

Design and Application of Ultra Thin Lift Pavements

Amy Simpson

AMEC Environment & Infrastructure, Inc.



Presentation Outline

- Definition
- Advantages
- Project Selection
- Design Considerations
- Construction Considerations
- Performance Expectations
- Summary



What is a thin overlay? And Why Use One?

- Asphalt concrete overlay of 1.5-inch thickness or less
- Generally have a maximum aggregate size of 12.5-mm or less
- Ability maintain grade and slope with minimum impact to drainage
- Provide functional improvement of the pavement section
- No curing time required after placement
- Mix design standards allow for use of a variety of different mixes to address function concerns
 - Warm-mix asphalt
 - RAP
 - Open Graded mix



Project Selection

Projects with structural damage are not good candidates for thin overlay.

So what are good candidates?



- Visual Survey
 - Identify type, extent, and severity of distresses
- Structural Assessment
 - No structural improvement required
- Drainage Evaluation
 - Identify needed changes
- Functional Evaluation
 - Ride quality
 - Skid resistance
- Discussion with Maintenance Personnel



- Projects with minor distresses occurring primarily in the surface such as transverse cracking, non-wheelpath longitudinal cracking or raveling and weathering.



Project Selection

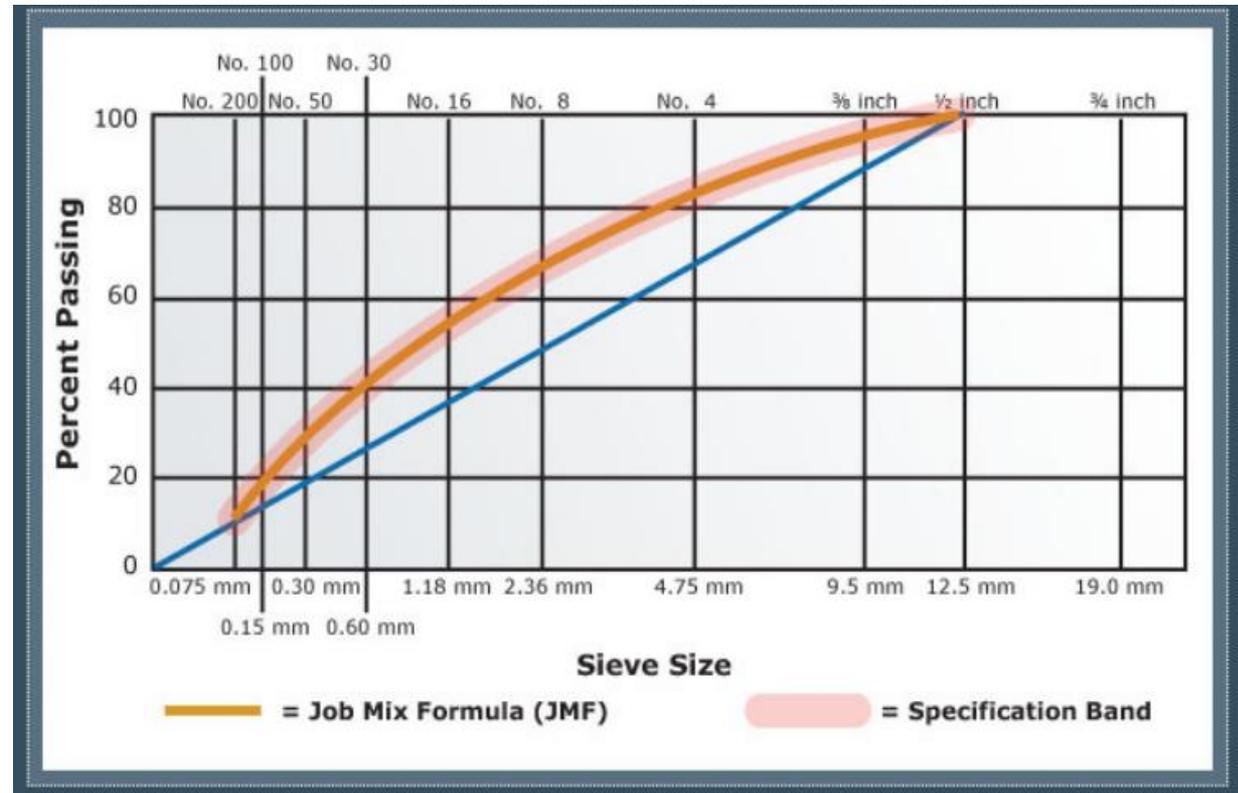
- Pavement Sections with structural distress are not good candidates for treatment with a thin overlay



