RESEARCH NOTES

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September 1995 **RSN 95-14**

Repair of Rutting Caused by Studded Tires

Rutting caused by studded tire wear has become a major issue in Oregon because of the impact on the infrastructure and the increase in driving hazards. It is estimated that the cost to mitigate the damage from studded tire use in 1993 alone is $42 million state-wide. The ruts caused by the studs lead to reduced pavement life which increases the life cycle costs. The safety hazards include an increase in splash and spray and hydroplaning during rainy weather.

The *Repair of Rutting Caused by Studded Tires* Literature Review was prepared to document the alternatives available for Oregon pavements. Other study objectives included determining the viability of the alternatives with regard to material costs (including life-cycle costs), availability, constructability, and compatibility with Oregon pavements types. Since Oregon has several hundred miles of concrete and porous pavements, there was concern that appropriate treatments be considered by pavement type.

Several alternatives were identified to repair the ruts caused by studded tires. The alternatives include: microsurfacing, stone mastic asphalt (SMA), NOVACHIP®, thin overlays, conventional overlays, roller compacted concrete, ultrathin concrete overlays, fine tooth milling, diamond grinding, hydroblasting with a bonded inlay, and realigning travel lanes.

Microsurfacing and fine tooth milling are feasible alternatives for pavements that will be overlaid or reconstructed within a couple of years since the life expectancy of the surfaces is questionable under studded tire wear. Microsurfacing is a polymer-modified cold-mix paving system where the material is placed in micro, or thin lifts (10 to 15 mm). Microsurfacing would reduce the splash and spray resistance of porous pavements and result in a black wearing surface for concrete pavements.

SMA is reported to offer the best resistance to studded tire wear and would be applicable for all Oregon pavement types. SMA is a hot-mix with a relatively large proportion of stones and an extra large amount of mastic-stabilized asphalt cement. The principle idea of the mix is to obtain greater stone on stone contact, when compared to a dense-graded mixture. SMA can be placed in thicknesses of 13 to 20 mm. The mix provides high skid resistance due to its coarse and open texture, which also promotes good drainage of water and lessens spray problems. A key component to long-term performance is the quality of the aggregate used in the mix. Field testing of an SMA section is warranted for evaluation.

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Shifting travel lanes was also suggested as a means of dealing with rutted pavements, as an alternative to resurfacing. For example, on a multi-lane highway, the fog line and inside stripes could be moved left, reducing the left shoulder width. Disadvantages of this option include decreased shoulder widths, clear zones, and vertical clearance. Another disadvantage on concrete is that the existing stripe runs along the top of the joint. If the stripe was shifted, the motorist would be driving on top of the joint, resulting in a rough ride and possible pavement degradation. The option may be most appropriate as a prevention measure on new pavements where the section is designed for systematically moving travel lanes before ruts develop.

There are no fail safe solutions for repairing rutting caused by studded tires. Due to the limited scope of the literature review, additional research is needed to answer questions raised during the study. The recommendations for further research include:

1) Investigating the preventive techniques Scandinavian countries have initiated. The investigation would entail identifying the aggregate properties that reduce wear caused by studded tires, based on Finland's aggregate specifications; evaluating sources that would meet the properties, and finally, modifying the ODOT aggregate specifications.

2) Identifying pilot projects and investigating surface preparation requirements and/or tack coats for thin SMA overlays.

3) Conducting a more detailed investigation into the advantages and disadvantages of shifting travel lanes in certain areas as a preventive measure.

We recommend the ODOT Paving Committee consider constructing an SMA wearing course to compare the performance with conventional mixes. At a minimum, one section should include PCC using a dense-graded mix as a leveling course and another section should include AC using rotomilling for leveling. The research will continue under Phase II of the *Repair of Rutting Caused by Studded Tires* project.

If you would like a copy of the recently published Literature Review, please contact:

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SUMMARIES OF CURRENT TRANSPORTATION RESEARCH