



Pavement Management with Thin Lift Overlays in Pima County – July, 2019

The purpose of this paper is to compare the merits of thin lift asphaltic concrete overlays to a standard 2" mill and fill asphaltic concrete treatment for pavement management of local streets by the Pima County Department of Transportation (PCDOT).

Pavements deteriorate at a rate that is typically represented by a performance curve. The exact shape of the curve is dependent on the use of the road, pavement section properties and climate. Pavement treatments are most cost effective when applied within the threshold range appropriate for the treatment type. These treatment types are generally described as seal coats, surface treatments, and structural replacement/overlay.

The National Asphalt Pavement Association (NAPA) Information Series 141 table "When to Use Thinlays" provides an analysis of the use of thin overlays and describes benefits of thin overlays to include extended service life, protection from water damage, improved structural strength and improved ride quality.

The sweet spot that thin overlays provide over other treatments is where it is desired to improve the ride quality or somewhat increase structural strength. NAPA's table describes when thin overlays are and are not recommended.

Pima County has in the past rated roads based on a Pima County modified Pavement Surface Evaluation and Rating System (PASER) which was originally sourced from the University of Wisconsin-Madison. By comparing the NAPA table and the PASER rating system, it is possible to determine the appropriate treatment window where thin overlays would be a successful preservation method.

To be consistent with our current change to Pavement Condition Index (PCI) Ratings from PASER, this window is most compatible with a PCI level 50 where there is limited fatigue or thermal cracking, rutting, patching or other significant distress. A good use might be where surface raveling has occurred to a limited depth that cannot be smoothed out enough with a seal coat treatment.

Thin overlays are not recommended as a treatment where road conditions have deteriorated to a PCI 39 or less and are of limited benefit and more costly as compared to other treatments at PCI 60 or above. In some cases, based on a thorough review of the actual pavement condition against these distress levels, along with repair of isolated failure areas, pavements rated PCI 40-49 could be treated with thin overlays in addition to those rated PCI 50-59.

For Fiscal Year 20, PCDOT has decided to treat failed local roads (PCI 0-39) which means that thin overlays are not appropriate for this cycle of work and that we are currently focused on the substantial increase in average network PASER rating that can be achieved by taking these low PCI roads to a near new condition index rating.

Due to the fact that current local street PCI ratings are not available for all streets, our pavement management system used an algorithm to degrade the PASER rating (sometimes over 10 years old) to a current "degraded" PCI. In some cases, the algorithm overestimated the degradation of the condition and provided a failed rating where the rating has actually only degraded to poor.

Ana M. Olivares, P.E., Director

201 N. Stone Avenue, 4th Floor, Tucson, Arizona 85701-1207 • Phone: 520-724-6410 • Fax: 520-724-6439



PCDOT acknowledges the limitations of degrading old PASER ratings and has started the process of procuring a consultant to update pavement condition ratings countywide. In future program years these updated pavement condition ratings will help us select the correct roads for the identified treatments thereby assuring that this problem does not reoccur

At the call to the audience at our PCTAC meeting on June 25th, Tucson Asphalt identified local streets in our proposed FY 20 projects list that met their criteria for use of their proprietary thin overlays. These identified roads included some streets that had not degraded as much as modeled and some of these roads were actually PCI 40-59 (poor) and may include isolated sections of failure that could be repaired prior to application of a thin overlay.

Industry standards have consistently not recommended a thin overlay be applied to failed (PCI 0-39) roads and PCDOT's Street Saver pavement management software also utilizes a decision tree for preservation treatments which does not apply a 2" mill and fill to roads rated above PCI 39.

Since we have now determined that some of our 2" mill and fill streets are indeed above this PCI 39 threshold, we have provided a list of possible streets that could be treated with a thin overlay in lieu of the 2" mill and fill. The thin overlay would use a specification based on a 1" nominal PAG 3 hot mix asphaltic concrete with a terminal blend rubberized asphaltic cement binder or equivalent.

