FUTURE DIRECTIONS

WSDOT will continue to monitor the performance of the various test sections and investigate additional potential methods for mitigating the damage caused by studded tires. In addition, WSDOT is in the process of evaluating the wear rates on hot mix asphalt pavements. This effort has been delayed due to software limitations and the challenges in distinguishing rutting (caused by heavy trucks) versus wear (caused by studded tires on passenger cars).

CARPET DRAG

Surface texturing technique that drags either a burlap or Astroturf™ across the wet concrete surface to create the required texture.

Device used for applying carpet drag.

Final carpet drag finish.

FOR MORE INFORMATION:

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Washington State
Department of Transportation

SUMMARY OF RESULTS

for Mitigating Damage Caused by Studded Tires on Concrete Pavements

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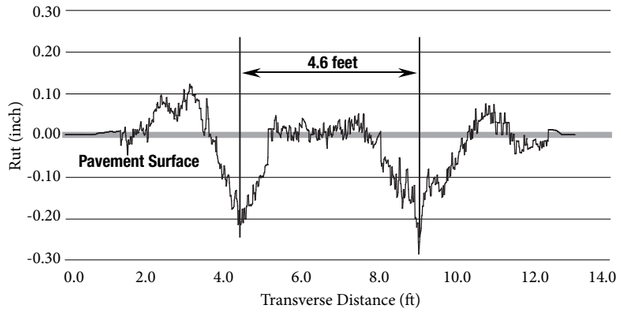
SUMMARY OF RESULTS for Mitigating Damage Caused by Studded Tires on Concrete Pavement

INTRODUCTION

Previously, damage caused by studded tires was difficult to quantify. With improved technology it is now possible to measure the amount of damage on concrete pavements (WSDOT is working diligently to estimate the amount of damage on hot mix asphalt pavements). It is estimated that the damage caused by studded tires on concrete pavements will require $18.2 million for rehabilitation.

Pavement showing severe wear.

High speed van and schematic of wear depth determination.



STUDDED TIRE DAMAGE ON CONCRETE PAVEMENTS

The carbide steel in the studs is several times stronger than the surface of the concrete pavement. Over time the studded tires grind away at the concrete pavements surface. The amount of wear can become severe and requires pavement rehabilitation to restore a smooth, even surface.

I-90 in Spokane.

The following table illustrates the amount of wear due to studded tires that is present on the concrete pavements of Washington State compared to comparable pavements (in age) to those in California, Texas and Minnesota.

State	Roadway	Age	Average Daily Traffic (ADT)	Average Depth of Wear (mm)
Washington	SR-395 Ritzville	11 years	6,800	1
Texas	I-45 Houston	16 years	178,000	0
Washington	I-90 Seattle – Rainier Avenue	16 years	120,000	2
Minnesota	I-84 Minneapolis	28 years	130,000	0
Washington	I-90 Preston-Fall City	28 years	50,000	7
California	SR 101 Ukiah	34 years	26,000	0
Washington	I-5 Seattle – Boeing Field	34 years	204,000	5
Washington	I-5 Tacoma	40 years	194,000	7
Washington	I-90 Spokane	48 years	100,000	7

WHAT IS BEING DONE TO MITIGATE THE DAMAGE?

Over the last several years, WSDOT has constructed several experimental projects in the Eastern Region, specifically SR-395 south of Ritzville and I-90 in Spokane, in an effort to mitigate the damage caused by studded tires on concrete pavements. These projects have investigated the following:

- Increasing the amount of cement to increase the strength of the concrete (increasing the strength would make the concrete surface harder and potentially more resistant to studded tires).
- Modifying the aggregate to get a more uniform gradation (this would result in a more even distribution of aggregate sizes which would minimize the amount of finer aggregate, which are more susceptible to damage from studded tires).
- Evaluation of a carpet drag surface texture.
- Addition of Hard-Cem (concrete additive that is reported to improve the abrasion resistance of concrete, this product is often used on industrial floors).

PRELIMINARY RESULTS

Though many of these sections have less than five years of service, preliminary results indicate:

- Higher strength concrete is showing less studded tire wear, while in the less strength mixes most of the tining has been worn away from the wheel paths.
- Modifying the aggregate gradation has not shown a difference in studded tire wear rates.
- Though there is no one mix that is outperforming any of the other mixes, the sections that were carpet dragged are performing better than the standard WSDOT practice of transverse tining.
- Addition of Hard-Cem does not appear to minimize the amount of studded tire wear.

I-90 Seattle (Rainier Avenue),
ADT = 120,000 vehicles, age = 16 years.

I-45 Houston, TX.,
ADT = 178,000 vehicles, age = 16 years.

I-94 Minneapolis, MN.,
ADT = 130,000 vehicles, age = 28 years.

I-90 near Preston-Fall City,
ADT = 50,000 vehicles, age = 28 years.