Asphalt Quality

Northeast Pavement Preservation Partnership

November 8, 2011

Anyone who has never made a mistake has never tried anything new. – Albert Einstein

Pavement Engineering

- “Pavement engineering is the art of molding materials that we do not wholly understand, into shapes we cannot precisely analyze, so as to withstand forces we cannot assess, in such a way that the community at large has no reason to suspect our ignorance”

  » Dale Decker

Asphalt Binder

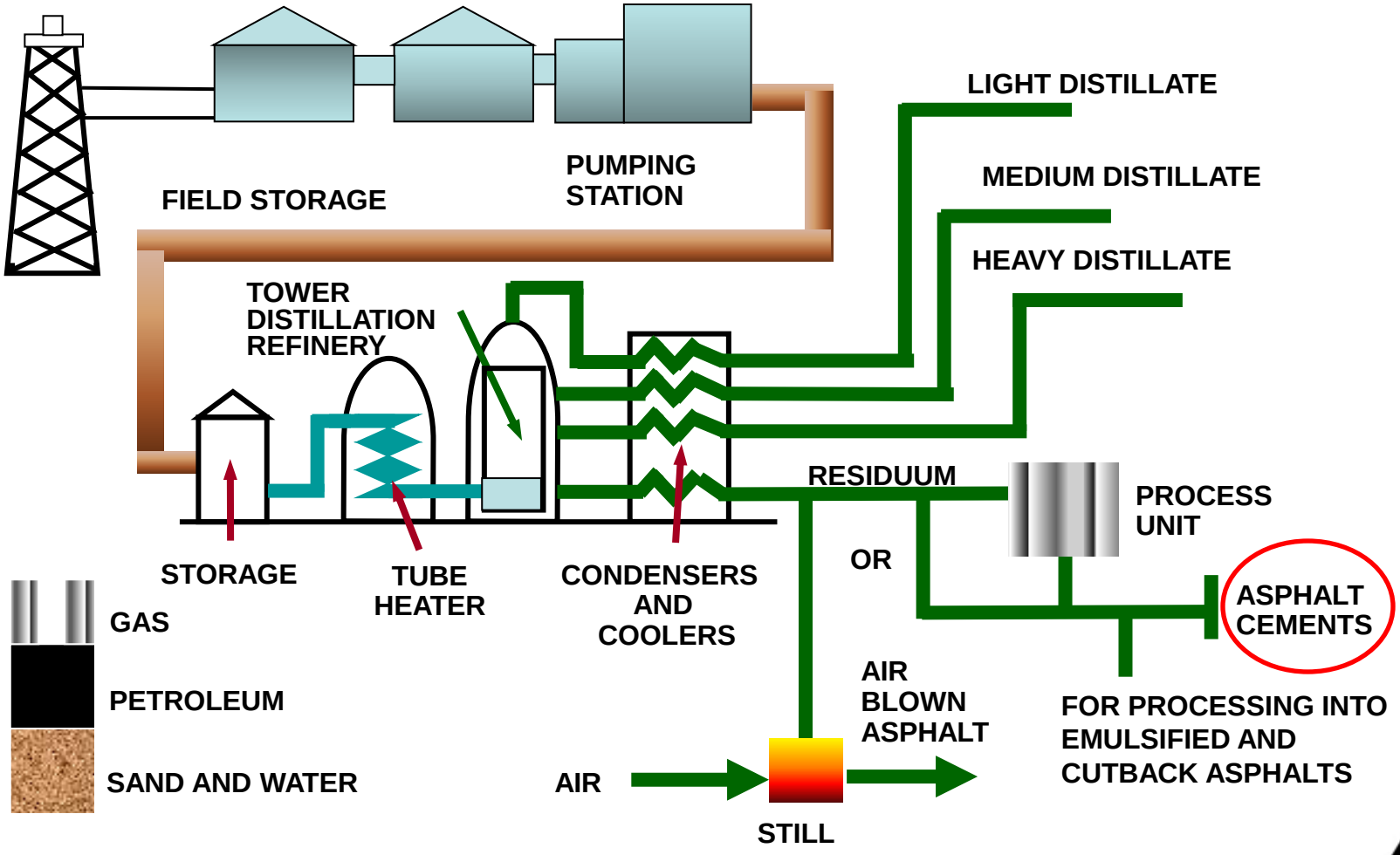
"A dark brown to black cementitious material in which the predominating constituents are bituminous which occur in nature or are obtained in petroleum processing." – ASTM D8

