

Drum Mix Plant Equipment and Operations [Presentation Slides]

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"Evaluation and Training Related to Drum Mix Plants"

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Introduction. Drum Mix Plant Equipment and Operations

DRUM MIX PLANT EQUIPMENT AND OPERATIONS

Slide 1

**THOMAS W. KENNEDY
JAMES A. SCHEROCMAN
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Slide 2

**JAMES A. SCHEROCMAN
THOMAS W. KENNEDY
RICHARD J. HOLMGREEN**

Slide 3

ASPHALT PLANTS

Slide 4. Asphalt Plants

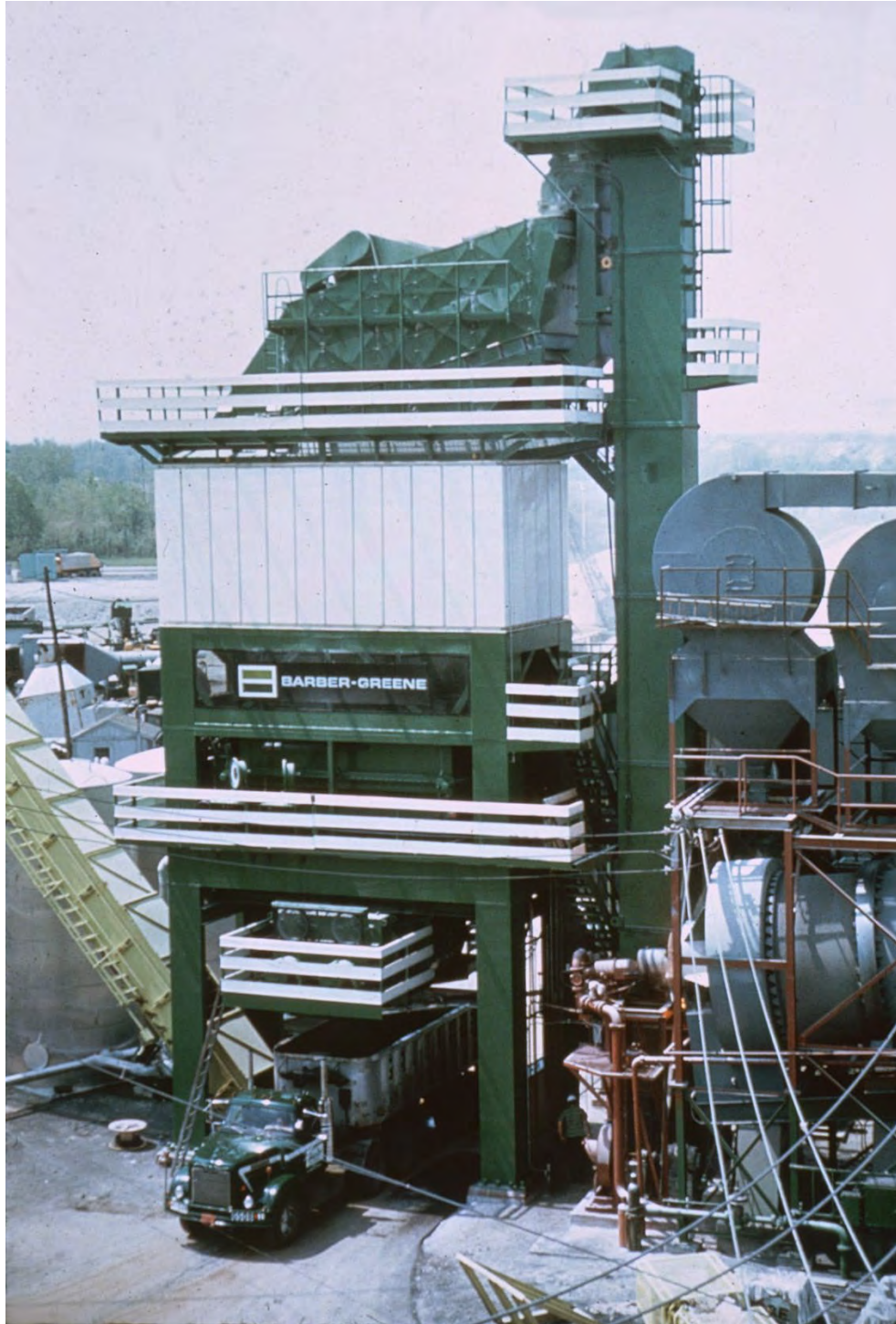
ASPHALT PLANTS

- **Batch Plants**
- **Continuous Mix Plants**
- **Drum Mix Plants**

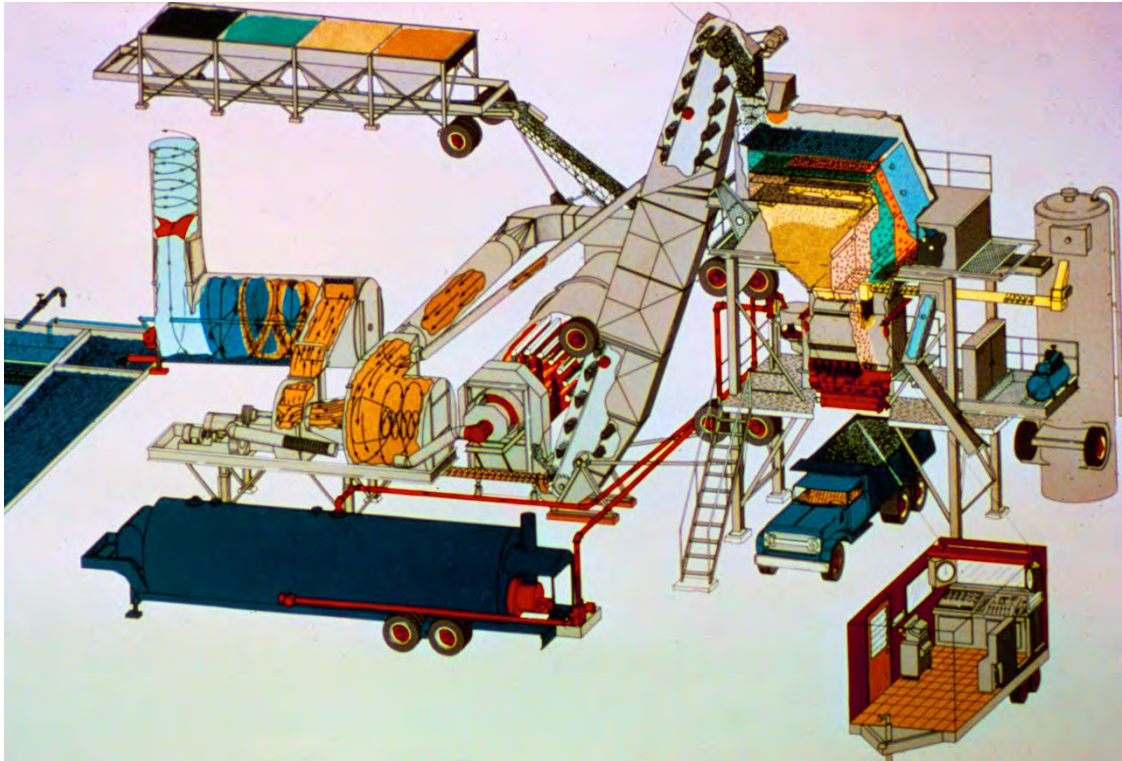
Slide 5. Asphalt Plants [Types]

BATCH PLANT

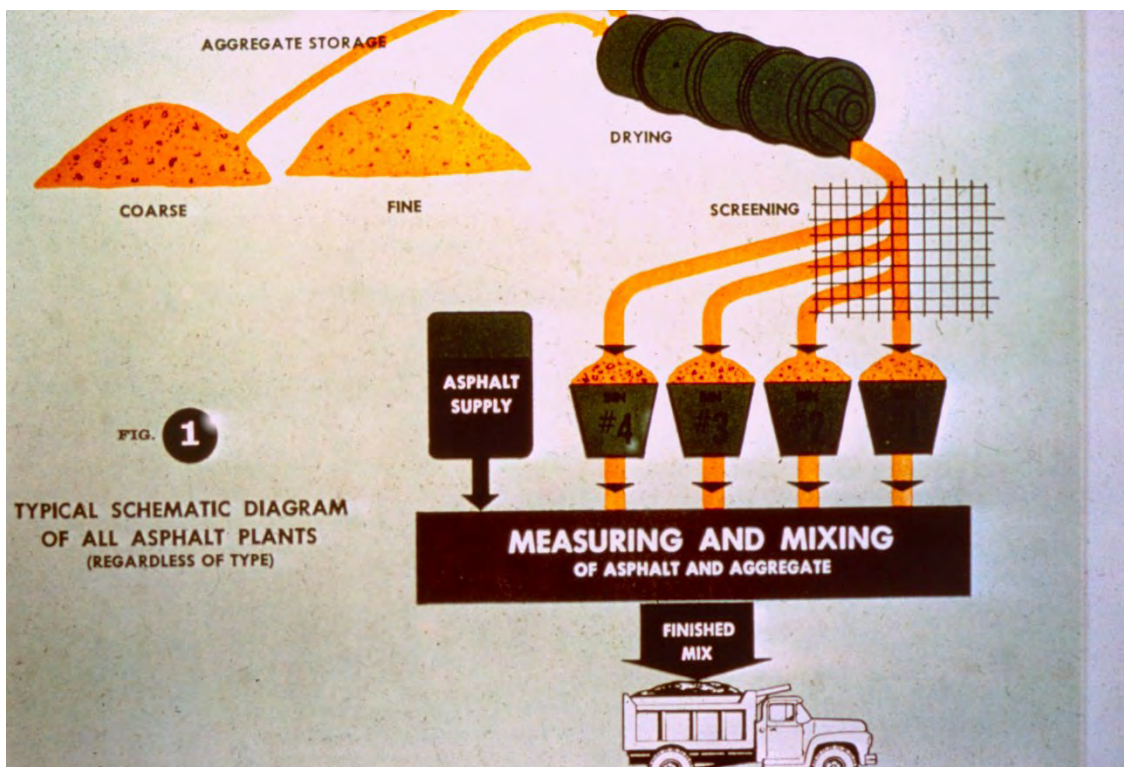
Slide 6. Batch Plant



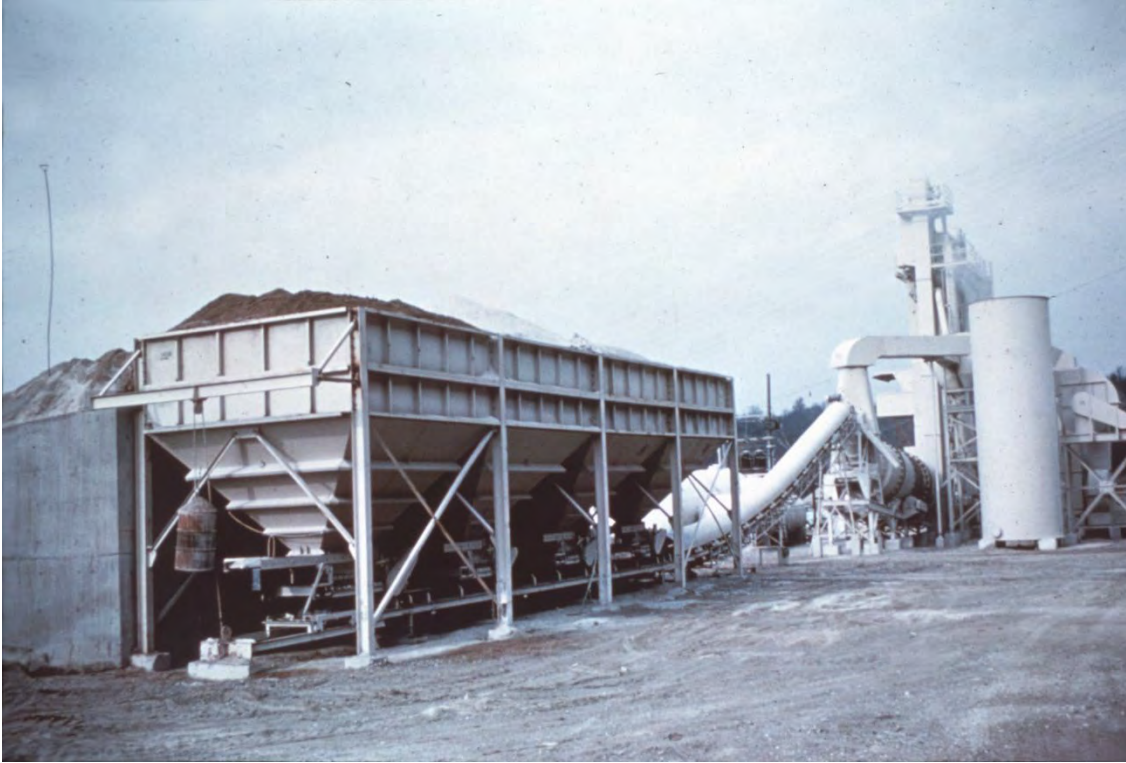
Slide 7



Slide 8



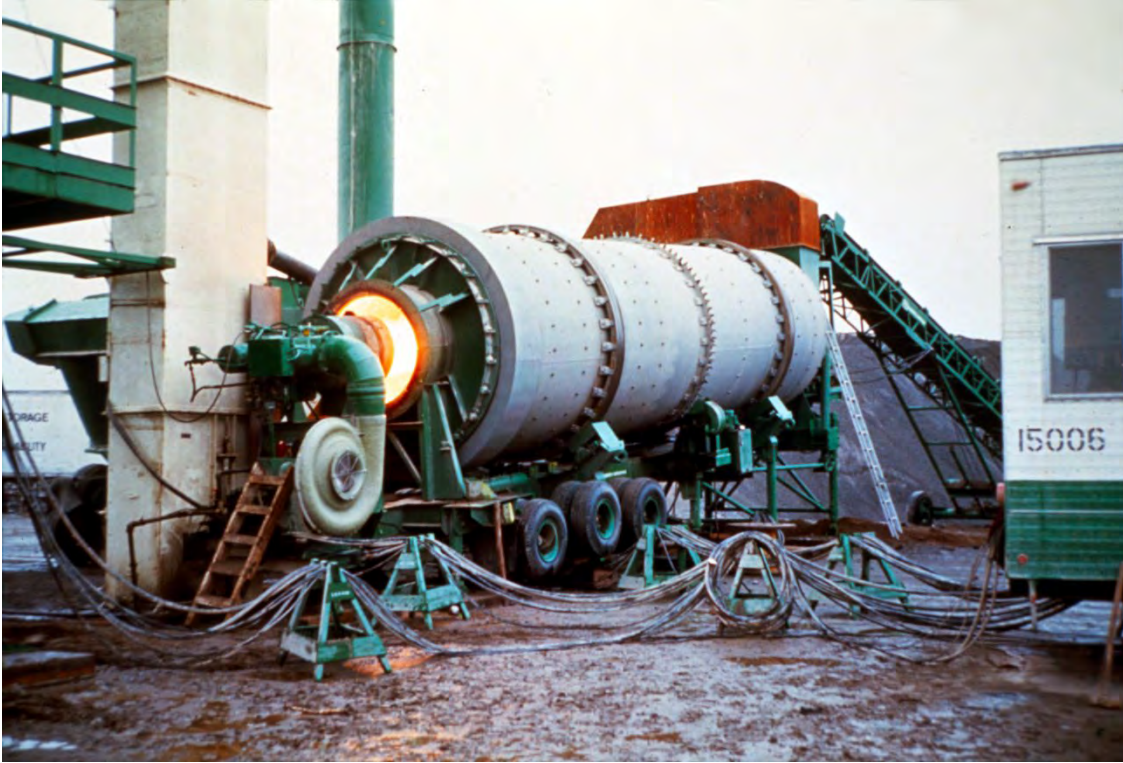
Slide 9. Typical Schematic Diagram of All Asphalt Plants (Regardless of Type)



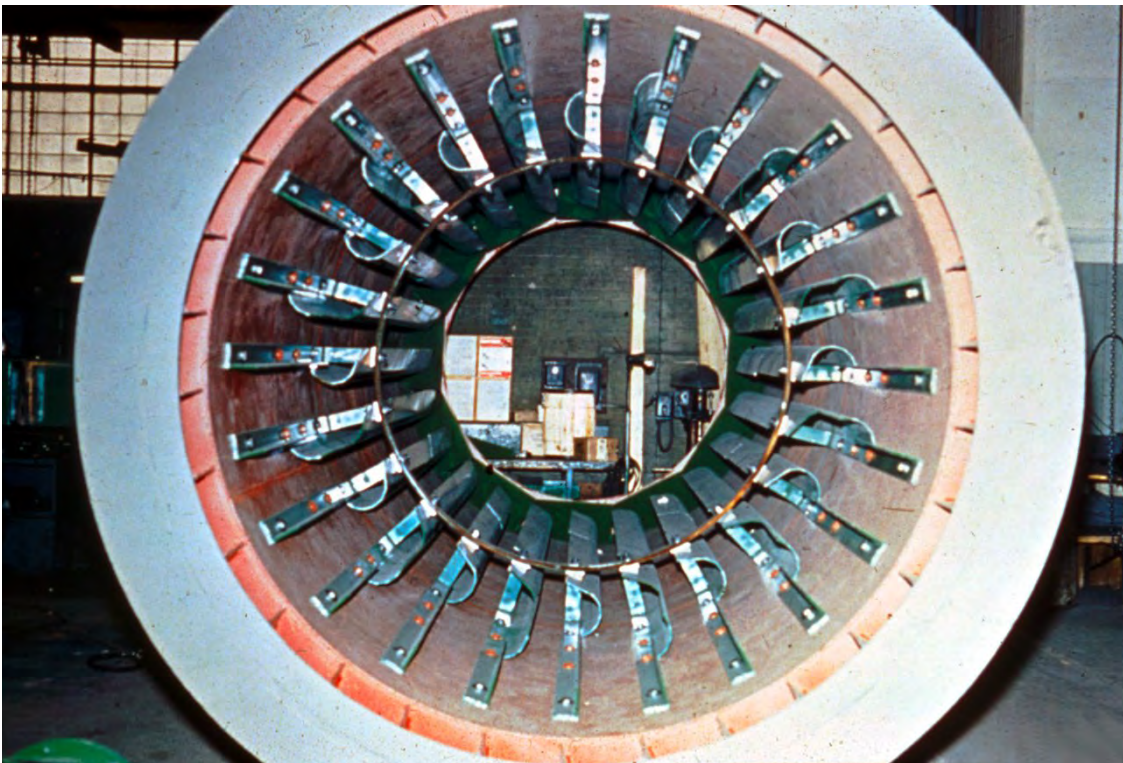
Slide 10



Slide 11



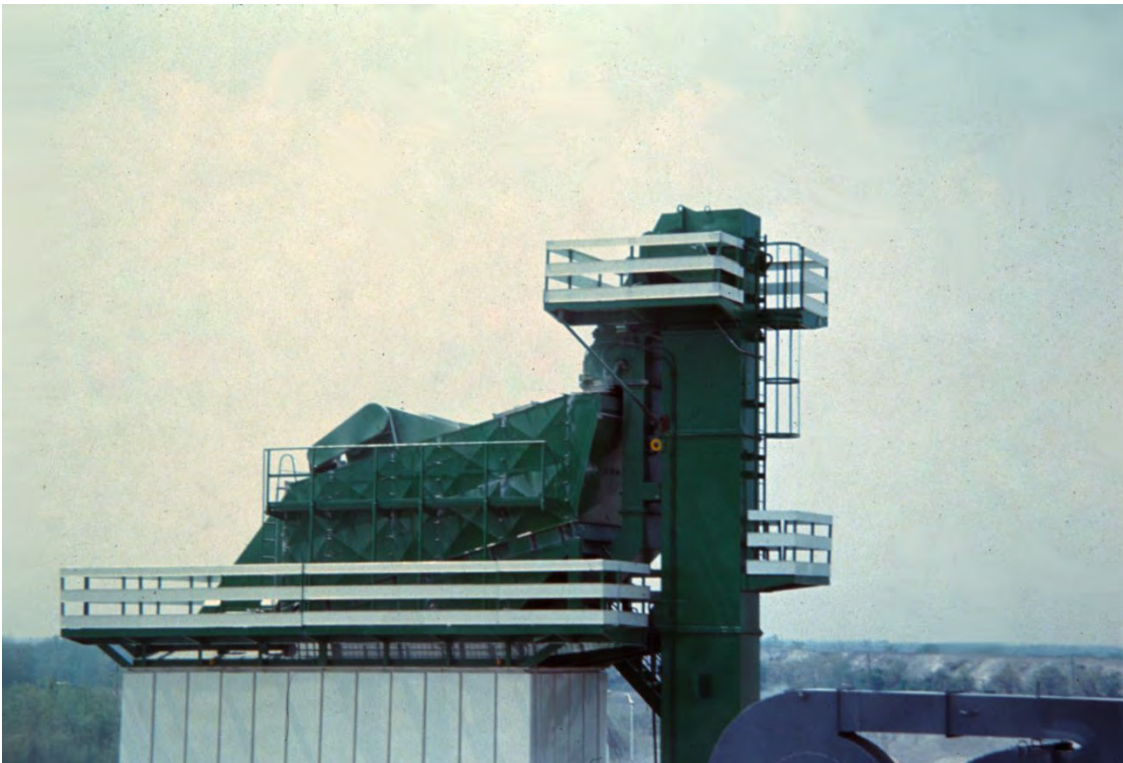
Slide 12



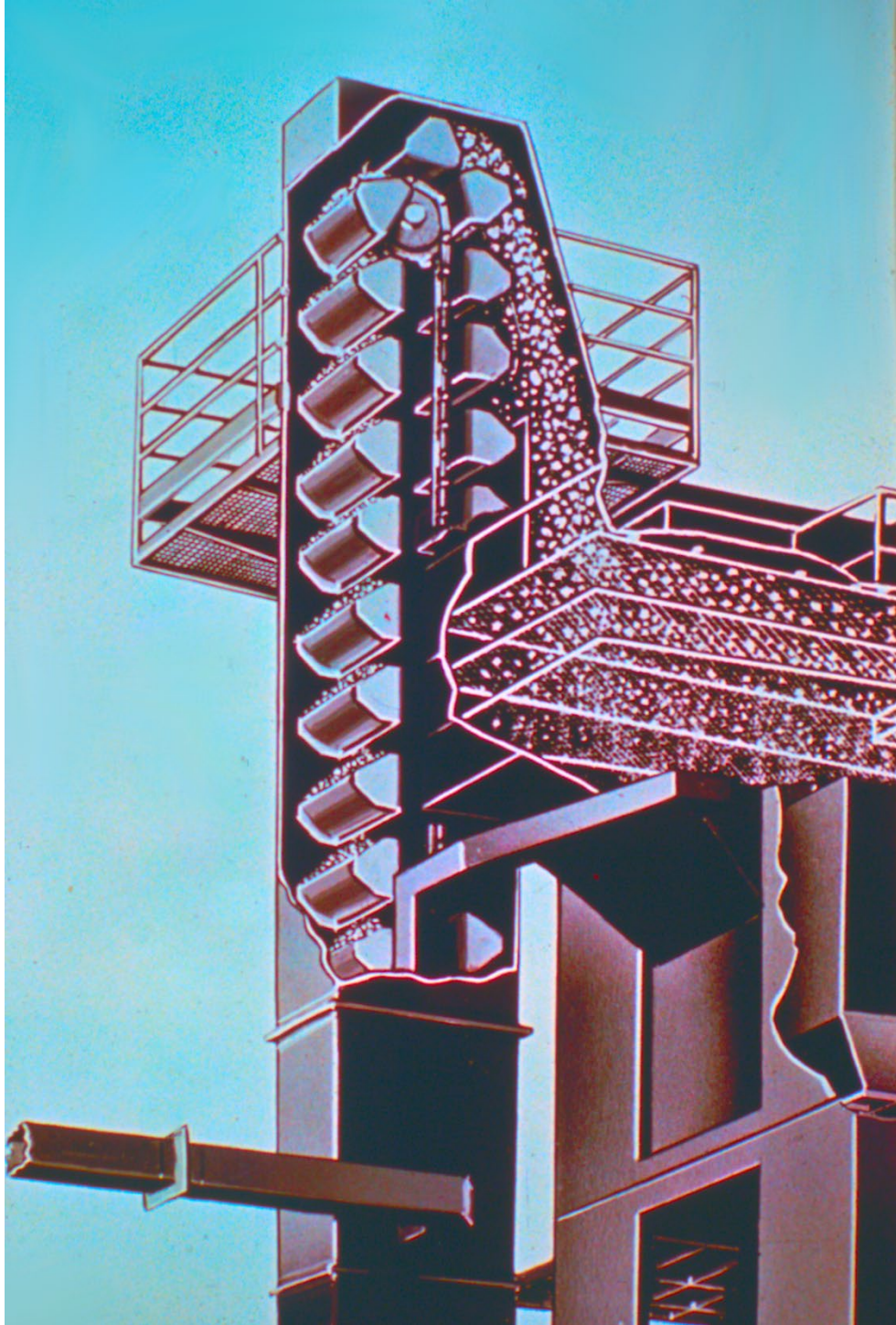
Slide 13



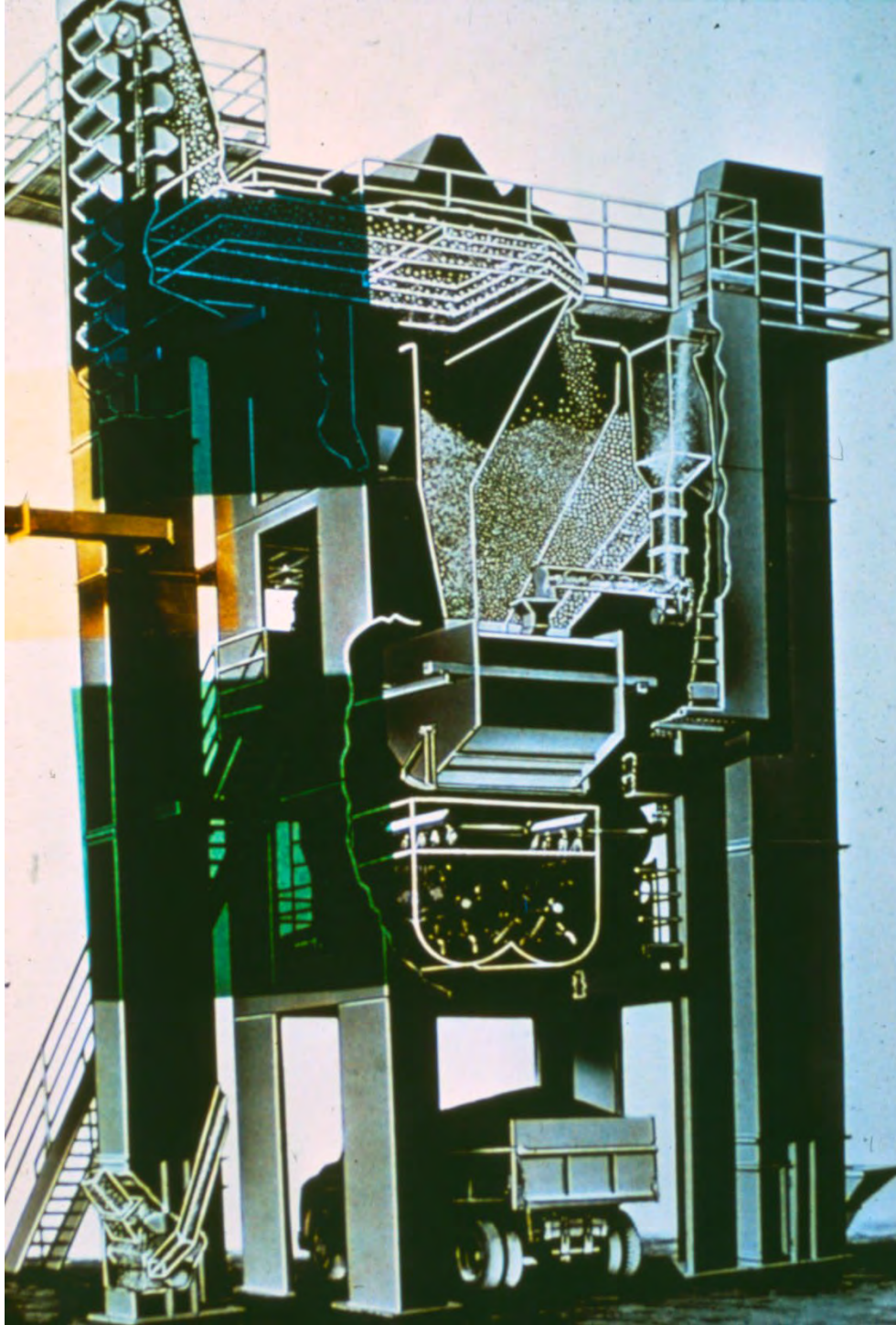
Slide 14



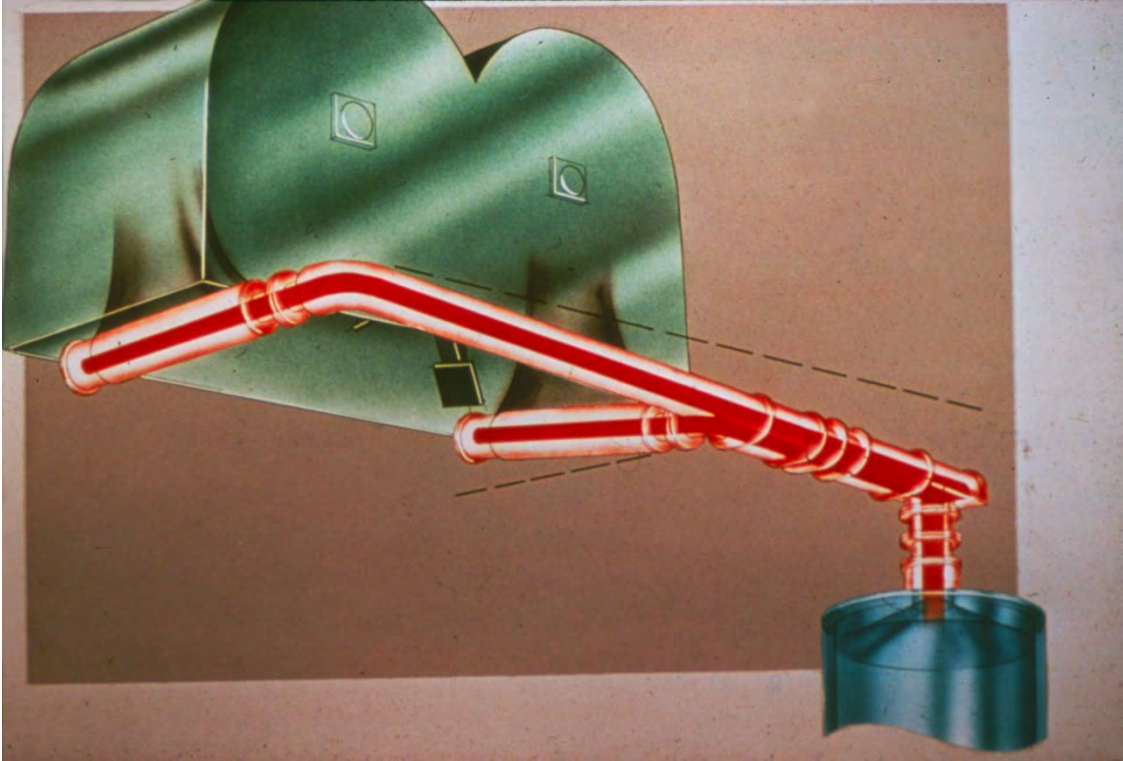
Slide 15



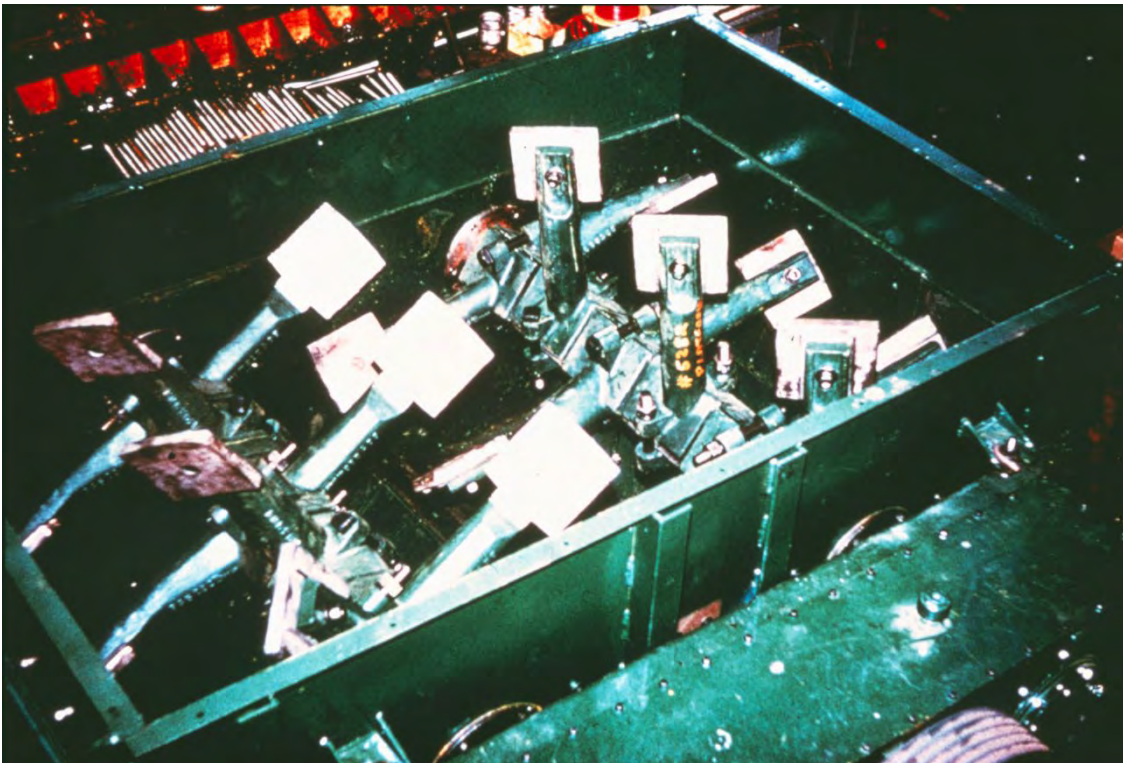
Slide 16



Slide 17



Slide 18



Slide 19



Slide 20



Slide 21

CONTINUOUS MIX PLANT

Slide 22. Continuous Mix Plant



Slide 23

DRUM MIX PLANT

Slide 24. Drum Mix Plant

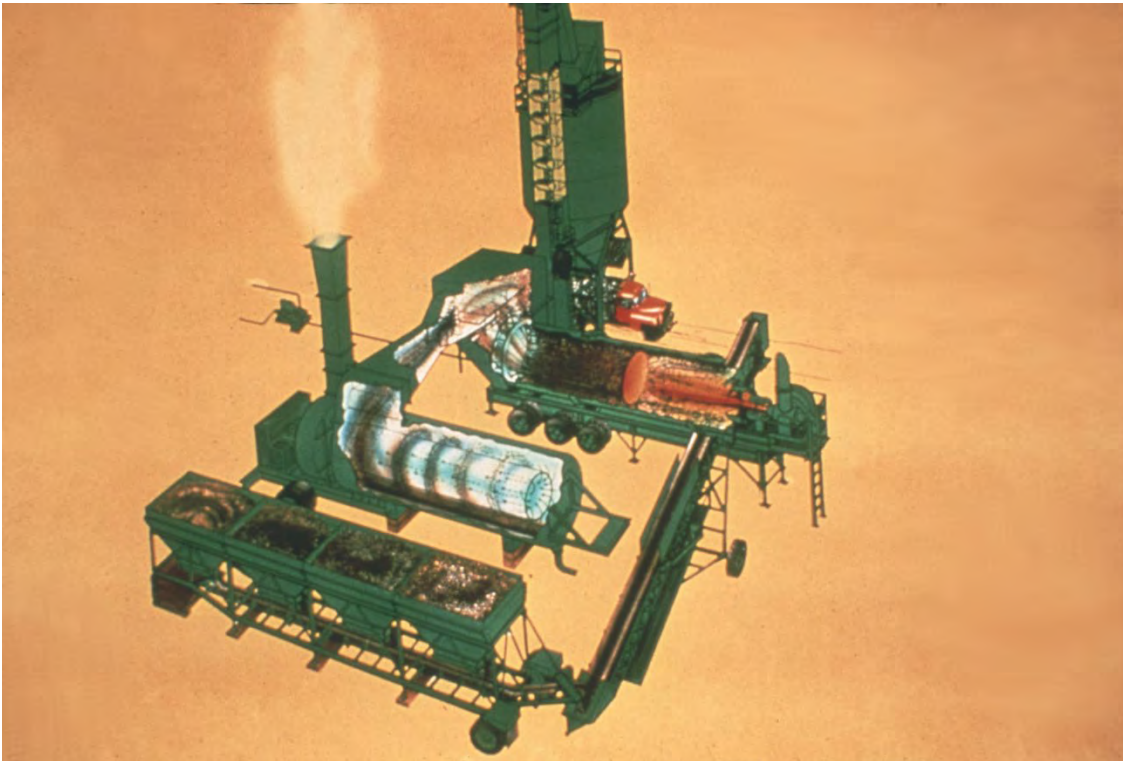


Slide 25

DRUM MIX PLANTS

- **Aggregate System**
- **Asphalt Binder System**
- **Material Blending and Processing System**