Mix Design Considerations – Dense-Graded



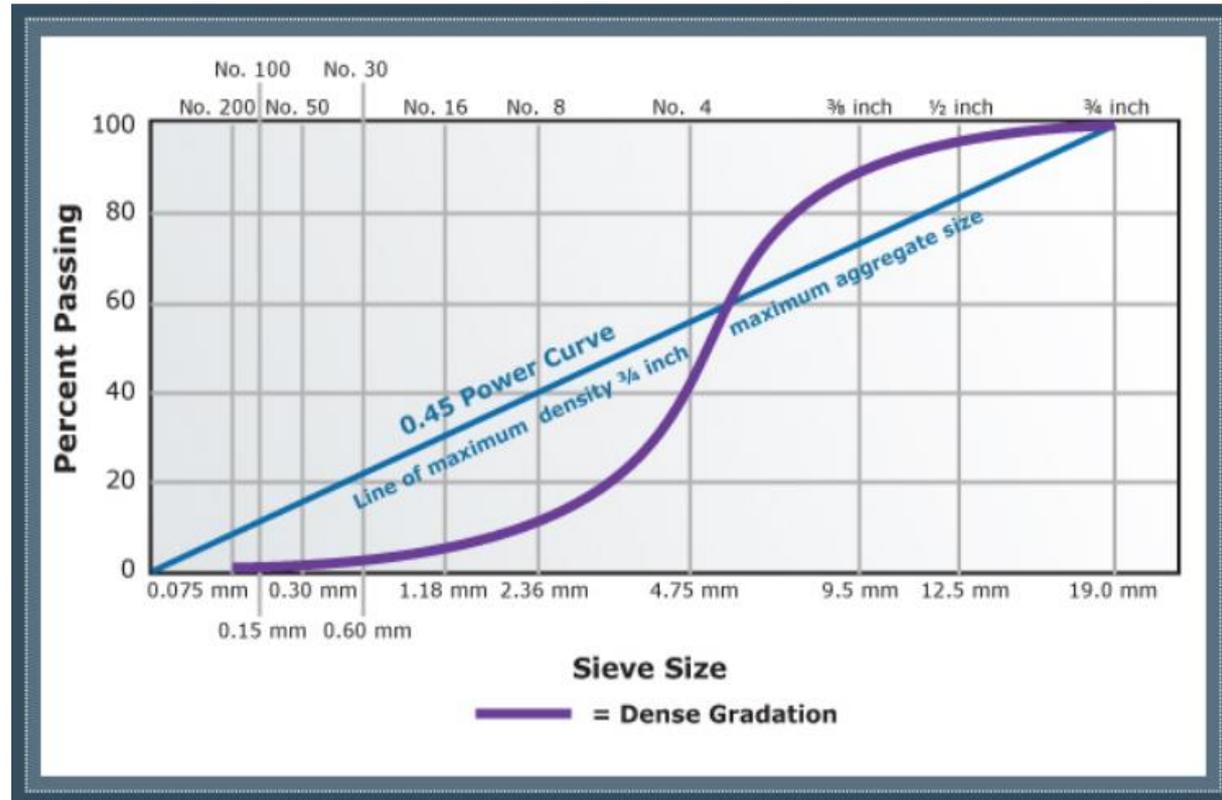
- Conventional mix design
- Abrasion resistant
- Functionally impermeable