Two Types of Asphalt

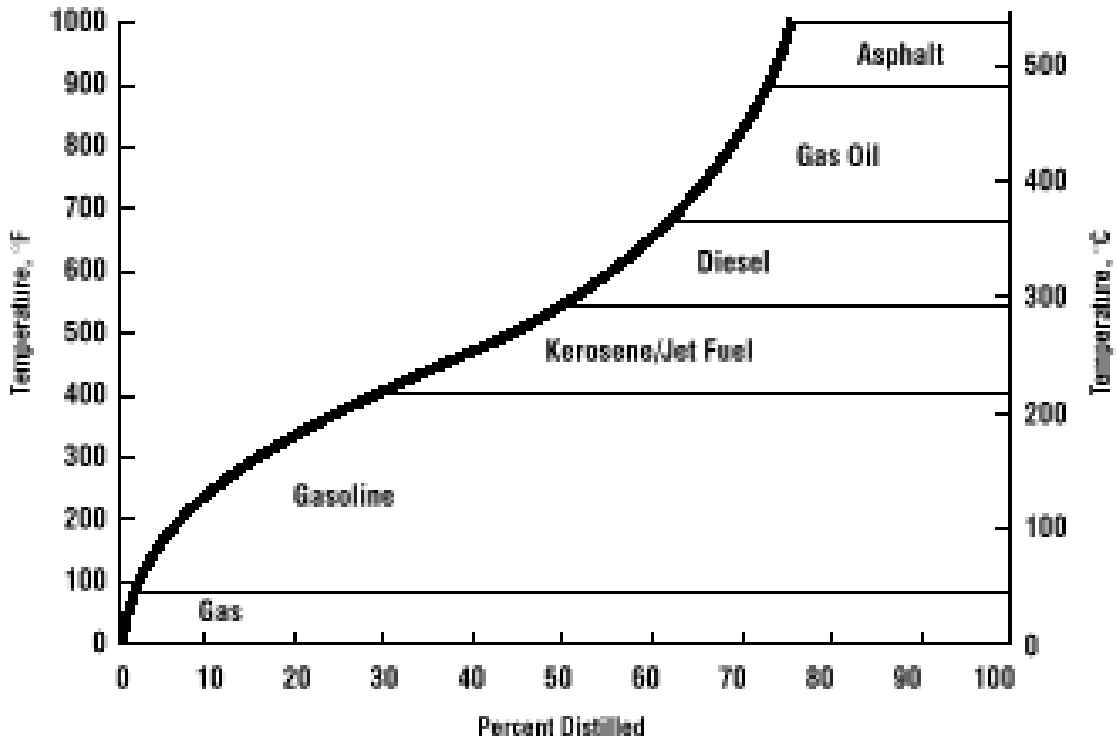
- Natural asphalt deposits
  - Island of Trinidad
  - Bermudez, Venezuela
- Petroleum asphalts
  - A product of the petroleum industry

