

# WST2

## Washington State Technology Transfer



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**Washington State  
Department of Transportation**

A Technical Digest of the  
Washington State Department of Transportation (WSDOT)  
and the Local Technical Assistance Program (LTAP)

Issue 80, Fall 2003

# Washington State Technology Transfer

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**Cover Photo:** *Cover photo by Bob Brooks:  
The Guardrail Repair Trailer, a Better Mousetrap  
invented by the WSDOT Port Orchard Maintenance  
Shop. See the "Build a Better Mousetrap Department"  
for details.*

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E-mail Address: T2PAVE-L@lists.wsdot.wa.gov

Receive periodic technical information on pavement technology and local agency pavement management information, including Northwest Pavement Management Association (NWPMA) information and any late breaking technical information and announcements.

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WST2 Center Listservs are the ultimate information exchange tool. Enjoy!

## From the Editor's Desk



I would like you to know that as we work through a transition period, we will continue to provide you with the same services and products you know and appreciate. Also, your comments and suggestions on how we might best provide those services and products will continue to be a key to our success.

We hope working with you and the WST2 Advisory Committee will continue to be a positive experience. We see a bright future ahead, and we are glad you're along for the journey.

A handwritten signature in cursive script that reads "Kathleen B. Davis".

Kathleen B. Davis  
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Any opinions, findings, conclusions or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of WSDOT or FHWA. All references to proprietary items in this publication are not endorsements of any company or product.



Washington State  
Department of Transportation



U. S. Department of Transportation  
Federal Highway Administration

# WST2 Center Publishes School Safety Guide



*By Dave Sorensen, Traffic Technology Engineer, WSDOT Highways & Local Programs*

The WST2 Center is pleased to announce the completion of a collaborative project with the Washington Traffic Safety Commission and the Office of Superintendent of Public Instruction. Dave Sorensen, Washington State Department of Transportation, Highways & Local Programs Traffic Technology Engineer, organized and chaired a statewide committee of pedestrian and school safety experts to update the August 1996 report titled "A Guidebook for Student Pedestrian Safety." The report has been renamed "School Administrators' Guide to School Walk Routes and Student Pedestrian Safety."

#### The Guidebook:

- Explains the laws and liabilities associated with school walk routes.
- Provides a background on student pedestrian safety education.
- Identifies potential partnerships and responsibilities for improving student pedestrian safety.
- Suggests processes for developing and maintaining school walk routes.
- Presents guidelines for identifying when pedestrian enhancements should be considered.

- Recommends procedures school administrators can use in working with their local public works agencies to implement needed improvements.

The Washington Traffic Safety Commission provided funds for this project and will distribute the new guide to schools throughout the state. The guide is also available from the WST2 Center by calling (360) 705-7386 or e-mail [schmidw@wsdot.wa.gov](mailto:schmidw@wsdot.wa.gov).



*For more information, contact Dave Sorensen at (360) 705-7385 ([sorensd@wsdot.wa.gov](mailto:sorensd@wsdot.wa.gov)) or Lynn Drake, Washington Traffic Safety Commission, at (360) 586-3485 ([ldrake@wtsc.wa.gov](mailto:ldrake@wtsc.wa.gov)).*

# Studded and Studless Tire Traction and Safety

By Dan Sunde, P.E., Assistant Director, WSDOT Project Control & Reporting Office

## The Purpose

Since their introduction in the United States in the early 1960s, studded tires have become very popular with drivers in cold climates as a means of improving traction and mobility on snowy and icy winter roads. Their popularity is due to the advantages of convenience, driving comfort, and reduced noise over snow chains. Over the past 40 years, the designs of both studded and non-studded snow tires have evolved and improved.

The purpose of this report is to summarize and document the performance of studded tires compared to non-studded winter tires and all-season radials, and the traffic safety, economic, and health factors related to the use of studded tires based on recent research.

## The Method

This report is based on an extensive review of recent research reports published over the past 12 years documenting the safety and performance of light-weight studded tires, studless winter tires, and all-season radial tires on three common vehicle types and anti-lock braking systems. A few initial studies were conducted prior to

1990 but, for the most part, the majority was conducted during the 1990s or later.

Although related, tire performance and safety are treated independently in this report. Tire performance was investigated for the three types of tires with respect to stopping distance, starting traction, maximum cornering speed, and maximum incline for winter road surface conditions, roadway geometrics, and temperatures. Performance was measured using four-wheel drive, front-wheel drive, and rear-wheel drive vehicles.

Winter tire safety in this report is focused on the use of studded tires in the following areas:

- Crash risk.
- Driving hazards caused by pavement wear.
- Incidental traction improvements caused by roughening of the roadway surface by studs.
- Driver behavior.

Other factors presented that relate to studded tire use are:

- Economic (tire cost and fuel consumption).
- Health (road noise and dust due to roadway wear).
- Serviceability (convenience and mobility).

## The Key Findings

### Traction Performance

- Of the performance factors involved with tire traction, the most important are stopping distance and deceleration. Overall, the all-season tires performed significantly worse in virtually every stopping-distance test on packed snow and ice than studded and non-studded winter tires. The key factors that determine the difference in traction performance between studded tires and the non-studded winter tires on snow and ice are:
  - Ice is soft at 32°F and gets harder as the ice temperature gets colder.
  - Studded tires have optimal friction resistance on clear, smooth ice near 32°F. (Any deviation reduces the friction resistance and increases stopping distance.)
  - Ice at 32°F occurs rarely (less than 1% of the time in Washington).
  - As ice gets harder, studded tires can't dig into the ice easily and lose friction resistance faster than non-studded winter tires. When the temperature is near 0°F, studded tire performance is reduced to the point it equals that of non-studded winter tires.

- Tire wear appears to reduce the friction resistance of studded tires faster than non-studded winter tires since stud wear seems to have a greater effect than tread wear.
- Using two studded tires yields a stopping distance between that of a vehicle equipped with four studded tires and one equipped with four all-season tires. (For full comparison, instability should also be taken into consideration).

As a result, non-studded winter tires perform better than studded tires on snow and ice in most situations except when the studded tires are new, the temperature is at or near 32°F, and the ice is smooth and clear. This combination rarely occurs; therefore, the benefits of studded tires are rarely achieved. If the benefits are achieved, it's only temporary.

- Because studded tires have difficulty gripping hard surfaces, they have less traction on Portland Cement Concrete Pavement (PCCP) than both non-studded winter and all-season tires. Poorest traction occurs on wet PCCP and when using studded tires on all four wheels. On Asphalt Cement Pavement (ACP), there is little difference in stopping distance between vehicles using highway tires, two studded tires, or four studded tires on either wet or dry ACP pavements.

### **Traffic Safety**

- When studded tires are used, the difference in the friction factor between lock-wheel braking (when wheels don't rotate) and the optimum-slip braking (10-15% tire rotation) is reduced, which could improve braking for anti-lock braking systems and could reduce driver misjudgment of stopping distances.
- Studded tire use appears to help break up packed snow, roughen ice, and pavement. This helps increase traction on snow, ice, and bare pavements.
- According to a study in Norway, the use of studded tires appears to provide a small reduction in the collision rate (1-10%).
- Four-wheel drive vehicles have better traction and control but are not better at stopping. Vehicles with anti-lock brakes have better control but do not have better locked-wheel braking or traction maneuvering.
- Use of studded tires results in wheel rutting that affects vehicle directional control and allows ponding, which can cause excessive road spray and possible vehicle hydroplaning.
- Studded tires also accelerate deterioration of paint striping and other pavement markings.
- Study results on driver behavior and studded tire use are diverse and contradictory.

### **Economic Factors**

- Non-studded winter tires are approximately 50% higher in cost than studded tires.
- Studded tire use increases fuel consumption a very small amount (approximately 1.2%).

### **Health Factors**

- Studded tire use increases airborne dust that is considered to be a risk to human health due to the studs grinding away the roadway surface.
- Ambient tire noise increases with studded tire use and is most noticeable at 25 mph.
- Pavement roughness caused by the use of studded tires can cause road vibrations to be transmitted through the vehicle chassis, which can accelerate vehicle wear, produce passenger discomfort, and increase interior noise.

▲  
For more information, contact Dan Sunde at (360) 705-7137 or [sunded@wsdot.wa.gov](mailto:sunded@wsdot.wa.gov).

# Innovative High Performance Steel Bridges in Washington State

By Jugesh Kapur, P.E., S.E., WSDOT Bridge and Structures Office

This article describes two recently completed bridge designs by the Washington State Department of Transportation (WSDOT): the SR 104 Hood Canal Floating Bridge design and the SR 2 Barclay Creek Bridge design.

## SR 104 Hood Canal Floating Bridge

For the Hood Canal Floating Bridge, WSDOT designed a tubular truss to reduce maintenance and increase service life by eliminating flat surfaces, hand-holes, connection plates, diaphragms, and stiffeners (Figure 1). The tubular members of the truss were designed in accordance with the requirements of the recommended practice for planning, designing, and constructing fixed offshore platforms.<sup>1</sup> These were supplemented with the latest AASHTO Standard Specifications for Highway Bridges<sup>2</sup> and WSDOT's own criteria for the design of floating bridges. The truss was designed as a space frame with full moment connections at each joint. The design live load for the truss was HS-25 or two 24-kip axles at 4-foot centers.

Used in the approach spans of the Hood Canal Floating Bridge, the truss has a height of 35 feet, a width of 67 feet 9 inches, and a total span length of 280 feet. Although the full width of the truss will not be utilized at this time, the truss was designed to accommodate future expansion.

The truss members were proportioned for minimum weight. Weight optimization was essential to maintain the required draft for the floating pontoons. Being highly efficient in resisting torsional forces, the tubular members provided the required resistance to the truss as the floating bridge pontoons twist during wind-storms. No top laterals were used.

The joint cans and the diagonal ends at nodes will be fabricated from American Petroleum Institute (API) specification 2Y, Grade 60 (Figure 2). The chords and diagonals between the nodes, identified as fracture critical members, will be fabricated from American Society for Testing & Materials (ASTM) A709, Grade high performance steel (HPS) 70W. The longitudinal centerline strut, the transverse and diagonal struts

and top transverse brace, and the truss floorbeams also utilized ASTM A709, Grade HPS 70W. The bottom flange of the floorbeam was designed to be either tubular or have a sloping flange. HPS was chosen for the additional strength, improved toughness, and weldability characteristics. All welding for tubular members is to conform to the American Welding Society (AWS) code D1.1, with additional requirements stated in the special provisions. Portions of the AWS D1.5 Bridge Welding Code were added as required. Blind bolts were used for the tubular members that were accessible from one side only. Spherical bearings were designed for the truss that could support 1000 kips of combined dead and live load, accommodate 15 inches of longitudinal movement, 1 inch of transverse movement, and a rotation of 3.5 degrees.

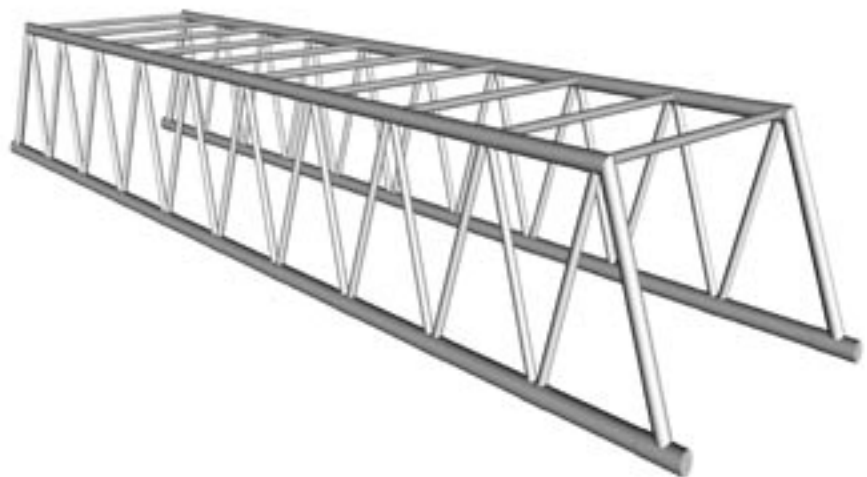


Figure 1 – Tubular Truss Framing for Hood Canal Floating Bridge

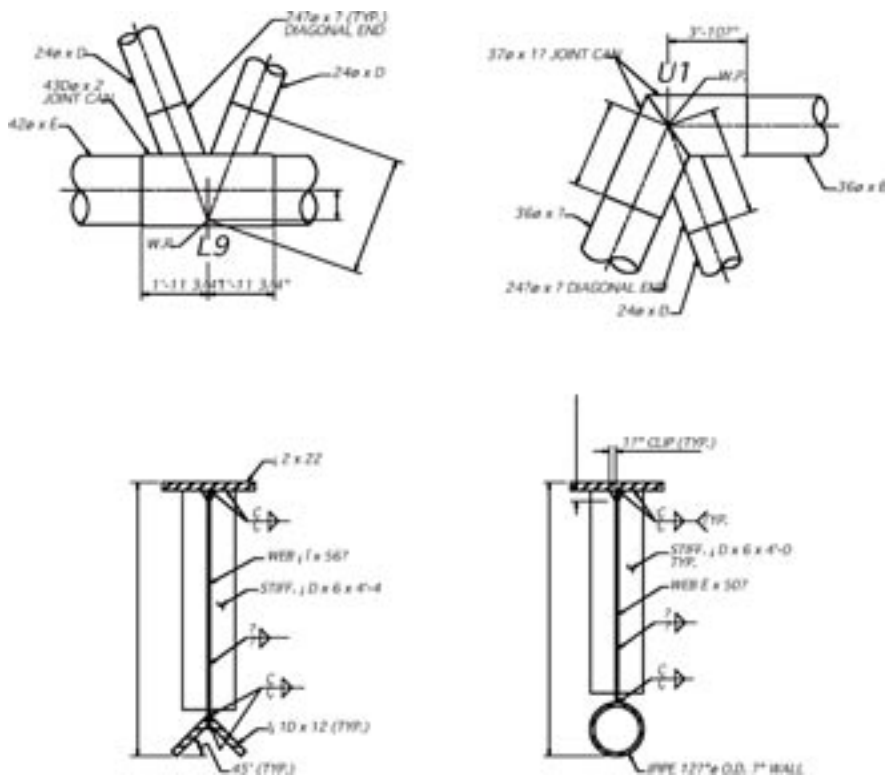


Figure 2 – Joint Can and Floorbeam Details

A unique design feature of this truss is the post-tensioning of the bottom chord. The bottom chord members are 42 inches in diameter with a wall thickness of  $\frac{3}{8}$  inches and have four tendons. Each tendon consists of nine 0.6-inch diameter strands jacked to a total load of 330 kips. The post-tensioning is to be performed after the entire dead load of the truss is applied to prevent buckling of the bottom chord. The post-tensioning makes the bottom chord redundant and non-fracture critical. This eliminates the elaborate fracture critical inspection requirements and helps reduce the life cycle cost of the structure.

The exterior surfaces of tubular members are painted. The interior surface of all tubular bottom chord and longitudinal strut members will be painted with primer only. All other interior surfaces of tubular members are unpainted.

The initial cost will be more than a traditional truss. However, long-term issues, such as painting and replacement of members due to accumulation of debris and bird droppings, will be minimized. This will reduce the total life cycle cost of the structure. Removal or flushing of debris requires full containment and elaborate collection methods. This precludes our maintenance crews from performing any work causing development of rust and section loss in the truss members.

### SR 2 Barclay Creek Bridge

WSDOT recently completed the design and construction of Barclay Creek Bridge, a steel plate girder bridge that utilized high performance steel. Located on SR 2, this single span structure with a three-girder cross-section was the first WSDOT HPS bridge. The goal of this design was to meet

the functional requirements at the site and maintain low initial and long-term maintenance costs. The new bridge replaced an aging steel truss that was functionally obsolete and structurally deficient.

A structure that could span the entire waterway was required to meet the environmental restrictions at this site. Another factor that influenced the bridge type was the high water elevation at this location. The clearance between the roadway grade and the high water elevation was about 8 feet. The superstructure had to be shallow enough to provide the required clearance. Although prestressed girders are usually the most economical bridge type in Washington State, the logistics of transporting the full-length girders to this remote site made this option undesirable. As the optimum superstructure type, the engineer selected steel plate girders that allow rapid construction, are easy to transport, and are relatively shallow. The bridge has a span of 174 feet with three 70-inch deep girders spaced at 13.1 feet. The girders were fabricated from grade 70W HPS:

- Steel weight per deck area – 38 lb/sf
- Steel cost per unit weight – \$1.30/lb
- Steel cost per deck area – \$49/sf

### Design Enhancements

Although new AASHTO load and resistance factor design (LRFD) Bridge Design Specifications<sup>3</sup> were used for this design, several areas warranted a refined analysis. The most significant refinement was a finite element analysis to determine the distribution of live load to the steel plate girders. The LRFD specifications allow two methods for determining live load

distribution factors. The designer is directed to use the lower of the calculated distribution factors using the lever rule or the empirical equations. In this case, both methods gave the same values. In lieu of using the LRFD specifications, the live load distribution factor was calculated using finite element analysis. This resulted in a 25% reduction in the live load distribution factors.

