"Improving Alaska's quality of transportation through technology application, training, and information exchange."

TECHNOLOGY FOR

Alaskan Transportation

Local Technical Assistance Program

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In this issue . . .

The New Wave of Marine Transportation

Two new vessels are about to join the Alaska Marine Highway System (AMHS) fleet. Unlike the state's conventional vessels, the new additions will be fast vehicle ferries (FVF).

A catamaran (twin hull) design of lightweight aluminum will be used to provide the highest transport efficiency of any high-speed ferry of its size. The new 235-foot vessels will be capable of 36 knots, or 41 mph, nearly twice the speed of anything currently in operation.

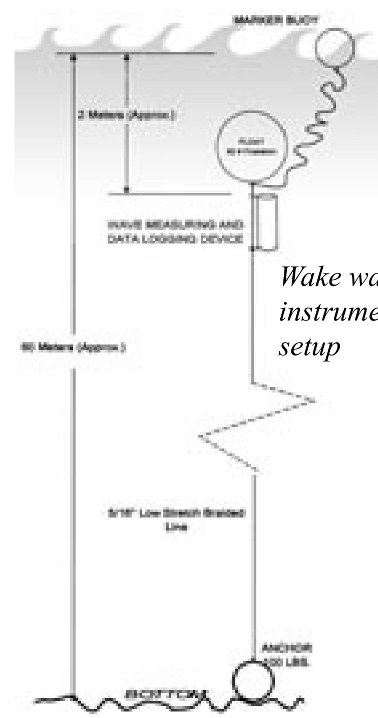
Conceptual drawing of MV Fairweather

Ensuring Low Environmental Impact

When AMHS secured the funding for two new fast vehicle ferries they wanted to ensure the design would be efficient and environmentally friendly. Would the wake of these fast vessels exceed that of current vessels? To measure the wake of vessels currently in operation and to predict the FVF wake, the Alaska Department of Transportation & Public Facilities Research Section worked with marine transportation consultants at Stumbo Associates.

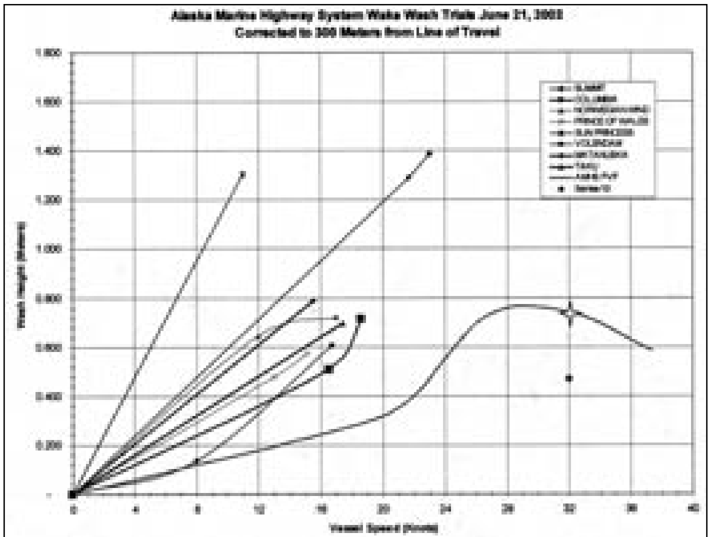
How do We Measure the Wake of a Vessel?

Researchers deployed wake wash instrumentation on vessel paths to measure wash characteristics of AMHS vessels and cruise ships in the vicinity of Ketchikan, Alaska. The sites were chosen so vessels would pass within 1,000 meters. The exact distance to the ship was measured by laser range finder, and the vessel speed was determined by hailing the vessel with VHF radio. Plots were then developed for wash height vs. vessel speed and wash energy vs. vessel speed.

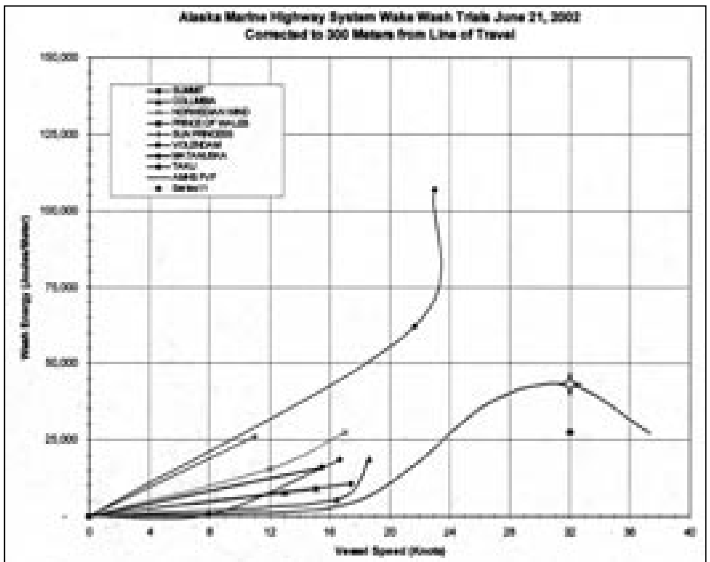


Wake wash instrumentation setup

continued



Comparison of ferries and cruise ships to AMHS FVF
(height vs. speed)



Comparison of ferries and cruise ships to AMHS FVF
(energy vs. speed)

Will the Fast Vehicle Ferries Create a Large Wake?

- Not likely. Wake wash will, in all likelihood, be less both in height and energy than cruise ships at service speeds greater than 20 knots.
- Wake wash height will likely be less than produced by the largest, fastest conventional AMHS ships.
- Wake wash energy may be more than is produced by the largest, fastest conventional AMHS ships.
- If there are perceived wake wash problems, it will probably be due to longer period bow waves produced at 32 knots, which may persist for longer distances and have a longer run-up on beaches than the shorter waves of other vessels.

What do the Researchers Recommend?

- Measure wake wash of completed vessels in fully loaded condition. Reexamine the comparison with other ship types.
- Route planning decisions in narrow sections should be made as a result of careful observations.
- Although wake wash may prove to be lower than predicted, public perception of fast vehicle ferry wash makes it prudent to thoroughly document the shoreline conditions of possible sensitive locations.
- Observe the effects of the FVF wake wash on any floating docks and other structures to determine if undue motion develops.

Fairweather and *Chenega* Currently Under Construction

The MV *Fairweather* arrives the summer of 2004 and will sail in southeast Alaska, connecting the ports of Sitka and Juneau. The name *Fairweather* was nominated by Alyeska Central School fourth grader Wesley Tyrell, who won an essay contest to name the new ferry. The name is consistent with the Alaska state law requiring a state ferry to be named after an Alaskan glacier.

The *Fairweather* will have interior seating for 250 passengers, with dedicated areas for work/study, video games, a full service snack bar, and a cargo deck capable of holding 35 vehicles.

