PROJECT SUMMARY REPORT

# 5-6674-01: Statewide Implementation of New Binder Selection Catalog and New Binder Performance Tests

## Background

Asphalt binder is one of the most expensive and critical materials used in the construction and maintenance of asphalt pavements. A key step toward a long-lasting asphalt pavement is selecting a proper binder grade. The Texas Department of Transportation's (TxDOT's) current binder performance grade (PG) selection method serves its purpose well for new pavement constructions. However, TxDOT predominantly works with asphalt overlays. The most significant difference between new constructions and asphalt overlays is preexisting cracks underlying the asphalt overlays. The preexisting cracks significantly impact asphalt overlay performance in terms of early reflective cracking, which was not considered when developing current PG binder selection catalogs. Consequently, current PG asphalt binder selection catalogs (such as the one TxDOT uses) have limitations when applied to asphalt overlays.

## What the Researchers Did

This project evaluated many softer but polymer-modified asphalt binders (PGxx-28 and PGxx-34) in both laboratory and field test sections. Binder tests, such as the multiple stress creep recovery (MSCR), linear amplitude sweep (LAS), and pure linear amplitude sweep (PLAS), were performed to evaluate binders' rutting and cracking resistance. Mixture tests, such as the Hamburg wheel tracking test (HWTT) and overlay test, were conducted to compare and validate binder test results. Field performance data from multiple test sections in 10 TxDOT districts were surveyed and analyzed. Based on the laboratory test results and field observations, a revised asphalt binder grade selection catalog is recommended and validated. In addition, asphalt binder quality was evaluated using IDEAL Cracking Test (IDEAL-CT) with a focus on aging and cracking resistance.

## What They Found

The MSCR test and associated specification proved to be better than the current G*/sin δ–based PG specification and were validated by the HWTT results.

The PLAS test is more effective than the LAS test in discriminating the effect of the binder sources, the conditions of chemical aging, and the source and dosage of engineering agents.

The cracking and rutting surveys on field test sections in 10 TxDOT districts showed that the soft, highly modified binders (PGxx-28 or PGxx-34) have better cracking resistance. Their benefits in the colder areas of Texas are confirmed.

According to the IDEAL-CT test results, aging time significantly impacted the cracking resistance of the mixes. The longer the aging time, the poorer the cracking resistance. When the loose mixes were aged too long (e.g., 144 h at 95°C), the normalized cracking resistance differences among various mixes diminished. Researchers also confirmed that the same PG binders could perform significantly differently in cracking resistance.

## What This Means

The soft, highly modified binders (PGxx-28 or PGxx-34) have better cracking resistance and were recommended to be used in the colder areas of Texas.

A new statewide asphalt binder selection catalog was proposed (Figure 1). The binders recommended by this new approach for new construction are exactly the same as the binder recommended by TxDOT's current method. However, for asphalt overlays, the binders are usually softer than the binder recommended by TxDOT's current method (Figures 2 through 4). This difference highlights that binder recommendations for each county must be updated when an overlay construction is considered.

IDEAL-CT can be used as a tool to evaluate binder quality at different aging conditions and to differentiate binders with the same PG grade.

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**Project Completed:**
8-31-2022

