Hawaiian Connections

The Hawai'i Local Technical Assistance Program

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Repairing Hawaii's Highways: Focus on Maui County

By Glenn Okimoto, Director, Hawaii Dept. of Transportation

Construction on Maui County's state highways, bridges, and slopes totals more than $173 million worth of work this year. That work includes resurfacing, pavement preservation maintenance, emergency slope and shoreline repairs, bridge rehabilitation, and most significantly new highway construction. By far the largest projects responsible for the majority of those funds are the Honoapiilani Highway Realignment, known as the Lahaina Bypass, and the Kahului Airport Access Road. After more than 30 years in the planning stages, construction of the Lahaina Bypass started in 2009 with Phase 1A. This section connects the Keawe Street Extension to Lahainaluna Road, running mauka of the current Honoapiilani Highway in Lahaina, and opened to the public this year, relieving traffic congestion and providing an alternate corridor to drivers for everyday use and providing a much needed second access in times of emergency or natural disaster. The first phase was a $77 million project, funded with 80% federal and 20% state funds, and included the $24 million Kahoma Stream Bridge, considered an engineering marvel. *(See separate article in this newsletter for further information on the Kahoma Stream Bridge)*

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Highway continued from page 1

The work in West Maui continues with the next phase of the project, a $25 million segment known as Phase 1B-1 which extends the completed section at Lahainaluna Road to Hokiokio Place and is anticipated to open this summer. The construction of the Lahaina Bypass could not have been possible without the hard work and dedication of our DOT Highways staff. This project has also had the strong support of the public in the form of the Lahaina Bypass Now coalition, state legislators, the Maui Mayor and county council members.

Another major new highway project set to break ground this year is the Kahului Airport Access Road, Phase 1. This 1.1-mile highway will connect with another upcoming project, the Airports Division-funded Kahului Airport Loop Road. Together, these two projects will offer an alternate route and congestion relief for those traveling to and from Kahului Airport and relieve current traffic on Dairy Road. These projects are anticipated to begin in the fall of 2013 and be completed in late 2014.

Other important work includes $7 million for several emergency hillside stabilization projects along Hana Highway, $7 million in emergency shoreline work along Honoapiilani Highway at Launiupoko, and a $6 million dollar replacement project for the Kawaipuku Bridge on Kamehameha V Highway on Molokai. In the next LTAP newsletter, state DOT will focus on what is happening on Kauai Highways.

Training the Workforce: the NHI Way

By C. S. Papacostas, Hawaii LTAP

The National Highway Institute was established by the U.S. Congress in 1970 as the technical and educational arm of FHWA.

It offers training in a variety of areas in a variety of delivery formats, including Instructor-led training (ILT), Web-conference training (WCT), and Web-based training (WBT). Web-coference training is led by instructors and is presented live at specified times, whereas “web-based” training is self-paced by individual trainees.

NHI courses cover an extensive variety of Program Areas ranging from Highway Safety to Hydraulics to Financial Management. The list, along with sample contents includes:

- Business, Public Administration, and Quality: training on writing skills, the Federal-Aid Highway Program, program financing, contract administration, and public private partnerships;
- Communications: Instructor development training, public speaking, and presentation skills;
- Construction and Maintenance: Value engineering, managing highway contract claims, accelerating innovation implementation, risk management;
- Design and Traffic Operations: Highway capacity and quality of flow, traffic signal design and operation, and freeway management and operations;
- Environment: NEPA and transportation decisionmaking, environmental justice, water quality management of highway runoff;
- Financial Management: Funds management for FHWA employees;

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Workforce continued from page 2

- Freight and Transportation Logistics: Integrating freight in the transportation planning process, linking freight to planning and the environment, principles of effective commercial motor vehicle (CMV) size, and weight enforcement;

- Geotechnical: Geosynthetics engineering, drilled shafts, driven pile foundations, soil slope and embankment design, and construction;

- Highway Safety: Roadside safety design, construction zone safety inspection, road safety audits, low-cost safety improvements;

- Hydraulics: River engineering for highway encroachments, urban drainage design, and stream stability and scour at highway bridges;

- Intelligent Transportation Systems (ITS): How to improve highway safety with intelligent transportation systems and the ITS deployment analysis system;

- Pavement and Materials: Trainings on hot-mix asphalt construction, Asphalt Pavement In-Place Recycling Technologies, Pavement preservation;

- Real Estate: Basic relocation under the Uniform Act, real estate acquisition under the Uniform Act, and local public agency real estate acquisition;

- Structures: Bridge inspection, fracture critical inspection techniques for steel bridges, highway bridge superstructures, and underwater bridge inspection;

- Transportation Performance Management: Definition and basic concepts of performance management;

- Transportation Planning: The FHWA Traffic Monitoring Guide, statewide transportation planning, and traffic monitoring and pavement design programs.

