

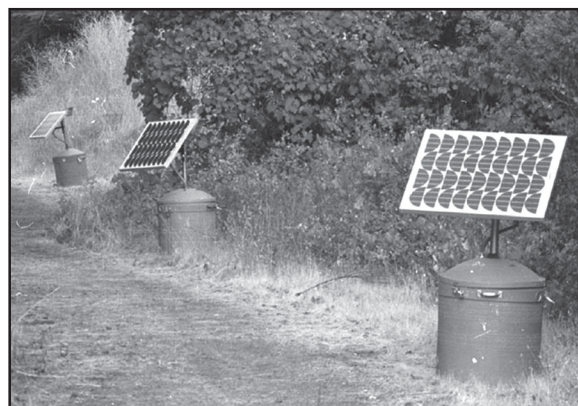
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Missoula Technology and Development Center

Solar-Powered Fire Camp Lighting

Photovoltaic power units can provide a dependable, quiet source of electrical power for fire camps. They eliminate the noise, environmental hazards, and fuel supply problems associated with gasoline- or diesel-powered generators. MTDC obtained a grant from the Department of Energy's Federal Energy Management Program to test the concept of solar-powered fire camp lighting. Ten units were purchased from the Power Pod Corporation of Telluride, CO. Five of the units were tested



These photovoltaic units provided lighting during tests at a fire camp in northern California without the problems associated with generators.

in the Big Bar fire camp in northern California during the 1999 fire season. They were used to light the trails leading to the camp's dining facilities. The pods were later transferred to the Cleveland National Forest for further field evaluation.

Most photovoltaic power systems are cumbersome to transport and lend themselves more to stationary applications. To be more useful in fire camp and disaster relief situations, truly portable solar systems will have to be developed. MTDC is currently seeking a partnership with the Federal Energy Management Program to design and develop solar lighting units that are truly portable.

Solar power will probably never completely replace generators because of generators' portability and high power output. Solar is well suited for lighting remote fire camps and disaster relief areas. It is quiet, allowing crews to get much needed sleep, and does not require a continuous fuel supply. It also avoids the environmental hazards associated with fuel storage and handling.

The report, *Evaluation of Solar-Powered Lighting for Fire Camps*, 9971-2855-MTDC, provides details of the field tests and recommends pod modifications. This document is available on MTDC's web site: <http://fsweb.mtdc.wo.fs.fed.us/pubs/htmlpubs/htm99712855/index.htm>.

For more information on the solar-power pods project, contact Steve Oravetz, Program Leader: (406) 329-1037; Openmail: soravetz/wo.mtdc; Lotus Notes: Steve Oravetz/WO/USDAFS; or Wes Throop, Project Leader: (406) 329-3957; Openmail: wthroop/wo.mtdc; Lotus Notes: Wes Throop/WO/USDAFS.

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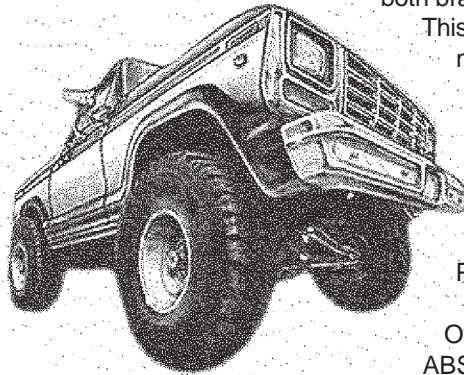
Driver Safety Alert: Anti-Lock Braking Systems

Many Forest Service personnel are encountering vehicles equipped with Anti-lock Braking Systems (ABS) for the first time, either in vehicles from a motor pool or in rental cars. Dave Dieziger, Project Leader at MTDC, notes that drivers who are not familiar with ABS can find themselves in a dangerous situation. Studies have shown that ABS has not reduced the number or severity of vehicle accidents. The National Highway Traffic Safety Administration found that accidents in which vehicles run off the road have increased by 28 percent in vehicles equipped with ABS. The system is not dangerous when used properly by a driver familiar with the way it affects a vehicle in a hard braking stop.

ABS keeps wheels from locking during hard braking. It does so by automatically releasing brake pressure at any wheel it senses has a lower rate of rotation than the others. That wheel is approaching a skid situation. There are two advantages in detecting this situation and immediately releasing the brake. First, braking is most effective just short of lockup. Second, a vehicle can be steered only if the wheels are turning. A vehicle cannot be steered once a wheel locks up. The safety advantages of ABS include shorter stopping distances under most road conditions and retention of the ability to steer.

There are two types of ABS: two-wheel and four-wheel. With four-wheel ABS, the pedal will pump or vibrate and the driver will hear a grinding sound. This is normal. The driver must maintain a firm, steady pressure on the brake. If the brake is pumped, the sensing function of ABS will be negated. The result will be a much longer stopping distance with possible loss of directional control.

