

Binder Aging Methods

Presented by

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1.3. 1

Binder Aging

- **Purpose**
 - simulation various stages of aging
 - transport, storage, & handling (**fresh**)
 - construction (**short term**)
 - pavement (**long term**)
- **Output**
 - aged specimen for testing (**DSR, BBR**, etc)

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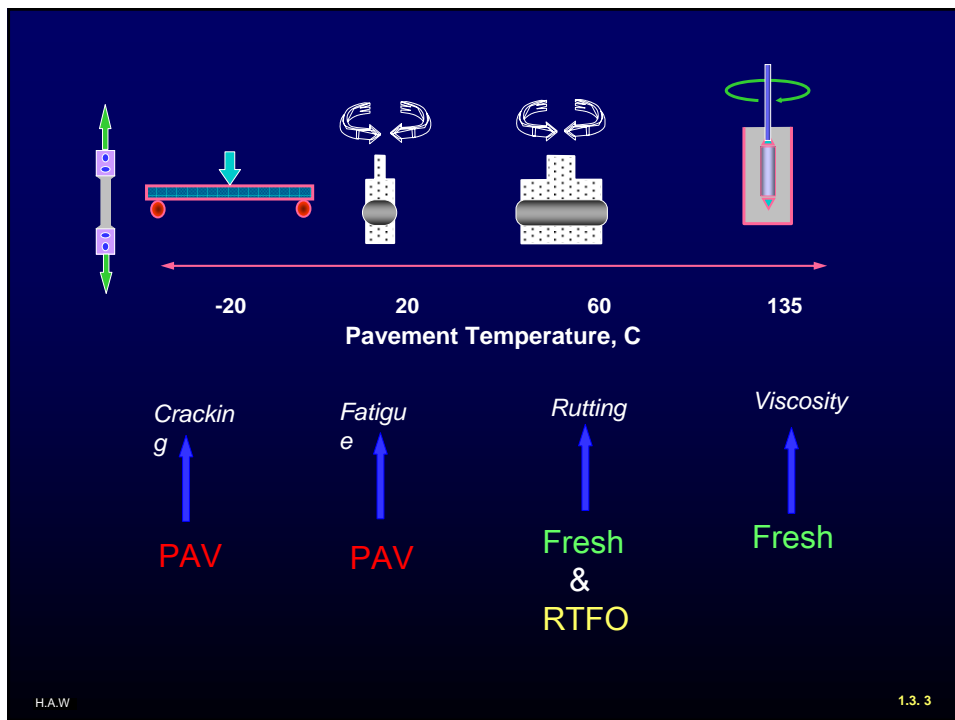
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Binder Aging Methods

- **Rolling Thin Film Oven (RTFO)**
 - simulation construction aging
- **Pressure Aging Vessel (PAV)**
 - simulation long term pavement aging

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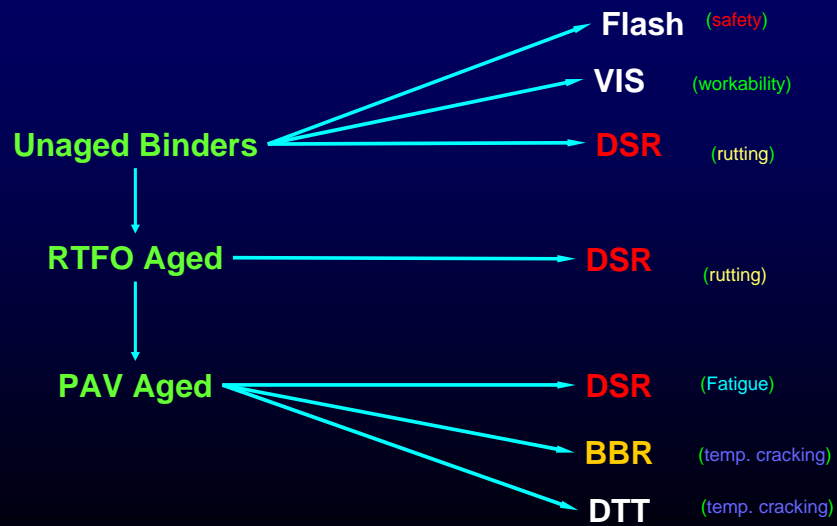
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Binder Aging Test Sequence

Binder Condition

Test



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Short Term Ageing Test Equipment - RTFO