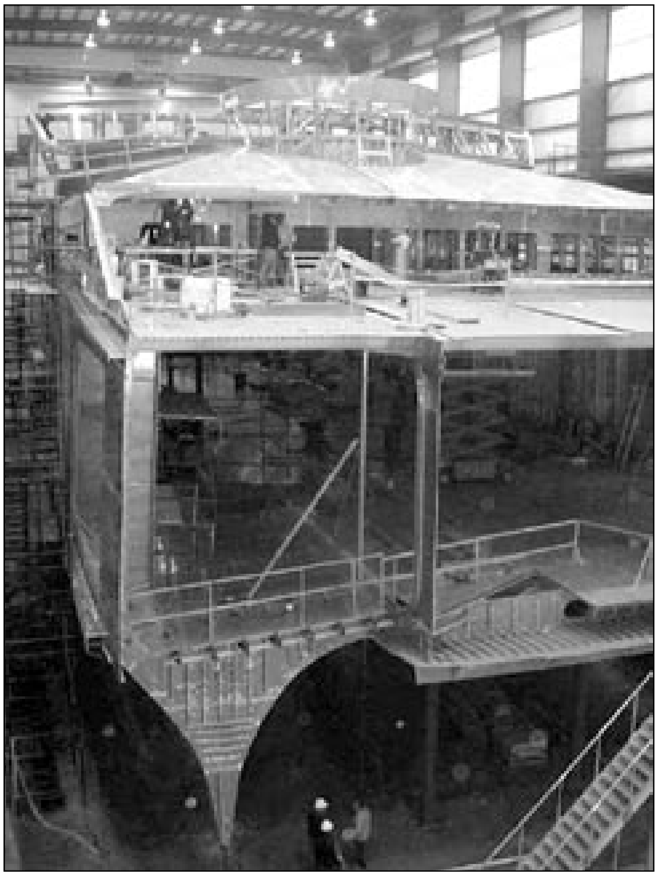
Cordova, Valdez, and Whittier, in Prince William Sound, will be served by the *Chenega.* The name *Chenega* was nominated by sixth-grader Emily Oskolkoff of Ninilchik School, who won the essay contest. The *Chenega* will be of similar configuration as the *Fairweather.* Both vessels are being built at Derecktor Shipyards of Mamaroneck, New York. Derector's bid of $67.9 million (for two vessels) was within 4% of ADOT&PF's engineer's estimate.

The Alaska Marine Highway System has been operating year round since 1963. Between 1992 and 2001, AMHS carried 3.7 million passengers and one million vehicles, or an average of 370,000 passengers and 100,000 vehicles per year. Currently there are nine vessels in the state-owned fleet transporting people, goods, and vehicles to 30 communities in Alaska plus Bellingham, Washington, and Prince Rupert, British Columbia.

A Preview Tour

These photos show the new ferry MV *Fairweather* under construction at Derecktor Shipyards in New York.

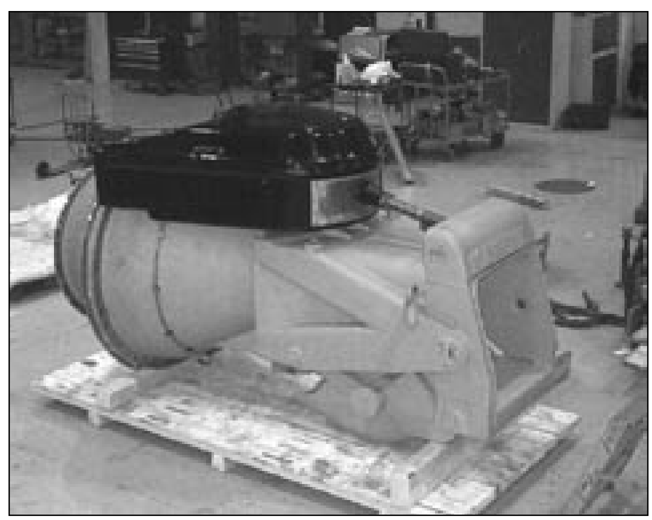
Between the catamaran hulls



View of MV Fairweather's *bow; remaining 32 feet to be added soon*

MTU 16 V 595 medium speed diesel engine, rated at 3600 kw at 1800 rpm – the Fairweather *and the* Chenega *will have four each.*

View of starboard hull, vehicle and passenger decks



Each diesel engine drives a Kamera waterjet propulsor

(photos continued on back page)

Alaska DOT Co-sponsors Alaska Summer Research Academy

Nearly 100 junior high and high school students gathered in Fairbanks for the third annual University of Alaska Fairbanks, Alaska Summer Research Academy (ASRA). ASRA is a 10-day residential summer outreach program administered by the UAF College of Science, Engineering, and Mathmatics.

Participants enrolled in a variety of fields of study where they worked alongside an outstanding faculty and staff assembled from colleges, research institutes, and state agencies. Students selected from a wide variety of disciplines like biology, forensics, robotics, computer science, and civil engineering, to name just a few. Each discipline supported 2 teams of four students, an arrangement that allowed for maximum individual instruction.

The Alaska Department of Transportation and Public Facilities, was one of the sponsors for this year's camp. In addition to a monetary donation, DOT's Research & Technology Transfer Section provided two engineering interns as teacher assistants: Jamie Brownwood helped with the electrical engineering group and Kim Phillips with the civil engineering cohort. They both did a great job working

Above: UAF proffessor Dr. Hulsey (upper right) demonstrates flow rate of water through diffferent materials of selected size to the civil engineering group.

Below: DOT construction engineer Tanya Knopke escorts ASRA students out on Centennial Bridge before the final concrete pour. Ross Benjamin and Login Daum are part of the civil engineering cohort participating in the field trip as part of ASRA 2003.

Education

Dr. Hulsey, third from left, leads a demonstration on how waves are induced by loading a bridge deck. Participating from left to right: Joe Nathan Mosley, Luisa Walmsley, and Derek Kalbfleish.

directly with students and faculty, providing assistance in lab activities and during field trips.

Several DOT employees chipped in to help make ASRA a success. Billy Connor presented impressive photos of the Nov. 3, 2002 Denali Fault earthquake; Steve Saboundjian and Simon Howell led an activity with the thermal camera; Myles Comeau and Scotty Sexton hosted a surveying event; and Northern Region Maintenance and Operations provided a front-end loader for the students to inspect.

The Construction Section hosted two field trips for the civil engineering group. Tonya Knopke arranged and led a tour of the Chena River Centennial Bridge project, and Bruce Herning arranged for a visit to the Loftus Road Extension project.

ASRA civil engineering students look on as Tanya Knopke shows them plans to the Centennial Bridge project.

Joe Nathan Mosley sits in a DOT front-end loader during DOT's transportation night.

Making the Grade

In Alaska, like many rural states, gravel roads are and probably always will be a reality. Maintenance for gravel roads result in a significant drain on resources for State and public works agencies. While good grader operator can reduce agency costs with efficient use of grader time and proper preventive maintenance, so can agencies reduce costs with effective planning and a clearly defined maintenance plan.

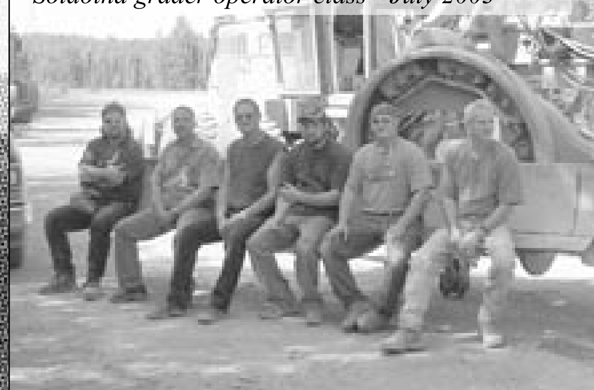
The DOT&PF, Research and Technology Transfer section is working to improve grader operator performance across Alaska. This summer we introduced a pilot program for grader operators in collaboration with the Utah Technology Transfer Center. The Utah Center provided an instructor, Dee Hadfield, who was able to adapt the program to the needs of four communities in Alaska (Palmer, Nome, Fairbanks, and Soldotna). The training was available to city, borough, and state operators.

