Asphalt Shingles in HMA
Missouri DOT Experience

North Central HMA Conference

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January 10, 2007

In The Beginning

- Approached by Pace Construction and Peerless Landfill
  - MoDOT Not Using RAP in Mixtures
  - Deleterious Material
  - Stiffness of Asphalt in Shingles

First Look

The “Ex” Factor

- Exhaustive Literature Search
- Exclusion of Tear Offs in States Allowing Manufacturing Waste
- Extra Clean Material – Contained Little Deleterious Matter
- Exceptionally Stiff Asphalt Extracted from Shingles

Shingle Components

- Asphalt ⇨ 20%-40%
  - –Stiffen Roadway Asphalt
- Aggregate ⇨ ≈30%
  - –Good Stuff
- Fiberglass or Paper Mat ⇨ ≈30%
  - –No Harm if Well Dispersed

MoDOT Goals

- Engineering Properties First
  - Harmful Effects of Deleterious Material
  - Asphalt Binder Properties
- Traffic Safety – Nails, etc.
- If Everything Else Works Out, Landfilling is Reduced

Why Should We Pursue Shingles?

- High Asphalt Content
- Granules Are Hard and Durable

- Recycling CO$T

Concerns

- How Will Deleterious Material Affect the Mixture
- Can the Low Temperature Grading be Maintained at Various Blending Ratios

Asphalt After Blending with Shingle Asphalt

- Resist Rutting 
- Resist Fatigue Cracking 
- Resist Cold-Weather Cracking 

Asphalt Grades

- High Temperature for Rut Resistance
- Low Temperature for Fatigue and Cold Weather Performance

