MANAGING ASPHALT PAVEMENTS

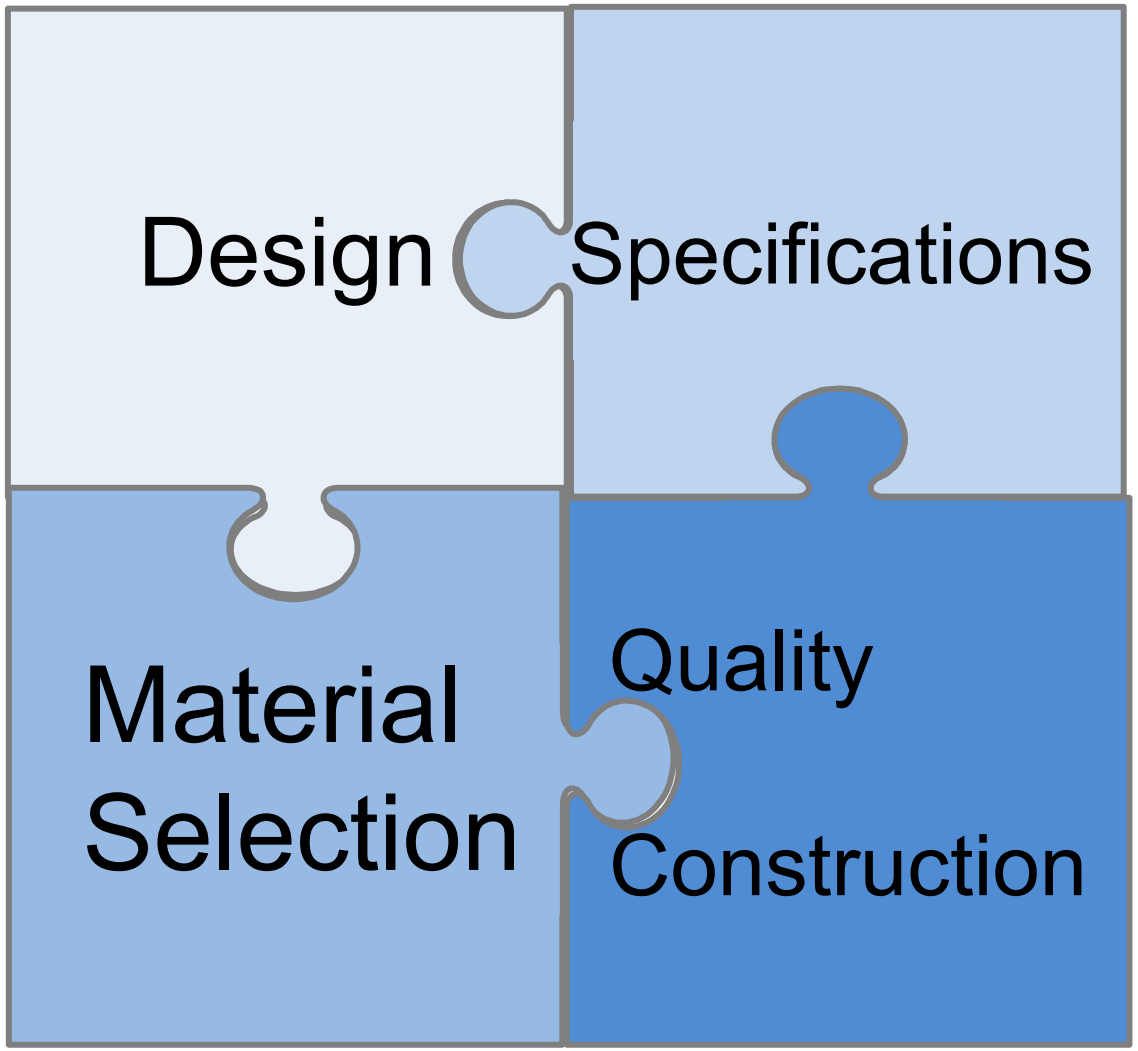
CONFERENCE AND TRADE SHOW

MAY 15-17, 2023 ★ WACO, TEXAS