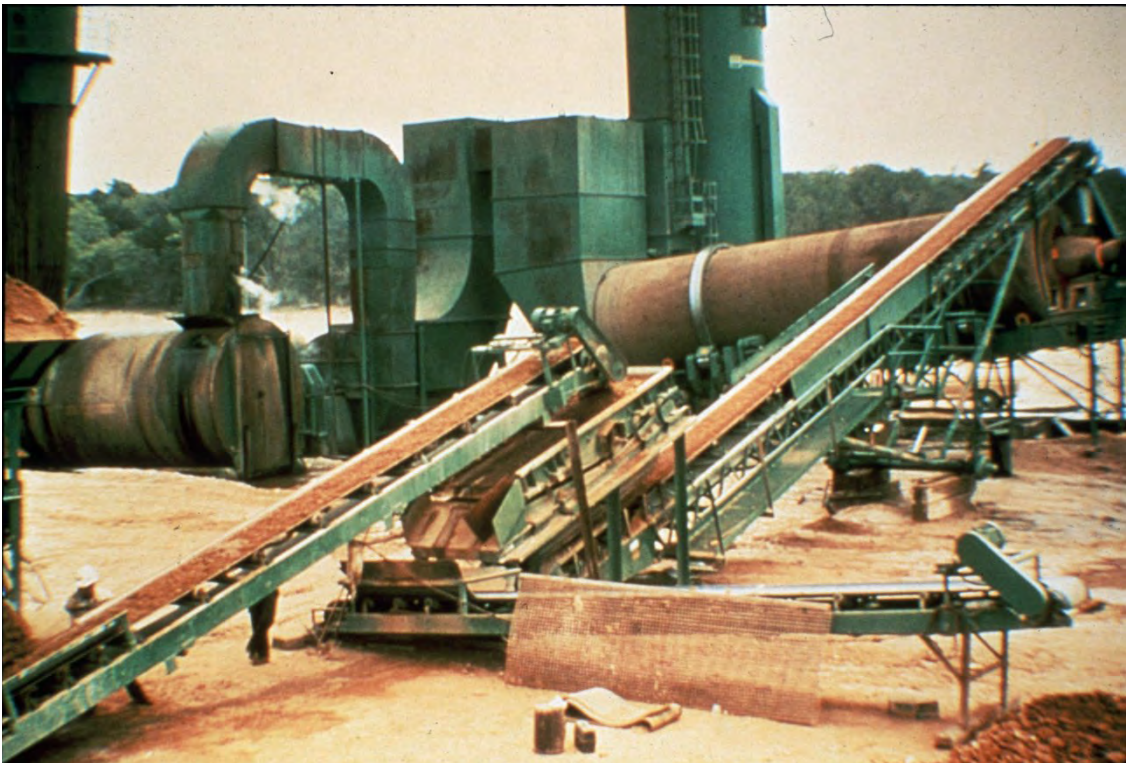
Slide 26. Drum Mix Plants [System Types]



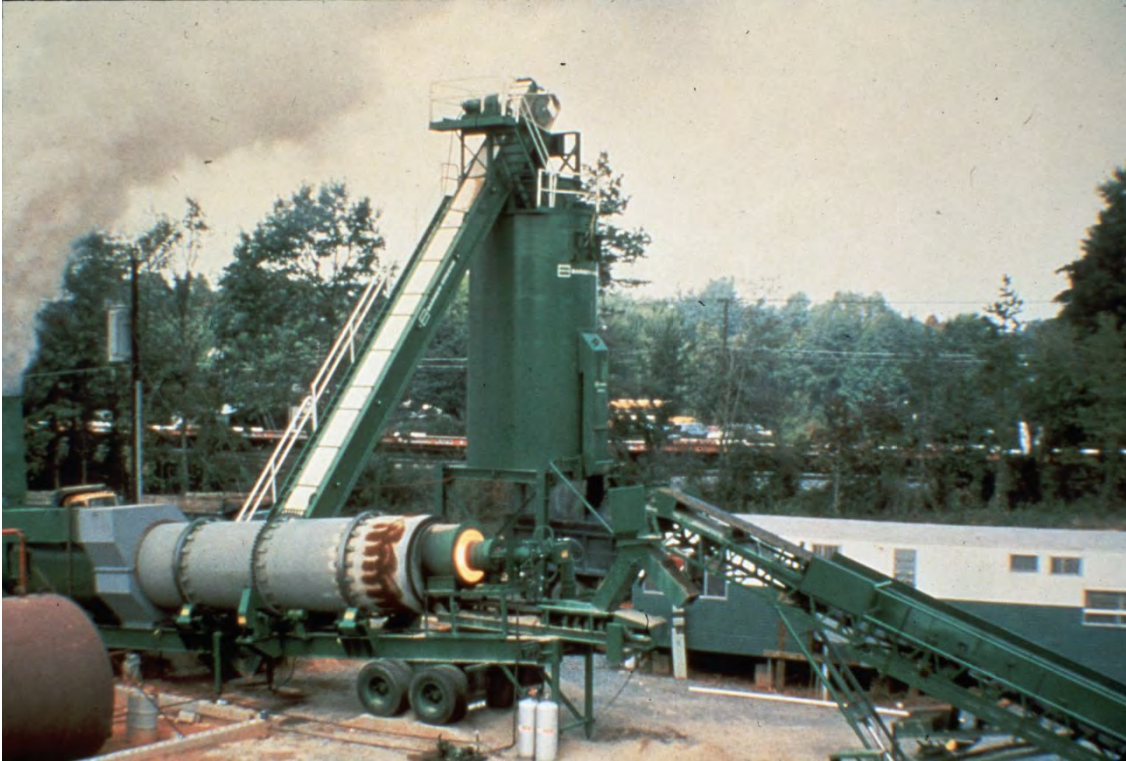
Slide 27



Slide 28



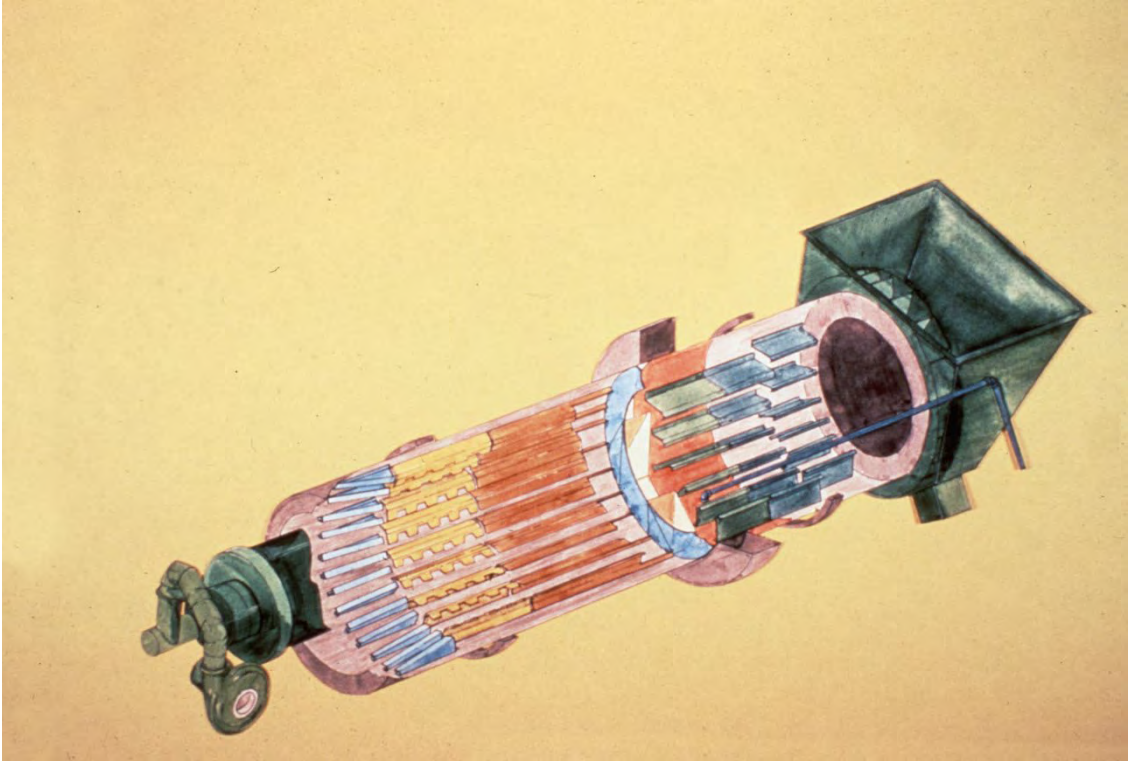
Slide 29



Slide 30



Slide 31



Slide 32



Slide 33



Slide 34



Slide 35

Chapter 4. Cold Feed System

COLD FEED SYSTEM

Slide 1

COLD FEED SYSTEM

- **New Aggregate**
- **New Aggregate-Reclaimed Material**

Slide 2. Cold Feed System

AGGREGATE HANDLING SYSTEM

- **Aggregate Stockpiles**
- **Cold Feed Bins**
- **Gathering Conveyors**
- **Charging Conveyors**
- **Weigh Bridge-Belt Speed Sensor**
- **Mineral Filler System**
- **Dust Return System**
- **Reclaimed Material System**

Slide 3. Aggregate Handling System

Drum mix plants do not contain

- **Screen deck (hot screens)**
- **Weigh hoppers**

Slide 4

**Control of the asphalt mixture
begins with the stockpile**

Slide 5

Stockpiling

Slide 6. Stockpiling

AGGREGATE STOCKPILES

- **Clean, dry, stable surface**
- **Free draining**
- **Separated**

Slide 7. Aggregate Stockpiles

STOCKPILE SEGREGATION IS A MAJOR PROBLEM

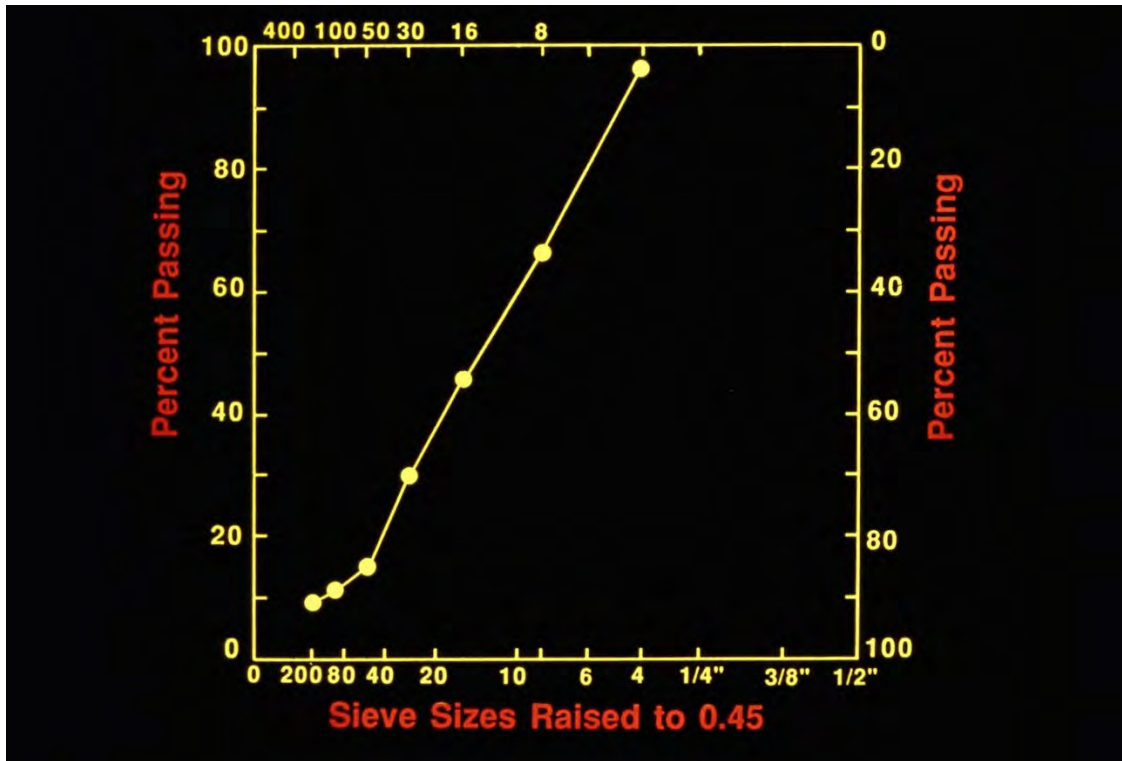
Slide 8

SEGREGATION

**Non-uniform distribution
of aggregates**

- **Sizes**
- **Specific Gravities**

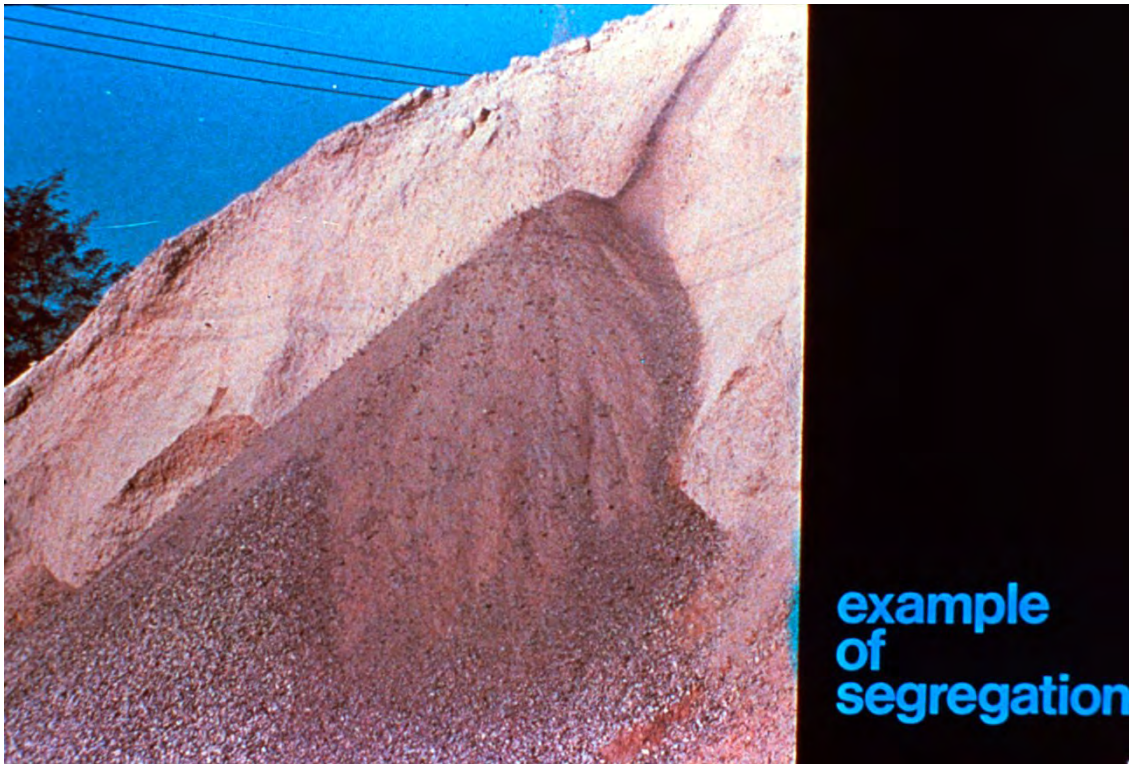
Slide 9. Segregation



Slide 10

- **Minimum of 3 cold feed bins**
- **Preferably more bins**

Slide 11

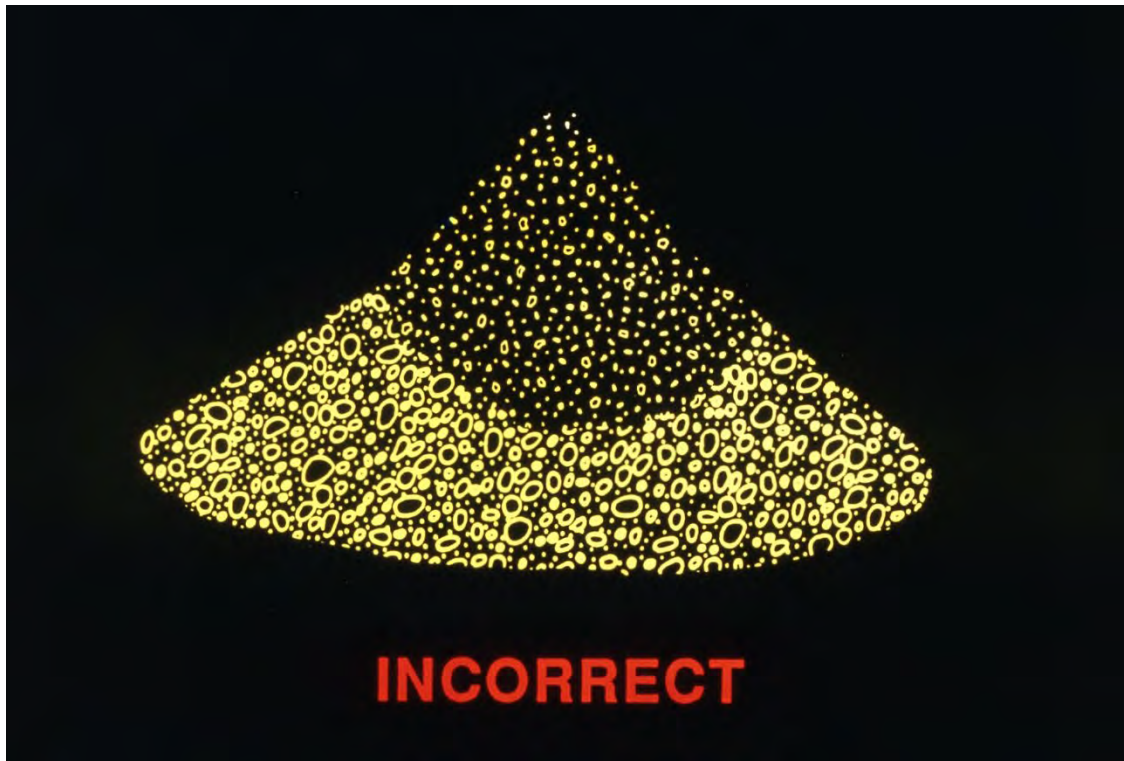


Slide 12. Example of Segregation

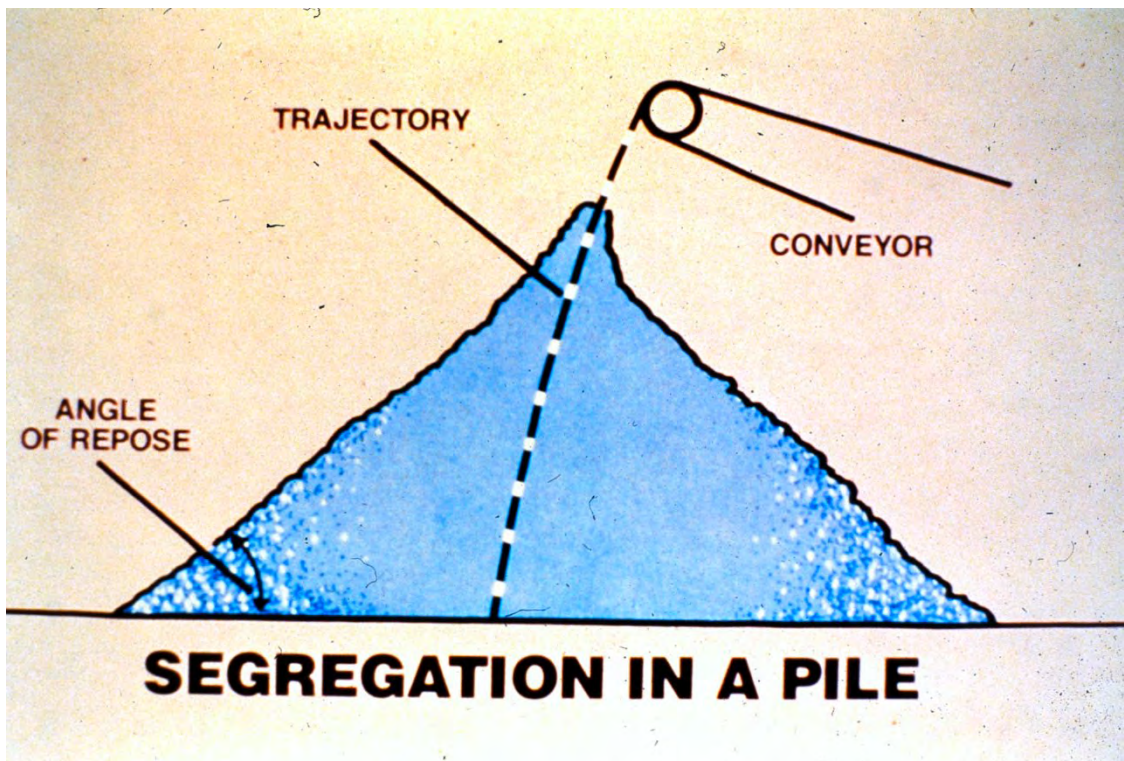
STOCKPILE SEGREGATION

- **Construct in layers**
- **Limit stockpile height**

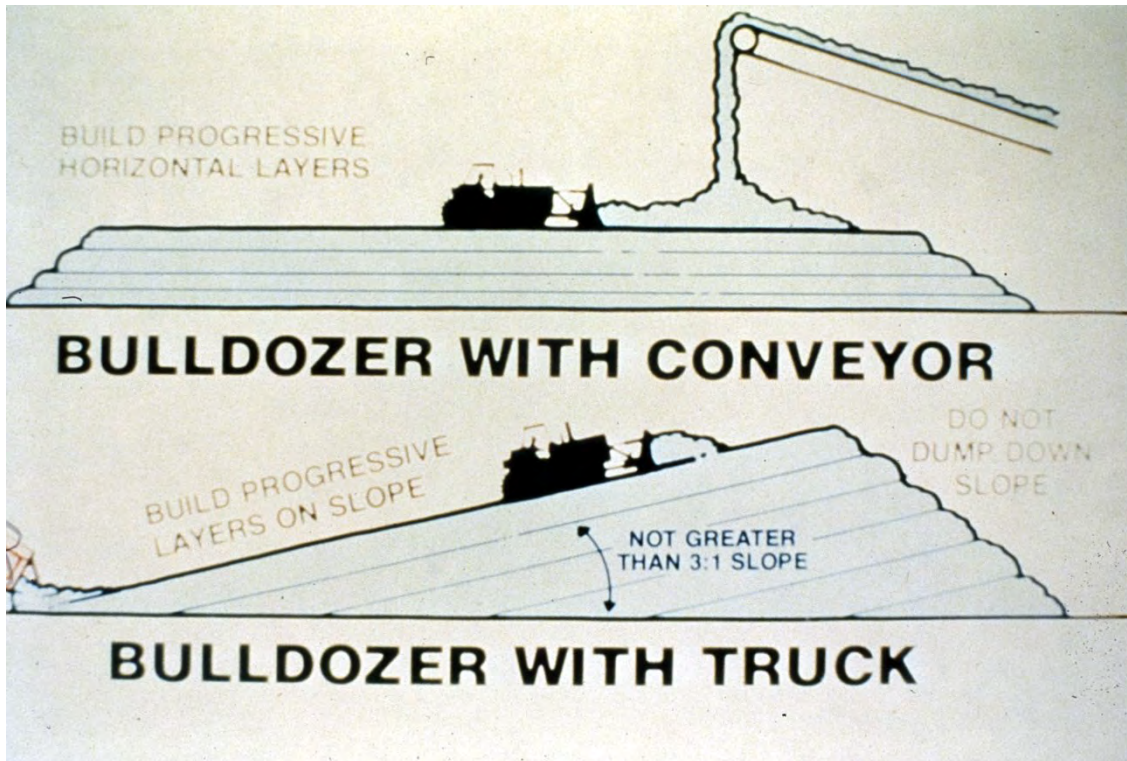
Slide 13. Stockpile Segregation



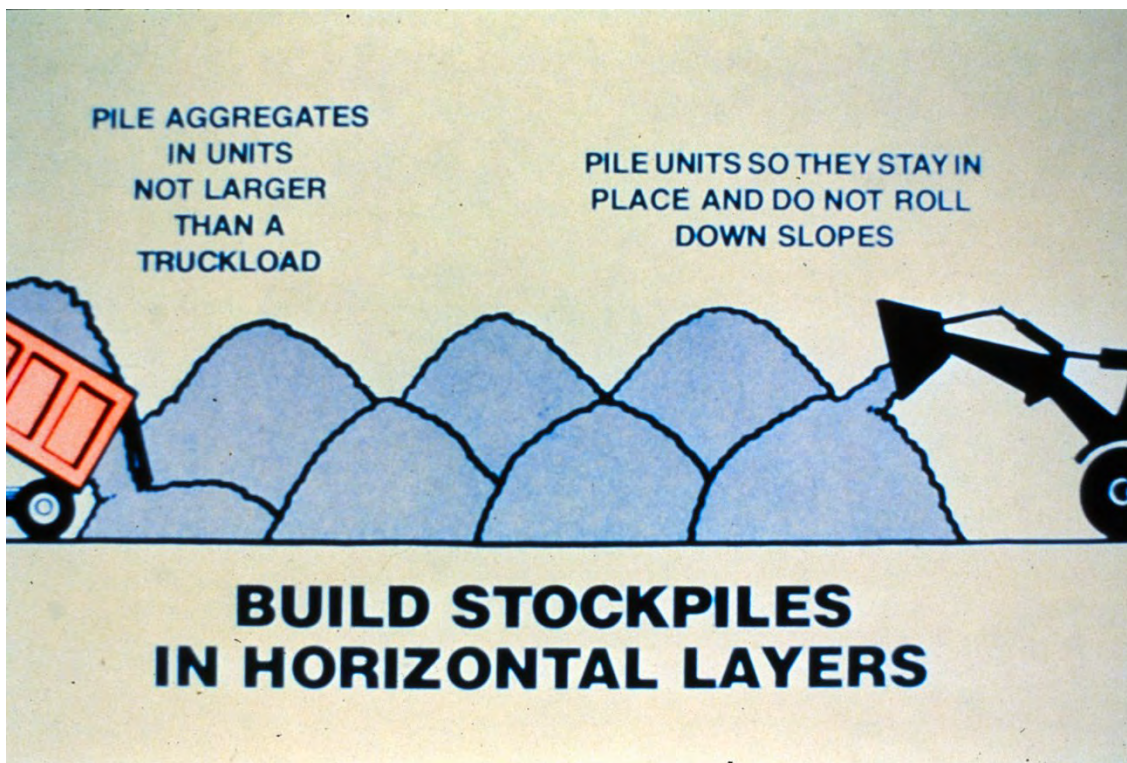
Slide 14



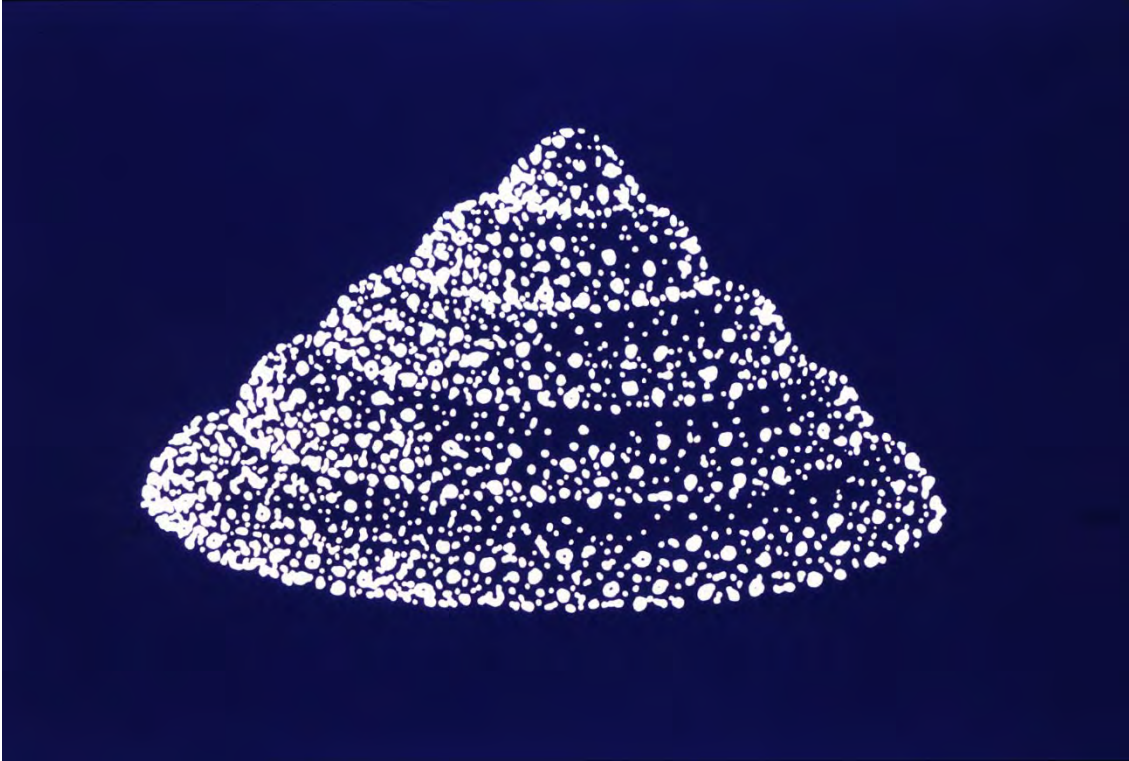
Slide 15. Segregation in a Pile



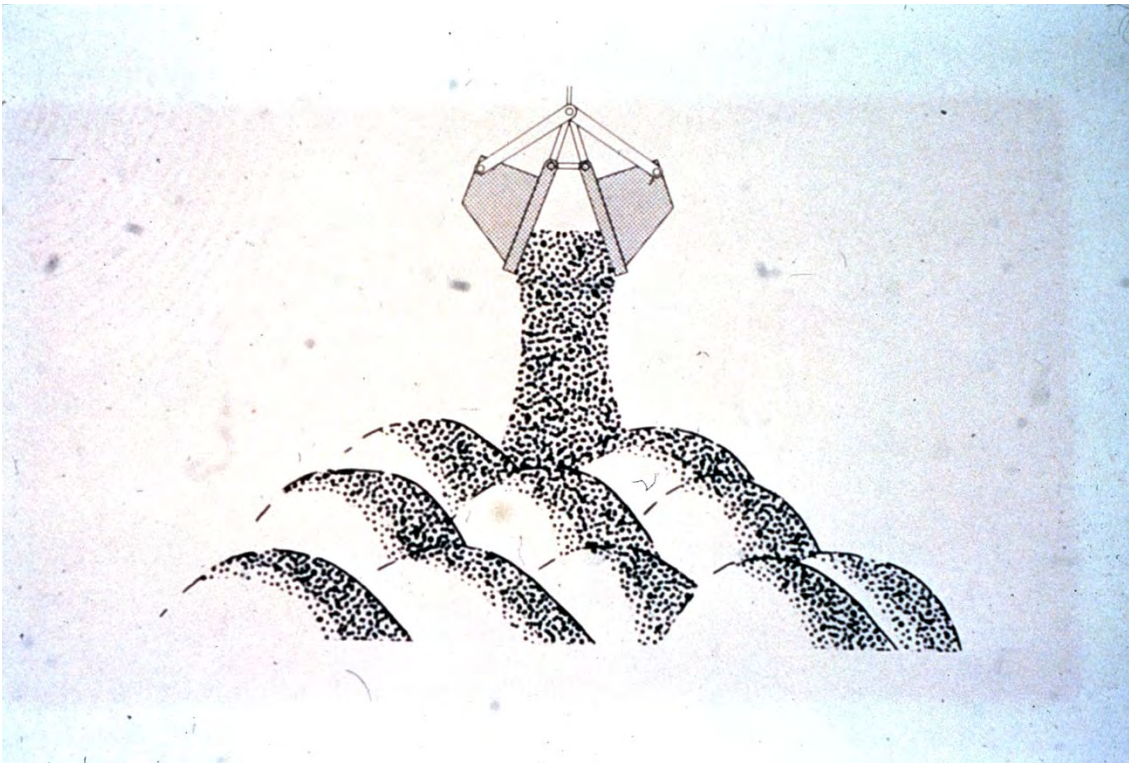
Slide 16



Slide 17. Build Stockpiles in Horizontal Layers



Slide 18



Slide 19

REMOVAL OF AGGREGATE

- **Should not be removed from bottom-up**
- **Blend the aggregates if segregated**
- **Dozers can cause crushing and segregation**

