“Best Management Practices To Minimize Emissions During HMA Construction”

NEAUPG Meeting

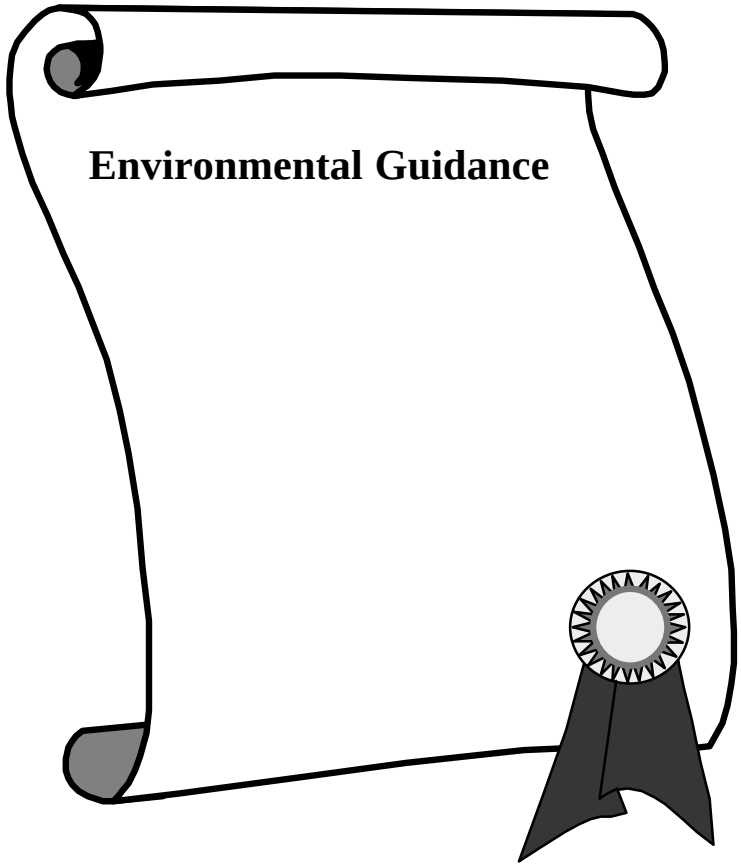
October 31, 2002

Newport, RI

Document Origin

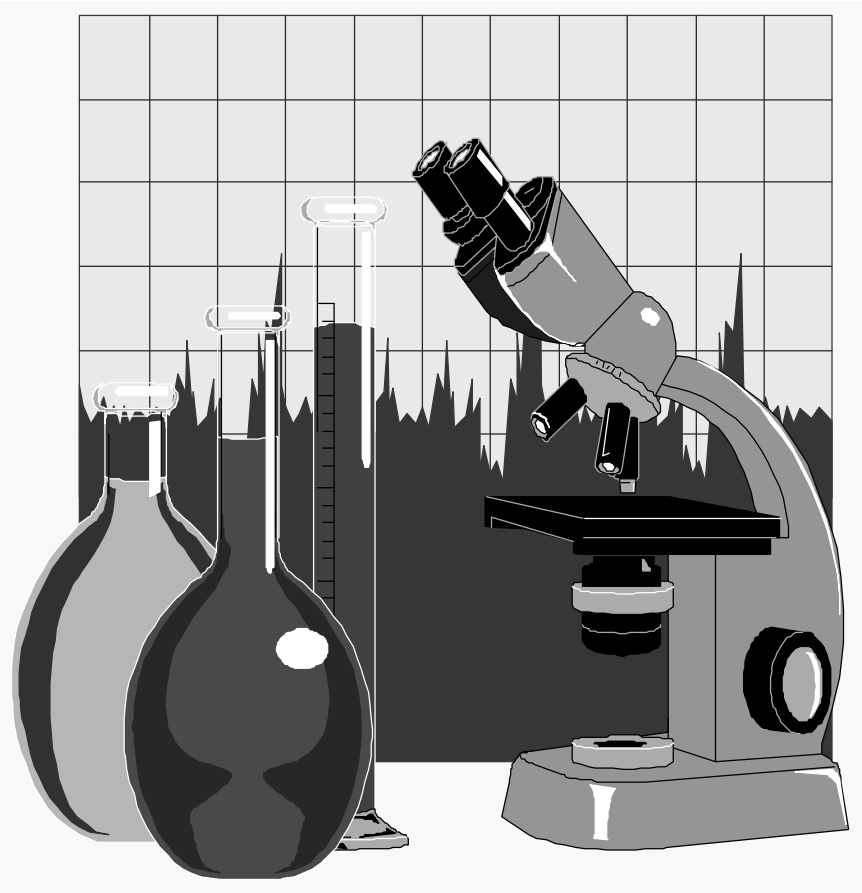
- Asphalt Paving Environmental Council (APEC)
  - National Asphalt Pavement Association
  - Asphalt Institute
  - State Asphalt Pavement Associations

