

## Binder testing for quality: Beyond PG specifications

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### Background

1. Current PG specs and gaps
2. Catalog of properties beyond PG
3. Next steps...

### Background – Performance Grading System



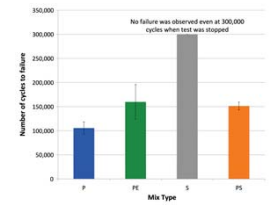
### Background – Performance Grading System

#### Implicit assumption / Theory:

Binder meets PG specs → Binder “performs” well

#### Practice:

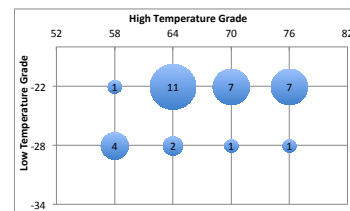
Binders with the same PG specs can be vastly different



### Background

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### TxDOT Binder Properties Catalog



### TxDOT Binder Properties Catalog

PG grading of binders +

1. XRF (metal content)
2. MSCR Continuous Grade (rutting and temperature sensitivity)
3. Spot test (chemical stability)
4.  $\Delta Tc$  (compositional difference from traditional binders)
5. Percent change with aging (age sensitivity)
6. Strength at intermediate temperature (strength)
7. Strength at low temperature (strength)

### TxDOT Binder Properties Catalog – 1. XRF

The circular binder chart shows various binder grades (e.g., 64-22, 70-22, 76-22, 58-28) with red dots indicating XRF data points. An inset image shows an XRF machine with a sample being analyzed, and a corresponding XRF spectrum plot.

### TxDOT Binder Properties Catalog – 2. MSCR cont. grade

The circular binder chart displays MSCR data points for various binder grades. A graph shows  $\log(Jnr)$  versus  $\log(\text{Temperature})$  with a slope of  $Jnr = 4.0 / kPa$ . An inset image shows a blue MSCR testing machine.

### TxDOT Binder Properties Catalog – 3. Spot test

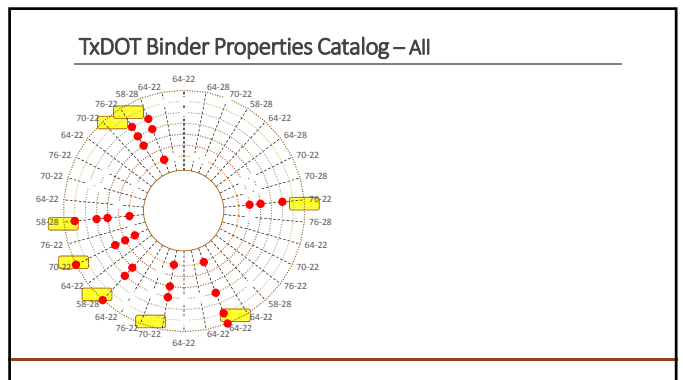
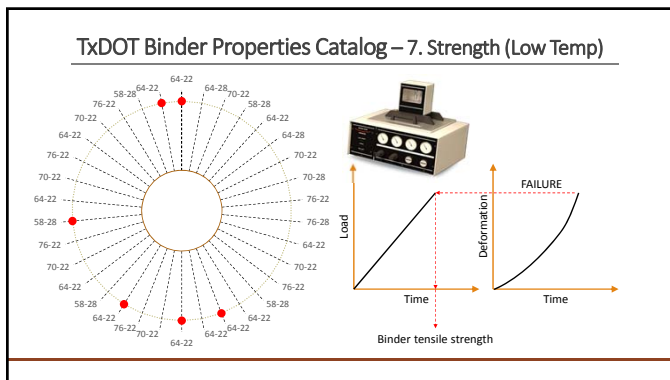
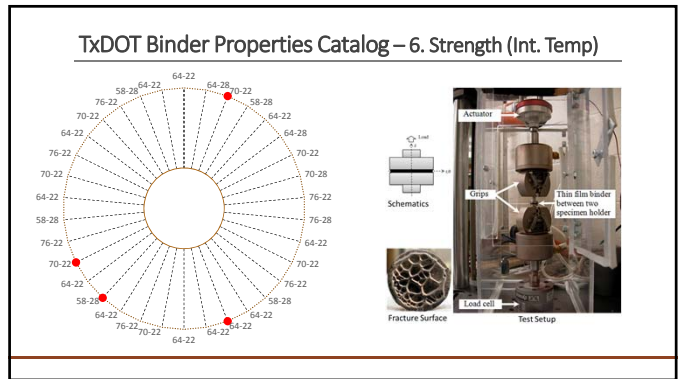
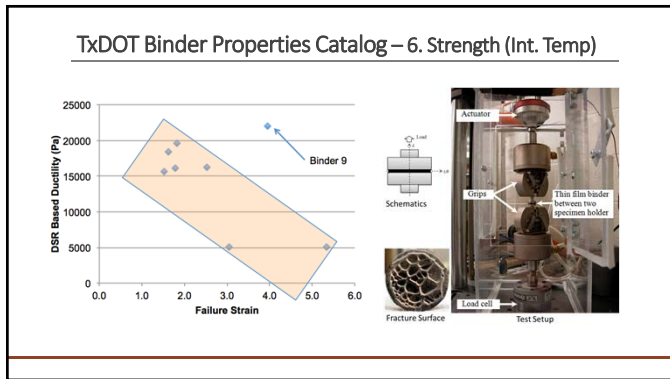
The circular binder chart shows spot test data points. Below the chart are three images of binder samples illustrating different levels of separation: Negligible separation, Slight separation, and Significant separation.

### TxDOT Binder Properties Catalog – 4. $\Delta Tc$

The circular binder chart displays  $\Delta Tc$  data points. A graph shows  $\log(\text{Stiffness or } S)$  versus Temperature with a slope of  $S = 300MPa$ . Another graph shows  $m\text{-value (ability to relax)}$  versus Temperature with a slope of  $m = 0.3$ . The difference between the two is labeled as  $\Delta Tc$ . An inset image shows a testing machine.

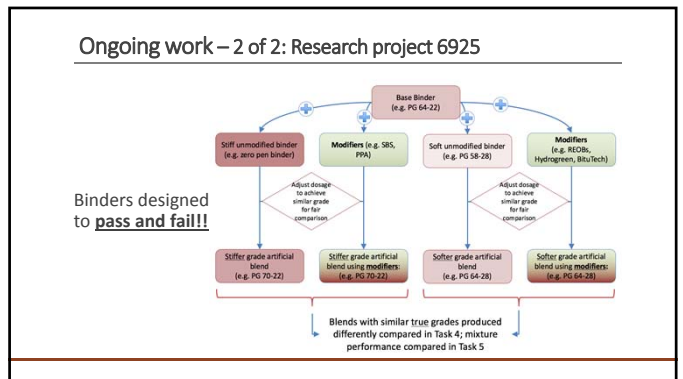
### TxDOT Binder Properties Catalog – 5. Aging Sensitivity

The circular binder chart shows aging sensitivity data points. An inset image shows two binder samples, one labeled 'S and m-value PAV aged compared to S and m-value 2xPAV aged', with a '2 X' multiplier indicating the aging factor.



### Ongoing work – 1 of 2: Binder catalog

- A subset of tests continued on additional binder samples
- Binder samples are being sampled from field mixes and tied to field performance and mixture performance



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Robert Lee, Jerry Peterson – TxDOT  
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Questions ?