Slide 20. Removal of Aggregate

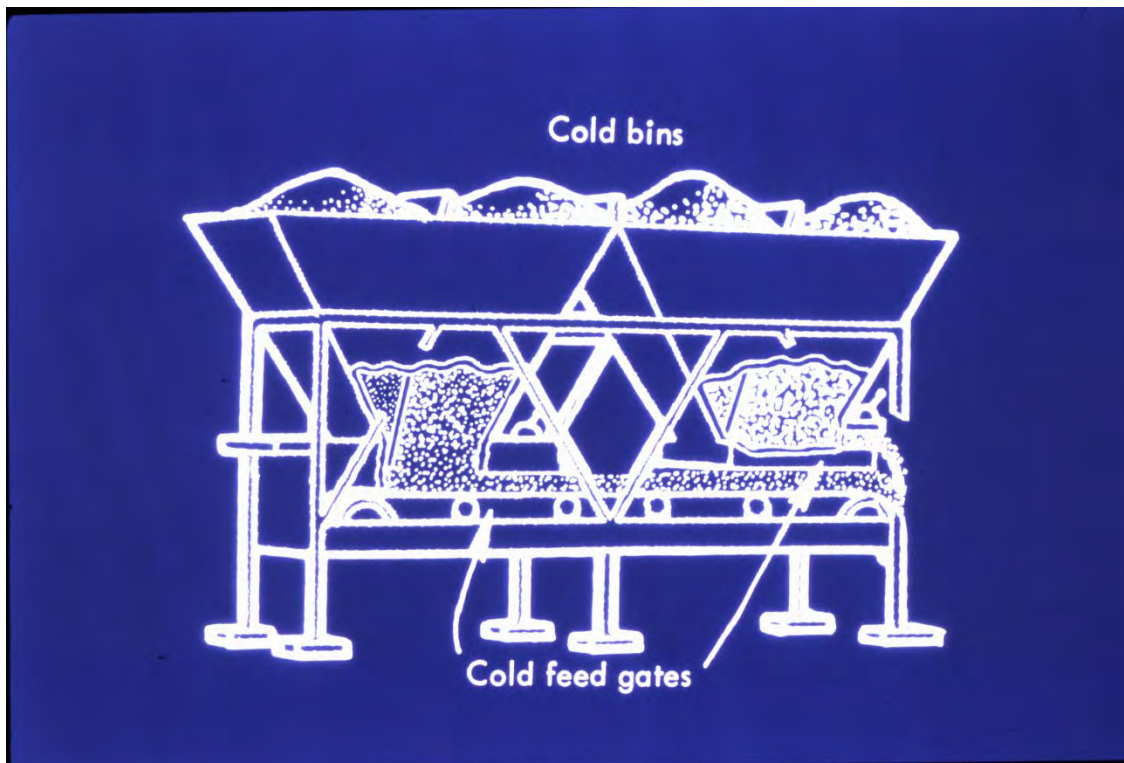


Slide 21

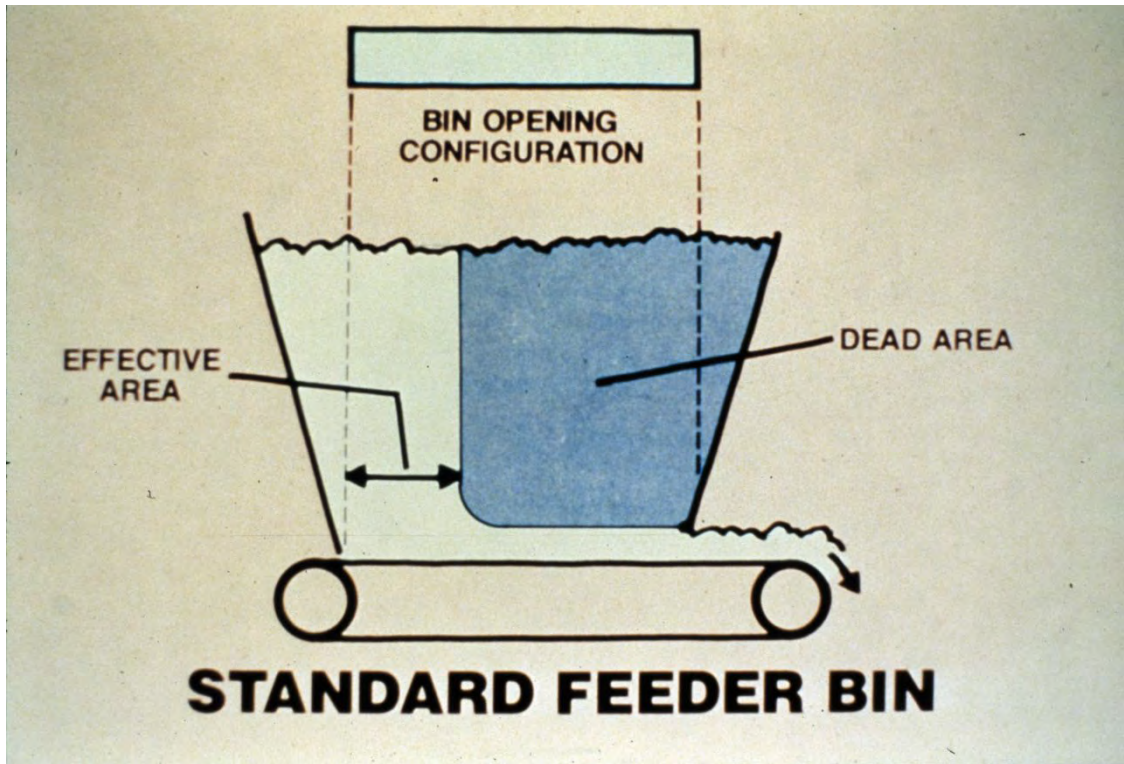
COLD FEED BINS

- Rectangular openings (normal)
- Trapezoidal openings
- Bulk heads between bins

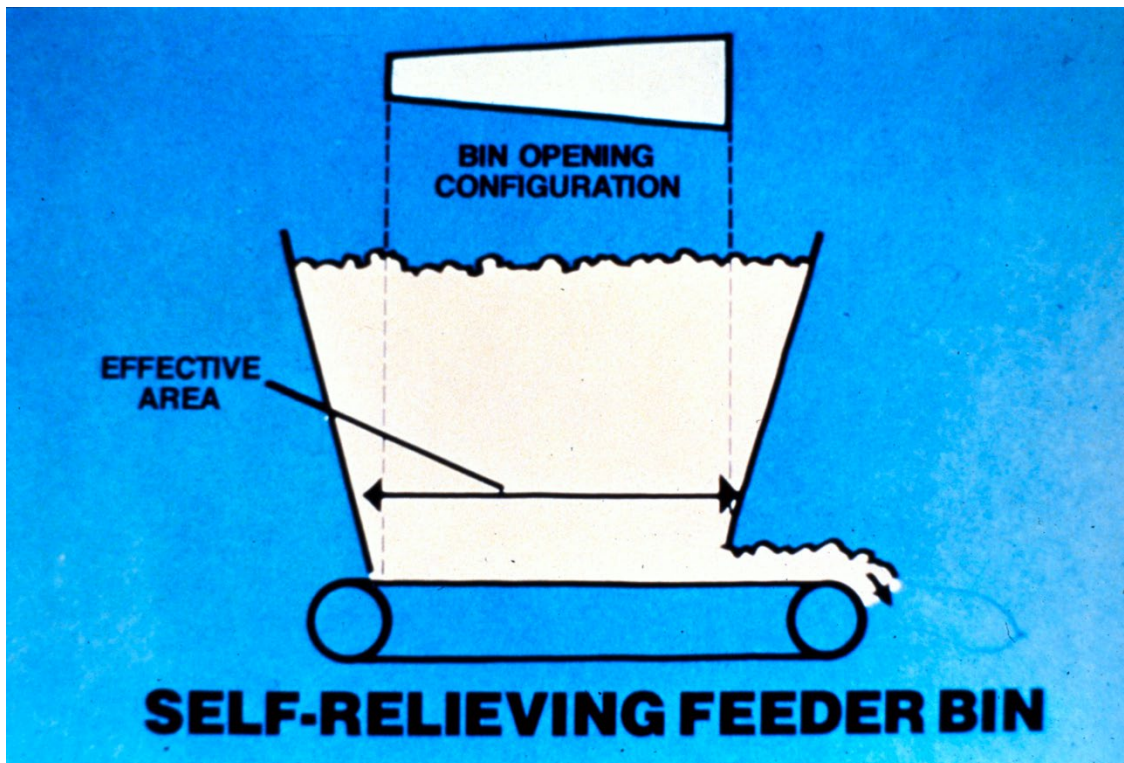
Slide 22. Cold Feed Bins



Slide 23



Slide 24. Standard Feeder Bin



Slide 25. Self-Relieving Feeder Bin



Slide 26

**BULKHEADS SHOULD BE
USED BETWEEN BINS**

Slide 27



Slide 28



Slide 29



Slide 30

**Scalping screens may be used
under cold feed bins**

- Small**
- Clog easily**

Slide 31



Slide 32

COLD FEED

Basic Control of Asphalt Mixture

- **Gate opening**
- **Belt speed**

Slide 33. Cold Feed

TWO COLD FEED SYSTEMS

- **Variable Gate Opening-
Fixed Belt Speed**
- **Constant Gate Opening-
Variable Belt Speed**

Slide 34. Two Cold Feed Systems

**INDIVIDUAL BIN CONVEYORS
GATHERING CONVEYOR
CHARGING CONVEYOR
SLINGER CONVEYOR**

Slide 35



Slide 36

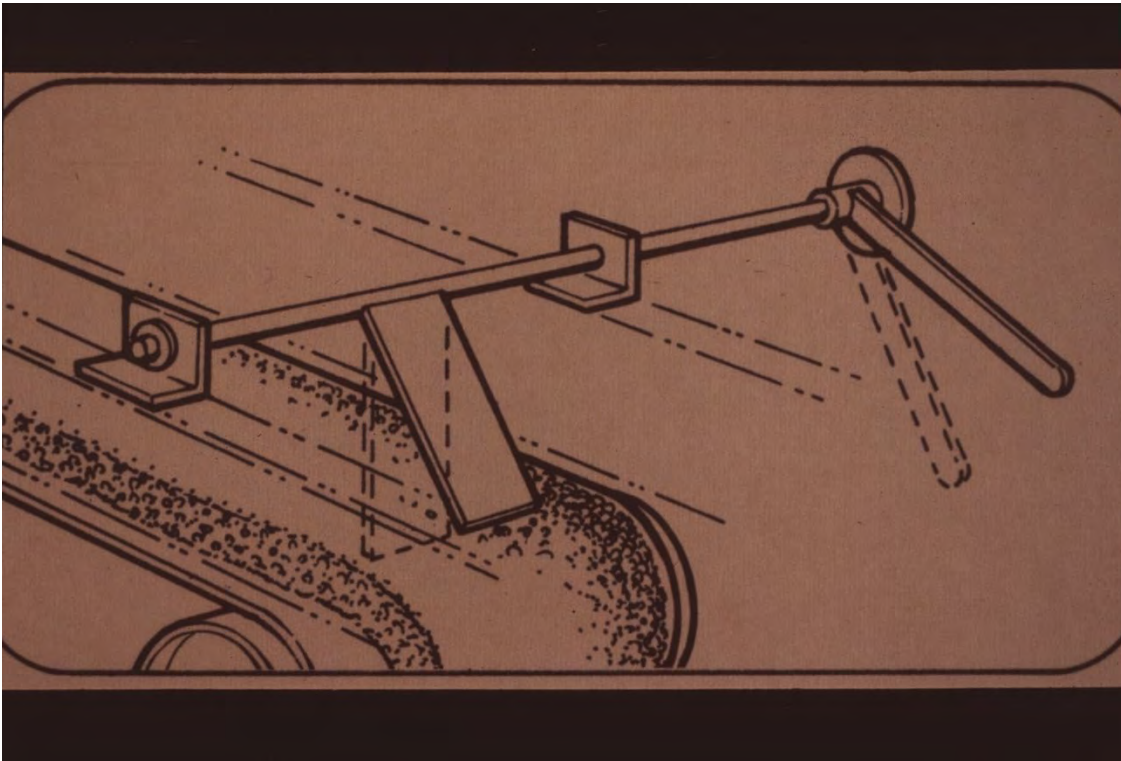
BELT FEEDERS

- Operates between 20 and 80% of maximum speed
- Gate set to operate at 50% of maximum speed

Slide 37. Belt Feeders

Belt feeders are interlocked
Speed shown on console
is % of maximum speed

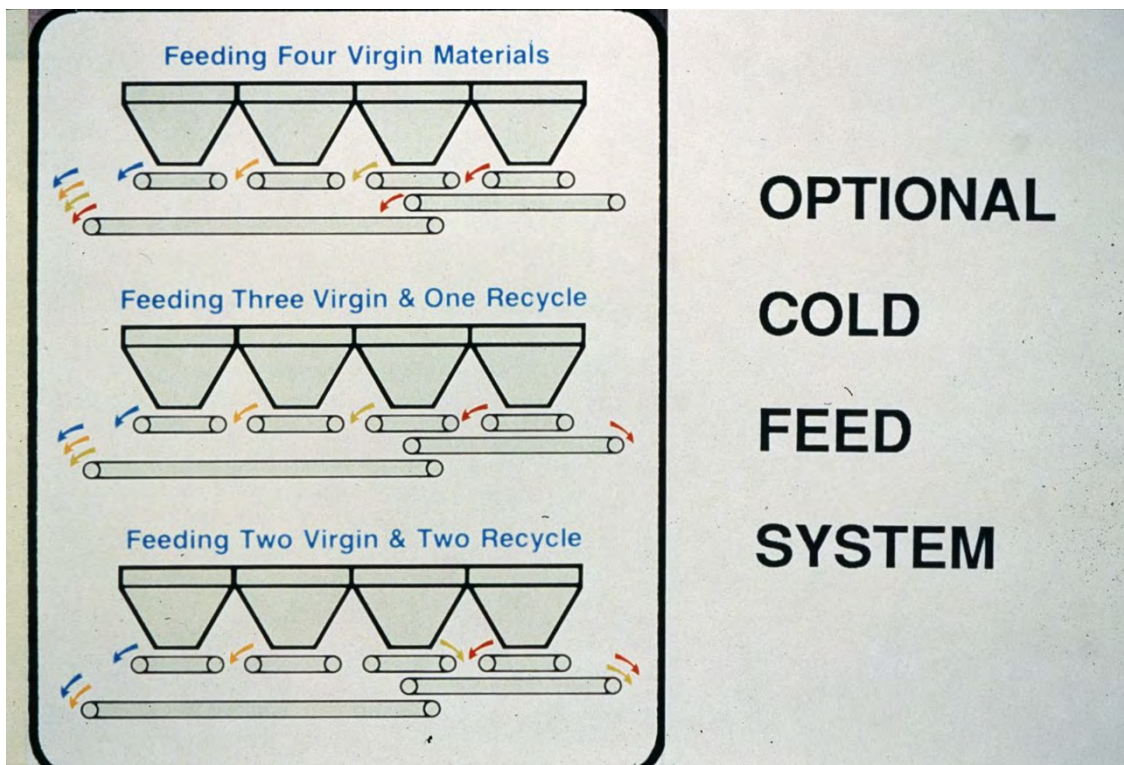
Slide 38



Slide 39

BELT FEEDERS DISCHARGE ON TO A GATHERING CONVEYOR

Slide 40



Slide 41. Optional Cold Feed System



Slide 42

GATHERING CONVEYOR DISCHARGES

- **Through scalping screen**
- **Onto charging conveyor**

Slide 43. Gathering Conveyor Discharges

SCALPING SCREEN LOCATED BETWEEN GATHERING AND CHARGING CONVEYOR

Slide 44

SCALPING SCREENS

- **Pit run aggregate**
- **Reclaimed material**

Slide 45. Scalping Screens

**Scalping screens are
required in Texas**

Slide 46

SCALPING SCREENS

- **Single deck**
 - Square
 - Slotted
- **Two deck**

Slide 47. Scalping Screens [Types]

**SLOTTED SCREEN REDUCES
REQUIRED SCREEN AREA**

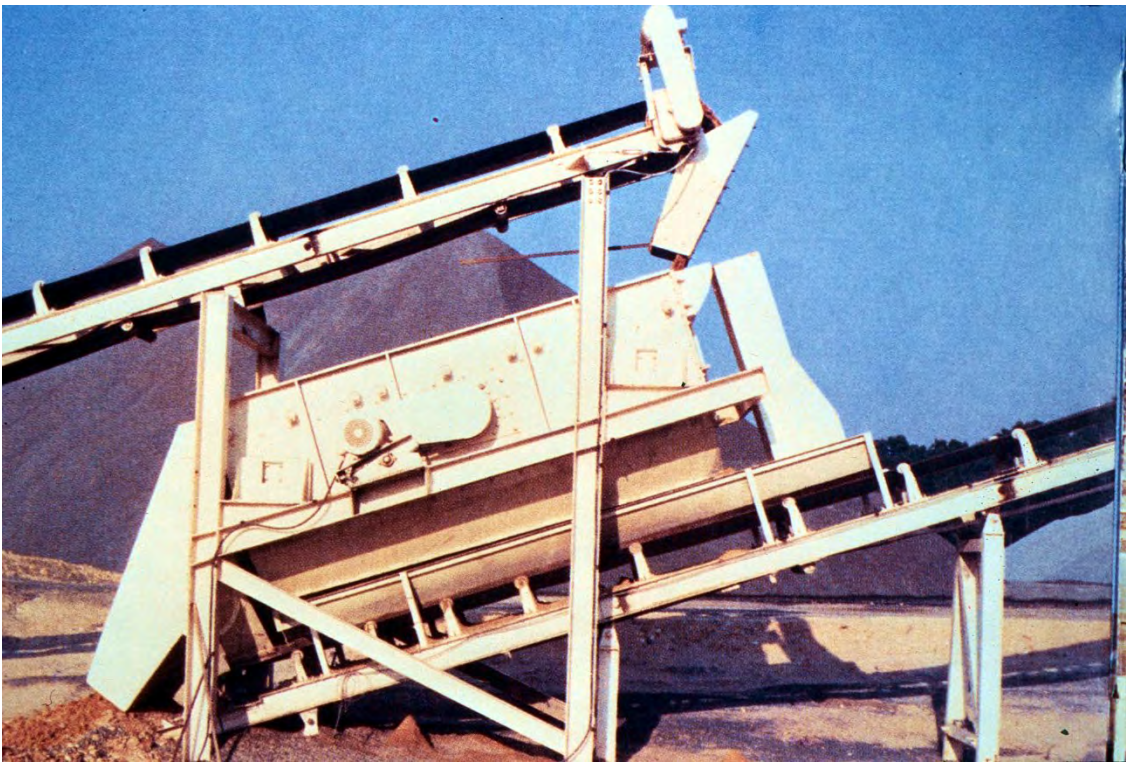
Slide 48



Slide 49



Slide 50



Slide 51

Some scalping screens have a bypass chute

- **Quarried aggregate**
- **Damaged screens**

Slide 52. Some Scalping Screens have a Bypass Chute

INCLINED-CHARGING CONVEYOR

- **Discharges**
 - Charging chute
 - Slinger belt
- **Contains**
 - Weigh bridge
 - Belt speed sensor

Slide 53. Inclined-Charging Conveyor



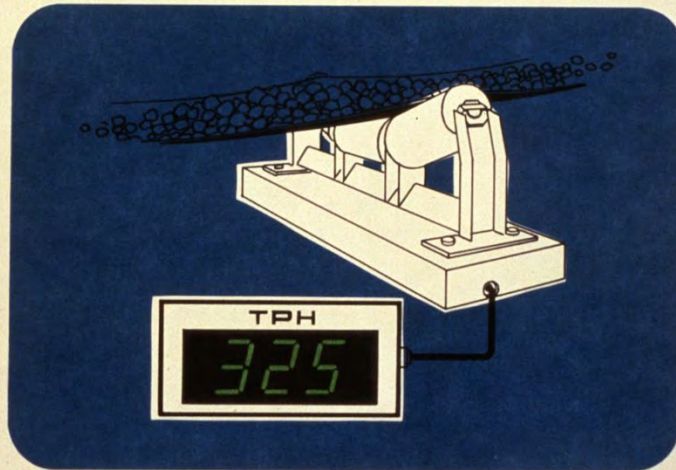
Slide 54

INCLINED CONVEYOR CONTAINS

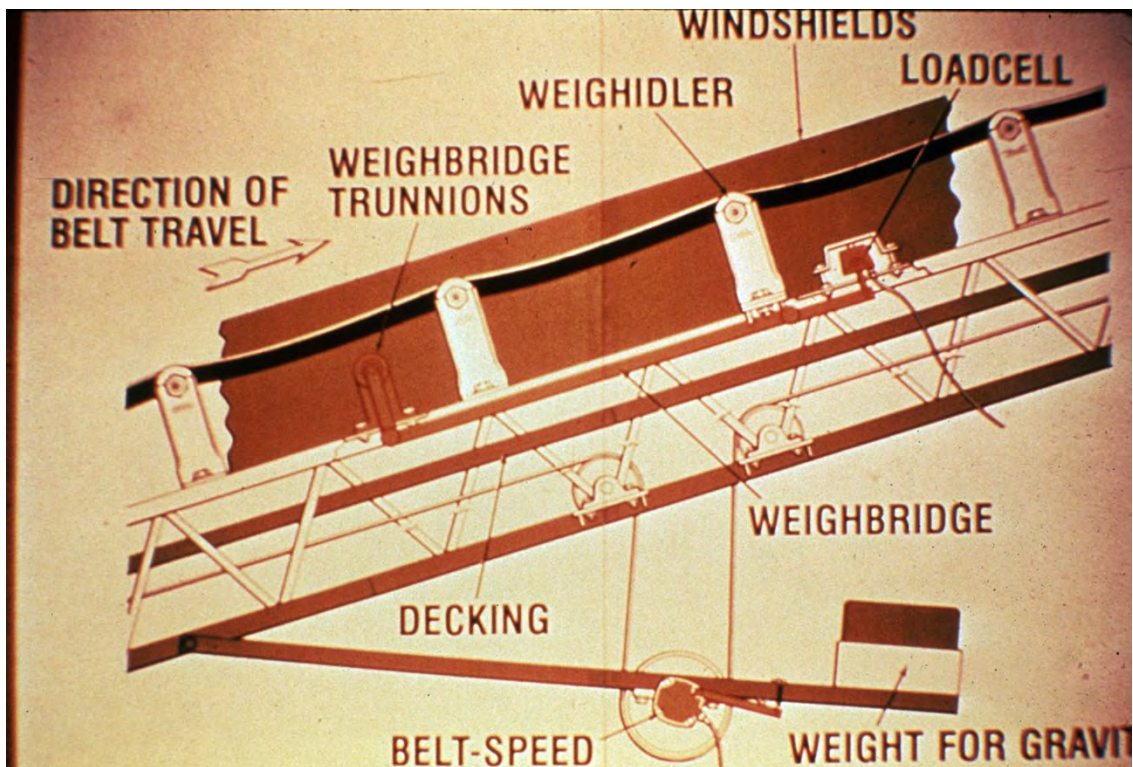
- **Weigh idler**
- **Belt speed sensor**

Slide 55. Inclined Conveyor Contains

ACCURATE AGGREGATE WEIGHT SENSING SYSTEM



Slide 56. Accurate Aggregate Weight Sensing System



Slide 57



Slide 58



Slide 59

**SPEED SENSOR
SHOULD BE TIGHT**

Slide 60

**BELT SCRAPERS SHOULD BE
USED TO REMOVE MATERIAL**

Slide 61

RECLAIMED MATERIAL COLD FEED

Varies with make, model, age

Slide 62. Reclaimed Material Cold Feed

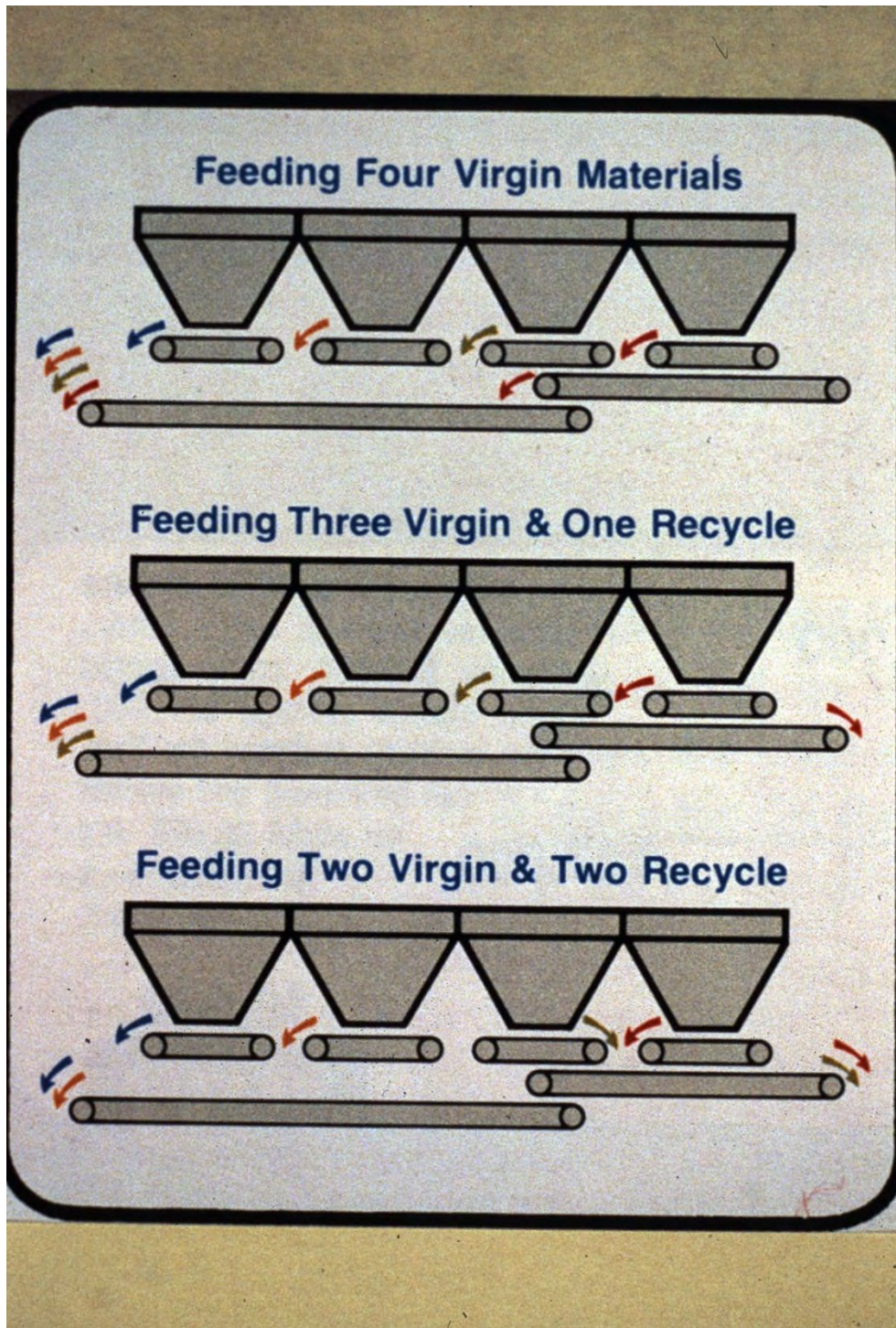
RECLAIMED MATERIAL COLD FEED BINS

- **Normal bins with split gathering conveyor**
- **Special bins**
 - Steeper sides**
 - Larger openings**

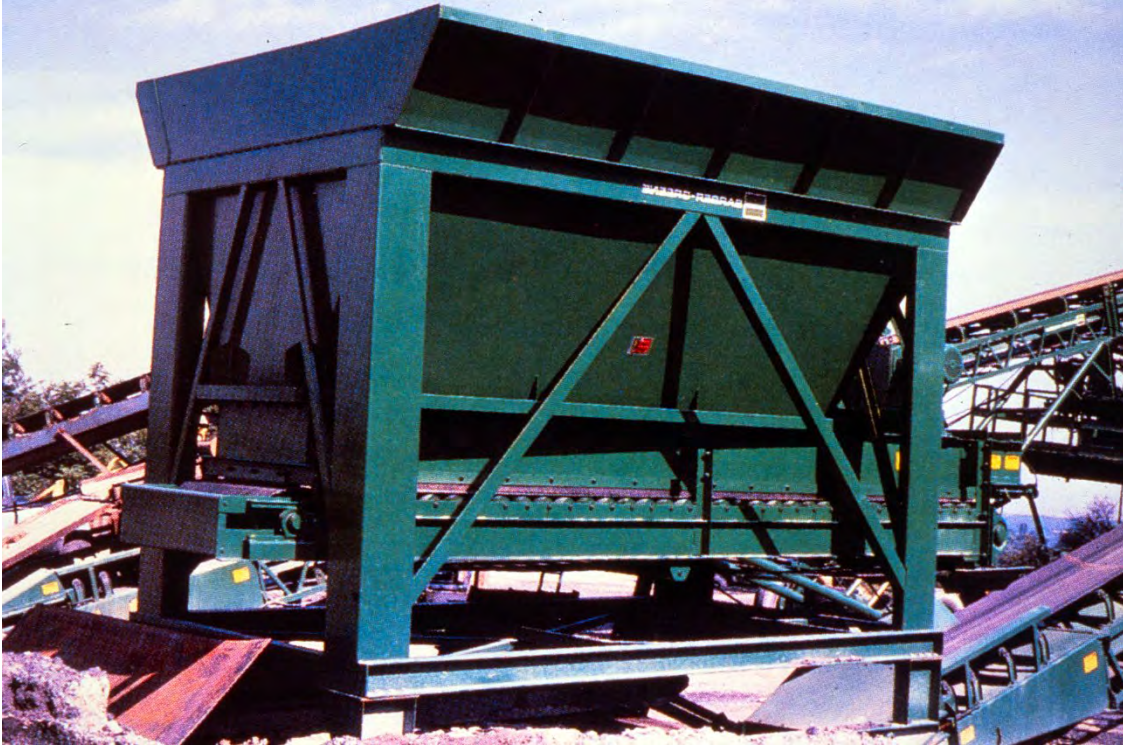
Slide 63. Reclaimed Material Cold Feed Bins



Slide 64



Slide 65



Slide 66



Slide 67



Slide 68



Slide 69



Slide 70

RECLAIMED MATERIAL ENTRY

Slide 71. Reclaimed Material Entry

RECLAIMED MATERIAL COLD FEED

- **Reclaimed material – New aggregate**
 - Inclined chute
 - Slinger belt
- **Split feed**
 - New aggregate-at burner
 - Reclaimed material-drum mid point

Slide 72. Reclaimed Material Cold Feed



Slide 73



Slide 74



Slide 75



Slide 76

Chapter 5. Asphalt Cement Supply System

ASPHALT CEMENT SUPPLY SYSTEM

Slide 1

ASPHALT SYSTEM

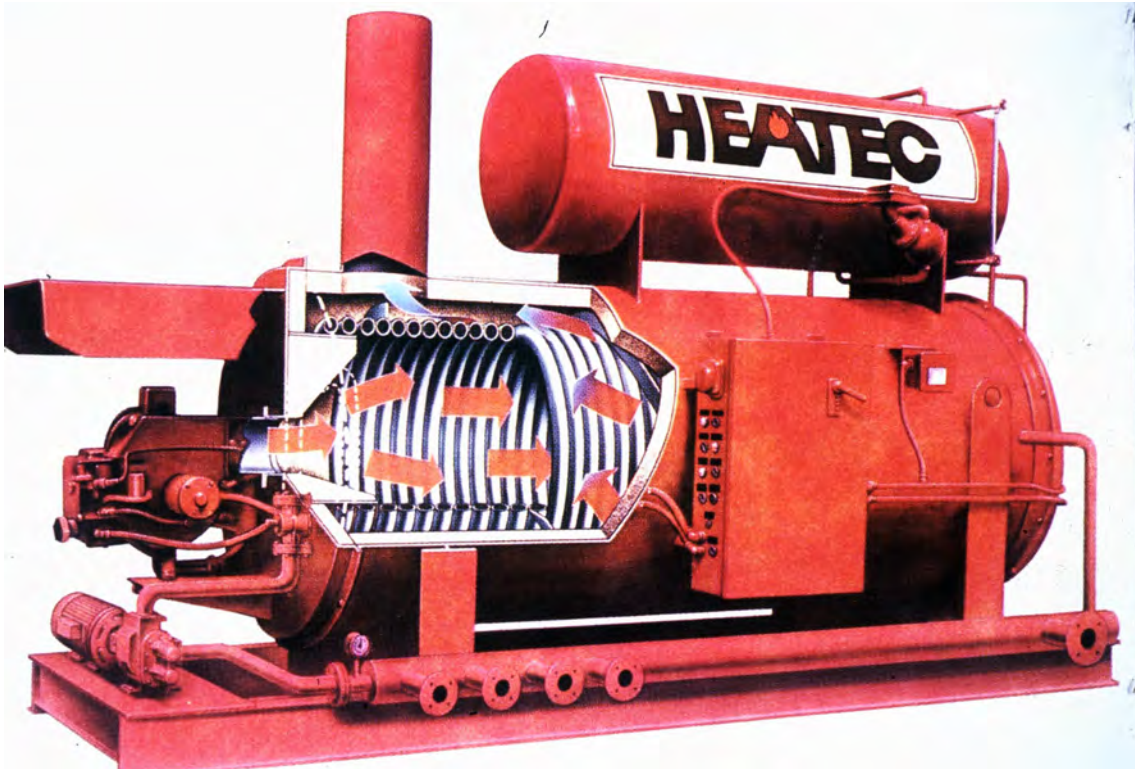
- **Heated Storage Tank**
- **Pump - Meter System**