Provisions of the AASHTO LRFD Design Specifications<sup>3</sup> were used to design the intermediate diaphragms. Recent research indicates that for simple span structures, permanent intermediate crossframes are not necessary.<sup>3</sup> Bracing of the compression flange is required prior to placing the concrete deck. To provide this bracing, a simplified permanent crossframe was designed. Figure 3 shows the detail of the crossframe used for the Barclay Creek Bridge. The horizontal members are small W-shapes with coped flanges that are bolted to stiffeners. The flanges

of the W-shapes are also coped to accommodate diagonal angle bracing, which is fillet welded to the horizontals. Gusset plates were eliminated in favor of attaching the W-shapes directly to the web stiffeners. The intermediate cross-frame spacing was 30 feet, higher than the 25 feet maximum spacing permitted in the previous code.

It was not possible to locate the field splice at an inflection point since this was a simple span design. Although the field splice was located as far from mid-span as possible, there was still a substantial amount of moment at the splice requiring a large number of bolts. In the past steel projects, WSDOT has used bolts with a minimum tensile strength of 105 ksi (AASHTO M164), with threads excluded from the shear plane. By excluding threads in the shear plane and using bolts with a tensile strength of 150 ksi (AASHTO M253), 45% fewer bolts were used. This was beneficial because the fabricator noted that

drilling holes for the field splice took longer and was more difficult than drilling holes in lower strength steel. The higher yield strength of the HPS 70W required additional drilling time. A reduction in the number of bolts reduced the fabricator's effort and lowered the overall cost of the splice.

## Acknowledgements

The author would like to thank WSDOT employees Patrick Clarke, Geoff Swett, Munindra Talukdar, Mark Gaines, Nate Brown, and Paul Kinderman.

<sup>1</sup>American Petroleum Institute, Load and Resistance Factor design, first edition, July 1993 with supplement 1, dated February 1997.

<sup>2</sup>AASHTO Standard Specifications for Highway Bridges, sixteenth edition, dated 1996, with interims through 2000.

<sup>3</sup>AASHTO LRFD Bridge Design Specifications, second edition, dated 1998, with interims through 2000.

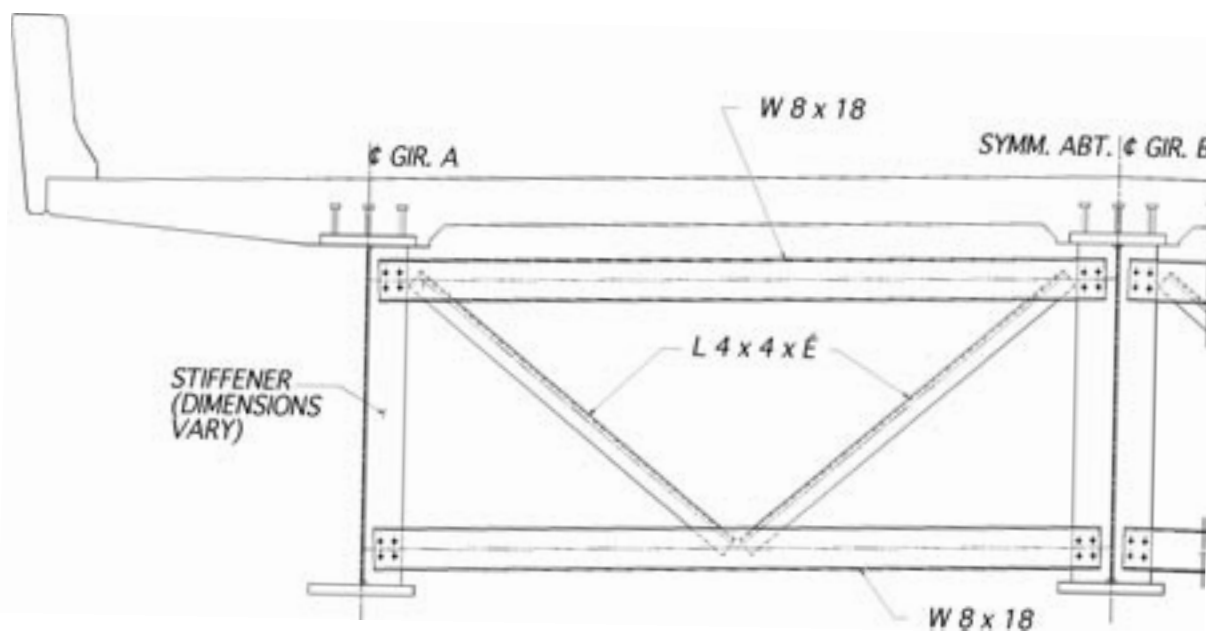


Figure 3 – Simplified Intermediate Crossframe

# The Use of NovaChip® as a Surface Treatment

*Reprinted from "TECH NOTES," a publication by the WSDOT Environmental & Engineering Program Materials Laboratory to share design and construction technology gained from projects done throughout WSDOT.*

Originating in France in the 1980s, NovaChip® is marketed as a pavement rehabilitation, preventive maintenance, or surface treatment that has a durable surface with improved skid, wear, and rutting resistance. NovaChip® is a paving process that places a thin gap-graded ( $3/4$  to  $3/8$  inch) mix (Photo 1) over a liquid membrane, known as Novabond®. Novabond® is a polymer modified emulsion that is specially designed to seal the existing roadway and provide a strong bond with the NovaChip® asphalt material.



*Photo 1 – NovaChip® asphalt placed as a surface treatment.*

The Washington State Department of Transportation (WSDOT) is interested in using NovaChip® as an alternative to Bituminous Surface Treatment (BST). Frequent complaints resulting from BST placements include rough surface texture and flying chips, both during and immediately following construction. To remedy this problem, WSDOT, in general, began placing Asphalt Concrete Pavement (ACP) Class D (open-graded friction course) or ACP Class G (thin dense-graded asphalt) on state highways that pass through small cities. However, due to the raveling problems experienced with ACP Class D friction courses and the shorter overlay life (6 to 10 years) of ACP Class G overlays, a more cost-effective, durable, and maintainable pavement surface is preferred.

Based on reports from other states, NovaChip® may provide the durability and pavement life that WSDOT desires. NovaChip® is placed onto the Novabond® membrane, which provides an immediate bond of materials, thus eliminating the flying chips experienced with BST seals. The experience in Europe and the United States demonstrates the service life of NovaChip® to be 10 years or longer where the asphalt is placed on structurally sound pavements.

## Use of NovaChip® on SR 17 through Soap Lake

During August 2001, Koch Pavement Solutions of Spokane, Washington, in conjunction with WSDOT's North Central Region's Program Management Office, Materials Lab, Project Engineer's Office, Ephrata Maintenance Office, and Headquarters Materials Lab placed a trial section of NovaChip® on a curbed portion of SR 17 through the City of Soap Lake (Photo 2).



*Photo 2 – A portion of SR 17 through Soap Lake in eastern Washington prior to the application of NovaChip®.*

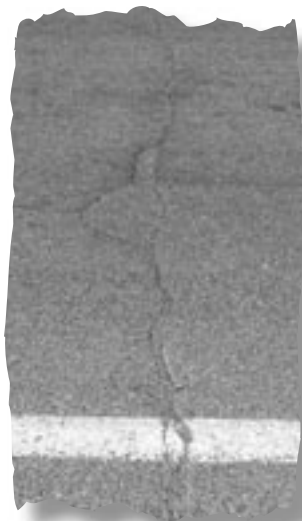
This portion of SR 17 carries an Average Daily Traffic (ADT) of approximately 4,300 vehicles, 8.5 percent of which is trucks.

## Surface Preparation

Prior to the NovaChip® overlay, WSDOT followed Koch Pavement Solutions' recommendation that cracks greater than  $1/4$  inch be patched or sealed. Pavement repair was performed to address isolated alligator cracking and potholes. Photos 3 and 4 illustrate typical distresses observed throughout the project.



*Photo 3 – Cracks of this severity (greater than ¼ inch) should be sealed or repaired prior to the NovaChip® overlay.*

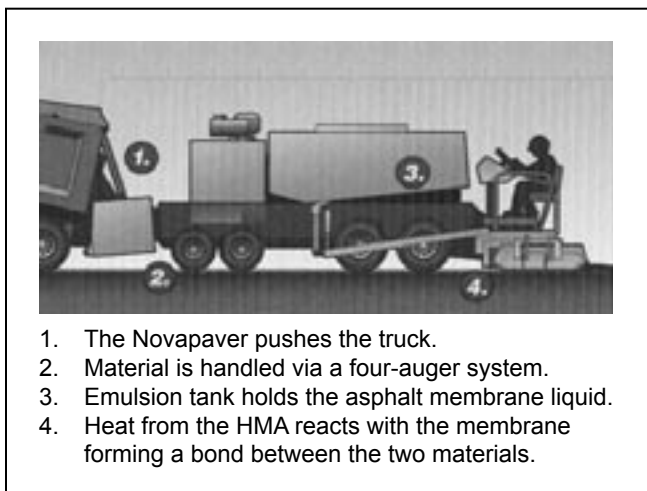


*Photo 4 – Low severity cracks (less than ¼ inch). Cracks of this severity do not require sealing or repair prior to the NovaChip® overlay.*

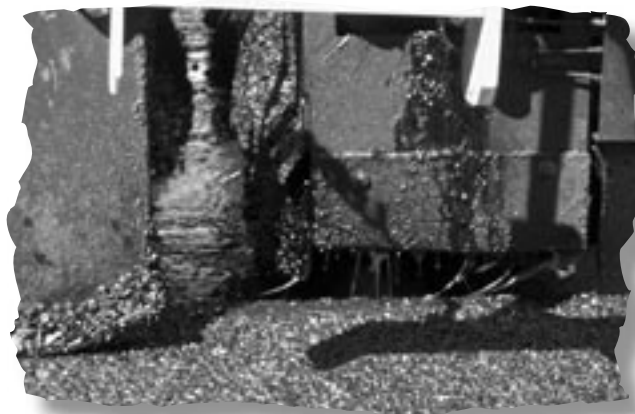
### **NovaChip® Placement**

Similar to typical hot-mix asphalt (HMA), NovaChip® is easily produced at a HMA facility and placed with little difficulty. The main difference in the placement of NovaChip® versus typical HMA is the use of a specialized paver, known as the “Novapaver.” The Novapaver essentially allows the placement of the Novabond® membrane and NovaChip® surfacing in a single pass. The Novapaver and its basic components are shown in Illustration 1. Unlike a typical HMA paver, a 3,000-gallon emulsion tank is mounted to the Novapaver. Though the Novapaver is much larger than a conventional paving machine, it functions much the same. The Novapaver has an asphalt placement rate of 65 to 75 feet per minute.

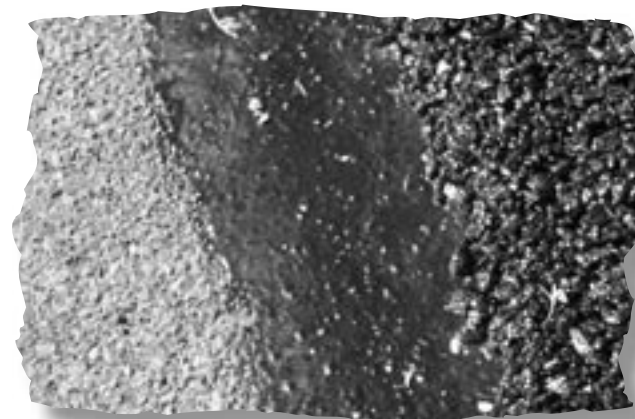
*Illustration 1 – The Novapaver*



Following production of the HMA, standard haul trucks deliver the asphalt to the paver. Once the asphalt is delivered to the paver hopper, a four-auger system delivers material to the rear of the paver where conventional augers distribute the asphalt the full width of the roadway. Just seconds before the paver distributes the hot mix to the roadway, the Novabond® membrane is sprayed on the roadway surface. Photos 5 and 6 show the Novabond® emulsion being applied to the existing roadway.



*Photo 5 – Novabond® emulsion applied just prior to the NovaChip® asphalt.*



*Photo 6 – From left to right – the pre-existing road surface, the Novabond® membrane, and the NovaChip® asphalt.*

The SR 17 project, nearly one mile in length, began on August 7, 2001 with the intent of completing only the northbound lanes. Progress was better than anticipated, and the southbound lanes were completed within a 12-hour day. Photos 7 and 8 show the NovaChip® placement through Soap Lake.

### **NovaChip® Compaction**

The purpose of compaction during NovaChip® placement is to seat the asphalt into the Novabond® membrane rather than to obtain density (Photo 9).



*Photo 7 – The “Novapaver” is capable of placing the NovaChip® and the Novabond® membrane in a single pass.*



*Photo 8 – Delivery of the NovaChip® asphalt to the Novapaver.*



*Photo 9 – Compaction should be started immediately after placement and be completed before the mix reaches 195°F.*

Compaction is partially obtained by the vibratory screed of the paver, and then by one or two passes from double drum rollers operating in the static mode (Photos 9 and 10). At Soap Lake, a 15-ton roller was used for the initial breakdown, followed by a 12-ton finish roller. Cross traffic was allowed on the

NovaChip® surface approximately 10 to 20 minutes after placement. The finished NovaChip® overlay through Soap Lake is shown in Photo 11.



*Photo 10 – Compaction was obtained by the use of two static double drum rollers.*



*Photo 11 – Soap Lake’s NovaChip® overlay.*

Roadways that may be potential candidates for a NovaChip® overlay should have satisfactory structural condition, uniform crown, and no patches or potholes that exceed moderate severity or rutting that exceeds  $\frac{1}{2}$  inch. NovaChip® is not intended for use as a leveling course or to fill severe ruts, nor is it designed to bridge weak spots or to cover underlying pavement deficiencies. Potholes and patches should be properly repaired and ruts greater than  $\frac{1}{2}$  inch should be milled or leveled prior to NovaChip® surfacing.

### **Cost Comparison**

Since NovaChip® is new to Washington State, prices are based on Koch Pavement Solutions estimates. Nationwide, Koch reports material and placement costs of \$4.00 per square yard in the Western United States and \$3.50 per square yard in the Eastern United States. These prices are predicated on projects that have 100,000 to 200,000 square yards. As with any paving operation, factors that will influence NovaChip® costs are contractor familiarity

and the quantity being placed. The expected material and placement cost in Washington State is from \$3.50 to \$4.00 per square yard. Table 1 compares the NovaChip® price to traditional WSDOT asphalt bid prices.

Table 1 – Range of WSDOT Asphalt Bid Prices for Asphalt Types (material and placement costs).

Asphalt Type	Cost Range (\$/Square Yard)
HMA (Class G – 0.08' depth)	1.65 – 2.06
HMA (Class A – 0.15' depth)	2.71 – 3.58
HMA (Class ½ inch Superpave – 0.15' depth)	2.50 – 4.13
NovaChip®	3.50 – 4.00

While the preceding table compares asphalt bid prices (including material and placement costs) on a square yard basis, comparing asphalt types on a project cost basis may be more reasonable. The reason being that individual bid prices do not take into account traffic control, guardrail adjustments, edge mitigation, and utility adjustments, to name a few. For instance, there would be minimal traffic control or guardrail adjustments needed on a typical NovaChip® project.

Table 2 shows project costs comparing BST, NovaChip®, and HMA Class A or ½ inch Superpave. Table 2 shows that the project cost for NovaChip® falls between that of BST and ½ inch Superpave, but similar to a Class G overlay.

Table 2 – Range of WSDOT Asphalt Bid Prices for Rehabilitation Types (material and placement costs).

Rehabilitation Type <sup>1</sup>	Project Cost (\$/Lane Mile)	Project Cost (\$/Sq. Yd.)
BST	14,000	1.49
HMA (Class G – 0.08' depth)	50,000	5.33
NovaChip®	58,000	6.18
HMA (Class A ½ inch Superpave – 0.15' depth) <sup>1</sup>	90,000	9.59

<sup>1</sup>Based on a rural two-lane highway with two 12-foot lanes and 8-foot shoulders in each direction.

### Performance

In May 2003, after twenty-two months of performance, a review of the NovaChip® project was performed. While the overall surface is performing well, some cracks were reflecting through the NovaChip® overlay (Photos 12 and 13).



Photo 12 – Transverse crack reflecting through the NovaChip® overlay.



Photo 13 – NovaChip® in Soap Lake, May 2003.

The Soap Lake project has provided a valuable platform to evaluate the capabilities of this product. NovaChip® asphalt can be placed in one pass, with or without milling, and exhibits an excellent bond to the underlying surface, excellent adhesion (no chip loss), and good skid resistance. Nationwide research has shown that NovaChip® provides reduced rolling noise, and a reduction in hydroplaning and back spray from roadway moisture. Curbs and drainage profiles can be maintained with minimal clearance adjustments due to the thin finished lift.

WSDOT will evaluate the Soap Lake NovaChip® project on a yearly basis, at which time a final report will be written to document the NovaChip's® performance, life cycle costs, and implementation procedures (if applicable). Depending on future research and the resistance to studded tires, NovaChip® could be used as a surface treatment on higher volume routes such as interstate highways and arterials throughout Washington State. ▲

For more information or the complete construction report, contact Jeff S. Uhlmeier, WSDOT Materials Lab, at (360) 709-5485 or uhlmeij@wsdot.wa.gov.

