We will cover:

- Asphalt Rubber Hot Mix
- RAP = Reclaimed Asphalt Pavement
- RAS = Recycled Asphalt Shingles
- WMA = Warm Mix Asphalt
Definitions

- **HMA** = Hot Mix Asphalt
- **ARHM (RAC)** = Asphalt Rubber Hot Mix / Rubberized Asphalt Concrete
- **RAP** = Reclaimed Asphalt Pavement
- **Virgin aggregate** = New Aggregates
- **RAS** = Recycled Asphalt Shingles
- **Virgin Binder** = New Binder
Asphalt Rubber Hot Mix
Ground Tire Rubber is blended with hot liquid asphalt and sent to a reaction vessel before it is mixed with aggregates and sand.
The “Rubber Plant”
Why Asphalt Rubber?

- **Rubber is “Green”**
  - Every ton of Asphalt rubber uses 3 tires.
  - A typical 2” overlay uses approx. 2000 tires per lane mile

- **Resistance to cracking**
  - Resists thermal and reflective cracking
  - Used extensively for maintenance paving
Why Asphalt Rubber?

- Sound Reduction
  - Lowest decibels across the board

- Safety
  - Excellent skid resistance
  - Gap graded mix mitigates rain hazards
Why Asphalt Rubber?

- Quality
  - Higher binder content
  - Greater Durability
  - Better Aging Properties
  - Handles temp changes better than conventional

- Cost Effective
  - Overlay vs. reconstruct
  - Longevity
RAP
Recycled Asphalt Pavements
Recycling Rates by Category

- 64% Scrap Steel
- 60% Aluminum Cans
- 56% Newspapers
- 37% Plastic Soft Drink Bottles
- 31% Glass Beverage Containers
- 23% Magazines
- 90% Asphalt Pavement
RAP Statistics

- The #1 most recycled material*
  - 66.7 million tons of RAP used in 2011
    - 19 million barrels (3.3M tons) of virgin asphalt conserved
    - 63.4 million tons of virgin aggregate conserved
  - Caltrans allows up to 25% RAP in mix

RAP is brought to the Asphalt Plant location, crushed and screened, tested, and added to Hot Mix.
Why RAP?

- Landfill Diversion
- Reduces Cost to Agencies
  - Competitive Bids
- Reduces consumption of natural resources
  - Aggregate
  - Oil
- Reduces energy consumption
  - Hauling virgin aggregates
  - Aggregate production
RAS
Recycled Asphalt Shingles
RAS Statistics

- 1.2 Million tons of RAS used in 2011*
  - 2.2 million barrels (380K tons) of virgin asphalt conserved
- Caltrans is working on a specification to allow RAS in hot mix asphalt

RAS is generated from manufacturers’ waste or post-consumer shingles, crushed and screened, tested, and added to Hot Mix.
Warm Mix Asphalt
What is WMA?

- **Warm Mix Asphalt**
  - Like HMA, but Cooler
    - Typically 212-250°F vs 250-320°F
  - Many WMA Technologies
  - Produced with minor plant modifications
  - Placed with Conventional Equipment
  - Many Benefits over HMA
WMA Environmental Benefits

- Reduces Fuel Consumption Avg. 20% (NAPA)
- RAP (Reclaimed Asphalt Pavement) Friendly
- Reduces Odors at Plant and Paving Site
- Reduces Temperatures at Paving Site
- Reduces Greenhouse Gas Avg. 10% (NAPA)
- Reduces Plant Emissions
WMA Paving Benefits

- Equal or Better Compactability
- Longer Haul Potential
- Cooler Weather Paving Potential
Reduced Emissions

Astec Double Barrel Green

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<tr>
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<th>HMA</th>
<th>WMA</th>
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<tr>
<td>Temp</td>
<td>320°F</td>
<td>270°F</td>
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Temp = 320°F
Temp = 270°F
WMA Statistics

- 69 Million tons of WMA produced in 2011*
- Caltrans working on WMA implementation
  - Improved Performance (in place air voids)
  - Sustainability
  - Governors Climate Action Plan

Granite Pleasanton Plant, CA

½ Dense Graded

Plant Temp: 270 F. (Astec Double Barrel)

Job Temp/Breakdown Rolling: 230 F.

Intermediate Rolling: 175 F.

Final Rolling: 160 F.

Average Density: 93% RICE
Questions?