Slide 2. Asphalt System

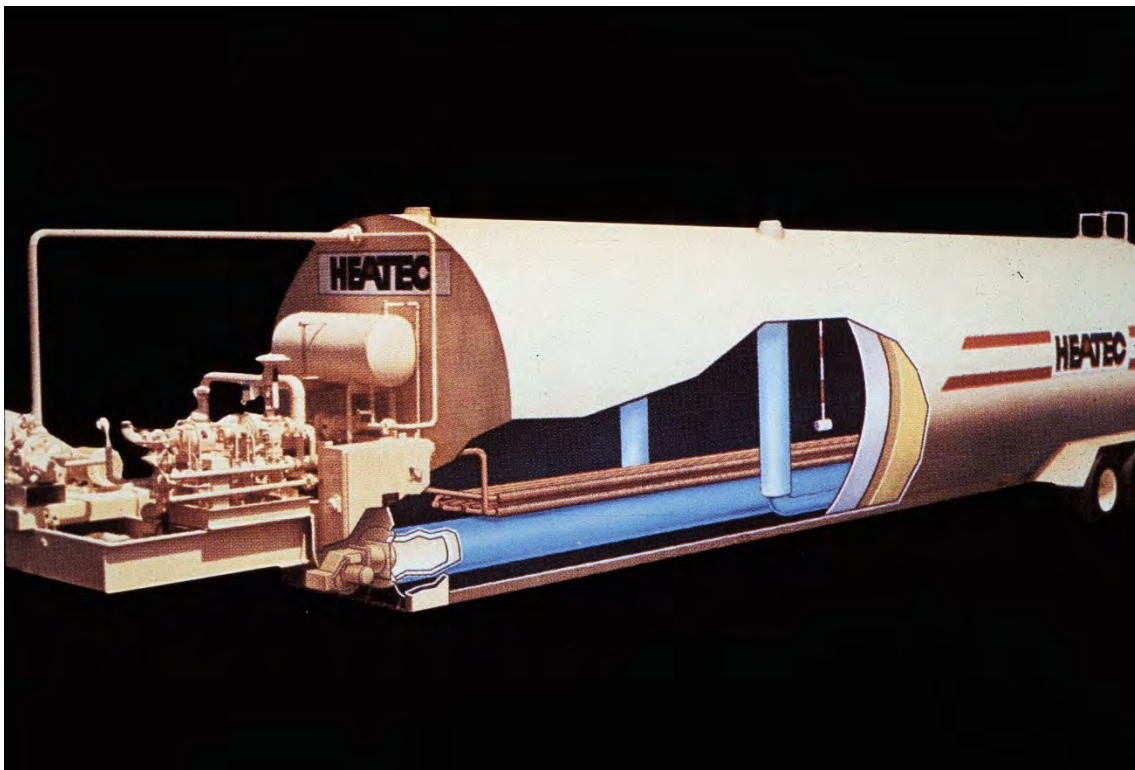
**Most storage tanks
are heated (300-350F)**

- **Hot oil system**
- **Small burner**

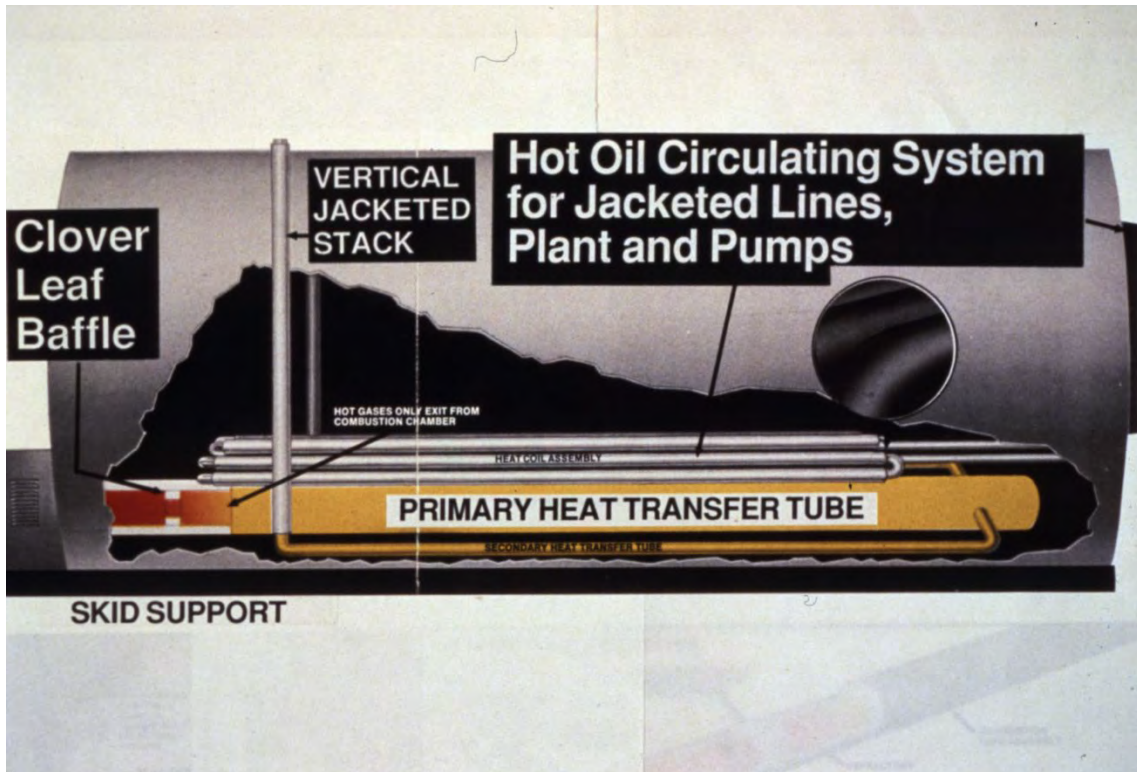
Slide 3



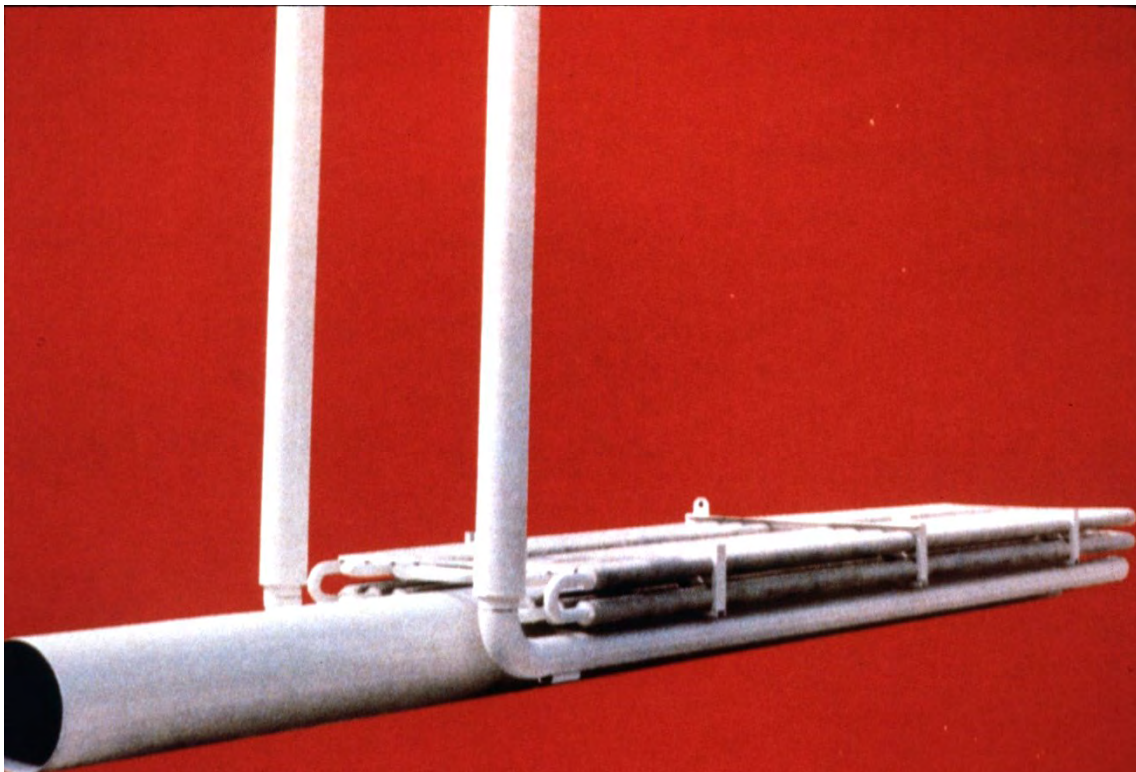
Slide 4



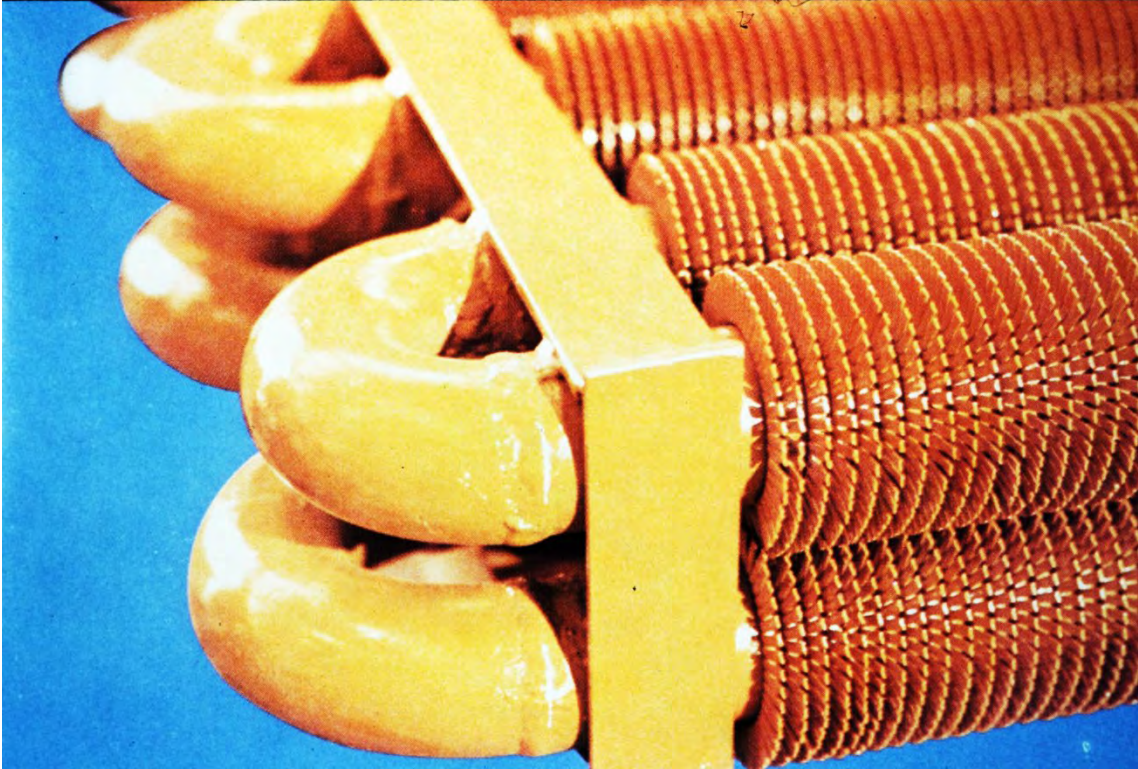
Slide 5



Slide 6



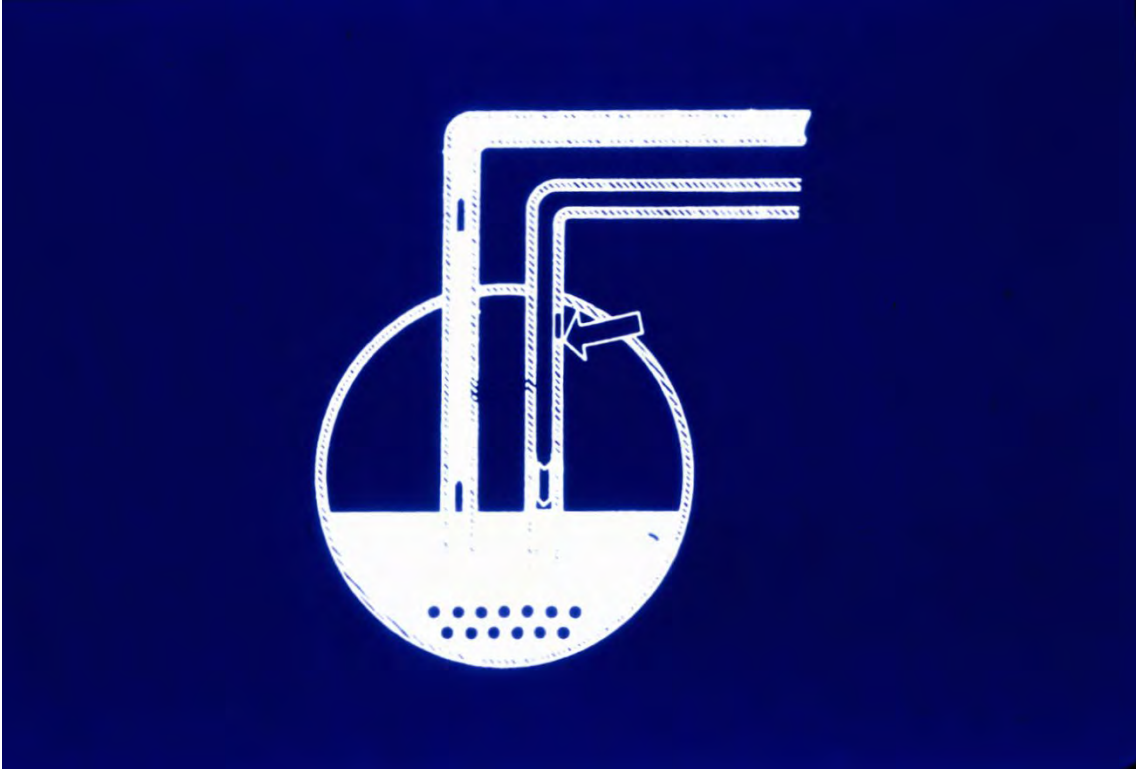
Slide 7



Slide 8

**TANKS SHOULD
BE INSULATED**

Slide 9



Slide 10

TANK CAPACITY

- **Calculated from dimensions**
- **Measured with a "tank stick" and calibration chart**

Slide 11. Tank Capacity

**TANKS CONTAIN A "HEEL"
OF MATERIAL BELOW
HEATING COILS**

Slide 12

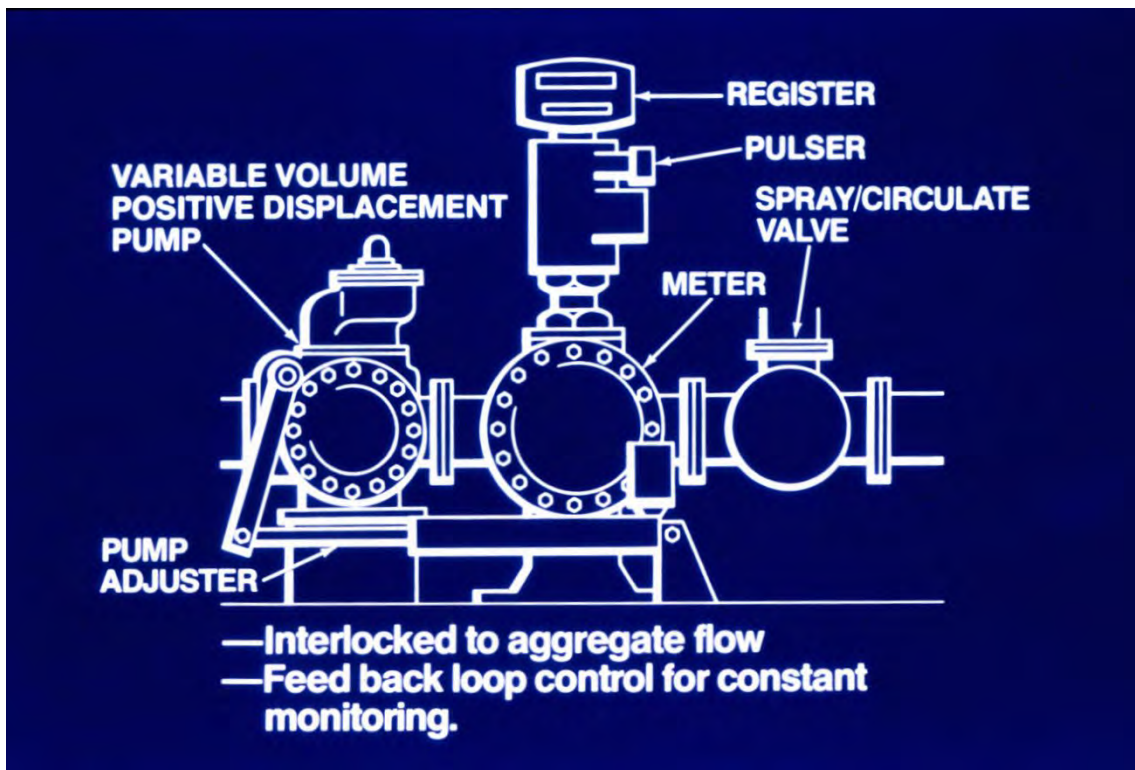
MULTIPLE TANKS

- **Different AC grades**
- **Interconnected**

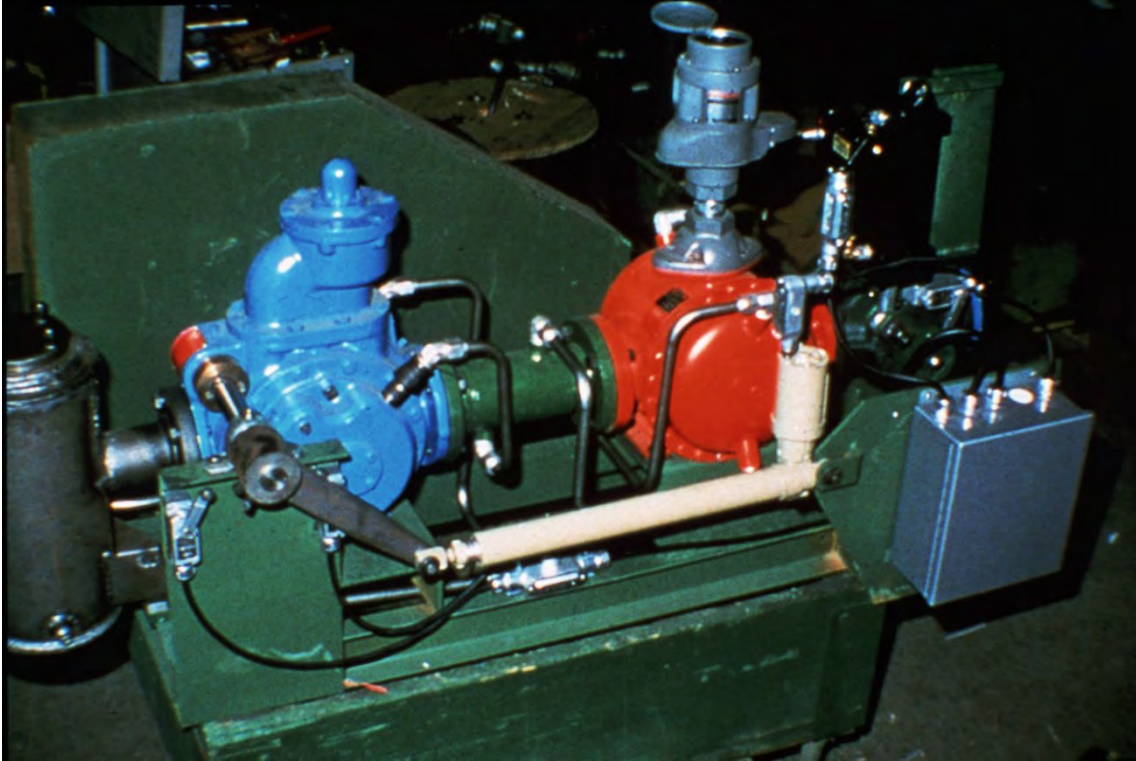
Slide 13. Multiple Tanks

BITUMEN METERING SYSTEM

Slide 14. Bitumen Metering System



Slide 15



Slide 16

**PUMP IS USED TO PULL
ASPHALT CEMENT
FROM TANK**

Slide 17

PUMP SYSTEMS

- **Variable volume pump with constant speed motor**
- **Fixed displacement pump with constant speed motor**
- **Constant volume pump with constant speed motor**

Slide 18. Pump Systems

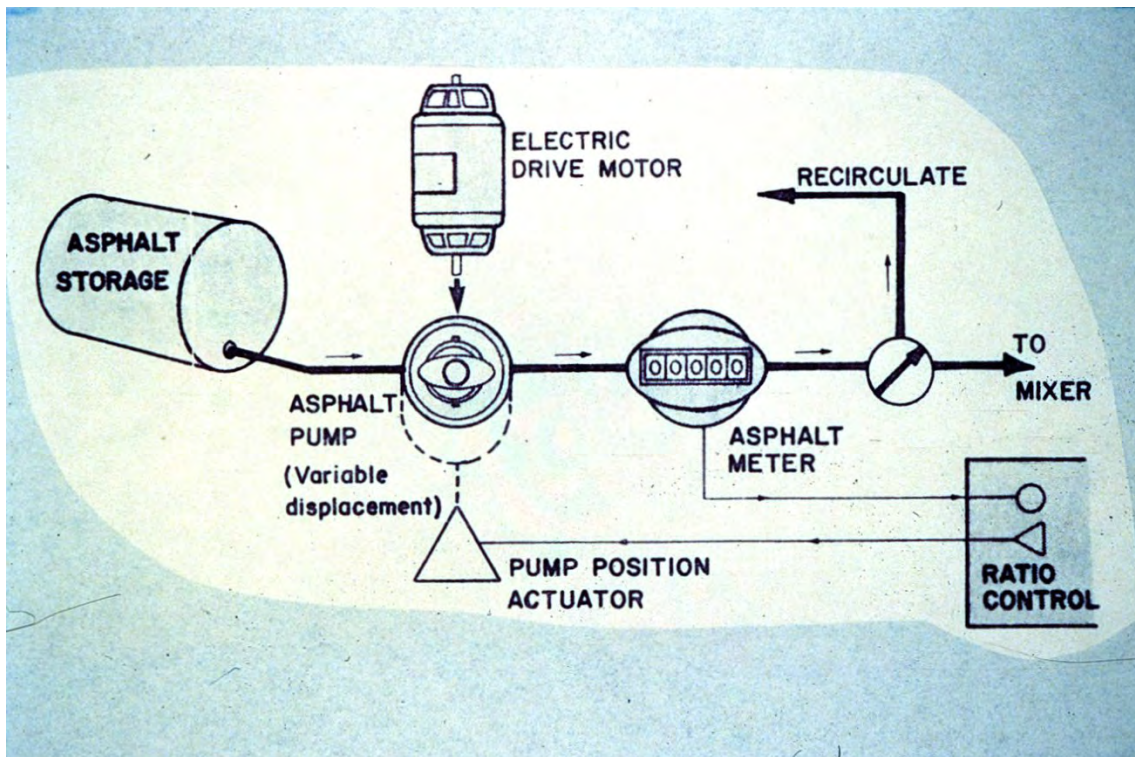
METERS INCLUDE

- **Manual control for specific gravity-temperature**
- **Temperature compensating device**

Slide 19. Meters Include

VOLUME OF ASPHALT CEMENT STANDARDIZED AT 60F

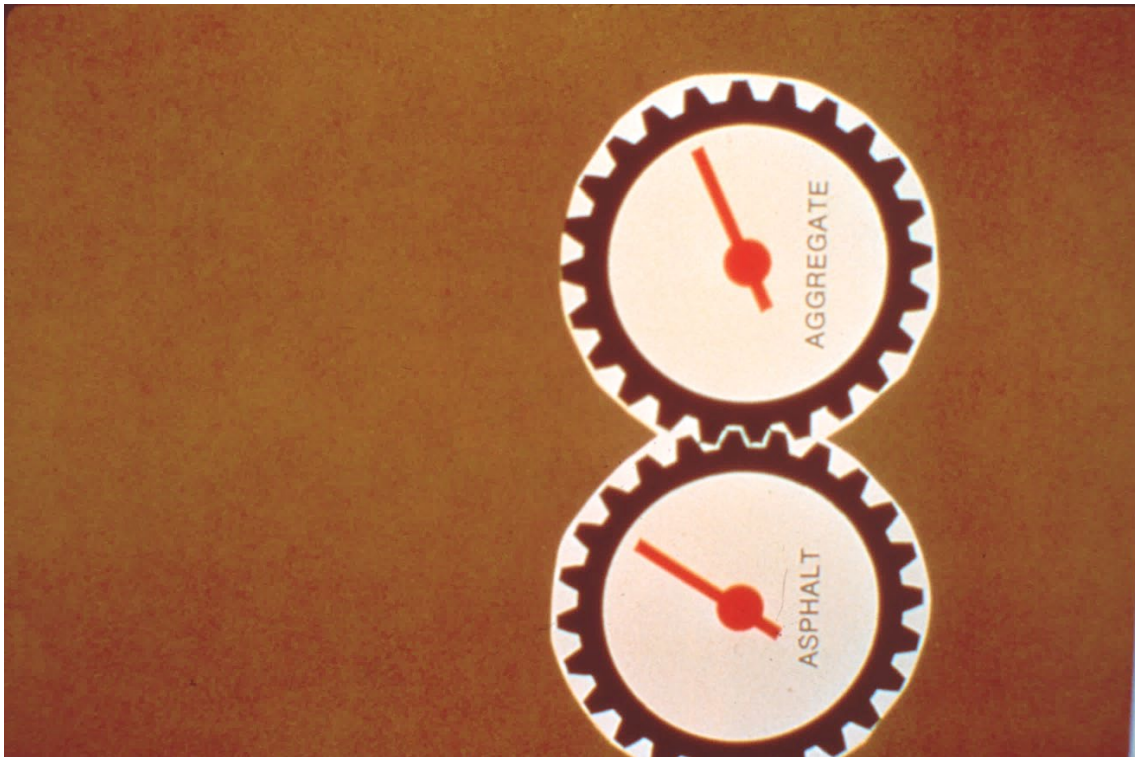
Slide 20



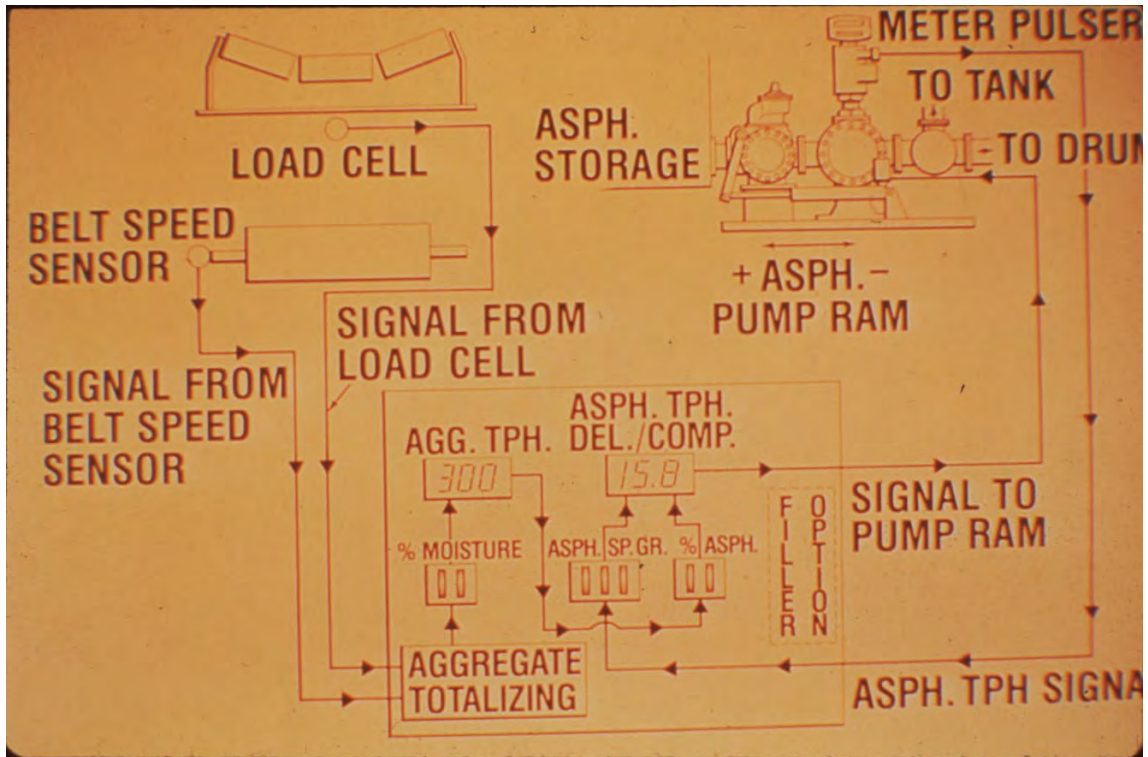
Slide 21

AGGREGATE-BITUMEN BLENDING SYSTEM

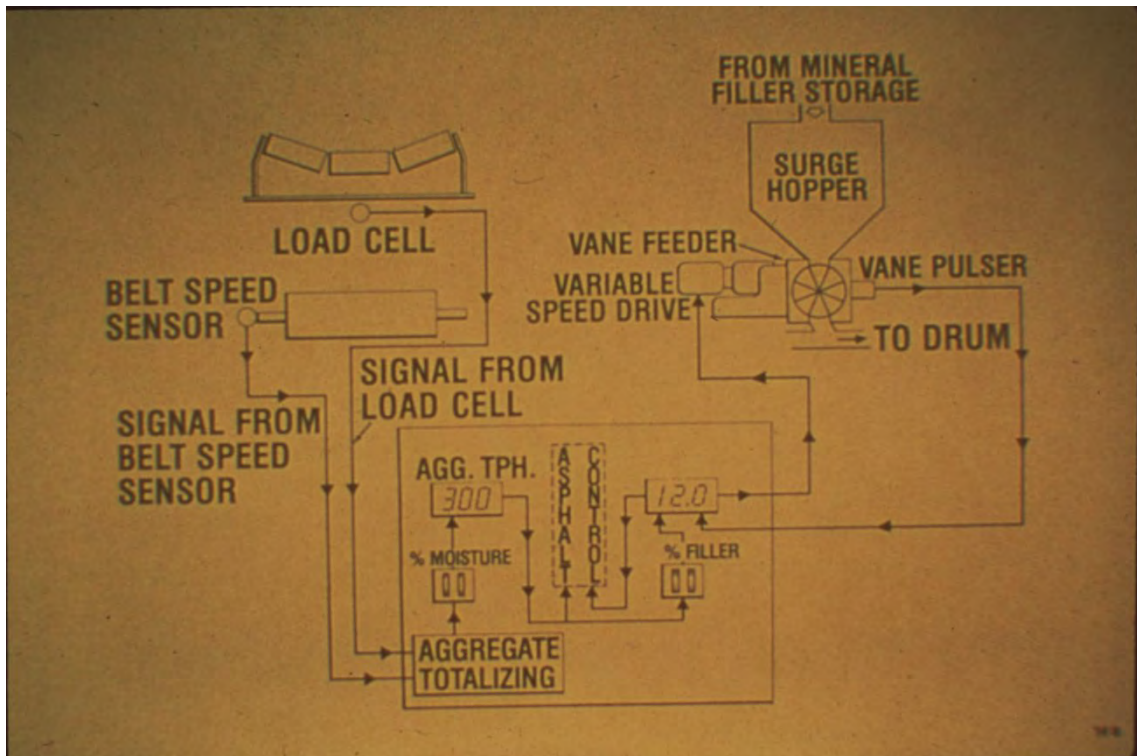
Slide 22. Aggregate-Bitumen Blending System



Slide 23



Slide 24



Slide 25

Chapter 6. Plant Calibration



PLANT CALIBRATION

Slide 1

INCLINED CONVEYOR CONTAINS

- **Weigh idler**
- **Belt speed sensor**

Slide 2. Inclined Conveyor Contains



Slide 3



Slide 4

TWO COLD FEED SYSTEMS

- **Variable Gate Opening-
Fixed Belt Speed**
- **Constant Gate Opening-
Variable Belt Speed**

Slide 5. Two Cold Feed Systems

CONSTANT OPENING- VARIABLE SPEED

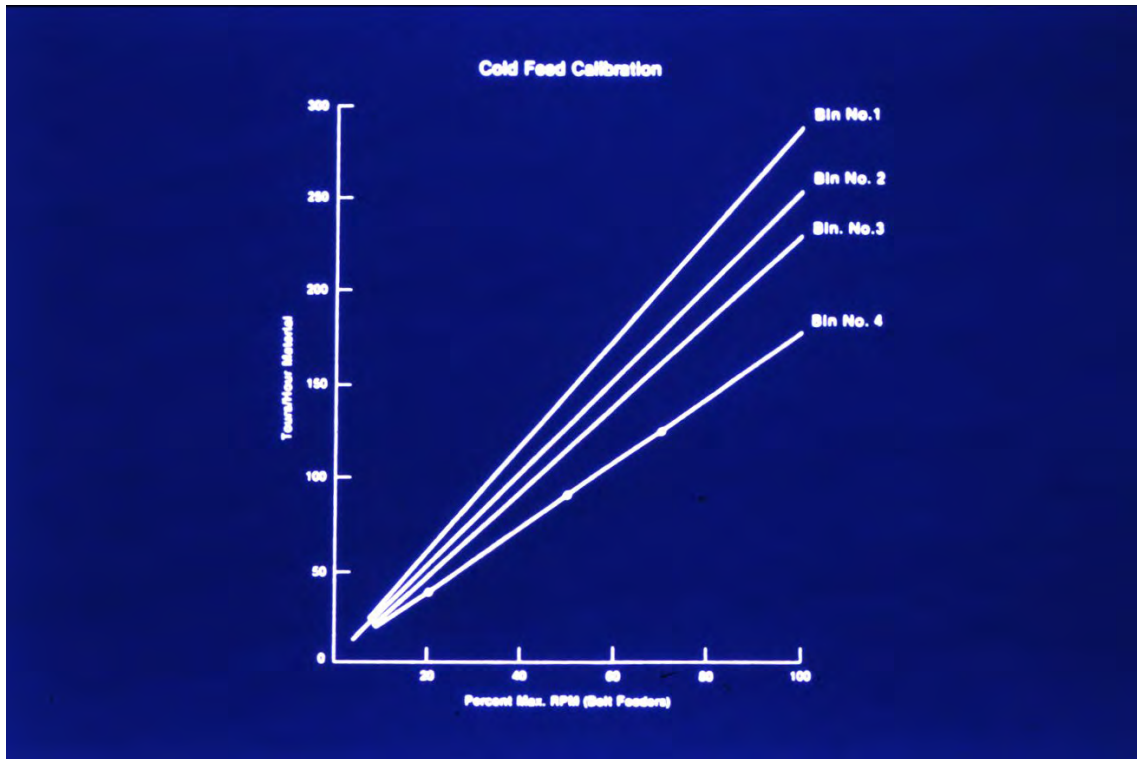
- **Most common on new plants**

Slide 6. Constant Opening-Variable Speed

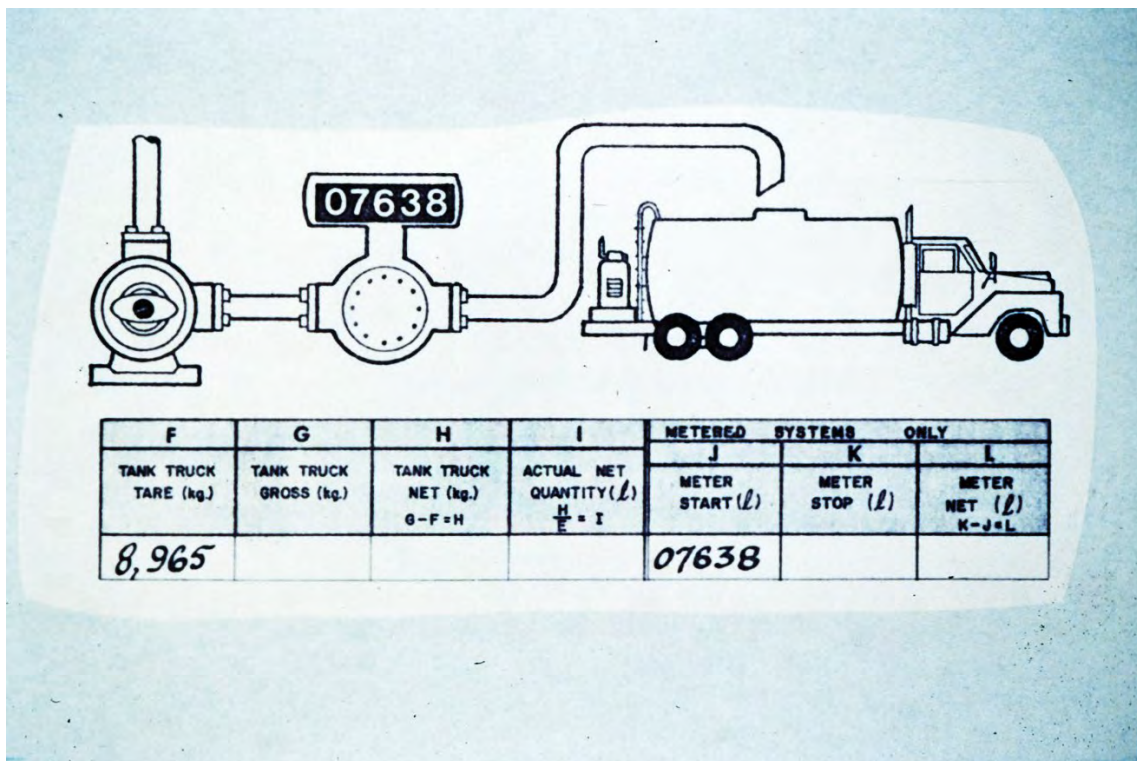
BELT FEEDERS

- **Operates between 20 and 80% of maximum speed**
- **Gate set to operate at 50% of maximum speed**

Slide 7. Belt Feeders



Slide 8. Cold Feed Calibration [Graph]



Slide 9

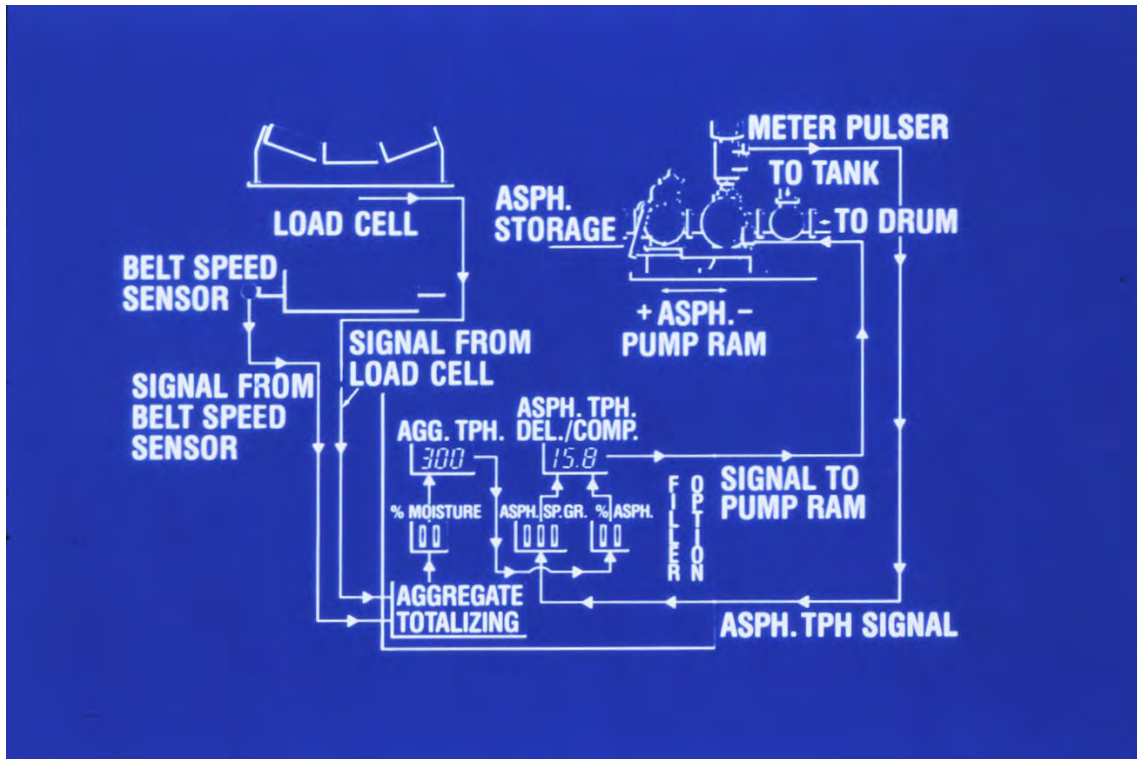
VOLUME OF ASPHALT CEMENT STANDARDIZED AT 60F

Slide 10

METERS INCLUDE

- **Manual control for specific gravity-temperature**
- **Temperature compensating device**

Slide 11. Meters Include



Slide 12

The presentation binder did not include a Slide 13.