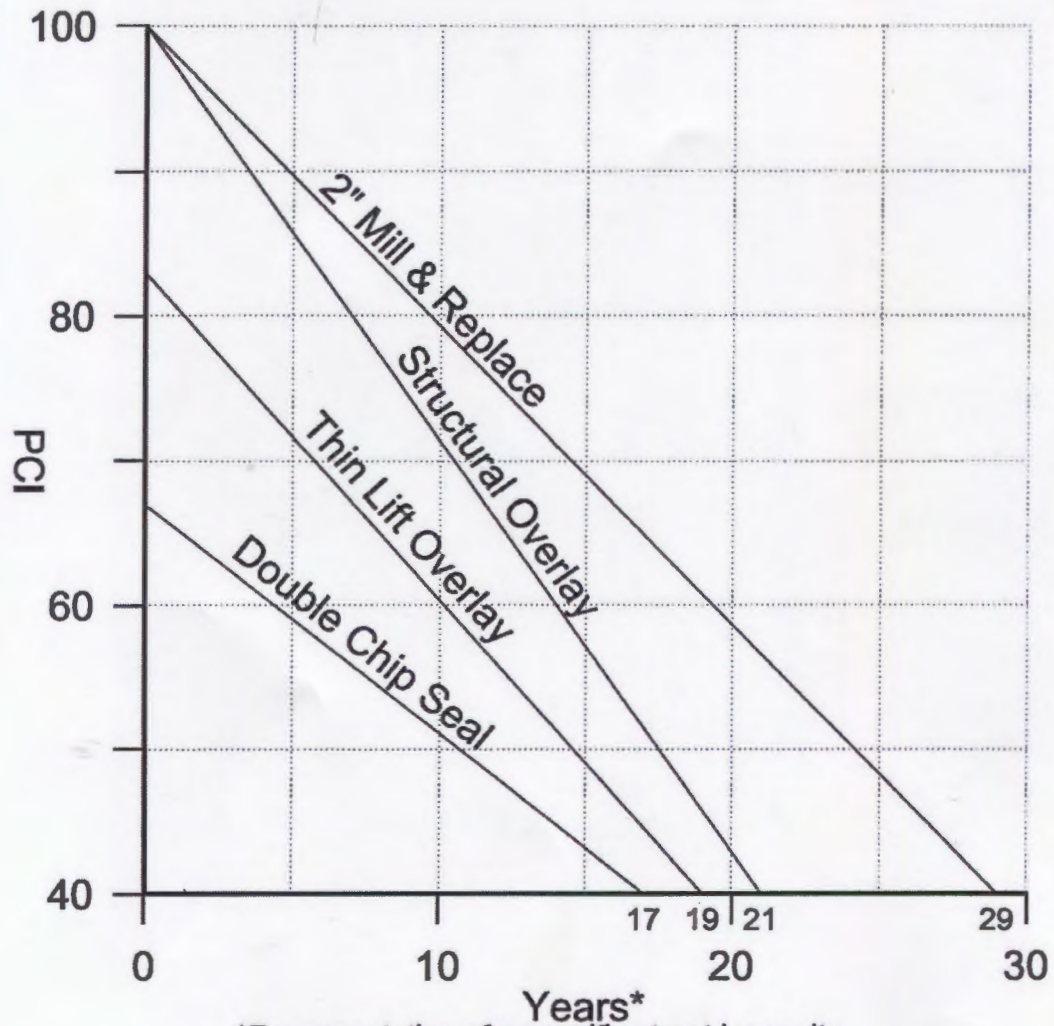
Subdivision or Roadway Name	Cross Roads <i>(Location of Subdivision)</i>	Pavement Type:	Pavement Rating PCI
		<i>(A) = Min 2" AC with AB (B) = Intermediate AC thickness with known or unknown base (C) = Chip Seal, no AB</i>	
Mountain Village Estates (1-30)	Bilbray Av and Calle Del Monte	C	20
			20
Avenida Paisano	Avenida Paisano and Calle Don Monte	C	20
Bilbray Av	Bilbray Av and Lincoln St	C	20
Calle Don Miguel	Calle Don Miguel and Bilbray Av	B	30
Calle Don Monte	Calle Don Monte and Bilbray Av	B	30
Mountain Village Estates No II (1-150)	Camino De Oeste and Don Miguel	A	50
			50
			50
			50
			50
			50
			50
Avenida Paisano	Avenida Paisano and Calle Don Miguel	A	50
Circle J Estates (1-17)	Valencia Rd and Avenida Don Fernando	C	20
			20
			20
Green Valley Fairways NO 3 (475-763)	La Bellota and El Naranjo	A	40
Del Cerro Ranch III (1-32)	El Camino Del Cerro and Desert Tortoise Pl	A	50
			50

Ana M. Olivares, P.E., Director

201 N. Stone Avenue, 4th Floor, Tucson, Arizona 85701-1207 • Phone: 520-724-6410 • Fax: 520-724-6439



PCDOT has projected the deterioration of a PCI 40 local street after application of the PCDOT 1" thin overlay and compared it to a 2" mill and fill with asphaltic concrete. A 2" mill and fill would degrade to a PCI level of 40 after 29 years, a 1.5" structural overlay over a PCI 40 existing pavement would deteriorate to the same level in 21 years and a thin overlay in 19 years. This degradation curve is relative and the exact shape and longevity varies depending on specific factors relative to the roadway segment such as pavement thickness and subgrade conditions.