Each class consisted of one day in the classroom and two days of hands-on instruction with the grader. Course activities included preventative maintenance, nomenclature, safety, and hands-on operational techniques.

Dee Hadfield of Utah T2 (far left) outlines the next drill for Nome operators.

Nome grader operator class—June 2003

Soldotna grader operator class—July 2003



Fairbanks grader operator class—July 2003

Motor grader course outline:

- safety and nomenclature
- preventative maintenance
- proper positioning of grader/windrow
- proper wheel lean
- when/how to use articulation
- v-ditching & backslopes
- developing proper A-shape (crown)
- building a road with ditches and proper 4% grade

In this drill, students were asked to split the windrow several times to practice proper moldboard placement and grader articulation.

Dee demonstrates how to swing the moldboard up and out for cleaning in front of culverts or digging a trench.

Commandments of a Good Gravel Road

Adapted with permission from Bill Heiden's *Odyssey of a Dirt Road*.

It takes more than just knowing how to operate a grader to effectively maintain a gravel road.:

Philosophy

- **Establish Four Wheel Paths**—Necessary so intervals between maintenance can be minimized. When only two or three wheel paths are used, a road will wear out twice as fast as four wheel paths.
- **Maintain Centerline**—As basic as it sounds, the centerline must be maintained in the middle of the road. This facilities the construction, maintenance, and proper gravel thickness across the entire roadway.
- **Establish Cross Slope**—A consistent grade allows the driver to maintain steady pressure on the steering wheel and enables them to drive down the right lane easily. For this to happen the cross-slope must be predetermined and adhered to throughout the agency (often 4% using the A-shaped method). Using a slope meter will help the operator maintain the grade within one-half percent.
- **Create Parallel Roadway Edges**—The opposite edges of the road must be parallel to the centerline and to each other. Road and lane width variation confuse the driver and tend to force them to the center of the road, creating two wheel paths.
- **Avoid Driveway Intimidation**—Does the driveway meet the road or does the road meet the driveway? If the crown of the road is interrupted by a driveway, the driver will again head for the center of the road, creating two wheel tracks.
- **Avoid Roadside Intimidation**—Caused by mailboxes, trees, power poles, fences etc. To avoid these hazards, traffic again moves to the middle of the road.

Logistics

- **Use Proper Road Surface Material Whenever Possible**—Whatever your materials, in most cases your best results will come with good gradation, proper moisture, and proper compaction.

Operations

- **Grade the Entire Roadway**—Edge to edge! This requires at least five passes to cut and four to lay back. Really depends on the width of the road.
- **Quality First, Production Second**—The road may be cut in second gear but the layback should be done in first. Going faster only starts the washboard.
- **Cut All Potholes and Washboards**—If not done, they will reflect through and shorten the maintenance interval.
- **Cut at the Predetermined Cross Slope**—This need to be done to assure uniform lay back and good compaction.
- **Mark Centerline**—This can done with the grader's tires.
- **Lay Back in First Gear**—This will minimize the wave or the beginning of a new washboard. Uneven tire wear, loose graders, worn cutting edges, and uneven tire pressure are villains working against getting that perfect surface.
- **Never Leave a Windrow or Working Berm**—Windrows are water traps and driver intimidators. They cause erosion and soft spots—get the water off and away from the road.

Longevity

- **Use Dust Suppressants/Base Stabilizers**—Increases the life between maintenance by a factor of seven.

Proper Headlamp Aiming Instructions

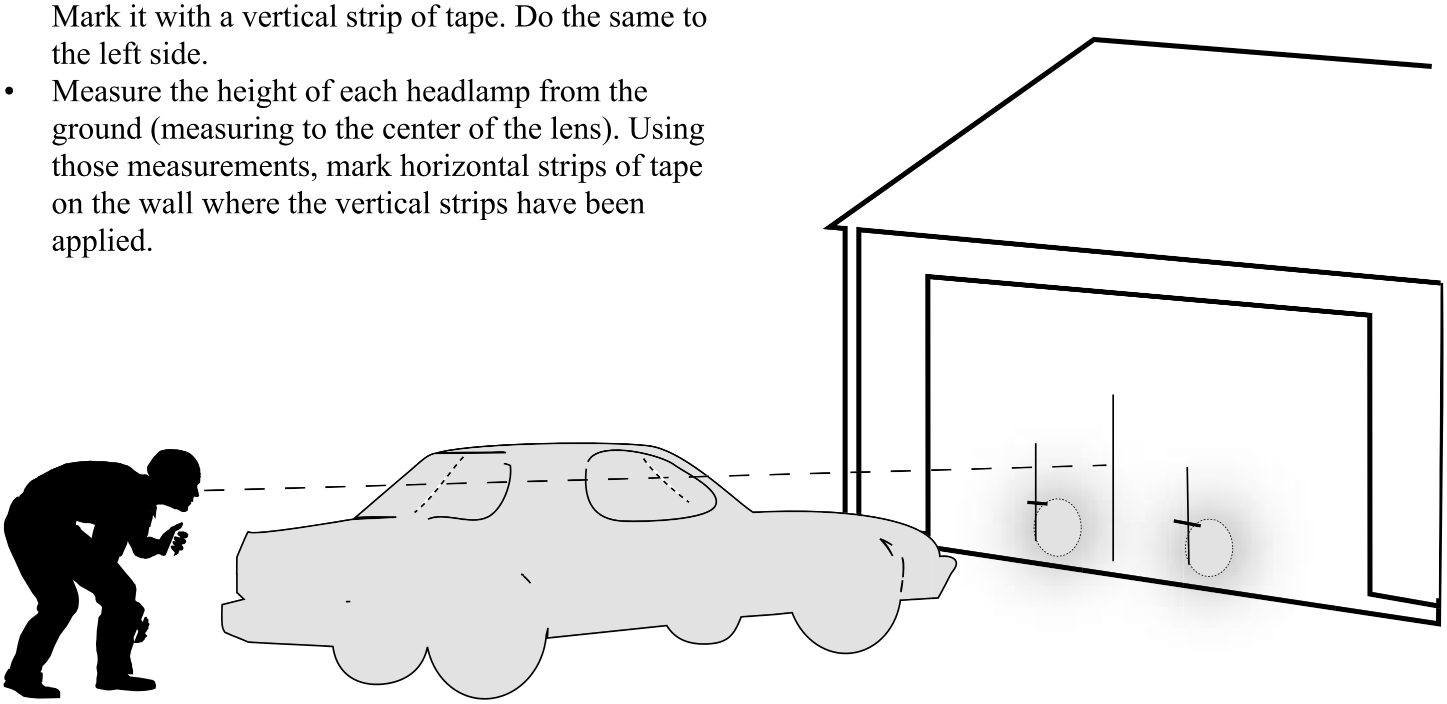
Reprinted from Texas Engineering Extension Service's newsletter *Lone Star Roads.*

What you will need:

A level
A spacious parking area near a flat, light-colored wall
A tape measure
Masking tape

Instructions

- Park the vehicle so that both the left and right headlamps are precisely 25 feet from a flat, light-colored wall.
- Measure the exact middle of both the windshield and rear window and mark them with strips of tape, creating vertical centerlines front and rear.
- Standing behind the car, sight along those centerlines, as if you were lining up sights on a rifle in a carnival shooting gallery. When the centerlines are aligned, you can locate the headlamp centerline on the wall. Mark this spot with a vertical strip of tape on the wall.
- Now measure the distance between headlamp lenses, center to center. Divide the headlamp-to-headlamp distance in half and measure that distance to the right of the centerline on the wall. Mark it with a vertical strip of tape. Do the same to the left side.
- Measure the height of each headlamp from the ground (measuring to the center of the lens). Using those measurements, mark horizontal strips of tape on the wall where the vertical strips have been applied.
- You should now have two crosses on the wall, with centers that correspond exactly to the center of each headlamp lens.
- Clean your headlamp lenses and then turn your headlamps on low beam. The left edge of the bright spots on the wall should just touch the vertical bars of the crosses in the lower-right quadrants. The top edge should just touch the horizontal bars. On some cars, you can adjust the headlight aim yourself by turning small set screws at the top and sides of each lamp.
- To increase the accuracy of this procedure, be sure the vehicle is loaded as it would be when inspecting signs. This includes the weight of the driver (and passenger if used).
- If you cannot do it yourself, a mechanic can adjust your headlamps at a garage or dealership. Aligning your headlamps does not substitute for any required state inspections.