SCALE TOLERANCES

Slide 14. Scale Tolerances

0.4% TOLERANCE

- Belt scale
- Truck scale

Slide 15. 0.4% Tolerance

TRUCK SCALE TOLERANCE FOR LOADED TRUCK

Slide 16. Truck Scale Tolerance for Loaded Truck

**FOR 0.4% TOLERANCE
ON 20,000 lbs**

- **Range 19,920 lbs to 20,080 lbs**
- **Difference of 160 lbs**

Slide 17. For 0.4% Tolerance on 20,000 lbs

**BELT SCALE SHOULD
HAVE 0.4% TOLERANCE**

Slide 18

**SAME RANGE AS
TRUCK SCALE
19,920 lbs TO 20,080 lbs**

Slide 19

SUPPOSE
on a 20,000 lb sample

- **Truck scale = 20,080 lbs**
- **Belt scale = 19,920 lbs**

Slide 20. Suppose on a 20,000 lb Sample

**ASSUMING TRUCK SCALE
ABSOLUTELY CORRECT
 $20,000 \text{ lbs} - 19,920 \text{ lbs} = 160 \text{ lbs}$**

Slide 21

$$\frac{160 \text{ lbs}}{20,080 \text{ lbs}} \times 100\% = 0.8\%$$

Slide 22

SOLUTION

- **Use 0.8% of truck scale**
- **Allow 0.4% on limits of truck scale**

Slide 23. Solution

Chapter 7. Drum Mixer



Slide 1

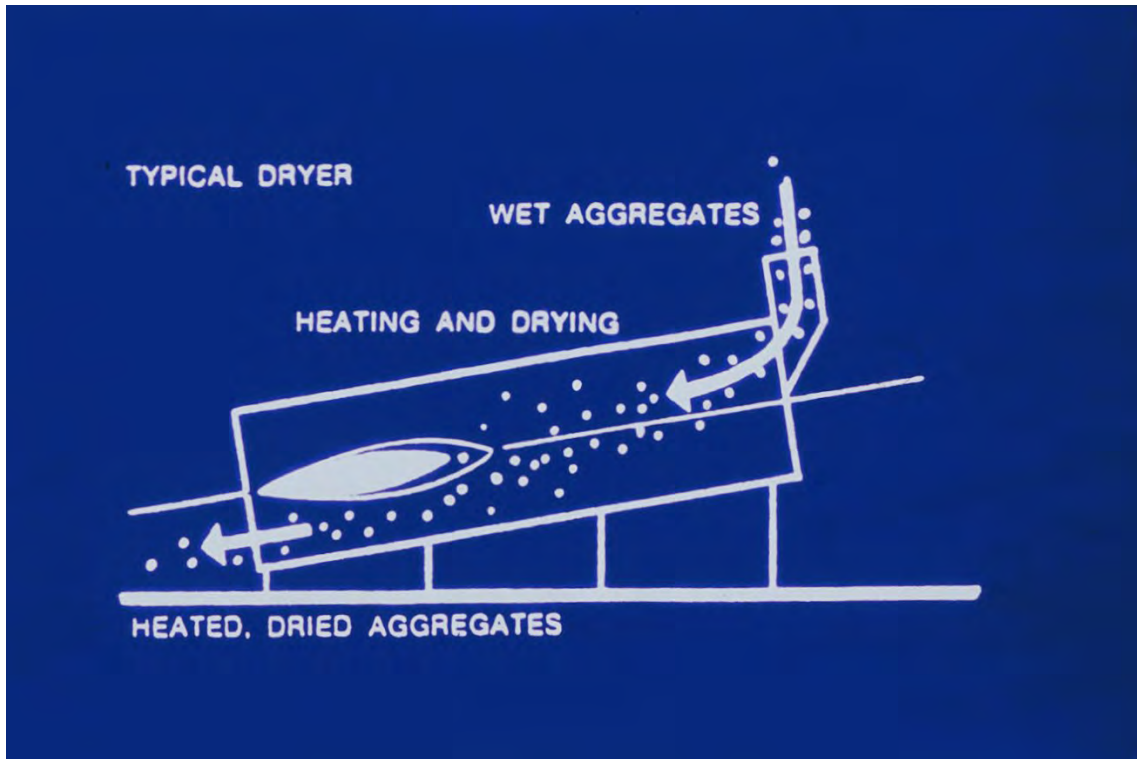
the mixing process

Slide 2. The Mixing Process

COUNTER FLOW PROCESS

- **Drier gases move in opposite direction of aggregate**

Slide 3. Counter Flow Process

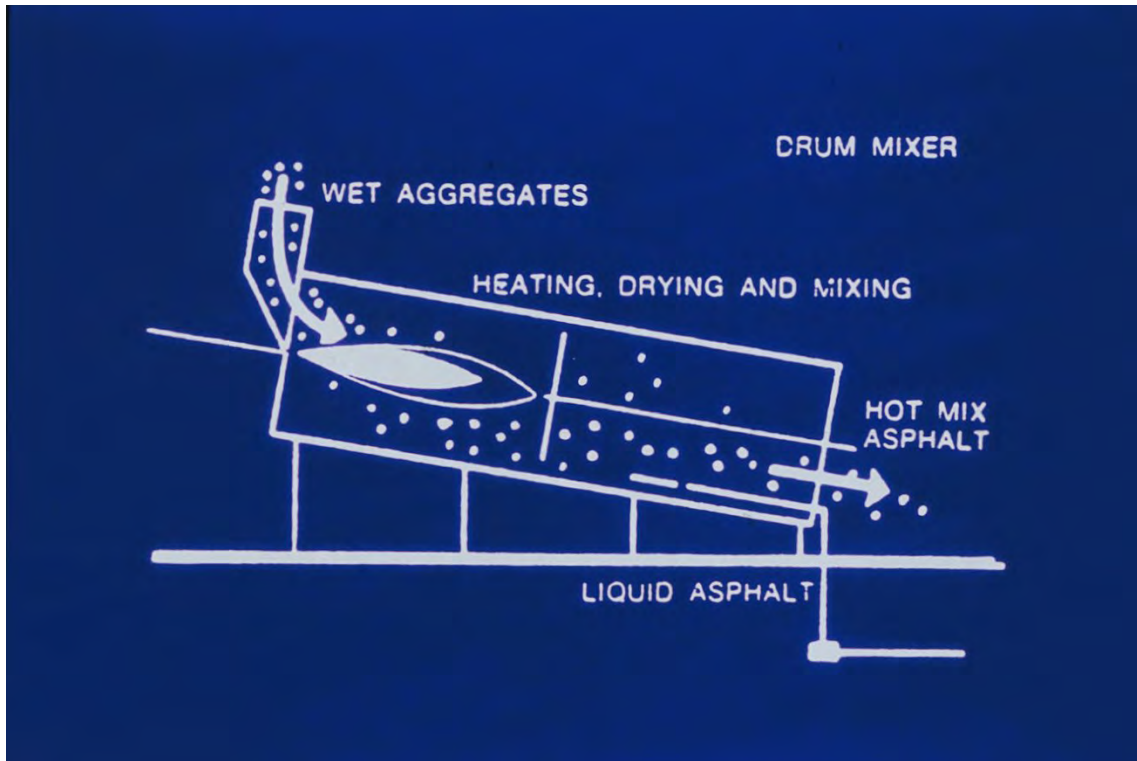


Slide 4. Typical Dryer

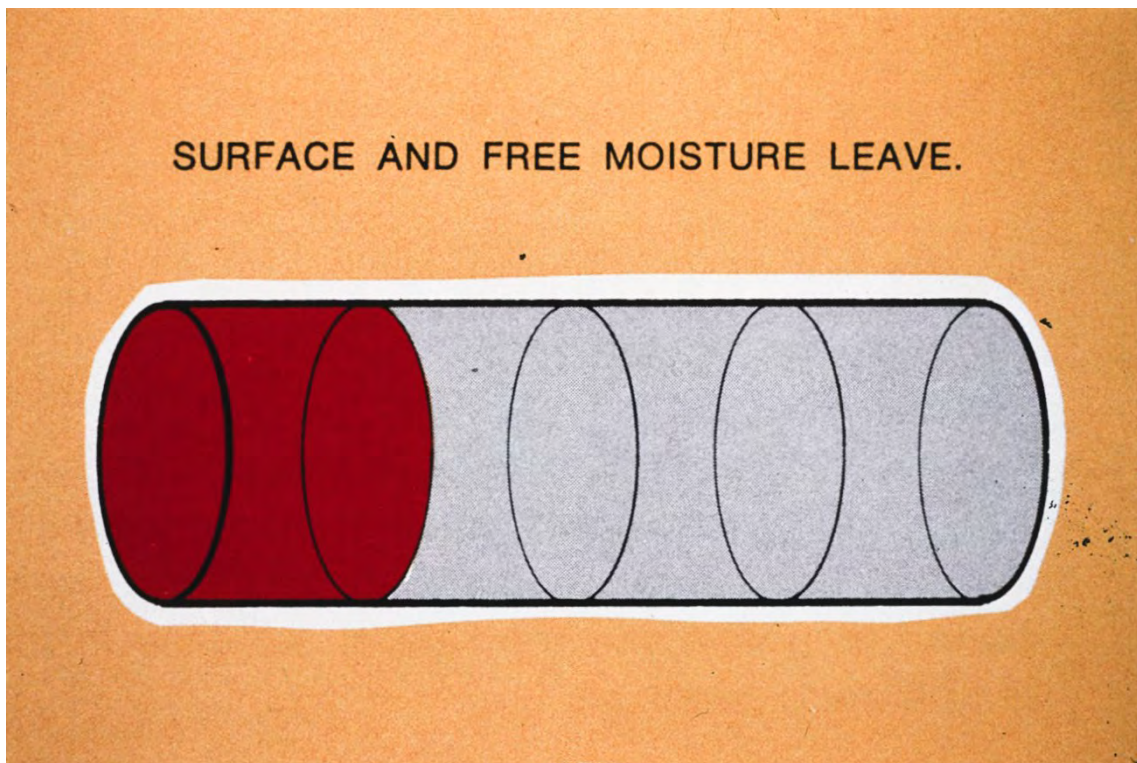
PARALLEL FLOW PROCESS

- Drum gases move in direction of aggregate

Slide 5. Parallel Flow Process

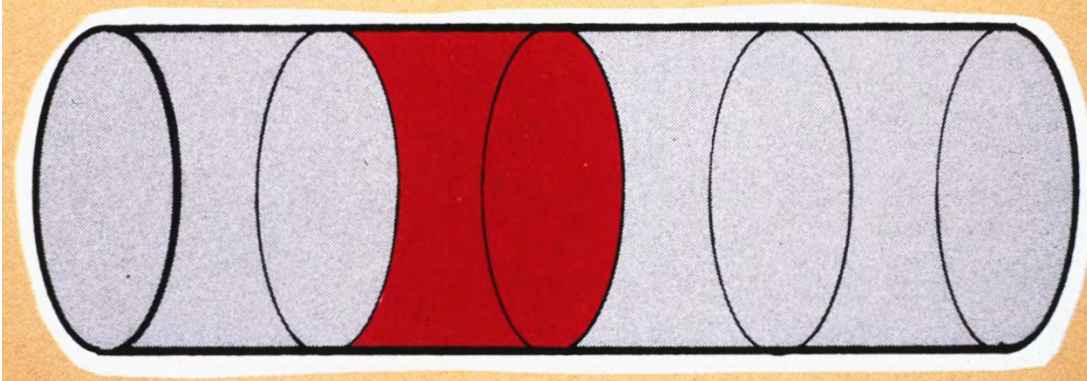


Slide 6. Drum Mixer



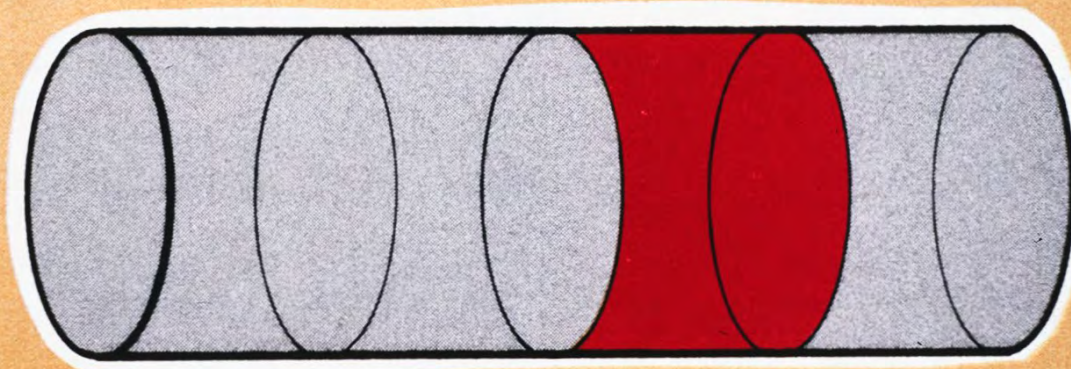
Slide 7. Surface and Free Moisture Leave

MAJOR HEAT RISE.



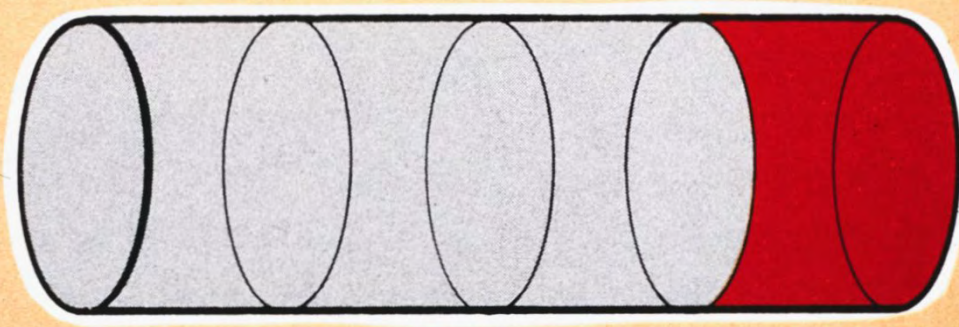
Slide 8. Major Heat Rise

ASPHALT INTRODUCTION AND COATING.

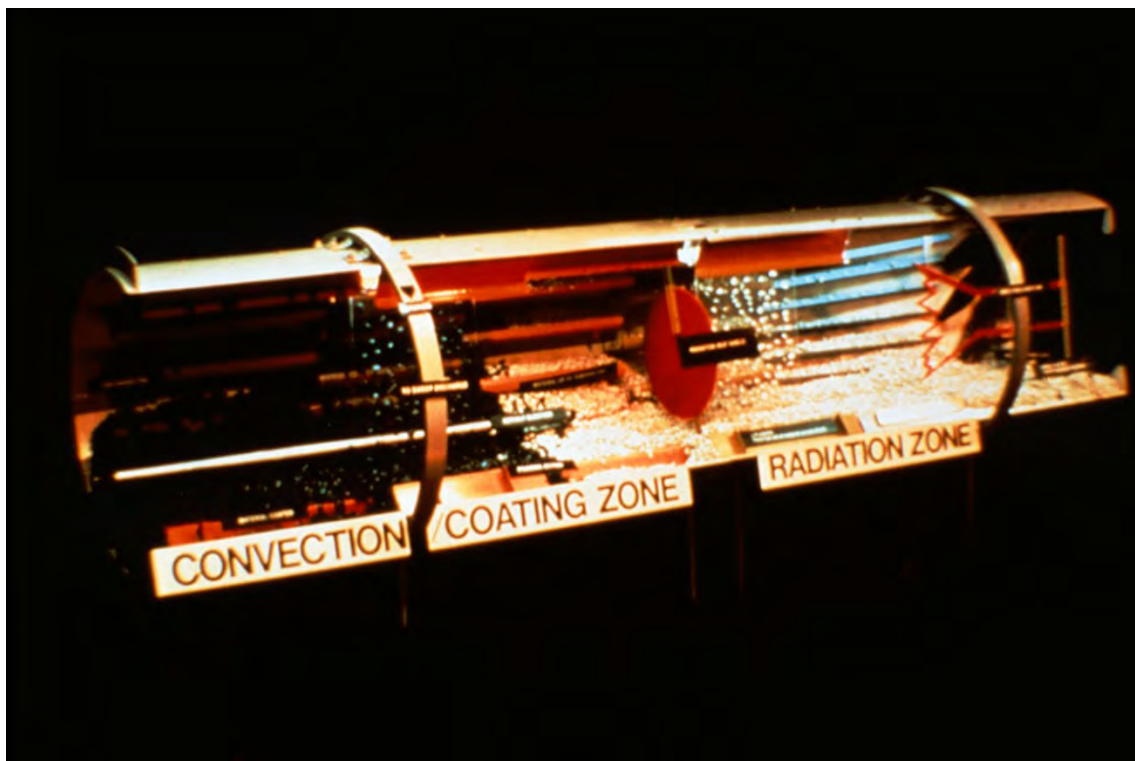


Slide 9. Asphalt Introduction and Coating

MIX COMPLETED, FINAL TEMPERATURE LEVEL ACHIEVED.



Slide 10. Mix Completed, Final Temperature Level Achieved



Slide 11



Slide 12

BURNER

- **Upper end of drum**
- **Drum Flame - short and bushy**
- **Drier Flame - long and thin**

Slide 13. Burner



Slide 14



Slide 15

FUELS

- **Gaseous**
- **Liquid**
- **Solid**

Slide 16. Fuels

GASEOUS FUELS

- **Natural Gas**
- **Vaporized LPG**

Slide 17. Gaseous Fuels

LIQUID FUELS

- **Propane**
- **Butane**
- **LPG**
- **Slurried Coal**
- **#2 Fuel Oil**
- **#4 to #6 Heavy Fuel Oil**
- **Waste Oil**

Slide 18. Liquid Fuels

SOLID FUELS

- **Pulverized Coal**
- **Pelletized Biomass**
- **Sewage Sludge**

Slide 19. Solid Fuels



Slide 20



Slide 21



Slide 22

FORCED DRAFT BURNER

Air supplied by pressure blower

Slide 23. Forced Draft Burner

INDUCED DRAFT BURNER

Air pulled by exhaust fan

Slide 24. Induced Draft Burner

BURNER RATING CRITERIA

- 25% excess air
- 5% leakage air
- 10% casing loss
- 350F fan gas temp.
- 5% aggregate moisture
- 300F discharge temp.
- #2 fuel
- Aggregate specific heat = 0.2

Slide 25. Burner Rating Criteria

ABILITY TO HEAT AND DRY

- Volume of air
- Mix discharge temp.
- Stack temp.
- Amount excess air
- Draft system leaks
- Incomplete fuel combustion

Slide 26. Ability to Heat and Dry

NEW AGGREGATE ENTRY

- **Inclined chute**
- **Slinger conveyor**

Slide 27. New Aggregate Entry

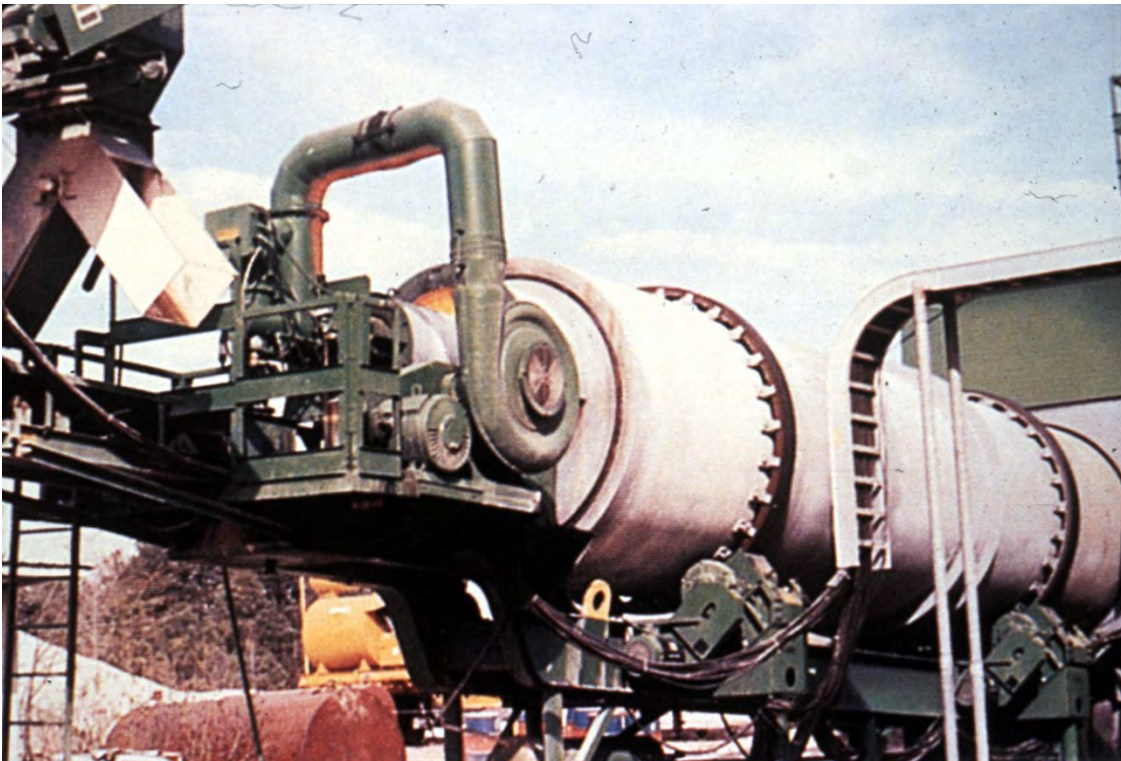
INCLINED CHUTE

- **Sloped chute above burner**
- **Angled to slide aggregate away from burner**

Slide 28. Inclined Chute



Slide 29



Slide 30

SLINGER CONVEYOR

- Conveyor beneath burner
- Conveyor speed can be varied

Slide 31. Slinger Conveyor



Slide 32



Slide 33



Slide 34

- **AGGREGATES MOVE BY GRAVITY**
- **TIME 3-4 MINUTES**
 - Length and Slope -Rotation Speed
 - Flight Design -Production Rate
 - Aggregate Size

Slide 35. Aggregates Move by Gravity



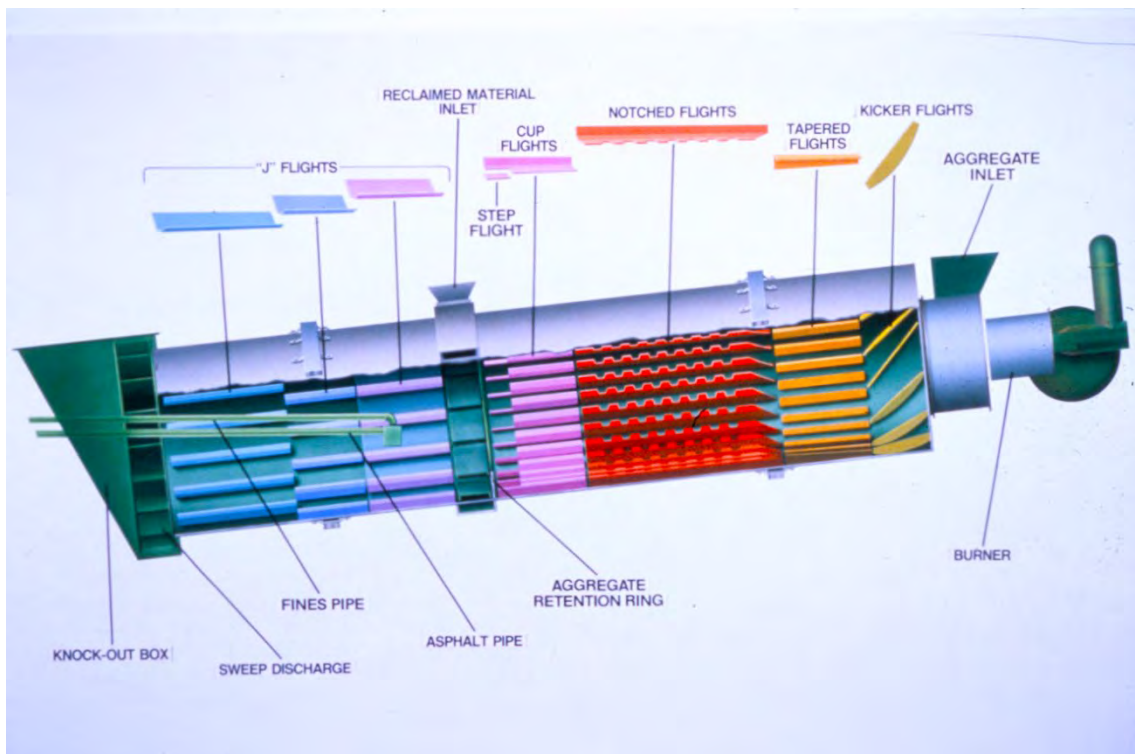
Slide 36. Special Flight Design

FLIGHT DESIGN

Varies with time and manufacture

- **Pattern**
- **Number**
- **Shape**
- **Location**

Slide 37. Flight Design

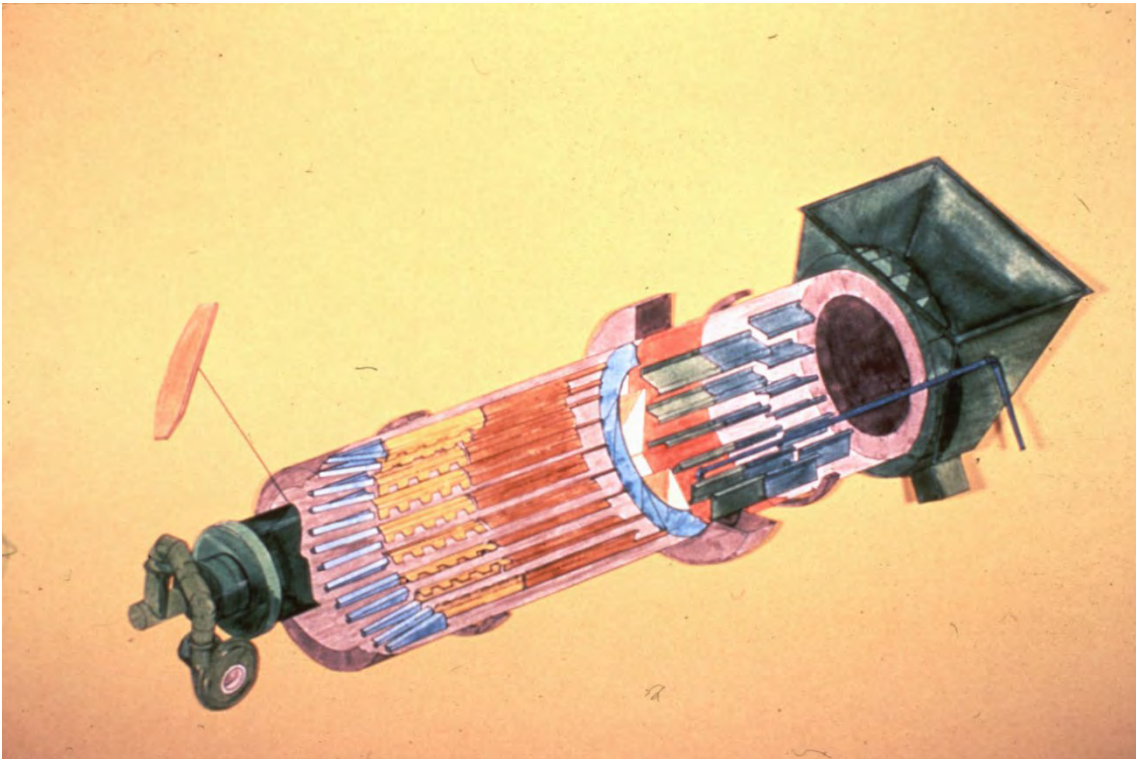


Slide 38

KICKER FLIGHTS

- **First flights**
- **Move aggregate away from burner**
- **No tumbling**
- **Allows flame to expand**