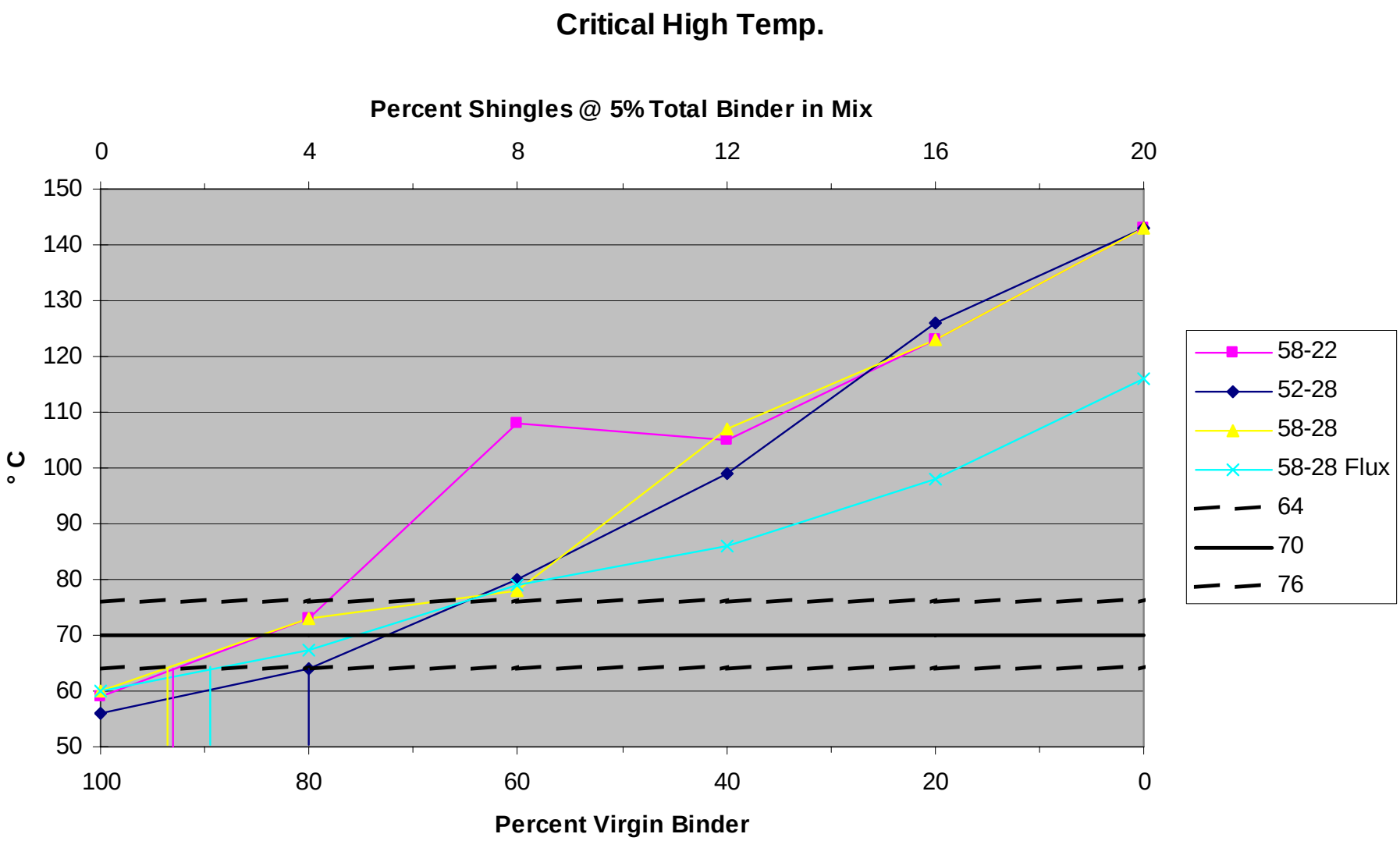
Performance Graded = PG

PG 64-22 (PG Sixty-four Minus Twenty-two)

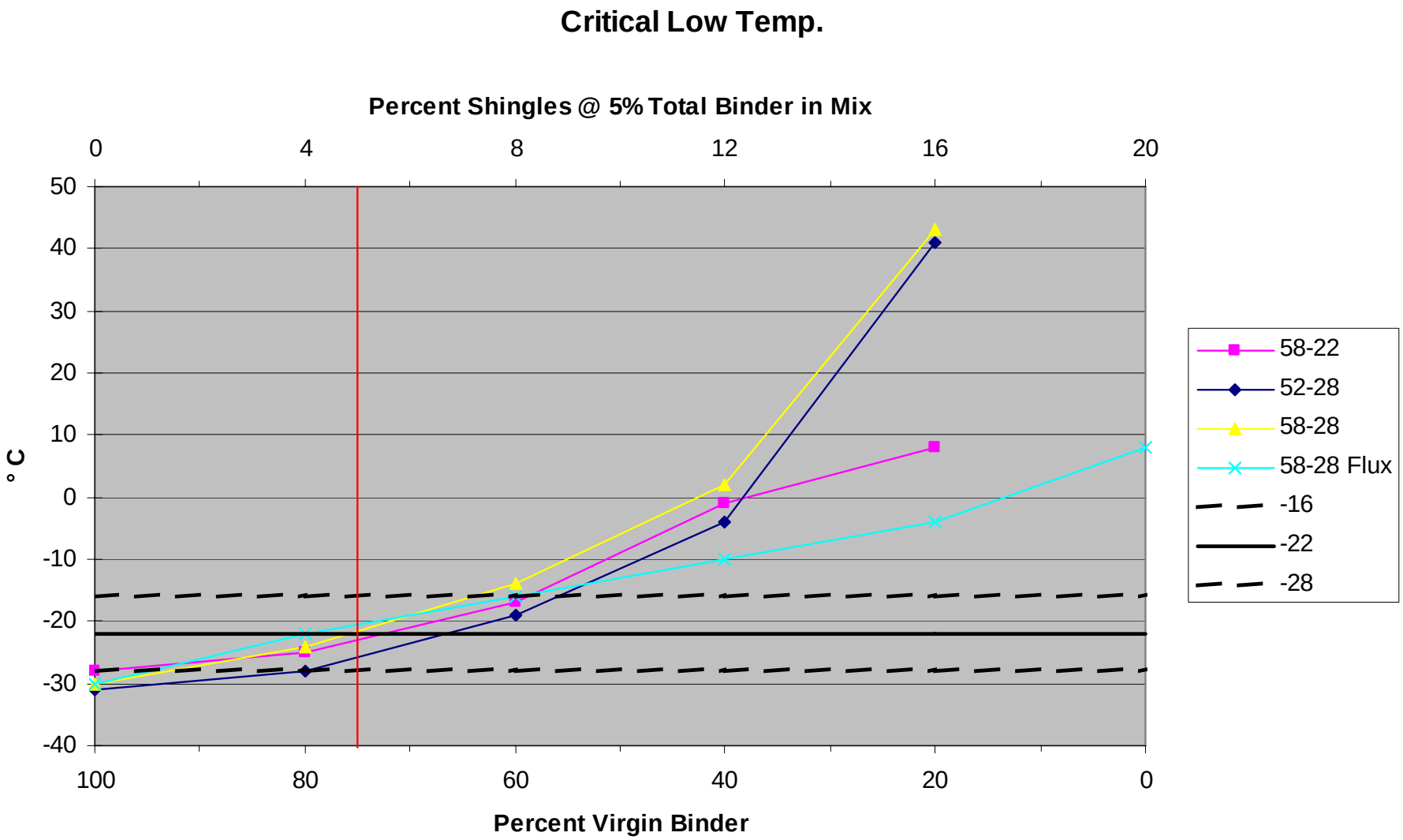
High Temp 64°C (147°F)