Don't Try to be Perfect—Be Excellent Instead

From NDOT's *Nevada Milepost,* winter 2002

Perfection is viewed as a noble attainment. But trying to attain perfection can cause the perfectionist to be critical of himself and others and a pain to live with! In addition, perfectionism can create stress, counteract efficiency, and sink morale for everyone who deals with the perfectionist.

A productive mind set is excellence: meeting the highest standards agreed upon for oneself or by the group.

Perfectionists are:

Critical
Overwhelmed
Unable to see the big picture
Stressed out and anxious
Rarely enjoy their accomplishments

The person concentrating on excellence focuses on:

Continued personal and professional growth
Job satisfaction and customer service
Clear and reasonable expectations
A strong sense of accomplishment

Going from Perfectionism to Pursuit of Excellence

Get real. When you find yourself becoming frantic about a goal that you have to meet, stop and ask, "Is the frustration level equal to the problem?"

Set clear expectations. If you know what's expected of you, you can better track your progress and draw "perfection" boundaries when needed, which will signal you to stop stalling and move forward with the project.

Identify your triggers. Identify and recognize the factors that lead or contribute to your perfectionist thinking and behaviors—and avoid them.

Get some coaching. The outside perspective of someone trained in helping others reach more balanced expectations can be of benefit.

Delegate. Many perfectionists are overwhelmed, thinking that they—and only they—can complete the task at hand. Allow others to be responsible, which will increase the odds that the group will more easily reach excellence.

Know what's important. Ask yourself or the group members, "What's most important about this project?" Talking openly, then narrowing to key points and agreements, allows everyone to measure his or her performance and outcomes using the same gauge.

Fatalities by Transportation

Here are some interesting statistics of transportation safety that give a good perspective for us all.

Mode	1970	1980	1990	2000	2001
Large air carrier [a]	146	1	39	92	531
Commuter air carrier [a]	N	37	R7	5	13
On-demand air taxi [a]	N	105	51	71	60
General aviation [a]	1,310	1,239	767	592	553
Highway [b]	52,627	51,091	44,599	R41,945	42,116
Railroad [c]	785	584	599	512	548
Transit [d]	N	N	339	295	U
Commercial ship—Vessel	178	206	85	32	U
Commercial ship—Nonvessel [e]	420	281	101	87	U
Recreational boating	1,418	1,360	865	701	U
Gas and hazardous liquid pipeline	30	19	9	38	7

a Includes people on planes and on the ground. For large air carriers, fatalities resulting from the Sept. 11, 2001, terrorist attacks include only those persons onboard aircraft.
b Includes occupants, nonoccupants, and motor vehicle fatalities at railroad crossings.
c Includes fatalities from nontrain incidents as well as train incidents and accidents. Also includes train occupants and nonoccupants except motor vehicle occupants at grade crossings.
d Fatalities resulting from all reportable incidents, not just accidents. Includes commuter rail, heavy rail, light rail, motorbus, demand-responsive, van pool, and automated guideway.
e Fatalities unrelated to vessel accidents, e.g., individual falling overboard and drowning.

Key: N = data do not exist or are not cited because of reporting changes; R = revised; U = unavailable.
Source: Various sources, as cited in USDOT Bureau of Transportation Statistics, National Transportation Statistics 2002 (Washington, DC: 2002).

Longitudinal Joint Construction Techniques

from Washington State Department of Transportation *Tech Notes,* February 2003

Background

Distresses caused by poor longitudinal joint construction can result in the premature failure of multilane hot mix asphalt pavements. These distresses are often in the form of raveling and eventually cracking (Figure 1). The cause is attributed to relatively low density and surface irregularity at the joint. Low density at the joint is not unusual since the edge of the lane first paved (cold lane) is unconfined. The subsequent lane (hot lane) has a confined edge and therefore tends to have a higher density, but still does not typically meet the minimum requirements. Because these irregularities exist, techniques for proper construction should be identified and used to ensure improved performance and longer lasting pavements.

Figure 1. Joint in Washington with raveling and cracking present

A report titled *Evaluation of Eight Longitudinal Joint Construction Techniques for Asphalt Pavements in Pennsylvania*[1] is the primary source of information contained within this edition of TechNote. The report was produced based on findings from the Pennsylvania Department of Transportation (PennDOT) and the National Center for Asphalt Technology (NCAT). This study was done on five projects that were constructed in Michigan (1992), Wisconsin (1992), Colorado (1994), Pennsylvania (1995), and New Jersey (1996). This TechNote will concentrate on the Pennsylvania test sections with one additional joint construction technique used in Michigan and Colorado.

Construction of the Pennsylvania test sections was done in Lancaster County in mid-September of 1995. Each of the eight test sections were 500 feet in length and consisted of a 1.5-inch thick wearing course (see Table 1 for gradation) with ambient air temperatures ranging from 48 to 72°F. The overlap of new (hot) mix onto the cold lane was 1 to 2 inches, with the idea that it would be luted so as to provide additional material at the joint to achieve higher density. However, this material was broadcast across the hot mat (up to 1½ feet) and therefore defeated the purpose of the overlap.

Table 1. Gradation for Pennsylvania mix.

Sieves	1/2"	3/8"	4	8	16	30	50	100	200	%AC
% passing	100	98	68	45	25	15	11	8	5	6.0

Joint Construction Techniques

The eight types of construction techniques used in Pennsylvania include the following:

1. Joint Maker: Consists of boot-like device that is about 3 inches wide and is attached to the side of the screed, at the corner, during construction (Figure 2). The device forces extra material at the joint and a kicker plate lutes back the overlapped material so that raking is eliminated. The rolling was accomplished from the hot side with a 6-inch overlap on the cold lane (see technique 2).

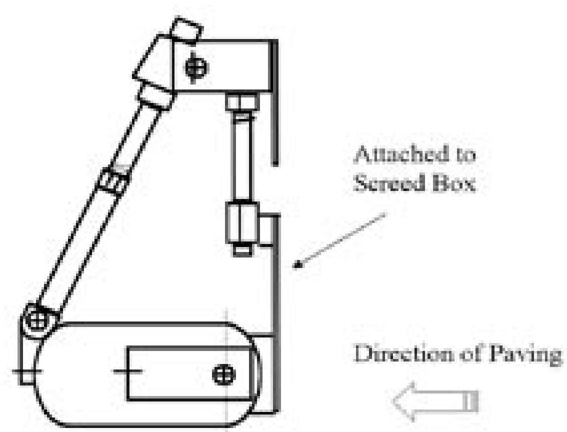


Figure 2. Joint maker

2. Rolling From Hot Side: The initial pass was compacted from the hot side with a 6-inch overlap on the cold lane (Figure 3). The breakdown roller made two passes (forward and backward) in vibratory mode at this location.