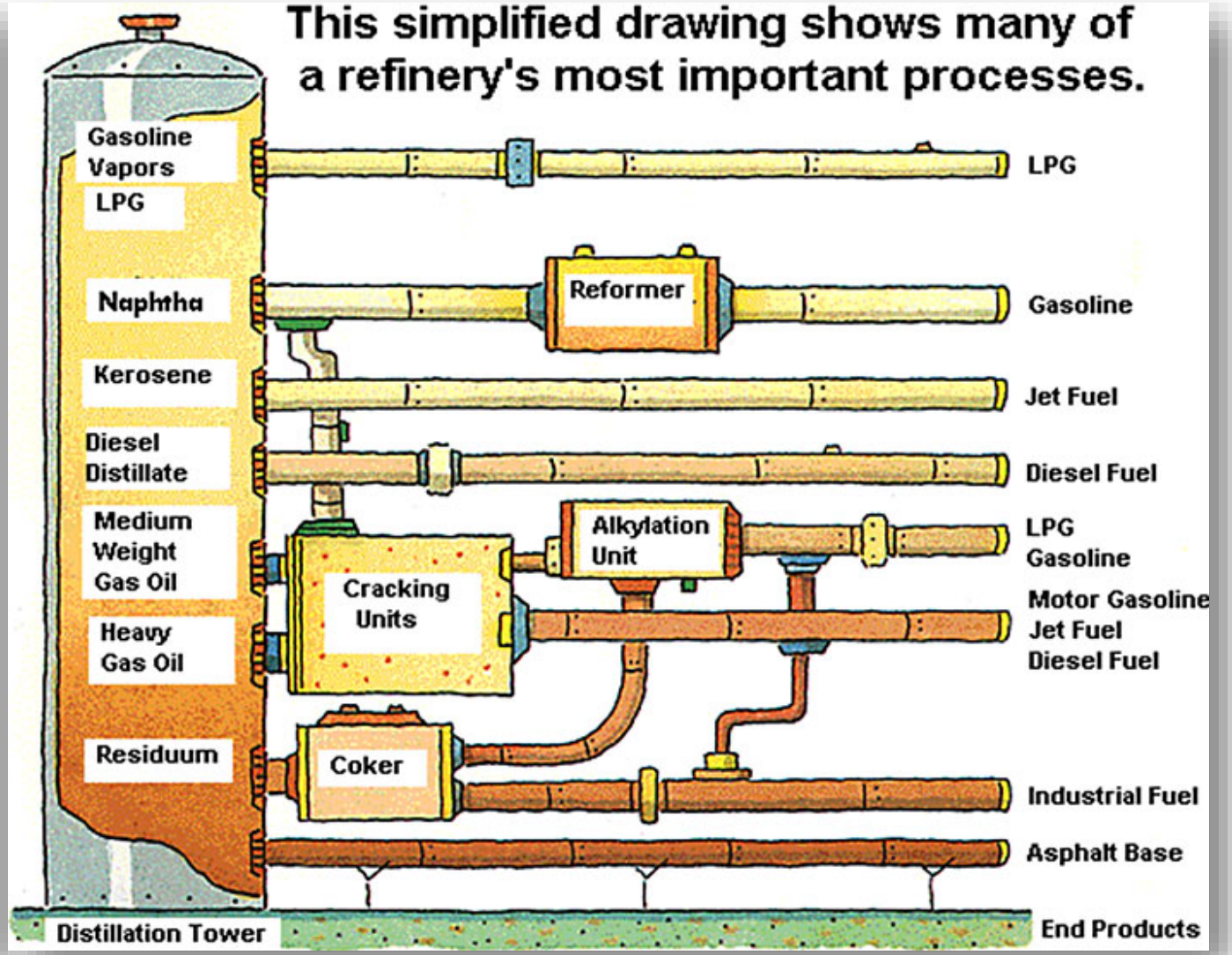
WELCOME!

Please check your App for scheduled Sessions!

