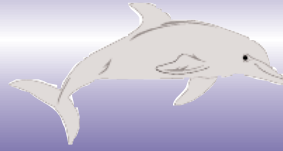


# HAWAIIAN CONNECTIONS



NEWSLETTER OF THE HAWAII LOCAL TECHNICAL ASSISTANCE PROGRAM

VOLUME 2, No 1

SPRING 2000

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

## Work Zone Awareness

By: Wayne Kaneshiro, FHWA Engineer

Statistics from the Federal Highway Administration show that in 1998, 772 fatalities and approximately 39,000 injuries resulted from crashes in work zones. To increase the public's awareness of the need to use greater caution when driving through a work zone, the week of April 3 to 7 was designated National Work Zone Safety Awareness Week. AASHTO, ATSSA, FHWA and more than 30 public and private organizations sponsored the event. Locally, HDOT will be promoting work zone safety awareness the entire month of June.

Besides educating the public, transportation professionals must also strive to keep up with the state of the art in work zone traffic control and traffic management practices. An emerging source of information is the Internet. Below are several web addresses for sites that focus on work zones:

<http://mutcd.fhwa.dot.gov> - This is the Web site for the Manual on Uniform Traffic Control Devices (MUTCD). Find amendments to the MUTCD and proposed changes.

[Http://wzsafety.tamu.edu](http://wzsafety.tamu.edu) - This is the web site of the National Work Zone Safety Clearinghouse. The clearinghouse is sponsored by the Federal Highway Administration and the American Road & Transportation Builders Association. It provides information on safe and effective work zone traffic control.

[Http://www.atssa.com](http://www.atssa.com) - This is the web site of the American Traffic Safety Services Association. All work zone devices, used on the National Highway System (NHS), are to be crash tested to

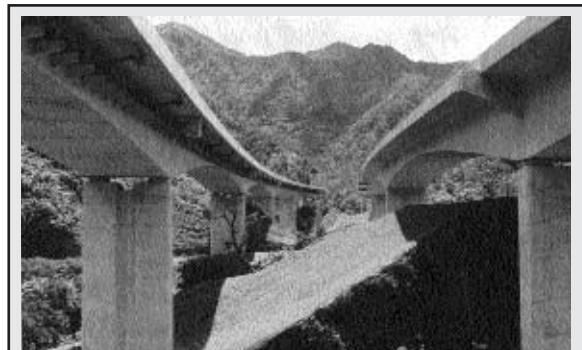
NCHRP 350 requirements. Find the latest information on NCHRP 350 testing and required compliance dates at this site.



<http://safety.fhwa.dot.gov/> - FHWA's web site providing the latest information on work zone safety and "Best Practices" for work zone traffic control and traffic management.

<http://www.utaht2.usu.edu/IC/Default.html> - Utah's LTAP center maintains a web page of innovative contracting techniques. Find actual contract specifications and evaluation reports.

<http://www.eng.hawaii.edu/~hltap/workshop.html> - The Hawaii LTAP web site for the latest schedule of LTAP sponsored workshops. The next work zone courses are scheduled for June 2000. Contact the Hawaii LTAP if you are interested in attending.



Long-term monitoring of the H3 North Halawa Valley Viaduct: See page 6.

# 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.*

## Some Benchmarks For Storm Drainage Design

(Part I of II)



**h**ydraulic computations for storm drainage design can get quite complicated. Often the input data could be based on crude assumptions but the computations may appear quite precise, particularly when a computer program is used. Also, hydraulic formulas used for computation usually assume clean water flows. What happens when boulders, grass and tree limbs get into the flow? Designers can fall back on their experience with similar situations that have worked to guide their judgement. Some engineers have rules of thumb or benchmarks to guide their decisions. A few of the more useful benchmarks are:

- Critical Slope: 1%
- Orifice formula:  $Q = 0.6A(2gh)^{1/2}$
- Weir Formula:  $Q = 3LH^{3/2}$

This is how these benchmarks could be applied:

### Critical Slope: 1% for Self-Cleaning

The critical depth is usually defined as the depth at which a given flow occurs with a minimum energy. The critical slope is defined as the slope that is sufficient to maintain a given flow at critical depth. When the slope is greater than critical, the flow will be supercritical or the depth of the flow will be below the critical depth.