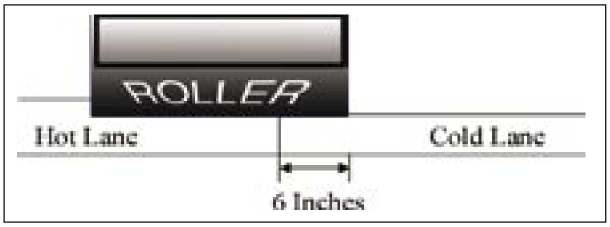


Figure 3. Rolling from hot side

3. Rolling From Cold Side: Initial compaction was from the cold side with a 6-inch overlap on the hot lane (Figure 4). The first pass (majority of roller wheel on cold lane) was made in the static mode and the second pass (backward) was made in the vibratory mode with a 6-inch overlap on the cold lane.

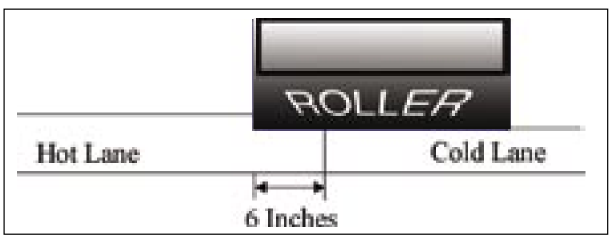


Figure 4. Rolling from cold side

4. Rolling From Hot Side Away From Joint: Compaction began with the roller edge approximately 6-inches from the joint on the hot side (Figure 5). Both passes (forward and backward) were made in vibratory mode with the second pass overlapping the cold lane by 6 inches.

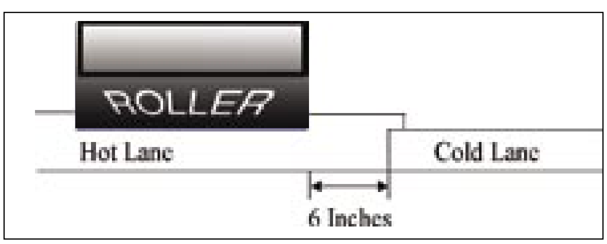


Figure 5. Rolling from hot side away from joint

5. Cutting Wheel: This technique cuts 1 to 2 inches off the unconfined, low-density edge of the initial lane after compaction, while the mix is still plastic. The cutting wheel is placed on the intermediate roller to produce a vertical edge, with higher density. The vertical edge was covered with an AC-20 tack coat before the placement of the second lane. Rolling was performed from the hot side with approximately 6 inches on the cold lane (technique 2).

6. Edge Restraining Device: This device provides restraint of the hot-mix on the first lane of construction. A 3-inch wide wheel with a 45-degree bevel is attached to the breakdown roller. When the device is lowered, the roller passes within 6 inches of the edge and it offers restraint at the edge of the first lane constructed. Two passes in the static mode were made with this device. The breakdown roller then finished compaction, including the 6 inches not already compacted. The adjacent lane was then compacted following technique 2.

7. Rubberized Asphalt Tack Coat: A rubberized asphalt tack coat (Crafco pavement joint adhesive) was applied to the unconfined edge of the cold lane. The tack coat was approximately 1/8-inch thick. Rolling was performed from the hot side (technique 2).

8. New Jersey Wedge (3:1): A wedge joint was created using a sloping steel plate attached to the inside corner of the paver screed extension (no compaction of the wedge itself). This formed a 3:1 taper while constructing the cold lane (Figure 6). The breakdown roller stayed 3 to 5 inches away from the tapered edge. The adjacent lane was placed with an infrared heater preheating the wedge to approximately 200°F prior to rolling from the hot side (technique 2).

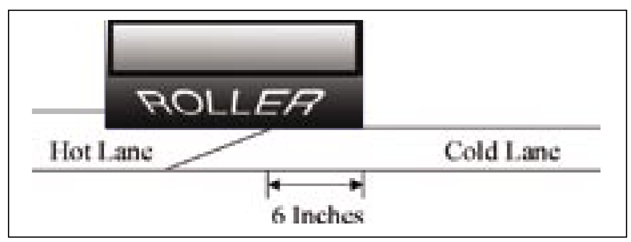


Figure 6. New Jersey wedge (3:1)

The Michigan[2] and Colorado[3] projects used a step wedge joint (Figure 7), very similar to what has been used in Washington state over the past few years.

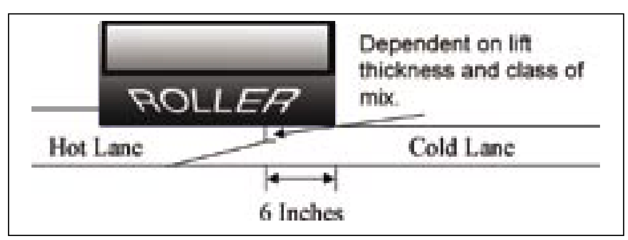


Figure 7. Notched wedge joint

The Michigan project used hot mix asphalt that had approximately 12 % passing the 1/2-inch sieve and retained on the 3/8-inch sieve. The vertical offset was 1/2 inch and the taper was 12:1 (compacted with a

continued

small roller wheel attached to the trailing edge of the screed). The Colorado project used hot mix asphalt that had approximately 17 % passing the 3/4-inch sieve and retained on the 1/2-inch sieve. With the larger aggregate size, the vertical offset was 1 inch and the taper was 3:1. The adjacent lane was compacted according to technique 2 and the tapered face was tacked in both cases.

Test Results

Core samples were obtained at the joint and 12 inches from the joint on the cold side for the Pennsylvania project. Density determinations were then made, including the percent air voids. Table 2 illustrates the average air voids at the specified joint type.

Since construction, yearly evaluations were made, with the last visual performance evaluation made in July 2001. Performance data collected over this period of time, including the initial density measurements, has identified which construction technique resulted in the best functioning joint over time (Table 3).

Table 2. Percent air voids at the pavement joint

Joint Type	Mean	Std. Dev.
Joint Maker	9.2	0.94
Rolling from hot side	10.3	1.49
Rolling from cold side	9.3	2.36
Hot side 6 inches away	10.0	1.29
Cutting wheel	8.7	2.16
Edge restraining device	7.7	1.78
Rubberized Joint Material	12.9	1.53
New Jersey Wedge (3:1)	14.8	2.15
Michigan Wedge (12:1)	8.8	---
Colorado Wedge (3:1)	9.2	---

Table 3. Six-year field evaluation of longitudinal joints (organized by rating)

	Cracking			Raveling
Joint Type	Avg Rating	% Length	Avg Width (mm)	% Length
Rubberized Joint Material	9.88	0	---	2
Cutting Wheel	9.12	6	6.25	0
Hot side 6 inches away	8.75	6	3	8
New Jersey Wedge (3:1)	7.75	3	2	4
Edge restraining device	6.75	35	4.75	8
Joint Maker	5.50	85	9.5	0
Rolling from hot side	4.75	99	6.25	0
Rolling from cold side	4.62	88	9.5	0

Performance Observations

In the early stages, some of the joints appeared to perform better than others, regardless of density. As time progressed, environmental conditions caused several of the joints to worsen, especially during cold winters. The joints constructed by rolling from the hot side, rolling from the cold side, and the joint maker went from being rated as three of the top four in 1997 to the three worst in 2001, due to almost continuous cracking at the joint. On the other hand, the joints constructed with the rubberized material, cutting wheel, and rolling from the hot side 6 inches away were able to maintain a tight joint with minimal to no cracking and raveling.

