HAWAIIAN CONNECTIONS

NEWSLETTER OF THE HAWAII LOCAL TECHNICAL ASSISTANCE PROGRAM

VOLUME 2, NO 2 SUMMER 2000

IN THIS ISSUE

Please pass this on to other interested parties in your office.

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MUTCD MILLENNIUM EDITION

Prepared by Linda L. Brown, Federal Highway Administration

The Federal Highway Administration, Office of Transportation Operations is in the process of a major rewrite of the Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD contains the criteria used by traffic engineers and transportation officials to communicate safe driving messages to the roadway users. This manual contains the standards and guidance for the design and use of signs, pavement markings, traffic signals, and other traffic control devices. The last time that the MUTCD was rewritten in its entirety has been over 20 years ago. Innovative technology, roadway developments, new traffic control device applications, and complicated technical text has made it necessary to reexamine the information in the current 1988 edition of the MUTCD. A major rewrite and reformat effort of this manual has been underway since 1995 to incorporate technology advances in traffic control device application and to improve the overall organization and discussion of the contents in the MUTCD to make it clearer and more user friendly.

The MUTCD is incorporated by reference in 23 CFR part 655 and all changes to the MUTCD must be made through the Federal Register rulemaking process. This process allows all interested persons to provide comments on the proposed changes. The FHWA has published Federal Register notices of proposed amendments for all of the following

Parts of the MUTCD:

- Part 1 - General Provisions
- Part 2 - Signs
- Part 3 - Markings
- Part 4 - Signals
- Part 5 - Traffic Control Devices for Low Volume Rural Roads (New)
- Part 6 - Traffic Control for Construction and Maintenance
- Part 7 - Traffic Control in School Areas
- Part 8 - Traffic Control at Highway-Rail Grade Crossings
- Part 9 - Traffic Control for Bicycle Facilities
- Part 10 - Traffic Control for Light-Rail Transit (New)

FHWA has also published a notice of proposed update information for Parts 1, 3, 4, and 8. Public comments for all parts of the MUTCD must be received by June 2000 at which time FHWA will review and summarize the comments and prepare a Final Rule position which will be published in the Federal Register in December 2000.

The FHWA realizes the critical role public awareness and education play when introducing new or revised products to our customers and partners. We also realized that the new policies and technologies that we implement will have a strong impact on our citizens and industries well into the 21st century. The FHWA goal is to expand our traditional network and audience to include others such as motor vehicle departments, driver's education classes, law enforcement personnel, travel and tourist agencies, community civic leaders, and emergency response providers.

In an effort to create more public awareness of the MUTCD, the FHWA is publishing the Millennium MUTCD in several media formats: traditional hard copy, CD-ROM and Internet. The Federal Register notices and the proposed text are available at the following Internet locations: The Federal Register home page is http://www.nara.gov/fedreg and the MUTCD home page is http://mutcd.fhwa.dot.gov.

Kamehameha Highway Open to the Public, Page 4.

Walter Lum's Rules of Thumb

Editor's Note: Walter Lum, consulting engineer, through many years of experience has developed quick and easy ways to solve complex problems. He has shared his rules of thumb with us. In this issue, we feature the second part of storm drainage design. The first part covered the critical slope and various uses of the orifice formula. Here, Walter Lum discusses how the weir formula can be used as a benchmark to guide engineering judgement.

Some Benchmarks For Storm Drainage Design

(Part II of II)

Culvert with Little Headroom

Box culverts are often used when there is little headroom above the top of the culvert. As with pipe culverts, rounding the inlet can improve the capacity and the efficiency of the entrance. What happens when there is a lot of grass and tree limbs in the storm flow?

Remember a culvert is nothing but a glorified weir or orifice. For culverts with little headroom, the weir formula could be used as a benchmark for judging the adequacy of the size of the culvert for dirty water flows.

Openings under Bridges

Bridges are often constructed over open storm or flood control channels. These channels have been known to overtop when a fallen tree trapped by a bridge clocks the storm flow. It is not very often that flood channels under a bridge are designed to accommodate fallen trees. Then how big should a reasonable channel be under a bridge?