Critical slope for partially full pipes may be around 0.6% and for almost full pipe flows, the critical slope is about 1%. The one percent benchmark could be used as a rough guide, e.g., drainage pipe flows at 1% slope will nearly always be super critical and the velocities will be high enough for the pipe to be self cleaning. A velocity of 3 feet per second is assumed as being self-cleaning.

### Orifice Formula: $Q = 0.6A(2gh)^{1/2}$

Where,

$Q$  = downstream flow, cu. ft. per sec.

$A$  = area of pipe or culvert, sq. ft.

$g$  = gravitational acceleration, 32.2 ft. per sec<sup>2</sup>.

$h$  = height of water surface to center of pipe or culvert, ft.

### Culverts With Entrance Control

When the slope of a culvert is about 1%, the flow will most likely be supercritical and entrance control will dictate the design flow. The efficiency of the culvert is greatly improved by rounding the pipe inlet. Every effort should be made to design the entrance to perform efficiently. Culvert computations can be quite detailed and precise for an assumed flow but the actual storm runoff could be quite variable. Nomographs are available to ease the tedious hydraulic computations.

Even with the best designs, culverts have been blocked at the entrance and storm flows have over-flowed banks in grassy, undeveloped or poorly maintained areas by dirty storm water filled with grass, tree limbs and boulders.

Besides the use of debris catchers, one benchmark for designing culverts with entrance control is to use the orifice formula for poor entrance conditions to allow for sufficient head room or free-board or culvert size for grass and dirty stormwater.

### Head Losses in Manholes

When several storm flows discharge into a manhole, the computation for head loss becomes a difficult hydraulic problem. One technique is to use impulse and momentum theory. A benchmark for the analysis would be to use the orifice formula and the down-stream  $Q$  to determine whether or not there is enough headroom to prevent an overflow of the manhole.

### Popping Manhole Covers at Foot of Steep Slopes

Manhole covers at the foot of steep slopes have been known to pop open during heavy rainstorms. This is because a sudden change in grade at the toe of slope and head losses in the manhole can result in a hydraulic jump. Also catch basins that feed into the manhole contribute to the formation of the jump and have been known to overflow.

The orifice formula is a simple benchmark for making a judgement on whether or not there is enough headroom in the manhole to prevent the cover from popping and overflowing.

**Popping Manhole Covers at Foot of Steep Slopes**

At several street intersections in the city of Honolulu and Waikiki, water may be seen flowing out instead of into catch-basins during heavy rainstorms. This is because of the high water table in the area and the outlet pipe being submerged and too small.

The orifice formula can be used as a benchmark or guide to determine if there is enough head or pipe size to allow the storm flow through the outlet culvert. The head,  $h$ , in this case is the distance from the water level at the top of the orifice to the top of the ground water table.

Submerged and partially submerged pipes deserve more attention than routine designs. Outlet control, backwater effects and periodic maintenance need to be considered. Rubbish and debris tend to collect and reduce flow capacity in these pipes because of low velocities or even negative velocity when the flow is nil and affected by tidal changes.

