New Technologies in Asphalt Testing

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- **Each day**, approximately 1.4 Million tons of HMA are produced in the U.S. (M-F production basis)
  - Equivalent to ~2500 lane miles @ 12' wide and 1.5" thick
  - Distance from New York to Las Vegas

Why is Performance Testing Important?

- Can be used to Evaluate a mix design in the lab and Predict how well it will perform prior to making an investment to place it on the roadway
- Can be used to make the best or most effective use of a situation, opportunity, or resource
- Allows a user to increase understanding of the factors which drive mix performance
- Can be Used to Correlate lab predictions to field results
- Can be used to test Plant Produced Mixes and Cores from the in place compacted mix.
- Provides a performance history of a mix from beginning to end
- Can allow mix designers to look at Life Cycle Cost Analysis versus Initial Cost

Why is Performance Testing Important?-Continued

- “Mixture Economics” can be introduced into the Mix Design Process. Mixes can be designed that cost less without compromising their performance. Ex. Increasing percentage or RAP/RAS
- Improve the Quality of Asphalt Mixes
- Utilized as a Forensic Tool for projects slated for rehabilitation. Information can be used to determine a proper rehabilitation strategy
- Rewards innovative and proactive contractors
- Qualify Aggregate Sources
- Warranty and Design Build Projects
- Conflict resolution between DOT and Producer

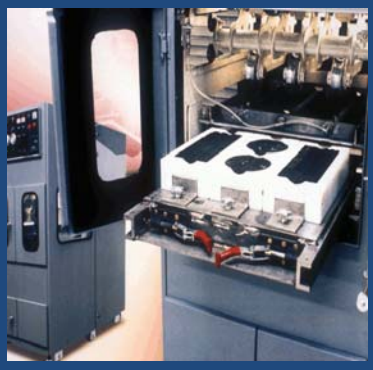
New Technologies

- Performance Testing
  - Rutting(AASHTO T340-10)
  - Moisture Susceptibility-Hamburg(AASHTO T324-14)
  - Fatigue
- Real-Time Quality Control
  - Asphalt Plant
  - Aggregate Plant

AASHTO T 340-10 Test Method

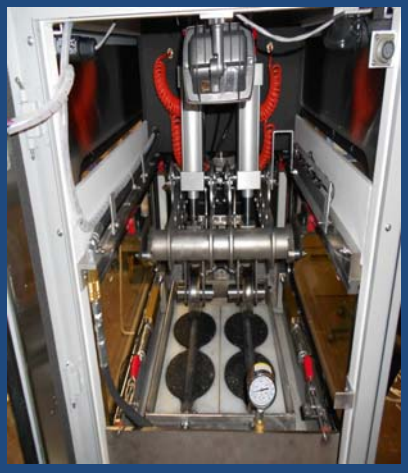
- **Test Temperature: Hi-PG Temp(Ex. 64C)**
- **Load 100lbs.**
- **Hose Pressure 100psi**
- **Speed 60 cycles per minute**
- **Test Duration 8,000 cycles (2 ½ hours)**
- **Samples are tested in a dry environment**
- **Gyratory Samples(75mm or Design 115mm samples) are utilized for testing**
- **Field Cores and Slab Specimens can also be tested**

Asphalt Pavement Analyzer(APA)



Asphalt Pavement Analyzer-Junior (APA Jr)

Chamber View of APA Jr Rut Testing



Rutted Beam and Cylindrical Specimens Tested in the APA

Rut Specifications

Arkansas DOT

- **Design ESAL's < 3.0, Nmax 115, Ndes 75, PG64-22, LWT: Max 8mm**
- **Design ESAL's 3.0 – 30.0 Nmax 160, Ndes 100, PG70-22, LWT: Max 5mm**
- **Design ESAL's > 30.0 Nmax 205, Ndes 125, PG76-22,LWT: Max 5mm**

- **These LWT results are for any of the type of mix, 9.5, 12.5, 25.0 or 37.5mm**

Rut Specifications-Continued

Oregon DOT

- **Level 3 (80 gyration) with PG 64-22 or 64-28: 6.0mm max rut**
- **Level 3 (80 gyration) with PG 70-22 or 70-28: 5.0mm max rut**
- **Level 4 (100 Gyration) with PG 64-22 or PG 64-28: 5.0mm max rut**
- **Level 4 (100 Gyration) with PG 70-22 or PG 70-28: 4.0mm max rut**