The simple weir formula could be benchmark as a guide for sizing the opening under a bridge to allow for grass, tree limbs and boulders.

Turbulence at Channel Intersections

Most often lateral or secondary channels discharge into a major storm channel. At the intersection of these channels, the flow can be quite turbulent causing a rise in the water level of the main channel.

How much freeboard should be allowed for such turbulence?

The simple weir formula could be used as a benchmark or guide to assess whether or not the design freeboard is sufficient.

Weir Formula: $Q = 3LH^{3/2}$

Where,

Q = downstream flow, cu. ft. per sec.
L = length of weir, ft.
H = height of water surface, ft.

***Correction**: The heading of the last part in the Spring issue should have been "**Overflowing Catch-basins, Submerged Pipes**."*

ITE WASHINGTON WEEKLY

ROUNDABOUTS:
AN INFORMATIONAL GUIDE IS NOW AVAILABLE

A comprehensive informational guide for round abouts that was announced by the Federal Highway Administration earlier this year is now available. The report, "Roundabouts: An Informational Guide," covers all aspects of the practice from planning to landscaping. Copies of the report are now available at

http://www.tfhrc.gov/safety/00068.pdf.

Smooth and Quality Asphalt Concrete Pavement

By Garret Okada, Hawaii DOT

A National Quality Initiative survey indicated that pavement smoothness is the most significant aspect of how the motorist judge the quality of our highways. Pavement smoothness directly relates to driver comfort as well as pavement life expectancy. Driving on a smooth road is more economical for the motorist in fuel and vehicle maintenance expense. Longer pavement life will result in decreased road repairs and in less traffic disruptions for Hawaii motorists.

The Hawaii Department of Transportation (HDOT) in partnership with our local industries, counties and Federal Highways Administration (FHWA) is committed to improving the smoothness and quality of asphalt pavements in our highway system.

To promote smoother pavements, workshops on "Smooth and Quality Asphalt Concrete Pavements" were held in November of 1998 and May 1999. (A workshop video and publications are available at Hawaii LTAP, call 808-956-9006). Participants included members from the state, counties, paving contractors, suppliers and private consultants. Discussion highlighted principles of laying a smooth pavement. These principles are:

1. Do not let the truck bump the paver.
2. Keep a constant head of hot mix material in front of the screed.
3. Do not stop the paver.
4. The hot mix material should be uniform without segregation.
5. Construct traverse joints properly.

To improve the ride quality of our highways, the Materials Testing and Research Branch with assistance from FHWA, developed a ride quality specification with incentives and disincentives.

The Whitmore Avenue resurfacing project was chosen as a pilot project for the new ride quality in the specifications. This project was awarded to Hawaiian Bitumuls & Paving Company (HB). Paving was completed in June 1999 with very good results. The Contractor received an incentive payment of $4,767.

Presently several asphalt concrete paving projects include ride quality in the contract specifications. The contractor has an opportunity to receive an incentive when the roughness is less than the minimum roughness allowed or pay a disincentive when the roughness of the pavement exceeds the maximum roughness specified. Projects awarded with the ride quality requirement are:

- **H-1 Resurfacing**, Punchbowl to Kapiolani Interchange (HB)
- **H-1 Resurfacing**, Kunia Interchange to Waikele Stream Bridge (Grace Pacific)
- **H-3 Resurfacing**, Halekou Interchange to Kaneohe Marine Corps Base (HB)
- **Kalanianaole Highway Resurfacing**, Ainakoa Avenue to West Hind Drive (Grace Pacific)

The current specification requires the contractors to use a material transfer vehicle (MTV) during paving. This allows for nonstop paving and eliminates contact between the trucks and paver. The MTV will remix the asphalt concrete to assure a uniformly consistent mix behind the paver and minimize material and temperature segregation. The MTV will perform a key role in producing a long-lasting smooth pavement with consistent density.

To measure roughness of the pavement surface, the contractors are using a lightweight profiler. The vehicle is similar to a golf cart and is equipped to measure the profile of the pavement surface. The data collected is used to calculate a profile index to rate the surface roughness.