Mix Design Considerations – Open-Graded

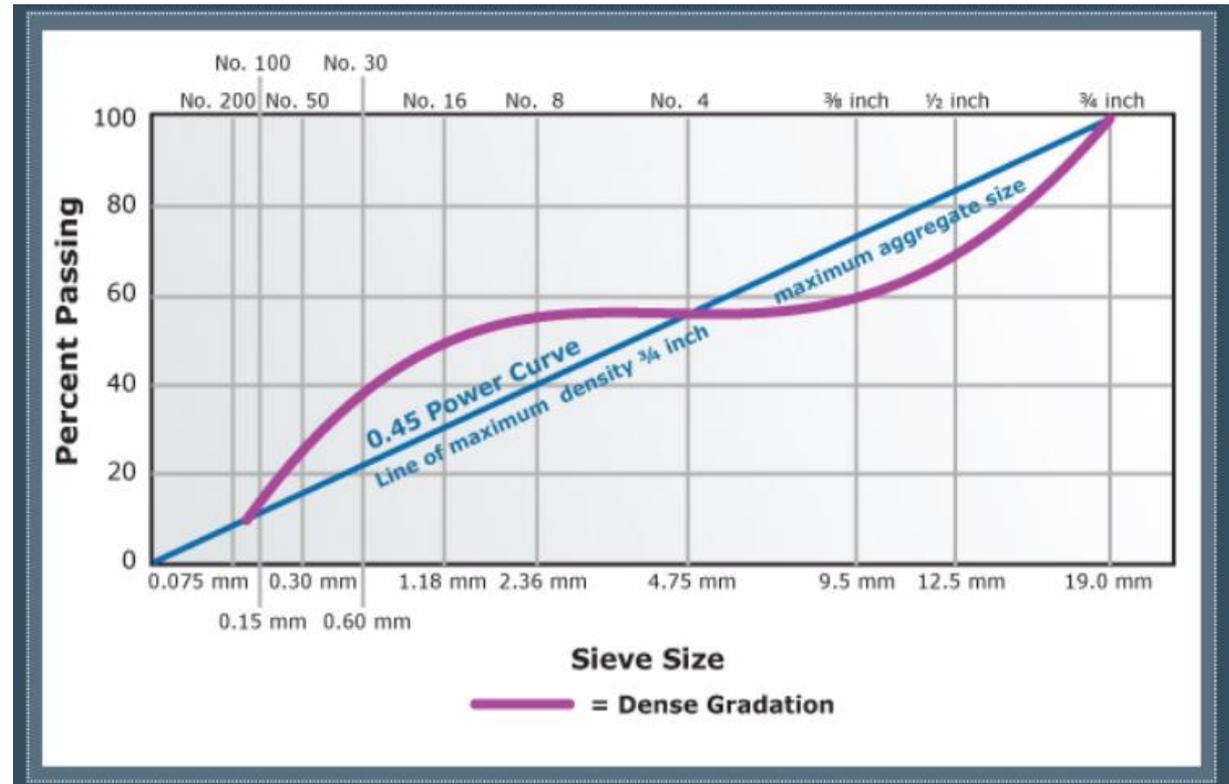


- Open-graded mixes are not recommended for areas of heavy snow and ice or areas with severe turning movements
- Open-graded allows surface water to quickly drain away
- Mitigate flushing
- Noise reduction



Mix Design Considerations – Gap-Graded

- Increase stone-to-stone contact
- Improved skid resistance
- Generally have low permeability and good durability



Surface Preparation

	Mill	Fill Cracks with Mix	Clean and Tack
Raveling			
Long. Crack – not in wheelpath			
Long. Crack – wheelpath			
Transverse Crack			
Alligator Crack			
Rutting			

- Production
 - Aggregate Stockpiles
 - Slower plant operations
- Paving
 - Tack coat is recommended
 - Best to move continuously
 - Cooling can be an issue
 - 1" cools 2X faster than 1.5"
 - Warm mix
- Compaction
 - Seal voids & increase stability
 - Low permeability
 - No vibratory on < 1"



- TRR 1940 “Analysis of Long-Term Effectiveness of Thin Hot-Mix Asphaltic Concrete Overlay Treatments” Labi et al. (2005)
 - 18 to 36% decrease in roughness
 - 5 to 55% decrease in rut depth
 - 1 to 10% improvement in condition rating

- TRR 2005 “Ultrathin Bonded Wearing Course as a Pavement Preservation Treatment for Jointed Concrete Pavements” (2007) Corley-Lay and Mastin
 - 6.7 dB reduction on overlaid PCC