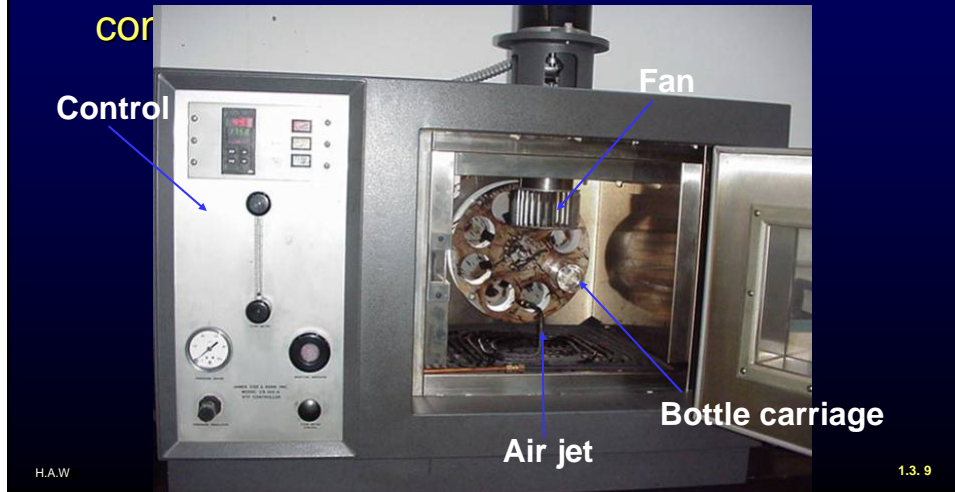
- Convection Oven
- Circular Carriage
- Air Jet
- Fan

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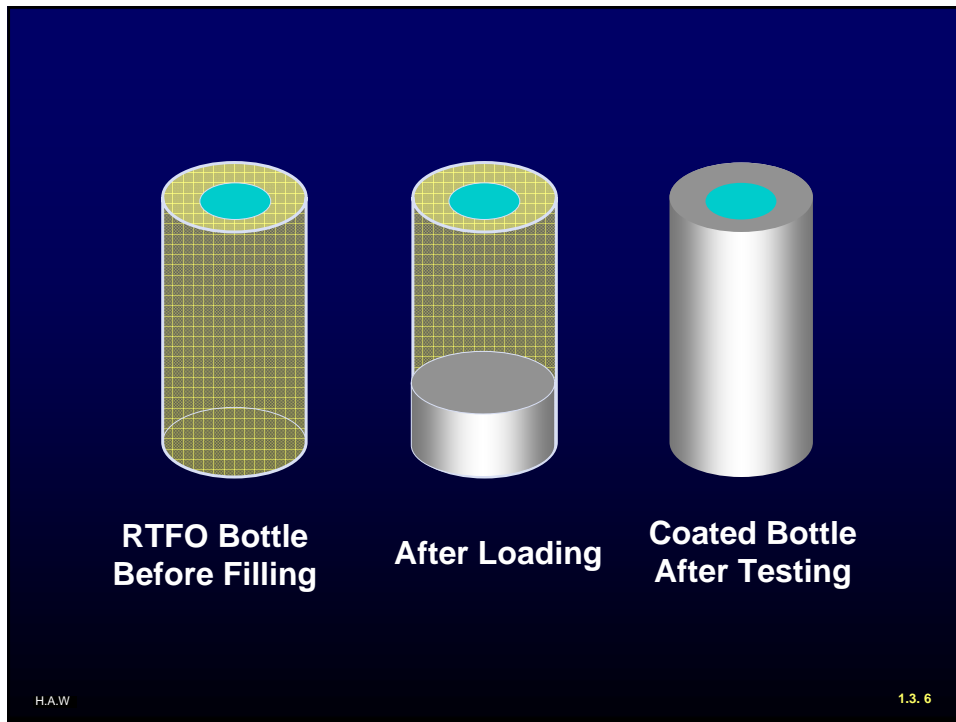
Short Term Binder Aging

- Rolling Thin Film Oven
 - ◆ Simulates aging from hot mixing and cooling



Specimen Preparation - (RTFO)

