

## TIRE CHIPS

### A NEW ROAD-BUILDING GEOMATERIAL



Placing tire chips with dump truck and bulldozer.

Tire chips have unique properties that make them particularly useful for road construction: low compacted density, low lateral earth pressure, low thermal conductivity, and high permeability. This material has already been put to use in more than a dozen U.S. highway projects. Each cubic meter of tire-chip fill contains 100 scrap tires (75 tires per cubic yard). A typical highway project uses many tires; a recently constructed tire-chip fill in Maine, which was 120 meters (400 feet) long, used 200,000 tires. Highway construction has the potential to make a significant contribution to disposal of the 2 billion to 3 billion scrap tires that are stored or discarded throughout the United States.

The in-place density of tire chips is less than 50 percent of that for a typical gravel fill. This makes tire chips an ideal lightweight fill to stabilize embankments against landslides. Tire chips can be placed with conventional earthmoving equipment. In 1989 the Oregon Department of Transportation used a tire-chip fill that was 4.3 meters (14 feet) thick to lighten the load at the top of an embankment vulnerable to landslide. In Maine tire chips are being used to construct a bridge-approach fill that is also 4.3 meters thick to correct stability problems caused by a weak clay foundation.

What about the effect of a compressible tire-chip layer on pavement life? For two projects in Maine, it was found that placing 1.8 meters (6 feet) of soil cover over 0.61 meters (2 feet) of maximum-size tire chips yielded tensile strains at the bottom of the test pavement that were the same as for a control section with no tire chips. Even for soil covers as shallow as 0.76 meters (2.5 feet), the tensile strains at the bottom of the pavement were only 40 percent greater than those in the control section.

The low unit weight and high permeability of tire chips makes them an attractive retaining-wall backfill. A test wall constructed at the University of Maine showed that the lateral earth pressure at the base of tire-chip fill 4.3 meters (14 feet) thick with a 36-kPa (750-psf) surcharge was less than 50 percent of that for a typical gravel fill. Lower pressures would allow thinner, lower-cost walls to be constructed. These low earth pressures could result in significant cost savings for retaining walls and bridge abutments.

Tire chips are also a good thermal insulator to limit frost penetration beneath roads. Their thermal resistance is approximately eight times higher than that of gravel. A test project constructed on a gravel-surfaced road in Maine showed that 0.3 meters (1 foot) of tire chips reduced the depth of frost penetration by 40 percent.

Finally, tire chips are inexpensive compared with natural fill materials. Tire chips can typically be purchased for between \$2 and \$13 per cubic meter (\$1.50 to \$10 per cubic yard). Their affordability, combined with their proven uses, is sure to increase their rate of use in highway construction.

—Dana N. Humphrey  
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project, including chipped tires for embankment fill materials, ground tires for hot-mix asphalt, and whole truck tires to construct a retaining wall. The clearing and grubbing debris from the project construction site was used for erosion control, and leaf mold was applied as plant mulch. Recycled plastic fence posts were integrated into control-of-access fencing, and recycled plastic posts served as roadway delineators. Recycled plastic traffic control barricades and refurbished traffic signal heads were also used.

Additional recycled and solid-waste materials were incorporated into a second recycling project awarded in December 1992 and completed in 1994. In addition to materials incorporated in the first project, crushed glass served as drainage aggregate, and plastic pipe made with recycled polyethylene resins was used for the first time. These pilot projects will be periodically monitored and evaluated.

A total of 15 construction projects containing recycled and solid-waste products have been

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