



## King County Environmental Purchasing Program

# Tire-Rubber Material and Products

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## Introduction

Used tires become raw material for the manufacture of an increasing number of products. Applications for shredded, ground, or chipped tires include rubber mats, playground surfaces, and "soaker" hoses. Tire rubber that has been sliced is fabricated into entry mats, loading-dock bumpers, and other products. Shredded tires are used as a lightweight fill material in construction applications.

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## Usage History and Experience

In the summer of 1996, a contractor to Solid Waste Division used 100 mats, each created by "stitching" slabs of recycled tires into 5-foot by 10-foot sections, in a project at a landfill on Vashon Island. These portable and reusable temporary road mats are easily installed to provide traction for trucks in muddy conditions, minimize erosion, and save time and money.

Tire Retreading services worth \$100,000 were used to retread tires for trucks and other heavy equipment at the Renton Maintenance Facility, Fleet Division and the Cedar Hills Landfill, Solid Waste Division. Retreading a tire costs 50% less than buying a new tire. This prevents landfill disposal of tires and saved the County \$100,000 in 1999.

## Play-Area Surface of Recycled Tire-Rubber

Rubber chips made of processed waste-tire material have been used by Parks Division as play area cover. Not only does this product meet the safety and performance standards set by Parks Division, it also uses rubber derived largely from Washington State waste tires. Parks Division has also used recycled rubber mats for backstop padding in ball parks.

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## Lightweight Fill

The States of Oregon, Minnesota, Washington, and Wyoming, among others, have conducted trials in which tire-rubber was used as lightweight fill in construction applications.

### **State of Oregon, DOT Summary and Sample Specifications**

Experimental Project:  
Use of Shredded Tires for Lightweight Fill, Oregon DOT (1992)

Contact:

Rich Watanabe (503)986-2819 or  
Tim Dotsun (503)986-3600 Salem, OR  
Report and video available

Shredded waste tires were used as lightweight fill to repair a landslide associated with a highway improvement project in southwest Oregon. Approximately 580,000 shredded waste tires were placed and compacted with a dozer, then capped with 3 feet of soil and a pavement section consisting of aggregate base course and asphalt pavement.

Lightweight Rubber Fill Specifications

*Sample Specification (Oregon Department of Environmental Quality - Adapted from State of Minnesota Department of Natural Resources)*

The lightweight fill shall consist of chipped rubber tire pieces meeting the following specifications:

1. 80 percent of the material (by weight) must pass an 8" screen.
2. At least 50 percent of the materials (by weight) must be retained on a 4" screen.
3. All pieces shall have at least one sidewall severed from the face of the tire.
4. The largest allowable piece is 1/4-circle in shape or 24" in length whichever is the lesser dimension.
5. All metal fragments shall be firmly attached and 98% embedded in the tire sections from which they were cut. NO METAL PARTICLES SHALL BE PLACED IN THE FILL WITHOUT BEING CONTAINED WITHIN A RUBBER SEGMENT. Ends of metal belts and beads are expected to be exposed only in the cut faces of some tire chips.
6. The lightweight fill material supplied shall weigh less than 600 pounds per cubic yard, truck measure.
7. Unsuitable material delivered to the project shall be rejected in truckload quantities and removed from the site at no cost to ODOT.
8. ODOT, by use of this material, does not absolve the supplier of the responsibility of proper disposal of the lightweight rubber fill material if the section should fail to perform as expected.

### **State of Minnesota, DOT Summary**

Contact: Blake Nelson, Assistant Foundation Engineer  
DOT Foundation Unit, (612)779-5599

Shredded tires were encapsulated in a geotextile.

Three projects have been completed:

1. - Roadway widening, upgrade
2. - Embankment, lightweight fill 52,000 tires used
3. - Embankment, bearing capacity, concrete pavement overlay 30,000 cu yds

Throughout the State of Minnesota, up to 50 projects have been completed utilizing waste tires as lightweight fill.

### **State of Washington, DOT Summary and Sample Specification**

Each year, four million waste tires are generated in Washington State.

DOT used approximately 10,000 cubic yards of shredded tires to repair a slide area on SR 101 near Cosmopolis in 1993. The advantage of using tires is that there is no biodegradation of the material, as opposed to wood chips. Tires weigh less than wood chips, which are commonly used as lightweight fill. At 20 to 40 pounds per cubic foot, these weigh less than gravel at 150 lbs/cu ft. They based their specifications on the State of Oregon's project (see State of Oregon in this file). The Department of Ecology assisted in finding the material, which was provided at no cost.