Based on the six-year field performance of the different longitudinal joints constructed in Pennsylvania and relevant NCAT experience in Michigan, Colorado, and Wisconsin, the following ranks the techniques according to performance.

Longitudinal joints constructed using rubberized joint material (Figure 8) gave the best performance with no significant cracking, closely followed by the cutting wheel. However, the quality of the joint with the cutting wheel is dependent upon the skill of the operator.

The test section that constructed the joint by rolling from the hot side 6 inches away (Figure 9) and the New Jersey wedge also performed well with no significant cracking. However, the section with New Jersey wedge (without a notch) showed raveling 2 to 3 inches wide at the joint.

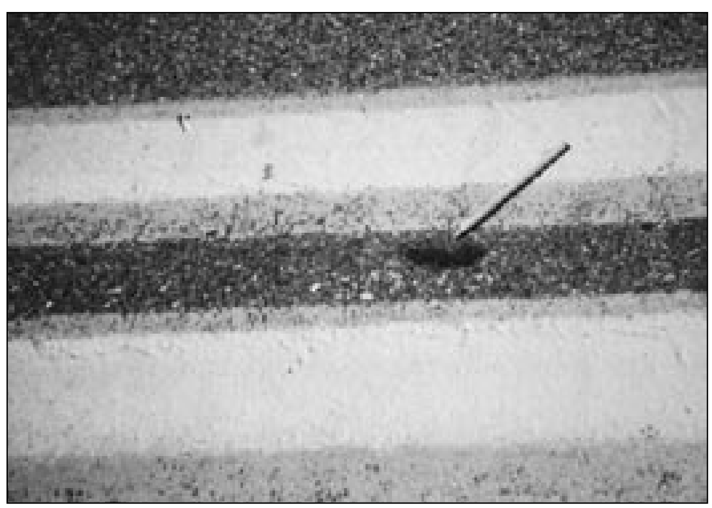


Figure 8. Rubberized joint material

The notched wedge joint, like that used in Michigan and Colorado, would have prevented the raveling and also allowed higher density at the joint (Table 2).

Figure 9. Rolling from hot side 6 inches away from joint

Test sections using the edge-restraining device, joint maker (Figure 10), rolling from hot side (Figure 11), and rolling from cold side (Figure 12) developed cracking at the longitudinal joint on anywhere from 35 % to 99 % of the test section.

Overall of rolling from the cold side resulted in a wider and deeper crack compared with rolling from the hot side.

Figure 10. Joint maker

Figure 11. Rolling from hot side

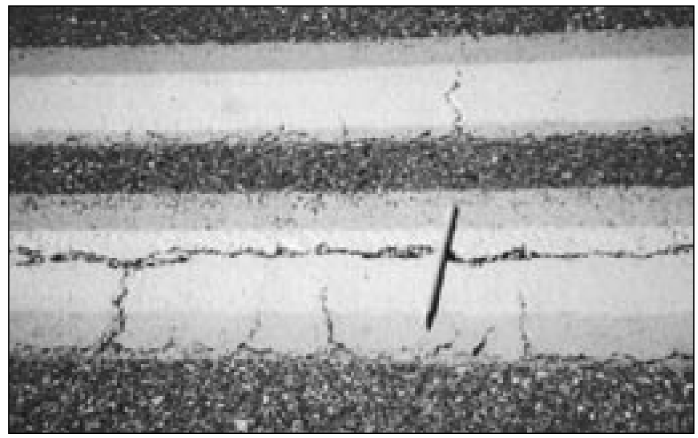


Figure 12. Rolling from the cold side

Conclusions

It is recommended that all rolling should be performed from the hot side, no matter which type of joint is constructed. This allows the use of a vibratory roller in the first pass and generally results in higher density. If just a change in roller operations is used, rolling from the hot side 6 inches away from the joint should be used. If a different type of joint is considered, using rubberized joint material and/or the use of a notched wedge joint (12:1) or a cutting wheel will give the best overall durability.

The final recommendation is to specify a minimum joint density. Generally, this should be 2 % lower than is allowed for mainline; however, NCAT recommends that air voids be no more than 10 %.

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[1] *Evaluation of Eight Longitudinal Joint Construction Techniques for Asphalt Pavements in Pennsylvania.* P. Kandhal et al., July 2001. In 81st Annual Proceedings of Transportation Research Board, paper number 02-2451, January 2002.
[2] *Evaluation of Longitudinal Joint Construction Techniques for Asphalt Pavements.* P. Kandhal et al., Transportation Research Record 1469.
[3] *Study of Longitudinal-Joint Construction Techniques in Hot-Mix Asphalt Pavements.* P. Kandhal et al., Transportation Research Record 1543.

Using Geotextiles in Unpaved Low Volume Roads

Reprinted with permission from SD T3 Service, South Dakota LTAP, Special Bulletin No. 17, 1995.

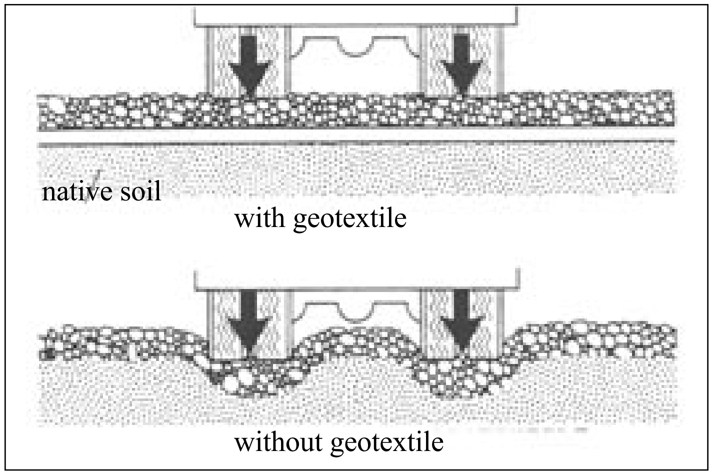
There is an old saying about roads: "If you can drain it, you can maintain it." Excessive water in a roadbed is the most common cause of rutting on rural roads. A poor or insufficient base compounds the problems caused by water. Common sources of water in the roadbed are underground springs in or near the roadbed, a high water table in flat areas, or low areas where surrounding fields are higher than the roadway and there is nowhere to divert the water. The problem may be a continual one such as ground seepage or an intermittent one due to rain or flooding. Improving drainage is ideal but cannot always be accomplished.

Geotextiles have been used successfully to increase the stability of weak subgrades and increase the load bearing capacity while reducing the cost of maintaining the road.