A recent addition to NHI's repertoire are two series of free webinars, covering "NHI Real Solutions" and "NHI Innovations" that are offered at specified times and are posted for later viewing at http://www.nhi.fhwa.dot.gov/about/realsolutions.aspx and http://www.nhi.fhwa.dot.gov/about/innovationseries.aspx, respectively.

"Real Solutions" address items such as Planning for Evacuations, Geosynthetic Reinforced Soil Integrated Bridge System, and Road Safety Audits. The innovations series has addressed topics such as Bridge Preseration, GIS Tools, and Severe Duty Crash Cushions.

For more information about specific offerings, see http://www.nhi.fhwa.dot.gov.

Got a Better Mousetrap?

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Your name and phone number:

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Inventor's name and phone:

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Invention:

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News From Our Partners

Kahoma Stream Bridge Opens to the Public

By Eric Matsumoto, KSF, Inc.

In order to improve the quality of life for the West Maui community, the Hawaii Department of Transportation (HDOT) assessed the input from the public and made the dream of a Lahaina Bypass into reality.

Lahaina Bypass provides an alternate route to Honoapiilani Highway in the vicinity of Lahaina town, alleviates traffic congestion, and improves circulation of vehicles in the area. This new roadway also contains a truly unique structure to traverse Kahoma Stream.

The final design of Kahoma Stream Bridge was selected after considering a myriad of structure types and construction methods. The evaluation process included the desired span length, existing conditions, environmental impacts, material strengths and capabilities, aesthetics and cost. As a result, the community was presented with a curved, 60-foot wide, 360-foot single span, low-profile, inverted tied arch bridge that neither obstructs the scenic view planes nor interferes with the stream environment below.

During the design phase, 30 acres of historical agricultural terraces were discovered on the Kaanapali side of Kahoma Stream. In order to respect this culturally significant site, the roadway was realigned. The bridge, which was previously straight, now required a horizontal curve with a radius of 1,200 feet. This new configuration significantly magnified the complexity of this structure. With the full cooperation and dedication of everyone involved, the bridge re-design expeditiously proceeded. In December of 2010, construction of Kahoma Stream Bridge commenced.

While falsework (temporary platforms that support the bridge components until the structure is self-supporting) was installed, Hawaiian Dredging Construction Company, Inc. (HDCC) proceeded with the fabrication of the precast elements in their base yard near Kahoma Stream. Constructing these components two minutes from the site effectively eliminated transportation requirements of plant cast components and disruption of traffic flow along Honoapiilani Highway. The first of these precast pieces to be installed were rectangular planks that would form the bottom chord of the bridge. These planks also contained ducts that would later encase high strength strands for post-tensioning.

Simultaneously, abutment spread footings and pedestals were constructed. Above the pedestals, friction pendulum bearings were placed. These bearings were installed to allow the bridge to expand, contract, and rotate without imposing significant loads on the structure and foundation.

Kahoma Stream Bridge

On top of the bearings, cast-in-place end blocks were constructed. Due to the size and function of these components, the concrete design and production needed additional consideration. Thus, the concrete mix design addressed heat generation encountered when pouring mass concrete and placement of concrete within the forest of reinforcing steel required to resist all forces. The bottom portion of the end blocks were poured concurrently with the stiffener beams which connect the ends of the planks that form the bottom chord. Above the stiffer beams, cast-in-place