Smoother pavements result in benefits and cost savings to both users and taxpayers.

Enjoy the Ride.

This vehicle is used to measure the smoothness of the pavement surface.

HDOT's Quick Response to the Waimea Bay Landslide

By Abraham Wong, Hawaii Division Administration, FHWA

I always tried to turn every disaster into an opportunity. John D. Rockefeller (1839-1937)

The FHWA, compliments the Hawaii Department of Transportation (HDOT), Highways Division for turning the rockfall incident at Waimea Bay into an opportunity to demonstrate the teamwork, ingenuity, creativity, and engineering skills of the division.

On March 6, 2000, approximately 20 cubic yards of boulders fell from the nearly vertical cliffs above Kamehameha Highway to the road below. The HDOT immediately pulled together a team of engineers to address the incident. Only 96 days later, on June 10, Kamehameha Highway was reopened to the public.

This project had many constraints to comply with, hurdles to jump, and obstacles to overcome.

Immediately following the closure of the road, the HDOT had to address the need for residents to travel between Pupukea and Haleiwa. Due to the possibility of more boulders falling, the HDOT felt it was too hazardous to allow the public to travel under the cliff. This closure left residents with three alternatives:

1) Drive 1 1/2-hours through central Oahu
2) Park and walk the 1/4-mile stretch of beach
3) Stay at home

The HDOT constructed a bypass road on a sandy beach using materials that were environmentally friendly, fast to install, and easy to remove. After much discussion, the bypass road was constructed using two lifts of geoweb fabric, ordinary geotextile fabric, and a base course-wearing surface made of coral rock. Water-filled barriers were placed on each side and a line of gabion baskets and reno mats were placed on the makai-side (ocean side) to protect the road from high surf. The bypass road was nicknamed the Menehune Bypass Road, after the mythological Hawaiian elves who worked at night building roads.

Temporary bypass road open.

Temporary walkway for pedestrians.

The next issue was to design the permanent road to prevent future boulders from falling into the travelway. The main constraint during design was the requirement to minimize impacts to the environmental resources. As shown in the picture, there are archaeological features, a river that empties into a tidal estuary with endangered birds, a pristine beach, a popular visitor park, underground waterlines, and overhead utility lines that surround the road. Early coordination with the agencies having jurisdiction over these resources was essential to the timely completion of the project.

Aerial photo of Waimea Bay. Foreground shows the Menehune Bypass Road.

After careful consideration of the resource agencies' concerns, environmental impacts, and cost, the alternative to construct the Mechanically Stabilized Earth Wall (MSEW) system was chosen to be the most feasible and prudent. The alternative consisted of shifting the highway 20-30 feet away from the cliff face with a MSEW system and constructing a 20-foot-wide fenced and catchment ditch. Although this alternative required some fill of the tidal estuary, it avoided the known burial sites in the cliff face.

Goodfellow Brothers, Inc., was selected as the low bidder with a bid of $7.4 Million. Once they were given Notice To Proceed on April 11, the clock on the 60-calendar-day contract started ticking. The Contractor and the HDOT construction staff worked 24 hours-a-day, opening the road to the public on the 59th day of the contract. The road is now open to vehicles, pedestrians, and bicyclists; final touches are being placed on the wall and roadway; and the Menehune Bypass Road will be removed and the beach restored to its original condition.

Congratulations to the HDOT Highways Construction staff and Goodfellow Brothers, Inc. for meeting a schedule that at times seemed impossible - especially to the dedicated and hard-working engineers and inspectors who spent many long hours working on this project. This project was a success because of the cooperation by all of the resource agencies, utility companies, design consultants, archaeologist, cultural monitors, and contractors.

When there is a will, there is a way.

The project schedule and a list of participating entities are shown on the next page.

Closer view of Waimea Bay and the Menehune Bypass Road.