Existing Guide Documents



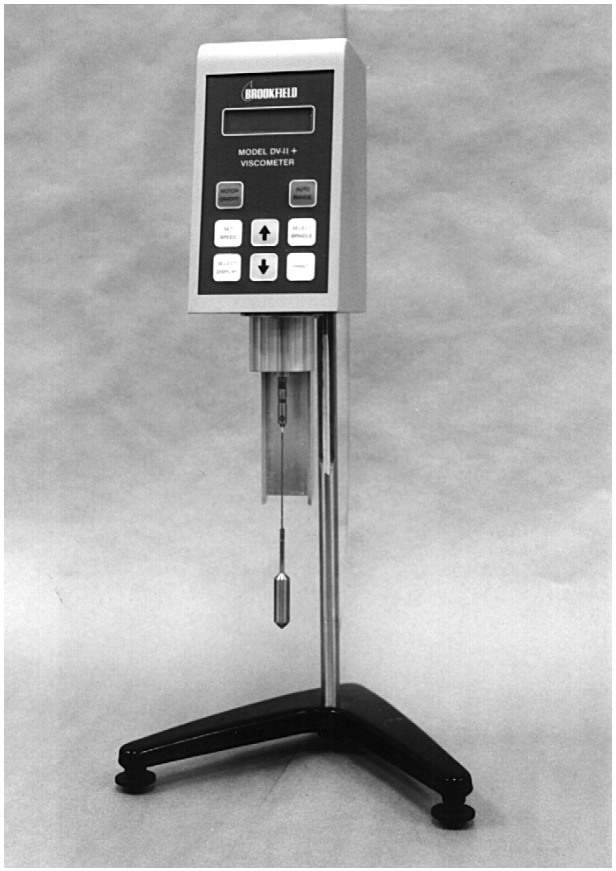
- **Australian APA Environmental Guide**
  - **Specs for PMA**
- **OHMPA Environmental Practices Guide**
  - **Written to help HMA plants be good neighbors and deal with environmental problems**