Petroleum Asphalt

Refinery Operation



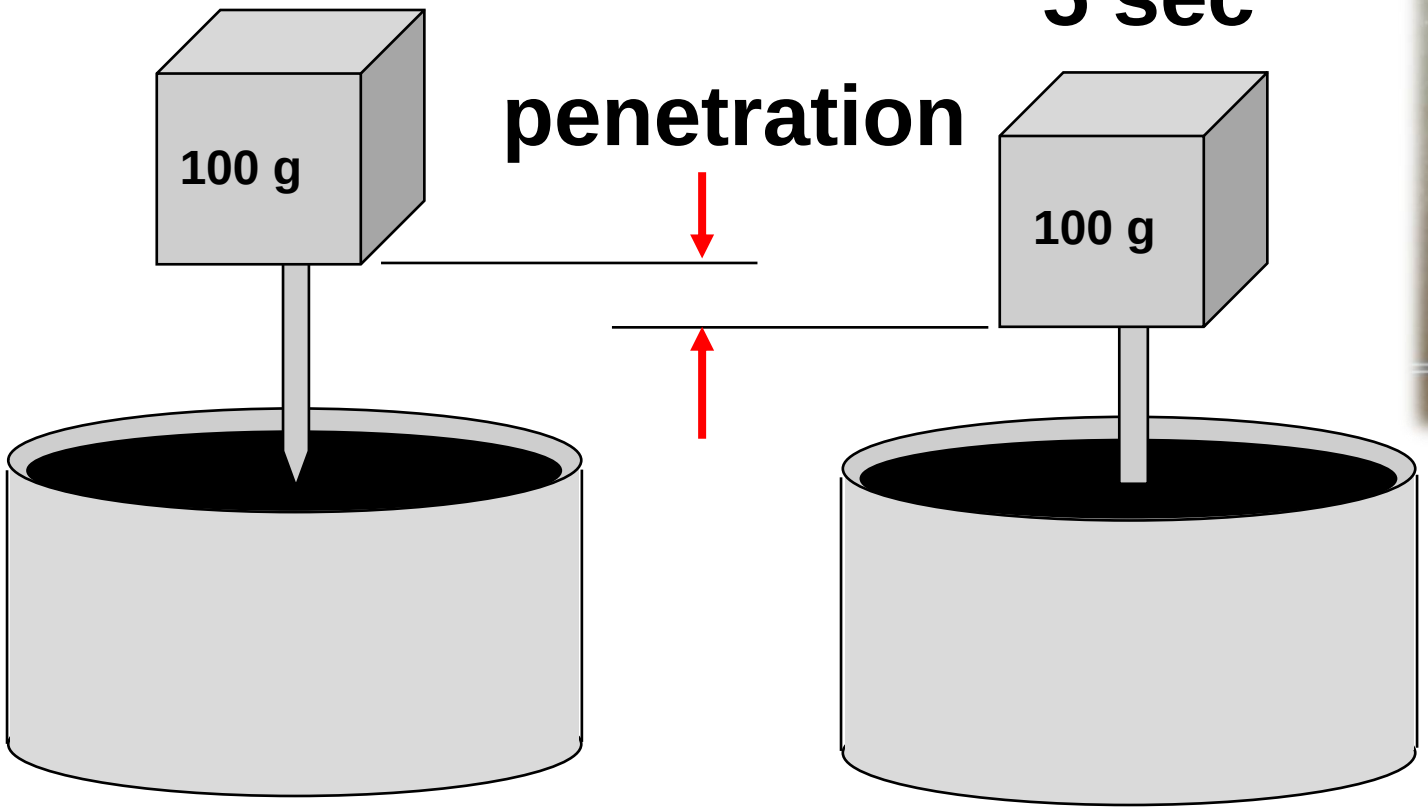
Typical Crude Oil Distillation Temperatures and Products



“The asphalt (tar) just isn’t the same as it used to be”

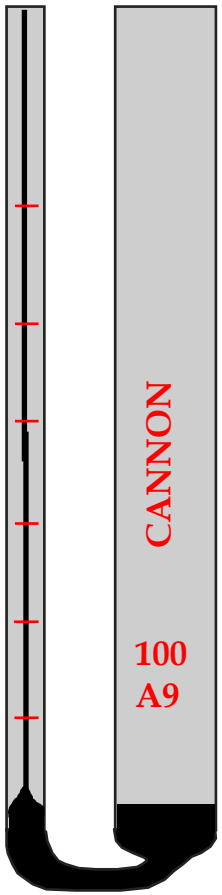
“Refiners are taking out all of the goodies”

Penetration
(1900s)