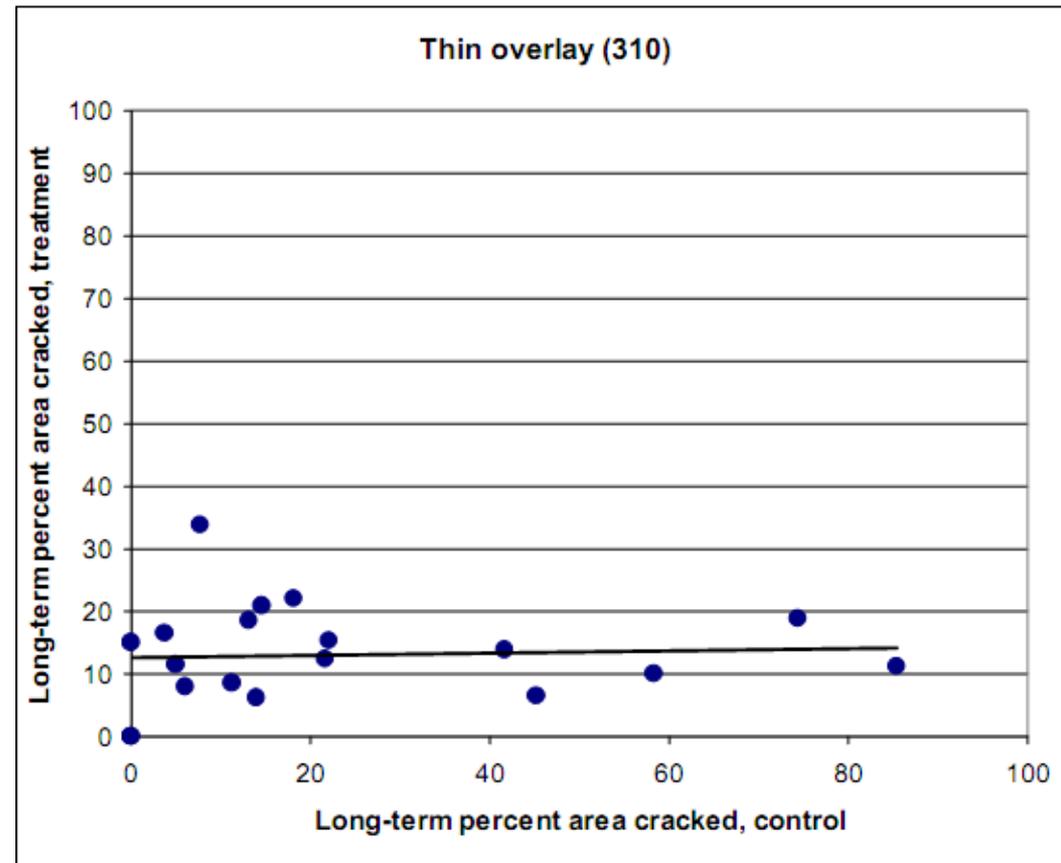
- *Focus* “Pilot Program Evaluates Quiet Pavements in Arizona” (June 2005)
 - 5 dB reduction on overlaid PCC in Phoenix

- Remember 3dB reduction in noise = reduction of ½ traffic volume

Performance Expectations



- NCHRP 20-50(3/4) – *LTPP Data Analysis: Effectiveness of Maintenance and Rehabilitation Options (June 2002)*
- Rate of increase in roughness on thin overlays reduced in comparison to control section
- Rate of increase in rutting on thin overlays reduced in comparison to control section
- Reduction in observed cracking on thin overlay sections



- TRR 1680 “Effectiveness of Maintenance Treatments of Flexible Pavements” (1999)

Original Condition	6-year Failure Probability (%)	Average Median Survival Time (Yrs)	Average Median Benefit Compared to no Treatment (Yrs)
Good	25	7.5	2.2
Fair	30	7.3	4.8
Poor	100	2.2	2.5

Performance Expectations - Economics



■ 2008 NAPA Survey of State Asphalt Associations

Treatment	Expected Life (Yrs)	Range (Yrs)	Cost (\$/SY)	Range (\$/SY)	Annual Cost (\$/lane-mile)
Chip Seal	4.08	2.5 – 5	2.06	0.50 – 4.25	3,554.51
Slurry Seal	3.25	2 – 4	1.78	1.00 – 2.20	3,855.75
Microsurfacing	4.67	4 – 6	3.31	2.30 – 6.75	4,989.81
Thin Surfacing	10.69	7 – 14	4.52	2.40 – 6.75	2,976.69

- Thin overlay treatments consist of 1.5-inch or less asphalt material
- Used on pavement before extensive rehabilitation is required
- For Pavement Preservation
 - Improve ride quality
 - Maintain road geometrics
 - Reduce noise
 - Reduce long-term growth in distress



Questions?

