

# PRESERVING THE LONG LIFE CONCRETE PAVEMENT NETWORK OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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## ABSTRACT

The Washington State Department of Transportation (WSDOT) has about 2,360 lane miles of concrete pavements. It is generally old but has performed remarkably well since the majority of sections have far exceeded their original design lives and carried several times the design traffic loading. The performance of these pavements combined with what WSDOT has learned in the intervening 40-50 years gives a high level of confidence that future concrete pavements will perform for 50 years or more. However, the greatest current issue is not with performance, but rather funding. This study developed preservation strategies based on the current pavement condition, predicted future condition and the agency's financial constraints. A triage effort is also engaged by WSDOT to keep the concrete network in serviceable condition.

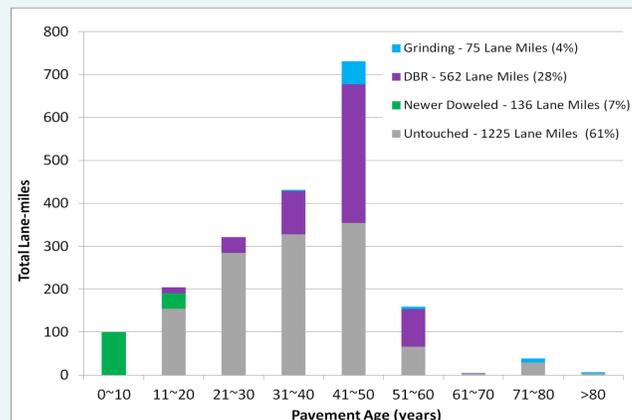
## BACKGROUND

### ❖ WSDOT's concrete pavements

- 2,360 lane-miles.
- Vary in age between 1 and 80 years, the average is 35 years.
- The majority were built in the 1950s and 1960s (Jointed Plain Concrete Pavements without dowels), and the original design life was 20 years.
- 60% are over 30 years old.
- 62% have never been maintained,

### ❖ WSDOT's budget constraints

- Growing backlogs of concrete pavement rehabilitation needs throughout the state.
- Development of preventive strategies to delay or avoid capital construction spending.



WSDOT concrete pavement lane-miles in 2011

## MONITORING PAVEMENT PERFORMANCE

### ❖ The Washington State Pavement Management System monitors the performance of each 0.1 lane-mile pavement section

- Cracking, Spalling and Patching
- Faulting
- Roughness and Rutting

### ❖ Concrete pavement rehabilitation methods

- Grinding
- Dowel Bar Retrofit (DBR)
- Reconstruction

### ❖ Pavement rehabilitation trigger values

#### Reconstruction:

1. >15% panels having multiple cracking, or
2. >60% of slabs having single cracking, or
3. The combination of other distresses causing the same damage.

#### DBR for undoweled sections:

1. >10% of slabs having 0.5" or higher faulting, or >25% of slabs having 0.25" to 0.5" of faulting, or >50% having 0.125" to 0.25" of faulting, or the combination causing same damage; and
2. Pavement age less than 40 years; and
3. All type of cracking and high patching <10%.

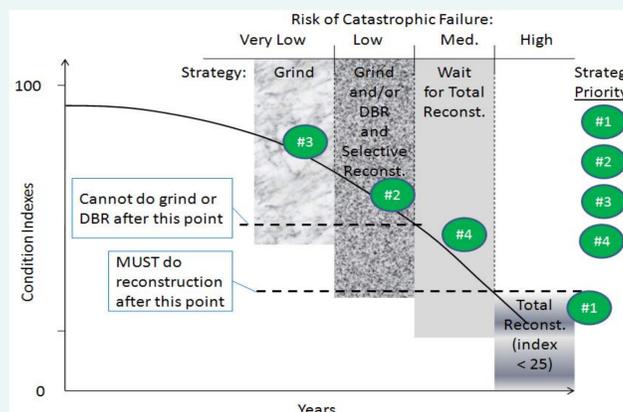
#### Grinding:

1. >25% of slabs have faulting, or
2. Rutting > 0.5", or
3. IRI > 220 in/mi.

## PRIORITY OF FUNDING EXPENDITURES

### ❖ Priorities for concrete pavement expenditures

- #1: High risk that requires reconstruction.
- #2: DBR and/or grinding with selective panel replacement to postpone reconstruction.
- #3: Grinding.
- #4: Wait for total reconstruction.



## REHABILITATION NEEDS AND TRIAGE

### ❖ WSDOT concrete pavement rehabilitation needs in ten years (fiscal year 2011-21)

Based on the pavement distress conditions and the lowest life-cycle cost with unlimited funds.

Year	Grinding	Reconstruction	DBR	Panel Replacement	Total
<b>Length</b>	<i>Lane-mile</i>	<i>Lane-mile</i>	<i>Lane-mile</i>	<i># of slabs</i>	<i>Lane-mile</i>
2011-2013	488	148	126	4584	762
2013-2021	445	152	38	2257	636
<b>Cost</b>	<i>million\$</i>	<i>million\$</i>	<i>million\$</i>	<i>million\$</i>	<i>million\$</i>
2011-2013	85	369	88	92	634
2013-2021	56	380	27	45	508

### ❖ Summary of WSDOT concrete pavement triage rehabilitation plan for fiscal year 2011-23

The required funds of the ten-year rehabilitation needs far exceed WSDOT's available budget. Therefore, a triage plan of lower cost preventive repairs is applied, such as diamond grinding and selective panel replacements, and short stretches of reconstruction.

	Grinding	Reconstruction	DBR	Panel Replacement	Total
<b>Length</b>	<i>Lane-mile</i>	<i>Lane-mile</i>	<i>Lane-mile</i>	<i># of slabs</i>	<i>Lane-mile</i>
2011-2013	482	77	31	3,899	590
<b>Cost</b>	<i>million\$</i>	<i>million\$</i>	<i>million\$</i>	<i>million\$</i>	<i>million\$</i>
2011-2013	62	192	22	62	338

Notes: 1 lane-mile = 1.609 lane-km.

## CONCLUSIONS AND RECOMMENDATIONS

- The existing WSDOT concrete pavements are in reasonable condition for their advanced age.
- Current concrete pavement rehabilitation is largely driven by financial constraints.
- Alternative rehabilitation strategies are developed corresponding to the constrained budget situations.
- In the interim WSDOT is using a triage practice to extend the life of very long-life concrete pavements as long as possible.
- Future issues: (1) the long-life pavements will still eventually need prohibitively expensive reconstruction; and (2) the practical limit to how long a concrete pavement lasts is likely financial.
- Future research ideas: (1) a better way to finance major concrete pavement reconstruction, and (2) development of a concrete pavement that can be resurfaced periodically without needing major reconstruction.