SUPERPAVE System



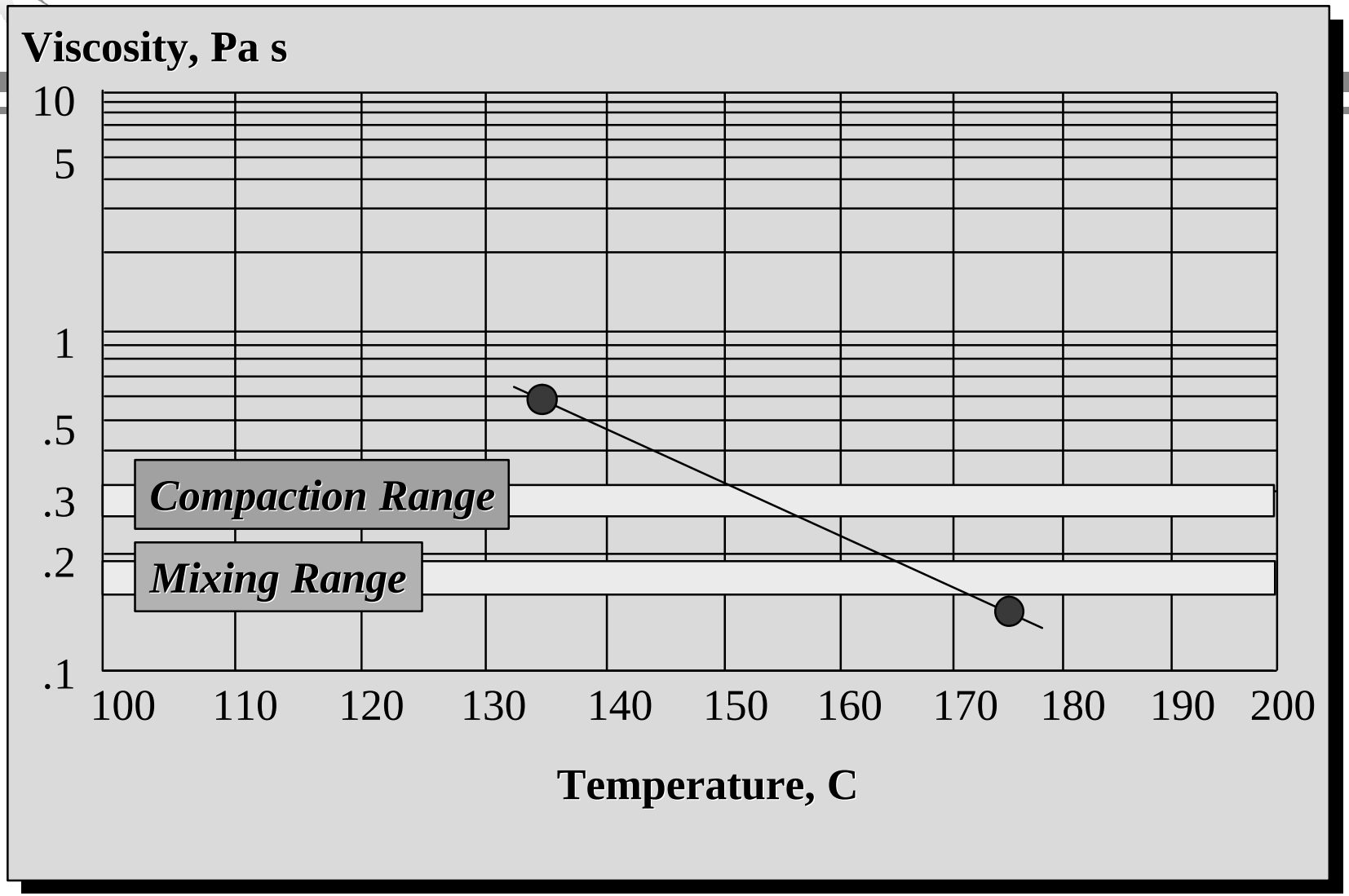
- Performance Graded Asphalts
  - Grades for specific climatic and traffic conditions
  - New grades for both suppliers and users

Laboratory Temperatures



- Rotational Viscometer (Brookfield)
  - Viscosity at 135ºC and 165ºC
  - Viscosity @ 135ºC < 3.0 Pa·s
  - Equi-viscous Lab Mixing and Compaction Temps
- Does not work for PMA - use suppliers' recommendations
- ***Not for field temperatures***

PG Asphalt Temperatures



Laboratory Vs Field Temperatures

- EX: PG 70-22
  - Lab Mix Temp: 333ºF - 343ºF
  - Lab Comp Temp: 311ºF - 320ºF
  - Best Practices Recommendation Field Mix Temperature: 280ºF - 330ºF
  - Field Compaction Temp determined by Test Strip

SUPERPAVE Compaction

- SUPERPAVE coarse mixes may be hard to compact
- Poor density may mean permeability - FL experience
- DOTs are focused on density
- Contractors are focused on density

SUPERPAVE Compaction

- Pavement designers usually have little SUPERPAVE training
- Maximum Size vs Nominal Maximum Size
- Lift thickness less than 3 X NMAS makes density very hard to achieve

