Asphalt BINDER
Performance Grade Table

Section 7 – Mix Design

Variables and Effects

Mix Design Variables and Their Effects

➢ **Variables**

  ▸ **Aggregates**

  ▸ **Asphalts**

  ▸ **Density**

Aggregates

➢ **Gradation**

➢ **VMA**

➢ **Crushed Faces**

Gradation

➢ **0.45 Power Chart**

▸ **Max. Nominal Size**

▸ **Max. Size**

▸ **Max. Density Line**

Gradation (continued)

➢ **Interpreting 0.45 Chart**

  ▸ **Dense Gradation**

  ▸ **Coarse Gradation**

  ▸ **Fine Gradation**

  ▸ **Gap Gradation (limestone mixes)**

  ▸ **VMA vs. Gradation**

  ▸ **Excess Fines**

Gradation
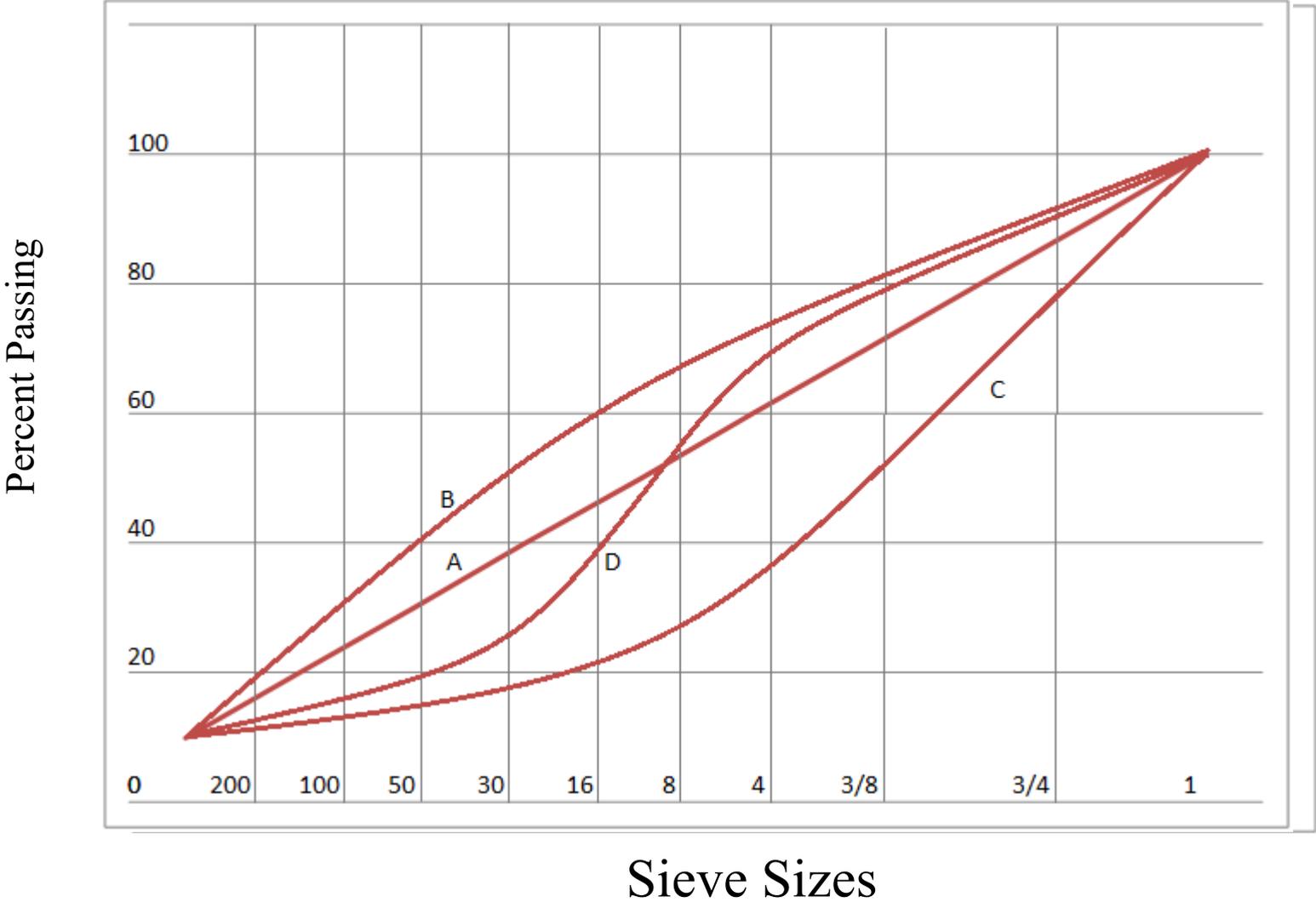
VMA

➢ **vs. Gradation**

➢ **vs. Crushed Faces**

➢ **vs. Angularity**

➢ **vs. Absorption**

➢ **vs. Asphalt Content**

Crushed Faces

- ➢ **Vs. Stability/Durability**

- ➢ **Minimum requirements**

  - ▸ **Table 803.5.5-2**

Summary

Coarse Gradation   +

High VMA   +

High Crushed Faces   =

Better Pavement

Adverse Effects

➢ **Coarse Gradation**

  ▸ **Decreased Workability**

  ▸ **Decreased Compactibility**

  ▸ **Segregation**

  ▸ **Raveling**

➢ **High VMA**

  ▸ **Special Attention to AC Content**

  ▸ **Sensitivity to AC Content**

➢ **High Crushed Faces**

  ▸ **Decreased Workability**

  ▸ **Decreased Compatibility**

Asphalt

- **Asphalt Content**
- **Temperature / Viscosity**

Asphalt Content

- ◆ **Vs. Gradation**
- ◆ **Total vs. Effective**
- ◆ **Excessive / Insufficient**

Excess Asphalt

➢ **Flushing / Bleeding**

➢ **Tenderness**

➢ **Low Skid Resistance**

➢ **Rutting / Shoving**

➢ **Shearing When Hot**

Insufficient Asphalt

➢ **Inadequate Coating**

➢ **Low Film Thickness**

➢ **Difficult Compaction**

➢ **Raveling**

➢ **Stripping**

➢ **Segregation**

➢ **Shearing When Cool**

Temp. / Visc.

➢ **Mixing Temperature – high enough to coat without draindown**

➢ **Compaction Temperature – high enough for workability without bleeding**

High Temp.

➢ **Blue Smoke**

➢ **Drain Down**

➢ **Fat Spots**

➢ **Low Film Thickness**

➢ **Non-Uniform Density**

Low Temp.

➢ **Poor Coating / Mixing**

➢ **Poor Workability**

➢ **Difficult Compaction**

➢ **Checking / Shearing**

➢ **Raveling**

Density

➢ **Proper density – 92% to 97% of Voidless**

➢ **WYDOT – Q A Spec.**

➢ **Low Density**
  - **High Air Voids**
  - **Low Stability**
  - **Rapid Aging**
  - **Poor Moisture Resistance**
  - **Poor Fatigue Resistance**
  - **Rutting / Shoving**

Density (continued)

- ➤ **High Density**
  - ▸ **Flushing / Bleeding**
  - ▸ **Poor Skid Resistance**
  - ▸ **Poor Flexibility**