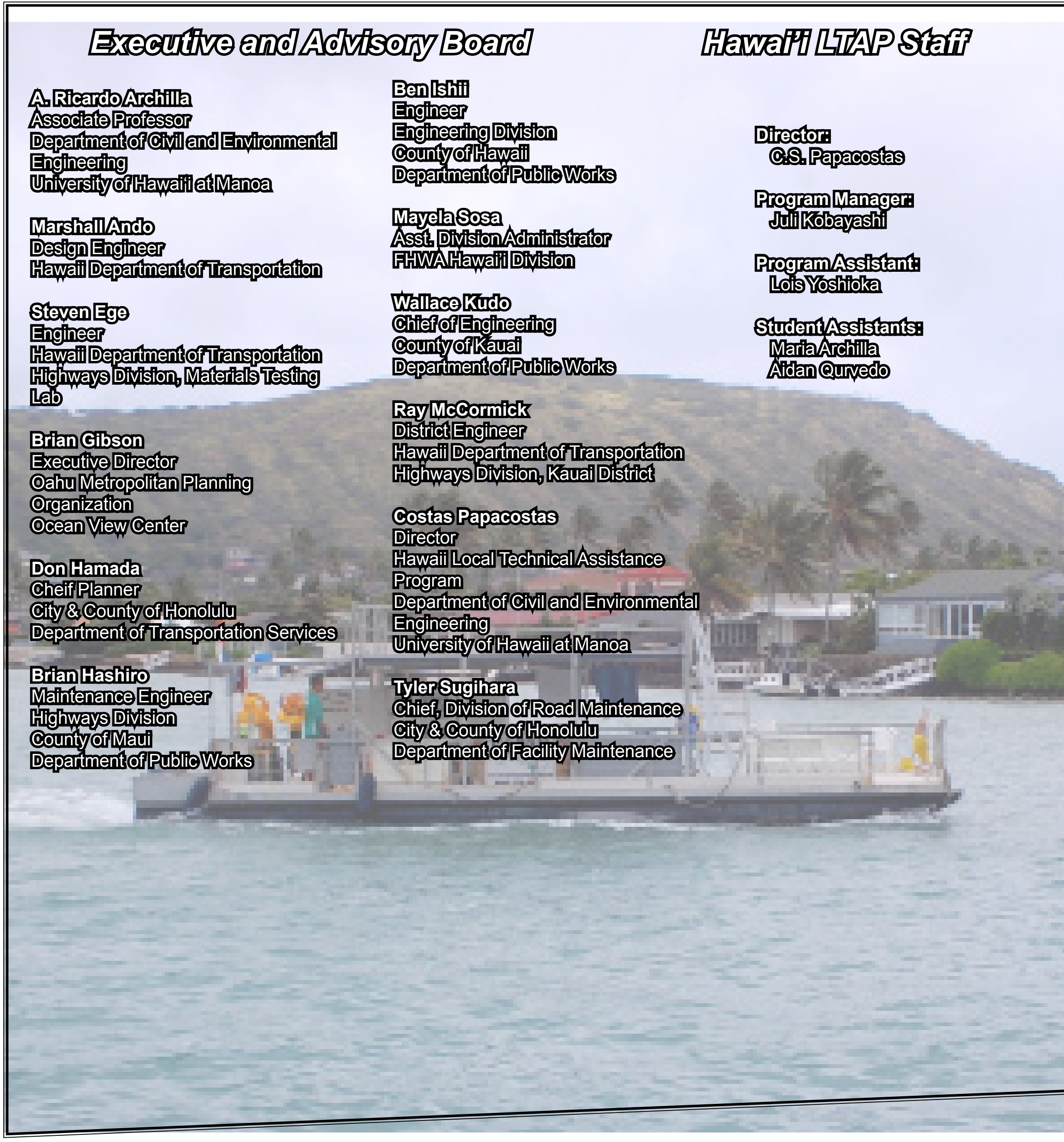

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The Hawai‘i Local Technical Assistance (LTAP) is a cooperative program of the University of Hawai‘i Department of Civil and Environmental Engineering, the Hawai‘i Department of Transportation, Highway Division, State of Hawai‘i and the U.S.. Department of Transportation Federal Highway Administration, Hawai‘i. The LTAP program provides technical assistance and training programs to local transportation related agencies and companies in order to assist these organizations in providing cost-effective improvements for the nation’s highways, roads and bridges. Our office is located at:

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