Slide 39. Kicker Flights

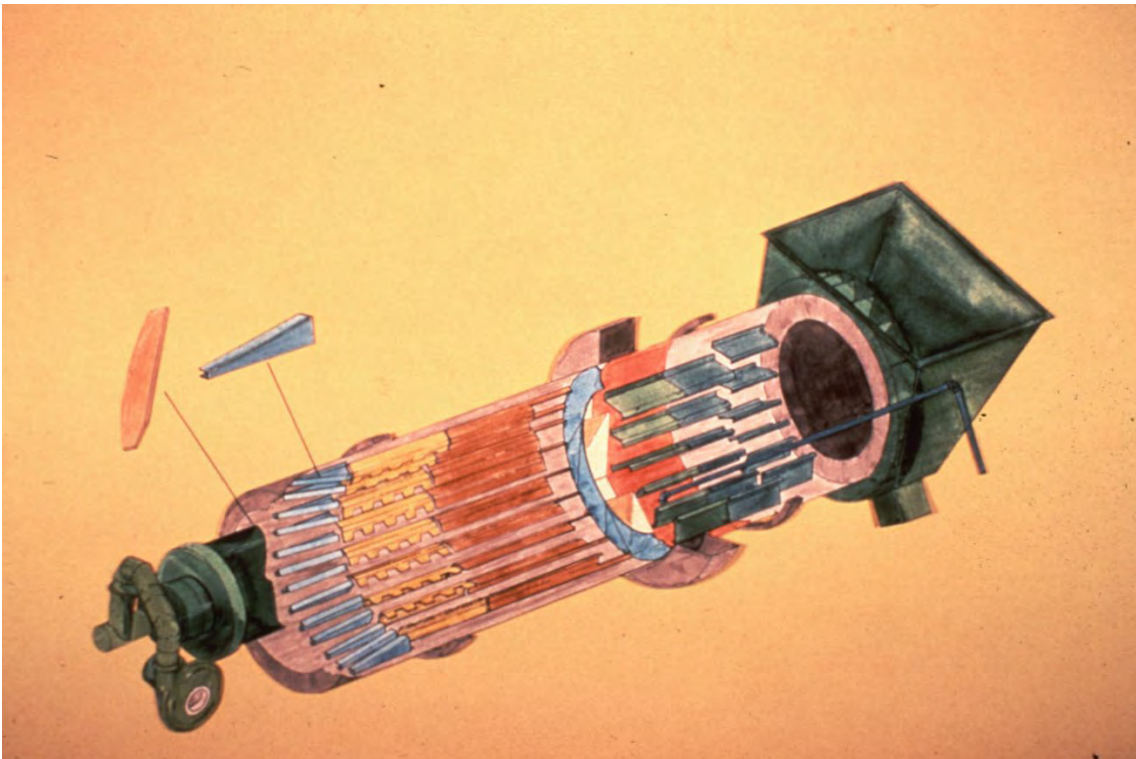


Slide 40

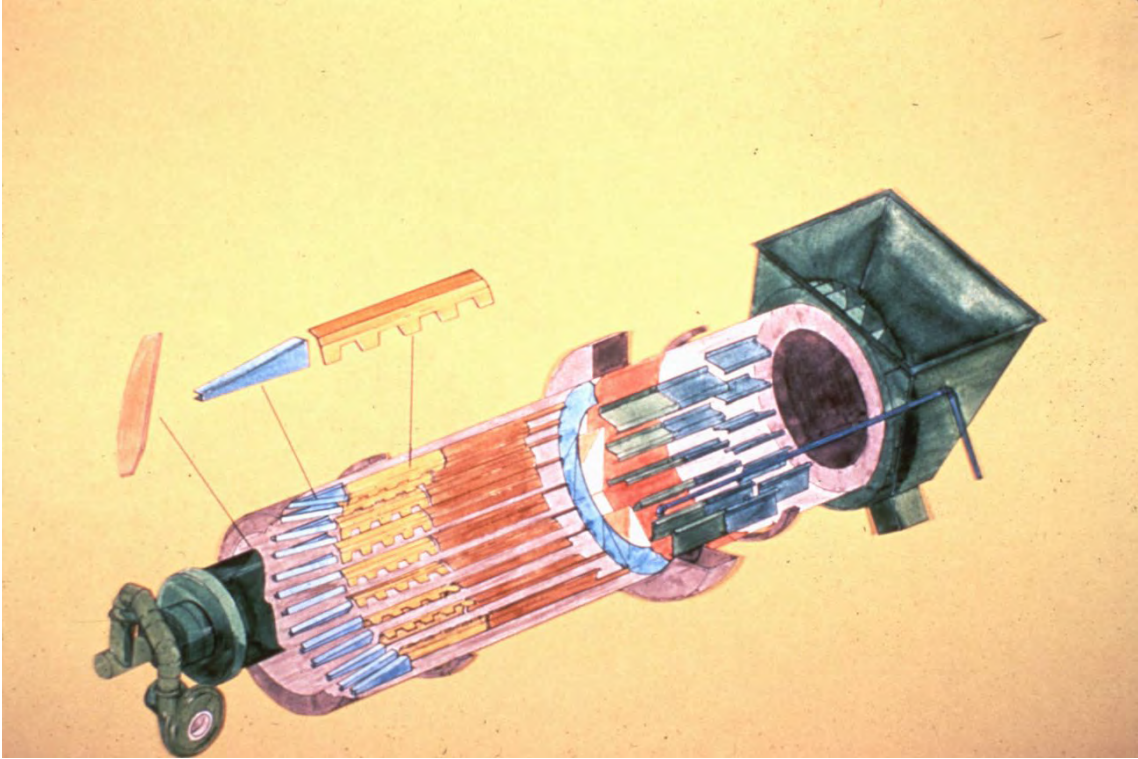
LIFTING FLIGHTS

- Second group
- Cup, notched, tapered
- Start to lift aggregate
- Begin cascading action
- Veil created at quarter point

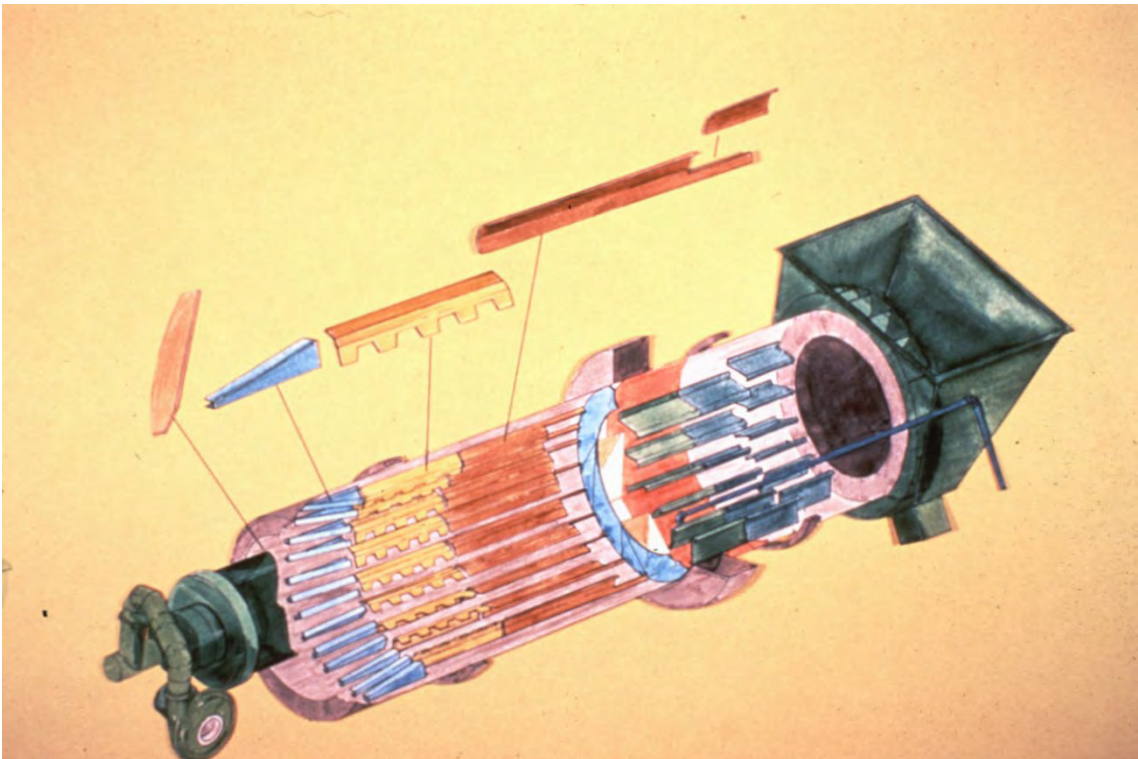
Slide 41. Lifting Flights



Slide 42



Slide 43

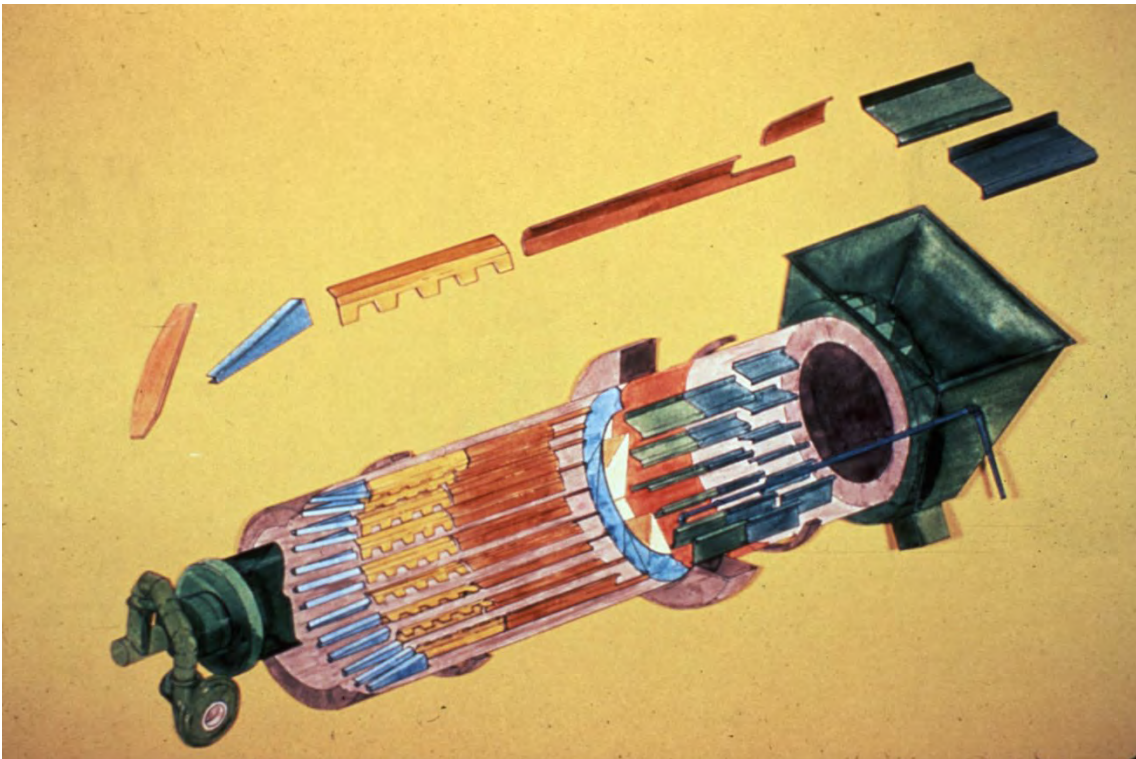


Slide 44

MIXING "J" FLIGHTS

- Beyond middle of drum
- Tumble aggregates-
asphalt cement
- Cascade mixture
through exhaust gases

Slide 45. Mixing "J" Flights



Slide 46

DISCHARGE FLIGHTS

- **Before discharge chute**
- **Changes direction of flow**
- **Shape and angle depend on side or end discharge**

Slide 47. Discharge Flights

VEIL

- **Barrier for exhaust gases**
- **A dense veil across drum is more efficient**

Slide 48. Veil

DEVICES TO RETARD FLOW

- **Drum midpoint**
- **"Donut" -retention ring, dam reduces drum diameter**
- **Kicker Flights -intercept, turn aggregate upstream**
- **Creates heavier denser veil**

Slide 49. Devices to Retard Flow



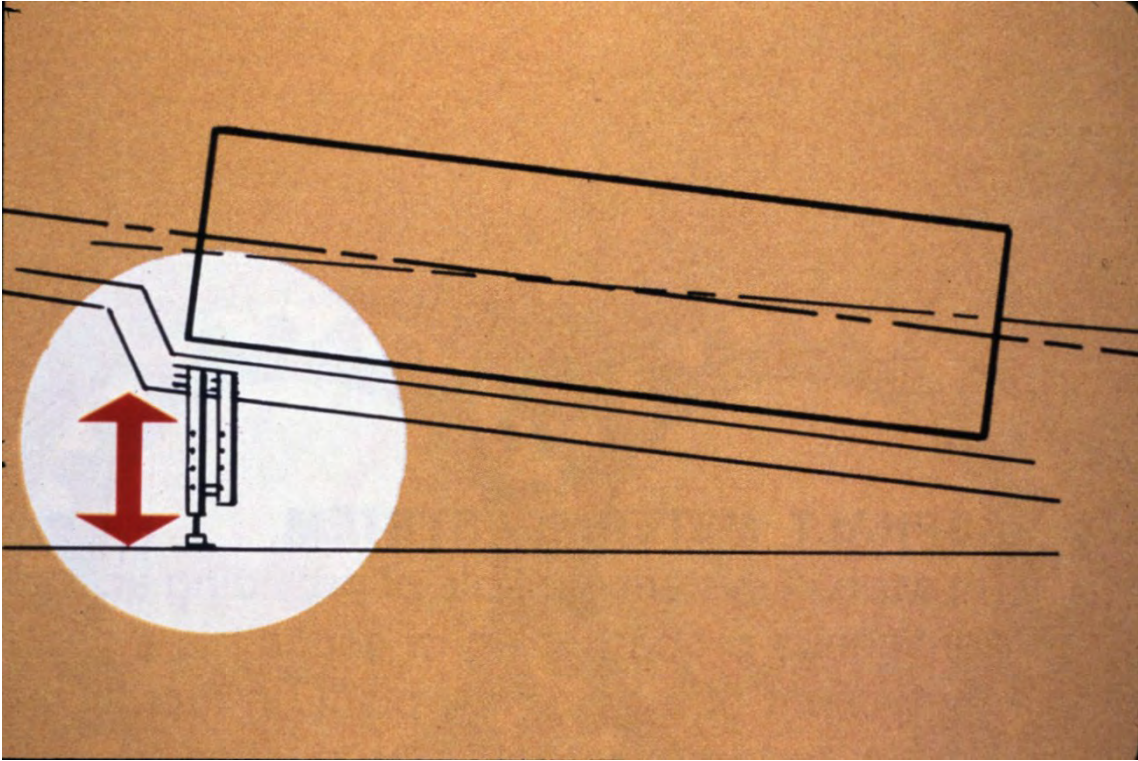
Slide 50



Slide 51



Slide 52



Slide 53



Slide 54



Slide 55



Slide 56



Slide 57



Slide 58



Slide 59



Slide 60



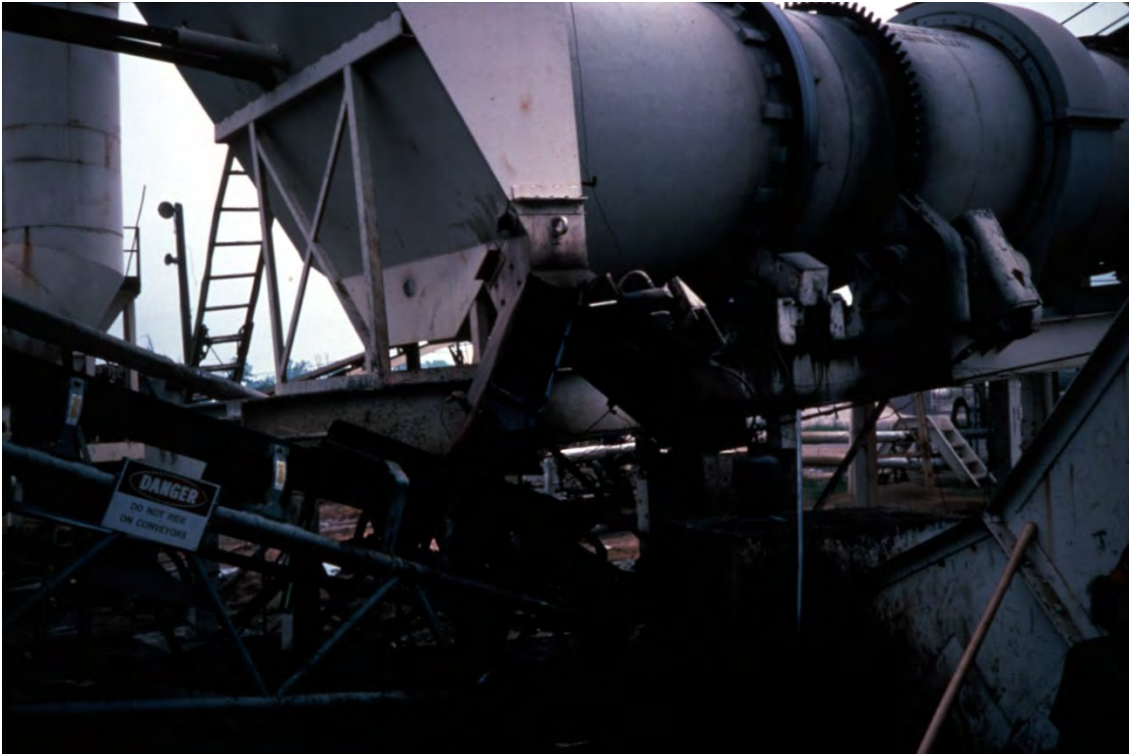
Slide 61



Slide 62



Slide 63



Slide 64



Slide 65

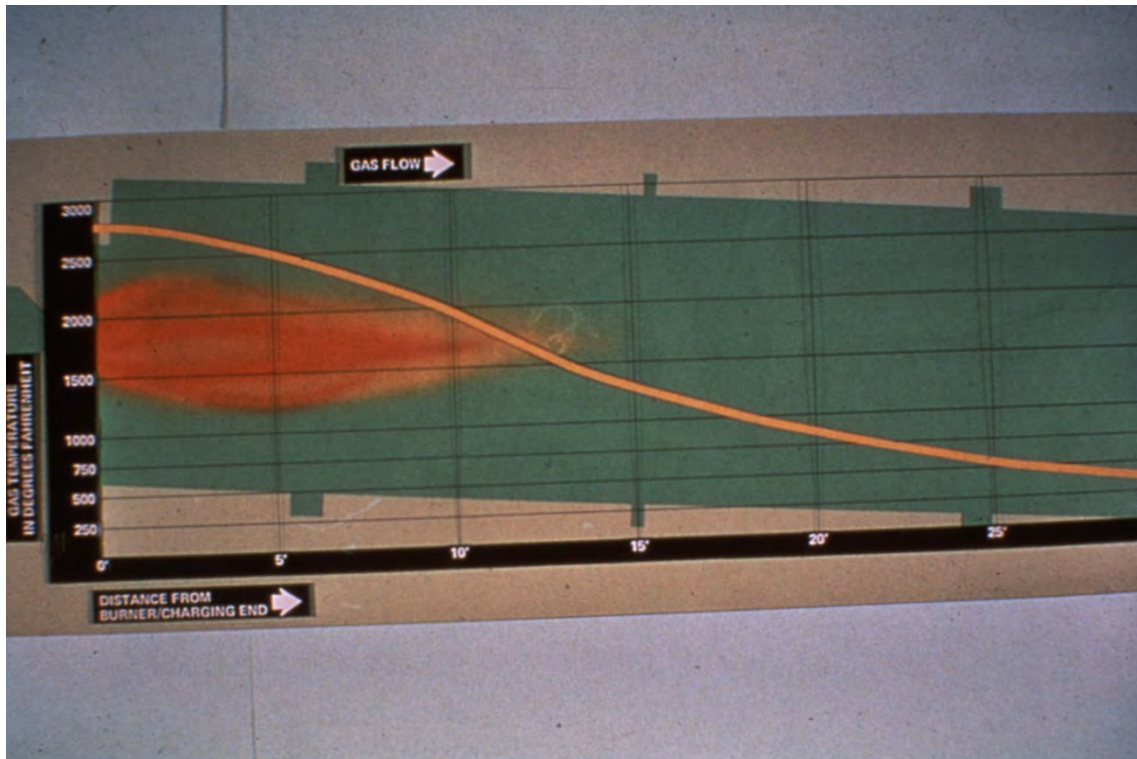
TEMPERATURE PROFILE

- **Burner Flame > 2500F**
- **Exhaust gases 300-350F**

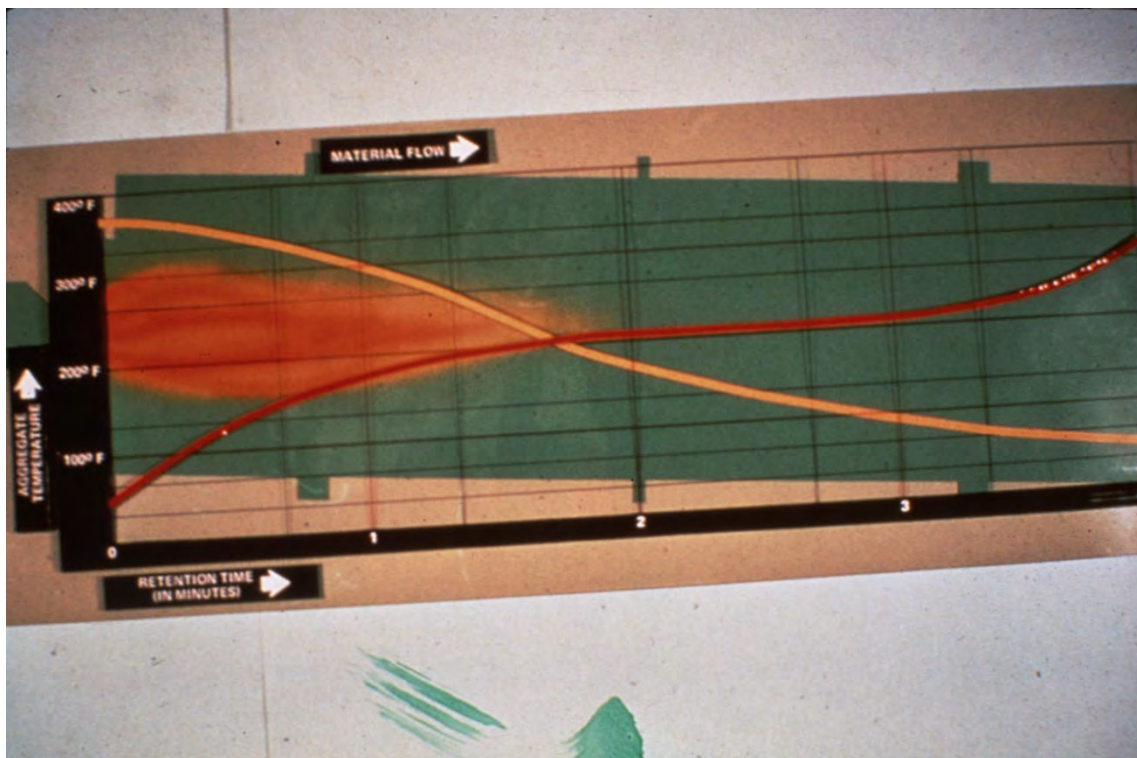
Slide 66. Temperature Profile

**TEMPERATURE DIFFERENTIAL
REPRESENTS HEATING AND
DRYING AGGREGATE**

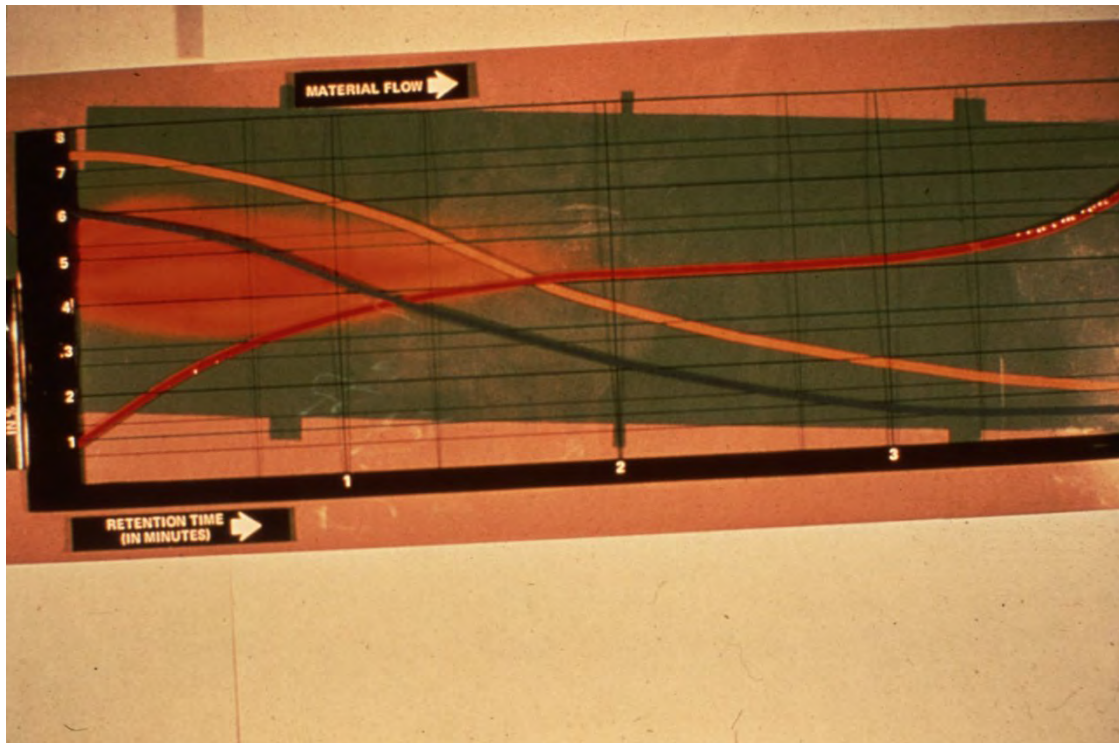
Slide 67. Temperature Differential Represents Heating and Drying Aggregate



Slide 68



Slide 69



Slide 70



Slide 71

**STACK TEMPERATURE MINUS
MIX TEMPERATURE $\leq$ 20F**

Slide 72. Stack Temperature Minus Mix Temperature $\leq$ 20F

**DRUM MIXERS COAT THE
AGGREGATE WITH ASPHALT**

Slide 73. Drum Mixers Coats the Aggregate with Asphalt

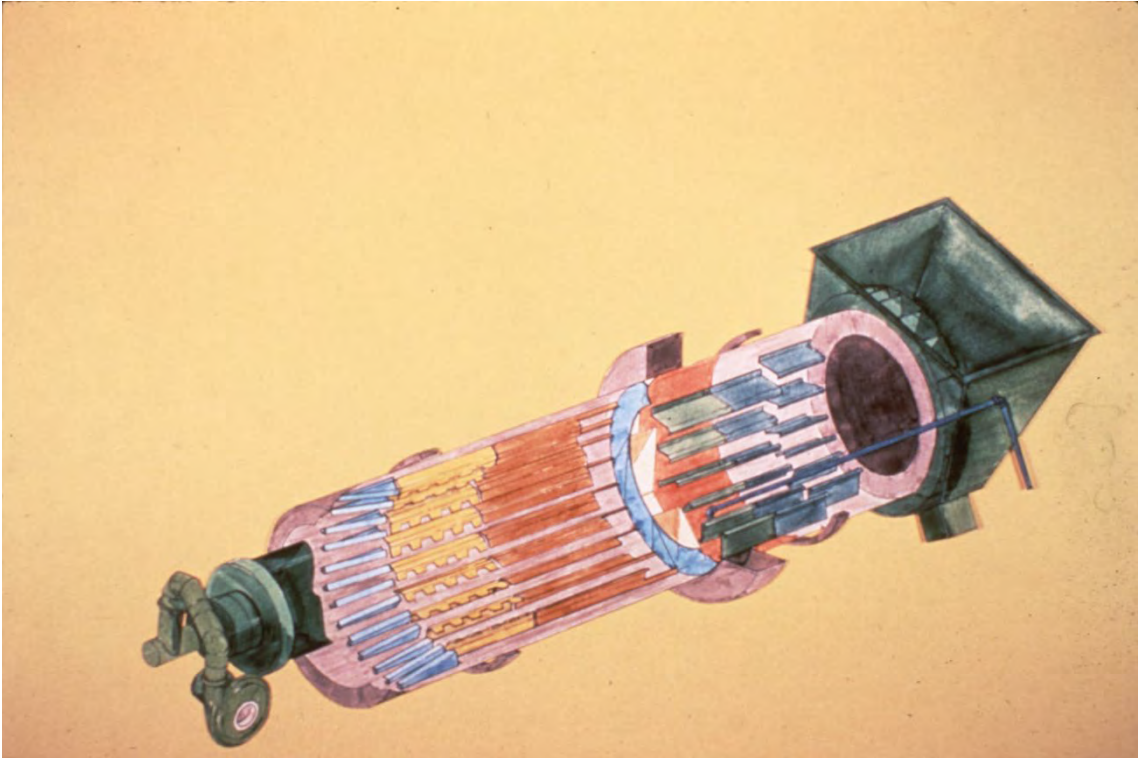
ASPHALT CEMENT FOAMS AND COATS AGGREGATE

Slide 74. Asphalt Cement Foams and Coats Aggregate

ADDITION OF ASPHALT CEMENT

- **Generally pumped through pipe from discharge end**
- **Variable location**
- **30 to 40% from discharge end**