Key Components to Success



Crude Oil Refining



History: Pre 1970s

- 1950s & 1960s – Paving of the Federal Interstate System – “Get the Farmer out of the Mud”
- HMA Mixture Types: Type A, B, C, D, F
- Asphalt Binder: AC10 & AC20 – Non-Polymer Modified
- HMA Design Methodology: Agency Provided
  - Hveem Method using Texas Gyratory Compactor (TGC)
  - Marshall Method using Marshall Hammer
- Agency Performed Pavement Design & Specified Construction Methodology
  - Pavement Design: Pavement Thickness
  - Construction Methodology – “Method Specs” – Inspector Dependent Outcomes

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History: Pre 1970s

- Tests for Quality – Performed by Owner/Agency
  - Lab: Density, Gradation, AC%, Hveem Stability or Marshall Stability & Flow
- Tests for Quality
  - Field: Density (Compaction)
  - Field: Ride Quality using 10 foot straight edge
- Focus was on Production, Production, Production
- Other Factors
  - Truck Traffic – Relatively low
  - Truck Weights – Relatively low
  - Biased Ply Tires – Relatively low tire pressures – “Balloon tires”

History: 1970s & 1980s

- Significant Factors
  - Truck Traffic – Increased Significantly
  - Truck Weights – Increased Significantly
  - Biased Ply Tires “Balloon tires” replaced by Steel Belted Radial Tires – Higher Pressure - Smaller “footprint” - More Stress Damage to the Roadway – Increased Rutting
- HMA Performance and Durability Generally Went Down
- Decrease in Overall Ride Quality
- Increased Awareness of Physical & Thermal Segregation and Decreased Ride Quality
- Shifting from Production Focus to Quality Paving Focus – Emergence of QCQA Specs
- Emergence of Additives – Latex & SBS Polymer, Lime, Anti-strip additives

History: 1990s

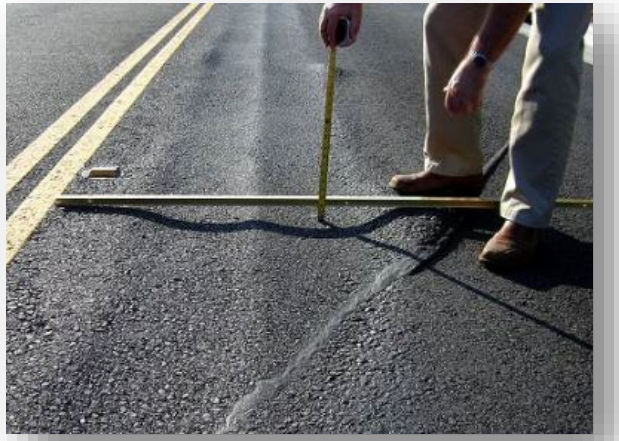
- Traffic Continued to Increase (Trucking) – Congestion Increased – “Slow Heavy Loads”
- HMA Mix Types
  - Stone Matrix Asphalt (SMA)
  - Superpave Mixes – Designed with Superpave Gyratory Compactor (SGC)
  - Permeable Friction Courses (PFC) & Other “Specialty Mixes”
- Additives to Address Rutting & Stripping: Lime, Liquid Anti-strip, Fibers, Etc
- Performance Graded (PG) Asphalt Replaced Viscosity Graded Binders
  - Much more reliance on polymer modified asphalt
- Rutting Problems Greatly Decreased – Cracking Issues Increased
- Ride Quality Measurement Shifted from 10-foot Straight Edge, California Profilograph to High-Speed Laser Profilers
- Public Demanded Better Ride Quality – Agencies Began Requiring Minimum Ride Quality Standards

History: 2000s to Present

- Quality Control Quality Assurance Specifications (QCQA) Became The Standard
- Emergence of New Laboratory Tests
  - Hamburg Wheel Test to Identify Rutting & Stripping Susceptibility
  - Overlay Test, Ideal CT test etc. to Identify Cracking Susceptibility
  - Focus on “Balanced Mix Designs” to address Rutting & Cracking
- Increased Use of Recycled Asphalt Pavement (RAP) in HMA
- Increased Use of Warm Mix Additives to Reduce Emissions and Improve HMA Workability
- Migration of all Mix Designs to Superpave Gyratory Compactor
- Emphasis on Tack Coat and Bonding Between Layers
- Emergence of Thermal Imaging Systems (TIS) to Identify Thermal and Physical Segregation in HMA Paving

Balance Mix Design Objectives

- Permanent Deformation
- Fatigue Cracking (Load)
- Low Temperature Cracking (Environment)



Most Common HMA Mix Types

Dense Graded – Item 340, 341 (SS 3076)

- Type/Size A, B, C, D, F

Superpave – Item 344 (SS 3077)

- Type/Size SP-A, SP-B, SP-C, SP-D

Permeable Friction Course (PFC) – Item 342 (SS 3079)

