Gyratory Superpave Mix Design for Local Governments Low Volume Roads

Iowa Department of Transportation
Implementing the Gyratory Mix Design System for Low Volume Routes

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Why change to gyratory?

- Superior mix design process
- Eliminate duplicate design systems
Iowa Gyratory System Implementation

**PG-Binder Full Implementation Jan 1997**

- **Mix Design State Routes**
  - ’97 - 10%
  - ’98 - 25%
  - ’99 - 50%
  - ’00 - 100%

**All other routes 2004**
Iowa’s Implementation Process

• 1999 Identified need, formed team
• 2000 Data collection
• 2001 Analysis, develop guidelines
Team Approach

• DOT/County/industry
• Agency concerns
• Industry practice
• 7 activities outlined

• Training
• Public relations
• Mixture analysis
• Quality control
• Constructibility
• Cost
• Plan validation
PUBLIC RELATIONS

Implementation Bulletin
No. 1 - The Plan

No. 2 - Training Sessions
No. 3 - Send Marshall Mixes
No. 4 - Mix Analysis
No. 5 - Specification
No. 6 - Mix Selection Guide
Mixture Analysis Input Data Fields

- Project Identification
- Traffic
- Marshall Mix
- Requirements
- Gyratory Compaction Curves
- Marshall Mix Volumetrics
- Aggregate Characteristics
Getting the Data!

- 102 Mixes
- 170 Split Samples
- Huge Data Base
  - 8500 Data Entries
  - 16200 Calculations
- Over 2000 hours of work
Gradation Curves - 3/4"

Percent Passing vs. Sieve Size

Sieve Sizes:
- 0.0
- 10.0
- 20.0
- 30.0
- 40.0
- 50.0
- 60.0
- 70.0
- 80.0
- 90.0
- 100.0
Gyratory Density

Gyrations vs. %Gmm
Normalized to 4% at 68 Gyrations
Mixture Levels

Less than 100,000 ESALs (40 trucks/day)
100,000 to 300,000 ESALS (40-125 T/day)
300,000 to 1,000,000 ESALS (125-350 T/day)
Normalizing the Database

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< 100,000 ESALs, Filtered
Normalized to 3.0 Voids at 68 Gyrations
100,000 to 300,000 ESALs, Filtered
Normalized to 3.5 Voids at 68 Gyrations

%Gmm vs Gyrations for 50 Mixes
> 300,000 ESALs, Filtered
Normalized to 4.0 Voids at 75 Gyrations

27 Mixes
### Mix Criteria for Lab Density

**Surface and Intermediate Lifts**

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Gyratory Mix Design System

Material Selection Guide

- Part 1- Design Checklist
- Part 2- Material Properties
- Part 3- Mixture Guide Overview
- Part 4- Example Plans
- App A- Terms & Definitions
- App B- Determining ESALs
- App C- Mixture Selection Guide
- App D- Bid Item List
Mix Selection Guide

• Design Checklist - 8 step process
  – Step 1 - traffic forecast
  – Step 2 - pavement rehabilitation strategy
  – Step 3 - climate
  – Step 4 - 20-year pavement loading
  – Step 5 - special conditions
  – Step 6 - select mixture criteria
  – Step 7 - check for non-standard criteria
  – Step 8 - prepare plans & proposal
Implementation Progress

• 5 pilot projects in 2001
• 40+ projects in 2002
• Initiate study for cities in 2003
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