# CHIP SEALS: ART, SCIENCE OR JUST PLAIN LUCK?

## PURDUE ROAD SCHOOL

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PURDUE UNIVERSITY
WEST LAFAYETTE, INDIANA

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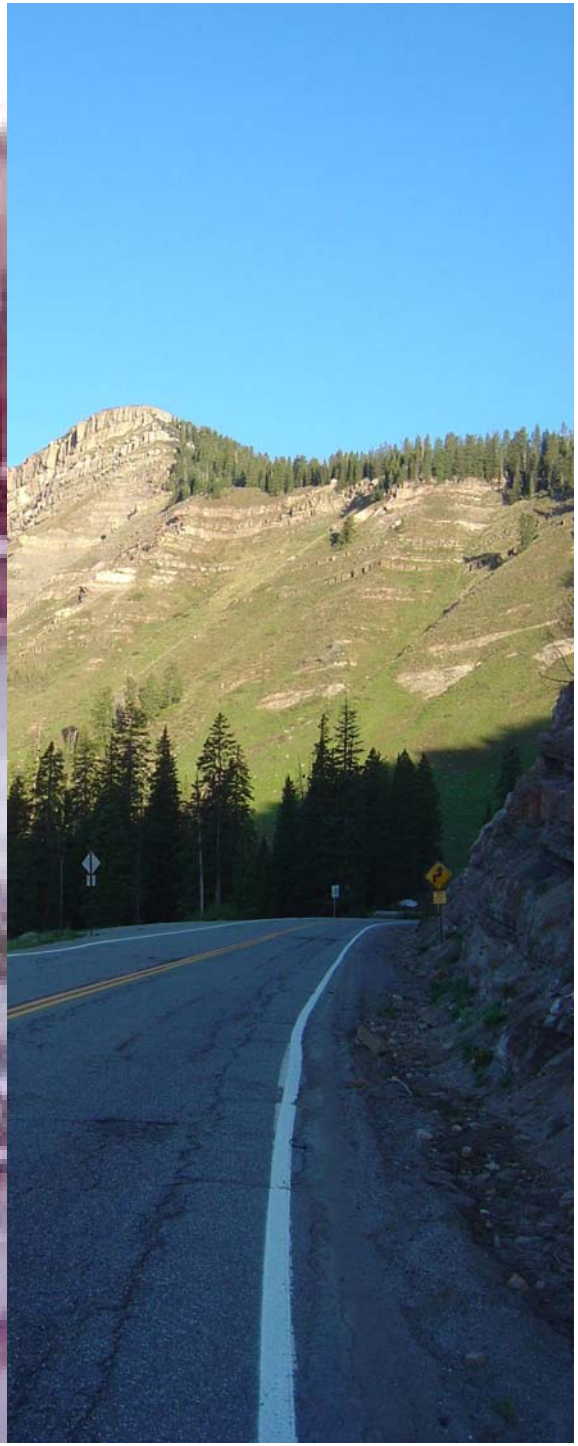


# WHAT ARE CHIP SEALS?


HIGHWAY PATROL

# Who, What, When, Where, Why?

- Who?
  - Owner Crews
    - Advantages
      - Patience, Care, Ownership, Experience
    - Disadvantages
      - Experience
  - Contractors
    - Advantages
      - Depends on Contract and Contractor
      - Experience
    - Disadvantages
      - Depends on Contract

# Who, What, When, Where, Why?

- What, When, Where?
  - What?
    - Asphalt Pavements
      - Surface Treatments
      - HMA
    - Unsurfaced
      - Earth
      - Aggregate
  - When?
    - Before It's Too Late
      - Distress Should be Low to Moderate
  - Where?
    - Anywhere
      - Traffic
      - Climate

# Who, What, When, Where, Why?

- Why?
  - Waterproof Surface
  - Improve Friction

# Design

- Aggregate
  - Properties
  - Spread Rate
- Emulsion
  - Properties
  - Spray Rate

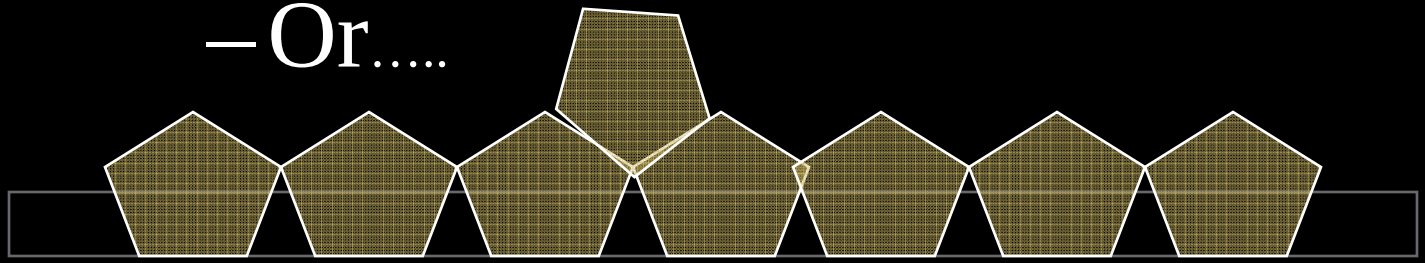
# Aggregate

- Properties
  - Crushed
    - 2 Mechanically Fractured Faces
  - Hard

Like THIS Right?