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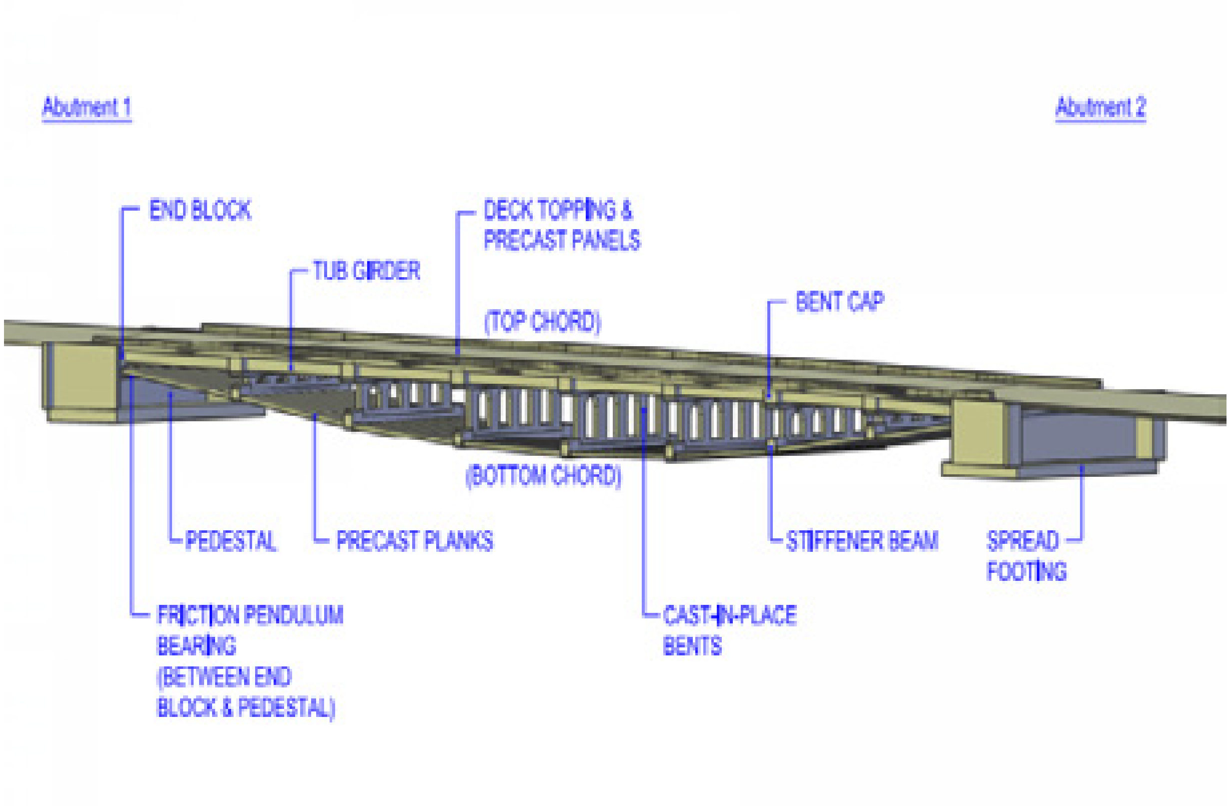

bents that link the top and bottom chords were then built.

Upon completion of the bents, the top chord was constructed. Due to the shape of the structure, the top chord was subjected to tremendous axial forces, bending moments and twisting. Thus, a considerable amount of reinforcing was placed in all top chord components - tub girders, precast concrete panels above the tub girders, deck topping, cast-in-place bent caps that connect the girders, and top portion of the end block. Concrete for these components also required a higher level of attention in the design, handling of materials, and placement. For increased durability in the traveling surface, the deck concrete included fibers to address micro and macro cracking. In addition, admixtures were incorporated to enhance fatigue endurance, minimize bleeding, increase workability for proper placement, and reduce plastic shrinkage.

Once the deck has sufficiently cured, post-tensioning strands were placed in the bottom chord pieces. These high strength strands were stressed to provide compressive and lifting forces. The strands were then anchored at the rear face of the end blocks. At the completion of this stage of construction, the structure was self-supporting.

In retrospect, the collective efforts from HDOT and the HDCC Design-Build team produced the desired outcome. Engineering projects of this magnitude have historically encountered numerous obstacles throughout the construction process. However, issues that arose during the construction of Kahoma Stream Bridge were easily and immediately rectified due to the cooperation of all parties. As a result, in March of 2013, the long-awaited Kahoma Stream Bridge was opened to the public.