SUPERPAVE Compaction

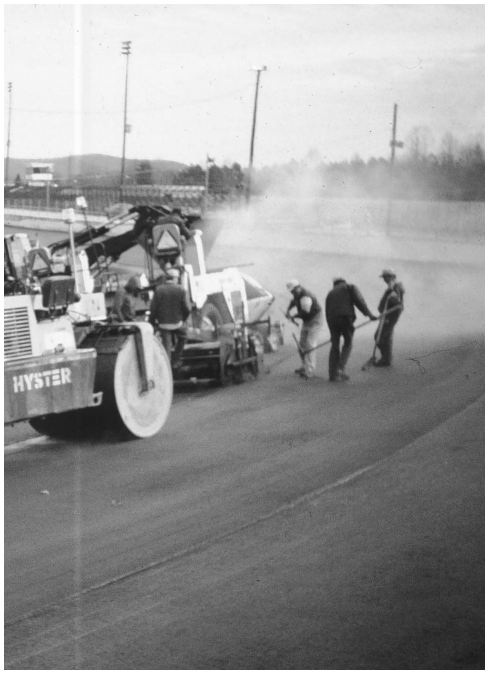
- **Contractors want to extend compaction time - Higher Mix Temperatures should be** LAST RESORT
- **Use more rollers - three or four**
- **Keep front roller close to paver**
- **Watch the Tender Zone**
- **Use an Infrared Device**

What's Wrong With Higher Mix Temperatures?

What's Wrong With Higher Mix Temperatures?

- **Each 10°F Increase in Temperature <u>Doubles the Amount of Fumes</u>**
- **From 310°F to 350°F**
- **2x2x2x2 = <u>16 Times</u> the Fume Amount**

High Mix Temperature Consequences



- Excessive aging during construction
- Excessive fumes
- Tender mix
- Asphalt drain-down - SMA and OGFC mixes

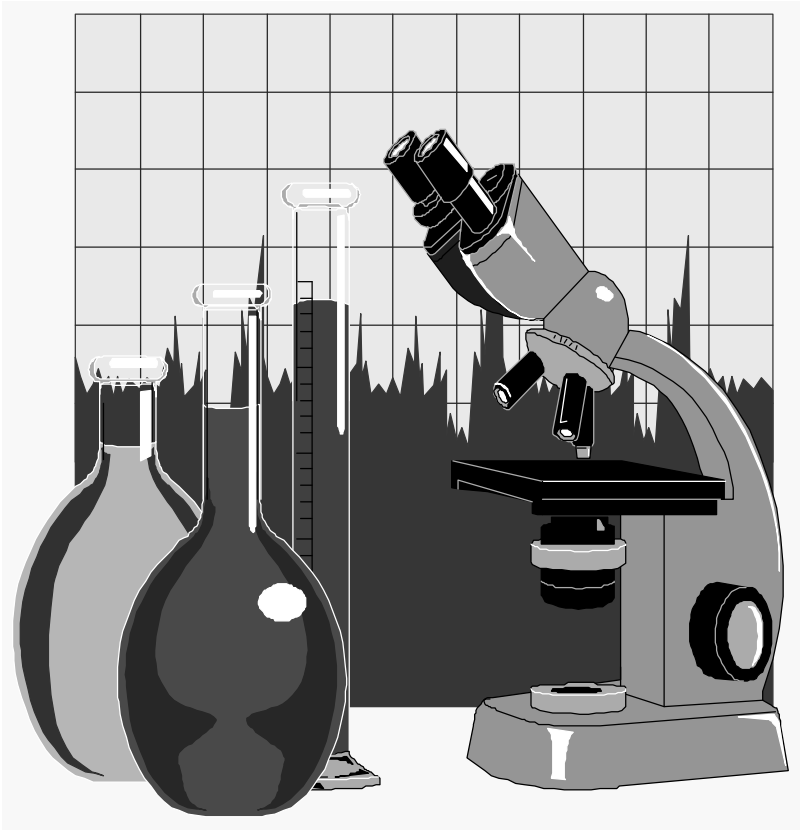
Lab Temperatures as a Starting Point?