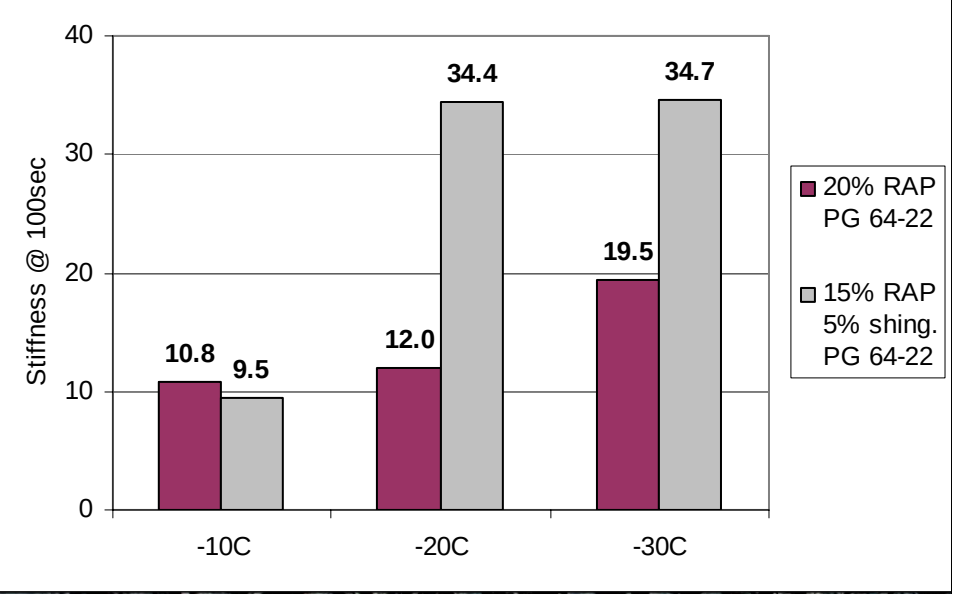
Low Temp –22°C (-8°F)