- Type/Size PFC-F, PFC-C, PFCR-F, PFCR-C

Stone Matrix Asphalt (SMA) – Item 346 (SS 3080)

- Type/Size SMA-C, SMA-D, SMA-F, SMAR-C, SMAR-F

Thin Overlay Mixes (TOM) – Item 347 (SS 3081)

- Type/Size TOM-C, TOM-F

Thin Bonded Friction Course – Item 348 (SS 3082)

- Type/Size PFC-F, PFC-C, PFCR-C, TBWC (Type-A, Type-B, Type-C)

Mixture Selection Goals & Options

Goals:

- ✓ Performance
- ✓ Functionality
- ✓ Cost

Options:

- ✓ Type of Mix
- ✓ Size of Mix
- ✓ Lift Thickness
- ✓ Binder Grade
- ✓ Additives
- ✓ Recycled Material

First Choice (Cracking Resistance): Selecting the right mix (Based on Overlay Results)

GOOD
- Type C
- Type D
- Type F

BETTER
- SP-C
- SP-D

BEST
- SMA-C
- SMA-D
- SMA-F
- SMAR-C
- SMAR-F

SPECIALTY
- PFC-C
- PFC-F
- PFCR-C
- PFCR-F
- TOM

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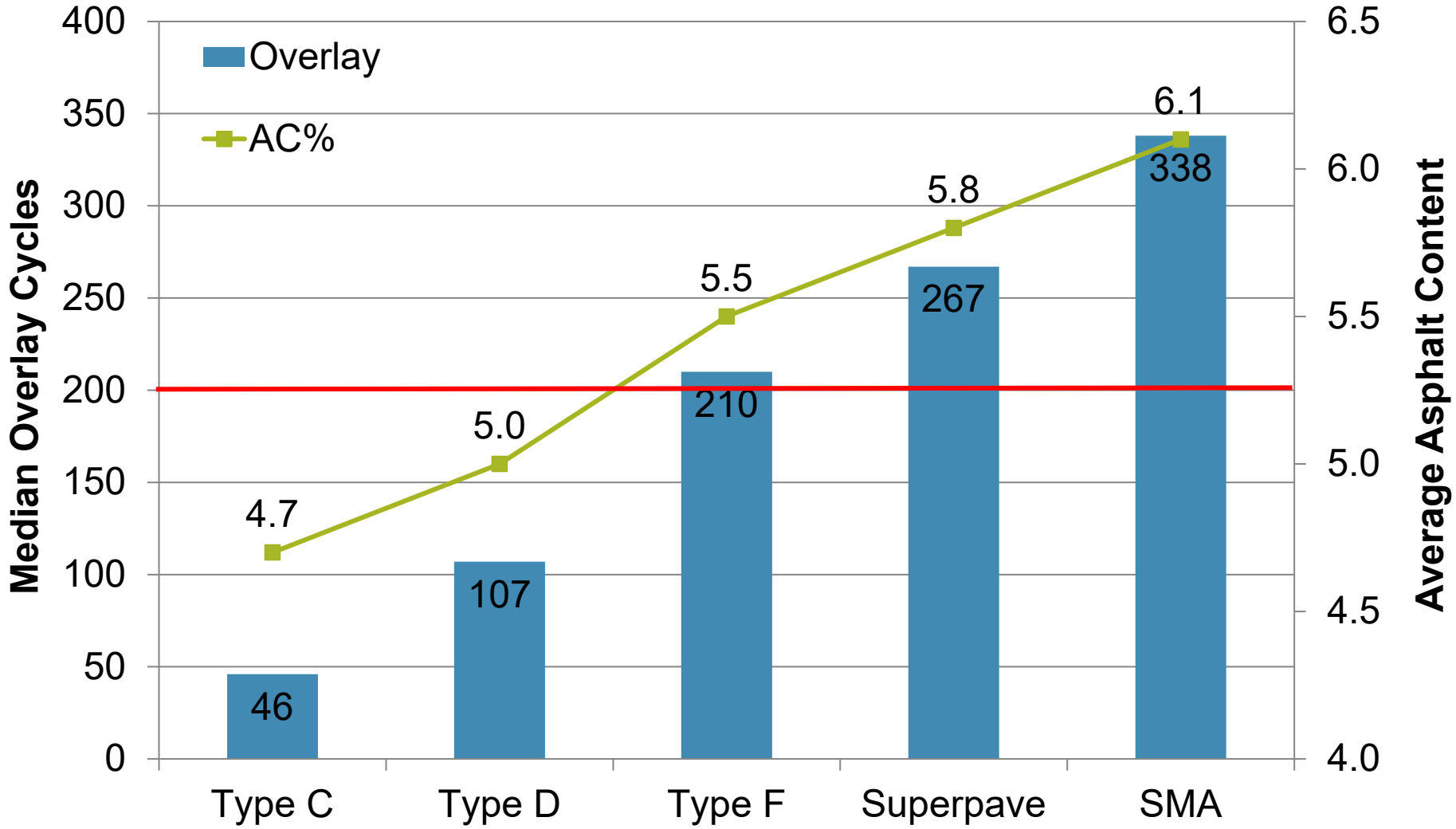
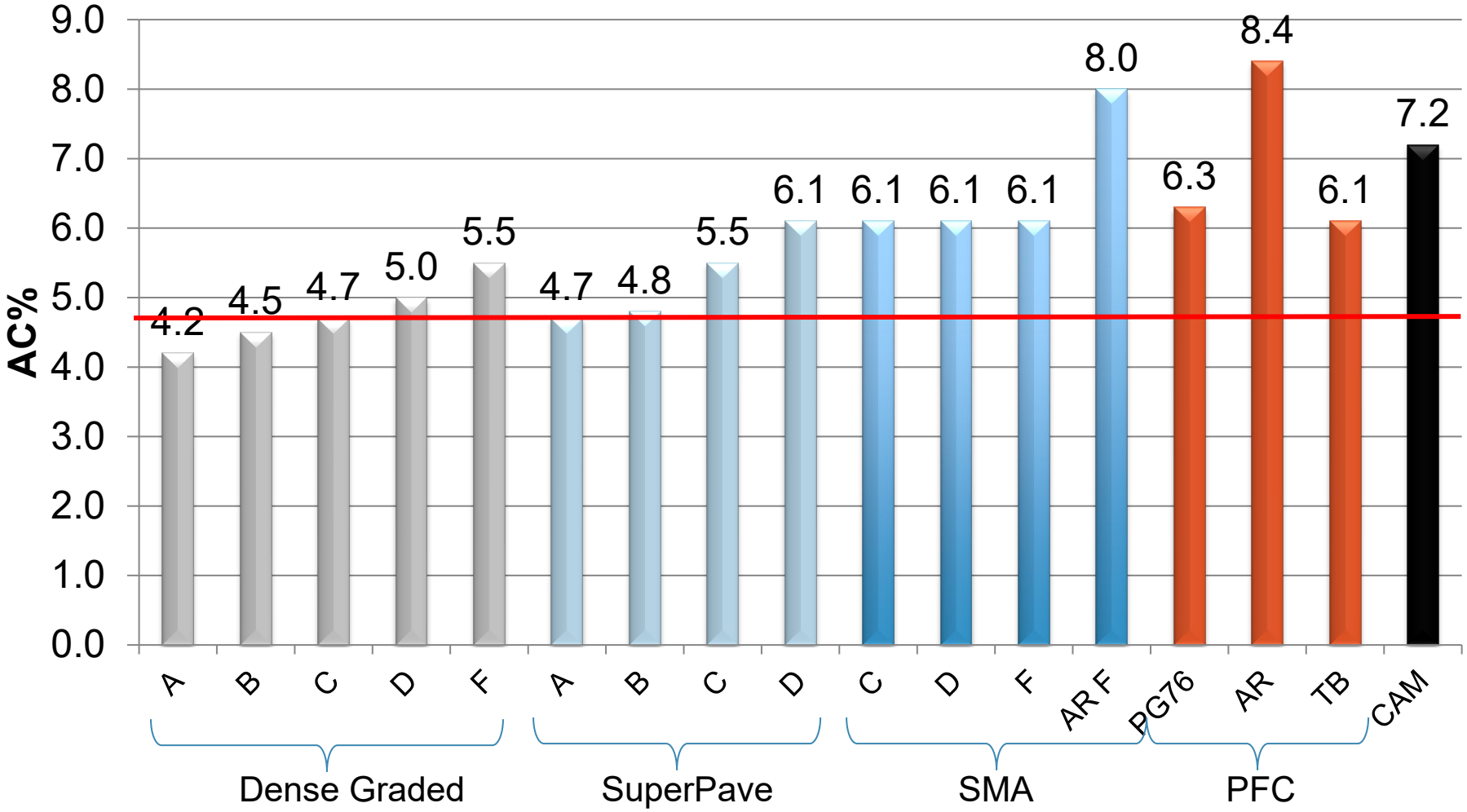
How much Better are the "better" mixes?