Slide 75. Addition of Asphalt Cement



Slide 76



Slide 77



Slide 78



Slide 79

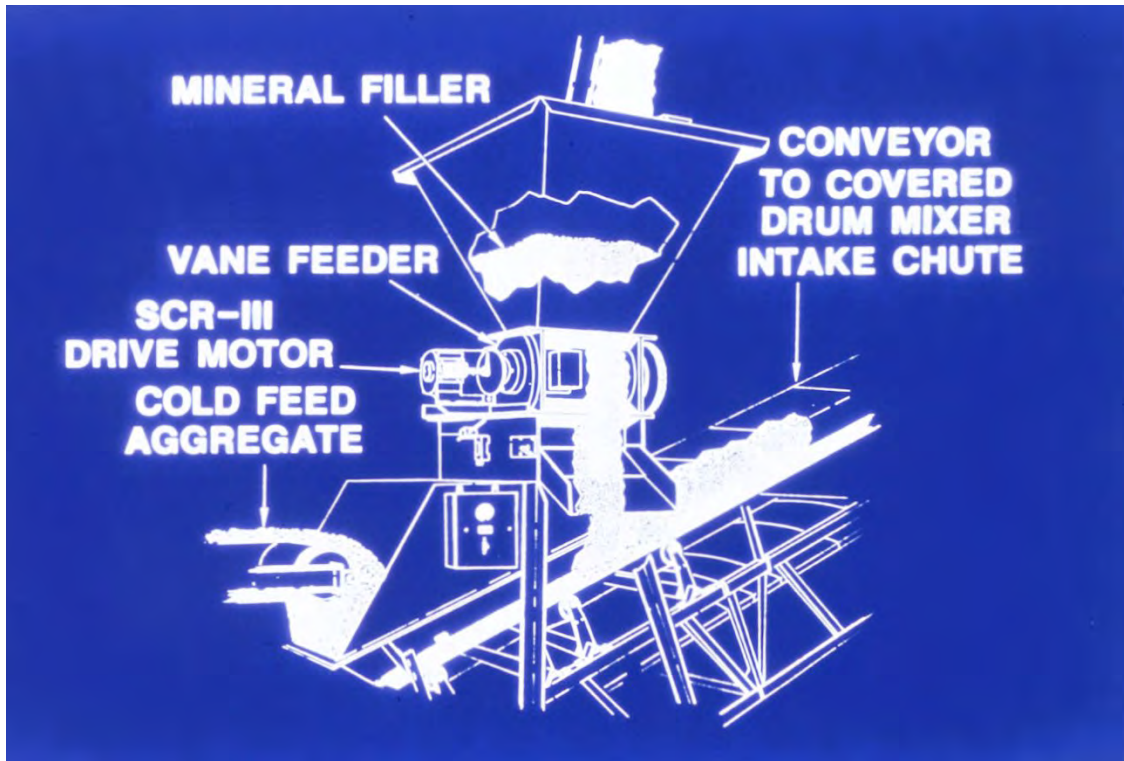


Slide 80

FINES SYSTEMS

**FOR HANDLING AND FEEDING
COLLECTED DUST AND
MINERAL FILLER**

Slide 81. Fines Systems



Slide 82



Slide 83



Slide 84



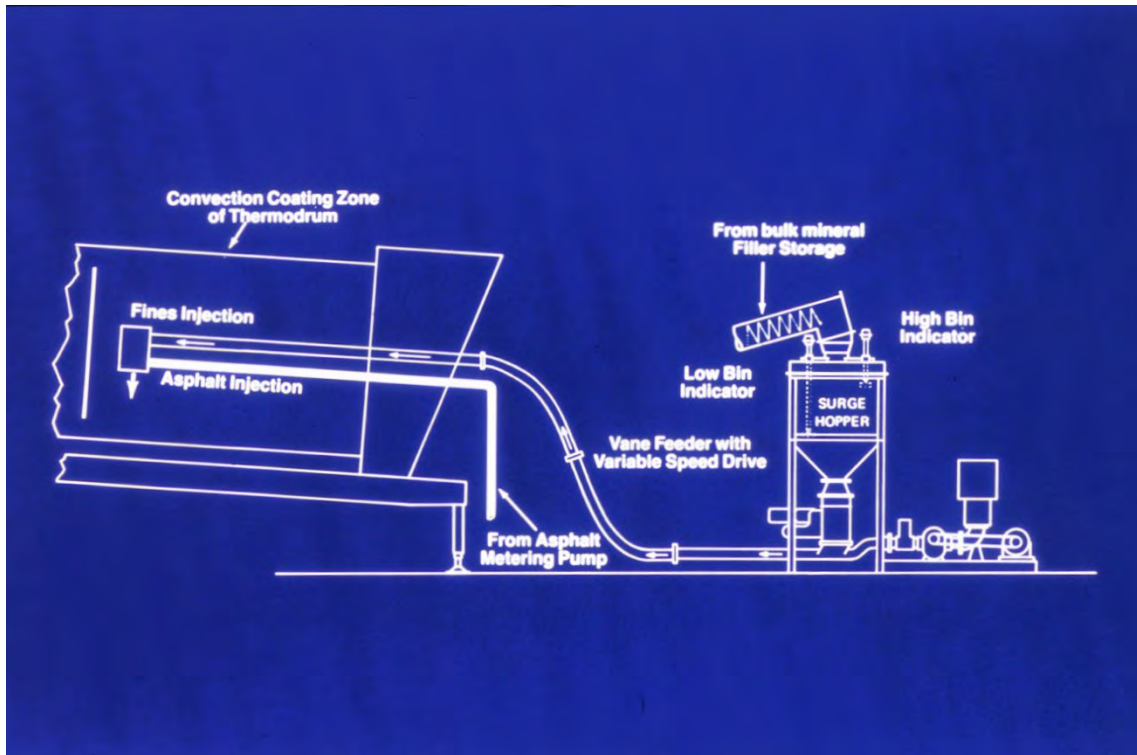
Slide 85



Slide 86



Slide 87



Slide 88



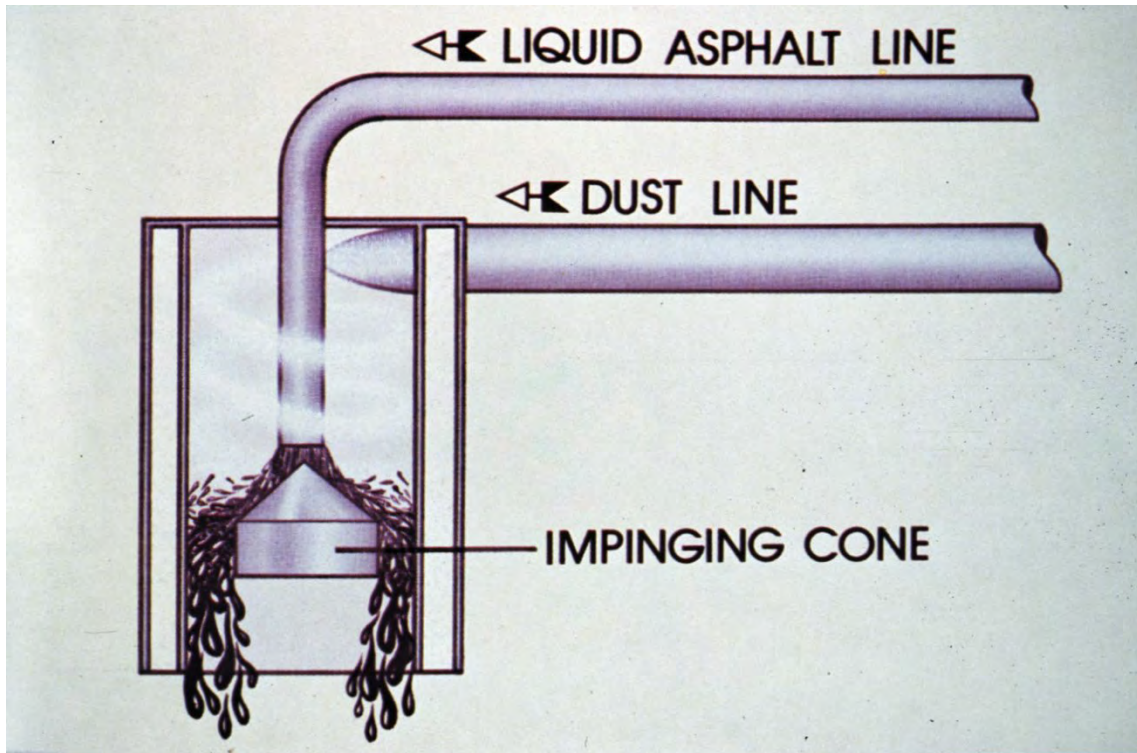
Slide 89



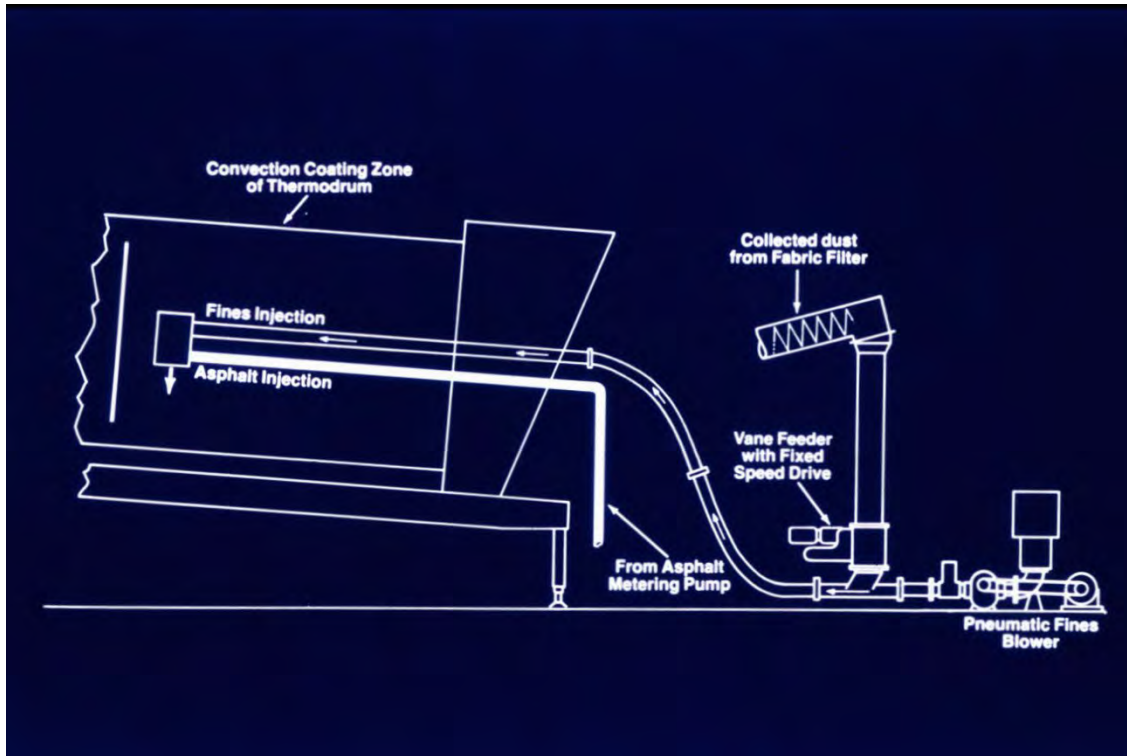
Slide 90



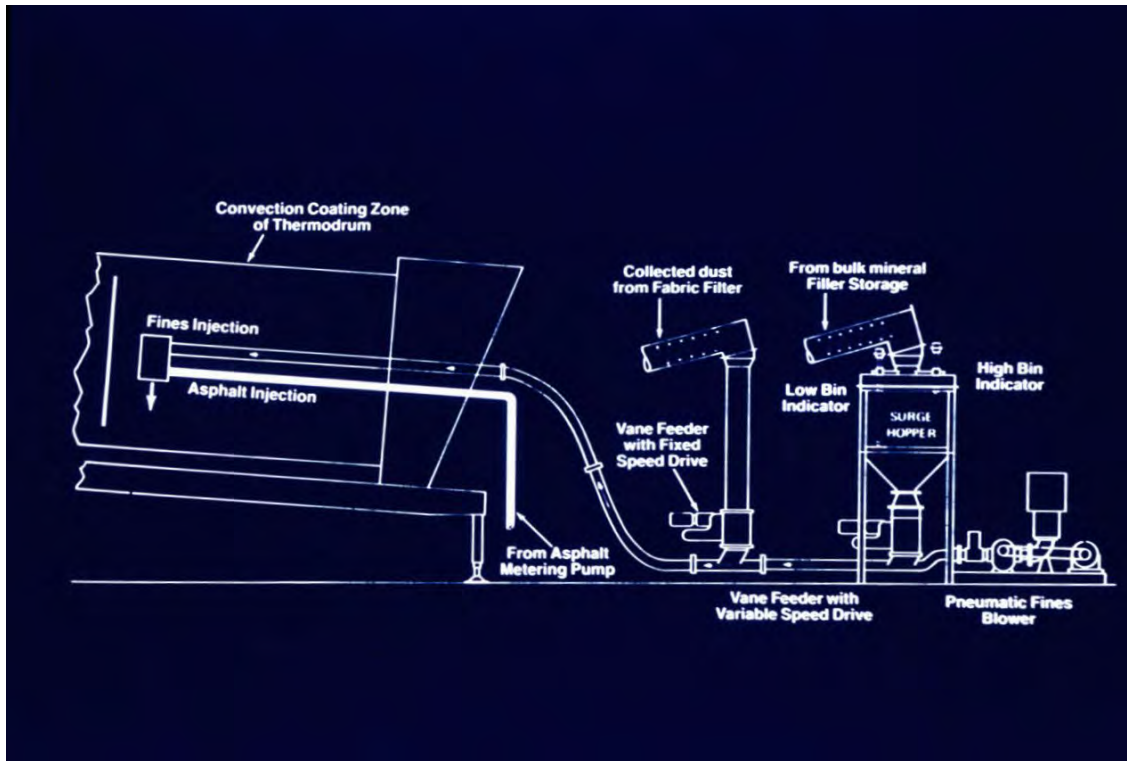
Slide 91



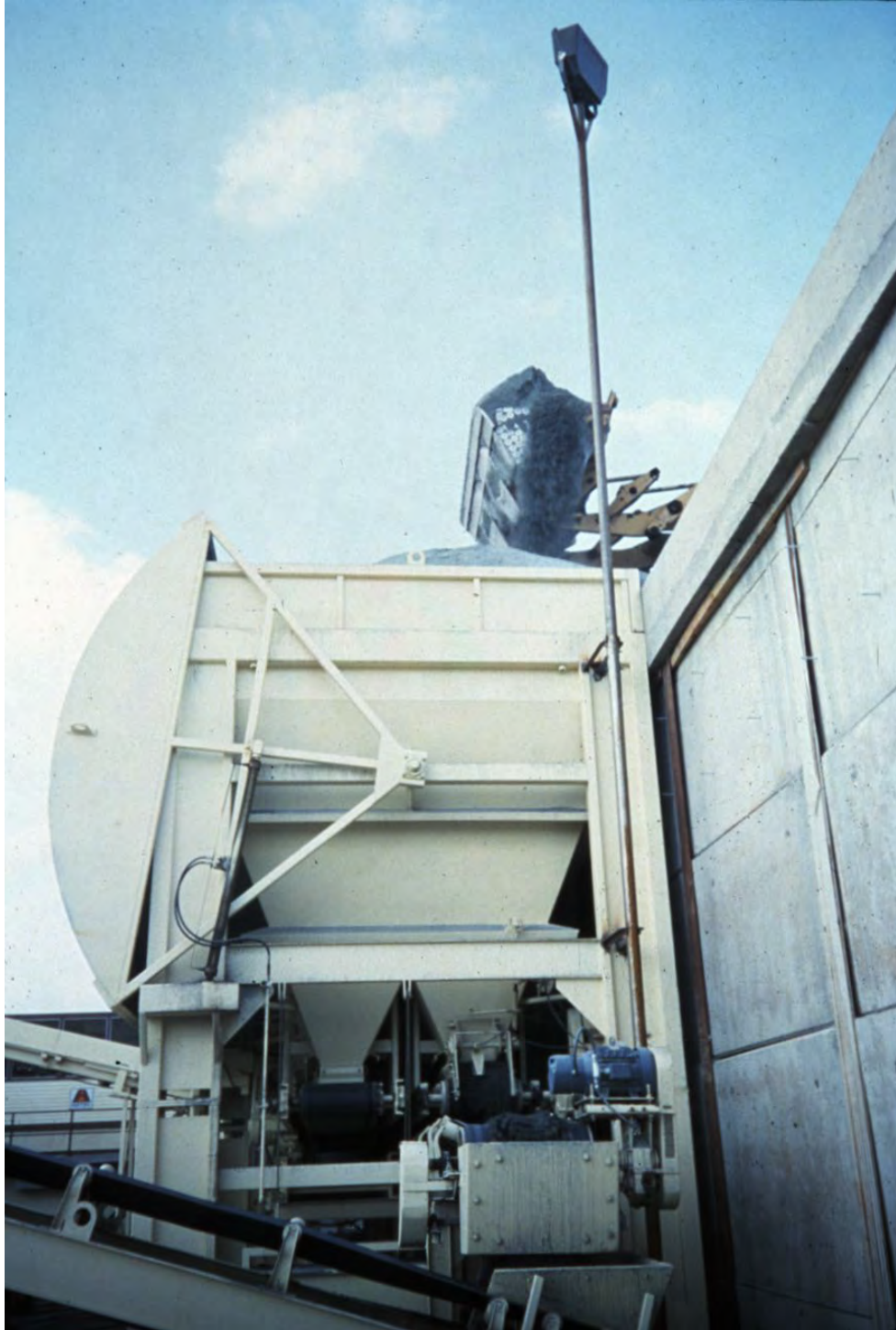
Slide 92



Slide 93



Slide 94



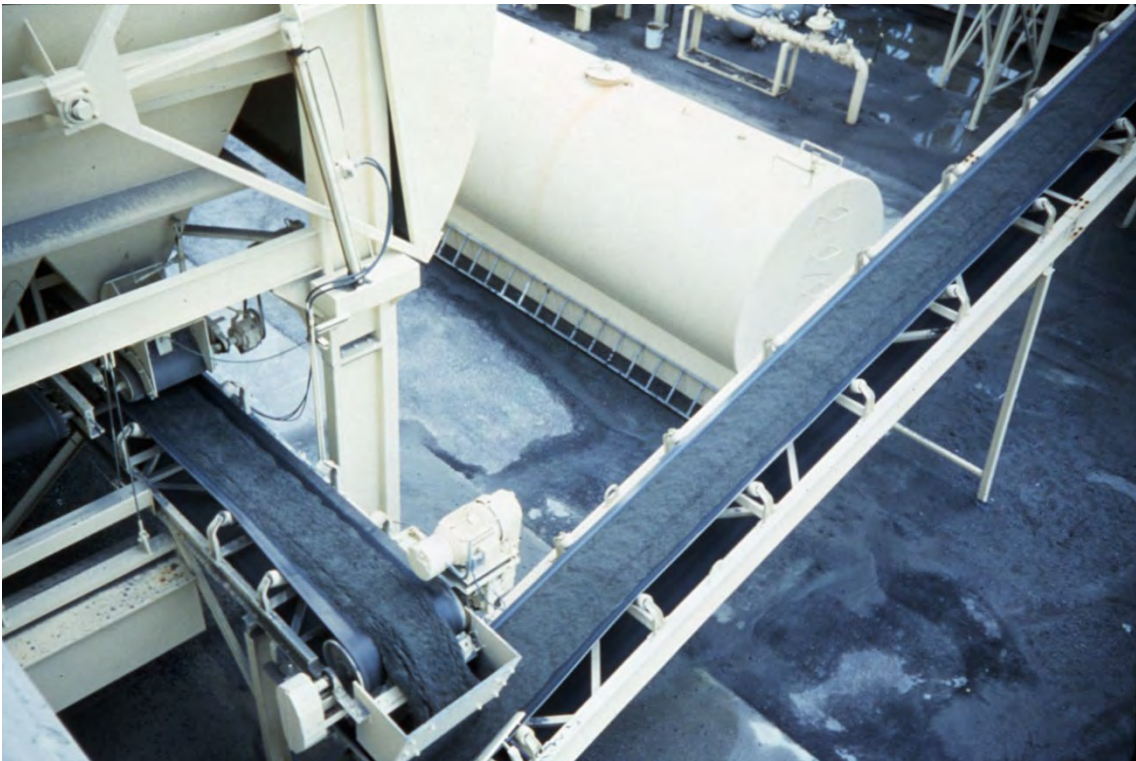
Slide 95



Slide 96



Slide 97



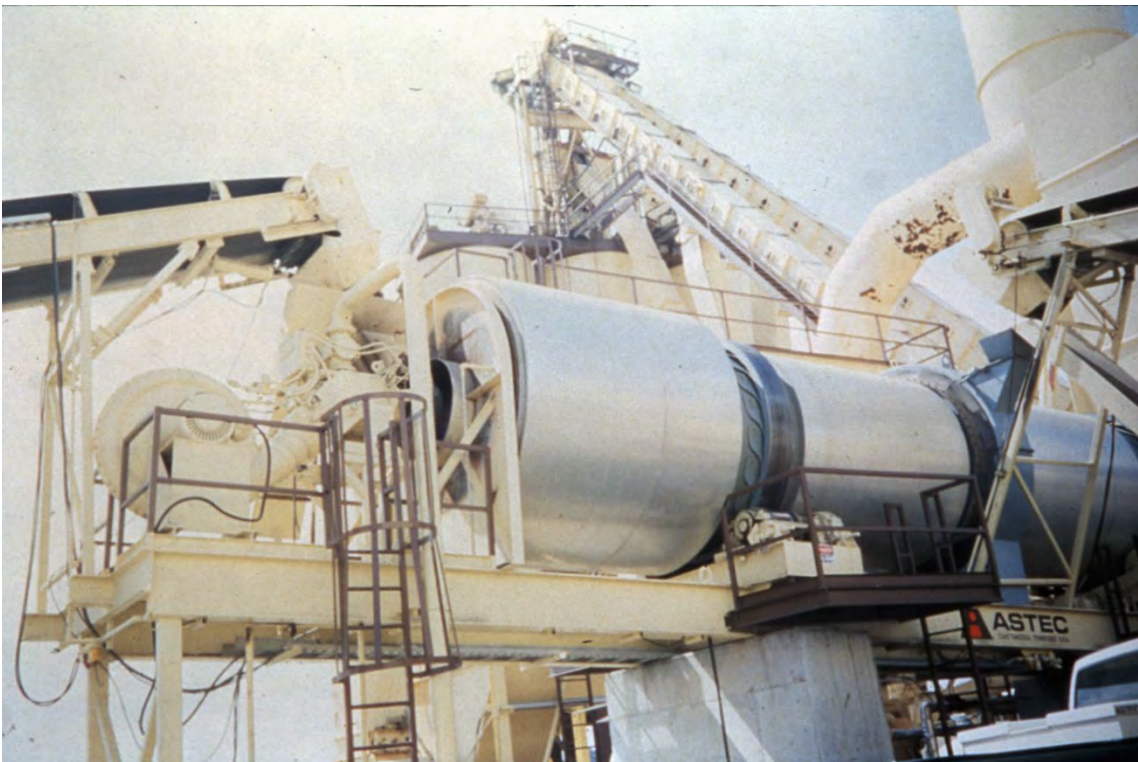
Slide 98



Slide 99



Slide 100



Slide 101



Slide 102



Slide 103



Slide 104



Slide 105

RECLAIMED MATERIAL AT BURNER

- A heat diffusing device or heat shield is required
- Protects reclaimed asphalt from hot gases (blue snake)

Slide 106. Reclaimed Material at Burner



Slide 107



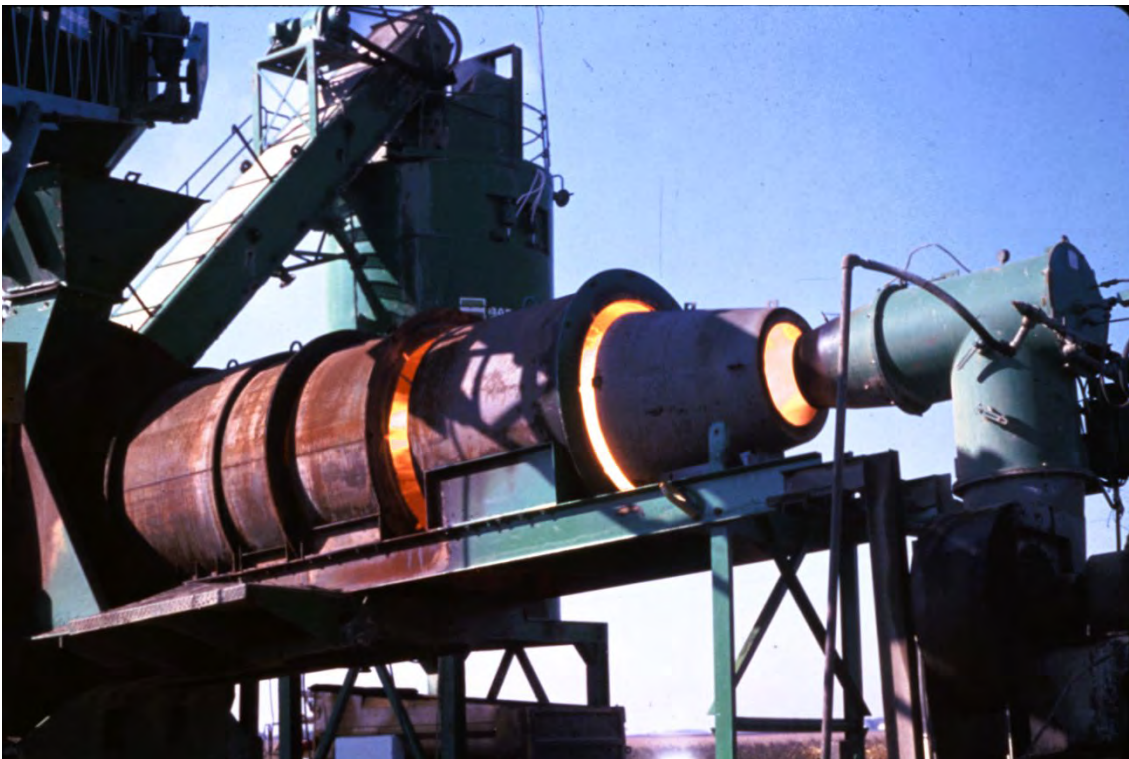
Slide 108



Slide 109



Slide 110



Slide 111



Slide 112



Slide 113



Slide 114



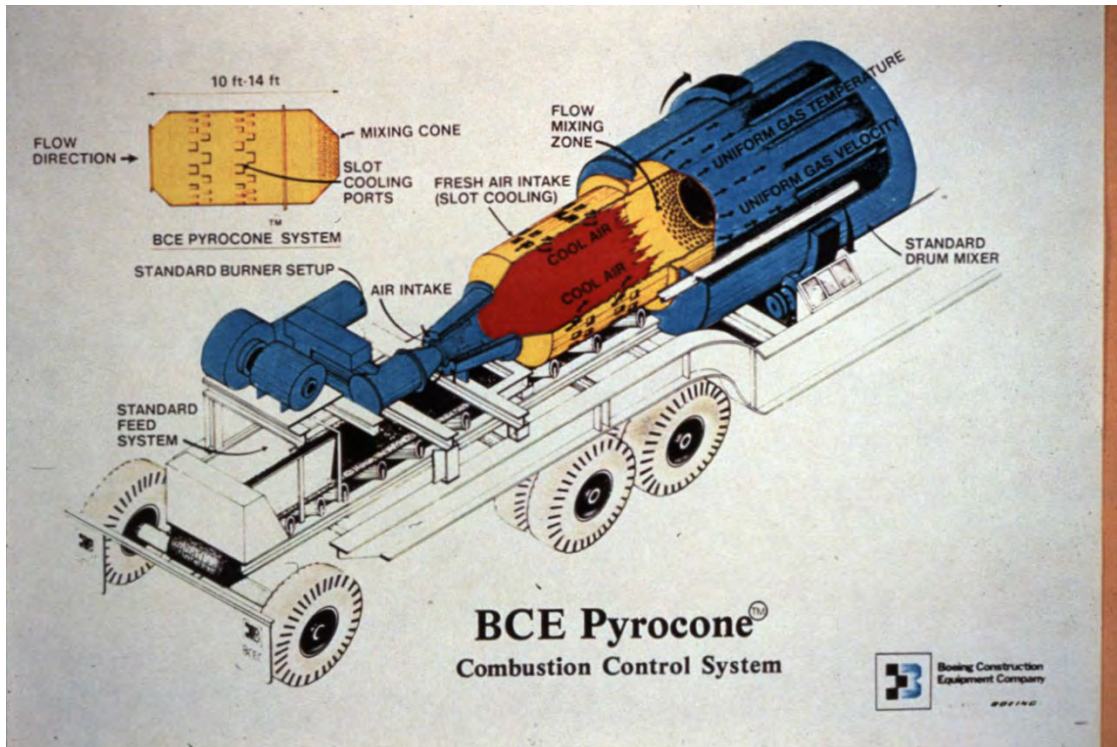
Slide 115



Slide 116



Slide 117



Slide 118. BCE Pyrocone™ Combustion Control System



Slide 119



Slide 120



Slide 121



Slide 122



Slide 123



Slide 124



Slide 125



Slide 126



Slide 127

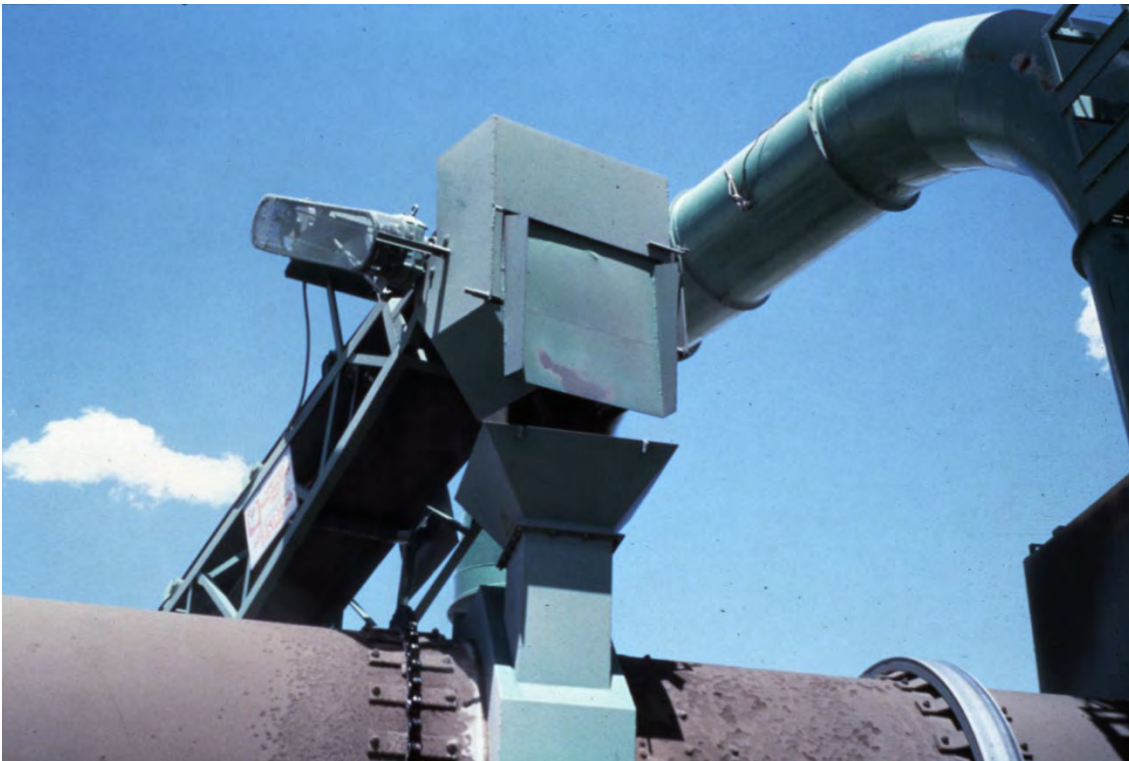


Slide 128

RECLAIMED MATERIAL AT MIDPOINT

- **Lower gas temperatures**
- **Protection provided by vail**
- **New aggregates are super heated**

Slide 129. Reclaimed Material at Midpoint



Slide 130



Slide 131



Slide 132



Slide 133



Slide 134



Slide 135



Slide 136



Slide 137



Slide 138



Slide 139



Slide 140



Slide 141



Slide 142



Slide 143



Slide 144



Slide 145



Slide 146



Slide 147



Slide 148



Slide 149



Slide 150



Slide 151

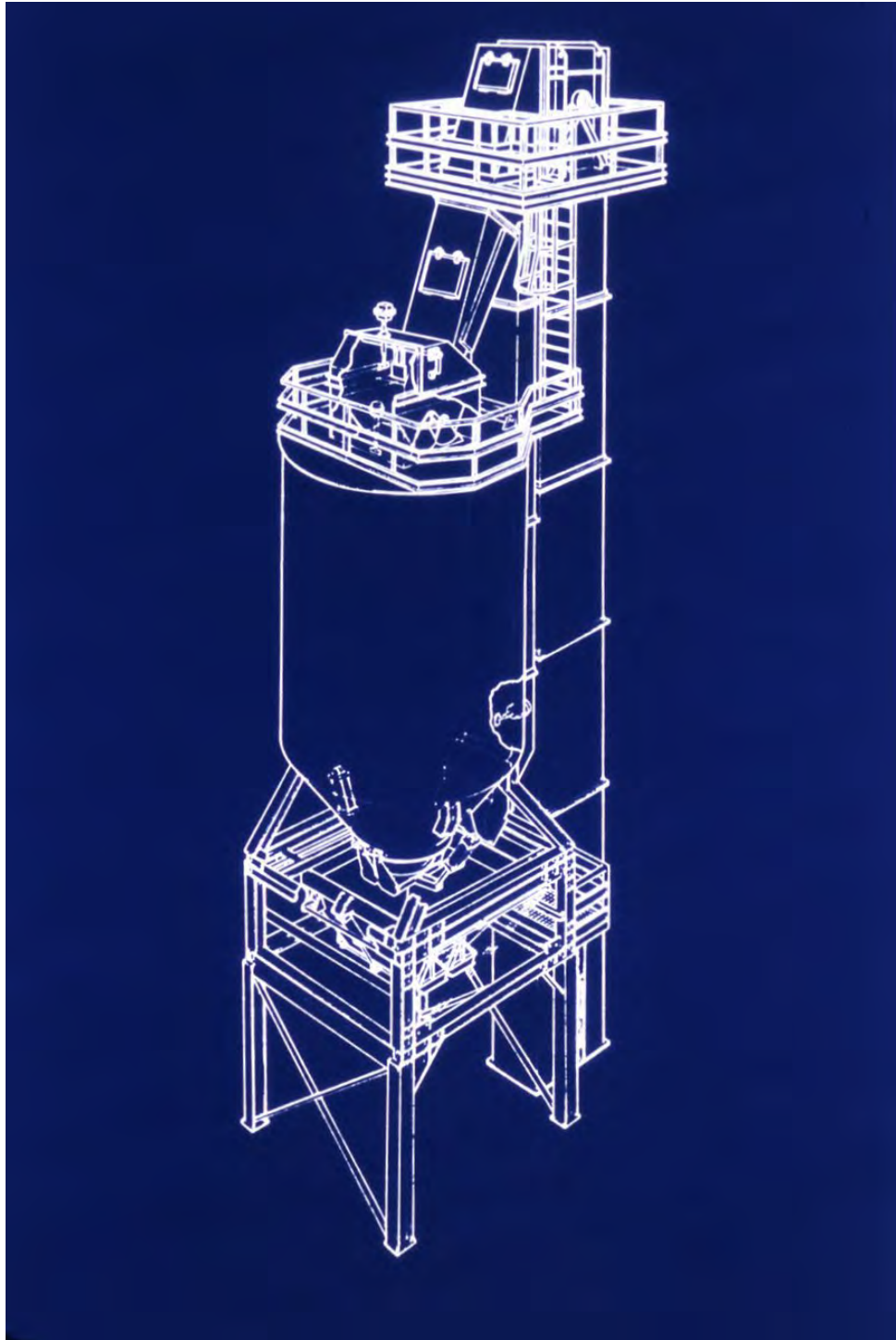


Slide 152

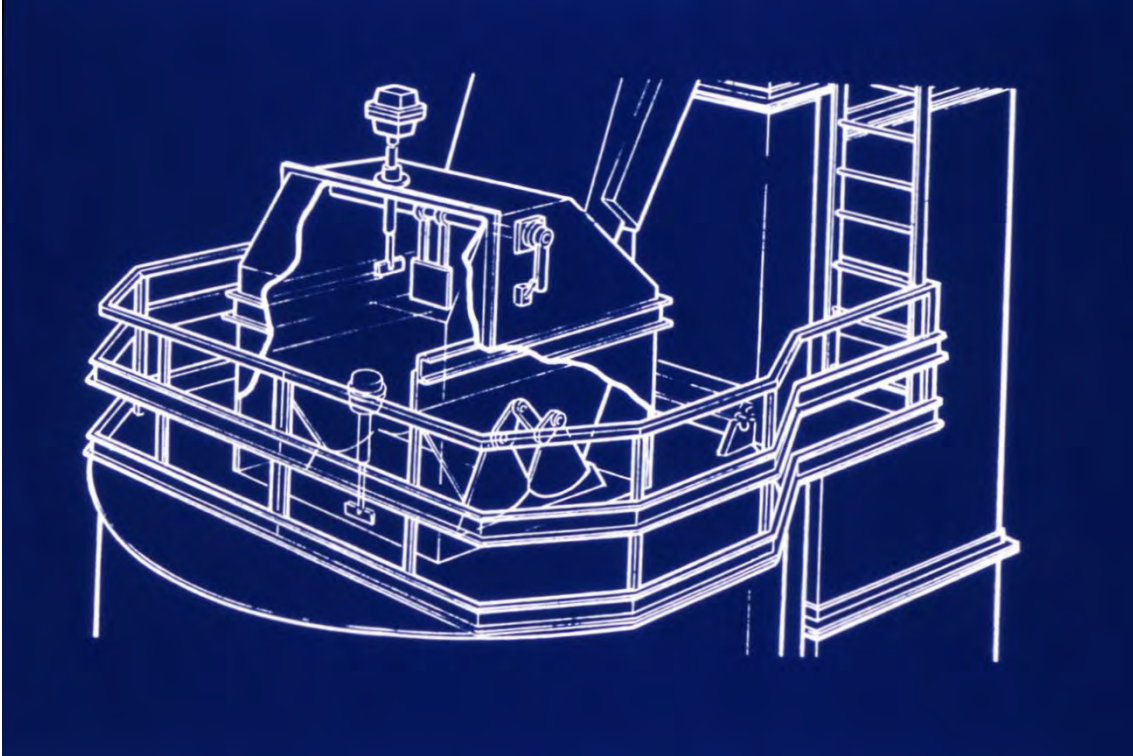
Chapter 8. Hot Mix Loadout Systems



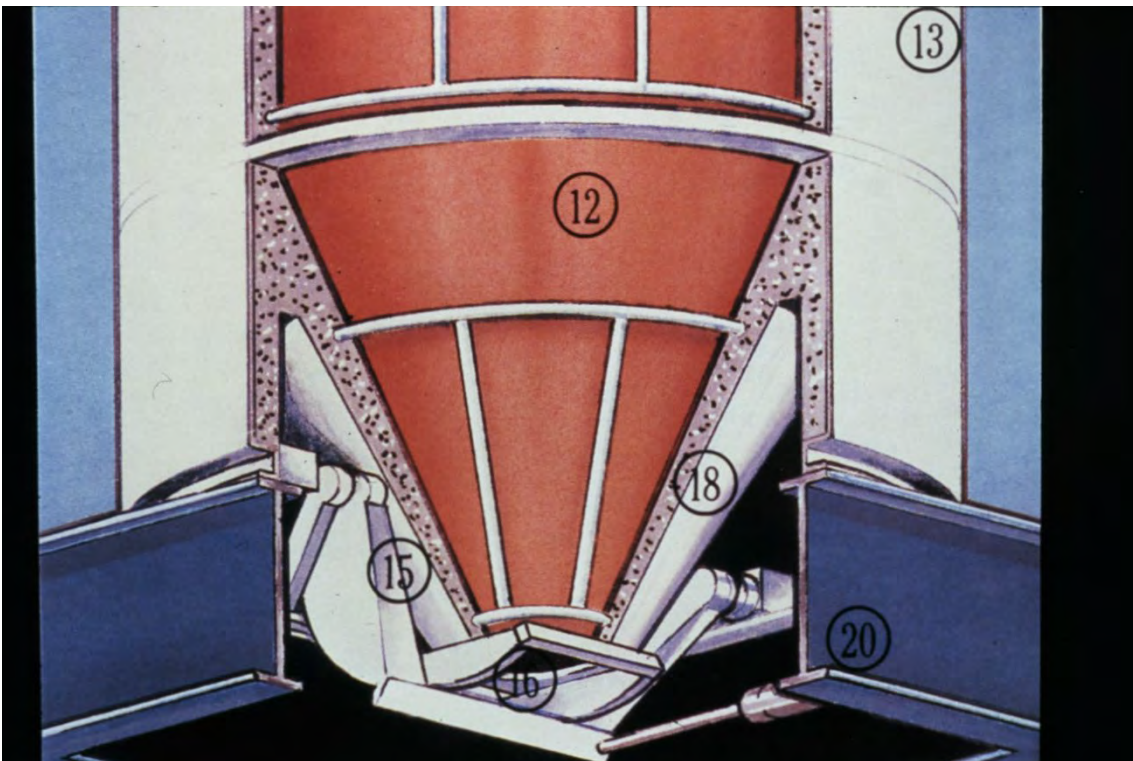
Slide 1



Slide 2



Slide 3

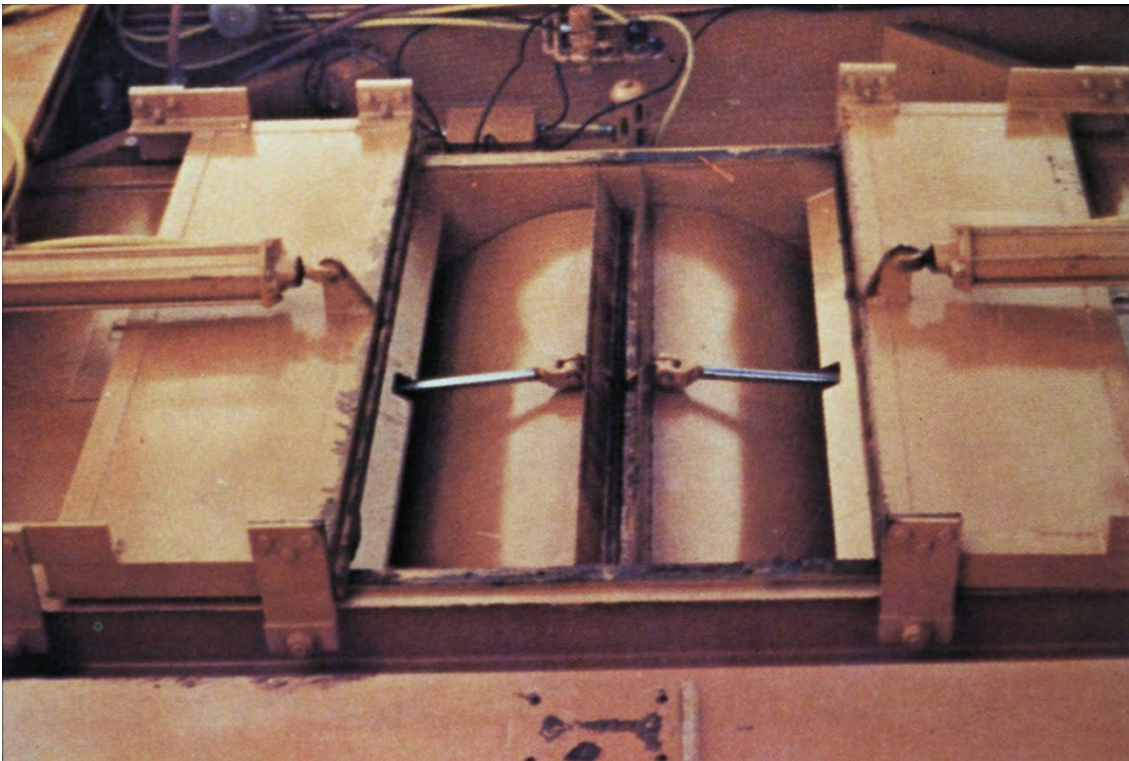


Slide 4

SURGE BIN CONE

- **Bottom of bin shaped like funnel**
- **Angle is 55° - 70°**
- **Mixture should cover top of cone**