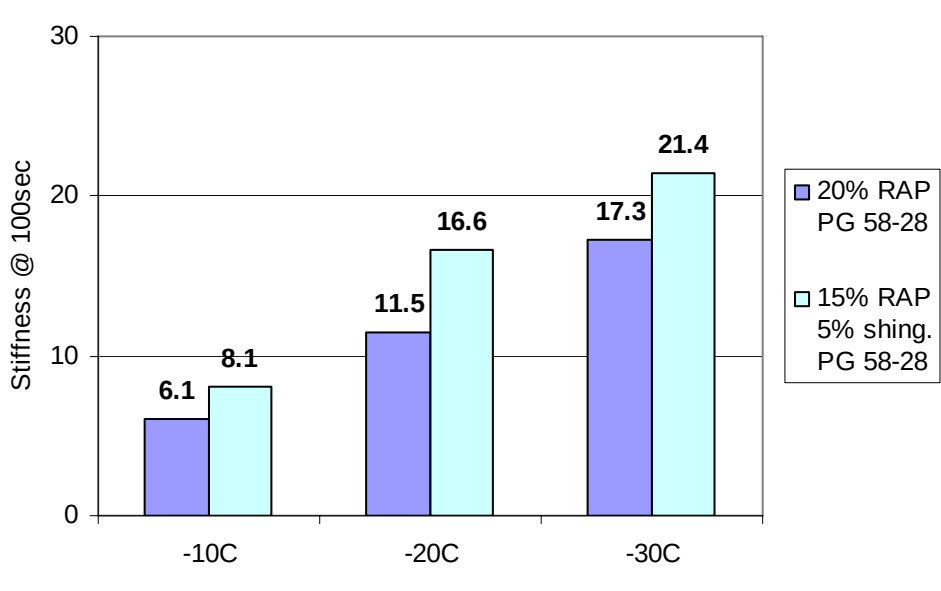
High Temperature



Low Temperature

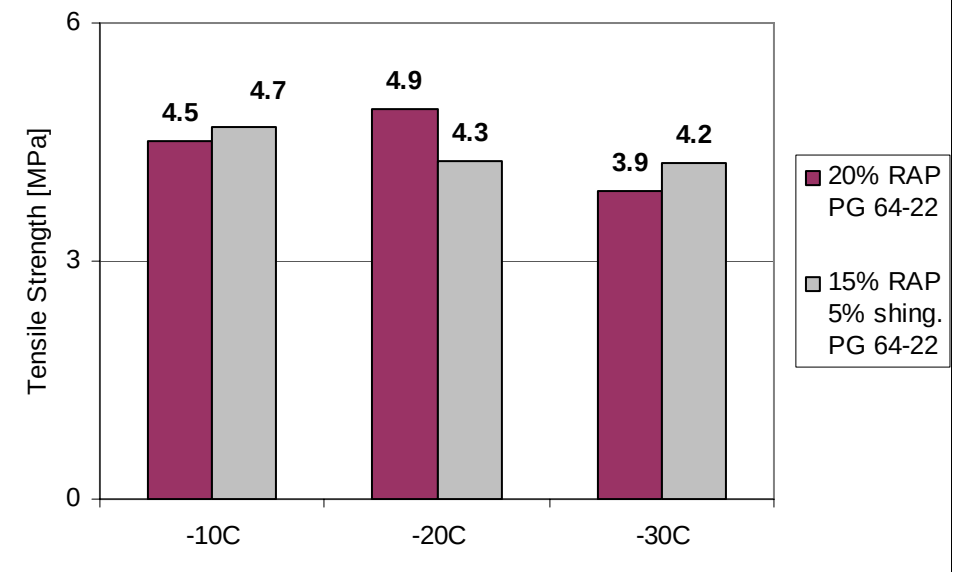


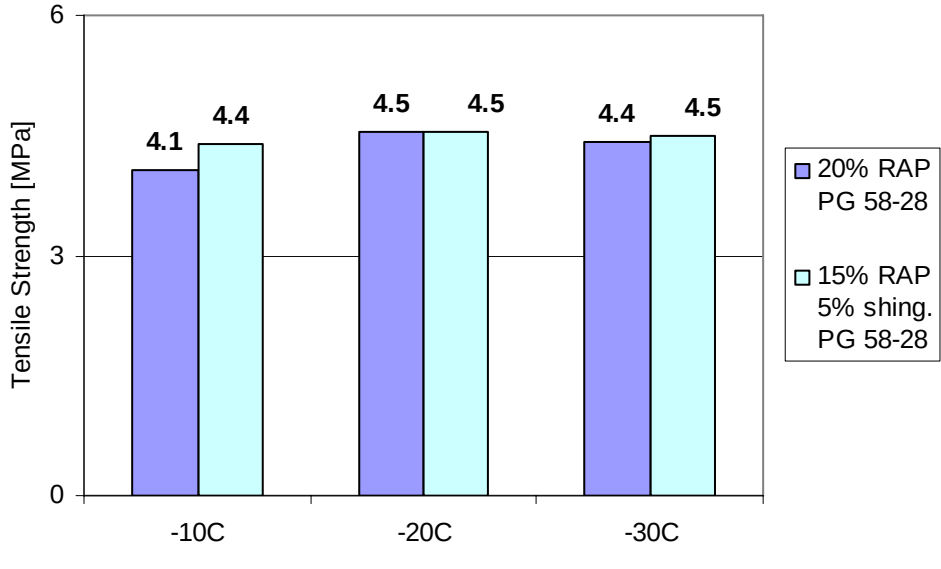




PG 64-22

PG 58-28

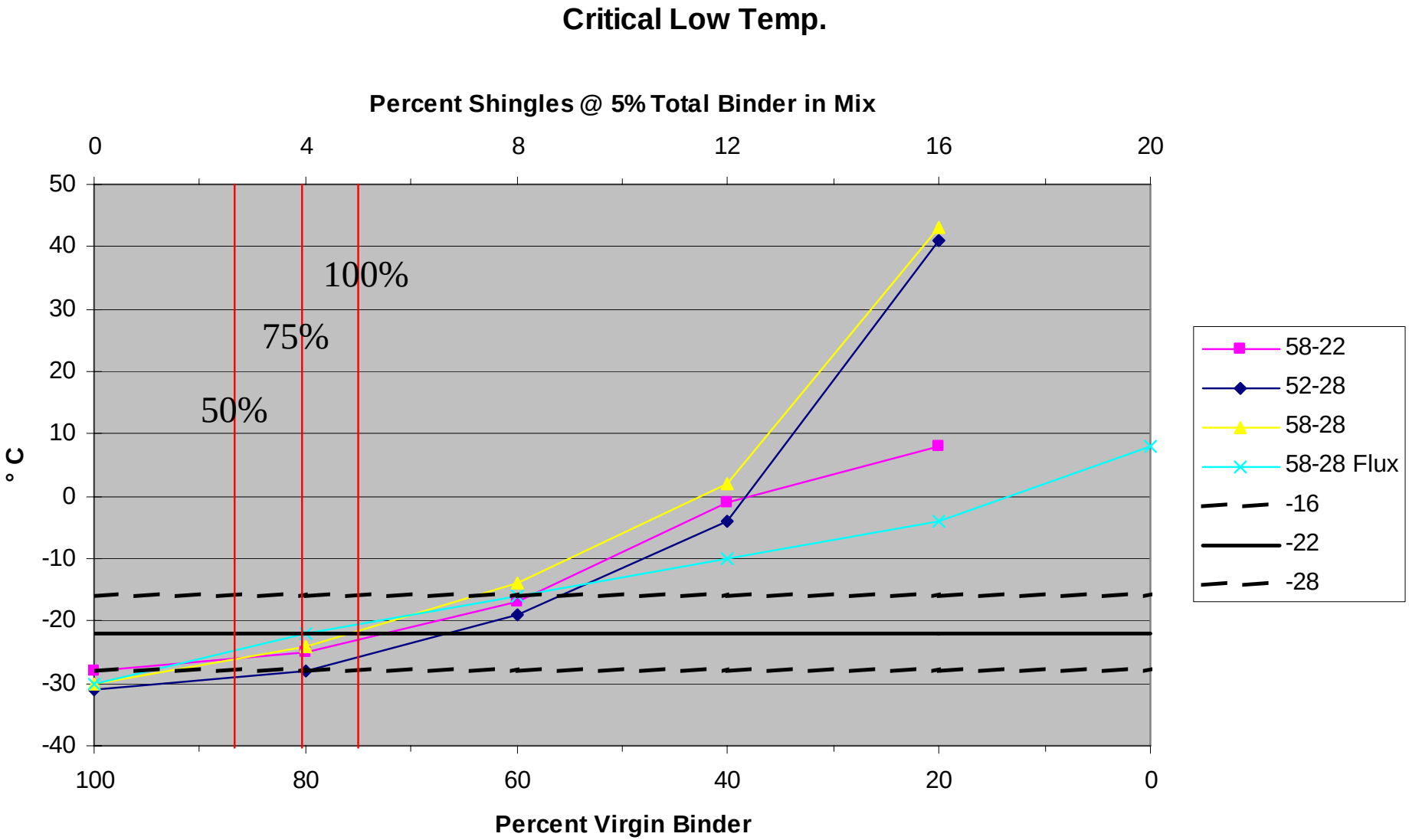




Asphalt Modifications Require PG 64-22

- Stiffer at High Temperature – OK
- Stiffer at Low Temperature
  - Use Lower Percentage of Shingles
  - Use Softer Roadway Asphalt ←

Assume Incomplete Blending



Deleterious Evaluation

- Specification for Aggregate
  - –0.5% “Other Foreign Material”
    - Sticks, mud balls, deer fur, etc.
- Shingle “OFM”
  - –Approximately 3% Total

Deleterious Material

- Nails
- Wood
- Plastic
- Cellophane
- Paper
- Fiber Board

Trial by Fire

No Difference

- Visually
- Standard Mixture Tests
- Placement

Big Difference

- Rut Resistance
- Cold Temperature Tests
- OFM in Mixture

Can Tear-Off Shingles be Used?

- Allowance in OFM Due to Small Percentage of Shingles and Trial Mixture
- Start with Softer Roadway Asphalt

Where Are We?

The "Ex" Factor 2

- Extrinsic Material Allowance Raised
  - 3.0% Total
  - 1.5% Wood
- Expect PG 64-22 met w/ PG 58-28
  - Extra grades optional w/ testing
  - Examining various proportions and asphalts
- Exuberant Contractors


Cardboard
Milk Jugs,
Aluminum
Cans
Plastic Bottles
Newspaper


MoDOT