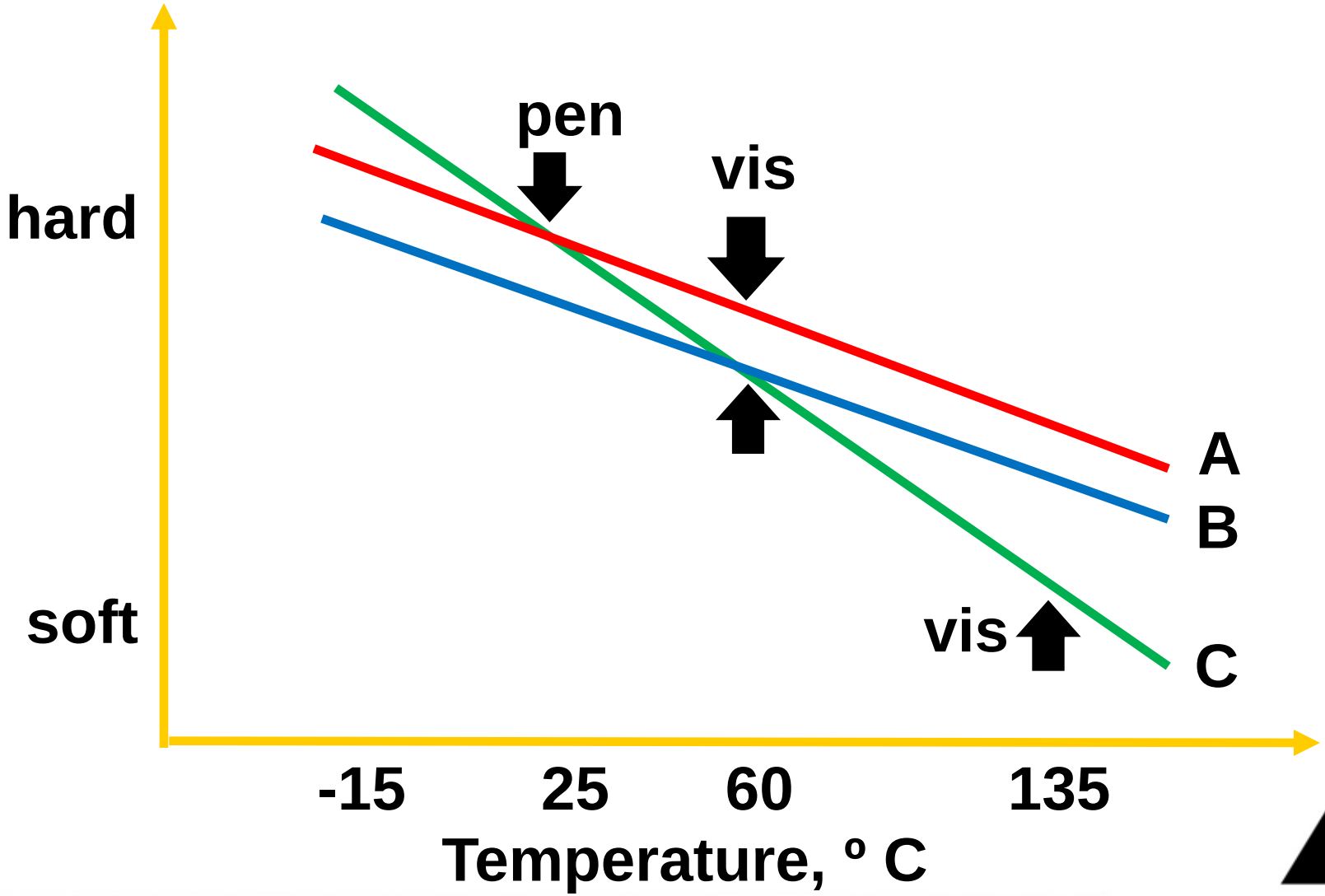


Viscosity
(1950s)

vacuum



Consistency (pen or vis) Historic Specifications



Pre-Superpave Shortcomings

- Viscosity
  - viscous effects only
- Penetration
  - empirical measure of viscous and elastic effects
- No Low Temperature Properties Measured
- Problems with Modified Asphalt Characterization
- Specification Proliferation
- Long Term Aging not Considered