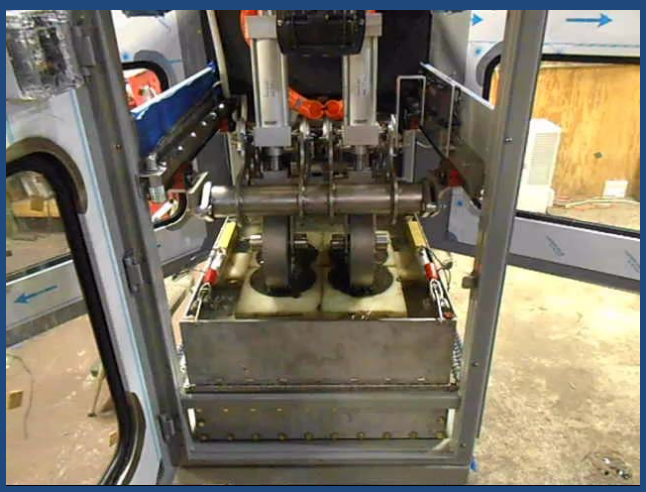
AASHTO T 324-14 (Hamburg Test Method)

- **Test Temperature: 50C**
- **Load 158lbs.**
- **Speed 50 passes per minute**
- **Test Duration 20,000 passes (Approx. 7 hours)**
- **Samples are submerged in water during test**
- **Gyratory Samples(62+/- 2mm height x 150mm diameter) will need to cut and "Butted Together" inside the molds**
- **Field Cores and Slab Specimens can also be tested**

Chamber View with Hamburg Wheels and Molds

Chamber View with Hamburg Wheels in Water

Hamburg Test-APA Jr.



Hamburg-Type Cylindrical Samples(Testing Complete)

Hamburg Specifications

California DOT

PG 58	**10,000 passes**
PG 64	**15,000 passes**
PG 70	**20,000 passes**
PG 76 or Higher	**25,000 passes**

12.5mm Max Allowable Depth

Hamburg Specifications-Continued

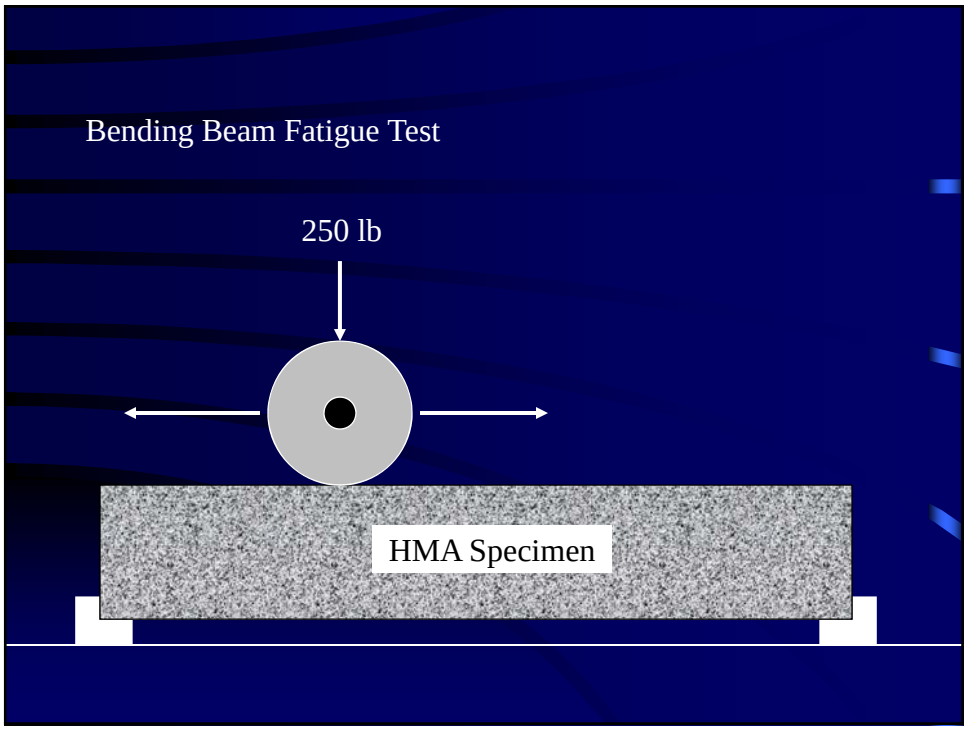
Illinois DOT

PG 58 or lower	**5,000 passes**
PG 64	**7,500 passes**
PG 70	**15,000 passes**
PG 76 or Higher	**20,000 passes**