Friction Surfaces

By Kelly A. Cruz, Dept. of Transportation Services, C&C of Honolulu

The City and County of Honolulu, Department of Transportation Services (DTS) recently completed their pilot project to install a high friction pavement treatment along Round Top Drive and Tantalus Drive. Due to community concerns regarding drifting, DTS initiated a pilot project to install a product called "Tyre Grip" along four curves of Round Top Drive and four curves along Tantalus Drive.

The winding road is ideal for drifters to slide through the curves at higher speeds. However, these maneuvers also have a potential risk for serious accidents. In addition to the safety concerns, the residents have complained about the noise that these racing motorists create, especially during the late night hours and weekends.

An installed "Tyre Grip"

The total construction costs for this proect, which began in October 2012, was $378,000.00. Integrated Construction Inc. completed the project in January 2013, which included the installation of the coarse pavement treatment, replacing the double yellow center line and the installation of new curve warning signs along the eight curves.

As this was the first installation of this product for the DTS, one unanticipated issue that occurred was an initial "shedding" of the loose aggregate. Although the product was installed in accordance with the manufacturer's application directions, vehicular travel resulted in loose surface aggregate over the next 10-14 days, despite mechanical and manual street sweeping. This shedding may have a negative effect for 2 wheeled vehicles, such as bicycles or motorcycles. After approximately 14 days of sweeping, the shedding appeared to have subsided and no further issues surfaced.

Construction on Tantalus Drive

The DTS will be installing another "Tyre Grip" pavement treatment along the hairpin turn on Komo Mai Drive at the entrance to the Pacific Palisades subdivision. The anticipated construction date for the Komo Mai Drive Tyre Grip installation is June 2014.

Due to the elusive and evasive nature of drifting, we were unable to document empirical evidence that the pavement treatment does in fact reduce drifting. However, if neighborhood complaints about drifting which have subsided are indicative that drifting has stopped then a reasonable conclusion can be drawn that the pavement treatment is working or serving as a deterrent.

News From Our Partners

Selection and Use of Concrete Overlays

By Wayne Kawano, CCPI President

Through the years, CCPI has sponsored Mike Ayers to conduct several workshops and training sessions in Hawaii on concrete pavements and overlays. Here's a brief preview of an upcoming workshop planned for this summer:

Interest in concrete overlays as a cost effective pavement restoration technique has grown significantly in the past decade. Innovations in design, materials and placement techniques, as well as greater focus on economic and environmental impact, has resulted in a wider variety of concrete overlay options.

The initial step in selecting a concrete overlay is to become familiar with the various overlay options and their suitability for different applications. Concrete overlays are categorized as either bonded or unbonded with significant differences in both design and construction. A number of options exist within each of these categories as shown in Figure 1.

Detailed information about these options may be found in the "Guide to Concrete Overlays: Sustainable Solutions for Resurfacing and Rehabilitating Existing Pavements,[i]" (the Guide) which is the source of much of the information in this article.

- Bonded Concrete Overlays - Bonded overlays are generally used for improving the frictional characteristics or ride quality of existing pavements, but may also be used to increase structural capacity. To be a candidate for a bonded concrete overlay, the underlying concrete, asphalt, or composite pavement must be in fair to good condition. The bond between the concrete overlay and the existing pavement is the key element affecting performance. With adequate bond, the overlay and existing pavement become a monolithic structure, particularly in the case of concrete over concrete. Bonded overlays tend to be relatively thin (2 to 5 inches) and can be constructed using conventional placement techniques.

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i Harrington, D., "Guide to Concrete Overlays: Sustainable Solutions for Resurfacing and Rehabilitating Existing Pavements," published by the National Concrete Pavement Technology Center, 2nd Edition, September 2008, Ames, Iowa.