# Street Maintenance Funding – Could a Street Utility be the Answer?

*Jim Seitz, Transportation Specialist,  
Association of Washington Cities*

Like many other United States' communities, the cities and towns in Washington State have experienced increasing difficulty in maintaining their street infrastructure system. With shrinking general fund budgets, many communities have unsuccessfully tried several traditional funding methods, such as street bonds, to address the deteriorating street system. For a variety of reasons, the voters have soundly rejected them. Upon analyzing the basic concerns expressed by voters and comparing it with their current street department organizations and administrations, some cities have concluded that the public would be better served if the street infrastructure were managed as a utility, similar to the water and sewer systems.

Of course, this is not a new idea. For example, the City of Seattle attempted to form a street utility, but it was found unconstitutional under Washington State law by the Washington State Supreme Court

(Covell vs. Seattle). To paraphrase the finding, the Seattle Street Utility was apparently structured as a "thinly veiled property tax." There was no real connection established between fee assessment and benefit derived. The tax was levied against parcels, not uses.

However, in some other states, street utilities are common. For example, in Oregon, the City of Tualatin has successfully implemented a street utility. Their utility was clearly established based upon anticipated street usage. Predicted vehicle trips were derived from nationally accepted standards as published by the International Transportation Engineers (ITE) trip generation tables and applied to property uses based upon relative size. This program has been functioning successfully for more than 10 years now. Following the establishment of the Tualatin Street Utility, several other Oregon communities implemented similar programs. For many of these communities, these programs have become a major revenue source for the street maintenance fund.

So what will it take to make street utilities a viable funding source for Washington communities? Many cities believe that the answer is new legislative authority. With the help of the Association of Washington Cities, cities and towns have formed a coalition in an effort to pass new legislation granting them the authority to form street utilities. In last year's legislative session, HB 1735 was introduced to provide cities this authority. Unfortunately, this bill did not pass, but it will be reintroduced in the 2004 legislative session. If passed in 2004 or a future legislative session, cities and towns in Washington State will, for the first time, have a dedicated revenue source for their street operations and maintenance. In the meantime, cities and towns need to continue to communicate to their citizens, in particular elected officials, their street maintenance needs, while at the same time maintaining this important infrastructure with a shrinking revenue base.



## Jack King and Gene Greenfield's Guardrail Repair Trailer Organizes Job

By Bob Brooks, WST2 Center  
Pavement Technology Engineer

Approximately seven years ago, Jack King and his Supervisor Gene Greenfield, both from the Washington State Department of Transportation's (WSDOT) Port Orchard Maintenance Office, devised a way to improve the efficiency of their guardrail repair activities. They designed and built a guardrail repair trailer that gathered in one convenient place all the necessary tools and equipment needed during guardrail repairs.

Prior to the development of this trailer, the four-person repair crew would gather the tools and supplies needed, load them onto a dump truck, and head out to the job site. Loading and unloading the dump truck, which took about one hour to complete on each end of the operation, required lifting heavy tools and supplies high up into the bed of the truck. This effort could cause injury to backs if not done properly. Invariably, once the repair crew arrived at the job site and started the repair operation, they would discover that they needed a tool that wasn't loaded onto the truck. Therefore, someone would be required to travel back to the maintenance yard to find, if lucky, the needed tool.

With the guardrail repair trailer, there is no more wasted time. The trailer is dedicated to just guardrail repairs and has been equipped with everything needed for that effort, both tools and supplies. At the end of each repair operation, the trailer is re-supplied, parked, and ready for the next time it is needed.



Jack King with Guardrail Trailer and Post Puller

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*The only major cost associated with the construction of the trailer was the purchase of a 14-foot double axle trailer for \$1,200.*

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The only major cost associated with the construction of the trailer was the purchase of a 14-foot double axle trailer for \$1,200. All the other racks and toolboxes came from materials on-hand in the yard. The only other significant cost that one might incur when building the trailer is the double compartment toolbox, which would add approximately \$350 to the cost. Jack King and Gene Greenfield also built a companion tool that accompanies the trailer:

a tripod device with a hand winch that is used for pulling old guardrail posts from the ground.

The completed trailer is equipped with a chain saw, a generator for powering drills and wrenches, an oxy-acetylene torch, an auger, a handy-man jack for jacking rail sections, hand tools, signs, fasteners,

guardrail posts, rail sections, and other assorted odds and ends that may be needed for a particular job. Additional racks have been constructed on the trailer to hold most of the tools and equipment in place.

The racks built to hold the guardrail sections can accommodate both straight and radius rail sections. The straight sections overlap in the rack and are held in place by pins that have been built into the racks. An additional rack section slides out and is used to store radius rail sections that extend down toward the bed of the trailer.

The oxy-acetylene torch is secured in-place by two collars that hold the bottles and prevent them from moving around when being transported. The bottles are equipped with safety guards that allow the gages to remain on the bottles at all times and have quick-disconnects for the hoses that make it a snap to attach and remove the torch.

The companion post puller was built to remove guardrail posts from the ground with a minimum of effort. The tool is designed as a tripod with adjustable legs so it can be setup over a post on uneven ground. A post spike was made by welding a  $\frac{5}{8}$ -inch diameter plow bolt to  $\frac{5}{8}$ -inch diameter round stock and welding fins to the round stock. The plow bolt was used because of its high strength and resistance to deforming when hit. The spike is driven into the post and attached to a  $1\frac{1}{2}$ -ton hand winch through the use of a bell from a cable choke. After attaching the spike to the hand winch and tripod, the post is lifted out of the ground by the ratcheting action of the winch. After removal, the post is cut off to about a 16-inch length and then split with an ax to remove the spike. The crew tried using a large screw bolt for removing posts but found it did not work as well, especially if the post was slightly split.

Over the years, the guardrail repair trailer has proven to be a very effective tool at improving the efficiency of guardrail repair operations and contributing to the safety of the crew by reducing the need for much of the high lifting that was previously needed.



*Post puller spike*



*Jack King and trailer-mounted toolbox*



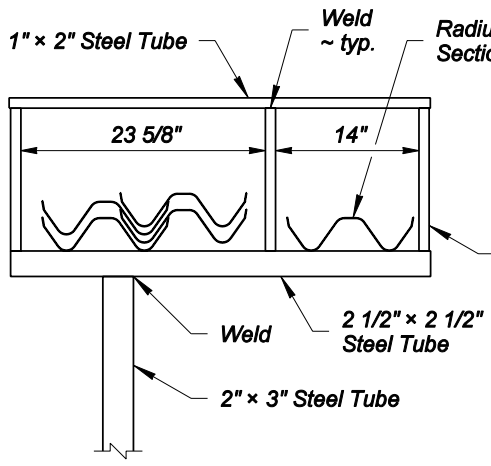
*Guardrail sections and posts*



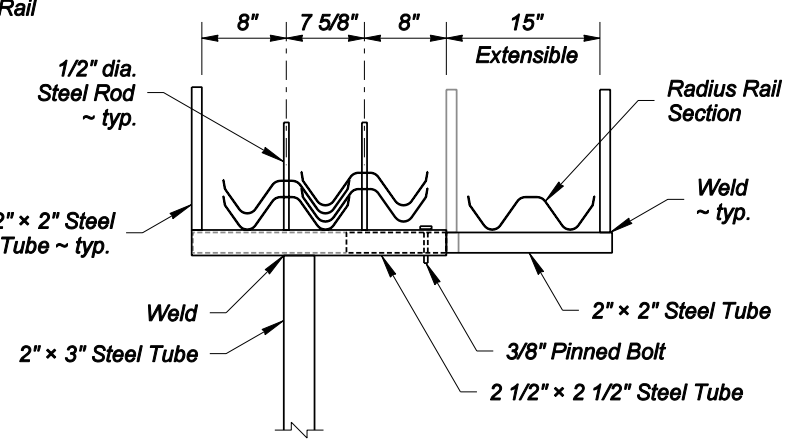
*Guardrail Post Puller*



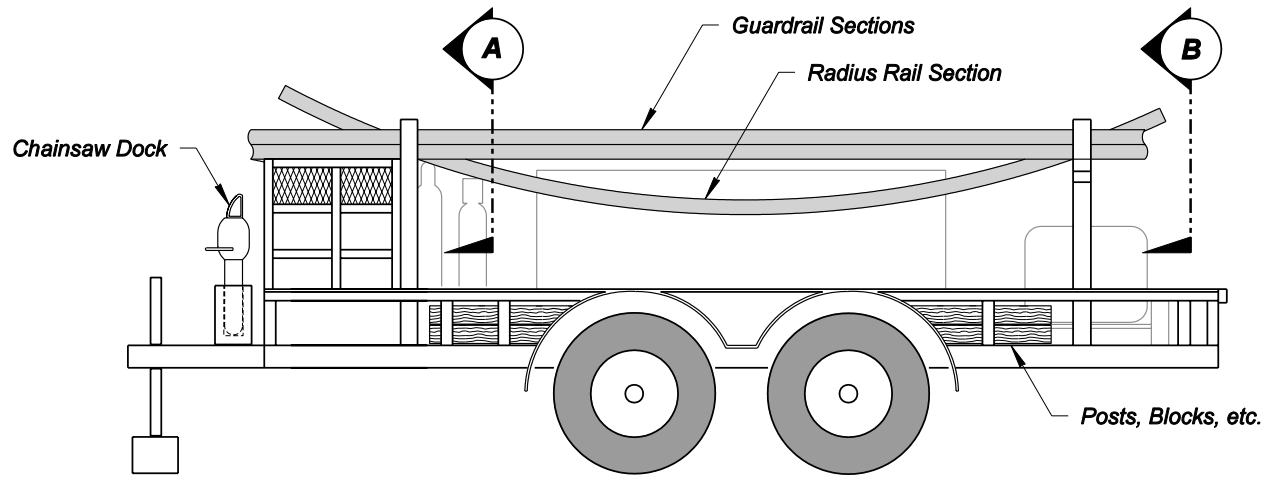
*Guardrail Trailer equipment shelving*



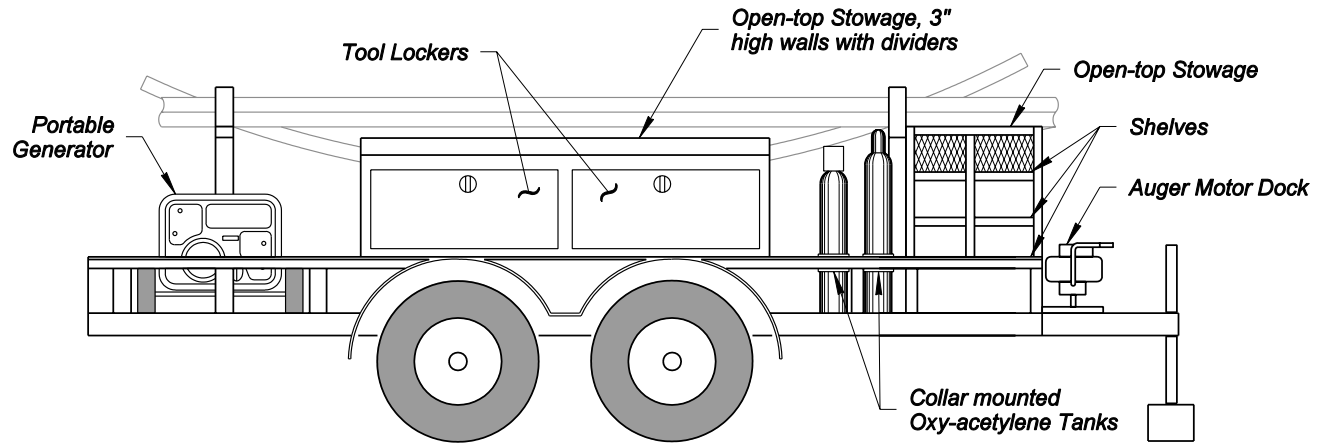
**Guardrail Rack Detail View A**



**Guardrail Rack Detail View B**

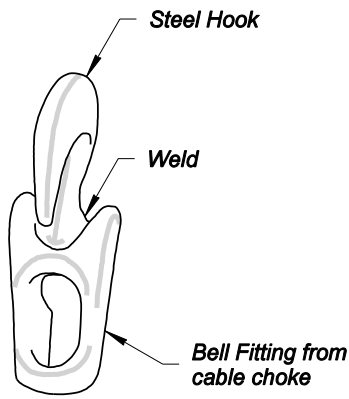


**Left Side**

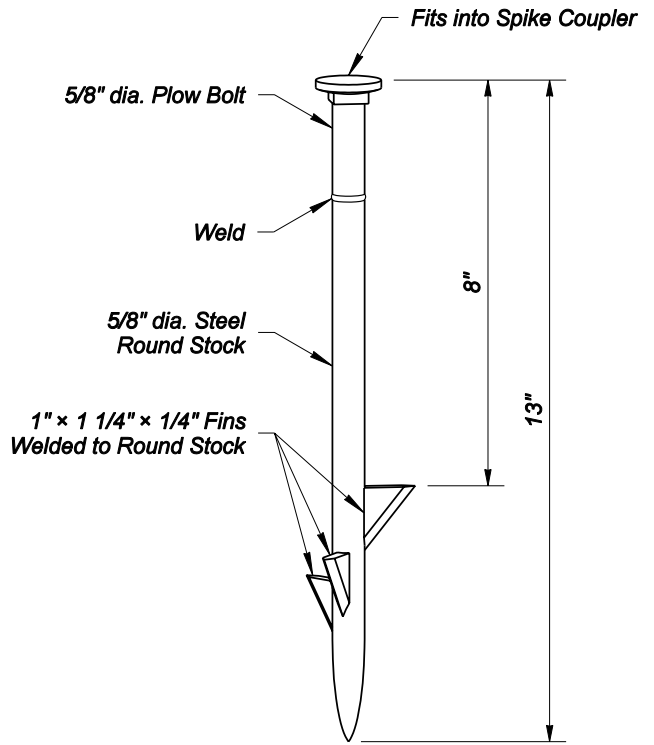


**Right Side**

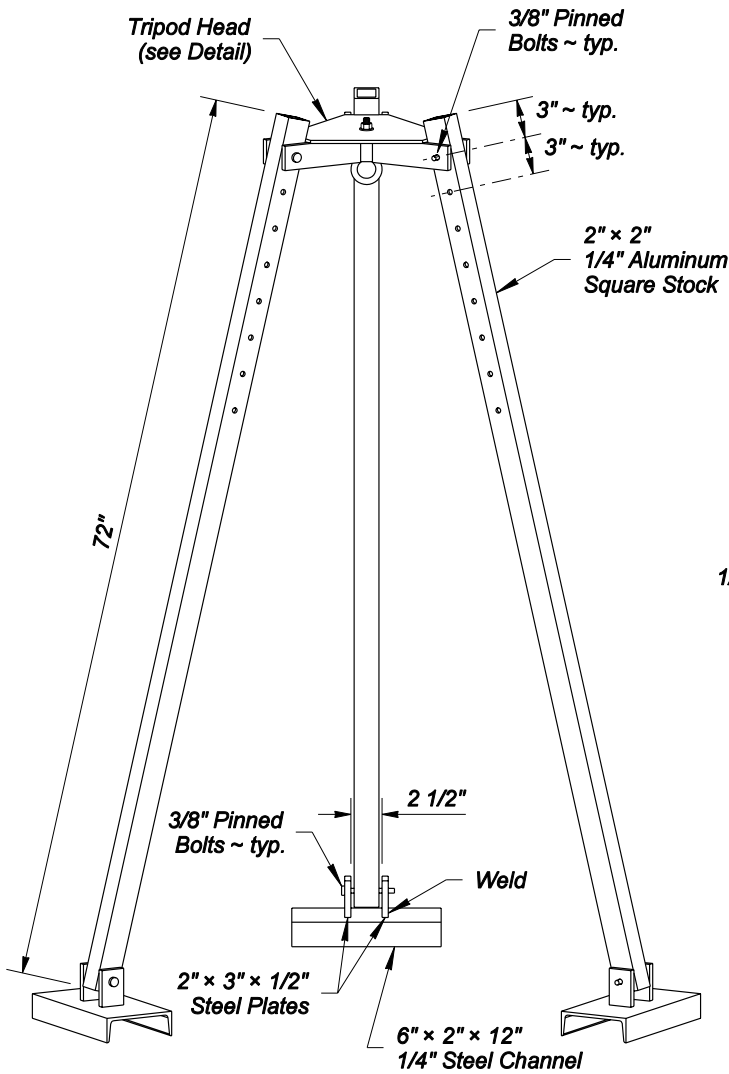
**Guardrail Repair Trailer**



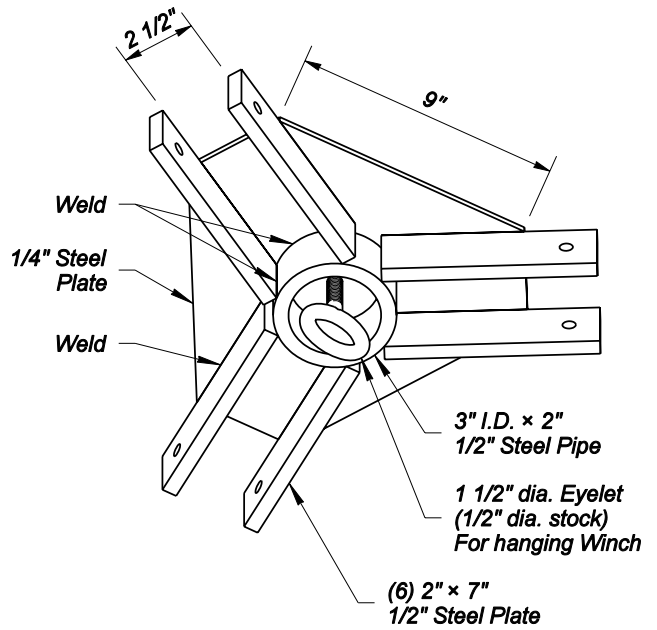
**Spike Coupler**  
For attaching Post Spike to Winch Chain



**Guardrail Post Spike**



**Assembled Tripod**



**Tripod Head Detail**  
Underside View

**Guardrail Post Puller**



*The  
 "Better Mousetrap"  
 is awarded each quarter  
 for the most innovative  
 working ideas presented  
 by a public agency and  
 published in WST2.*

**Award:**  
 The best concepts will be published in the WST2 and posted on the WST2 web page.

Published mousetraps will receive a "Better Mousetrap" baseball cap and certificate.