Sample Specification

Lightweight Fill - Special Provision (C4337)

Description: This work shall consist of placing lightweight fill (shredded tires), to the line and grade as staked by

the Engineer.

Materials: Lightweight fill shall consist of shredded rubber from the stockpile, which is being provided at no cost to the Contractor, or if needed, as follows:

Shredded tire lightweight fill shall consist of 100% chipped rubber tire pieces weighing less than 700 pounds per cubic yard, truck measure. Ends of metal belts and beads are expected to be exposed only in the cut faces of the chips. All metal fragments will be firmly attached and 98% embedded in the tire sections from which they were cut. No metal particles will be placed in the fill without being contained within a rubber segment. All pieces will have at least one sidewall severed from the face of the tire. The largest allowable chip dimension shall be 24 inches or 1/4 of the original tire circular shape, whichever is the less dimension. At least 50 percent of the material by weight must be retained on a 4 inch screen, and 80 percent of the material by weight must pass an 8 inch screen.

Lightweight fill material shall be stockpiled at the same site as that indicated in the Special Provision SOURCE OF STOCKPILE MATERIALS. Unsuitable material delivered to the project or project stockpile shall be rejected in truckload quantities and removed from the site at no cost to the State. The State, by use or rejection of this material, does not absolve the supplier of the responsibility of proper disposal of the lightweight fill material.

#### Construction Requirements:

The lightweight fill shall be constructed by end dumping by trucks or other method approved by the Engineer. The lightweight fill shall be placed in layers not to exceed three feet thick. Each layer shall be compacted by at least three passes of a D-8 Dozer equivalent or larger tracked vehicle weighing at least 72,000 pounds. A full coverage pass is a pass during which at least one track of the dozer passes over every portion of the lift surface being compacted, by traveling back and forth the length of the lift followed by a full coverage pass traveling back and forth the width of the lift and continuing to alternate travel direction on successive passes.

Prior to placement of the gravel base slope seal, the top of the lightweight fill shall be constructed with a top elevation 12 inches above the finished elevation to allow for shrinkage. The sides of the lightweight fill shall be overbuilt to provide for final trimming. The side slopes shall be smooth and compact.

The final trimming of the lightweight fill shall be accomplished by a backhoe with a bucket, with a thumb on it, or another method approved by the Engineer.

After the final trimming, the lightweight fill shall be covered with construction geotextile for soil stabilization, as shown in the Plans.

Lightweight fill shall not be exposed to petroleum products or open flames. The gravel base seal shall be placed over the completed lightweight fill as soon as possible.

At least four weeks shall be allowed for consolidation of the lightweight fill under the gravel base and 0.45 foot depth of asphalt concrete pavement Class E, prior to final paving.

The Contractor is hereby alerted that reinforcing wire in shredded rubber typically precludes travel of rubber-tired vehicles over the lightweight fill.

#### Measurement:

Lightweight fill will be measured by the cubic yard of shredded rubber in place after final trimming.

#### Payment:

The unit contract price per cubic yard for "lightweight fill in place" shall be full pay for furnishing all labor, materials, tools, and equipment necessary for hauling, placing, and compacting as specified.

Any lightweight fill material that is furnished in addition to the stockpiled source provided will be paid for under the item "Force Account - Additional Lightweight Fill Material," as provided in Section 1-09.6.

For the purpose of providing a common proposal for all bidders, the State has entered an amount for the item "Force Account - Additional Lightweight Fill Material" in the bid proposal to become a part of the total bid by the Contractor.

For information about projects described in this section, contact:

Ed Shustak, Designer  
John Hart, Project Engineer  
Washington DOT (Grays Harbor)  
(360)533-9352

#### **Garfield County, Washington**

Contact: Mike Selivanoff, (509)843-1301

The County used 40,000 cu yds of waste tires to lightweight fill a 50 foot deep ravine in 1995. This lightweight fill was covered with topsoil and a road was built as a shortcut to eliminate a hairpin curve. The fill material is 4" x 8" pieces. The State Department of Ecology (DOE) payed for the material and its delivery to the site (114 miles one-way). DOE's incentive is to eliminate a huge private tire pile in Spokane. They did an RFP to find markets for

these tires.

***Please see the following articles regarding this project:***

**Daily Journal of Commerce** article (about Garfield County project)  
"Experimental road smolders, burns" February 1, 1996

SPOKANE (AP) - Talk about hot wheels. A road in Garfield County is closed because flames and smoke keep bursting through the surface.

This road began as an experiment that used old shredded tires to build up a roadbed north of Pomeroy, in the southeastern corner of Washington. As engineers ponder a solution, the steaming road remains a warm oasis in frozen Eastern Washington.