Waimea Bay Landslide *(Continued)*

Project Schedule:

March 6	Rockfall at Waimea Bay
March 9	Governor's Proclamation
March 10	Notice To Proceed (NTP) Issued to Kiewit Pacific to Construct Menehune Bypass Road
March 18	Menehune Bypass Road Open
March 22	NTP Issued to Earth Tech, Inc. and HDOT to Start Design
March 28	Approval of Federal-aid Highway Emergency Relief Funds
April 4	Advertise for Bids
April 11	Notice to Proceed Issued to Goodfellow Brothers, Inc.
June 10	Kamehameha Highway Open

Special thanks to all the agencies that had a part in this project:

- State Historic Preservation Office
- Army Corps of Engineers
- Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Coastal Zone Management
- Department of Health
- National Marine Fisheries Service
- Office of Hawaiian Affairs
- Advisory Council on Historic Preservation
- Department of Land and Natural Resources
- Burials Program
- City and County of Honolulu
- Hawaiian Electric Company
- GTE Hawaiian Tel
- Oceanic Cable
- Oahu Metropolitan Planning Organization
- Board of Water Supply
- Cultural Monitor
- Pacific Legacy
- Waimea Falls Park
- Goodfellow Brothers, Inc.
- Earth Tech, Inc.
- Kiewit Pacific

Kamehameha Highway opened to the public after 59 calendar days of the contract. Congratulations!!!

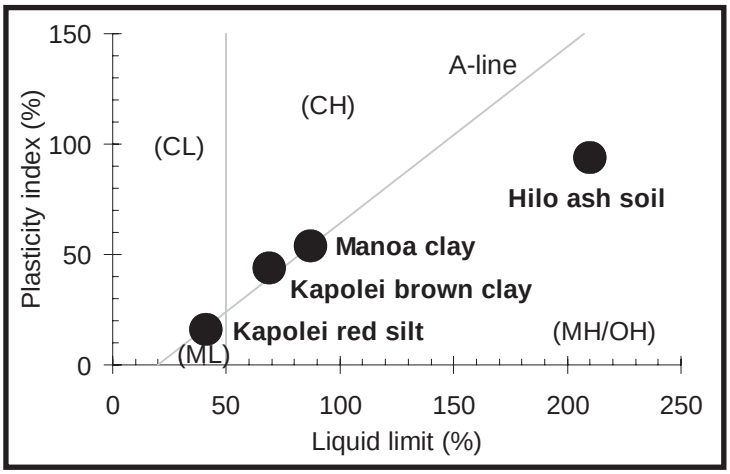
HAWAII DOT RESEARCH REPORT

Creep Characteristics of Tropical Soils

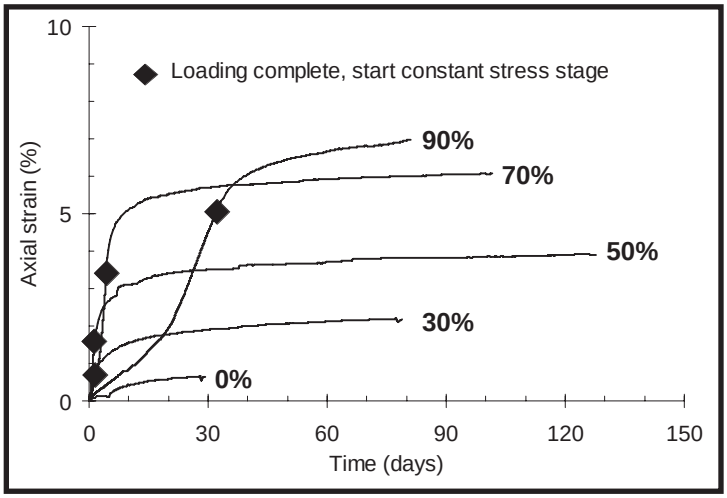
By Horst Brandes, University of Hawaii

The purpose of this study is to evaluate the creep potential of Hawaiian tropical soils. Creep is an inherent visco-plastic property common to many natural and synthetic materials. It is of particular concern in fine-grained soils such as clays and silts, which may undergo significant shear and volume deformations over time. It may also result in changes in strength, compressibility, and other electro-chemical soil properties. Creep is due to changes that occur in inter-particle forces and results from the slow but continuous rearrangement of the soil microstructure.