Superpave Asphalt Binder Specification

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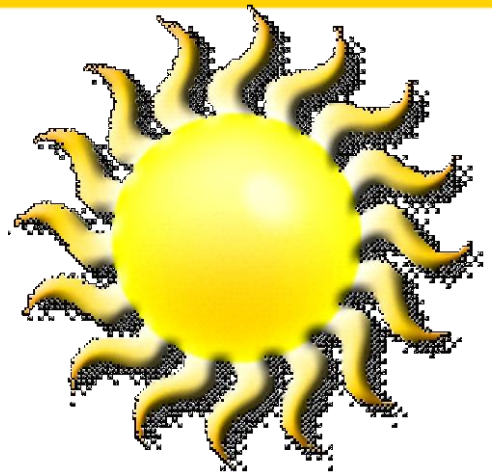
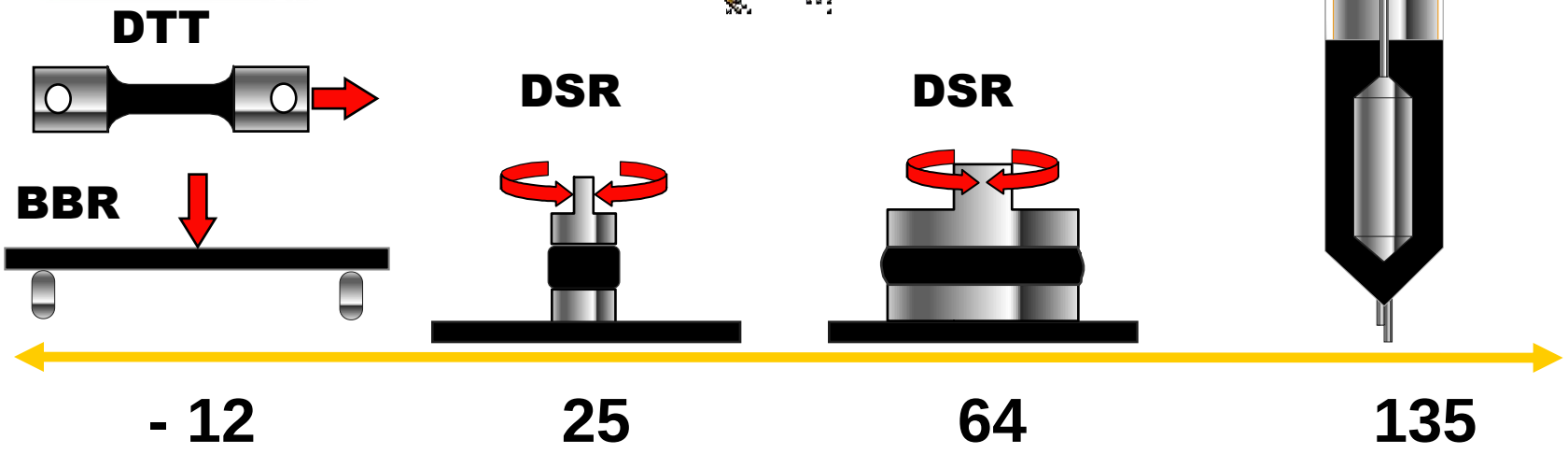
Grading System Based on Climate

PG 64-22

- **Performance Grade**
- **Average 7-day max pavement design temp**
- **Min pavement design temp**