# Aggregate

- Spread Rate
  - One Stone Thick
    - Or…..



# Designing it One Stone Thick

- Basically, Two Design Methods
  - Hanson/McLeod/AusRoads
    - ALD, Flakiness Index, Unit Weight, SG
  - Kearby/Gallaway/Epps
    - Board Test, Unit Weight, SG

# Emulsion

- Properties
  - Thick Enough, but Not Too Thick
  - Fast Setting, but Not Too Fast
  - Sticky
- Spray Rate
  - Embed Chips about 30-70% Initially
  - Traffic Embeds to 50-90%

# Emulsion

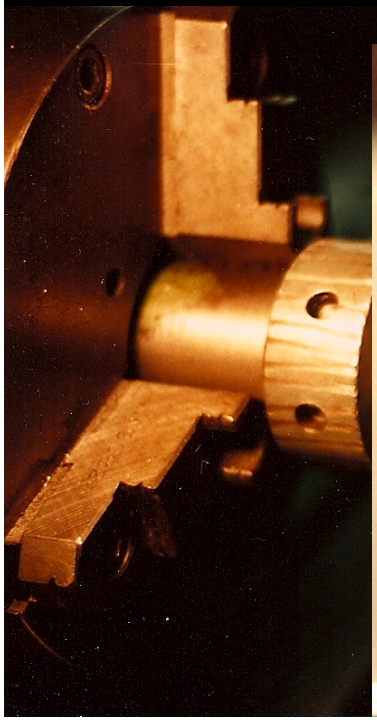
- Estimating Spray Rate (Modified Kearby)
  - A = %embedment x avg mat depth x {1- (W/62.4G)} x T + V
  - Where
    - A = Asphalt, gsy
    - W = Loose Unit Weight of Aggregate, pcf
    - G = Bulk Specific Gravity of Aggregate
    - T = Traffic Correction
    - V = Surface Condition Correction

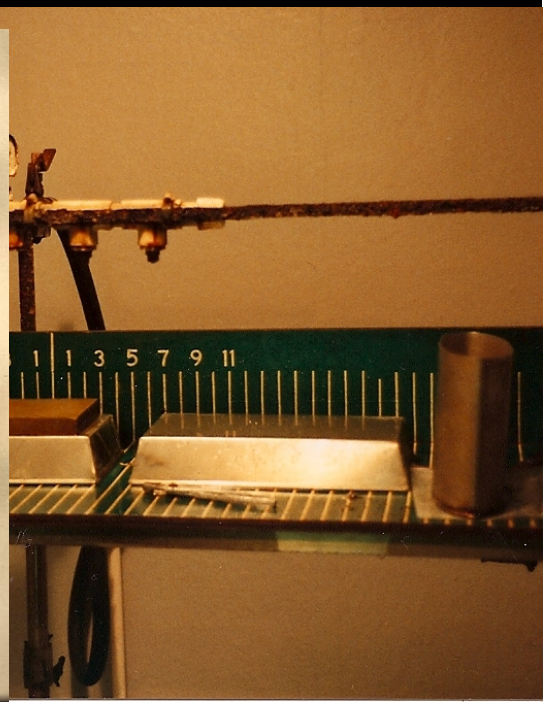
# Construction

- Equipment
- Conditions
- Emulsion Application
- Aggregate Application
- Rolling
- Sweeping
- Traffic Control

# Equipment

- Distributor Spraybar
  - Nozzles
    - Calibrated Equal Flow





- Rollers
  - Rubber
    - 3 mpl
      - Arou
    - Equal
    - Equal Tire Pressure
      - 40-90 psi
  - Enough for 1 Coverage Before ‘Gelling’

# Equipment

- Rollers
  - Steel-Wheel ??????
    - Why?
      - Smoothes Surface
      - ‘Locks’ chips
      - 3 – 6 t, max.
    - Why Not ?
      - Crushing
      - Non-uniform surfaces

# Equipment

- Brooms
  - Why?
    - Remove 10% Extra for Pickup
  - What?
    - Push, Sweep/Pi
      - EASY Pressure
      - Nylon
        - Wears Out Fa
  - Timing
    - After Final Em
    - When Cooler
    - Before Traffic

# Ideal Conditions

- Dry
  - No rain threatening
  - Pavement Dry
- Low Wind
  - <10 mph
- Temperate
  - 50F Air, min
  - 70F Surface, min
    - However, lower possible if sunny and warm later

- Start and Stop on Paper
- Rate = +/- 5% of Design to Start
  - Check after 1st Distributor

# cation


- Adjust u
  Rubber

# Traffic C

- Pilot Cars
  - 15-25 mph depending on traffic volume

# Current Research

- Quantify Judgement Items, ie 'Art'
  - Time to Broom/Traffic
    - Modified Sweep Test (ASTM D7000)
  - Compatibility of Emulsion and Chips
    - Modified Sweep Test
  - Surface Texture
    - Sand Patch
    - CT Scan
  - Field Consistency
    - Portable Viscosity
  - Specifications
    - Emulsions
    - Residues
      - New Recovery Test

# Questions ?