- EXAMPLE - PG 70-22
  - Lab Mix Temp: 333ºF - 343ºF
- DOT allowed contractor to select mix temp
  - Target +/- 25ºF
- Contractor selected Job Mix Range: 345ºF - 395ºF
- Temperature Lowered to 315ºF - Improved Density and Ride

Research Efforts are Underway

- NCHRP 9-10 - Bahia Zero Shear Viscosity in Brookfield
- Univ. of Texas - Kennedy Shear Rate of Mix in Gyratory Compactor
- NCAT - Paddle Mixer Torque

Research Efforts are Underway



- **NCAT Smoke Emission Potential (SEP) Test**
  - **Oven gradually increases temperature - measures opacity and mass loss vs. time and temperature**
  - **Possibly may identify safe maximum mixing temperature for a given binder**

Interim Guidelines

- Field Mix Temp Chart
  - Asphalt Institute Survey
  - Listed by Binder Grade
- Select starting point in middle of range
- Test strip - monitor temperatures & density

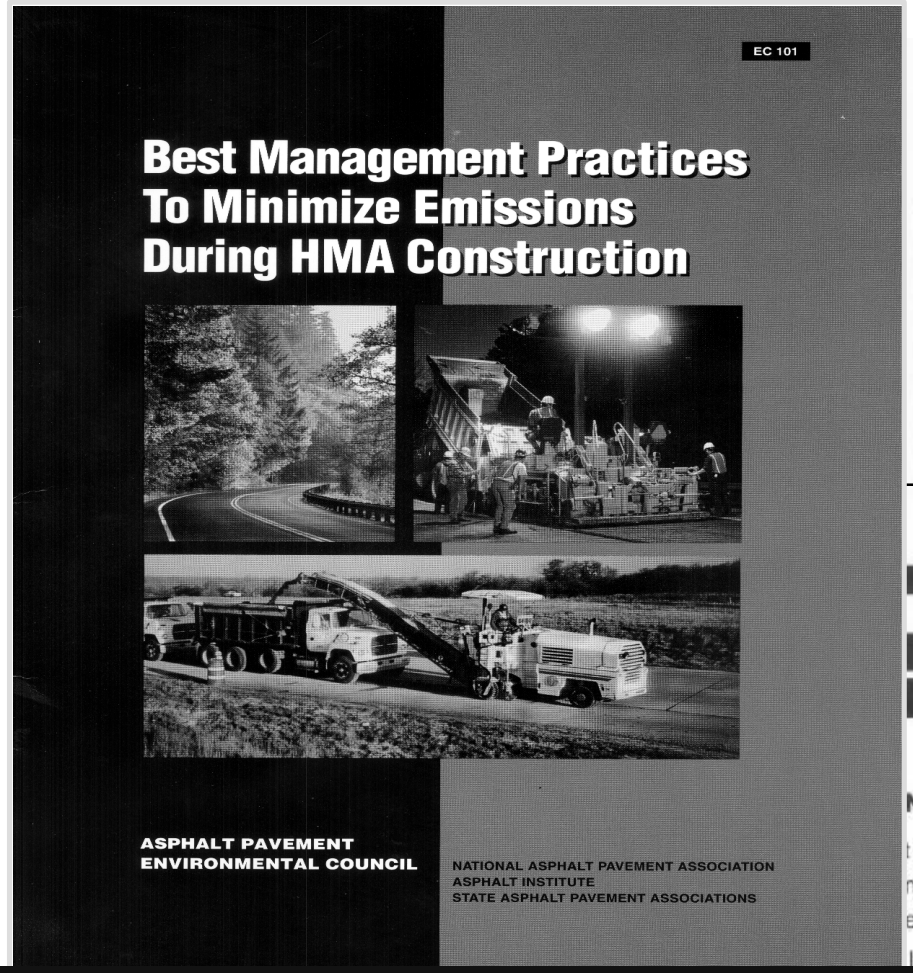
Interim Guidelines (continued)