## A Look at some Manhole Covers from around the World



Calgary, Canada



Quito, Ecuador



Tour, France



Westin Hotel Pool, Maui



Las Vegas, Nevada



University of Hawaii, Oahu \*



London, England

\* Picture taken on the UH campus 1911 manhole



# For Your Information...

By: Gary Choy and Garret Okada, HDOT

## MTRB Qualifies Highway Construction Inspectors

**t**he HDOT, Materials Testing and Research Branch (MTRB) is in the midst of training and qualifying all of its highways construction inspectors in field sampling and testing of materials to meet a federal mandated deadline of June 29, 2000. This personnel qualification requirement is part of the HDOT Materials Quality Assurance Program established in compliance with Title 23, Code of Federal Regulations, Part 637, Subpart B - Quality Assurance Procedures for Construction. Subpart B of the Regulation prescribes the policies, procedures and guidelines for 'State highway agencies' to assure the quality of materials and construction in all Federal-aid highway projects on the National Highway System (NHS). The HDOT Materials Quality Assurance Program has been developed to provide adequate assurance that the public is receiving the desired quality in the product provided by the contractor. To assure quality the assurance program employs a multi-level approach. The first level of assurance is provided by qualifying laboratories and personnel to assure that the equipment and personnel are capable of performing the required test properly. The second level of assurance is provided by an Independent Assurance program. This program provides an unbiased evaluation of the capability of the testers and condition of the equipment used. A third level of assurance is provided by verification sampling and testing. This level reassures the quality of the product. Also, since it would be too time consuming and difficult to identify only Federal-aid projects on the NHS, HDOT quality assurance program will apply to all federal and state highway projects and implementation of these new requirements will begin with all projects advertised after June 29, 2000.

This personnel qualification program, the first step in obtaining quality assurance, provides a uniform statewide procedure for sampling and testing to ensure that test required by specifications are performed in accordance with the prescribed sampling and testing methods. The training and qualification class emphasizes the need to perform the test correctly, the importance of the test and

the consequences of improper sampling and testing procedures. To qualify, field personnel must successfully pass both a written and a performance (proficiency demonstration) examination consisting of nine (9) test methods covering the areas of aggregates, soils, asphalt and

asphalt concrete sampling; concrete sampling and testing; and soil density testing. A certificate of qualification will be issued to all personnel that successfully completes the course. The qualification is good for five (5) years, after which the individual must be re-qualified.



Reactions of the participants to this program have been varied and some of the responses received are:

- Why am I here?
- Too much covered in too little time.
- Now I know the proper way the test is to be done.
- Video provided was very helpful.
- Especially benefitted from the hands-on performance sessions.
- Could use more visual aids.
- Material provided is directly related to my job.

The overall response received has been very positive as the training provides an excellent refresher for some and valuable training for others. MTRB plans to complete this session in March. Qualification (written and performance examinations) for private agencies' personnel doing construction management work for HDOT will follow with announcement of the dates and time provided at a later date.

# From National Headquarters

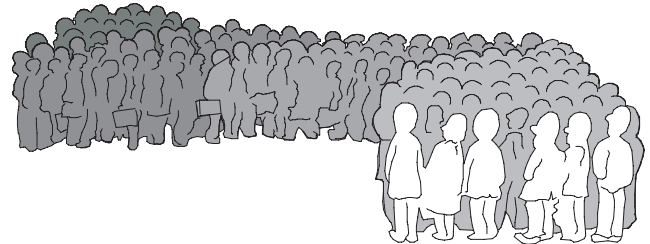
## National LTAP Conference Scheduled

Exhibitor/Sponsor opportunities available

**t**he 2000 National LTAP Conference will be held July 30-August 2 at the DoubleTree Boise Riverside Hotel in Boise, Idaho.

LTAP is the most direct, hands-on method to the FHWA and BIA has for moving innovative transportation technologies out of the lab, off the shelf and into the hands of the people who maintain our local, rural and tribal streets and roads. This conference brings together representatives from all the centers, as well as representatives from FHWA, BIA and many foreign countries. The conference provides the opportunity to enhance the centers training programs and learn more about new technologies and techniques.

By participating at the conference as a sponsor or exhibitor, you can display your interest and abilities to provide assistance to highway agencies, regionally and nationally. And more importantly, the people that you will meet at this conference are the ones who have day-to-day contact with the highways agencies and are the ones who can assist you in getting the word out about your equipment and technology.



If you have questions about sponsor/exhibitor participation and registration, contact Ruthie Fisher, Idaho Technology Transfer Centers at (208) 885-4334.

**Note:** Upon receipt of your registration form and payment, Idaho T2 will send you an exhibitor packet describing display rules, check-in times, setup instructions and other information.

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## PaveCool



**a**s a part of the Federal Highway Administration (FHWA) initiative for continuous quality improvement, the Hawaii LTAP will distribute copies of a program called PaveCool to interested parties. The University of Minnesota in cooperation with the Minnesota Department of Transportation developed this program.