"It stinks like burned rubber," Clay Barr, director of emergency services for Garfield County, complained Wednesday.

That's because it is, to misquote Elvis, a hunka hunka burning rubber. Half a million old tires were cut into chips and mixed with dirt and gravel to fill a 50-foot deep gully last year. Then gravel was laid across the top of the 350-footlong experimental section.

Steam began escaping from the side of the elevated roadbed last fall. Flames up to 18 inches high began appearing in mid-January.

Falling Spring Road runs from Pomeroy north to the Snake River town of Central Ferry. The burning stretch is 10 miles north of Pomeroy.

Engineers aren't sure why the road began smoldering.

The theory is that massive floods last fall saturated the old tires with water. That water accelerated the rusting of steel in the steel-belted tires. Rust creates heat and that may have ignited the tires, Barr said. The state Department of Ecology is trying to find a solution. The agency runs a program to rid the state of gigantic piles of old tires. The program so far has disposed to 8.5 million tires by cutting them into chips and using them for a variety of purposes.

Assistant, Director., Dan Silver said several roads in Washington and Oregon included tire chips in the roadbeds in recent years.

There is a similar burning road situation near the Pacific County town of Ilwaco.

Flames burst through the side of the Garfield County roadbed on Jan. 17, Barr said. That prompted the county to close the road. Flames have jumped out several other times, and the road is constantly smoldering, he said.

"At times you can't see through the steam," said county engineer Mike Selivanoff. "It's kind of scenic more than anything else. Like driving through Yellowstone National Park.

He said the heat of the smoldering roadbed allows grass to stay green in the dead of winter and draws birds and wildlife.

Firefighters have dumped foam on the road several times, but it continues to smolder.

In addition, the roadbed itself is settling, creating large holes in the surface.

A meeting is scheduled on Feb. 7. between local and federal officials to discuss a solution, Barr said. The material may have to be removed, he said.

Traffic has been rerouted onto an older road, Barr said.

**Recycling Times article, April 16, 1996 by Kathleen M. White**

**"Burning Roadbeds in Washington Could Wreak Havoc on Used Tire Chip Markets"**

Two stretches of highway in southern Washington that were built with used rubber tire chips were smoking and oozing a toxic oily substance, causing the state to issue a moratorium on use of the recovered material in similar applications until the exact cause of the underground fires at the site is determined.

A 100-foot stretch of State Highway 100 in Ilwaco, Wash., began emitting oil and gas last December after cracks appeared in the asphalt of the roadway. The Washington State Department of Transportation (WSDOT) rebuilt the portion of the road in October 1995 using approximately 10,000 cubic yards of used tire chips as fill for the roadbed after the original portion was washed out because of flooding.

In January, a 300-foot stretch of road in Garfield County began exhibiting similar problems. Like the road in Ilwaco, the 300-foot roadbed on Highway 101 in Garfield County also was built using shredded tire fill.

"Citing the incidents in Ilwaco and Garfield County, we issued a moratorium on using tire [chips] for road fill in January until we can find out what is going on," said Clarissa Lundeen, a spokeswoman for WSDOT. With the exception of a case that involved combustion of scrap tires used for

embankment on a section of Colorado's Interstate 70, the incidents in Washington are a first for this specific type of application for used tires, Lundeen said.

While the roadbeds continued to smolder, WSDOT and the Washington State Department of Ecology have coordinated investigative and cleanup efforts that include 24-hour monitoring of the sites. The Ilwaco site's proximity to fish and eagle habitats and the Pacific Ocean complicated the cleanup efforts. As a result, the U.S. Coast Guard also has joined the cleanup.

To date, more than 1,150 gallons of oil have been collected from the Ilwaco site, according to WSDOT. The total cost for the cleanup is expected to run between \$1 million and \$3 million.

Because this type of situation is unprecedented, investigative and cleanup efforts are expected to take a long time, Lundeen said. The agency has called on a national tire fire expert to help assess the situation and advise on safe removal of the tire chips, which have been smoldering well below the surface of the roadway for several months now. Removal of the tire chips is expected to take about one month, Lundeen said.

The tire chips will be removed from the site and analyzed for any information that could help determine the cause of the fires, Lundeen said.

Currently, WSDOT said it has not determined what caused the tire chips to ignite under the roadbeds at Ilwaco and Garfield County. Lundeen would not speculate on a cause, although she added that shredded tires have been used as fill for a state highway near Cosmopolis, Wash., without incident since 1993.