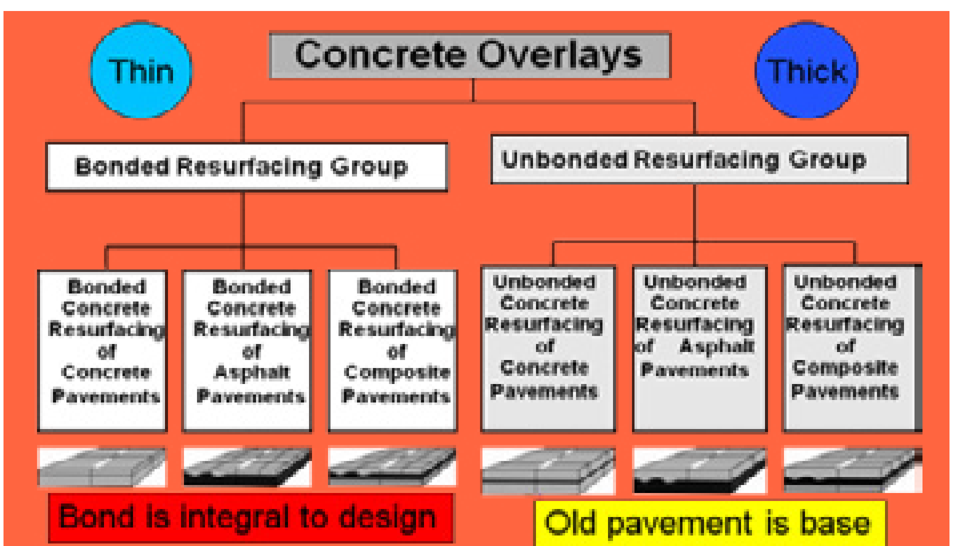

Figure 1. Overlay Categories

Concrete Overlays continued on page 9

Concrete Overlays continued from page 8

- Unbonded Concrete Overlays – Unbonded concrete overlays are essentially new concrete pavements constructed on existing concrete, asphalt or composite pavements. These overlays are designed to remedy both structural and functional deficiencies in the existing pavement and are considered as major rehabilitation. Unlike bonded overlays, the underlying pavement can be in fair to poor condition and the bond between the two layers is not relied on for structural enhancement. Unbonded overlays are typically 6 in. to 11 in. thick and may include a physical separation layer between the existing pavement and the overlay.

Figure 2 illustrates how concrete overlays can be used for pavement preventive maintenance as well as rehabilitation. The expected service life of an overlay will depend on a number of factors, including the overlay structural design, compatibility with expected traffic and other site conditions, and good construction practices. As a general rule, the service life for overlays 2 to 6 in. thick will be 15 to 25 years; for overlays 6 in. or greater, the service life will be 20 to 30 years, or even longer.

Both bonded and unbonded concrete overlays have demonstrated excellent performance when designed and constructed correctly. Emphasis on economic and environmental factors makes concrete overlays a viable option for preventive maintenance strategies through major rehabilitation phases.
For further information, please contact CCPI at wkawano@ccpihawaii.org.

Mahalo!

Michael E. Ayers, Ph.D.
Global Pavement Consultants, Inc.
cmayers@globalpavements.com.

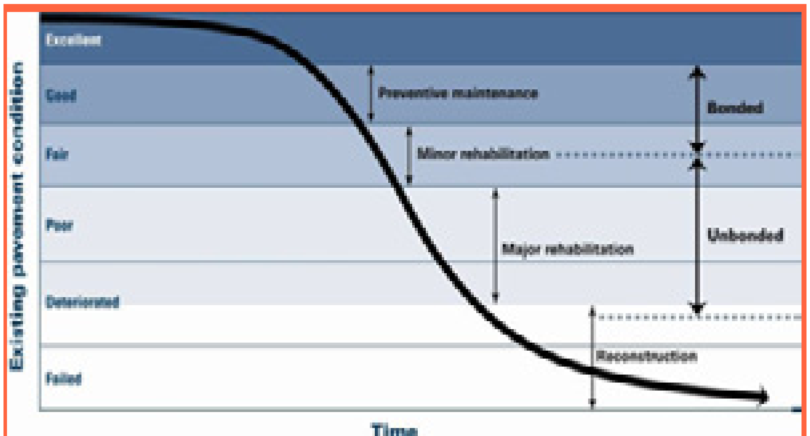

Figure 2. Overlay Types as a Function of the Condition of the Existing Pavement

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Invention:

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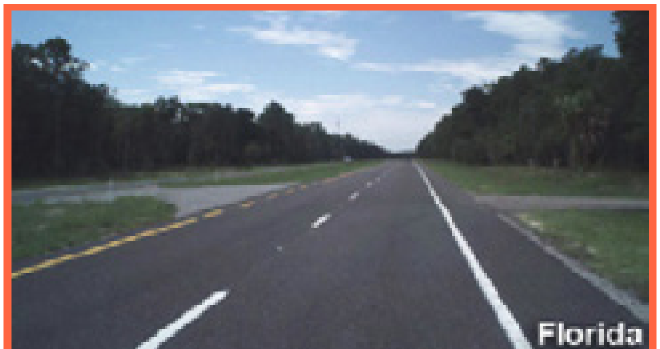
News From Our Partners