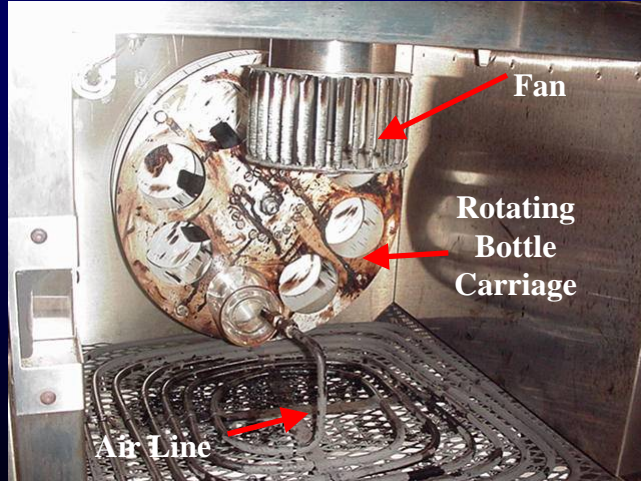
- **Load Bottles with 35 g**
- **2 Bottles for Mass Loss**
 - weigh bottles to 0.001 g



Overview of Procedure - RTFO

- **Preheat Oven**
 - 163 C
 - 16 hrs
- **Load Bottles**
- **Condition for 85 minutes**
 - carriage @ 15 rpm
 - air flow at 4000 ml/min
- **Approx 25g Yield Each Bottle**
- **Combine Material Into Single Container**
- **Scrapping Allowed**

Inside of RTFO



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Bottles Before and After Testing



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Data Analysis and Presentation

- Calculate Mass Loss after RTFO

$$\text{Mass Loss (\%)} = \frac{\text{Original Mass} - \text{Aged Mass}}{\text{Original Mass}} \times 100\%$$

Calibration and Standardization (RTFO)

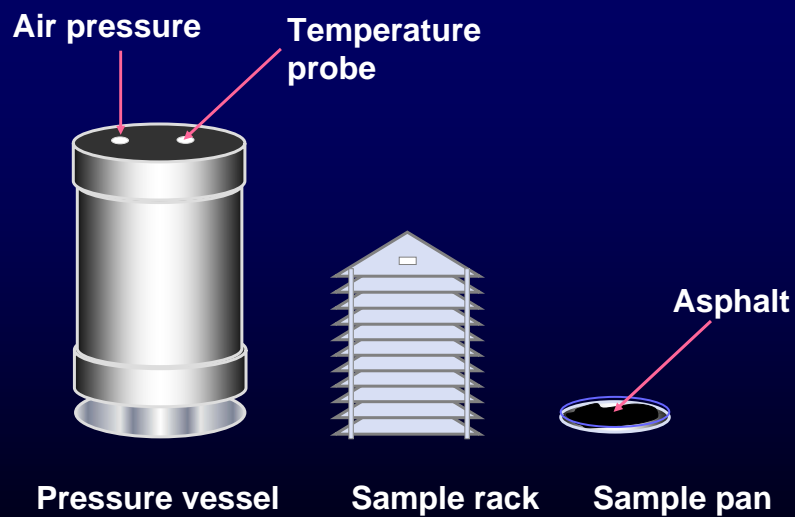
- **Temperature Detector**
 - calibrated thermometer
- **Air Flow**
 - flow meter
- **Carriage Speed**
 - stopwatch

Long Term Ageing Test Equipment - PAV

- Temperature Chamber
- Pressure Vessel
- Instrumentation
 - Regulated air pressure
 - Temperature recorder

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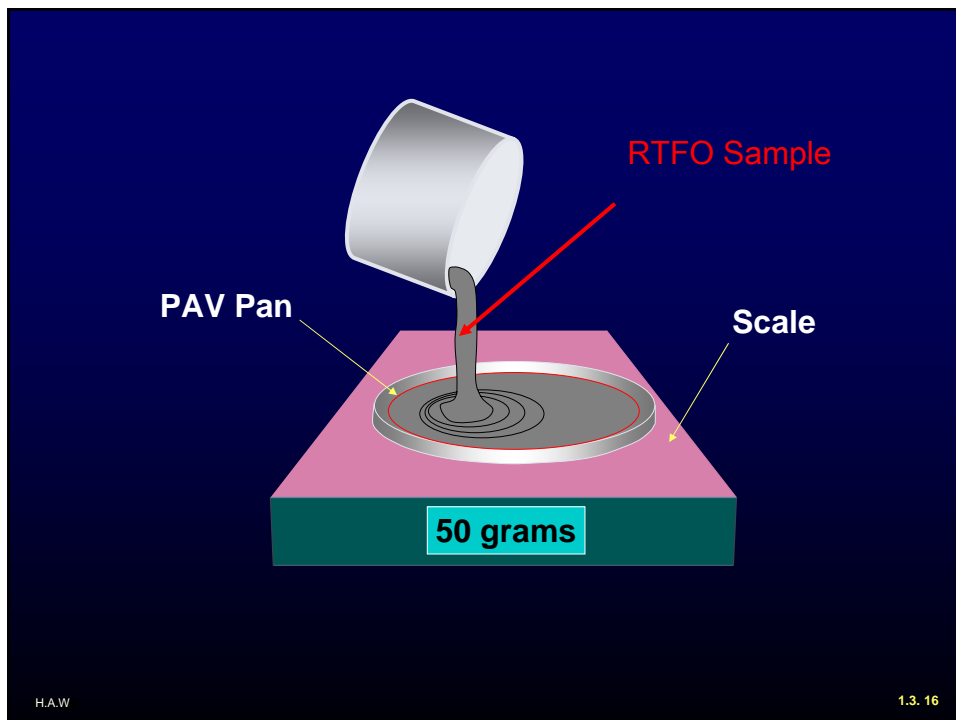
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Specimen Preparation - PAV