The Function of Geotextiles

The four primary functions of geotextiles when they are used in unpaved roads are as follows:

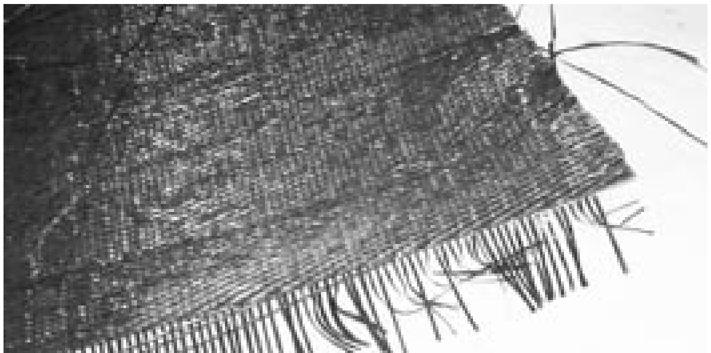
- Separation is the main benefit in stabilization work with geotextiles. It is the ability to prevent the intermixing of two materials. With a geotextile in place, aggregate base materials under load are not forced into the subgrade. Subgrade soils cannot mix with the clean aggregate layer. Without geotextiles, the aggregate and weak subgrade soil would mix. Load-bearing capacity would be reduced and rutting accelerated. The fabric allows water to pass through while preventing the layers from mixing.
- While acting as a separator, the geotextile may also function in a filtration and drainage capacity in wet or saturated soils. Under load, high pressure creates a soil slurry that "pumps" upwards against the fabric. The fabric acts as a filter, screening out the fines from contaminating the aggregate layer while allowing water to drain freely through the aggregate. Filtration is the process of allowing water to pass through the fabric while preventing soil migration. Evaporation from underlying soil can proceed, preventing development of water pockets and hydrostatic excessive pressure due to rapid or repeated loads.



- Drainage can be critical to the structural performance. Water must be able to pass through the fabric. If the subgrade soil is subjected to persistent or even occasional wet conditions, the section must be permeable to allow rapid drainage of water from the loaded subgrade soils up into the free-draining aggregate base. Maintaining the drainage of the aggregate base and of the subgrade soils is very important in preventing failure of the support system.
- The use of geotextiles on a road section allows for the increase of stress of subgrade soils. Geotextiles with superior frictional characteristics, such as needle punched nonwoven fabrics, help in "locking" the aggregate in place. By keeping the aggregate in place, the base course retains its structural integrity. When using geotextiles, a reduction in the thickness of aggregate is possible.

Benefits of Using Geotextiles

- Longer serviceable life of the roadway.
- Reduced maintenance costs.
- Reduction of the depth of the structural section required to carry the load.
- Reduced initial construction costs.
- Possibility of reclaiming aggregate used in temporary roads.
- Structural section life is prolonged and maintenance costs reduced because soil intermixing between layers is restricted.
- Cost effectiveness: approximately 33% reduction in aggregate required in the initial design of unpaved structural sections.



Woven Versus Nonwoven Geotextiles

Woven fabrics have a higher modulus (stress/strain) and develop maximum tensile strength with minimum elongation, but woven fabrics have lower abrasion resistance, less permeability, and poorer surface friction than nonwoven fabrics. Passage of water within the plane is defined as lateral permeability or transmissivity. Woven fabrics do not pass within their plane, and, because they do not, woven fabrics can be a problem on gravel bases. Woven fabrics should be considered only for locations that are fairly dry, where abrasive forces are minimized and where soil/fabric/aggregate friction characteristics are not important.

Nonwoven fabrics offer superior resistance to abrasion damage and provide excellent characteristics for separation and filtration/drainage. Under load they develop high tensile strength and have good friction properties making them excellent for reinforcement. Nonwoven fabrics have the capacity of passing water through both normally and within the plane. Nonwoven geotextiles are recommended for most unpaved road applications.

Installing Geotextiles

In order for geotextiles to perform well in road stabilization, the fabric chosen must be of the proper type, and it must be installed properly. Fabrics damaged during placement or installed in a highly wrinkled condition will not perform well.

The aggregate overlay must be placed to its full depth and must be applied in a way that will not cause damage to the fabric from movement of construction equipment. The performance of geotextiles will be no better than selection and installation procedures.

Packaging and Storage

Geotextiles come in rolls that are wrapped for protection from moisture and ultraviolet exposure. If these are stored outside, they should be elevated and covered with waterproof protection.

Site Preparation

Clear and grade the area. Remove sharp objects. Cut trees and shrubs flush with the subgrade. Top soil and vegetation need not be removed. Excavate soft spots, backfill, and compact so filled area provides an equal stability with the adjacent areas. Grade the surface as much as possible to provide surface drainage and cross-slope shaping. Tight blading will provide a smooth surface to support the fabric and will also provide a well-established crown. When roadbed material contains gravel, as the blade or grader drags the surface, sharp tips and edges on the gravel will be rolled over and become flush with the surface, reducing the possibility of punctures or tears in the fabric.

Unroll the geotextile in the direction of the construction traffic. Overlap in the direction of subbase placement. Overlap is dependent on load-bearing capacity of the subgrade, and it varies from 2 feet to 3 feet.

Dump the aggregate on top of the geotextile. Spread it using a loader or small bulldozer. Avoid heavy traffic directly on the geotextile. Spread the aggregate in the same direction as the geotextile. Overlap to avoid separation. Aggregate depth is determined by subgrade strength and anticipated wheel loading. Usually 4 to 6 inches is used. Compact the aggregate using conventional methods. Vibratory compaction is NOT recommended.

Damage Repair

If the geotextile is damaged during the installation process, repairs can be made. Clear the damaged area plus three additional feet of all fill material. Cover area with a geotextile patch extending three feet beyond the perimeter of damage. Replace subbase material and compact.

The Road to Reauthorization Challenges and Opportunities in the Reauthorization of TEA-21

By U.S. Representative Don Young from *Transportation Builder,* February 2003

Today, more than ever before, transportation facilities and services drive the economic engine of America. These facilities and services drive our economy because they provide mobility and access—the cornerstones of economic development. In turn, mobility and access contribute directly to the economy's ability to generate jobs.

The highway and transit systems that move America's people and goods, and make economic growth possible, are paid for by a combination of federal, state, and local dollars. These highway, transit, and transportation safety programs are implemented at the U.S. Department of Transportation and must be reauthorized before September 20, 2003, when the current six-year authorization under the landmark Transportation Equity Act for the 21st Century (TEA-21) will expire.

Importance of Transportation Investment

In addition to providing mobility and access, highway and transit investments stimulate economic activity. For every $1 billion in federal highway and transit spending, 47,500 jobs are created or sustained. These investments also increase productivity by decreasing time spent on the road, encouraging new development, and increasing property values. Transportation infrastructure generates up to a 6-to-1 net return on investment. In addition, more than 75 % of the nation's freight moves on the nation's highways—an annual value to the economy of more than $5 trillion. Freight transportation is critical to our economic growth.

> "In order to improve the nation's highway and transit infrastructure for present and future generations, the combined size of the federal-aid highway and transit programs must grow from $39 billion in fiscal year 2003 to—at a minimum—$74 billion by the fiscal year 2009."

Perhaps the single largest obstacle to increased transportation and economic efficiency is congestion. Traffic congestion costs the United States more than $67 billion annually—more than 3.6 billion hours in delays and 5.7 billion gallons of excess fuel wasted in traffic jams. The average cost of congestion for each peak-road-traveler is $1,160 a year, and drivers now waste an average of 62 hours per year in traffic—the equivalent of more than a week and a half of work days. This is unacceptable. Congestion is choking America's freedom of movement and must be addressed in an aggressive manner.

Current Conditions

Adding to these challenges is the current condition of our transportation infrastructure. Today, 32 % of our major roads are in poor or mediocre condition and 28 % of bridges are either structurally deficient or functionally obsolete. In addition, 36 % of our nation's urban rail vehicles and maintenance facilities and 29 % of the nation's bus fleet and maintenance facilities are in substandard or poor condition. Although these figures are slowly getting better through investment in transportation infrastructure, we must increase the pace of investment, or we will fall so behind that we'll never catch up.