Binder Content – Statewide Averages



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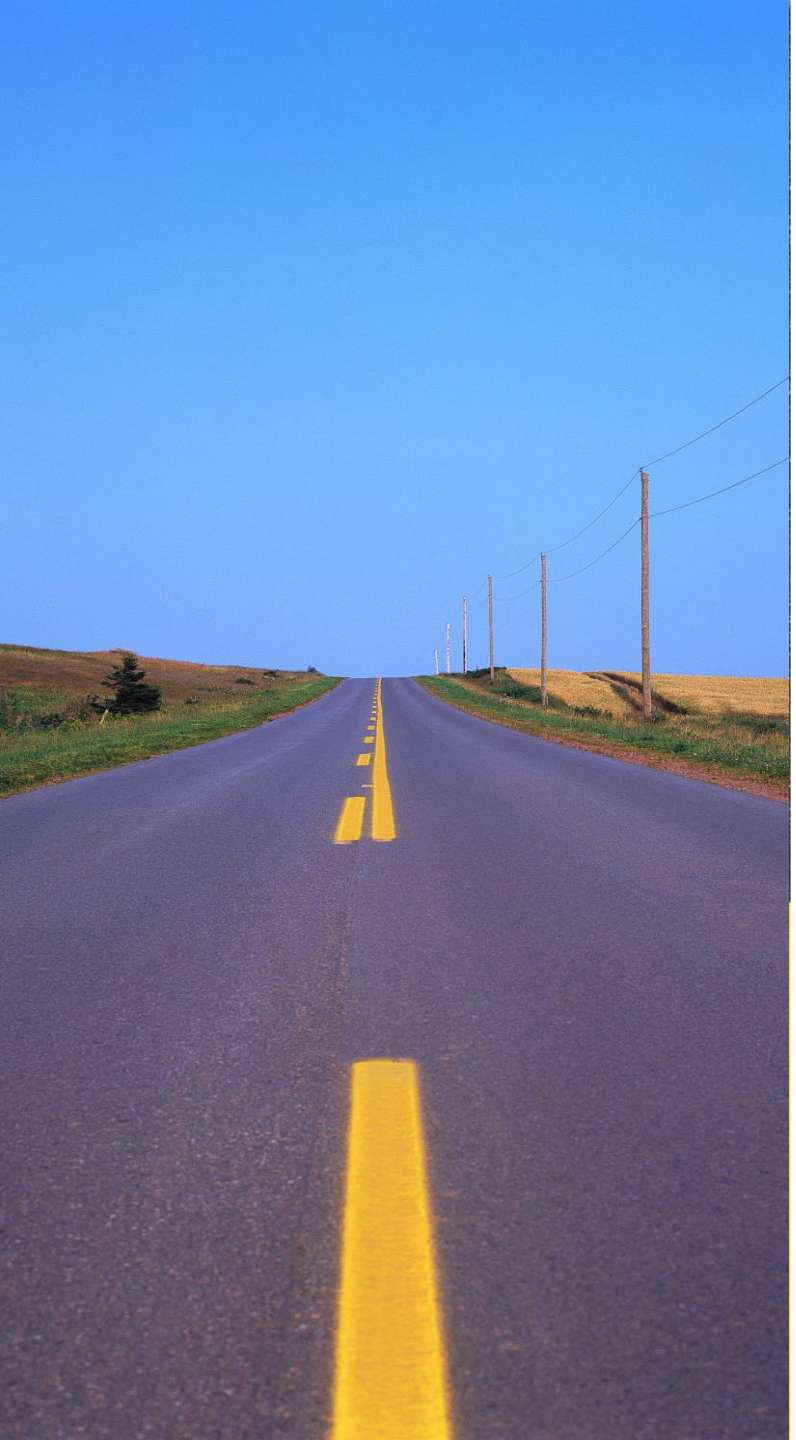

Dense Grade HMA (Small Quantity)
"Non-QCQA" – Item 340

Typical Use

- Typically used for projects with small quantities (less than 5000 tons) of hot mix asphalt (HMA).
- It is recommended for miscellaneous applications such as routine maintenance work, backfilling utility cuts, driveways, etc.