Plasticity Characteristics



Triaxial Drained Creep Tests - Manoa Clay



Associated time-dependent variations in strength and compressibility are just as critical to long term performance. Creep is of concern in natural and constructed slopes. It may also lead to undesirable settlement of foundations and earth structures. For example, the flanks of many of the valleys that cut into East Honolulu, such as Manoa and Aina Haina, are undergoing continuous creep deformations due to the presence of a colluvium stratum rich in smectite and other creep-susceptible clay minerals. In Honolulu alone, the damage to public and private property has reached into the tens of millions of dollars.

Laboratory testing to evaluate creep and other time-dependent effects is complex, time-consuming, expensive, and is typically not done routinely. One objective of this study is to develop correlations between soil properties obtained from simple index tests and creep susceptibility measures obtained from detailed laboratory tests. In particular, correlations are sought with standard Atterberg limits. These limits reflect the plastic nature of the fine fraction and are widely used for soil classification and other purposes. Four soils have been selected for initial study, all having distinctly different Atterberg limits as shown. These materials were prepared for strength and creep testing following consistent set up procedures to yield results that are comparable among all soil types. The strength tests are needed to determine appropriate stress levels for the creep tests. All testing is being conducted on triaxial specimens with back-pressure. Measurements include axial and volumetric deformations, vertical and lateral pressures, and pore pressures where appropriate. Strength is determined before and after each creep test. Creep testing involves a series of tests on each soil type at various deviateric stresses ranging from 0% to 90% of the estimated strength.

Preliminary results are shown for the Manoa clay in the bottom figure. They indicate, as expected, that creep increases with deviatoric stress intensity. As of this date creep tests have only been conducted on the Manoa clay and the Kapolei red silt. It appears that the finer-grained Manoa clay is more creep-susceptible due to its higher Atterberg limits. Also, the Manoa clay undergoes significant strength gain with time. The testing of all soils is expected to be completed in January 2001.

The National Scenic Byways Program

By Jonathan Young, Federal Highway Administration

The National Scenic Byways program was created by ISTEA in 1991 as a purely voluntary program. $50 Million of funding with a federal share of 80% was available during ISTEA to the States for eligible work that included the planning, design, and development of State scenic byway programs. The Hawaii DOT received a $200,000 grant in FY 1996 for the purpose of developing its program; work is still ongoing. TEA-21 increased the nationwide funding to about $25 Million annually through 2003. To date approximately $139 Million has been made available to the States through grants. Eligible work includes:

1. Planning, design, and development of State scenic byway programs;
2. Development and implementation of corridor management plans;
3. Safety improvements to a state scenic byway, National Scenic Byway or All-American Road because of increased traffic due to designation;
4. Construction of byway facilities (pedestrians and bicyclists, rest areas, turnouts and overlooks, highway shoulder improvements, passing lanes and interpretive facilities);
5. Improvements to enhance recreation area access from byways;
6. Protecting historical, archeological and cultural resources adjacent to byways;
7. Developing and providing tourism information to the public about byways;
8. Developing and implementing scenic byway marketing plans.

The State cannot apply for grant funds to make improvements on specific routes until the State's program is developed, and State scenic byways are designated through that program.

Besides providing grants, a major feature of the program is to recognize those roads that are outstanding examples of scenic, historic, recreational, cultural, archeological, and/or natural intrinsic qualities by designating them as either National Scenic Byways or All-American Roads. With the designations made on June 15, 2000, there are now 18 All-American Roads and 66 National Scenic Byways. The complete list of these designation, as well as state designated scenic byways, and much valuable information on the program are available at the National Scenic Byways Online web site, *http://www.byways.org/.*

Anyone may nominate a road but the nomination must be submitted through a State. In Hawaii, the nomination must be submitted through the Hawaii Department of Transportation, which then files the nomination with the Federal Highway Administration. It is important to note that nominations must meet rigorous requirements, a key one being that a corridor management plan must accompany the nomination. A corridor management plan details strategies to preserve the intrinsic qualities of the nominated route. Information on nomination procedures are also included in the National Scenic Byways Online web site.