Perpetual Pavement

By Jon Young, Executive Director, Hawaii Asphalt Paving Industry

What is a perpetual pavement? In general, a perpetual pavement is designed to make at-depth distress unlikely. Therefore, when distresses do occur, they will initiate at the surface and propagate downward. This pattern of distress can then be corrected by periodic surface maintenance and renewal before it affects the bulk of the pavement structure.



2012 Perpetual Pavement Award given to Florida Department of Trandsportation

Perpetual pavements use multiple layers of durable asphalt to produce a safe, smooth, long-lasting road. The pavement design begins with a strong, yet flexible bottom layer that resists tensile strain caused by traffic, and thus stops cracks from forming in the bottom of the pavement. A strong intermediate layer completes the permanent structural portion, and a final layer of rut-resistant asphalt pavement yields a surface that lasts many years before scheduled restoration.

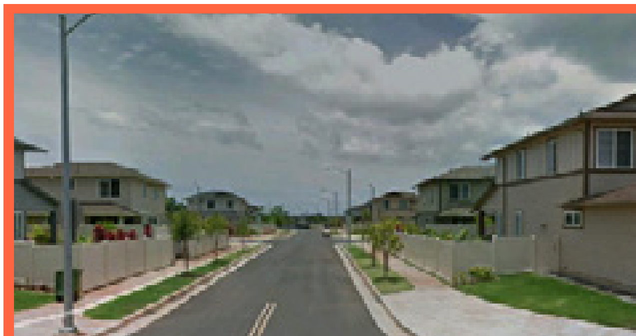
Michael J. Kvach, executive director of the Asphalt Pavement Alliance (APA) says "Asphalt roads can be engineered to last indefinitely with only routine maintenance and periodic surface renewal."

"The advantages of these Perpetual Pavements are significant. Life-cycle costs are lower because deep pavement repairs and reconstruction are avoided. User delays are reduced because minor surface rehabilitation requires shorter work windows and can be accomplished outside of peak traffic hours. And minimal rehabilitation, combined with recycling any materials that are removed from the pavement surface, reduces the amount of material resources required over the pavement's life."

In Hawaii, the City and County of Honolulu's "Structural Design Requirements for New Asphalt Concrete Pavements", which became effective in March 2006, is for long-lasting low-volume pavements. This new standard is getting us closer to the concept of perpetual pavements. Prior to the change, the standard pavement section was a surface wearing course place directly on an aggregated base course. The new standard requires a layer of asphalt treated base between these two layers, making it similar to the pavement structure described above. The aggregate base course is the bottom layer, the asphalt treated base is the intermediate layer, and wearing course is the final layer. In addition to the City's 2006 standard, some of the pavement designs done per the State Department of Transportation design procedure will result in very thick pavements, which are close to those required by perpetual pavements.

On the national level, the APA gives out annual awards to recognize and celebrate perpetual pavements. The award is given to the state transportation department owners of asphalt pavements that are at least 35 years old and have never had a structural failure. The average interval between resurfacing of each winning pavement must be no less than 13 years. The road must demonstrate the characteristics expected from long-life asphalt pavements: excellence in design, quality in construction, and value for the traveling public. Engineers at the National Center for Asphalt Technology (NCAT) evaluated the nominations for the Perpetual Pavement Award and a panel of industry experts validated the winners.

Perhaps one day, Hawaii will have an award winning road.