Many pickups are equipped with ABS only on the rear wheels. These vehicles have a single sensor on the rear differential. When one wheel begins to skid, it releases both brakes and almost all braking is left to the front wheels.



This causes the driver to increase braking pressure, and may result in one or both of the front wheels locking up. The driver of a two-wheel ABS system must be ready to reduce braking pressure if the front wheels lock up or steering will be lost. Drivers must watch for another idiosyncrasy. In some part-time four-wheel-drive vehicles, the ABS is disabled when the four-wheel drive is engaged. Please read the owner's manual to avoid this surprise.

Overconfidence is more dangerous than failing to use ABS properly. You should never reduce your following distance or drive faster because your vehicle is equipped with ABS. There are road conditions where you should drive more cautiously and more slowly with ABS. On loose gravel, unpacked snow, or "washboard" road surfaces, ABS can double stopping distances.

Vehicles equipped with ABS have an indicator light that comes on when the engine is first started. If it does not go out, the system is not working properly. If you are driving a vehicle with ABS for the first time, be sure and read the owner's manual. If possible, try making a test stop in a safe area with poor traction to see how the vehicle responds.

For more information on ABS and vehicle safety, contact Dave Dieziger, Project Leader: (406) 329-390; Openmail: ddieziger/wo,mtdc; Lotus Notes: Dave Dieziger/WO/USDAFS.

Missoula Technology and Development Center

Fiber-Reinforced Polymer Bridges

Fiberglass, the most common fiber-reinforced polymer (FRP), weighs about one-fifth as much as steel, yet has similar tensile and compressive strengths. It has a high resistance to corrosion. It can be protected from ultraviolet degradation by a surfacing veil of polyester fabric and resin. The FRP Trail Project was begun in 1997 to evaluate the use of fiber-reinforced polymer in Forest Service and National Park Service trail bridges.



Materials for this fiber-reinforced polymer bridge weighed just 4,000 pounds rather than 10,000 pounds for a comparable steel bridge.

A 45-foot FRP bridge was tested at the Forest Products Laboratory in Madison, WI. This bridge was fully loaded to its design load of 250 pounds per square foot and observed from October 1998 to August 1999. It performed well. Disassembly of the bridge showed no significant problems.

In September 1999 the disassembled materials from this heavy-duty FRP trail bridge were packed 1.5 miles from the trailhead to a site northwest of Vancouver, WA, on the Gifford Pinchot National Forest. The crew transported 4,000 pounds of materials to the site with little difficulty. The heaviest members weighed just 180 pounds. They were 45 feet long, but had enough flexibility to bend around tight corners in the trail. Materials for a comparable steel bridge would have weighed more than 10,000 pounds with individual members weighing 500 pounds or more. The bridge was completely installed shortly after noon of the second day. Only simple carpentry tools such as hammers, levels, and wrenches were needed.

This summer a 23-foot FRP pack bridge that is 6 feet wide will be installed on the Wallowa-Whitman National Forest near the Peavine Creek Trailhead.

MTDC will publish a manual presenting design methodologies, performance specifications, and installation and maintenance recommendations for FRP trail bridges.

For more information on these bridges, contact Merv Eriksson, Project Leader: (406) 329-3147; Openmail: meriksson/wo,mtdc; Lotus Notes: Merv Eriksson/WO/USDAFS.

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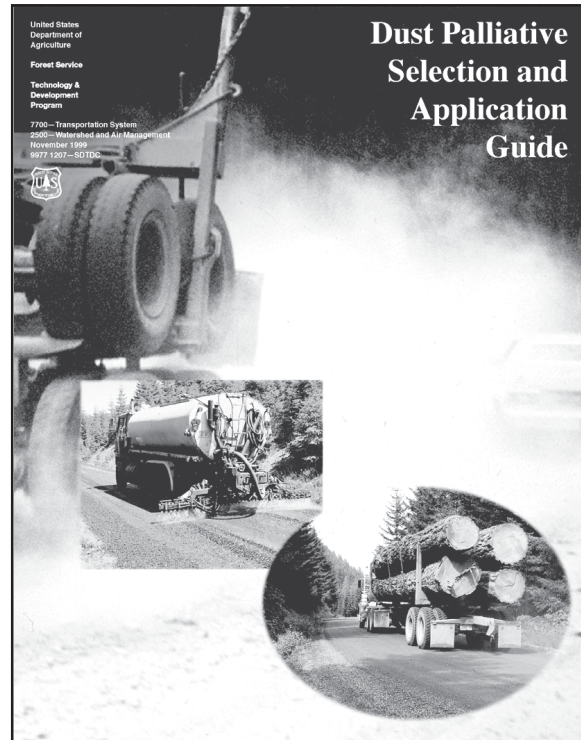
Recently Published Documents

The following documents are complete and will be distributed within the next few weeks.