Testing Temperature





Pavement Temperature, °C

Grading improvements

- Provides better binder characterization
- Performance related vs. empirical

What has changed

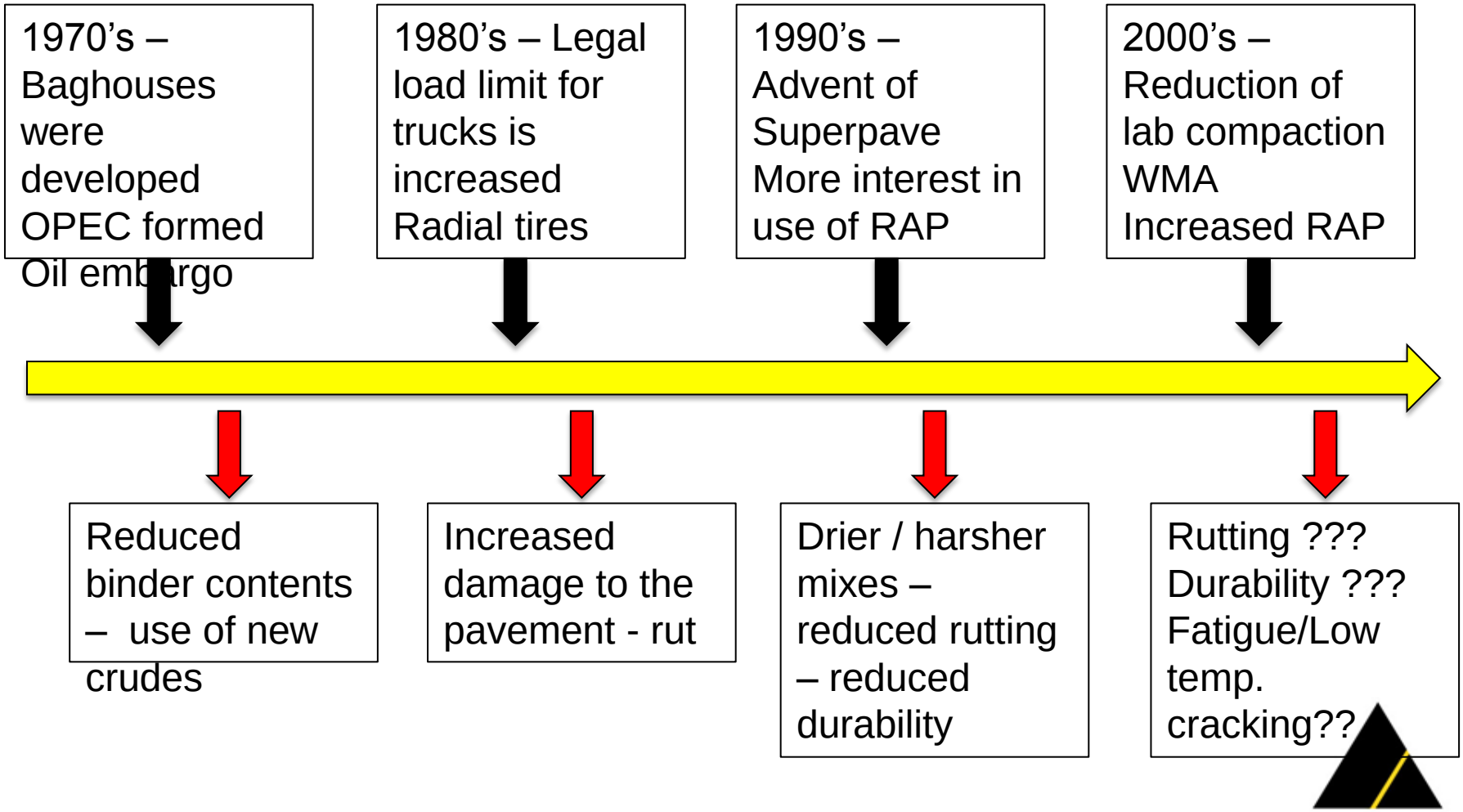
- Higher traffic volumes
- Higher loads
- Thinner lifts
- Superpave
- Bag houses
- Increased use of RAP/RAS