Published mousetraps will be included in competition for the annual "Crystal Mouse" award.

**Eligibility:**  
 Washington State Public Agencies

**Mail To:**  
 "Better Mousetrap"  
 WST2 Center/WSDOT  
 P.O. Box 47390  
 Olympia, WA 98504-7390

**E-mail:**  
 WST2Center@wsdot.wa.gov

**For questions:**  
 Larry Schofield, P.E.  
 Technology Transfer Engineer  
 schofil@wsdot.wa.gov  
 (360) 705-7380

# "Better Mousetrap" Submittal Form

Mousetrap Name: \_\_\_\_\_

Agency: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip+4 \_\_\_\_\_

Inventor's Name(s): \_\_\_\_\_

Phone Number: (     ) \_\_\_\_\_

Title: \_\_\_\_\_

E-mail Address: \_\_\_\_\_

Submitter's Name: \_\_\_\_\_

Phone Number: (     ) \_\_\_\_\_

E-mail Address: \_\_\_\_\_

## Description of the "Better Mousetrap"

Describe the situation before the invention: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Describe how it works: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

How was it built? (Include sketches, photos, drawings) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

How does it perform? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Please add a sketch with dimensions and materials used!  
 We will draw plans from them so others can build it too!

# Threatened Juvenile Salmon Get Scientific Assistance

Research has found that thousands of miles of essential juvenile salmon habitat are blocked by tens of thousands of culverts that lay beneath Pacific Northwest roadways. Many of these culverts, that for years have successfully channeled water under roadbeds, are acting as barriers to young salmon and preventing them from the upstream passage required for growth and development.

To find a more “fish friendly” design for future stream crossings and for the thousands of retrofits expected to be completed in coming years, the Washington State Department of Transportation (WSDOT), representing West Coast transportation agencies, has partnered with the U.S. Department of Energy, represented by the Pacific Northwest National Laboratory (PNNL), to design and install a culvert test bed in southwestern Washington. Battelle, located in Richland, Washington, operates PNNL for the U.S. Department of Energy.

“We’re blending the expertise of hydraulics engineers, mechanical engineers, statisticians, fish biologists, and fish behavior specialists to find a solution to a problem that faces the entire Northwest and has implications for culverts throughout the country,” said Walter Pearson, PNNL fish behaviorist and program manager.

The full-scale, one-of-a-kind culvert test bed system is located at the Washington Department of Fish and Wildlife Skookumchuck Hatchery near Tenino, Washington.

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*The system allows scientists to adjust and measure the hydraulic conditions – water velocity, turbulence, and depth – of various culvert designs being evaluated.*

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The system allows scientists to adjust and measure the hydraulic conditions – water velocity, turbulence, and depth – of various culvert designs being evaluated. By assessing different slopes and flow regimes, scientists can determine how these conditions influence fish behavior and the ability of the fish to pass through a variety of culvert designs being considered as retrofits.

“There are hundreds of possibilities for bed configurations,” Pearson said. “A particular design may stop passing fish at some flow rate or some slope, and that’s what we’ll be looking for. This will help us design stream crossings that accommodate fish in all life stages.”

The ability to quickly receive research results on these configurations is very appealing to transportation agencies. “Testing

culvert designs in a controlled setting will help us better understand how we can meet fish passage needs in a variety of conditions,” said Paul Wagner, from WSDOT’s Environmental Affairs Office. In coming years, tens of millions of dollars will be spent improving culvert fish passageways in Washington State alone.

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*The program will provide decision-makers scientifically sound data to retrofit existing culverts and develop better designs for new culvert installations.*

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Attempts to retrofit culverts are not new. Baffles, weirs, ladders, and other physical structures have been added to enhance fish passage over the years, but there is insufficient data to demonstrate the effectiveness of these efforts. The program will provide decision-makers scientifically sound data to retrofit existing culverts and develop better designs for new culvert installations. “Investing in this system provides WSDOT with improved scientific data to ensure

that we're spending money on solutions for fish passage that will work to provide long-term benefits to our environment," said Wagner.

A transportation consortium, which includes the states of California, Oregon, Washington, and Alaska and the Federal Highway Administration, pooled funds totaling \$1.16 million to contract with PNNL to conduct the first phase of a five-year, \$3.4 million interdisciplinary program. The Washington Department of Fish and Wildlife and Alaska Fish and Game are also part of the consortium. Scientists with extensive natural resources and hydraulics expertise were selected from PNNL's Marine Sciences Laboratory in Sequim, Wash., and from PNNL's Hydrology Group in Richland, Wash., to design, install, and operate the culvert test bed. PNNL recently completed installation of the test bed, has tested the mechanics of the device, and is currently testing water movement through the culvert.

Passage of juvenile salmon through culverts is a significant Endangered Species Act (ESA) issue for Pacific Northwest states. Scientists recognize fish passage, both upstream and downstream access to their habitat, is crucial for the rearing and feeding of young salmon. The test bed enables controlled experiments that will yield the behavioral and hydraulics data to address this ESA issue.



*For more information, news reports, and photographs, go to the WSDOT Research web site at <http://www.wsdot.wa.gov/Research/> and click "Project Could Aid Fish Passage."*

## New Improved Research Web Site

We are delighted to announce the launch of our new WSDOT Research web site. These informative and useful pages are the result of special labors by WSDOT Research Office staff and Web Communications staff, and we hope you'll find them valuable. Take a look and share these important agency resources with your groups, organizations, and others. So, grab your reading glasses and head off to the Research web site at:  
<http://www.wsdot.wa.gov/Research/>

At our new Research web site, you'll find easy access to:

- Research results and future research needs.
- Current research projects.
- Research funding.
- Search tools for national research projects and reports.
- Research partners.

Here you'll also find cool tools, staff recommended reading suggestions, links to the WSDOT Library, the New Products Committee, T2 Center, and federal research programs.

And it won't stop there. The Research web site will be growing, updating frequently, and is looking for other great features to add.



# WSDOT and FHWA Recognize “Excellence” in Local Agency Projects

The Awards of Excellence program is a collaborative effort between the Washington State Department of Transportation's (WSDOT) Highways & Local Programs Division (H&LP) and the Federal Highway Administration (FHWA) to formally recognize local agency projects that have achieved excellence in construction, innovative design, environmental compatibility, and public involvement and satisfaction. The award categories are Best City Project, Best County Project, Best Enhancement Project, and Best Special Project (this year, two very distinct projects were chosen in this category). Following are winners of the 2003 Awards of Excellence.

### **Best City Project: Port Townsend's F Street Improvement Project**



The F Street project brings a great transportation improvement to the City of Port Townsend that its citizens can be proud of. The overriding goal of the F Street Improvement Project was to improve traffic mobility and safety through the residential areas, while maintaining the character of the surrounding neighborhoods. Several traffic-calming measures were incorporated into the project, including meandering

the roadway where possible, 5-foot islands in straighter sections of the road, and two speed tables designed for 25 mph. Safety enhancements for pedestrians and bicyclists were accomplished by narrowing intersections and crossing distances, an in-pavement lighted crosswalk at a high school crossing, bicycle travel lanes and signage, and controlled street and driveway access.

Funding sources for the F Street Improvement Project included approximately \$1 million in local funds, \$594,882 in federal funds administered through H&LP, and \$1.3 million in Transportation Improvement Board funds.

For more information about this project, contact Ken Clow, City of Port Townsend Public Works Director, at (360) 385-7212.

### **Best County Project: Kitsap County's NE West Kingston Road**



The NE West Kingston Road project brings a community friendly transportation improvement to Kingston. It began with three governing principles: improving traffic circulation and vehicle safety; improving bicycle and pedestrian safety; and improving multi-modal transportation between rural areas

and the public port, ferry, and transit facilities in the urban and commercial areas of Kingston. The project included improvements to both rural and urban road cross-sections. The rural cross-section consisted of widened paved shoulders for pedestrians and bicyclists. The urban cross-section incorporated designated bicycle lanes, a sidewalk separated from the roadway by a landscaped strip, security lighting next to the sidewalk, and closed storm-water conveyance systems where none previously existed. With an increased number of school-aged children using this roadway (three schools access NE West Kingston Road), these improvements provided safer facilities for pedestrians, bicyclists, and vehicles.

Funding sources included approximately \$4.7 million in local funds and \$1.2 million in federal funds administered through H&LP.

For more information about the NE West Kingston Road project, contact Randy Casteel, Kitsap County Public Works Director, at (360) 337-5777.

### **Best Enhancement Project: Raymond's Northwest Carriage Museum**



The Northwest Carriage Museum houses a very unique bit of transportation history and will

be a centerpiece of the City of Raymond, not only for residents, but for tourists as well. The project began with Gary and Cec Dennis donating their collection of 22 horseless carriages to the City of Raymond. Citizens of Raymond formed the Northwest Carriage Museum Association and began planning and extensive fund-raising, culminating in an amazing array of funding partners. Six government agencies with eight different grants, one private corporation, and five foundations were involved in funding the project. It is very uncommon to have 20 different funding sources in a federal aid project! The museum building was designed to blend with the nearby Willapa Seaport Museum and the waterfront. The project is sited on a reclaimed rail corridor owned by Washington State Parks and is in use as a recreation/trail area.

Funding sources included approximately \$312,000 in local funds and \$288,000 in federal funds.

For more information about the NW Carriage Museum, please contact Rebecca Chaffee, Raymond Public Works Director, at (360) 942-3451.

**Best Special Project:  
Tacoma's Chihuly Bridge  
of Glass**



The Chihuly Bridge of Glass is destined to become world famous. The innovative design of this project created a grand entrance

into newly revitalized downtown Tacoma. The bridge exhibits glass art in the "Seaform Pavilion," "Crystal Towers," and "Venetian Wall." The project began as a partnership between Tacoma native and world-renowned artist Dale Chihuly, the City of Tacoma, and the Museum of Glass. The pedestrian bridge spans the I-705 freeway and the Burlington Northern Santa Fe West Coast main line tracks, and it serves as a safe pedestrian hub linking together several districts, public facilities, and Tacoma's waterfront. The project plays a strategic role in building community livability with centralized growth, residences, recreation, commerce, and enhanced non-motorized transportation.

Funding sources for the Chihuly Bridge of Glass project included approximately \$4.7 million in local funds and \$1.7 million in federal funds.

For more information about the project, contact William Pugh, Tacoma Public Works Director, at (253) 591-5525.

**Best Special Project:  
Port of Longview's  
Fibre Way Overpass**



A brand new plastic highway solves a major transportation problem for the Port of Longview. The grain trains entering the Port are a significant economic factor for Longview and the state of

Washington. Delaying the trains and traffic around the Port area results in extra cost and lost profits. The trains crossed SR 432 twice and California Way once. Each train blocked the crossings coming into and leaving the Port. These blockages lasted up to 10 minutes and took up to 45 minutes for traffic to clear. Also, when the trains blocked the crossings simultaneously, the Port was cutoff from all emergency services. To solve this enormous problem, the Port assembled a team of consultants to evaluate the situation and provide a conceptual design for a new rail corridor. As a result, the Fibre Way Overpass/ Alternate Rail Corridor project was developed. Both the overpass and the new rail corridor will eliminate a majority of train crossings, which will in turn, eliminate the potential for train-vehicle accidents.

A major challenge of the Fibre Way Overpass project was that the site could not tolerate settlement. The solution was to use a geofoam (a type of plastic insulation material) fill for the bridge approaches. The concept behind the geofoam fill was to calculate the weight of the fill, excavate an equivalent weight of existing material from the bridge approaches, and then construct the geofoam fill. The result was a fill with no added weight. To date, there has been no settlement in the bridge fills.

Funding sources for the Fibre Way Overpass included \$2.7 million in local funds, \$2.4 million in federal funds administered through H&LP, \$2 million in Transportation Improvement Board funds, and \$2.8 million in Freight Mobility Strategic Investment Board funds.

For more information about this project, contact Norm Krehbiel, Port of Longview Director of Facilities & Engineering, at (360) 425-3305.

# Partnership Success: The I-405 Bellevue Direct Access NE 8th Project

*By Dave Becher, WSDOT Access Downtown Construction Project Engineer and Laura Johnson, WSDOT Access Downtown Communications Specialist*

NE 8th is the main east/west arterial connecting Bellevue on either side of I-405. It carries tens of thousands of vehicles a day to and from the downtown Bellevue business district. To provide room on I-405 for a new direct access HOV ramp at NE 6th, the existing NE 8th bridge had to be removed and replaced.

This project is part of a \$164 million dollar package of projects called Access Downtown, designed to improve access to and from I-405 in Bellevue. The cornerstone of this package is a new direct access HOV ramp at NE 6th in Bellevue, which will provide improved access to downtown Bellevue and the newly completed Bellevue Transit Center. Access Downtown is a partnership between Sound Transit, the Washington State Department of Transportation (WSDOT), the City of Bellevue, King Country Metro, the Federal Highway Administration, and the Transportation Improvement Board.

## Design

During Access Downtown's initial planning stages, designers struggled with how to replace the NE 8th structure while maintaining traffic capacity on NE 8th during construction. Conventional construction staging (either complete demolition/replacement or staged construction with half the bridge removed and replaced at a time) was deemed unacceptable because of the potential to

cripple both east/west traffic as well as business operations in Bellevue.

The design consultant for this project, HDR Inc., devised an ingenious staging method to build the new bridge while keeping NE 8th open to both eastbound and westbound traffic. The design strategy involved building the permanent south half of the bridge in a temporary location to the south of the existing NE 8th structure.

The construction staging was developed as follows:

- **Stage 1** – Build the permanent south half of the new bridge on temporary piers just to the south of the existing bridge.
- **Stage 2** – Shift the eastbound lanes of traffic onto the new south half bridge while shifting westbound lanes onto the south half of the existing bridge. Once the traffic shift is completed, demolish the north half of the existing bridge.
- **Stage 3** – Build the permanent north half bridge in the same location where the old north half bridge was just demolished. Once the north half bridge is complete, shift westbound traffic onto the new north half bridge. Once this traffic shift is completed, demolish the remaining section of the existing bridge.
- **Stage 4** – Build the new permanent piers for the south half of the permanent structure in the location recently occupied by the old south half bridge. Once the permanent piers are complete, jack the south half

of the bridge off its temporary piers and onto Hilman rollers. Relocate this south half bridge approximately 64 feet to the north to its permanent location.



*Summer 2002. The NE 8th interchange with the old bridge. Construction was beginning on the new south half.*



*Late 2002/early 2003. The new south half of the bridge is on the left; the old south half is on the right. The old north half has been demolished and construction is underway on the new north half.*



Summer 2003. Both halves of the new bridge with the gap in between, where the old south half was demolished. The new south half (on the left) will be rolled across the gap.



Eastbound traffic (on the left) jogs over to the south half of the bridge; after the south half is relocated, traffic will flow smoothly straight through.

## Construction

The design and staging of this project allowed the new bridge to be built with a minimum of disruption to the motoring public. Full I-405 closures as well as lane and ramp closures were limited to nighttime operations and several weekend windows (for traffic shifts and bridge relocation), except for three specific periods when I-405 HOV lanes were closed 24 hours a day for construction operations. Lane and roadway closures within the City of Bellevue were limited to non-peak hours, nights, and select weekend windows.

	Old NE 8th Structure	New NE 8th Structure
Bridge Piers	7	3
Length of Bridge	292.5 feet	328 feet
Width of Bridge	103 feet	121.5 feet
Lane Configuration	3 lanes eastbound 3 lanes westbound	4 lanes eastbound 4 lanes westbound

The new bridge abutments are moved further to the east and west to allow for the additional HOV lanes that will exit and enter the NE 6th direct access ramp and for future widening of I-405 (room for one lane in each direction of I-405). In addition, the new NE 8th bridge was built approximately 3 feet higher to provide clearance for the new approach ramps to the NE 6th ramp.

Construction Information	
Contractor	Atkinson Construction
Dollar Value of Construction Contract	\$13,904,236 (includes sales tax)
Contract Working Days	418 days (later reduced to 398 days)
Start Date	June 2002
Expected Completion	November 2003

The partners have been fortunate that the contractor, Atkinson Construction, is a very experienced, professional, and responsive contractor willing to work with the State and the City to modify traffic control operations, work operations, and re-stage work to help minimize impacts to the public. Atkinson devised alternate work methods to improve the project. Several examples of their innovative approach to building this project are:

- **Pier 2 Construction** – Redesigned the temporary pier 2 footing and also developed an innovative shoring system, which allowed the contractor to eliminate nine days of 24 hr / day total I-405 HOV lane closures.
- **Girder Placement** – By using careful planning, staging, and advance preparatory work, the contractor was able to erect 18 steel plate girders in 2002 and 15 steel plate girders in 2003 with only six total I-405 nighttime roadway closures. It was expected that at least eight total I-405 roadway closures would be required.