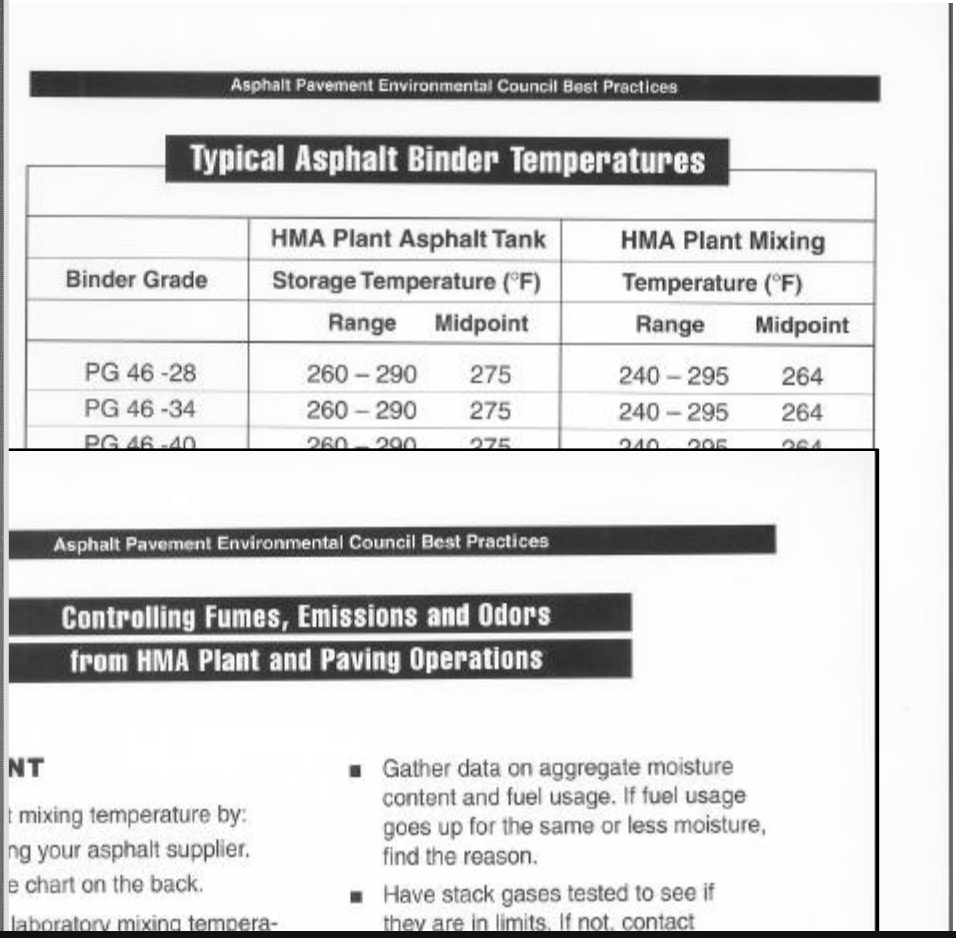
- **Determine lowest laydown temp to get density**
- **Estimate heat loss**
  - **Haul distance**
  - **Ambient temperature**
  - **Wind**
  - **Mat thickness**
  - **PaveCool**
- **Test Strip Temp + Heat Loss = Plant Mix Temp**

Other Items That Contribute to Emissions

- Handling aggregate and RAP
- Anti-strip additives
- Plant and paving equipment
- Plant burner operation
- Weather conditions

Guidance Available





Asphalt Pavement Environmental Council Best Practices

Typical Asphalt Binder Temperatures

Binder Grade	HMA Plant Asphalt Tank Storage Temperature (°F)		HMA Plant Mixing Temperature (°F)	
	Range	Midpoint	Range	Midpoint
PG 46 -28	260 – 290	275	240 – 295	264
PG 46 -34	260 – 290	275	240 – 295	264
PG 46 -40	260 – 290	275	240 – 295	264