The PaveCool program has been reviewed by members of the AASHTO Subcommittee on Construction and was found to be an effective application for providing accurate information on effective compaction time. PaveCool is a program to calculate cooling curve of a lift of Hot Mix Asphalt and evaluate the time available to effectively com-

pact the left. PaveCool is not a replacement for good engineering judgement; rather it is a tool to give the user insight into how climate and weather conditions will affect their ability to produce a durable, high quality road surface. Cooling rate and compaction are only two of several factors affecting overall Hot Mix Asphalt pavement quality.

Please contact the Hawaii LTAP if you are interested in a copy of this program.

# HAWAII DOT RESEARCH REPORT

## INSTRUMENTATION AND LONG-TERM MONITORING OF THE NORTH HALAWA VALLEY VIADUCT

By: Ian Robertson, University of Hawaii

In 1994, an ambitious project was undertaken by the University of Hawaii and T.Y. Lin International (structural engineers for the viaduct) to instrument the North



Halawa Valley Viaduct, portion of the new H3 Freeway. The project is funded by FHWA and the Hawaii Department of Transportation and its primary objective is to monitor the long-term behavior of the Viaduct. An initial five-year monitoring period was recently extended for an additional five years.

The 1.5 km box-girder viaduct has span lengths up to 110 m. It was built by means of post-tensioned in-situ balanced cantilever construction. Four spans were selected for instrumentation to provide an adequate representation of the viaduct behavior. During construction, all instruments were installed by personnel from the University of Hawaii (UH) and Construction Technology Laboratories (CTL) in Skokie, Illinois.

Over 200 instruments were installed to provide both short-term and long-term monitoring of the structural performance of the viaduct. The instrumentation includes vibrating wire strain gages, electrical resistance strain gages, demec strain gage points, thermistors, thermocouples, extensometers, tendon load cells, base-line deflection systems, tiltmeters, and automated recording systems.



Results from the concrete strain and deflection measurements have been compared with analytical predictions for both short-term and long-term events. Short-term response has been compared for events such as prestress application, topping slab placement, and a load test performed in August 1997. Monitored deflections and concrete strains compare well with analytical predictions obtained using SAP 2000, a general purpose finite element analysis program.



For long-term structural behavior, the program SFRAME (developed by Ketchum at the University of California, Berkeley) is used to account for all material properties, particularly creep and shrinkage of the concrete. Based on the initial assumptions regarding material properties, prestress and anticipated loading and construction sequence, SFRAME predictions underestimated the measured deflections after five years of monitoring.

Work is currently in progress at the University of Hawaii and T.Y. Lin International to update the SFRAME model with the material behavior observed during the monitoring program. This work has led to the development of an improved procedure to predict the concrete constitutive properties for use in future long-term structural simulation models.

# Improving Productivity in the Workplace

**W**hether we contract work or do it with our own transportation agency crews, talk of improving productivity is easy, but what of its implementation?

The implementation must be a formal and managed process. Everyone must make a concerted effort to meet predetermined goals.

The following four principles are the cornerstones of increased productivity.

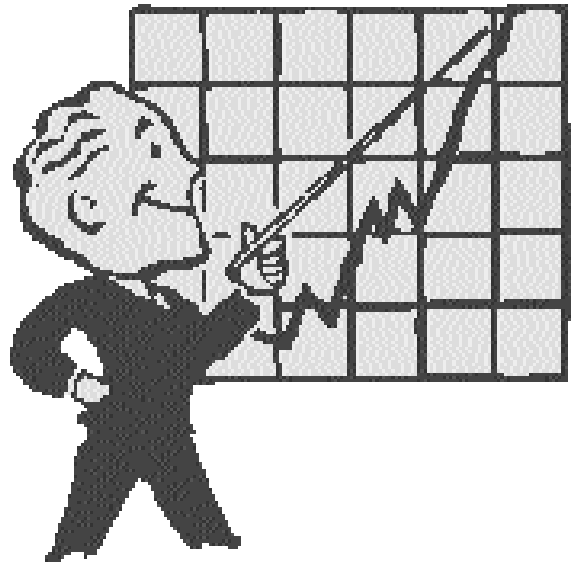
**Principle #1.** A formalized training program must be developed. One example is safety. Safety programs are a part of virtually all transportation agencies' strategic goals.