■ **Demolition of the North Half Structure** – Atkinson worked with WSDOT and the City of Bellevue to alter the method of demolition for the north half of the existing NE 8th structure. By changing the demolition method, the number of working days was reduced by a month.

■ **Weekend Traffic Shifts** – Atkinson worked closely with WSDOT and the City of Bellevue to modify the schedule for the traffic shifts associated with some of the construction to allow for more access across NE 8th.

The project partners also provided incentives in the project to encourage the contractor to devise a better way to build the foundation of the new bridge in the median of I-405 and shorten the HOV closures. These incentives were extremely successful. The contractor was able to reduce the number of days of total HOV closure from the allowed 29 days of round-the-clock closures (24 hours/day) to 10 days. The huge success of the incentives in this project to reduce impacts to the public resulted in an increase in the incentives offered on the next phase of the Access Downtown project.

## Communication

A project of this complexity and potential for traffic disruption requires constant communication between all parties to ensure information is properly disseminated, so that those involved can make well-informed, prompt decisions. Weekly meetings occurred between WSDOT, the contractor, the City of Bellevue, and transit agencies, and WSDOT staff meets daily with the contractor and the City.

Of course, the group most impacted by the traffic issues on this project is the traveling public. The project partners (particularly Sound Transit, City of Bellevue, and WSDOT) made the decision early in the design stages to commit significant resources to the project to ensure that the public was kept informed of the on-going construction and potential traffic impacts.

A web site was created for the Access Downtown projects ([www.AccessDowntown.com](http://www.AccessDowntown.com)). Portable changeable message signs have been used extensively to alert motorists to ramp and roadway closures. In addition, WSDOT's permanent variable message signs on I-405, I-90, and I-5 and highway advisory radio have been used to provide construction closure information to the public. The project partners have also devoted resources to direct mailings, newspaper inserts, radio advertising, and other community outreach efforts to reach the largest possible audience.

To date, the results have been impressive. The number of complaints for a project of this size and complexity has been minimal, whether the complaints are about noise impacts, traffic congestion, or impacts to business operations in Bellevue. The local business community has been generally very supportive of the work, and community and political leaders have expressed their satisfaction with the construction operations associated with this project.

## Success

The NE 8th project (at the time of this writing in early September) is 85 percent complete and ahead of schedule. Final completion is anticipated by Thanksgiving 2003, two to three months earlier than originally planned. The project is also tracking on budget.

The success of this project proves that it is possible for a multi-agency project to move from a conceptual plan into a final design that is built on time and within budget, while limiting traffic impacts to the public. The key to success on a project of this magnitude is the willingness of the project partners and the contractor to work together to identify and resolve potential problems as quickly as possible.



*For more information about the NE 8th project and the other Access Downtown projects, visit the web site at: <http://www.AccessDowntown.com>.*



By John W. Carpita, P.E., Public Works Consultant, Municipal Research & Services Center (MRSC)

Almost all local government agencies in Washington must go out for competitive bids for public works projects estimated to cost over \$200,000, although some agencies may have a lower threshold, either by statute or agency policy. Beginning with the presumption that the agency has a really good set of contract documents, it must follow certain procedures:

- Advertise and give proper notice.
- Identify the responsive and responsible bidder with the lowest price after the bids are opened.
- Enter into a contract with that firm.

Over the years, MRSC has developed a number of resources for cities and counties that—with proper reference to enabling statutes—can be adapted to other agencies. Chief among these are *The Bidding Book for Washington Cities and Towns* and *The County*

## Got Them Old Bidding and Bonding Blues?

*Bidding Book*, which are available in paperback and can be downloaded from the MRSC web site at <http://www.mrsc.org/>. As these publications are readily available and offer considerable detail about the bidding process, the remainder of this article is devoted to Q&A about “hot button” issues that agencies seem to ask about year after year.

### Do agencies always have to advertise in their official newspaper?

Generally, notice that bids will be accepted and of contract documents availability is to be published once at least 13 days before the bid date in the official or legal newspaper. However, this is not a global statutory provision and each agency must follow its specific statutory provisions. For example, Code cities over 20,000 have no specific statutory notice requirements, while Code cities under 20,000 (and 2nd Class cities) must provide 13 days notice “in the official newspaper, or a newspaper of general circulation most likely to bring responsive bids.” In counties, 13 days notice must be given in the county’s official newspaper and “also be published in a legal newspaper of general circulation in or as near as possible to that part of the county in which such work is to be done. If the county official newspaper is a newspaper of general circulation covering at least forty percent of the residences in that part of the county

in which such public works are to be done, then the publication of an advertisement of the applicable specifications in the county official newspaper is sufficient.”

### Can agencies make it mandatory that contractors attend a pre-bid meeting?

In its advertisement, an agency may “strongly urge” all bidders to attend such a meeting. The agency may feel, for example, that in order to make a responsible bid that meets all the specifications, contractors must make a field visit to the site. However, that is a contractor’s choice. He or she may still bid on the project without making the field visit. Additionally, the agency might lose a potentially low bidder because the bidder could not attend the pre-bid meeting.

### What about alternate bids?

If an agency wants to call for additive and/or deductible bids, it must make sure that the contract documents properly address this issue. Bidders should submit a base bid for the project. The specifications should clearly indicate that the city reserves the right to accept the base bid or to increase or reduce the scope of the project as necessary to fit the agency’s budget. Also clearly stated should be the order in which the additive and/or deductibles will be exercised. An agency may not choose a contractor and then negotiate the additive and/or deductibles.

### **May an agency prequalify bidders?**

Although some statutes applicable to state agencies require or allow prequalification on certain kinds of projects, there are no such statutes that directly authorize its use by most local municipalities. The *2002 Standard Specifications for Road, Bridge, and Municipal Construction*, Section 1-02.1 (including the APWA Supplement provision), authorizes a prequalification procedure. This would not, however, provide sufficient authority for an agency to use this procedure without enabling statutes, except those agencies with broad home rule authority.

### **May agencies accept bids by fax or electronically?**

Enabling statutes usually require an agency to receive "sealed" bids. Obviously, if a bid comes directly to the agency by fax or electronic means, it is not sealed. However, society is in a transition phase concerning accepted methods for transmitting documents. Just as some courts now allow the filing of legal documents to be done by fax, there is little reason to doubt that alternative methods for transferring bid documents will become legally acceptable in the future. Until fax or other electronic transfer of bid documents is statutorily permitted or judicially authorized, it is advisable to require a means of transfer that does not jeopardize the privacy of bid documents or allow any dispute concerning the authenticity of bid documents.

### **Must a bid opening occur at a council or commission meeting?**

No. Bids must be opened in public at the time and place given in the advertisement, but they do not have to be opened at a council/commission meeting and no council/commission members need be present at the bid opening.

### **Does a contractor have to provide a list of subcontractors at the time of bid opening?**

RCW 39.30.060, the subcontracting statute, was amended in 2002. Every invitation to bid on a prime contract expected to cost \$1 million or more must require each prime contractor to submit, as part of the bid or within an hour after the published bid submittal time, the names of the subcontractors who will perform HVAC (heating, ventilation, and air conditioning), plumbing, and electrical work, or to name itself for the subcontracted work. The prime contractor cannot list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the prime contractor must indicate which subcontractor will be used for which alternate. Failure of the prime contractor to submit the names of the subcontractors, to name itself to perform the work, or to name two or more subcontractors to perform the same work shall render the prime contractor's bid non-responsive and, therefore, void. The legislature's intent is stated as "This act is intended to discourage bid shopping and bid peddling on Washington State's public building and works projects."

### **Is there a new statute that governs bid protests?**

Yes. ESHB 2056 – Public Works Bidding (effective July 27, 2003) prohibits a municipality that receives a written protest from a public works bidder from awarding the contract without at least two full business days' notice. It also says that a low bidder who claims error and fails to enter into a contract cannot bid on the same project again if a second or subsequent call for bids is made.



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# Rock and Roll Moments

## Bidding Blues Question #1

"Big Mama" Thornton, City Clerk, is wailing the blues because the City's Big Street construction project was not advertised in the Tekoa Times. Instead, the project was advertised in that big city paper, the Daily Journal of Commerce. Did Ms. Thornton break the law by not advertising in the city's legal newspaper?

RCW 35.23.352, which applies to Code cities under 20,000, 2nd Class cities, and towns, states: "The notice shall be published in the official newspaper, or a newspaper of general circulation most likely to bring responsive bids, at least thirteen days prior to the last date upon which bids will be received." Requirements for larger cities and non-city agencies are different.

## Bidding Blues Question #2

Sumas just opened bids for its Mud Waters Treatment Plant. All the bids came in over the amount that the city has budgeted for the project. Does that make the bids non-responsive so that the city can negotiate with the bidders? What if none of the bidders acknowledged the addenda?

Bids that are higher than the city's budget are not non-responsive bids. If none of the bidders acknowledged the addenda, then it is possible that the city could declare all the bids non-responsive and invoke RCW 35.23.352, which states: "If no bid is received on the first call, the council or commission may re-advertise and make a second call or may enter into a contract without any further call or may purchase the supplies, material or equipment and perform the work or improvement by day labor." Requirements for larger cities and non-city agencies may be different.



## Bonding Blues Question #1

Berry and Berry Construction has asked your agency to accept a letter of credit, escrow account, or cash deposit instead of a performance bond for a \$100,000 public works contract. Do you tell him "sure" or to "Roll Over Beethoven"?

RCW 30.08.010 states explicitly that a contractor's bond, covering both performance and payment, is required and does not list any alternatives. "... shall require the person or persons with whom such contract is made to make, execute, and deliver to such board, council, commission, trustees, or body a good and sufficient bond, with a surety company as surety ..."

## Bonding Blues Question #2

Bluesville wants to contract with J.B. Hutt, Ltd. (not to be confused with Jabba the Hutt of Star Wars fame) to build a gazebo estimated to cost \$32,750. As J.B. has done great work for the city before, you want to waive bonding and retainage requirements. Can you? If so, under what circumstances?

If the estimated project cost is less than \$35,000, an agency can use the limited public works projects procedures in RCW 39.04.155(3). "... For limited public works projects, a state agency or authorized local government shall solicit electronic or written quotations from a minimum of three contractors from the appropriate small works roster and shall award the contract to the lowest responsible bidder as defined under RCW 43.19.1911 ... may waive the payment and performance bond requirements ... thereby assuming the liability for the contractor's nonpayment of laborers, mechanics, subcontractors, materialmen, suppliers, and taxes imposed under Title 82 RCW that may be due from the contractor for the limited public works project, however the state agency or authorized local government shall have the right of recovery against the contractor for any payments made on the contractor's behalf."



# Words from the Chair



A couple of issues back, I discussed the evolution of pavement management in Washington State. This issue is devoted to discussing pavement management in Idaho and Oregon, our NWPMA partners. I would like to thank George Alton, of Ada County Highway District, Idaho, and Joel Conder, of Marion County, Oregon, for their contributions to this column.

In Idaho, pavement management has been practiced for 15 years. Ada County, Madison County, Nampa Highway District, and Coeur d'Alene have been the most active in the state for pavement management. The Ada County Highway District (<http://www.achd.ada.id.us>) has had a system in place since 1987. The Highway District is somewhat unique in that it encompasses the entire county including cities. Madison County implemented a pavement management system in 2001. Nampa Highway District has investigated consultant services for its pavement management program.

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*The Ada County  
Highway District  
improves 150-250  
miles of surface  
each year using  
chipseals, slurry seals,  
and overlays.*

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Ada County has 1,850 miles of paved surface and adds about 30-40 miles per year in new subdivisions and added lanes. About 600-700 miles are inspected each year. The Ada County Highway District improves 150-250 miles of surface each year using chipseals, slurry seals, and overlays. Over the past 7 years, the overall condition of the roads has improved from an average PCI of 75 to 88. The District used a 9-year maintenance rotation, which allows them to seal, overlay, and improve

all roads in the county over this period of time. The first rotation will be completed in 2004.

After attending meetings for a number of years, the Ada County Highway District has been an active member of NWPMA since 1997. Madison County has been an active and enthusiastic member since 2001. Ada County and Madison County are working with their counterparts to become more active in the association.

In Oregon, the 90s saw a major effort at implementing pavement management. In the early 1990s, the Oregon Association of County Engineers and Surveyors (OACES) realized that there was a need to secure more funding for street maintenance and rehabilitation. They also realized that they could convey their needs to the legislature more effectively using consistent and quantifiable data. It was decided to implement a statewide pavement management program for all the counties in Oregon. As anyone might imagine, this was a daunting task.

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*A total of 28 counties, 25 cities, the City of Portland Water Bureau, the entire Oregon State Parks system, and the US National Forest Service received assistance in pavement management implementation.*

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In the spring of 1994, the OACES group looked to the Marion County Public Works staff to lead this effort. At this time, Marion County was the only county in the state that was using the software selected for the implementation and seemed best suited to lead this effort. Marion County staff began the process of implementing pavement management programs at other Oregon counties. By the spring of 1997, the pavement management program was implemented in 13 counties. In addition, a number of Oregon cities also saw the benefits of a consistent method of reporting needs to the legislature. By 1997, Marion County staff had implemented pavement management programs in six Oregon cities. The statewide pavement management implementation project was concluded two and a half years later. A total of 28 counties, 25 cities, the City of Portland Water Bureau, the entire Oregon State Parks system, and the US National Forest Service received assistance in pavement management imple-

mentation. Two 2-person crews performed all of the necessary fieldwork within 5 years, 1994-1999. The field work consisted of identifying which roads are to be included in the study, segmenting them into proper manageable sections, researching construction data on each road, and physically inspecting roads to determine their condition. The conclusion of the fieldwork included installing software for entering the field data, producing the first set of reports, and many hours of training staff on how to use the pavement management system program.

As a result of this intensive statewide pavement study, the Association of Oregon Counties (AOC) now had, for the first time, an accurate and up to date inventory of pavement conditions covering over 90 percent of all paved county roads throughout Oregon. Counties could predict immediate and future funding needs individually and collectively. This quantitative analysis replaced the previous guesswork and speculation. The AOC staff compiled this information and used it to successfully lobby a 5-cent gas tax increase with the state legislature. Voters in Oregon later rejected this increase. Regardless of the funding outcome, for the first time county road departments were looking at their maintenance and rehabilitation practices. The program demonstrated that "because we have always done it that way," did not mean it was still the best and most cost effective way to do it.

NWPMA has benefited from the participation of Idaho and Oregon. I hope that in the future there will be a continued strong partnership among the pavement managers in Washington, Oregon, and Idaho. If you have any comments, please e-mail me at [bill.whitcomb@ci.vancouver.wa.us](mailto:bill.whitcomb@ci.vancouver.wa.us).



*Bill Whitcomb*  
Chairman, NWPMA  
City of Vancouver, Washington



# News from FHWA Washington Division

By Liana Liu, P.E., Traffic/Safety/  
Research/T2 Engineer, FHWA  
Washington Division

## FHWA Releases 2003 Version of Highway Safety Tool for Rural Roads

The Federal Highway Administration (FHWA) released the 2003 version of the Interactive Highway Safety Design Model (IHSDM), a new computer software program to help improve safety by providing state and local transportation officials with better information on the effects of design decisions they make for two-lane rural roads.

In the 2003 version of the software, planners can evaluate the safety of two-lane rural highways through five modules:

- **Policy Review** – to ensure roadway design elements, such as cross section, lane, and curve design are in compliance with guidelines.
- **Crash Prediction** – to estimate the number and severity of crashes on specified roadway segments.

- **Design Consistency** – to assess driver speed behavior in relation to specific design features.
- **Intersection Review** – to identify potential safety concerns in intersection geometric design and suggest possible remedies.
- **Traffic Analysis** – to evaluate roadway traffic operations under current or projected traffic loads through simulation.

The 2003 release of the IHSDM software can be downloaded free of charge at <http://www.tfhrf.gov/safety/ihsdm/ihsdm.htm>.

## Road Safety Audits

Road Safety Audits is a process wherein a team of independent experts identifies unsafe roadway conditions during project design or on existing roads. See the report of the International Scanning Team at <http://www.international.fhwa.dot.gov/pubs.cfm> and at <http://www.roadwaysafetyaudits.org>. A training course has been developed and is now available for scheduling. The National Highway Institute contact for scheduling is Danielle Mathis-Lee, (703) 235-0528.



*Inspection Robot was displayed at WFLHD's Technology Day in May 2003*

## Inspection Robot

The FHWA Western Federal Lands Highway Division (WFLHD) in Vancouver, Washington, invented an inspection robot for culvert and down-hole application. The device can be used for horizontal culvert, down-hole, or under drain inspections. The size of a hole can be as small as 6 inches. The device can be used for structure inspections as well.

The inspection robot will be demonstrated at the 2004 Washington State Transportation Technology Expo in Moses Lake, Wash., on May 18 and 19, 2004.

▲  
*For detail information about the device, please contact Victoria Peters at (360) 619-7754.*

# Internet Viruses, Hoaxes, and Myths

*Jennifer Boteler, WSDOT Librarian*

WARNING!! Virus Alert!

URGENT! and Confidential

This is serious...Do not delete...Pass it On

Practically every time you turn on your computer, there is some type of dire warning coming to you via e-mail. How do you know which warnings are legitimate and which ones are hoaxes? There are other types of stories, news items, petitions, and rumors perpetrated through e-mail as well. How do you sort fact from fiction?