As in other states, the use of shredded tires for highway applications in Washington mainly has been fueled by the 1991 Intermodal Surface Transportation Efficiency Act, which mandates the use of recycled tire chips in asphalt and suggests the material be used for road fill. The Federal Highway Administration also has encouraged the use of recovered tires in highway projects.

"We thought it was a good technology, but we're shocked," said Harry Bennetts, assistant division administrator for the Olympia, Wash., branch of the Federal Highway Administration, which helped oversee the Ilwaco tire-fill project. "This technology has been used successfully time and time again. It wasn't like it wasn't proven technology."

"This use, in principal, is not new for scrap tires," added Michael Blumenthal, executive director of the Washington, D.C.-based Scrap Tire Management Council. "Scrap tires have been used in road embankments for five years.

"We know that what happened in Washington is a unique occurrence," Blumenthal said. "The tires did not just burst into flames by themselves. There were certain unique features that were different from other, similar, applications of tires."

For example, Blumenthal said the depth at which the tire chips were buried beneath the roadbed-27 feet in Garfield County and 47 feet in Ilwaco-was unprecedented. In addition, the Ilwaco tire-fill roadbed was located on a previously flooded site. Finally, "the insulatory properties of rubber [tires] probably helped sustain the heat, but there had to be a heat source," he said. "We have reason to believe that the cover that was put on top of the fill may have had something to do with it."

These variables combined may have contributed to the combustion of the tires, he said.

As a result of the recent incidents in Washington, which have received much mainstream media attention, inroads made in civil engineering applications for used tires have been affected, Blumenthal said. "This has gotten a lot of publicity that's been the negative type, and it's going to adversely affect five years of positive experience" with the applications, he added.

Civil engineering projects that incorporated the use of scrap tires in their design have been put on hold awaiting the outcome of the Ilwaco and Garfield County assessments, Blumenthal said. As a result, between 15 and 20 million used tires will not be used in civil engineering application this year. "This incident has put marketing projects back by a year and a half," he said.

In addition to providing damage control, the Scrap Tire Management Council has convened a task force of tire manufacturers and scrap tire processors to address the issue. The organization also has been working with WSDOT and the Federal Highway Administration and has sent consultants to the Ilwaco and Garfield County sites.

"We need to come up with answers," Blumenthal said. "We do not want to see a very valuable market be damaged."

#### **State of Wyoming, DOT Summary**

Contact:

Jan Winsbrough,  
Wyoming Tire Recyclers  
(307)235-0133

DOT used more than 500,000 shredded tires as lightweight fill in a road construction project. This site is a

severe slide area on a mountain pass. The material consisted of shredded, used tires. The specification required a minimum of 95% of the shreds shall be no larger than 4-inch wide cross cut pieces of passenger car tires having a diameter no larger than 16.5 inches. A maximum of 5% of the material shall be pieces which are no larger than 4- inch wide cross cut pieces of tires which are 16.5 inches to 24.5 inches in diameter. The material will be compacted. Rubber products such as inner tubes and conveyor belts shall not be used.

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### For More Information

Scrap Tire News  
PO Box 714  
Suffield, CT 06078  
(860)668-5422

Recreation Resource, (800)635-2525  
NorthWest Rubber Materials, (800)663-8724

Rich Watanabe or Tim Dotsun  
State of Oregon, DOT, Salem, OR  
(503)986-2819

Blake Nelson,  
Assistant Foundation Engineer  
State of Minnesota  
DOT Foundation Unit  
(612)779-5599

Publication:

"Using Shredded Waste Tires as a Lightweight Fill Material for Road Subgrades" Report Number:  
MN/RD - 94/10, April, 1994.  
This document is available through the National Technical Information Services, Springfield, VA  
22161

Mike Selivanoff,  
Garfield County Public Works  
(509)843-1301

Jan Winsbrough  
Wyoming Tire Recyclers  
6925 Cactus Lane  
Casper, WY 82602  
(307)235-0133

National Asphalt Pavement Association (NAPA)  
5100 Forbes Blvd  
Lanham, MD 20706-4413  
(301)731-4748

Publication:

"Scrap Tire Utilization Technologies"  
December, 1993; Information Series 116

University of Maine  
Dana N. Humphrey  
Thomas C. Sandford  
Associate Professors  
Department of Civil Engineering  
5711 Boardman Hall  
Orono, Maine 04469-5711

(207)581-2176

Publication:

"Tire Chips as Lightweight Subgrade Fill and Retaining Wall Backfill," October, 1993

Further information may be available through the following main menu selections:

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## Vendor Information

Alpine Commercial Tire and Retreaders (425)742-3533 Everett, WA  
Schuyler Rubber, (425)488-2255 Woodinville, WA (dock bumpers)



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