Dust Palliative Selection and Application Guide (9977-1207-SDTDC)—This publication will help practitioners choose and apply the dust palliative that is appropriate for their particular site, traffic conditions, and climate. In addition, this document describes the expected performance, limitations, and potential environmental impacts of various palliatives. The guide examines most of the commonly available dust palliatives currently available, but does not endorse any particular product. Because new products will become available and existing ones will change after this report's publication, the report is recommended just as a starting point for determining the palliative that would be most appropriate for a given situation.

This publication will be available on the Forest Service's internal computer network at: <http://fsweb.sdtc.wo.fs.fed.us>.

For more information, contact Alan Yamada, Project Leader: (909) 599-1267, ext. 224; Openmail: ayamada/wo,sdtc; Lotus Notes: Alan J Yamada/WO/USDAFS.



San Dimas Technology and Development Center

New Documents in the Water/Road Interaction Technology Series

A Guide to Computer Software Tools for Culvert Design and Analysis (9977-1806-SDTDC)—Forest engineers and hydrologists regularly calculate design culvert dimensions for use in wildland road-stream crossings. This project investigates existing software tools to aid resource managers in culvert design and analysis requirements for low-volume forest roads. This guide is a snapshot of information on software tools for culvert design and analysis as of June 1998. To select a cost-effective software product that meets design needs, the reader can:

- Look at all the tables, particularly the product review summary.
- Read the paper.
- Follow suggestions in the decision matrix (Appendix A).

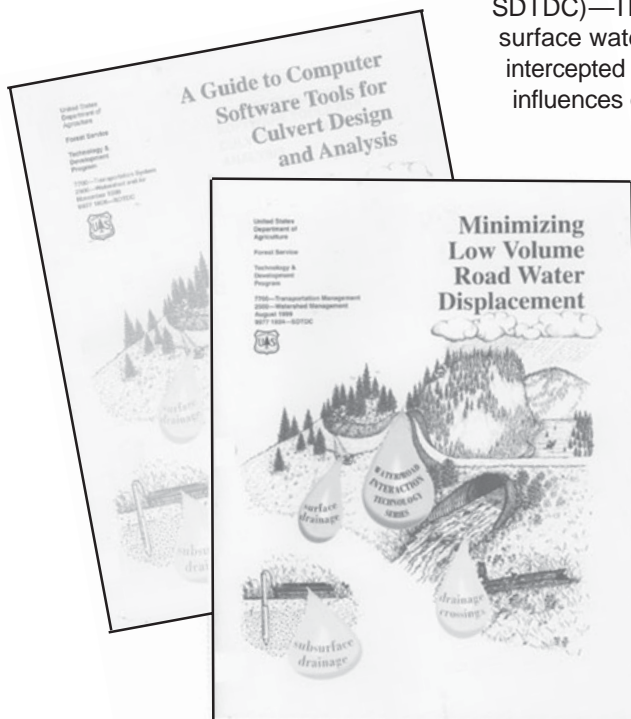
A glossary of terms and notations is included, as well as a decision matrix with selected criteria.

Minimizing Low-Volume Road Water Displacement (9977-1804-SDTDC)—This paper discusses water/road interaction in terms of surface water concentrations on road segments and subsurface flows intercepted by road cuts. Background information on low-volume road influences on hydrology is followed by a summary of existing methods for minimizing water concentrations and flow distances away from the road corridor.

The notion of water *displacement* due to low-volume road segments is introduced, as is the philosophy of *proper drainage* provision. Examples detailing these ideas appear in the appendix. Some new concepts and uses of emerging products for minimizing water displacement and attaining proper drainage provision are presented. Color photographs are used throughout the paper to illustrate the concepts.

These documents are available on the Forest Service's internal computer network at the following address:
<http://fsweb.sdtc.wo.fs.fed.us>.

For further information on the Water/Roads Interaction Technology Project contact Jeff Moll, Project Leader: (909) 599-1267, ext. 246; Openmail: jmoll@wo.sdtc; Lotus Notes: Jeffrey E Moll/WO/USDAFS.



Library Card

Kilroy, Bill. Clements, Susan. 2000. T&D News March-April 2000. Tech. Rep. 0071-2824-MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 6 p.

Reports projects underway at the USDA Forest Service's Missoula and San Dimas Technology and Development Centers. Topics in this issue include: *Solar-Powered Fire Camp Lighting*, *Driver Safety Alert: Anti-Lock Braking Systems*, *Fiber-Reinforced Polymer Bridges*, *Dust Palliative Selection and Application Guide*, *A Guide to Computer Software Tools for Culvert Design and Analysis*, and *Minimizing Low-Volume Road Water Displacement*.

Keywords: development, newsletters, product development, T&D, technology, technology transfer