Max Allowable Depth shall be less than or equal to 12.5mm

Chamber picture with Solid Steel Wheels(Fatigue Testing)

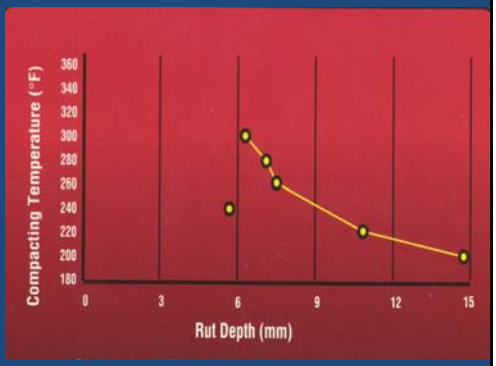
Asphalt Vibratory Compactor(AVC)



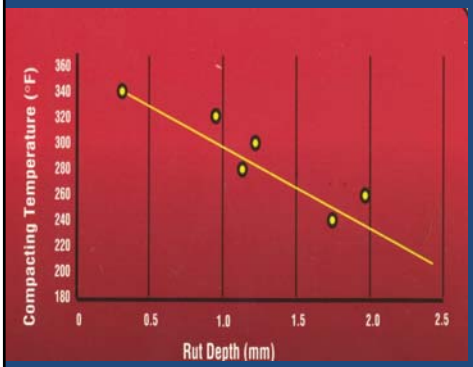
Superpave Beam Properties Tested in APA

Compacted at (°F)	Air Voids (%)		Rutting (mm)	Fatigue (# of Cycles)
	Rut Testing	Fatigue Testing		
300	6.7	6.8	6.38	46,718
290	7.1	7.4	6.26	20,956
280	7.0	7.5	6.06	19,690
260	7.6	8.0	7.47	13,198
240	8.5	8.4	9.50	8,010
220	8.2	8.6	10.72	4,578
200	9.1	9.5	14.84	4,250

9.5mm HMA Rut Susceptibility Tested in APA

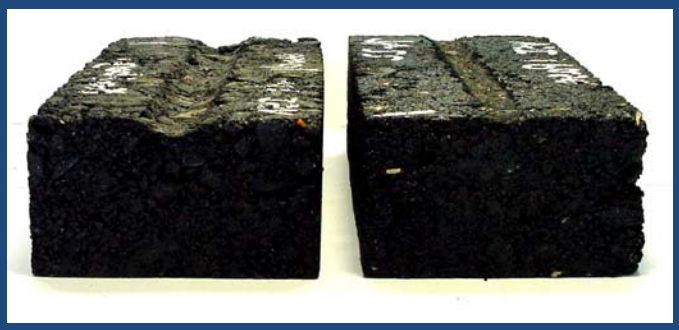


12.5mm HMA Rut Susceptibility Tested in APA



Superpave Beam Properties Tested in APA

Compacted at (°F)	Air Voids (%)		Rutting (mm)	Fatigue (# of Cycles)
	Rut Testing	Fatigue Testing		
340	7.4	7.4	0.53	300,000*
330	8.6	7.4	0.88	226,962
320	8.6	8.3	0.89	175,972
300	9.5	9.5	1.13	172,390
280	9.3	10.3	0.91	79,146
260	8.7	9.4	2.00	71,094
240	9.5	9.8	1.55	51,798



PG 64-22 PG 76-22

Fatigue Beam Tested to Failure

PLANT VERIFICATION

Robotic Truck Sampling Device (RTSD)

Benefits of the Robotic Truck Sampling Device (RTSD)