- Load Pans with 50g

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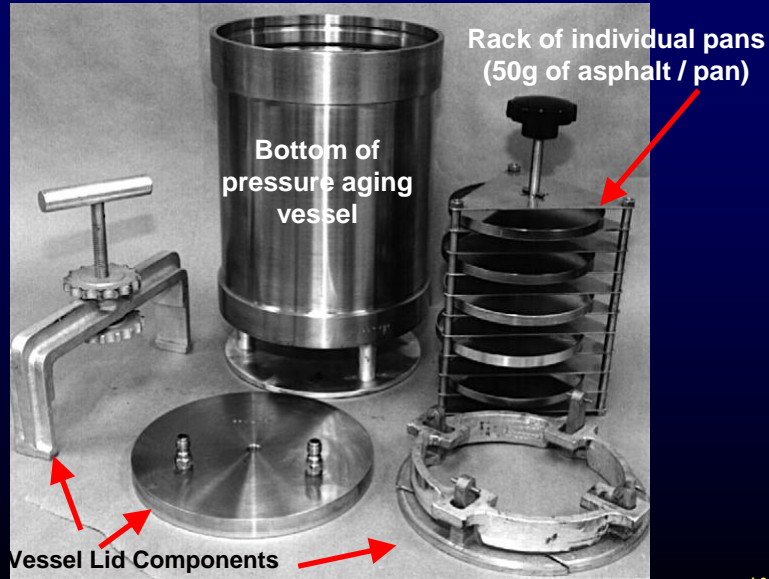
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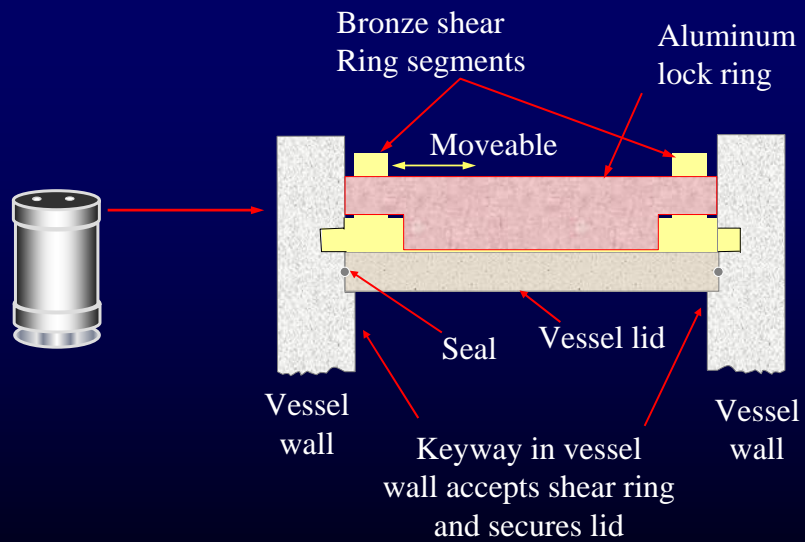
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Pressure Aging Vessel



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Overview of Procedure - PAV

- **Preparation**
 - preheat chamber and vessel
 - pans into sample rack
 - sample rack into vessel
 - secure lid shear ring assembly
 - vessel into chamber
 - connect pressure hose and temperature probe
- **Apply 2070 kPa for 20 hrs**
 - temp @ 100 or 110 C° (Desert)

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Pressure Aging Vessel



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Overview of Procedure - PAV

- **Slow Release of Pressure**
- **Remove Pans from PAV**
 - heat to pour
- **Combined Into Single Container**
 - stir to remove bubbles

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Calibration and Standardization (RTFO)

- **Temperature Detector**
 - calibrated thermometer
- **Pressure Gauge**
 - calibration service

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