Advantages

- Lower initial cost
- More experience & familiarity

Disadvantages

- Cannot accommodate high AC contents
- No stone on stone contact
- Lower texture for surface mixtures (Type C, D, and F)
- can either rut resistant or crack resistant, but not both.

Dense Grade HMA "QCQA"

Item 341 (SS 3076)

Typical Use

- Can be used for a variety of applications ranging from new construction to overlays.
- Applied to high volume and low volume roads.
- Used as base, intermediate or surface layers.

Advantages

- Lower initial cost
- More experience & familiarity

Disadvantages

- Cannot accommodate high AC contents
- No stone on stone contact
- Low texture of dense graded surface mixtures (Type C, D, and F)
- can either rut resistant or crack resistant, but not both.

Superpave Mixtures
Item 344 (SS 3077)

Typical Use

- Versatile mix used for a variety of applications ranging from high volume to low volume roadways; from new construction to overlays.
- Used as base, intermediate and surface layers.

Advantages

- Can be used on medium to high volume roadways.
- The binder content can be adjusted by adjusting the N-des level.
- Stone on stone contact is possible to achieve depending on the gradation
- The coarse surface texture can be beneficial for wet weather traction.

Disadvantages

- More difficult to compact.
- May have intermediate temperature tenderness (tender-zone).
- Gradation is not as “gap graded” as an SMA mixture.
- More susceptible to cracking and water infiltration than SMA mixtures

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PERMEABLE FRICTION COURSE (PFC)

Item 342 (SS 3079)

Typical Use

- Is normally used as a surface course on high-speed roadways (>45mph).
- PFCR is recommend as an overlay on existing concrete pavement, when a high degree of noise reduction is required and as an overlay on a pavement that has high severity cracking.

Advantages

- Reduced water spray,
- Improved wet weather visibility
- Improved visibility of pavement markings,
- Reduced tire noise, and
- Restored ride quality.

Disadvantages

- A higher initial cost (PFCR > PFC)
- Additives require modifications to typical HMA production processes.
- They must be placed on a pavement that is structurally sound and relatively impermeable.
- They freeze faster and thaw slower than other mixtures.
- PFC mixtures are not as resistant to high shearing forces.

Stone Matrix Asphalt

Item 346 (SS 3080)

Typical Use

- Used as a surface mix or intermediate layer in the pavement structure on high volume roadways.
- SMAR is recommend as an overlay on existing concrete pavement and as an overlay on a pavement that has high severity cracking.

Advantages

- Excellent rut resistance and crack resistance.
- Stone on stone contact.
- Usually more impermeable than performance design mixtures.
- High degree of surface texture beneficial for wet weather traction.

Disadvantages

- Higher initial cost compared to other mixtures.
- Additives such as fiber & mineral fillers can require modifications to typical HMA production processes.
- SMA mixtures can be particularly difficult to place and compact in cool weather.

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Thin Over Mixtures (TOM)

Item 347 (SS 3081)

Typical Use

- Used as a very thin surface mix (normally between 0.5 &1.25 inches
- Used for overlay and mill & fill operations

Advantages

- Good resistance to cracking & rutting
- Reduced tire noise, and
- Restored ride quality.

Disadvantages

- A higher initial cost per ton (although each ton goes a long way)
- Thin lift cools quickly so not suitable for construction in cold weather
- Typically requires Class A aggregate for skid resistance

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Thin Bonded Friction Courses

Item 348 (SS 3082)

Typical Use

- Uses as an overlay strategy over existing concrete pavement or flexible pavement
- Encompasses traditional “Nova Chip” mixes and some PFC mixes
- Incorporates a spay applied membrane that promotes bonding and improves cracking