But we must also provide training that gives employees the tools for implementing and managing change. Historically, we have promoted training in the technical skills. In today's work environment of change, training programs also need to include development of leadership and management skills.

**Principle #2.** Project management procedures must be applied in a consistent manner and constantly updated as innovations in project management are identified. The areas of pre-job planning and project organization are the areas with the most immediate results.

How we manage projects must be identified, analyzed and documented. The process then can be reviewed, evaluated and improved through comparison with similar efforts by other transportation agencies.

**Principle #3.** We must have a measurement tool for monitoring progress. It is said you get what you measure. When attempting to change behavior, reinforce that change and subsequently validate its progress. Posting results in a visual format has a powerful impact.



Measurement tools often are described as a means of keeping score. Keeping score makes the process more interesting, fun and competitive. Without an adequate measurement tool, it is impossible to tell if you are winning or losing.

All construction and technical procedures continually must be examined and compared against some yardstick to determine their positive contributions and continued usefulness.

**Principle #4.** Organizational behavior must be directed toward identifying improvements and implementing new approaches. To foster such an environment, management needs to create a culture of openness that encourages a free-flow of ideas from all levels within the agency.

Challenging but achievable goals need to be set. Once they are met, new goals should replace them.

Too often goals are defined as more. They need to be set with the idea of benefit to the transportation worker and agency.

Throughout the implementation process, employees must see that they are meaningful members of the team for change. Employees at all levels must view proposed changes as a means to improvement. But long-term success is dependent on management's commitment to develop and maintain a continuous productivity improvement program.

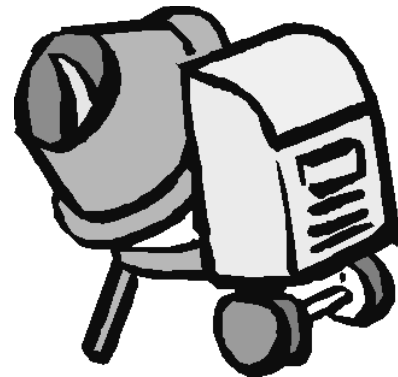


# NEW FHWA DRILLED SHAFT DESIGN CONSTRUCTION MANUAL PUBLISHER

**t**he second edition of the much acclaimed Drilled Shafts: Construction Procedures and Design Methods has just been published by the Federal Highway Administration (FHWA). The completely revised edition, which replaces the 1988 version, was authored by Drs. Michael O'Neill and Lymon Reese. The two-volume manual offers the most comprehensive, up-to-date design and construction information available anywhere. Almost every aspect of construction is covered in detail, with recommendations for constructibility-oriented specifications, as well as representative pricing.

Design equations utilizing LRFD methods are presented for soil and rock conditions. Construction equipment, materials, principles of concrete design and recommended methods of placement, as well as reinforcing steel configurations are detailed.

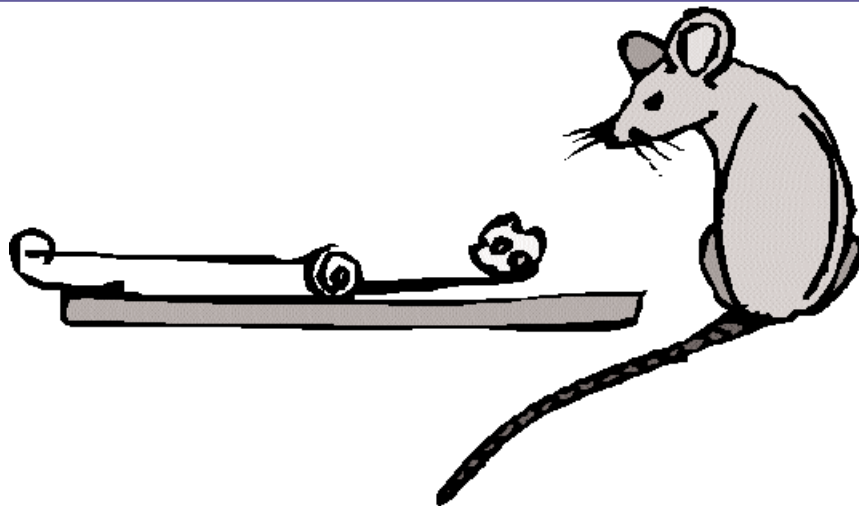
If you are involved in the design, construction, teaching, specifying, and/or contracting for drilled shaft foundations, you **MUST HAVE** this 560 page, thoroughly illustrated, two-volume manual in your working library.