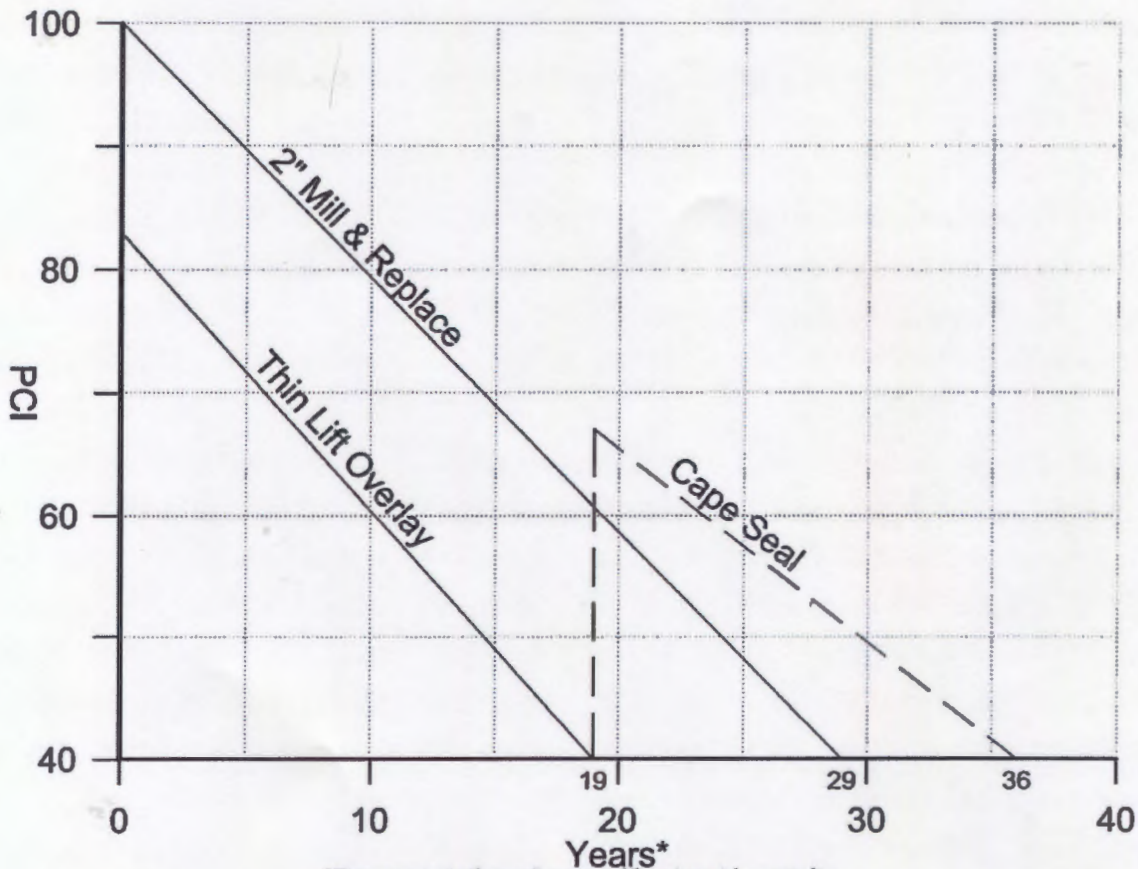
*Representative of a specific street longevity.

Ana M. Olivares, P.E., Director

201 N. Stone Avenue, 4th Floor, Tucson, Arizona 85701-1207 • Phone: 520-724-6410 • Fax: 520-724-6439



In order to represent a life cycle duration at least equal to that of the 2" mill and fill, another chart is included to extend the life of the thin lift overlay by applying a cape seal at year 19 (40 PCI). This extends the life to year 36:



*Representative of a specific street longevity.

Based on our recent bid history and cost estimating, we estimate that the 2" mill and fill in the current market would cost \$15 per square yard and the thin lift would cost \$10 per square yard including necessary utility adjustments and traffic control. The estimate for thin overlay also includes an allowance for some repairs. The cape seal has a present cost of \$6 per square yard which is equivalent to \$11 per square yard at year 19, assuming an annual inflation rate of 2.7%.

Ana M. Olivares, P.E., Director

201 N. Stone Avenue, 4th. Floor, Tucson, Arizona 85701-1207 • Phone: 520-724-6410 • Fax: 520-724-6439



A comparison of the cost to longevity is provided in the following table:

Treatments	Pavement Condition Rating	Cost	Longevity	Cost/Longevity
Mill and Fill	40	\$15.00	29	\$0.52
1" Thin Overlay	40	\$10.00	19	\$0.53
1" Thin Overlay with Cape Seal at Year 19 including inflation	40	\$21.00	36	\$0.58

Ana M. Olivares, P.E., Director

201 N. Stone Avenue, 4th Floor, Tucson, Arizona 85701-1207 • Phone: 520-724-6410 • Fax: 520-724-6439