Many of these fictitious stories are referred to as urban legends (even though they don't fall under the true definition of an "urban legend"). There are several types of urban legends and hoaxes circulating through the Internet.

**Help defeat this legislation.** These hoaxes describe pending legislation or rule-making requiring immediate citizen action. For example, an atheist organization has been granted a hearing by the FCC to get religious broadcasting banned, or, under proposed legislation, the U.S. Postal Service will charge a 5-cent surcharge for every e-mail sent over the Internet.

**Chain letters.** These e-mails ask recipients to send cards or e-mail messages to a terminally ill child, or claim that some national charity will donate funds to heart or cancer research for every e-mail forwarded to the charity.

**Freebies.** You will receive gift certificates, prizes, free merchandise, or trips from companies if you forward these e-mails to a certain number of people.

**Get rich schemes.** A Nigerian businessman has a large sum of money he needs to deposit in a foreign bank account and is seeking a "reliable foreign partner." For your assistance, you will receive a hefty percentage of the money.

**Health related.** Shipments of bananas from Costa Rica are infected with necrotizing fasciitis (flesh-eating bacteria). Ingestion of the artificial sweetener aspartame is causing an epidemic of multiple sclerosis and systemic lupus.

**Safety related.** Cell phones can cause explosions at gas stations. A large number of UPS uniforms have turned up missing and may be used by unauthorized persons to make dangerous deliveries.

**Computer viruses.** Jdbgmgr.exe file hoax. This hoax encourages you to delete a legitimate Windows file from your computer. It's also called the teddy bear virus because the Windows Jdbgmgr.exe file has a teddy bear icon. The Good Times hoax informs readers not to open any e-mail message with the term "good times" in the header. If they do, supposedly, it will infect their files or reformat their hard drives.

**Moral indignation.** Certain oil companies import a lot of Middle Eastern oil thereby funding terrorists; readers are encouraged to boycott these franchised gas stations. U.S. Congressmen have special retirement plans and receive lavish retirement benefits even though they don't contribute to Social Security.

For the sake of this discussion, I will only address the types of messages most likely to be received in the workplace. These are usually warnings associated with computer viruses or health and safety issues.

When you receive any warning, consider the source. Remember, headers and signatures can be forged. Just because there is a signature block at the bottom doesn't mean that the person actually exists or that the e-mail originated with them. If you know the individual who sent you the e-mail, try contacting the person and ask if the warning is true. Do not respond to spam or to e-mails from people you do not know.

Do not forward or circulate warnings without first checking with an authoritative source. If it is a warning about a computer virus, you should check with your computer system administrator, information technology staff, antivirus vendor company (most have a web page containing information about known viruses and hoaxes<sup>1</sup>), or your Internet service provider.

If it is a health or safety warning, check with the experts. For example, the National Library of Medicine has a searchable database listing what is in household products and potential health effects.<sup>2</sup> The Centers for Disease Control has a web page devoted to health-related hoaxes and rumors.<sup>3</sup> If the hoax involves a name brand product or fast food chain, call the company's customer relations number.

There are several good web sites that debunk hoaxes. Try these:

- **Urban Legends Reference Pages** — <http://www.snopes.com>

This is my all-time favorite web site. People have long asked librarians to confirm or deny the validity of something they have read or heard (news stories, gossip, rumors, etc.). To investigate these stories used to require consulting print reference sources, newspaper and magazine indexes, and calling authorities in the field. It could be very time consuming. Now I check here first and am almost always successful in debunking or verifying urban legends.

The creators of this web site, Barbara and David Mikkelson, research claims and rate the statements as true, false, or “of undetermined or ambiguous veracity.” Documentation is included for the sources they have used to come to their conclusions and most of the pages end with a bibliography. So if you want to read more about the subject or check the

validity of what they’ve written, you can consult the articles, web sites, and other documents listed in the bibliography.

- **Energy Department’s Computer Incident Advisory Hoaxbusters** — <http://hoaxbusters.ciac.org/>
- **Break the Chain** — <http://www.breakthechain.org>

When you receive a dubious or outrageous e-mail, check it out before you start worrying and before you forward it on to someone else. For assistance with any of these suggestions, contact your local public library where there is always a reference librarian ready to help you!

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<sup>1</sup>Symantec AntiVirus Research Center — <http://www.symantec.com/avcenter/hoax.html>;  
McAfee AntiVirus Center — <http://us.mcafee.com/virusInfo/default.asp>

<sup>2</sup>NLM Household Products Database — <http://householdproducts.nlm.nih.gov/>

<sup>3</sup>CDC Health-Related Hoaxes and Rumors — [http://www.cdc.gov/hoax\\_rumors.htm](http://www.cdc.gov/hoax_rumors.htm)



## Need help with a special project ... need the expertise and experience of a professional?

If your agency is seeking an experienced public works professional, the WST2’s Retired Professionals program is for you.

The program provides a listing of retired public works professionals with expertise in the areas of maintenance, operations, engineering, inspection, construction, and surveying, just to name a few. Access the Retired Professionals listing at:

<http://www.wsdot.wa.gov/TA/T2Center/Retired.htm>

If you have questions, contact Laurel Gray at (360) 705-7355 or [grayl@wsdot.wa.gov](mailto:grayl@wsdot.wa.gov)

### Retired? Soon to be retired?

Would you like to be part of this program? Give us a call.





By Roger Chappell, WST2 Technology Integration Engineer

In this article, I hope to blend hardware, software, and data requirements into a futurist vision from a technology integration perspective.

To begin, yottabytes really do exist in the data world. They are not just some phraseology left over from a popular science fiction movie. In a document called ISO 1000, the International Standards Organization defines the numerical prefixes.

Here is a byte-by-byte break down of how bytes are calculated:

- 8 bits = 1 byte
- 1024 bytes = 1 Kilobyte (thousands) or 1,024 bytes
- 1024 KB = 1 Megabyte (millions) or 1,048,576 bytes
- 1024 MB = 1 Gigabyte (billions) or 1,073,741,824 bytes
- 1024 GB = 1 Terabyte (trillions) or 1,099,511,627,776 bytes
- 1024 TB = 1 Petabyte (quadrillions) or 1,125,899,906,842,624 bytes

## Yottabytes ... Taking a Big Byte of Data

- 1024 PB = 1 Exabyte (quintillions) or 1,152,921,504,606,846,976 bytes
- 1024 EB = 1 Zettabyte (sextillions) or 1,180,591,620,717,411,303,424 bytes
- 1024 ZB = 1 Yottabyte (septillions) or 1,208,925,819,614,629,174,706,176 bytes

There is some debate as to the purest calculation due to rounding, but this should give you a good idea of how it works. To help put this into perspective, the entire contents of the Library of Congress would require only about 10 terabytes. I use this example to show that there are much bigger bytes of data and storage hardware that are available than today's gigabytes. In fact, there are many teraservers in use today, and petaservers are becoming more commonplace in large web search engines and advanced research projects. This combined with Moore's Law will open the doorway for technology that has only been dreamed about and was not possible only a decade ago. For those unacquainted with Moore's Law, the condensed version states that the transistor density on integrated circuits doubles every couple of years. This exponential growth and ever-shrinking transistor size result in increased performance and decreased cost. There are variants to Moore's Law and debates as to whether or not it is sustainable. Most microcomputer engineering information states that Moore's Law is sustainable for the next 10 to 20 years.

Even without Moore's Law, my own experience has shown the observations to be true. I paid over \$3,500 for my old Pentium II 200 computer when it was the latest and greatest of its kind. Now, only a few years later, it is a technological dinosaur. For a little over \$500, I recently purchased a 2-gigahertz computer with a gigabyte of RAM and an 80-gigabyte hard drive. This is Moore's Law at work: ever-shrinking transistor size resulting in increased performance and decreased cost. Today, for the price I paid for my old Pentium 200, I can buy 2.5 terabytes of NAS (Network Attached Storage) for my home or office. I have to ask myself what is next.

The answer: terabytes and petabytes of data with the hardware ability to make them useable. If you take away the storage and hardware limitations of today, future possibilities are almost limitless. Imagine a future portable device that has a couple of terabytes of RAM, could sync wirelessly, and contain all the data holdings of any governmental agency. Imagine the employees of that agency having every as-built, orthophoto, and database at their fingertips, even in the field. To some this may be a frightening scenario, but one I believe must quickly be addressed. From the new breed of "knowledge workers" to those who perform some of the most routine tasks, computerization will only continue to increase. With computerization also comes new challenges and opportunities, for both use and abuse.

Being a “datahead” and, in my former life, a transportation planning specialist, I find data interesting. For me, the more data (gigabytes, terabytes, petabytes) I have, the better I like it. I am interested in where the data comes from, what does the Metadata say it is and how it is to be used, the quality of the data, and most of all, how does it fit within my managing and planning processes.

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*I recently read an article in Industrial Physicist that claimed that 90 percent of the engineers and scientists that have ever lived in the history of the world are alive today.*

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I recently read an article in *Industrial Physicist* that claimed that 90 percent of the engineers and scientists that have ever lived in the history of the world are alive today. To me that was an interesting factoid, but I wondered what data was used to arrive at that conclusion. I have no doubt that the statement is true, but my investigations lead me in a different direction. I wondered if the statement could be based partly on the growth rates and world population. So my journey began.

I quickly found that on July 19, 1999, at 8:24:02 EDT according to the U.S. Census Bureau, there were six billion of us living on this planet. On October 12, 1999, the United Nations celebrated the “Day of 6 Billion.” The difference between the dates, July 19 and October 12, was based on the use of different projection models and data. The better the model and data, the better the predicted result. I don’t know of anyone that did an actual head count to validate the projected results, so either date could be true. For some planning processes, either date would be close enough.

From the United Nations Population Division, I found that:

- In 1804, the population was 1 billion.
- In 1927, the population was 2 billion (123 years later).
- In 1960, the population was 3 billion (33 years later).
- In 1974, the population was 4 billion (14 years later).
- In 1987, the population was 5 billion (13 years later).
- In 1999, the population was 6 billion (12 years later).

From the U.S. Bureau of the Census, International Data Base, I also found that:

- In 1950, the population was 2,555,360,972.
- In 2000, the population was 6,079,006,982.
- In 2050, the projected population will be 9,084,495,405.

Being a datahead with a planning background, this type of data raises questions like: Are we creating an infrastructure to support the anticipated population increase? Are our current modes of transportation adequate to handle future demands that will be placed upon the infrastructure? Are we prepared for the future or simply maintaining and managing the infrastructure that we have inherited?

It seems to me that even with adequate budgets, the figures noted above could quickly outstrip current available resources. If these projections prove to be true, our current practices of maintaining and managing our infrastructure will need to include this potential growth rate. If they do not, we will not be able to keep pace with the anticipated demands. The larger and more complex the infrastructure is, the more difficult this planning process becomes.

To further emphasize this point, I want to point out that there is added complexity when blending data types and sources. If I use the U.S. Bureau of the Census projections, I would include in my planning process the possibility of a “population explosion.” On the other hand, if I use the United Nations data and the “low variant” model, a depopulation scenario or “population implosion” could be projected. In this scenario, there would be less overall demand on certain aspects of the infrastructure, but the population base would be much older. This scenario would place a different set of stresses on our infrastructure that will need to be accommodated. I use these examples to show that when using a wider venue of data options, a person must have a good understanding of the data being used and how it relates to other data being evaluated.

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*Whether you are planning for a transportation system or a sewage system, demographic data may be an important piece of your strategic plan and a demographer may be an important team member to have.*

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Whether you are planning for a transportation system or a sewage system, demographic data may be an important piece of your strategic plan and a demographer may be an important team member to have. Choosing a planning team could easily be a topic that merits its own discussion. Since the art or science of demography is based on models to which data is applied and forecasts generated, the forecasted results are only as good as the data and models being used. This is true of most of the planning tools used today. I am not a demographer nor do I pretend to be. I am only using this example to illustrate a problem inherent in sorting through types of data and how it can affect planning processes.

We need to keep in mind that even the results from the best models are subject to interpretation. These interpretations range from the objective or scientific to what has been termed "junk science." Junk science uses data to support certain ideologies and preconceived outcomes, whereas "true" science allows the observations and results to speak for themselves without any foregone conclusions. In a perfect world, we could expect perfect results, but since this virtual data world is far from perfect, we must learn how to best manage the variables, evaluate the results, and plan accordingly. Ultimately, history will be our judge as to the quality of the data and how well we have used it.

To wrap this all up, I would like to offer the following observations. Computer size and storage will continue to be less of an issue as time goes on. Workers will need to broaden their current skill sets to include knowledge from other disciplines in their planning processes. Mechanisms will need to be developed that will retrieve, analyze, and present "smart data" in the decision making process. To do this, data gatherers, analysts, and those with profound knowledge will need to be involved in the planning and decision-making processes. The data that is gathered today, the plans that are developed, and the decisions that are made will affect present and future generations. My hope is that history will judge us kindly for the decisions we have made based on current data.



## Free Publications from Your WST2 Center

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Mail: WST2/WSDOT, H&LP, P.O. Box 47390, Olympia, WA 98504-7390.

- ✓ Check the items you would like to order. An asterisk (\*) denotes publications included in the 2003 WST2 CD Library.
- 1999 Audio Visual Catalog, T2Center
- 2003 WST2 CD Library: Technical Documents
- Asphalt Pavement Repair Manuals of Practice, SHRP, 1993\*
- Asset Management Primer, FHWA, 1999
- A Walkable Community is More Than Just Sidewalks, FHWA, 2000
- Bicycle & Pedestrian Case Studies: No. 7: Transportation Potential & Other Benefits of Off-Road Bicycle & Pedestrian Facilities, FHWA, 1992, No. 15: Environmental Benefits of Bicycling & Walking, FHWA, 1993
- Bicycle and Pedestrian Provisions of the Federal-Aid Program, FHWA, 1998
- Building Projects that Build Communities, Community Partnership Forum, 2003
- Concrete PASER Manual, University of Wisconsin, 1998
- Contracting for Professional Services in Washington State, MRSC, 1994
- Crack Seal Application, FHWA, 2001
- Data Integration Primer, FHWA, 2001
- Designing Sidewalks and Trails for Access, Part 2, FHWA, 2001
- Dust Control on Low Volume Roads, FHWA, 2001
- Dust Palliative Selection and Application Guide, USFS, 1992\*
- Engineer's Pothole Repair Guide, US Army Corps of Engineers, CRREL, 1984
- Entering the Quiet Zone: Noise Compatible Land Use Planning, FHWA, 2002
- Family Emergency Preparedness Plan, American Red Cross, et al., 1999
- Field Guide for Unpaved Rural Roads, Wyoming T2 Center, 1997
- Fish Passage Through Culverts, FHWA, USDA, 1998
- General Field Reference Guide (Pocket Size), 2002
- Geotextile Selection and Installation Manual for Rural Unpaved Roads, FHWA, 1989
- Getting People Walking: Municipal Strategies to Increase Pedestrian Travel, Rhys Roth, Energy Outreach Center
- A Guide to the Federal-Aid Highway Emergency Relief Program, USDOT, June 1995
- A Guide for Local Agency Pavement Managers, NWT2 Center, 1994\*
- A Guide for Erecting Mailboxes on Highways, AASHTO, 1984
- HMA Pavement Smoothness, FHWA, 2002
- Increasing Physical Activity Through Community Design, National Center for Bicycling and Walking, 2002
- Improving Conditions for Bicycling and Walking, FHWA, 1998
- Improving Highway Safety at Bridges on Local Roads and Streets, FHWA, 1998
- International State-of-the-Art Colloquium on Low-Temperature Asphalt Pavement Cracking, CRREL, 1991
- Local Agency Pavement Management Application Guide, WST2 Center, 1997\*
- Local Agency Safety Management System, WSDOT, 1998, Reprinted 2000\*
- Local Low Volume Roads and Streets, ASCE, 1992
- Maintenance of Aggregate and Earth Roads, WST2 Center (1994 reprint)
- Maintenance of Signs & Sign Supports for Local Roads and Streets, FHWA, 2001
- Manual for Controlling and Reducing the Frequency of Pavement Utility Cuts, FHWA, 2002
- Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel, FHWA, 1996\*
- New Generation of Snow and Ice Control, FHWA
- Pavement Surface Condition Field Rating Manual for Asphalt Pavement, NWPMA, WSDOT, 1999\*
- Pedestrian Facilities Guidebook, WSDOT, 1997
- Planning & Implementing Pedestrian Facilities in Suburban and Developing Rural Areas, TRB
- Pothole Primer – A Public Administrator's Guide, CRREL, 1989
- Recommendations to Reduce Pedestrian Collisions, WSDOT, December 1999
- Redevelopment for Livable Communities, Rhys Roth, Energy Outreach Center, 1995
- Reflective Sheeting Identification Guide, FHWA, 2001
- Roundabouts: An Information Guide, FHWA, 2000
- Scenic Byways Map of Washington State, 2003
- School Administrator's Guide to School Walk Routes and Student Pedestrian Safety, Washington Traffic Safety Commission and WSDOT, 2003
- Signposts for Snow Trails, USDA, 1998
- Soil Bioengineering: An Alternative for Roadside Management, USDA-FS, 2000
- State-of-the-Art Survey of Flexible Pavement Crack Sealing Procedures in the United States, CRREL, 1992
- Streetwise, A Simplified Local Agency Pavement Management System, WSDOT, 2000\*
- Superpave System – New Tools for Designing and Building More Durable Asphalt Pavements, FHWA
- Traffic Calming: A Guide to Street Sharing, Michael J. Wallwork, PE, 1993
- Trail Construction & Maintenance Notebook, USDA Forest Service, 2000
- Utility Cuts in Paved Roads, Field Guide, FHWA, 1997
- W-Beam Guardrail Repair and Maintenance, FHWA, 1996

- Washington Bicycle Map, WSDOT, 2001
- Washington State Highway Map, WSDOT, 2002
- Wetland Trail Design and Construction, USDA, 2001
- Wildlife Habitat Connectivity Across European Highways, FHWA, 2002

## Workbooks and Handouts from WST2 Center Workshops

- Access Management, Location and Design, FHWA, (NHI) 2001
- Application of Geographic Information Systems for Transportation, FHWA, 1999
- Construction Documentation: Construction Training Manual for Local Agencies, WSDOT, 2003
- Design, Construction and Maintenance of Highway Safety Features and Appurtenances, FHWA, 1997 (update included)
- Environmental Overview, LAG Manual Chapter 24, WSDOT, 2003
- Handbook for Walkable Communities, by Dan Burden and Michael Wallwork

## Videotapes

- Driving Modern Roundabouts, City of Lacey, City of Olympia, and WSDOT, 2002
- Walkable Communities: Designing for Pedestrians, Dan Burden, \$50/set of four videotapes

## CD ROM

- Best Practices for Road Weather Management, FHWA, August 2002
- Building Projects that Build Communities, WSDOT, 2003
- Driving Modern Roundabouts, City of Lacey, City of Olympia and WSDOT, 2002
- Gravel Roads: Maintenance and Design Manual, SD LTAP, 2000\*
- Pedestrian/Bicycle Crash Analysis Tool, FHWA, 1999
- Pedestrian/Bicycle Safety Resource Set, FHWA, 2000
- Pavement Preservation: State of the Practice, FHWA, July 2000
- Technology Transfer CD Library Technical Documents, 4<sup>th</sup> Edition, Spring 2003

## DVD

- Driving Modern Roundabouts, City of Lacey, City of Olympia and WSDOT, 2002

## Non-Credit Self-Study Guides

These non-credit WSDOT self-study guides may be obtained from the WST2 Center. An invoice will be sent with the books.