The FHWA Hawaii Division contact for this program is Mr. Jonathan Young, 541-2700, extension 325. The Hawaii DOT contact is Mr. Russell Iwasa, 587-1833.

Vista House at Crown Point is one of the most photographed spots along the Historic Columbia River Highway, an All-American Road.

Director's Note

by C.S. Papacostas

As you may recall, last year we executed a partnering agreement with the Hawaii Section of the Institute of Transportation Engineers, pledging to pool our resources to bring to you up-to-date training and continuing education offerings.

The first joint activity took place in April. With the help of ITE, we organized a most successful workshop entitled "Intelligent Transportation Systems (ITS) Software Acquisition."

The workshop covered the difference between software and other types of acquisitions, developing requirements and technical specifications, intellectual property rights and much more.

At the end of July, we plan to attend the Annual Meeting of the National LTAP in Boise, Idaho. We look forward to exchanging notes with our mainland counterparts and coming back with fresh ideas about how to serve you better.

Finally, our new initiative is to prepare a resource guide listing people in Hawaii who have special expertise in one or more aspects of transportation, including planning, design, construction, operation and maintenance. We plan to consult the list when looking for instructors and facilitators for future workshops. Please let us know if you are interested in this endeavor.

Program Manager's Note

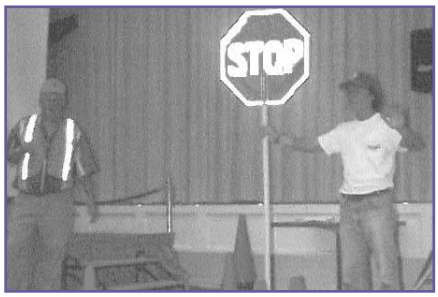
by Juli Kobayashi

In May, I had the wonderful opportunity to attend the LTAP Region 9 & 10 Meeting in Portland, Oregon. LTAP centers from Washington, Idaho, Oregon, Nevada, California, the Northwest Tribal Territory and Arizona were there to share information about their programs. They discussed how they were structured and organized. They also shared success stories and gave me a good insight as to how we can better serve you.

When I returned, we were invited to participate in the 27th Annual Public Works conference in Hilo. We were able to share with the participants who the Hawaii LTAP is and how we can assist in sharing transportation technology. We were happy to see all the great people that are involved in public works.

June was Work Zone Safety Awareness month in Hawaii. The Hawaii LTAP took the lead in training the supervisors and workers in the field how to better manage the installation, maintenance, and monitoring of traffic control devices in the work zone. Gene Wilson, from the Wyoming Technology Transfer Program was the excellent instructor who shared his invaluable knowledge to over 500 participants throughout the four counties. As much construction as there is out there this summer, we all need to "drive akamai"...especially through these work zones.

ITS Software Acquistion



Work Zone Safety Session

STAFF

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Graduate Assistants:
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Rhen Yamamoto
Lynne Yasui

Hawaii LTAP Transportation Library

The Hawaii Local Technical Assistance Program Library is located in Holmes 207A at the University of Hawaii. The library houses many transportation-related technical reference materials. Informational and workshop videos may also be found in the library. Reference materials and videos are available to the public and may be borrowed or copied.

Database of all materials may be found on the web at:

Videos –

www.eng.hawaii.edu/~hltap/video.html

Publications –

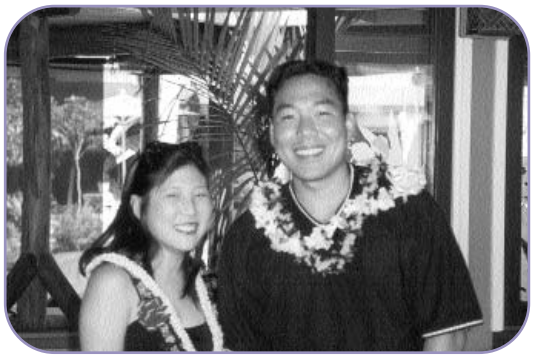
www.eng.hawaii.edu/~tlib

For more information, please contact Juli Kobayashi at 956-9006.