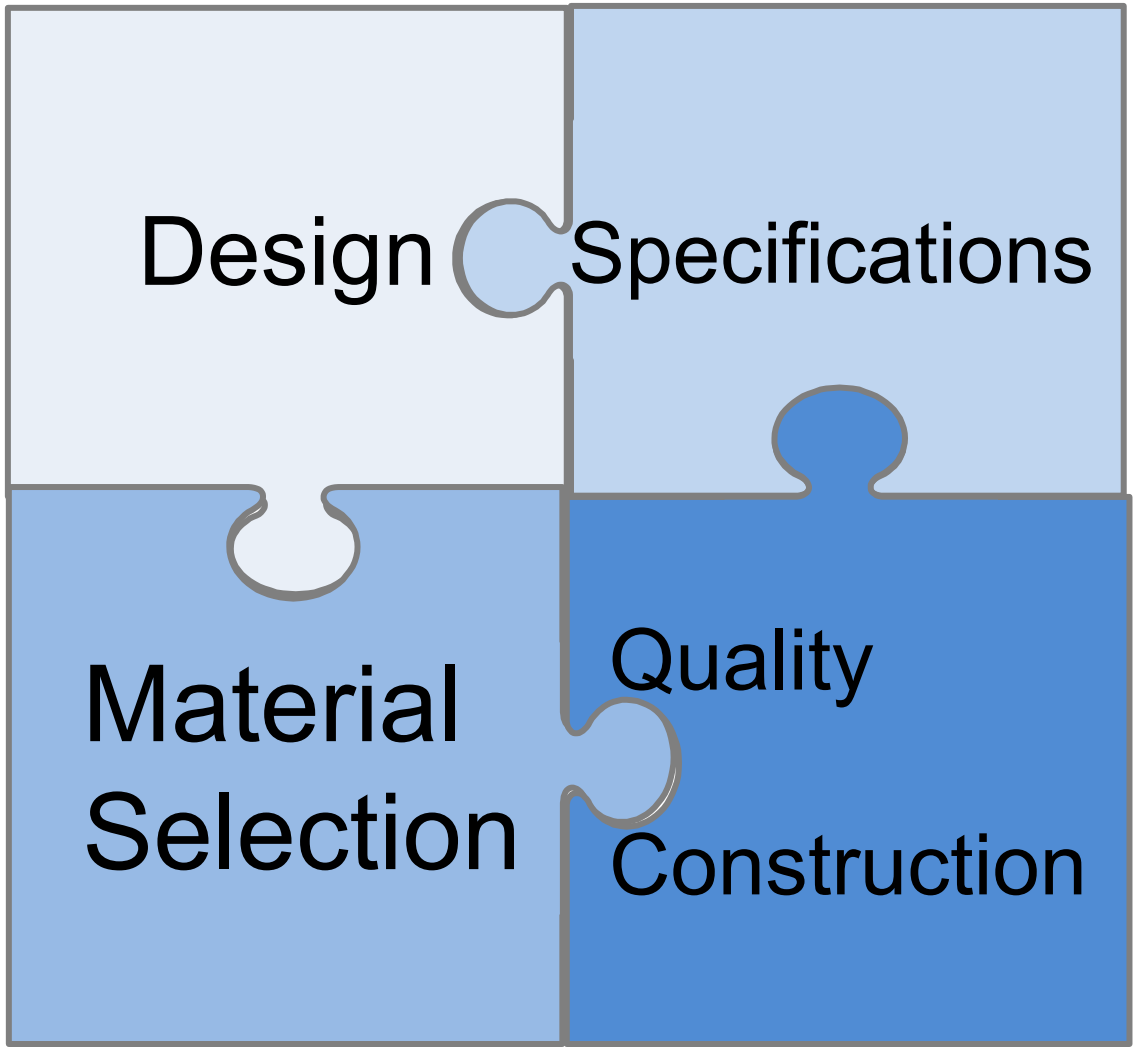
Advantages

- Essentially applies and underseal and paving layer in one pass
- Improves skid resistance
- Reduced water spray,
- Improved wet weather visibility
- Improved visibility of pavement markings,
- Placed in very thin lifts

Disadvantages

- Can require specialized pavement equipment
- They must be placed on a pavement that is structurally sound and relatively impermeable.
- Viewed by some as a proprietary process with higher cost implications

Key Components to Success



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What Gets Measured, Gets Done!!

Don’t Expect It If You Don’t Inspect It!!

We Can’t Solve Today’s Problems with Yesterday’s Thinking

Next – Robert Lee