Evolution of Traffic

- Interstate highways - 1956
- AASHO Road Test - 1958-62
  - still widely used for pavement design
  - legal truck load - 73,280 lbs
- Legal load limit to 80,000 lbs - 1982
  - 10% load increase
  - 40-50% greater stress to pavement
- Radial tires, higher contact pressure

The Result?

Timeline


1970's – Baghouses were developed OPEC formed Oil embargo
1980's – Legal load limit for trucks is increased Radial tires
1990's – Advent of Superpave More interest in use of RAP
2000's – Reduction of lab compaction WMA Increased RAP
Reduced binder contents – use of new crudes
Increased damage to the pavement - rut
Drier / harsher mixes – reduced rutting – reduced durability
Rutting ??? Durability ??? Fatigue/Low temp. cracking??

Asphalt Pavement History

We have always had some pavement problems

30-50 years ago

- Marginal Aggregate Sources
- Less demanding public
- Less attention to safety
- Lowest Cost was first priority

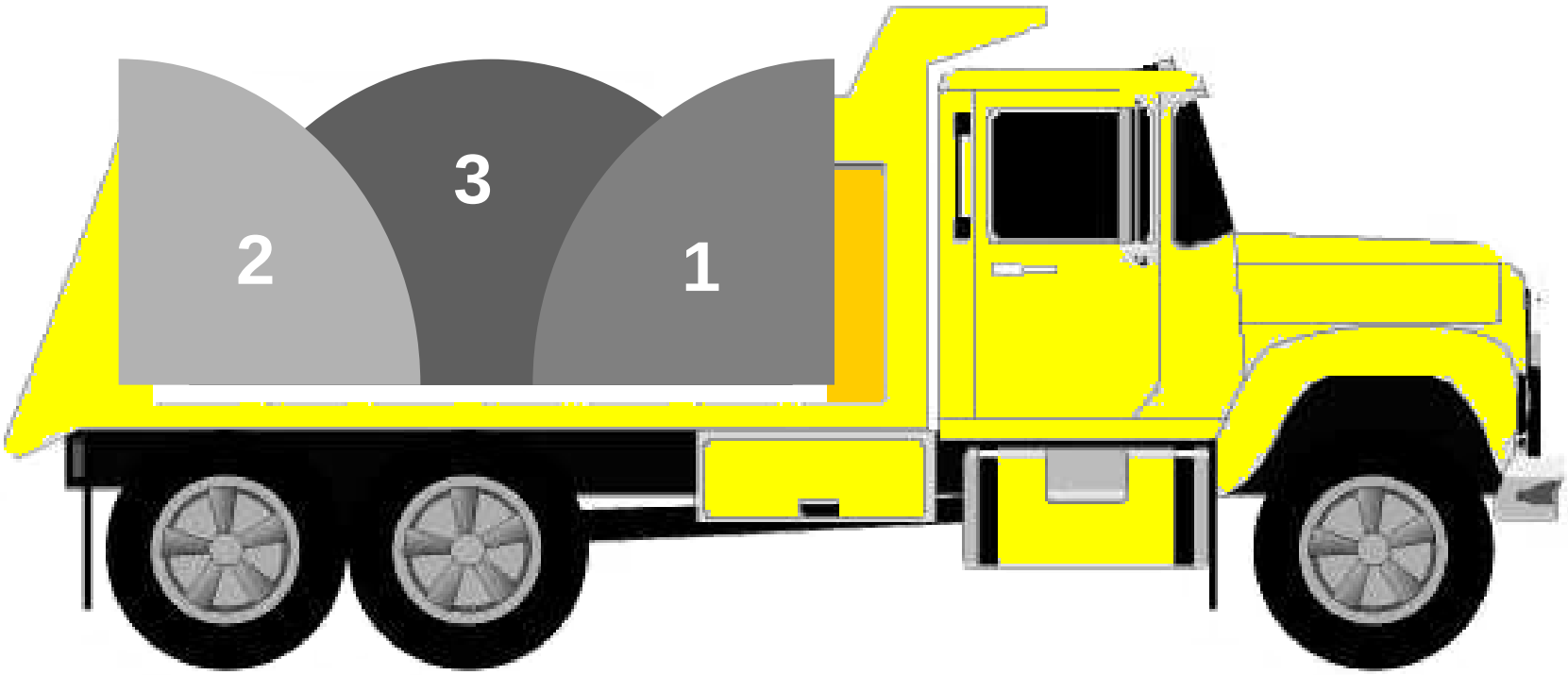
Asphalt Quality

- Asphalt quality = good practices
- Good practices include
  - Quality materials
  - Proper designs/formulations
  - Proper production/hauling
  - Proper laydown/construction techniques

Thin Lift Overlay

- Mix design – use of quality materials
- Stockpile management
- Mix production
  - JMF
  - Temperature
- Truck loading

