



Asphalt Mix Design and HMA Plant Quality Control Course: Marshall and Superpave

2 – 6 May 2027

Dammam - Eastern Province five-star



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Introduction:

Asphalt mix design and HMA plant quality control, covering Marshall and Superpave, is a 5-day course for asphalt laboratory, hot-mix plant and paving quality units that ends with a Mix Design and Plant Quality Control Plan for a case producer. Road surfaces rut, strip or ravel when a job-mix formula rests on weak volumetrics, plant feeds drift from calibration and mats are rolled below target density. Nominees already run mixture tests, plant production or paving inspection and learn through case studies on mix design data, plant records and core results. CoreConcept Training Center delivers this asphalt mix design course.

Course Objectives:

- Blend aggregate stockpiles to a target gradation within control points and verify specific gravity and absorption values used in volumetric calculations
- Design dense-graded asphalt mixtures by the Marshall method, selecting optimum binder content from stability, flow and density-voids analysis
- Design Superpave mixtures with the gyratory compactor at Ninitial, Ndesign and Nmax levels and check air voids, VMA, VFA and moisture susceptibility
- Calibrate batch and drum plant cold feeds, hot bins and binder metering so that production matches the approved job-mix formula
- Control laydown temperature, segregation, joint construction and roller patterns to reach specified in-place density
- Prepare lot-based acceptance testing, pay factor and nonconforming mix rules within a mix design and plant quality control plan

Target Audience:

- Asphalt laboratory units responsible for aggregate testing, trial mixes and job-mix formula submissions
 - Hot-mix plant production teams responsible for cold feed settings, burner and drying control and daily output
 - Paving contractor quality control teams responsible for mat temperature, density testing and core sampling
 - Road owner materials units responsible for mix design approval, plant audits and lot acceptance
 - Supervision consultant inspection teams responsible for witnessing plant sampling and paving operations
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Course Outline:

Day 1: Asphalt Mixture Types, Components and Distress Mechanisms

- Dense-Graded, Gap-Graded and Open-Graded Asphalt Mixture Types
- Rutting, Stripping and Bleeding Linked to Mixture Proportions
- Aggregate Source Properties Including Abrasion, Soundness and Absorption
- Hot-Mix and Warm-Mix Asphalt Production Temperature Ranges
- Laboratory and Plant Capability Baseline Review for a Producer

Day 2: Aggregate Gradation, Blending and Volumetric Principles

- Sieve Analysis and Gradation Curves on the Power Chart
- Stockpile Blending Spreadsheet for Three or Four Aggregate Sources
- Bulk and Apparent Aggregate Specific Gravity Determination
- Gmb and Gmm Measurement for Compacted and Loose Mixtures
- Air Voids, VMA and VFA Volumetric Calculation Worksheet

Day 3: Marshall and Superpave Mix Design Procedures

- Marshall Hammer Specimen Compaction at Trial Binder Contents
- Marshall Stability and Flow Testing With Optimum Binder Selection
- Superpave Gyratory Compactor Ninitial, Ndesign and Nmax Levels
- Superpave Consensus Properties Angularity, Flat Particles and Clay Content
- Modified Lottman Moisture Susceptibility Test Under AASHTO T 283

Day 4: HMA Plant Calibration, Laydown Control and Production Risks

- Batch Plant Hot Bin Screening and Weigh Hopper Calibration
- Drum Plant Cold Feed Belt Scale and Binder Metering Calibration
- Job-Mix Formula Verification and Production Tolerance Control Charts
- Paver Segregation, Mat Temperature and Longitudinal Joint Compaction
- Roller Pattern Trials With Nuclear Gauge and Core Density

Day 5: Case Study on a Mix Design and Plant Quality Control Plan

- Case Producer Mix Design Data and Volumetric Check Review
 - Ignition Oven Binder Content and Extraction Gradation Lot Testing
 - Lot-Based Acceptance Sampling and Pay Factor Calculation Sheet
 - Nonconforming Mix Disposition and Plant Adjustment Decision Rules
 - Mix Design and Plant Quality Control Plan Completion
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Skills You Will Gain:

- Aggregate Blend Proportioning
- Volumetric Mixture Analysis
- Marshall Mix Design
- Gyratory Mix Design
- Asphalt Plant Calibration
- Mat Density Control
- Lot Acceptance Testing
- Production Control Charting

Why Attend This Course:

- Deliver a Mix Design and Plant Quality Control Plan for a case asphalt producer to the plant manager and the road owner materials engineer
- Decide whether a trial mix, a plant adjustment or a paved lot meets volumetric and density criteria or must be reworked
- Avoid rejected lots, pay deductions and early rutting or stripping caused by drifting feeds, poor volumetrics and low mat density
- Coach laboratory technicians, plant operators and roller crews using blending sheets, calibration records and roller pattern charts

Conclusion:

Back at work, the participant presents the Mix Design and Plant Quality Control Plan to the plant manager, the paving superintendent and the road owner materials engineer. They use it to approve job-mix formulas, set cold feed and binder calibration intervals, fix sampling frequencies and agree acceptance, pay factor and rework rules for each paving lot. After the first production run under the plan, the unit should compare control chart trends, core densities, rejected lots and early surface distress against the baseline and tighten the weaker limits.

Frequently Asked Questions FAQ:

What should participants know before an asphalt mix design and HMA plant quality control course?

Participants should already work in an asphalt laboratory, at a hot-mix plant or on paving quality control and read basic test reports. Bringing an anonymised job-mix formula, a plant calibration sheet or core density results helps during the case study day.

How does asphalt mix design and HMA plant quality control differ from a pavement design course?

It proportions and produces the asphalt mixture itself, from aggregate blending and volumetric design to plant calibration, laydown and lot acceptance. Pavement design courses decide layer thickness from traffic and subgrade data, while binder courses deal with manufacturing and grading the bitumen.

Why does asphalt mix design use air voids, VMA and VFA rather than binder content alone?

Volumetric properties show how binder, aggregate and air share the compacted mixture. Too few air voids invite bleeding and rutting, too many invite moisture damage and ravelling, so optimum binder content is chosen where the target air voids and the VMA and VFA criteria are met together.

What do participants take back from the asphalt mix design and HMA plant quality control course?

Participants take back a Mix Design and Plant Quality Control Plan with a blending sheet, a volumetric worksheet, plant calibration checklists, roller pattern guidance, lot sampling tables and pay factor and rework rules they can adapt to their own plant.
