

# *The Bailey Method*

## **Achieving Volumetrics and Compactability**

### Day 1 – Monday

- I. Introduction** **1:00 – 2:15 p.m.**
- a. Aggregate Blending
  - b. Origin of the Bailey Method
  - c. 0.45 Power Curve
  - d. The Big Picture
    - i. Coarse-Graded
    - ii. Stone Matrix Asphalt
    - iii. Fine-Graded
- II. Aggregate Packing** **2:15 – 3:00 p.m.**
- a. What is Voids in the Mineral Aggregate (**VMA**)?
  - b. Aggregate Packing Factors
  - c. Defining Coarse and Fine
  - d. Primary Control Sieve
  - e. Volume vs. Weight
- Break** **3:00 – 3:15 p.m.**
- III. Conducting Unit Weight Tests** **3:15 – 5:00 p.m.**
- a. Coarse Aggregates (**9.5mm NMAS or >**)
    - i. Loose
    - ii. Rodded
    - iii. Rules-of-Thumb
  - b. Fine Aggregates (**4.75mm NMAS or <**)
    - i. Loose
    - ii. Rodded
    - iii. Rules-of-Thumb
  - c. Video of Laboratory Unit Weight Tests

## Day 2 – Tuesday

- IV. Review Time** **8:00 – 9:00 a.m.**
- V. Mix Type** **9:00 – 2:30 p.m.**
- a. Defining Mix Type
  - b. Determining Mix Type
- Break** **10:00 – 10:15 a.m.**
- c. Comparing CA's With Different Specific Gravities
  - d. CA Chosen Unit Weight
    - i. Mix Type
- Lunch** **Noon – 1:00 p.m.**
- ii. Categorizing Aggregates as CA or FA (**Tab 1**)
  - iii. Converting from Volume to Weight (**Tab 2**)
- Break** **2:30 – 2:45 p.m.**
- VI. Evaluating the Combined Blend** **2:45 – 5:00 p.m.**
- a. Coarse-Graded Mixes
    - i. Ratios – CA, FA<sub>c</sub> and FA<sub>f</sub>
    - ii. Overview of the Four Principles
    - iii. Summary Table & Suggested Ranges Based on NMAS
  - b. Stone Matrix Asphalt Mixes
    - i. Ratios - Similarities & Differences to C-G Mixes
    - ii. Overview of the Four Principles
    - iii. Summary Table & Suggested Ranges Based on NMAS
- Break** **4:00 – 4:15 p.m.**
- c. Fine-Graded Mixes
    - i. Revised Ratios – New CA, New FA<sub>c</sub> and New FA<sub>f</sub>
    - ii. Overview of the Four Principles
    - iii. Summary Table & Suggested Ranges Based on NMAS

**Day 3 – Wednesday**

<b>VII. Review Time</b>	<b>8:00 – 9:00 a.m.</b>
<b>VIII. Volumetrics vs. CA Volume</b>	<b>9:00 – Noon</b>
a. Coarse Volume Influence	
b. Fine Fraction Influence	
c. Coarse Fraction Influence	
d. Degradation Issues	
e. Influence of CA Volume on Field Compactability	
i. Coarse-Graded Mixes	
ii. Fine-Graded Mixes	
	<b>Break</b>
f. Aggregate Packing Overview	<b>10:15 – 10:30 a.m.</b>
g. Minus PCS Material ( <b>Tab 3</b> )	
h. Fine-Graded Mixes that “ACT” as Coarse-Graded Mixes	
	<b>Lunch</b>
	<b>Noon – 1:00 p.m.</b>
<b>IX. HRG Volume Blending Spreadsheets</b>	<b>1:00 – 2:00 p.m.</b>
a. Required Information	
b. Initial Blending Example ( <b>Tab 4</b> )	
<b>X. Including Recycle</b>	<b>2:00 – 3:00 p.m.</b>
a. Determining the Combined Blend	
b. Evaluating the Combined Blend	
c. Additional Considerations	
d. Initial RAP Blending Example ( <b>Tab 5</b> )	
	<b>Break</b>
	<b>3:00 – 3:15 p.m.</b>
<b>XI. Evaluating Existing Mixes</b>	<b>3:15 – 5:00 p.m.</b>
a. Virgin ( <b>Tab 6</b> )	
b. RAP ( <b>Tab 7</b> )	

**Day 4 – Thursday**

<b>XII. Review Time</b>	<b>8:00 – 9:00 a.m.</b>
<b>XIII. Finding a Starting Point</b>	<b>9:00 – 9:30 a.m.</b>
a. Mix Type	
b. Mix Needs ( <b>Tab 8</b> )	
<b>XIV. Laboratory Blending</b>	<b>9:30 – 10:00 a.m.</b>
a. Virgin Mixes	
b. RAP Mixes	
	<b>Break</b>
	<b>10:00 – 10:15 a.m.</b>
<b>XV. Estimating VMA and Voids</b>	<b>10:15 – 2:00 p.m.</b>
a. Coarse-Graded Example	
b. Fine-Graded Example	
c. Hand-Calculation Example ( <b>Tab 9</b> )	
	<b>Lunch</b>
	<b>Noon – 1:00 p.m.</b>
d. Spreadsheet Overview ( <b>Tab 10</b> )	
<b>XVI. HRG VMA and Voids Estimation Spreadsheets</b>	<b>2:00 – 5:00 p.m.</b>
a. Estimated vs. Actual Results	
b. Estimation Sheets with Values:	
i. Hand-Calculation Example ( <b>Tab 11</b> )	
	<b>Break</b>
	<b>3:00 – 3:15 p.m.</b>
ii. Coarse-Graded Example ( <b>Tab 12A</b> )	
iii. Evaluating Multiple Trials Before Doing Lab Work ( <b>Tab 12B</b> )	
iv. Fine-Graded Example ( <b>Tab 13</b> )	

## **Day 5 – Friday**

- XVII. Review Time** **8:00 – 8:30 a.m.**
- XVIII. Estimation Examples for Class Evaluation (Tabs 14, 15)** **8:30 – 10:15 a.m.**
- a. Close With the Rules-of-Thumb
  - b. Wrong Mix Type and Size
  - c. Importance of Determining FA Dips
  - d. Questionable Samples
  - e. Shape, Strength or Texture SHIFT
    - i. Includes Gradation and AC Content trend example
  - f. Gsb Gravity Issue
  - g. Adjusting AC Volume Correction for Voids Estimation
  - h. Evaluating a Proposed Blend Adjustment
- Break** **10:15 – 10:30 a.m.**
- XIX. Estimation Spreadsheets – Interpreting the Values** **10:30 – 11:45 a.m.**
- a. VMA1 graph – Sample to Design
  - b. Voids1 graph – Sample to Design
  - c. VMA2 graph – Sample to Sample
  - d. Voids2 graph – Sample to Sample
  - e. Things to Watch For!
    - i. Sample Location and Source
    - ii. FA Dip – Range Limits vs. Actual Values
    - iii. Individual Principle with Max Change
    - iv. Other Highlighted Cells
    - v. Negative Pba Values
    - vi. “Spread” Between Diff in VMA and Diff in Voids
    - vii. Enter ALL the Gmb’s and Gmm’s!
    - viii. Relating Standard Deviation to Proposed Adjustments
    - ix. Gradation and AC Content should NOT track!
    - x. Adjusting the Factor Range Limits during Optimization
- XX. Summary and Closing Thoughts** **11:45 – Noon**