Road in the Ewa Gentry development per the 2006 City standard

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Department of Civil and Environmental Engineering
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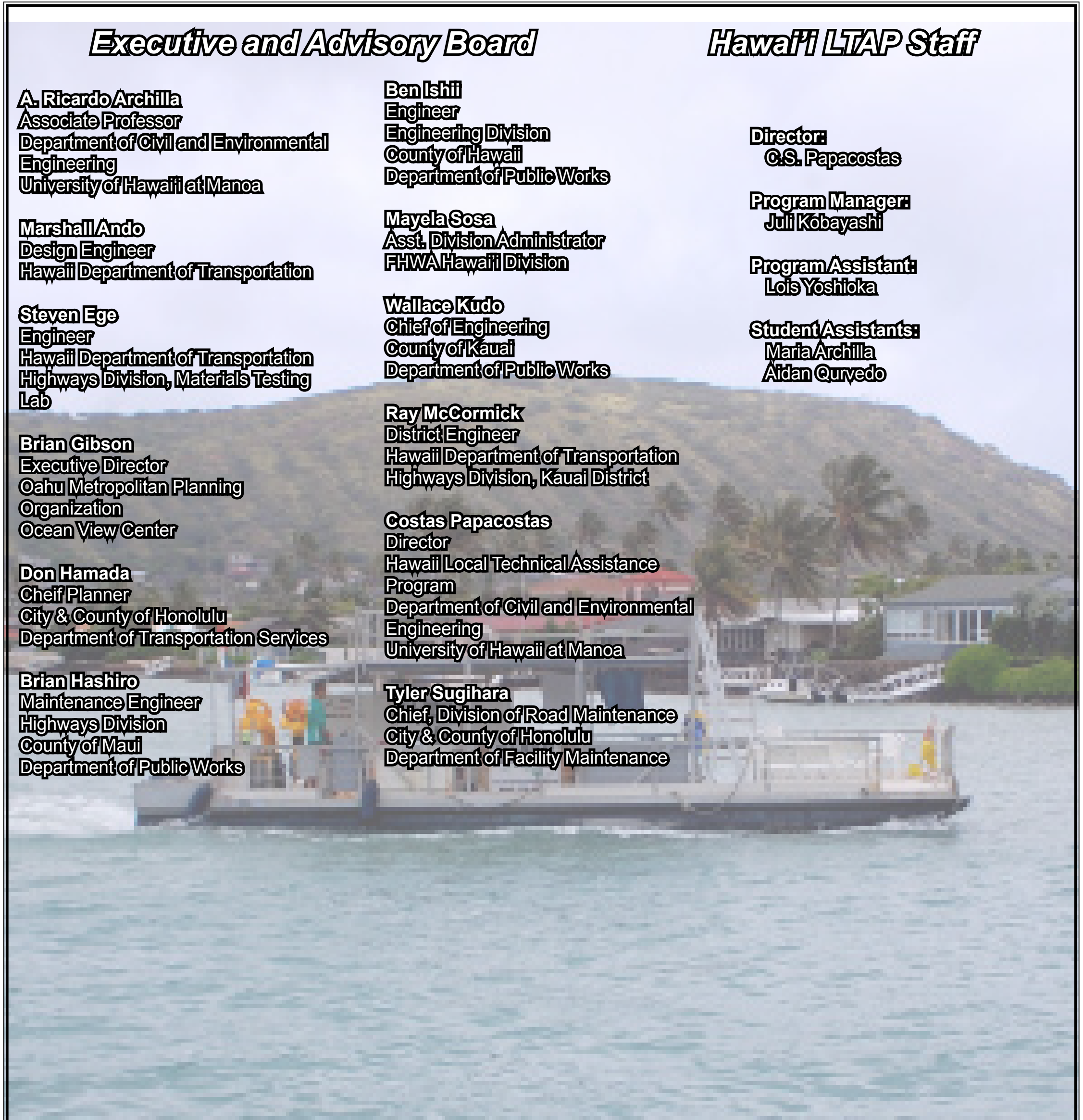

The Hawai‘i Local Technical Assistance (LTAP) is a cooperative program of the University of Hawai‘i Department of Civil and Environmental Engineering, the Hawai‘i Department of Transportation, Highway Division, State of Hawai‘i and the U.S.. Department of Transportation Federal Highway Administration, 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:

Hawai‘i LTAP
Department of Civil and Environmental Engineering
University of Hawai‘i at Manoa
2540 Dole Street - Holmes Hall 383
Honolulu, Hawai‘i 96822

Please contact:
C.S. Papacostas, Director
Tel: (808) 956-6538
Fax: (808) 956-5014
E-mail: csp@hawaii.edu
or
Juli Kobayashi, Program Manager
Tel: (808) 956-9006
Fax: (808) 956-8851
E-mail: juli@hawaii.edu

Website:
http://hltap.eng.hawaii.edu/