Asphalt Pavement Environmental Council Best Practices

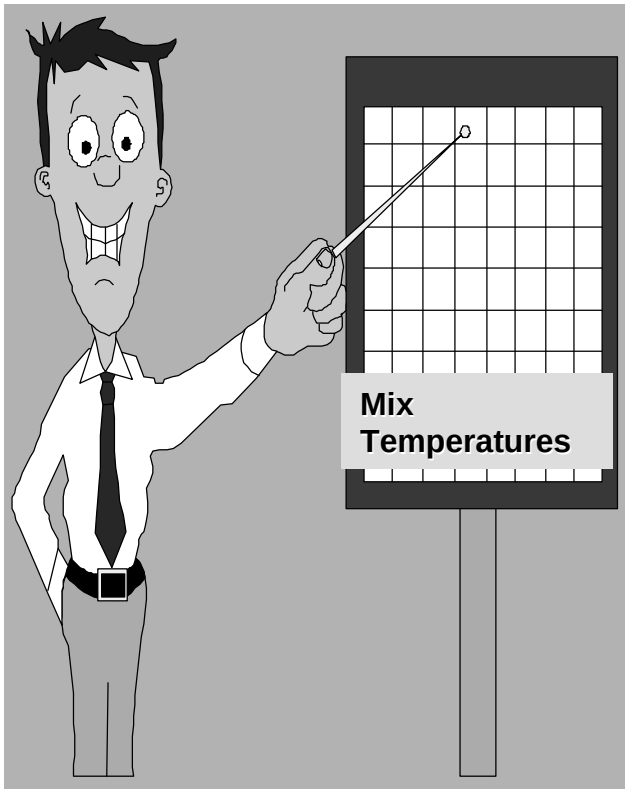
Controlling Fumes, Emissions and Odors from HMA Plant and Paving Operations

NT

mixing temperature by:
ng your asphalt supplier.
e chart on the back.
laboratory mixing tempera-

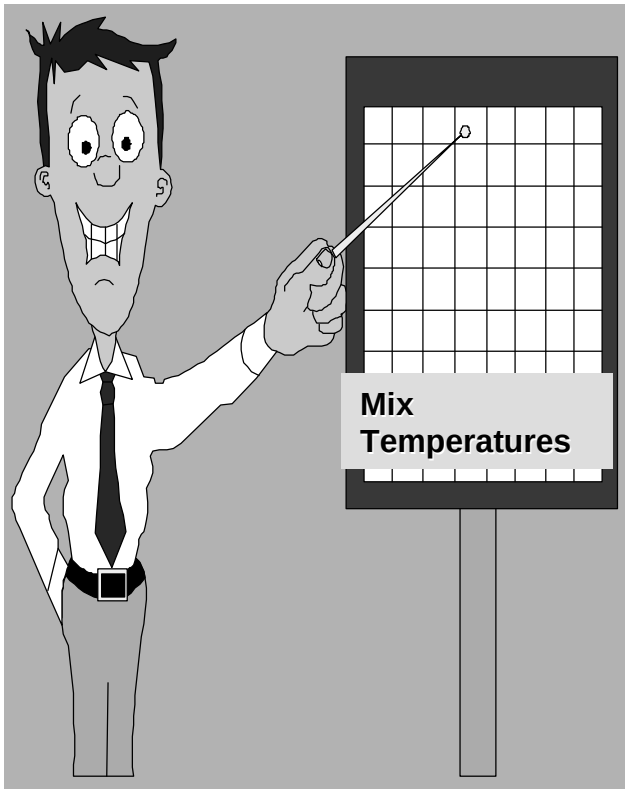
- Gather data on aggregate moisture content and fuel usage. If fuel usage goes up for the same or less moisture, find the reason.
- Have stack gases tested to see if they are in limits. If not, contact

Conclusions

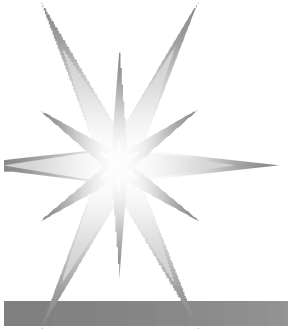


- New PG grades and density concerns lead to high mix temperatures
- Need separate ranges for lab and field
- Use common sense until research provides an answer

Conclusions



- EC 101 available through NAPA & Asphalt Institute
- Contact Al at www.asphaltinstitute.org
- Contact NAPA at www.hotmix.org



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Questions?