- Basic Surveying, \$20
- Advanced Surveying (metric), \$20
- Contract Plans Reading, \$25
- Technical Mathematics I, \$20
- Technical Mathematics II, \$20
- Basic Metric System, \$20

## Computer Programs

The following applications may be downloaded from the Washington State Department of Transportation Materials Laboratory web page at <http://www.wsdot.wa.gov/biz/mats/Apps/EPG.htm>.

Everseries Pavement Analysis Programs contains three independent modules:

1. Evercalc 5.0 – A FWD Pavement Moduli Backcalculation Program
2. Everstress 5.0 – A Layered Elastic Analysis Program
3. Everpave 5.0 – A Flexible Pavement Overlay Design Program

Important: These programs are updated regularly. Please send your e-mail address to [sivanen@wsdot.wa.gov](mailto:sivanen@wsdot.wa.gov) to be included in the mailing list for updates.

Falling Weight Deflectometer (FWD) Area Program – This program is useful in calculating Normalized Deflections Area Value and Subgrade Moduli from FWD Data. The program is available for download at <http://www.wsdot.wa.gov/biz/mats/pavement/fwd.htm>.



## Bridge

- WSDOT Highways & Local Programs <http://www.wsdot.wa.gov/TA/Operations/BRIDGE/BRIDGEHP.HTM>

## Environmental

- *Environmental Procedures Manual* (M31-11) <http://www.wsdot.wa.gov/eesc/environmental/programs/regcomp/ProceduresManual/start.pdf>
- Regional Road Maintenance Endangered Species Act Program Guidelines <http://www.metrokc.gov/roadcon/bmp/pdfguide.htm>
- National Marine Fisheries Service Species Listings & Info <http://www.nwr.noaa.gov/>
- U.S. Fish and Wildlife Service Species Listings & Info <http://endangered.fws.gov/>
- Washington State DNR's Natural Heritage Program Home Page <http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/fsrefix.htm>
- FHWA's Environmental Home Page <http://www.fhwa.dot.gov/environment/index.htm>

## Highways & Local Programs List Serves

- Local Agency Guidelines (LAG) Manual <http://lists.wsdot.wa.gov/guest/RemoteListSummary/LAG>
- Traffic and Safety Management [http://www.t2sms-l@lists.wsdot.wa.gov/guest/RemoteListSummary/T2SMS\\_L](http://www.t2sms-l@lists.wsdot.wa.gov/guest/RemoteListSummary/T2SMS_L)
- Pavement Management [http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2PAVE\\_L](http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2PAVE_L)
- WST2 Newsletter [http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2News\\_L](http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2News_L)
- WST2 Training [http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2TRNG\\_L](http://lists.wsdot.wa.gov/guest/RemoteListSummary/T2TRNG_L)

## Infrastructure Management & GIS/GPS

The site below has been established to promote interagency data exchange and resources sharing between local governmental agencies.

<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/InfrastructureTechnology/Infathp.html>

## Legal Search

- Search RCWs and WACs  
<http://search.leg.wa.gov/pub/textsearch/default.asp>
- City Streets as part of State Highways  
<http://www.wsdot.wa.gov/TA/Operations/LAG/CityStreets.html>

## Local Agency Guidelines (LAG) Manual

<http://www.wsdot.wa.gov/TA/Operations/LAG/LAGHP.htm>

## Pavement Management

- Pavement Publications & NWPMA Links  
<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/PavementTechnology>
- NWPMA - North West Pavement Management Association  
<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/PavementTechnology/nwpma.html>
- Asphalt Institute  
<http://www.asphaltinstitute.org/>
- National Asphalt Pavement Association  
<http://www.hotmix.org/>
- Pavement (A Web Site for Managing Pavements)  
<http://www.mincad.com.au/pavenet>
- SuperPave Information  
<http://www.utexas.edu/research/superpave>

## Project Development

- Federal Aid Progress Billing Form  
<http://www.wsdot.wa.gov/TA/ProgMgt/Projectinfo/BILLFORM.XLS>
- State Funded Progress Billing Form  
<http://www.wsdot.wa.gov/TA/ProgMgt/Projectinfo/BILLFORMSTATE.xls>
- STIP (State Transportation Improvement Program)  
<http://www.wsdot.wa.gov/TA/ProgMgt/STIP/STIPHP.htm>

- TIP (Local Agency 6-Year Transportation Improvement Program)  
<http://www.wsdot.wa.gov/TA/ProgMgt/STIP/TIP.html>

## Research

- WSDOT Research Office  
<http://www.wsdot.wa.gov/ppsc/research>
- Looking for a Transportation Research Publication?  
<http://www.nas.edu/trb/index.html>
- Municipal Research and Services Center of Washington  
<http://www.mrsc.org>

## Traffic & Safety

- Safety Management Publications & Information  
<http://www.wsdot.wa.gov/TA/T2Center/Mgt.Systems/SafetyTechnology/>
- WSDOT Traffic Data Office  
<http://www.wsdot.wa.gov/mapsdata/tdo/>
- Washington State Patrol  
<http://www.wa.gov/wsp/wsphome.htm>
- Washington Traffic Safety Commission  
<http://www.wa.gov/wtsc>
- National Highway Traffic Safety Administration  
<http://www.nhtsa.dot.gov>
- American Traffic Safety Services Association  
<http://www.atssa.com>
- Municipal Research and Services Center of Washington  
<http://www.mrsc.org>
- Transportation Research Board  
<http://www.nas.edu/trb/index.html>

## Training

- WST2 Classes & LAG Training  
<http://www.wsdot.wa.gov/TA/T2Center/Training/>
- WST2 Class Registration  
<http://www.wsdot.wa.gov/TA/T2Center/t2hp.html>
- County Road Administration Board  
<http://www.crab.wa.gov/>
- American Public Works Association  
<http://www.apwa.net/education>
- Transportation Partnership in Engineering Education Development (TRANSPED)  
<http://www.engr.washington.edu/epp>

## WSDOT Local Programs Engineers

- Eastern Region (Spokane)  
Keith Martin (509) 324-6080,  
[martink@wsdot.wa.gov](mailto:martink@wsdot.wa.gov)
- Northwest Region (Seattle)  
Terry Paananen (206) 440-4734,  
[paanant@wsdot.wa.gov](mailto:paanant@wsdot.wa.gov)
- Olympic Region (Olympia)  
Neal Campbell (360) 357-2666,  
[campben@wsdot.wa.gov](mailto:campben@wsdot.wa.gov)
- North Central Region (Wenatchee)  
Paul Maher (509) 667-3090 or 667-2900,  
[maherp@wsdot.wa.gov](mailto:maherp@wsdot.wa.gov)
- South Central Region (Yakima)  
Roger Arms (509) 577-1780,  
[armsr@wsdot.wa.gov](mailto:armsr@wsdot.wa.gov)
- Southwest Region (Vancouver)  
Bill Pierce (360) 905-2215,  
[pierceb@wsdot.wa.gov](mailto:pierceb@wsdot.wa.gov)

## Other Online Resources

- Bicycle maps and other information  
<http://www.wsdot.wa.gov/TA/PAandI/PAIHP.html>
- Pedestrian information  
<http://www.wsdot.wa.gov/TA/PAandI/PAIHP.html>
- Rural Partnerships and scenic byways information  
<http://www.wsdot.wa.gov/TA/PAandI/PAIHP.html>
- Better Mousetraps  
<http://www.wsdot.wa.gov/ta/T2Center/Mousetraps/>
- Retired Professional Program  
<http://www.wsdot.wa.gov/TA/T2Center/Retired.htm>
- Student Referral Program  
<http://www.wsdot.wa.gov/TA/T2Center/StudentReferral/>
- LTAP (Local Technical Assistance Program) Clearing House  
<http://www.ltapt2.org>
- Institute of Transportation Engineers  
<http://www.ite.org>
- Washington State Counties  
<http://access.wa.gov/government/awco.asp>
- Washington State Cities and Towns  
<http://access.wa.gov/government/awcity.asp>
- Governor's Office of Indian Affairs  
<http://www.wa.gov/goia/index.html>
- Southwest Interagency Coop - Grounds Equipment Maintenance (GEM)  
<http://www.gematwork.org>



Laurel Gray, WST2  
Training Program  
Coordinator

## Washington State T2 Center

Contact: Laurel Gray (360) 705-7355  
Wendy Schmidt (360) 705-7386  
<http://www.wsdot.wa.gov/TA/T2Center/Training>

*To register for a class in this section, use the contact listed above.*

The class fees shown apply to both public and private sector students. Classes marked with an asterisk (\*) are part of the Road and Street Management Training Program and fulfill a portion of the core requirements needed for the Certificate of Achievement (CA) in Road Management.

### Construction Documentation (LAG Program)

December 2, Tacoma; December 3, Tumwater; January 13, Spokane; January 27, Shoreline; January 28, Federal Way; February 24, Wenatchee; February 26, Kennewick; March 16, Port Orchard; March 17, Lacey; April 13, Kent; April 14, Mount Vernon. Free. Instructor: Ken Hash, Washington State Department of Transportation (WSDOT) SW Region Local Programs. All agencies, including Northwest Region, should register on-line. Regional Local Programs Engineers will be in attendance to answer questions. This course covers three phases: pre-contract, contract, and post-contract documentation of public works projects with Federal Highways Administration (FHWA) funding. Local agency and contractor's documentation is discussed, with a strong emphasis on the documentation requirements of the field inspector. On completion of this course, participants will have a working knowledge of: (1) required documentation that will be submitted by the contractor, (2) required documentation for acceptance of contract materials, (3) daily inspector's documentation of contract work, and (4) source documentation for the monthly progress payment to the contractor.

### Contract Specification Writing (LAG Program)

December 9, Marysville. \$50. Instructor: Steve Boesel. This course will provide guidance and methods for writing consistently clear, concise, complete, and well formatted contract special provisions. It will provide a thought process that can be used when writing or reviewing contract specifications to ensure the greatest possibility for a successful bid and a successful construction project.

### Writing Skills\*

December 18-19, Tacoma. \$110. Instructor: Jordan Peabody. This two-day workshop is designed to reduce the confusion caused by the poorly written word. Anyone who must write on the job, but is not a writing pro, will find the training both pleasant and helpful. Writing techniques apply to: letters, manuals, speeches, memos, newsletters, e-mail, proposals, reports, bulletins and minutes.

### Bridge Condition Inspection Update (BCIU)

February 3-4, Ellensburg; February 17-18, Lacey. Free. This course will provide information on the inspection manual and updates, laptop bridge inspections, load ratings and permitting, and other important bridge inspection issues.

### Bridge Condition Inspection Fundamentals (BCIF)

February 10-12, Lacey. Free to Washington State local agencies; \$150 to out-of-state attendees. This training is intended to provide engineers and technicians, who have little or no background in bridges, a basic knowledge of bridges and bridge maintenance and inspection skills.

### Introduction to the Design and Operation of Roundabouts

February 10, Bremerton; February 18, Wenatchee; March 10, Olympia area. Free. In this course, attendees will gain an understanding of circular intersections and understand the difference between a modern U.S. roundabout and the traffic circle and rotary intersection. Attendees will be aware of software products that can be used to do an acceptable capacity analysis and understand how to compare signalized intersections with roundabouts to determine levels of service. Intersection issues such as sign distance, drainage, pedestrians, bicycles, illumination, truck-turning templates, and landscaping will be discussed. Signing and striping are essential to a safely operating intersection, and the purpose for each element will be covered as it relates to the law. Attendees will also see a wide variety of operating roundabouts in Washington State and from around the country.

### LAG Manual Overview (LAG Program)

February 11, Shoreline; February 19, Spokane; February 25, Lacey. Free. Instructors: Brian Moorehead and Dick Egolf, WSDOT Olympic Region Local

Programs. This course will give a basic overview of the Local Agency Guidelines (LAG) Manual and the latest revisions. Students will gain an understanding of the manual format and have the ability to locate guidance for their individual projects. This course is for all users of the LAG Manual.

### **Bridge Condition Inspection Training (BCIT)**

March 15-26, Lacey. Free to Washington State local agencies; \$150 to out-of-state attendees. This two-week course is based on the "Bridge Inspector's Training Manual 90" and will provide extensive training on the condition inspection of in-service bridges. Satisfactory completion of this course will fulfill the training requirements of the National Bridge Inspection Standards (NBIS) for "a comprehensive training course" based on the manual. The training course will cover: bridge inspection programs; review of basic concepts; safety; inspection documentation; inspection and evaluation of bridge decks, common timber, steel and concrete superstructures and substructures; waterways; fracture critical bridge members; underwater inspections; and culvert inspections. This course is appropriate for new bridge inspectors or those desiring a refresher. Attendees should have a general understanding of bridges.

### **Pavement Condition Rating\***

May 4-5, east side; June 1-2, west side; September 7-8, west side. Free. Instructor: Bob Brooks, WST2 Pavement Technology Engineer. Participants will learn to rate any of the pavements commonly found in Washington. The rating values obtained using the definitions and methods learned in this course should compare favorably with those obtained and used in the Washington State Pavement Management System. Each participant should be able to perform a pavement condition survey with reasonable objectivity.

### **Basics of a Good Gravel Road\***

April 29, Yakima; May 11, Tacoma. \$45. Instructor: Bill Heiden. This is a basic road maintenance class. All major problems of unpaved gravel roads will be addressed: washboarding (corrugation), traffic patterns, rutting, surface drainage, dust control, surface material, and roadside obstruction. The techniques that Mr. Heiden teaches can help to reduce unpaved road maintenance expenditures by up to 40 percent of current expenditures in three to five years.

### **Roadway Drainage\***

April 27, Spokane; May 4, Ellensburg; May 6, Marysville; May 12, Tacoma. \$45. Instructor: Bill Heiden. This course will discuss basic road design characteristics as they relate to drainage, soil character-

istics, basic hydrology (drainage areas, runoff factors, rainfall intensity), hydraulics (culvert materials, sizing culvert, sizing ditches), placement of culverts, culvert end treatments, and culvert and ditch maintenance. The course is intended to cover the needs of all people responsible for roads, from managers to operators. The course will not provide design criteria for engineers.

### **Cultural Resources Workshop**

May 4-7 and October 5-8, The Dalles, Oregon. \$350. This training will introduce participants to the value and significance of Washington's irreplaceable cultural resources. The class provides an exceptional opportunity for local agencies to work with the Northwest's most qualified instructors, visit some of the area's finest examples of cultural resources, and attend the only statewide training session of this caliber. There will be presentations by Native Americans on their cultural perspective; speakers on state archaeology, prehistory of Washington, and Native American ethnobotany; prehistoric stone artifacts; rare plants; logging in the Northwest; and federal and state cultural resource regulations and how they apply to your agency. There will be in-field lessons on learning how to "read" the landscape and recognize the probable cultural resources located at the site and sharing of preservation techniques and strategies. This training is for any individual who wants to become knowledgeable about cultural resources and possess the necessary skills to address basic resource management problems associated with cultural resources. Call the WST2 Center at (360) 705-7386 to have your name placed on a wait list; this class is not available for on-line registration.

### **Superpave\***

Several sessions statewide coming this winter.