Horizontal Stockpiling with Separated Aggregate Piles


2
3
1

End of load segragation

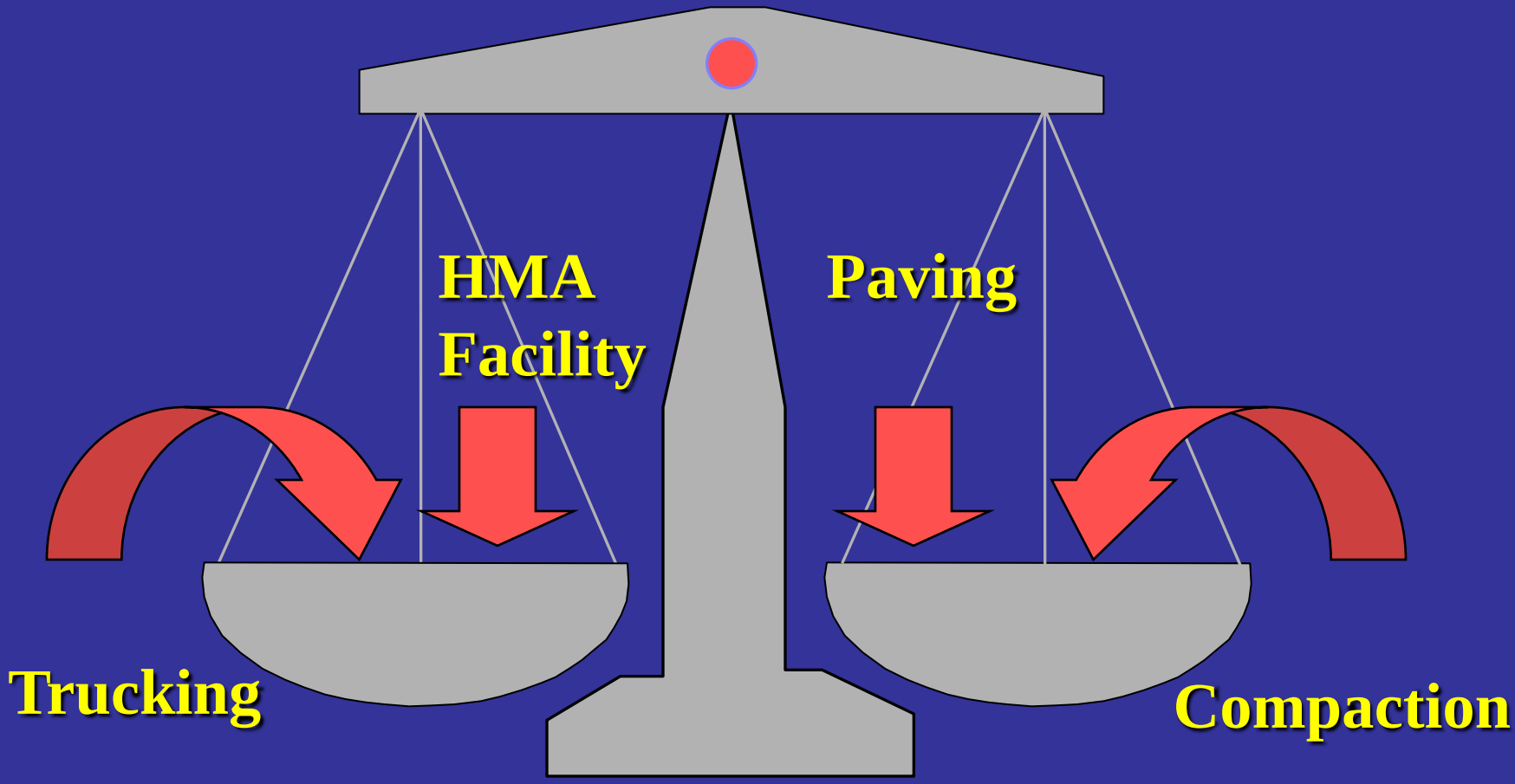
Thin Lift Overlay

- Proper surface preparation
  - Clean and free of loose debris
  - Cracks filled
- Proper application of tack
  - Uniform application
  - Proper rate of application
  - Break

Thin Lift Overlay

- Good paving practices
  - Don’t bump the paver
  - Balance paver speed with production/trucking/compaction capabilities
  - Keep the paver moving – avoid frequent stopping and starting
  - Constant speed
- Proper compaction techniques

Balancing Production




HYPAC
HAMM


STOP


HYPAC
HAMM


STOP


CATERPILLAR

Other PP applications

- Micro/slurry
  - Quality materials/good mix design
  - Choosing the right roads/time of year
  - Proper techniques
  - Proper surface preparation
- Chip seals
  - The same is true

Past and present

1956

2011

Past and present

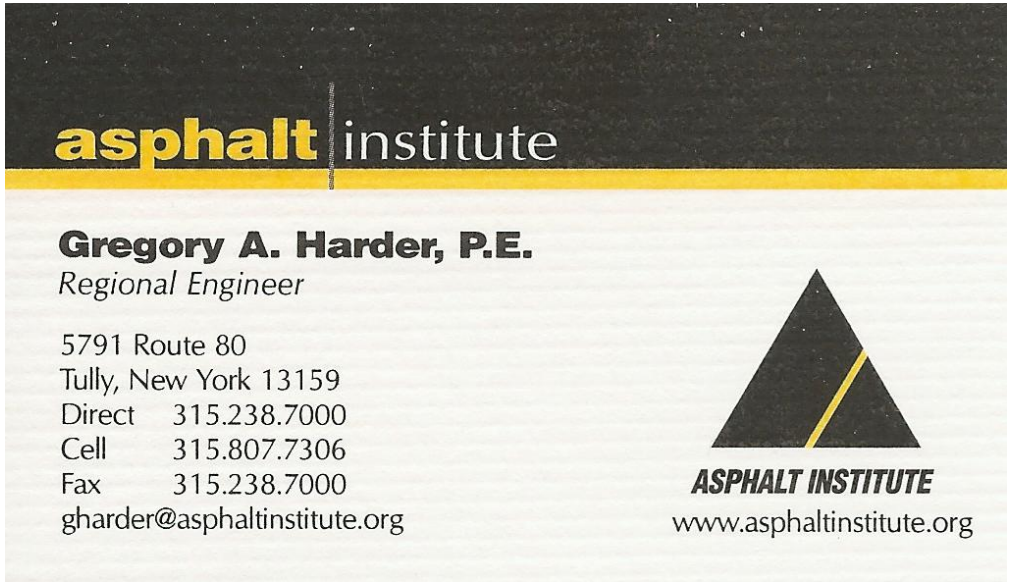
1970

2011

Conclusion

With the demands placed on our roadways today it has never been more important to specify and use good quality materials, applied using proper techniques, during the right time of year and on the right project. All of this adds up to improved asphalt quality.

Questions?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