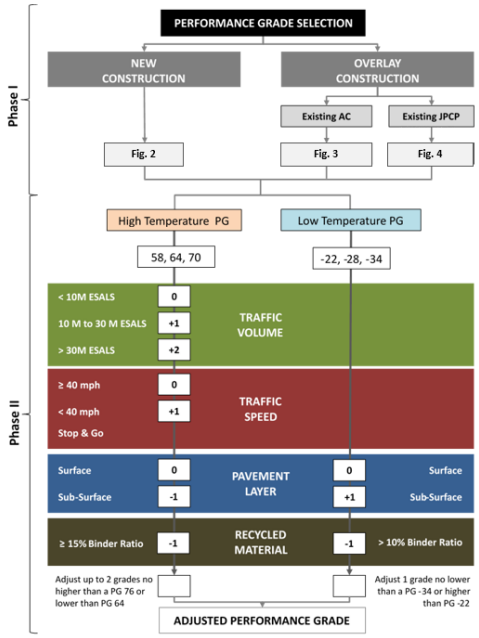


**Figure 1. New Asphalt Binder PG Recommendation and Adjustment: New Method.**

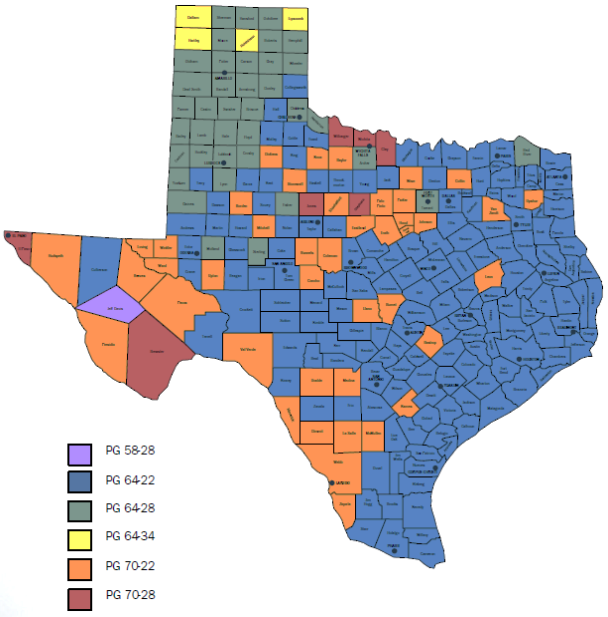


**Figure 2. PG Recommendation for New Construction.**

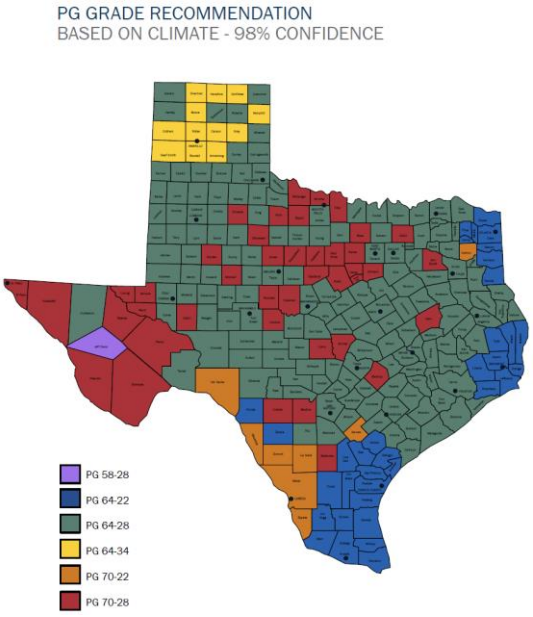


**Figure 3. PG Recommendation for Asphalt Overlay over Existing Asphalt Pavements.**

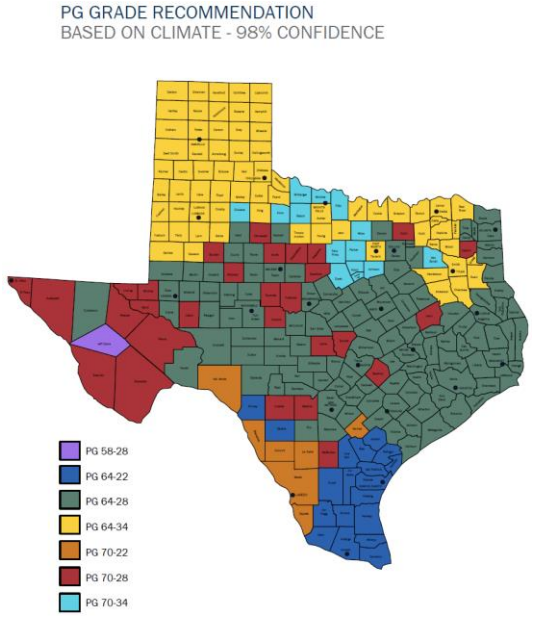


**Figure 4. PG Recommendation for Asphalt Overlay over Jointed Plain Concrete Pavements.**

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Keyword: Research

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