Staff News

The Hawaii LTAP would like to congratulate two staff members who graduated in Civil Engineering during the Spring semester; **Reid Ikemori** and **Joni Tanimoto**. We also welcome to the Hawaii LTAP team student summer assistant, **Lynne Yasui**.

As a sophomore at Washington State University, Lynne Yasui is majoring in Political Science. She is currently taking summer courses at the University of Hawaii. During her spare time, Lynne enjoys going out with her friends, shopping and soaking in the sun.



Thank you Joni and Reid for your wonderful work here at Hawaii LTAP.

Hawaii LTAP Staff

We finally got a group picture

We Need Your Feedback

Member Info...

Would you like to remain on our LTAP mailing list? Yes ___ No ___
Would you like to receive LTAP workshop notices? Yes ___ No ___
Would you like to receive our quarterly LTAP newsletter? Yes ___ No ___

If you are not on our mailing list, please fill out the form below.

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Free Publications

1. FHWA-IF-00-011 : Insights into Pavement Preservation

2. FHWA-RD-99-138: An Introduction to the Deep Soil Mixing Methods as Used in Geotechnicals Applications

3. FHWA-RD-98-167: Fast-Track Paving: Concrete Temperature Control and Traffic Opening Criteria for Bonded Concrete Overlays, Volume I: Final Report

4. FHWA-RD-98-168: Fast-Track Paving: Concrete Temperature Control and Traffic Opening Criteria for Bonded Concrete Overlays, Volume II: HIPERPAV User's Manual

5. FHWA-RD-99-200: Fast-Track Paving: Concrete Temperature Control and Traffic Opening Criteria for Bonded Concrete Overlays, Volume III: Addendum to the HIPERPAV User's Manual

6. HWY-L-UH-98-05: Reducing Soil Erodibility and Runoff by use of Polyacrylamides on Hawaii Soils

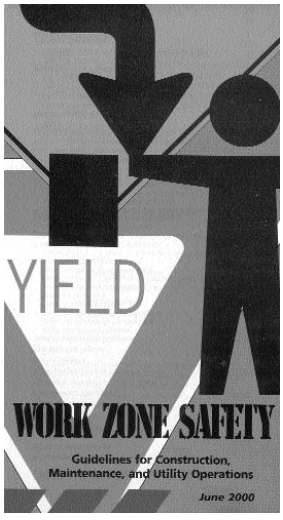
For free copies (while supplies last) please call (808) 956-9006.

Work Zone Safety Guide Available

In cooperation with HDOT, FHWA and UH/Manoa, we have produced a pocket guide entitled "Work Zone Safety: Guidelines for Construction, Maintenance, and Utility Operations."

This durable handbook covers the basics of Part VI of the Manual on Uniform Traffic Control Devices (MUTCD).

Please contact us for copies while supplies last.



HAWAII LOCAL TECHNICAL ASSISTANCE PROGRAM

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Advisory Committee

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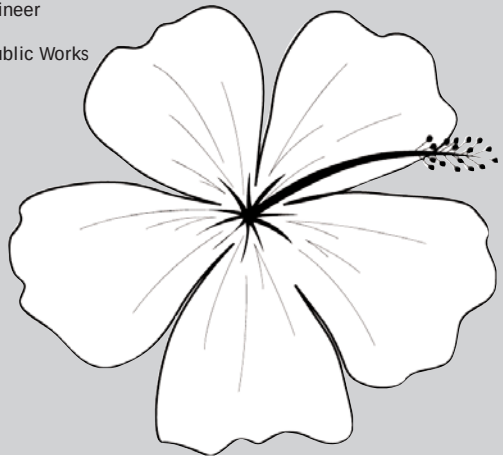
Program Manager:
Juli Kobayashi

Graduate Assistants:
Matt Nakamoto Reid Ikemori

Student Assistants:
Matthew Alonzo Rhen Yamamoto
Lynne Yasui



Hawaii LTAP is a cooperative program of the Department of Civil Engineering, University of Hawaii, the Hawaii Department of Transportation, Highway Division, State of Hawaii and the U.S. Department of Transportation Federal Highway Administration, Hawaii. The LTAP program is to provide 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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