The brand-new manual is only available for general distribution through the ADSC's Technical Library Service.

Standard Price is \$125.00. (Contact the ADSC to inquire about industry group industry discounts.)

For more information, or to order your copy, contact Susan King, ADSC Librarian, P.O. Box 550339, Dallas, Texas 75355-0339, telephone (214) 343-2091, FAX (214) 343-2384, or email: [sesking@adsc-iafd.com](mailto:sesking@adsc-iafd.com).



## Better Mousetrap?

Have you or one of your co-workers built a better mouse trap recently? A modified gadget? An improved way to do a job?

Please let us know about it. The best entries will be featured in a future issue of Hawaiian Connections.

Your Name and Phone Number:

\_\_\_\_\_

Inventor's name and phone:

\_\_\_\_\_

Invention:

\_\_\_\_\_

*Please fax this form to 956-8851*



## Director's Note

by: C.S. Papacostas

I am happy to report that our recent workshops have been very well received, informative and technically sound.

But we have become "victims of our own success!"

In some cases, the number of people that wanted to sign up far exceeded the enrollment limits. Also, in an attempt to be as responsive to local needs, we scheduled some workshops on very short notice and this caused some logistical problems with securing venues, executing agreements and the like.

Our goal is to try to accommodate all reasonable requests for training. It is necessary though to allow for sufficient lead-times, at least several months.

Please visit our website: ([www.eng.hawaii.edu/~hltap](http://www.eng.hawaii.edu/~hltap)) for updated information on upcoming activities and send in you requests for a seat as early as possible. Matt Nakamoto, graduate assistant, has done a super job revamping the site.

Next time you call the office, you may hear two new voices: Matt Alonzo, a senior CE student and Rhen Yamamoto, a CE sophomore.

Our continuing student assistants, Reid Ikemori and Joni Tanimoto, are always ready to provide their all-around competent and reliable service.

Aloha

## Program Manager's Note

by: Juli Kobayashi

In January, I had the pleasure of attending the 79th Annual Transportation Research Board Meeting in Washington D.C. There were over 490 different sessions going on in three separate hotels. It was rather impressive and very informative as well. I received a lot of information on transportation technology transfer and will use this to improve our LTAP operations.

There were also many exhibitors that participated. Some exciting things that I found were: FHWA's new and expanded MUTCD Web site at <http://mutcd.fhwa.dot.gov>, the National Transportation Enhancements Clearinghouse [www.enhancements.org](http://www.enhancements.org), and I got a glimpse of the FHWA Traffic Estimation and Prediction System (TrEPS), just to name a few.

I am glad that I got a chance to attend this meeting and would highly recommend it to anyone in the transportation community. It is well organized and maintained.

Coming back from it, I realize the importance of sharing new ideas with others. We are still looking forward to your input in our "Better Mousetrap" article. I am sure many of you have figured out a better or more innovative way to do your job. Please pass on the knowledge and wisdom to others.

Thus far, LTAP has conducted five separate workshops with over 150 participants. We are always interested in your suggestions and would like to help you in any way that we can.

## Staff:

Director:

C.S. Papacostas  
Department of Civil  
Engineering,  
University of Hawaii  
at Manoa

Program Manager:

Juli Kobayashi

Graduate Assistant:

Matt Nakamoto

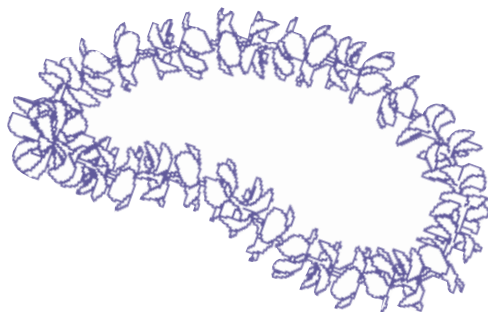
Student Assistants

Matthew Alonzo

Reid Ikemori

Joni Tanimoto

Rhen Yamamoto



## Hawaii LTAP's 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.

A database of all materials may be found on the web at:

### Videos –

[www.eng.hawaii.edu/~hltap/video.html](http://www.eng.hawaii.edu/~hltap/video.html)

### Publications –

[www.eng.hawaii.edu/~tlib](http://www.eng.hawaii.edu/~tlib)

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

# Staff News

We would like to welcome new student assistants **Rhen Yamamoto** and **Matthew Alonzo** to the Hawaii LTAP team. We would also like to congratulate student assistant **Joni Tanimoto** for having participated in the 48th Cherry Blossom Festival.



As a senior in the Civil Engineering Department, Matthew Alonzo is focusing his studies in the field of Transportation. Outside of the classroom, he enjoys playing music, basketball, volleyball and snorkeling.

Rhen Yamamoto is a sophomore majoring in Civil Engineering. When he is not in school he enjoys fishing, diving, surfing, bodyboarding, and anything to do with the ocean. Rhen aspires to one day have a government job in Hawaii.



"I would like to thank everyone who has supported me throughout this pageant. My deepest appreciation goes out to my family and the hard working staff at the Hawaii LTAP."

Joni

# 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.

Name: \_\_\_\_\_  
 Company/Organization: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Fax: \_\_\_\_\_

## Free Publications

1. FHWA-JPO-96-0014: Shared Resources: Sharing Right-of-Way for Telecommunications
2. FHWA-HI-98-031 : Hazardous Bridge Coatings
3. FHWA-PL-92-016 : Financing Federal-Aid Highways
4. Intersection Analysis: Theory and Software

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

## Check Out Our New Look

For the latest information on upcoming workshops, staff news, publications, etc., visit our newly "remodeled" website @:

[www.eng.hawaii.edu/~hltap](http://www.eng.hawaii.edu/~hltap)

Many thanks to Matt Nakamoto, LTAP's graduate assistant.

### The **Hawaii Local Technical Assistance Program**

The screenshot shows the website interface with a dark navigation menu on the left containing links like Home, About LTAP, News, Calendar, People, FAQ's, Feedback, Workshops, Newsletters, Publications, Videos, Traffic, Gams, National LTAP, and Links. The main content area features a search bar at the top with the text "Search our site via AltaVista:" and buttons for "Find it" and "Clear". Below the search bar is a "NEWS" section with two items: "Upcoming workshops: ITS Acquisition" and "New student hires Matt Alonzo and Rhen Yamamoto join the team." To the right of the news is a small map of Hawaii. At the bottom, there are two columns: "ORGANIZATION" and "OFFICE". The "ORGANIZATION" column describes the program as a cooperative effort between the Department of Civil Engineering at the University of Hawaii, the Hawaii Department of Transportation, and the U.S. Department of Transportation. The "OFFICE" column lists the location as the Department of Civil Engineering at the University of Hawaii at Manoa, 2540 Dole Street, Holmes Hall 383, Honolulu, Hawaii 96822, and lists C. S. Papacostas as Director and Juji Kobayashi as Program Manager.



# HAWAII LOCAL TECHNICAL ASSISTANCE PROGRAM

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FHWA Hawaii Division  
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## **Advisory Committee**

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Chairperson  
Materials Testing & Research Engineer  
Hawaii Department of Transportation  
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### Director:

C.S. Papacostas

### Program Manager:

Juli Kobayashi

### Graduate Assistant:

Matt Nakamoto

### Student Assistants:

Reid Ikemori      Matthew Alonzo  
Joni Tanimoto    Rhen Yamamoto



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:

*Hawaii Local Technical Assistance Program  
Department of Civil Engineering  
University of Hawaii at Manoa  
2540 Dole Street - Holmes Hall 383  
Honolulu, Hawaii 96822*

### Please contact:

C.S. Papacostas, Director  
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Fax: (808) 956-5014  
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or

Juli Kobayashi, Program Manager  
Tel: (808) 956-9006  
Fax: (808) 956-8851  
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