- Safely captures a representative sample along the cross section of the mix
- RTSD can be used to sample asphalt or aggregate
- Sample sizes can be obtained up to 60lbs.
- Sampling time is less than a minute
- Volumetrics are more consistent (Asphalt Content, Gradation, VMA, VFA)
- Adjustments to the plant can be made in a timely manner
- Fewer adjustments have to be made
- Contractors have fewer test result disputes with DOT's.
- Contractors can maximize pay factors by producing mix that is close to the original job mix formula

AUTOMATIC QUALITY CONTROL

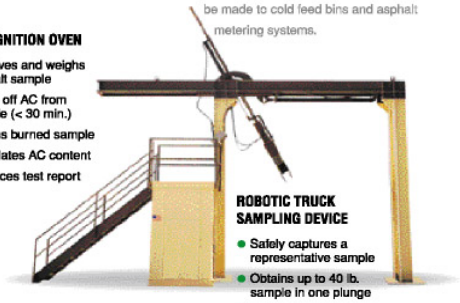
PTI introduces the first Automatic Quality Control (AQC) System for Asphalt Plants. This system allows a contractor to safely capture a representative asphalt sample from a haul vehicle utilizing the Robotic Truck Sampling Device (RTSD). The RTSD deposits the sample into the Field Ignition Oven which burns the sample and calculates the asphalt content. The burned sample is then deposited into the Automatic Gradation Unit (AGU). The AGU shakes the sample and produces a gradation with a test report. These test results go to the control house where adjustments can be made to cold feed bins and asphalt metering systems.

AUTOMATIC GRADATION UNIT

- Grades up to 100 lbs. in 10 mins.
- Computerized sieve analysis
- Automatic Self-Cleaning Cycle
- Frequencies vary with sieve size
- Generates gradation report

FIELD IGNITION OVEN

- Receives and weighs asphalt sample
- Burns off AC from sample (< 30 min.)
- Weighs burned sample
- Calculates AC content
- Produces test report



ROBOTIC TRUCK SAMPLING DEVICE

- Safely captures a representative sample
- Obtains up to 40 lb. sample in one plunge
- Helps contractors make adjustments
- Enhances process control

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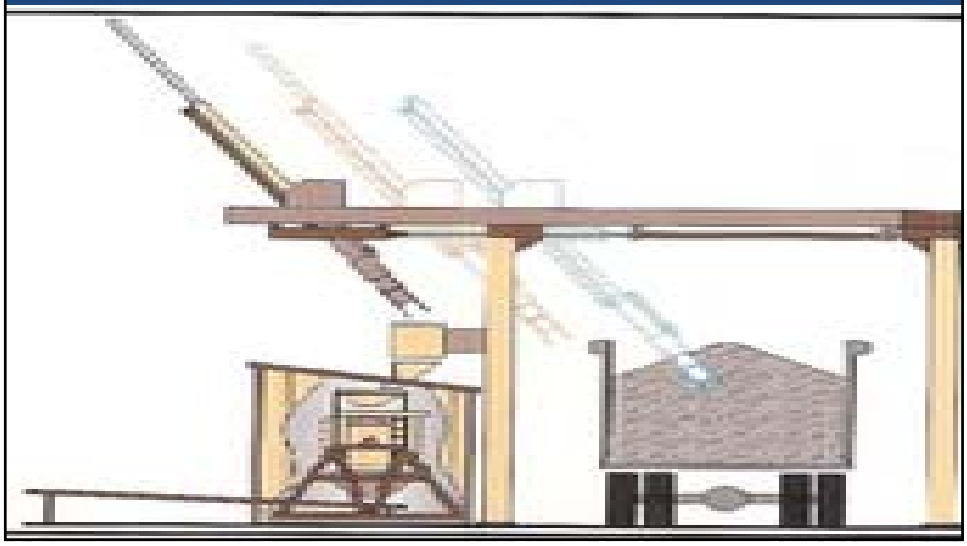
REAL-TIME QUALITY CONTROL SYSTEM ASPHALT PLANT



Real Time Quality Control (RTQC)

REAL-TIME QUALITY CONTROL SYSTEM AGGREGATE PLANT

REAL-TIME QUALITY CONTROL SYSTEM AGGREGATE PLANT

QUESTIONS???????