### **Introduction to GPS Mapping Grade Equipment**

\$325. This is a three-day class. Sessions can be scheduled upon request or scheduled for an individual agency. Fee is based on four students per session. If there are more than four students, the fee will be prorated. Instructor: Max Schade, WSDOT Transportation Data Office. This is an introductory course on mapping grade Global Positioning System (GPS) equipment and is taught by a Trimble-certified instructor. The course is designed to provide basic knowledge and skills in the use of GPS technology in mission planning, data gathering, and data processing. The training will enable field operation personnel to use new methods and Trimble mapping grade equipment as well as understand problems encountered when using the GPS satellite constellation.

# Local Agency Guidelines (LAG) Training

Unless otherwise stated, the courses in the LAG program are free.

- Appraisal Review Workshop: LAG Manual Chapter 25. \$100. Four sessions have recently been held; more will be scheduled depending on the demand.
- Construction Documentation: LAG Manual Chapters 51-53. The course covers pre-contract, contract, and post-contract documentation of public works projects with FHWA funding. The 2003-2004 schedule is listed on page 41.
- Consultants: LAG Manual Chapter 31. Training is offered by the University of Washington under the title "Managing Consultants." See the TRANSPEED section on page 45 for class details.
- Contract Specification Writing: LAG Manual Chapters 42-46. Course covers guidance and methods for writing clear, concise, complete and well-formatted contract special provisions. Four to six sessions will be scheduled statewide for 2004.
- DBE/EEO/OJT: LAG Manual Chapters 26 and 27. Training will provide local agencies with a basic understanding of the rules and procedures on Disadvantaged Business Enterprise (DBE), Equal Employment Opportunity (EEO), and On-the-Job Training (OJT) for federally funded projects. There are no sessions scheduled at this time.
- Emergency Relief Programs: LAG Manual Chapter 33. Curriculum is now available on CD. Call the WST2 Center at (360) 705-7386 to request a copy. The course covers instructions on procedures applicable to emergency projects funded by the Emergency Relief Program on federal-aid highways and by the Federal Emergency Management Agency disaster assistance for projects not on federal-aid highways.
- Enhancement Program: Training for this course will become available after the new Federal Act is in place.
- Environmental Overview for Local Agencies: LAG Manual Chapter 24. This course will give a basic understanding of environmental procedures and documentation, when they apply, and how to properly fill out the paperwork. This class is an elective in the Road and Street Management Program. Classes will be scheduled statewide for fall of 2004.
- Right of Way Procedures Workshop: LAG Manual Chapter 25 and the Federal Perspective. Right of way acquisition and certification procedures. Special request sessions have recently been held; more can be scheduled by calling your WSDOT region real estate representative.
- LAG Manual Overview: This course will give a basic overview of the Local Agency Guidelines Manual and the latest revisions. Three sessions are scheduled for February. See page 41 for class dates.
- Right of Way Plans Preparation: LAG Manual Chapter 25 and the Federal Perspective. This course consists of a general description of the different elements involved in preparing right of way plans and other mapping required for the acquisition of real property or property rights from private individuals and/or other government agencies. Sessions have recently been held, more available upon request.

Please let us know if you have an interest in any of the courses listed above by logging on to our web site at <http://www.wsdot.wa.gov/TA/T2Center/T2hp.htm> and accessing the online request list. Click on "WST2 On-Line Request," fill out the form, and send. Individual classes will be developed in response to the request lists. If your name is on the list, you will be notified by e-mail when classes are scheduled.

*If you have questions about the LAG Program, contact Larry Schofield at (360) 705-7980 or [schofil@wsdot.wa.gov](mailto:schofil@wsdot.wa.gov), or Laurel Gray at (360) 705-7355 or [grayl@wsdot.wa.gov](mailto:grayl@wsdot.wa.gov).*

## The Endangered Species Act Training Program Now Approved by US NMFS

Over three years of dedicated effort by the U.S. National Marine Fisheries Service (NMFS) and the Puget Sound Regional Forum culminated on August 15, 2003, when the Regional Road Maintenance Endangered Species Act (ESA) Program was approved by NMFS. The program was approved on the condition that **ALL** program elements are implemented by agencies seeking approval for routine road maintenance activities. An important program element is the Regional Road Maintenance training program that was launched in spring 2002. Since then, about 1,200 maintenance supervisors, engineers, environmental staff, crew leads, and maintenance crew members have been trained. The initial series of classes were scheduled primarily for agencies that had committed to the Regional Road Maintenance Program (RRMP)

Guidelines and had submitted a "Part 3 Application." The training is now available for anyone requesting it. The goal of the program remains to serve all maintenance personnel who want to expand their roadway maintenance knowledge and skills, and in particular, learn more about Best Management Practices (BMPs) in roadway maintenance.

The Part 3 Application is an agency commitment to the ten program elements (of which the training program is Element #3), and can be obtained from the following web site: <http://www.metrokc.gov/roadcon/bmp/pdfguide.htm> or by contacting Janine Johanson, Metro King County, at (206) 205-7101. The ultimate goal is to have all agency roadway maintenance personnel trained with approved Part 3 Applications on file.

The University of Washington's Transportation Professional Development Program (TRANSPEED) is coordinating and presenting the training program. The training tracks are described below. Fees for each track are part of a legislatively approved agreement for the 2003-05 biennium. The agreement provides partial funding to help maintain the low tuition rates. For program information or course registration, please contact Julie Smith at (206) 543-5539 or by e-mail at [jsmith@engr.washington.edu](mailto:jsmith@engr.washington.edu). Program and registration information can also be found at <http://www.engr.washington.edu/epp/esa/reginfo>.

#### Four ESA Training Tracks

The ESA Training Plan has four separate tracks:

- **Track 1: Briefing for Regional Decision Makers**  
2 hours. No fee. An overview of the ESA program for regional level management and administration. This is a stand-alone training class and not part of the required training program. It is offered by members of the Regional Road Maintenance Forum. Call Roy Harris or Gerry Crum at (425) 257-8800 for information. Information may also be obtained from Janine Johanson at METRO KC, (206) 205-7101.
- **Track 2: Introduction, Design and BMPs: Monitoring, and Environmental Roles for Technical and Scientific Staff**  
1.4 CEUs. Tuition is \$235. This course is an overview of the procedures for technical, professional and environmental staff, supervisors and leads involved in maintenance activities. This track provides an introduction to the program Guidelines, design, habitat, the ten program elements and maintenance BMPs to meet ESA requirements.
- **Track 3A: Classroom Introduction to ESA and Outcome-based Road Maintenance for Field Crews**  
0.7 CEUs. Tuition is \$160. This course is an overview of the procedures for field crews and leads involved

in maintenance activities. This track provides an introduction to the program Guidelines, design, habitat, environmental roles, the ten program elements and implementation of maintenance BMPs to meet ESA requirements.

- **Track 3B: Road Maintenance Crew Training in the Field Environment: Applying Maintenance BMPs**  
0.7 CEUs Tuition is \$190. This one-day course is conducted in a field setting where teams of maintenance crews construct, test, and assess the effectiveness of a variety of BMPs. Participants will also learn how to monitor each BMP and measure its outcome in comparison to the outcome goals established in the approved program. Note: Track 3A is a prerequisite for Track 3B.
- **Track 4: Train-the Trainer for The Regional Road Maintenance Program**  
1.4 CEUs. Tuition is \$240. For agency-selected ESA trainers. This track focuses on training skills and techniques, and evaluates, prepares, and certifies candidates to teach the Regional Road Maintenance Program classroom training (Tracks 2 and 3A) and field demonstrations of BMP installations.

#### Modified Tuition Rates

Tuition rates for this program have been revised and include two major differences from the previous program rates. First, costs for classroom facilities and other logistical costs that were previously provided by the sponsoring agency are now being offset by the funds provided through a support agreement with WSDOT. Secondly, agencies can now lower the training costs for its participants by providing a classroom facility/field site and equipment, and covering costs for instructional handouts for a full class. Those interested in exploring this option should contact Julie Smith at (206) 543-5539 or by email at [jsmith@engr.washington.edu](mailto:jsmith@engr.washington.edu). She will work with the Program Director, Jim McManus, to calculate modified tuition rates.

#### Looking to the Future

During the past year, the Regional Road Maintenance training program has been focused on the ESA issues related to fish species in the Puget Sound Region. The training has also been conducted in other locations, such as Jefferson County. In addition, the University of Washington has been asked to furnish instructional assistance by teaming with new Track 4-trained instructors who are beginning to train within their agencies. This instructional support has been quite successful and is expected to be an ongoing asset to agencies seeking supplemental and/or updated program information after their initial training has been completed.

The training program may also have far wider applications and venues. These procedures were developed to provide a comprehensive outline of effective management practices applicable in any area or maintenance setting. The training is thus appropriate for all roadway agencies that seek to implement a consistent and environmentally sound roadway maintenance program.

## **TRANSPEED University of Washington**

Contact: Christy Roop Pack  
(206) 543-5539, toll free 1-866-791-1275  
fax (206) 543-2352  
<http://www.engr.washington.edu/epp>

*To register for a class in this section, use the contact listed above.*

The prices in this section are for local agency / non-local agency.

### **Pavement Design**

December 2-4, Lacey. \$320 / \$520

### **Managing Consultants**

December 9, Seattle (web-based begins November 19). This two-day training is comprised of one-day web-based training and one-day of in-class training. \$485 / \$650

### **Traffic Engineering Operations**

December 15-17, Seattle. \$320 / \$520

### **Roadway Safety: Analysis, Evaluation and Programming**

January 5-6, Seattle. \$320 / \$520

### **Basic Highway Capacity for Engineers and Planners**

January 7-9, Seattle. \$320 / \$520

## **Engineering Professional Programs (EPP) University of Washington**

Contact: Emily West  
(206) 543-5539, fax (206) 543-2352  
<http://www.engr.washington.edu/epp>

*To register for a class in this section, use the contact listed above.*

### **Drilling and Blasting Techniques**

January 12-16, Seattle. Monday thru Friday. \$1,199 by December 29 or \$1,299 thereafter.

### **Engineering Refresher Courses**

Three evening courses provide thorough preparation for state of Washington engineering examinations.

- Fundamentals of Engineering / E.I.T. Review Course, February 18-March 29, Mondays & Wednesdays, 6:30-9:00 p.m., University of Washington campus, Seattle, \$495.
- Mechanical Engineering P.E. Review Course, February 24-April 1, Tuesdays & Thursdays, 6:30-9:00 p.m., University of Washington campus, Seattle, \$645.
- Civil Engineering P.E. Review Course, February 26-April 1, Tuesdays & Thursdays, 7:00-9:30 p.m., University of Washington campus, Seattle, \$495.

### **Fleet Management Workshops**

March 25-27, Seattle

- Vehicle Fleet Management
- Effective Shop Management
- Analytical Fleet Management

These three courses are scheduled to coincide with the Vehicle Maintenance Management Conference scheduled for March 22-25, 2004.

## Professional Engineering Practice Liaison (PEPL) University of Washington

Contact Stephanie Storm  
(206) 543-5539, fax (206) 543-2352  
<http://www.engr.washington.edu/~uw-epp/>

*To register for a class in this section, use the contact listed above.*

Prices are for early /late registration.

### Storm and Surface Water Monitoring

December 2-3, Seattle. \$475/\$510

## Associated General Contractors of Washington

Contact Education Foundation  
(206) 284-4500, fax (206) 284-4595  
<http://www.agcwa.com>

*To register for a class in this section, use the contact listed above.*

### Construction Site Erosion and Sediment Control Certification

December 3-4, Seattle; January 7-8, Tacoma;  
January 28-29, Vancouver; February 18-19, Bellingham;  
March 10-11, Everett/Shoreline; March 31-April 1,  
Seattle; April 21-22, Tacoma; May 12-13, Seattle;  
June 2-3, Tacoma; June 23-24, Seattle.

(12 hours) Designed to help implement and maintain effective Temporary Erosion and Sedimentation Control plans. Fulfills the requirements for certification in Construction Site Erosion and Sediment Control and Erosion Control Lead General Special Provision (GSP) to the Standard Specifications for Road, Bridge, and Municipal Construction. Includes WSDOT certification upon completion. Meets Department of Ecology requirements for Contractor Erosion and Spill Control Lead (CESCL) certification outlined in BMP C160 of the Stormwater Management Manual for Western Washington.

Certification training has been changed from a full two days to one and one-half days. Initial certification is \$275. Certification requires successfully completing end of course exam. Recertification requires attendance on Day 1 only, successfully completing exam, and proof of previous WSDOT certification. Recertification cost is \$200. You can check your certification with the on-line database as proof of certification.

## AASHTO Roadside Design Guide, Web Based Training

NHI Course Number: 380032C

This web-based course is approximately 14 hours long and is available anytime – 24 hours, 365 days a year via the Internet. The cost for non-FHWA employees is \$230 per participant and includes a copy of the 2002 AASHTO “Roadside Design Guide.” This course provides an overview of the 2002 AASHTO “Roadside Design Guide.” Emphasis is on current highway agency policies and practices. Participants must register online at [www.nhi.fhwa.dot.gov/registerdl.asp](http://www.nhi.fhwa.dot.gov/registerdl.asp)

Computer Requirements: You will need a fairly recent version of a browser (such as Internet Explorer 4 or 5 or Netscape 4 with JavaScript enabled), the latest version of Macromedia Shockwave and Flash (which you can download from the Internet), and a connection to the Internet (at least 56K modem). An older computer such as a Pentium 100 would work, but it would be slower than a Pentium III. For more information, visit <http://www.nhi.fhwa.dot.gov>

## **Traffic Solutions Workshop**

December 1-2, 2003, Tacoma, Wash.  
For information, contact WSU Conferences and Professional Programs at 1-800-942-4978.

## **Road and Street Maintenance Supervisor's School**

December 2-4, 2003, Tacoma, Wash.  
For information, contact WSU Conferences and Professional Programs at 1-800-942-4978.

## **Road Builder's Clinic**

March 2-4, 2004, Coeur d'Alene, Idaho.  
For information, contact WSU Conferences and Professional Programs at 1-800-942-4978.

## **Vehicle Maintenance Management Conference**

March 22-25, 2004, Seattle, Wash.  
Contact UW Engineering Professional Programs at (206) 543-5539 for more information.

## **APWA 2004 Conferences**

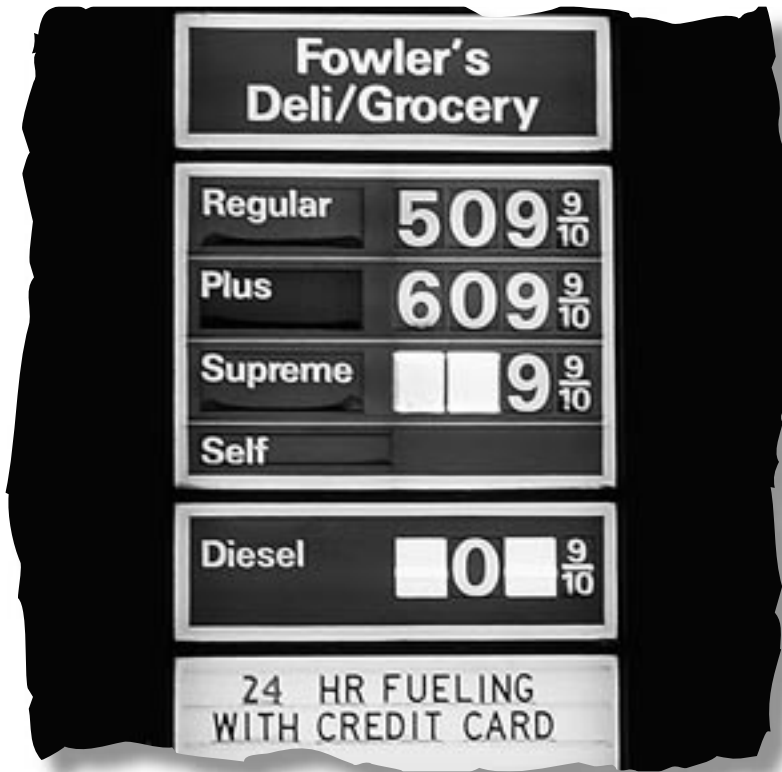
**Spring:** March 23-26, 2004, Olympia, Wash.  
Contact Jay Burney at (360) 753-8740 or jburney@ci.olympia.wa.us.  
**Fall:** October 19-22, 2004, Kennewick, Wash.  
Contact Bill Goodwin at (423) 741-5026 or bgoodwin@reidmidd.com.

## **Pacific Northwest Transportation Technology Expo**

May 18-19, 2004, Grant County Fairgrounds, Moses Lake, Wash.  
Contact WST2 Center at (360) 705-7386.

## **Pacific Northwest Snowfighters**

June 9-17, 2004, Ag Trade Center, Spokane, Wash.  
Sponsored by Washington State University.  
Contact information available at 1-800-942-4978.



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You can e-mail the image to [schofil@wsdot.wa.gov](mailto:schofil@wsdot.wa.gov)

Or mail the photo to:  
**"Sign of the Times"**  
**WST2 Center**  
**PO Box 47390**  
**Olympia, WA 98504-7390**

Please don't send your original photo. Although we will do our best to return the photo, we can't guarantee it.

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Web: [www.wsdot.wa.gov/TA/T2Center/T2hp.htm](http://www.wsdot.wa.gov/TA/T2Center/T2hp.htm)



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