We must also increase the safety of our highways and roads. Nearly one third of all fatal crashes each year are caused by substandard road conditions and roadside hazards. Our reauthorization legislation will address this vital issue as well.

Our central task is not just to maintain our current transportation infrastructure, but to actually improve it. In order to improve the nation's highway and transit infrastructure for present and future generations, the combined size of the federal-aid highway and transit programs must grow from $39 billion in fiscal year 2003 to—at a minimum—$74 billion by the fiscal year 2009.

Transportation Funding

The "Conditions and Performance (C&P) Report" recently published by the U.S. Department of Transportation describes the cost to improve the existing system of highways and bridges and transit systems. Using conservative assumptions, these estimates indicate that by 2009, the federal highway program needs to grow to at least $61.2 billion, and the transit program needs to grow to $12.4 billion. However, achieving this level of growth will require new revenue generating mechanisms.

Under current estimates of user fee receipts to the Highway Trust Fund, the size of the federal-aid highway program may only reach $35 billion by 2009, and the transit program may only grow to $8.6 billion. These numbers clearly fall well short of what is needed to improve the current highway and transit systems.

Possible Funding Sources

Over the six-year period of fiscal years 2004 through 2009, the following actions could generate an additional $65 billion for the federal-aid highway and transit programs. It's important that I stress that at this time these are only proposals that are under discussion to address our serious transportation funding situation. These possible proposals:

- Spending down the balances of the Highway Trust Fund could generate $12 billion.
- Transferring the 2.5 cents ethanol general fund contribution to the trust fund may produce between $4 and $5 billion. The amount would be greater if Congress mandates the production of five billion gallons of ethanol as the Senate proposed in last year's national energy bill.
- Terminating the 5.3 cents user fee subsidy that ethanol receives or reimbursing the Highway Trust Fund could add $8 billion to the highway program.
- Redepositing trust fund interest to the Highway Trust Fund may produce between $3 and $4 billion.
- Indexing the motor fuels user fee to the Consumer Price Index could generate over $15 billion.

Reauthorization Priorities

In addition to finding new revenue sources to meet our transportation needs, we also must address additional priorities in reauthorization, including:

- retaining TEA-2 1's budgetary firewalls and funding guarantees;
- preserving the principle that transportation user fees are dedicated exclusively to transportation improvements;
- continuing the Revenue Aligned Budget Authority (RABA), with adjustments to avoid extreme budgetary swings; and
- streamlining project delivery to expedite the review and completion of important highway and transit projects.

Working Together

As we move our highway and transit reauthorization bill through the legislative process, we will work in a bipartisan manner with the transportation industry; labor officials; federal; state, and local transportation agencies; and members of Congress to develop a consensus for addressing the important transportation needs and challenges in a way that benefits every community in all 50 states.

And in the end, I'm confident that we will develop legislation that will meet the transportation needs of our growing population and expanding national economy.

U.S. Rep. Don Young (R-Alaska) is chairman of the House Transportation and Infrastructure Committee.

99 years ago this construction season.

These remnants of the Council City and Solomon River Railroad at mile 32 on the Nome-Council road are referred to by some these days as the "train to nowhere." The construction for this railroad started in 1903 to access the mines in the area. Thirteen miles of track were laid by 1905, and the surplus locomotives, built in 1886 from the New York City elevated railroad, were shipped to Nome. It was the continent's most northern and most western standard-gauge railroad. It was eventually abandoned in 1916.

Photo by, and courtesy of Christine A. Storey

105 years ago this construction season.

This photo was taken in 1974 near the shore of Lake Bennett, B.C., Canada. It shows the cribbing and rock fill for the anchor weight of an aerial tramway probably built in 1897. The tramway was one of many similar schemes used to haul freight over the Chilkoot Pass.

Photo by Russell Mitchell

Training and Meeting Calendar

September

NHI 137024A: Introduction to Systems Engineering for Advanced Transportation.
Anchhorage: September 3–4

Construction: Contracting Warrant System - Level 2: Contract Administration.
Fairbanks: September 23–24
Anchorage: September 25–26
Juneau: September 29–30

October

RWIS: User Training.
Anchhorage: October 13
Fairbanks: October 14
Juneau: October 15

Construction: Contracting Warrant System - Level 2: Contract Administration.
Fairbanks: October 28–29
Anchorage: October 30–31

For information about T2-sponsored training, contact:

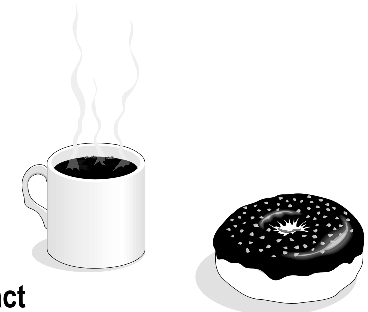
Dave Waldo at 907-451-5323, david_waldo@dot.state.ak.us

or

Simon Howell at 907-451-5482, simon_howell@dot.state.ak.us

or go to:

www.dot.state.ak.us, select "**T2 Training**" under "**Hot Topics Quicklinks**," and then choose "**Training**" from the menu on the left.



Meetings Around Alaska

Society	Chapter	Meeting Days	Location & Contact
ASCE	Anchorage Fairbanks Juneau	Monthly, 3rd Tues., noon Monthly, 3rd Wed., noon Monthly, 2nd Wed., noon*	Northern Lights Inn Captain Bartlett Inn Westmark Hotel * except June–Aug.
ASPE	Anchorage Fairbanks Juneau	Monthly, 2nd Thurs., noon Monthly, 1st Fri., noon Monthly, 2nd Wed., noon*	West Coast International Inn Captain Bartlett Inn Westmark Hotel * except June–Aug.
ASPLS	Anchorage Fairbanks Mat-Su Valley	Monthly, 3rd Tues., noon Monthly, 4th Tues., noon Monthly, last Wed., noon	Executive Cafeteria, Federal Building Ah Sa Wan Restaurant Windbreak Cafe George Strother, 745-9810
AWRA	Northern Region	Monthly, 3rd Wed., noon	Rm 531 Duckering Bldg., University of Alaska Fairbanks Larry Hinzman, 474-7331
ICBO	Northern Chapter	Monthly, 1st Wed., noon	Zach's Sophie Station Jeff Russell, 451-5495
ITE	Anchorage	Monthly, 4th Tues., noon**	Sourdough Mining Co. Laune Koziesek, 343-8145 ** except July & Dec.
IRWA	Sourdough Ch. 49 Arctic Trails Ch. 71 Totem Ch. 59	Monthly, 3rd Thurs., noon** Monthly, 2nd Thurs., noon** Monthly, 1st Wed., noon	West Coast International Inn Oriental House Mike's Place, Douglas ** except July & Dec.
Asphalt Pavement Alliance	Alaska	3rd Wednesday of every other month	varies John Lambert 267-5294
PE in Government	Anchorage	Monthly, last Fri., 7 a.m.	Elmer's Restaurant
Society of Women Engineers	Anchorage	Monthly, 1st Wed. 6:30 p.m. except July and August	varies Karen Helgeson, 522-6513

The New Wave of Marine Transportation

continued from front page

This photo, from bow looking aft, shows progress on the new ferry MV Fairweather. *The new AMHS fast vehicle ferry is under construction at Derecktor Shipyards in New York. The story begins on the front page.*

Inside the *Fairweather*'s pilot house

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