Slide 5. Surge Bin Cone



Slide 6



Slide 7



Slide 8



Slide 9



Slide 10



Slide 11



Slide 12



Slide 13



Slide 14

MOST SURGE BINS ARE INSULATED

Slide 15

CONVEYING DEVICES

- **Drag slats (common)**
- **Belts**
- **Buckets**

Slide 16. Conveying Devices



Slide 17



Slide 18



Slide 19



Slide 20



Slide 21



Slide 22



Slide 23



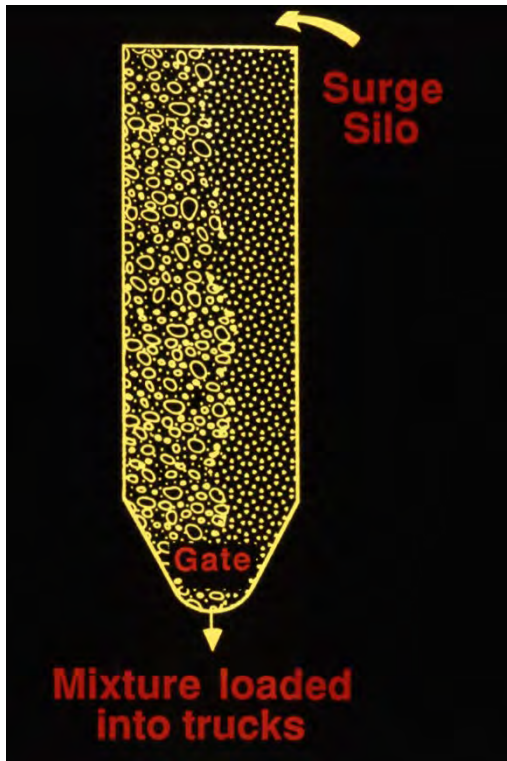
Slide 24



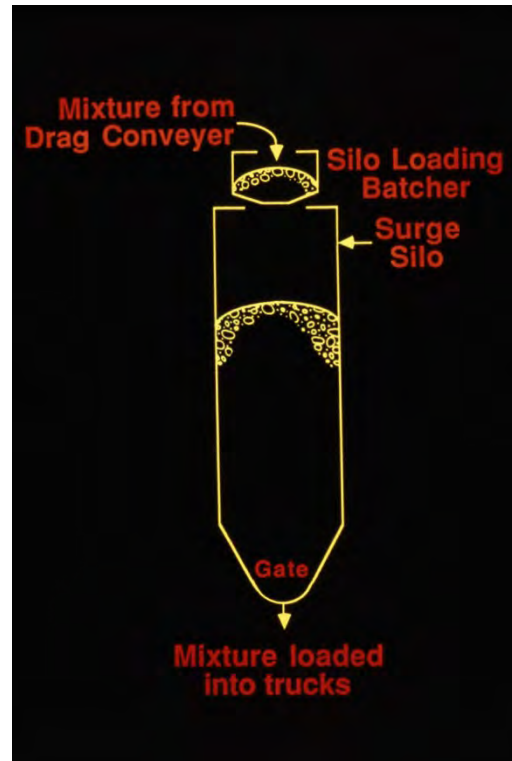
Slide 25

CONVEYING DEVICE NOT A MAJOR FACTOR

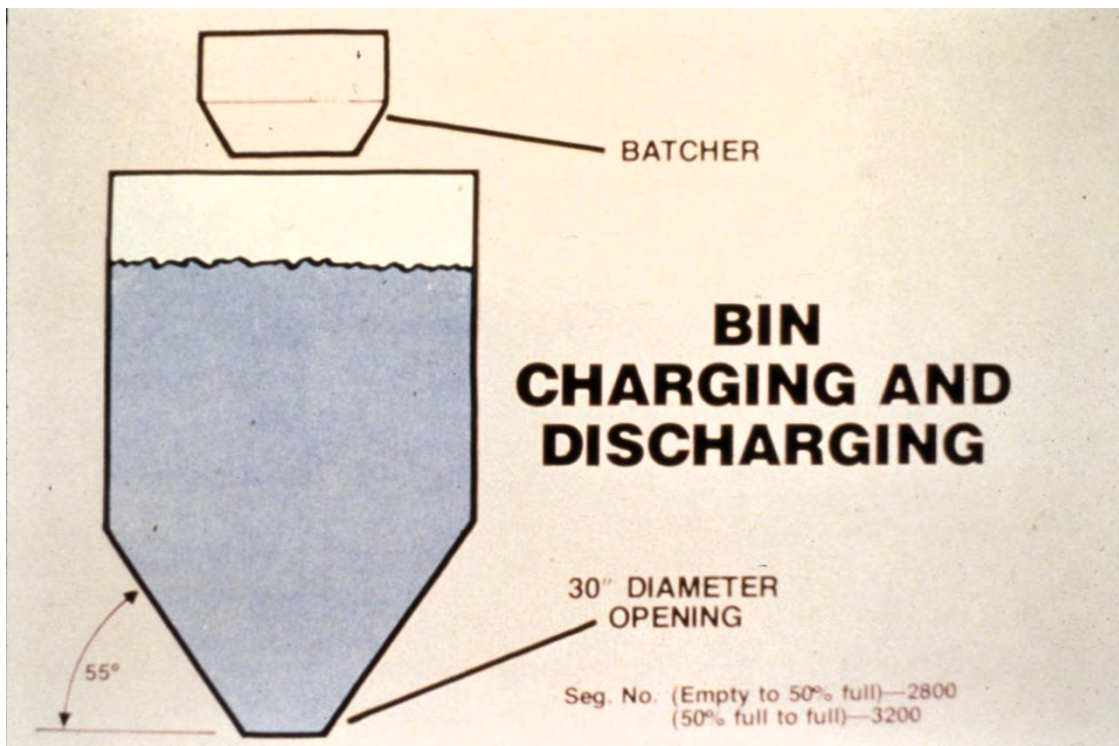
Slide 26



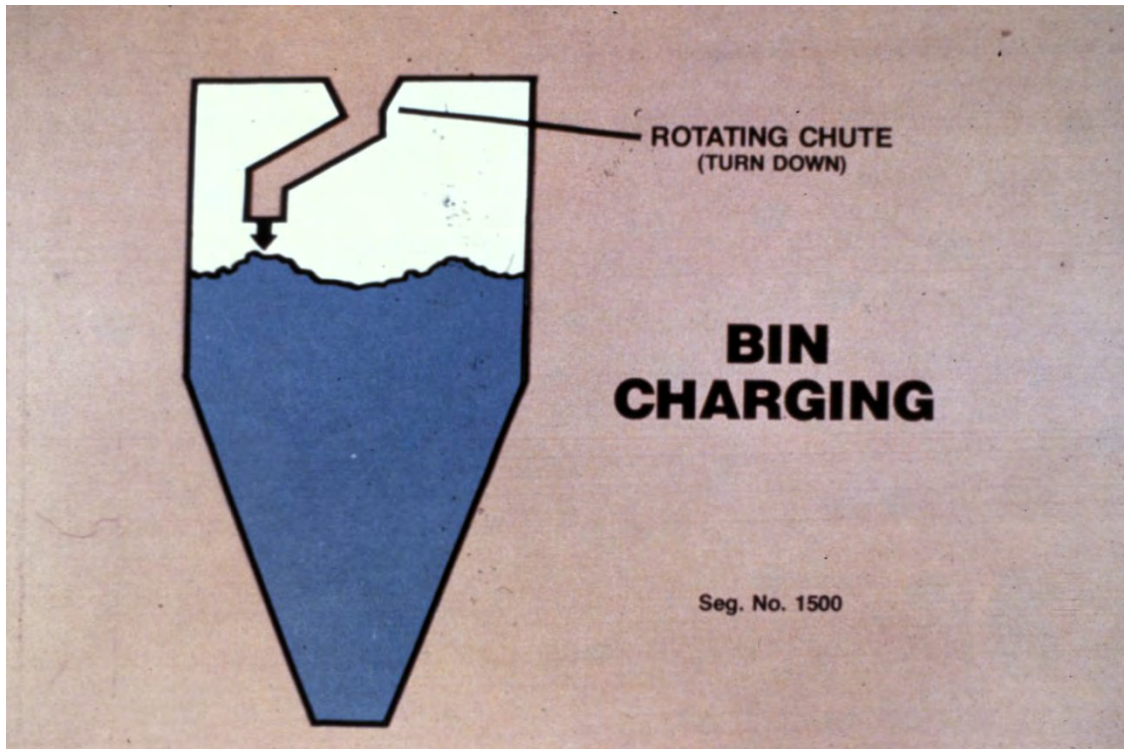
Slide 27



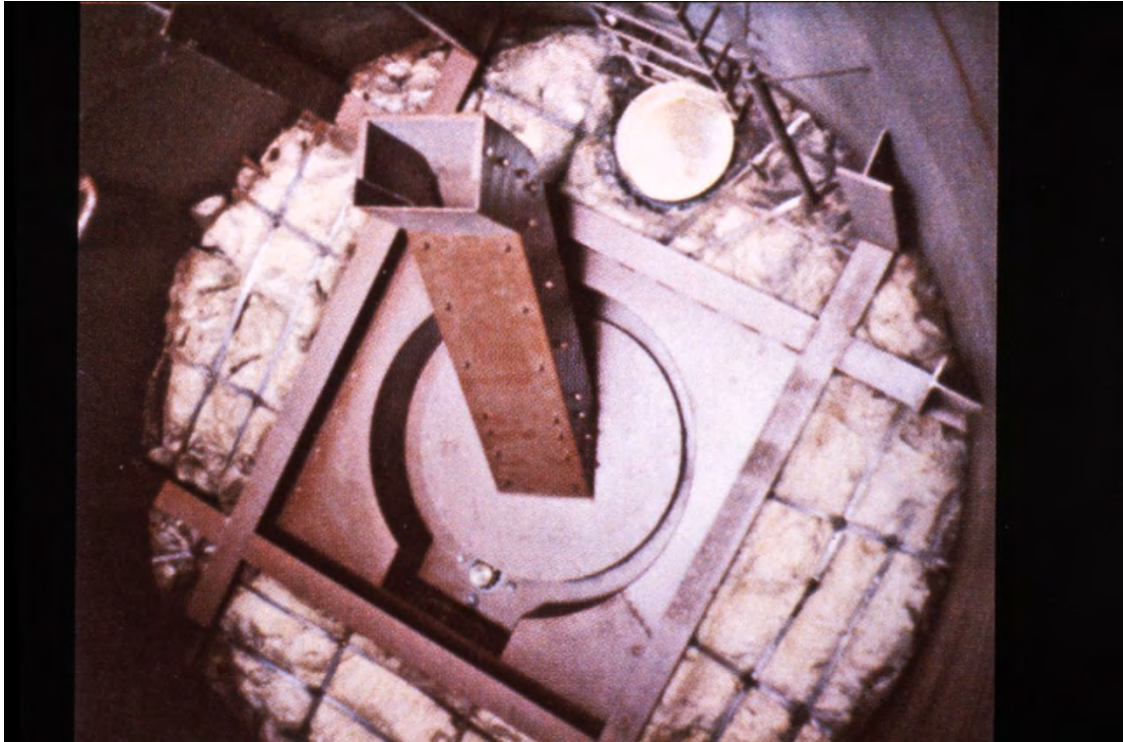
Slide 28



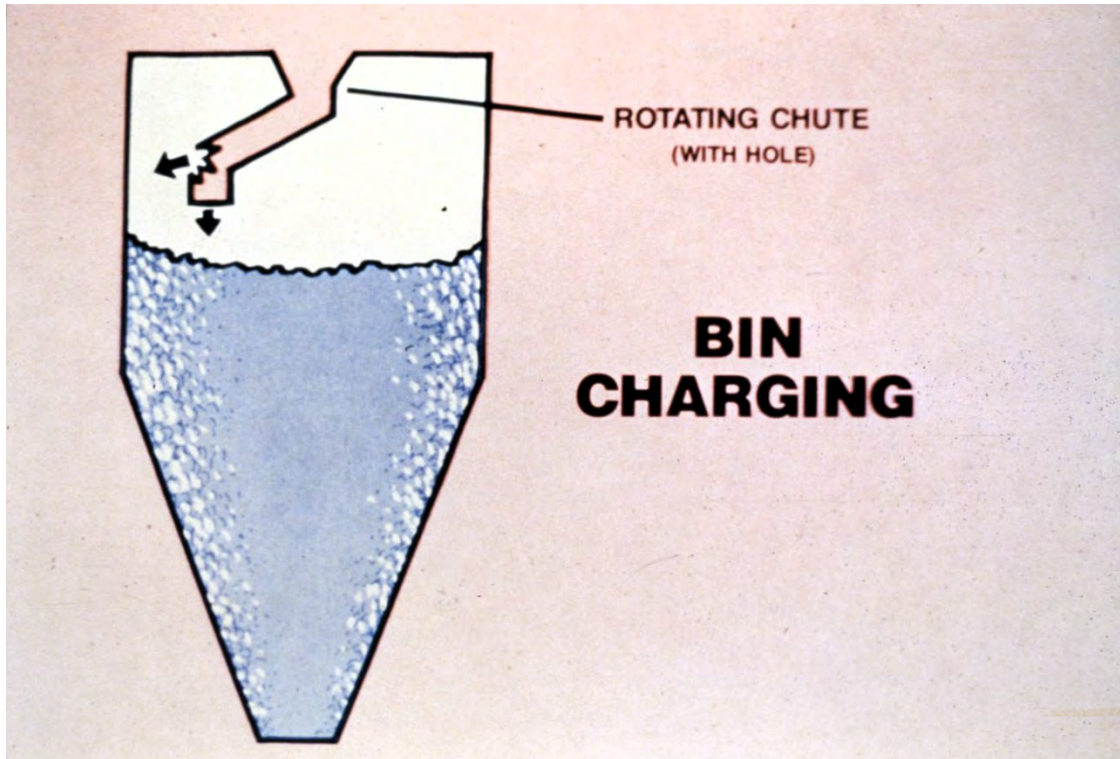
Slide 29. Bin Charging and Discharging



Slide 30. Bin Charging



Slide 31



Slide 32



Slide 33. Segregation

Surge and Storage Bins

Most Important

Slide 34. Surge and Storage Bins

BASIC FORMS OF SEGREGATION

LONGITUDINAL – SIDE TO SIDE

DOWN THE ROAD – TRUCK TO TRUCK

Slide 35. Basic Forms of Segregation

DOWN THE ROAD – TRUCK TO TRUCK

INTERMITTENT

CONTINUOUS

Slide 36. Down the Road – Truck to Truck

LONGITUDINAL – SIDE TO SIDE

SILO – IMPROPER MATERIAL STORAGE

TOP OF SILO

DRAG SLAT OR CONVEYOR – THROWING MATERIAL

PROVIDE SPLITTER OR REPOSITION

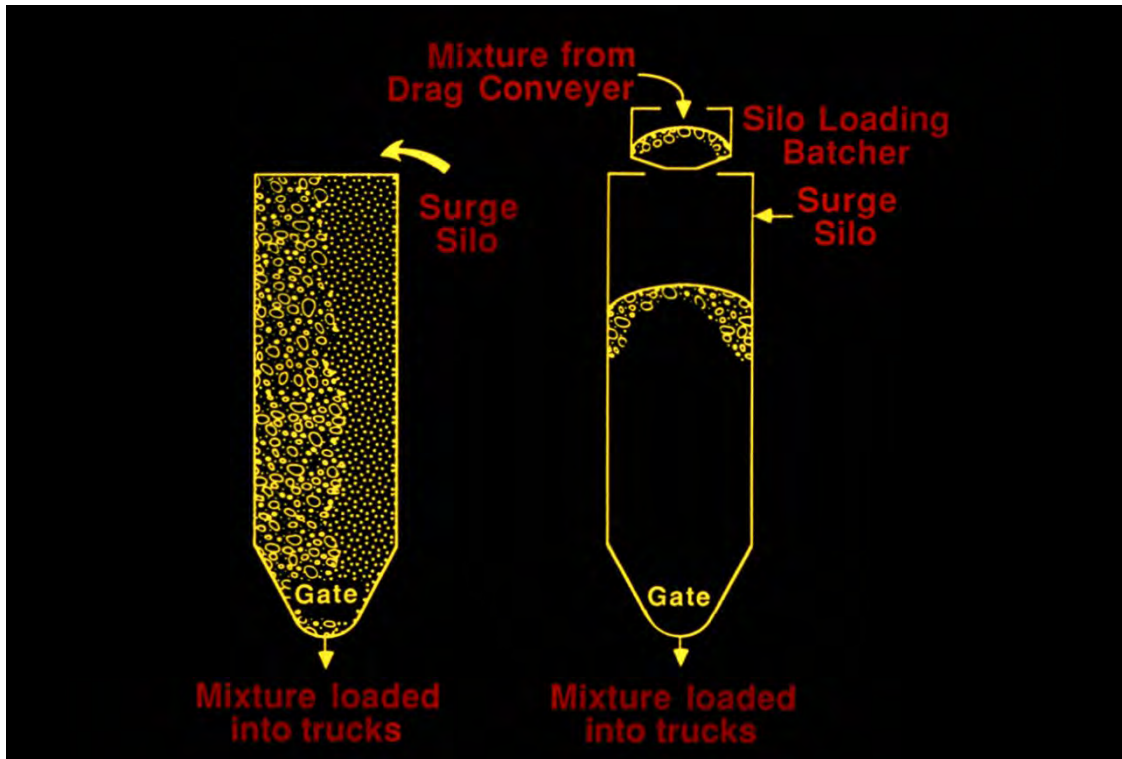
Slide 37. Longitudinal – Side to Side

**TRUCK TO TRUCK
INTERMITTENT
MATERIAL BELOW CONE**

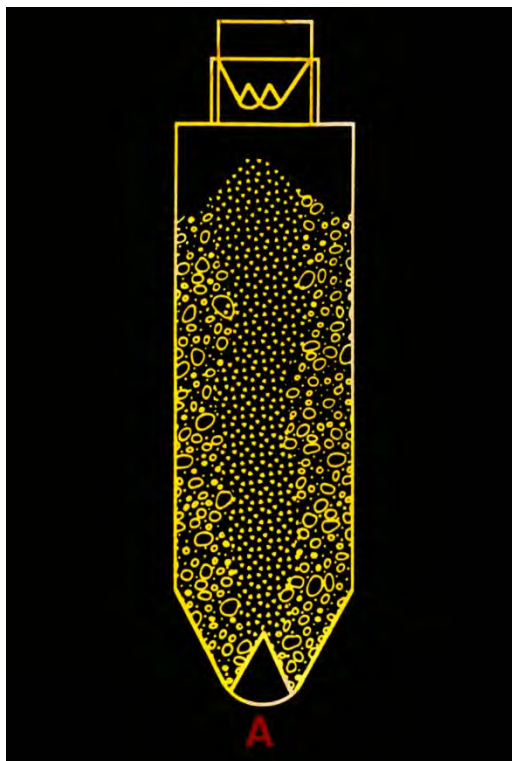
Slide 38. Truck to Truck Intermittent

**TRUCK TO TRUCK
CONTINUOUS
LOADING TRUCK ONE-DROP
EMPTYING PAVER HOPPER-WINGS
MIXTURE**

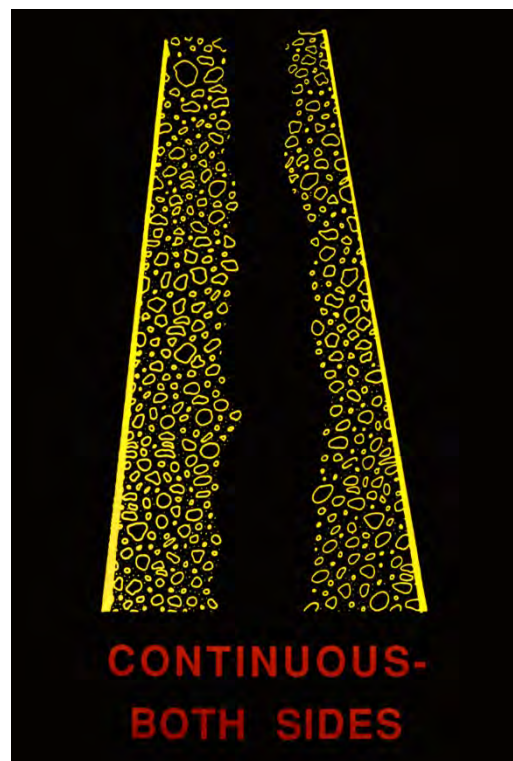
Slide 39. Truck to Truck Continuous



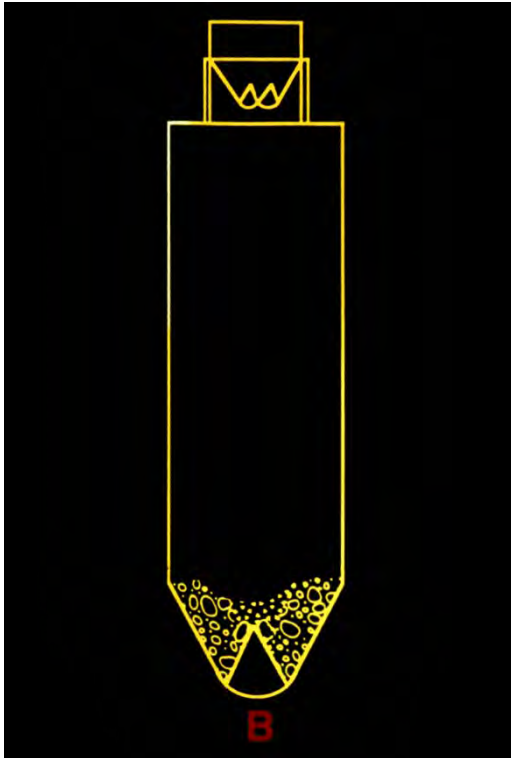
Slide 40



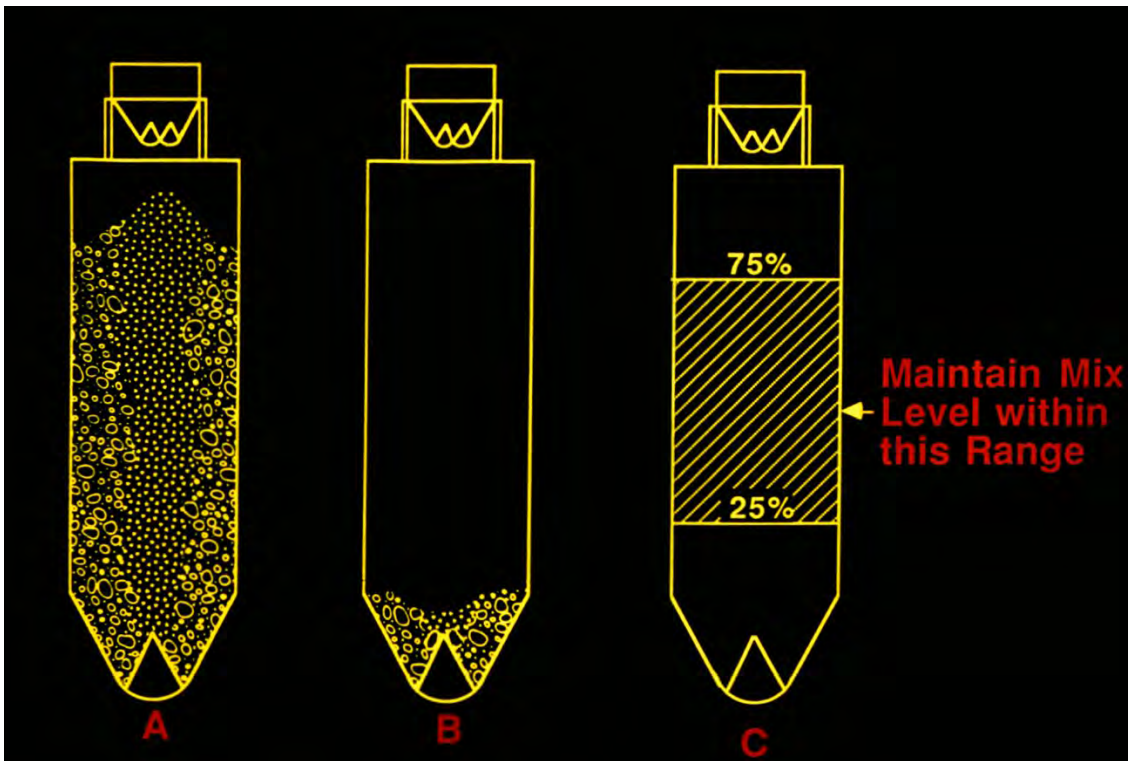
Slide 41



Slide 42



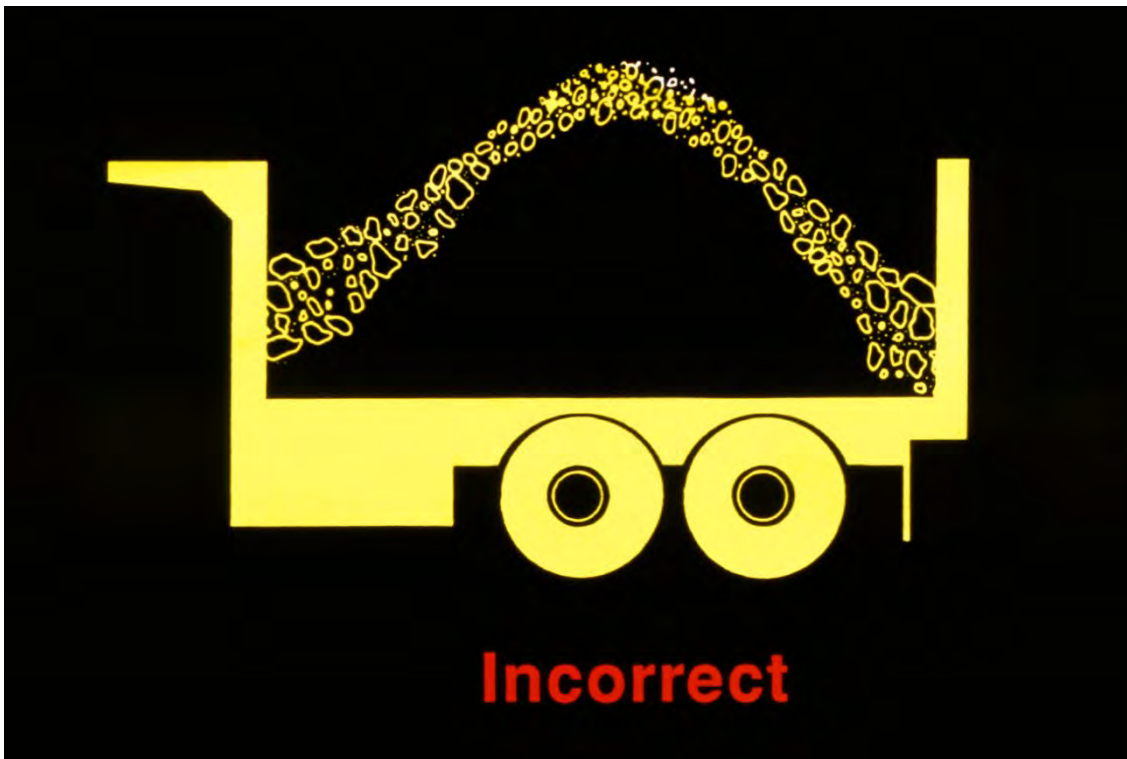
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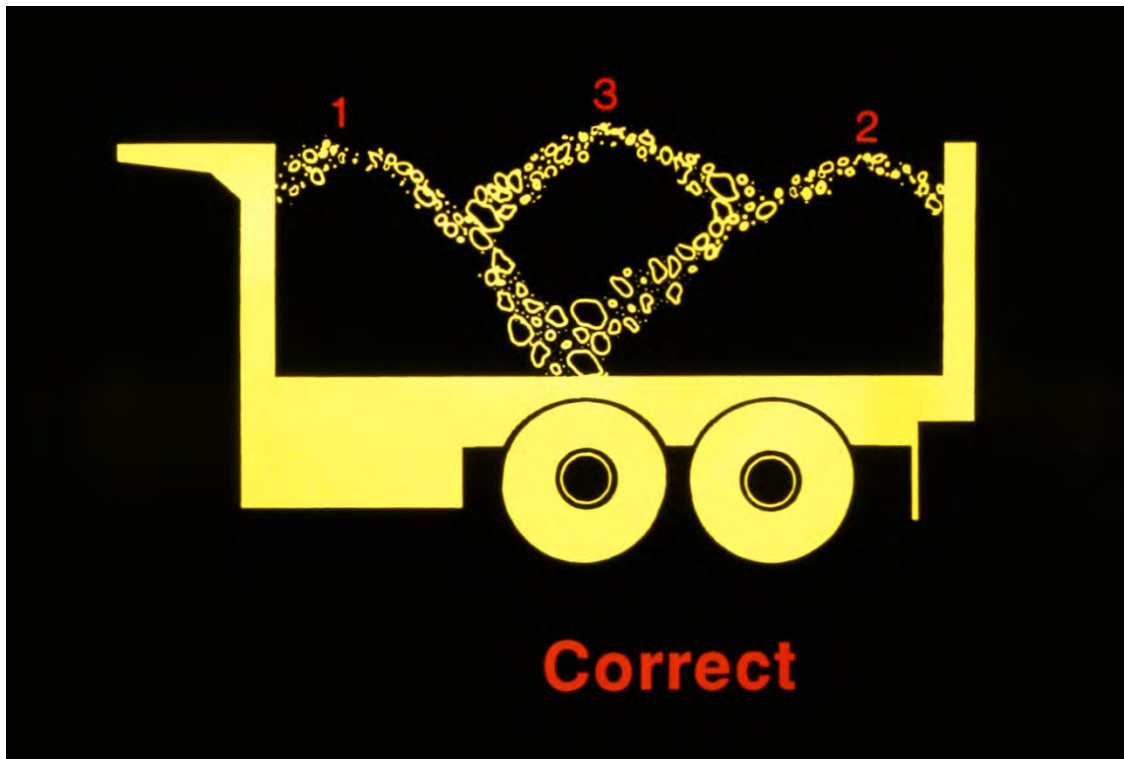
Slide 44



Slide 45



Slide 46



Slide 47



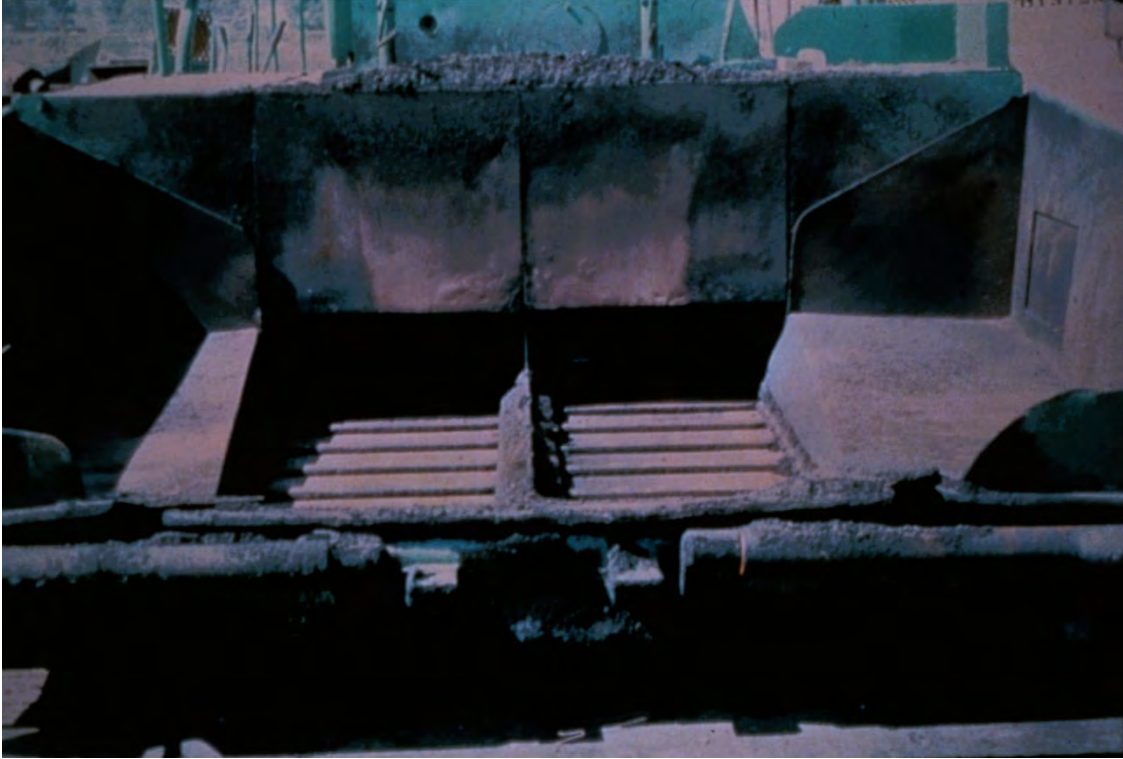
Slide 48



Slide 49



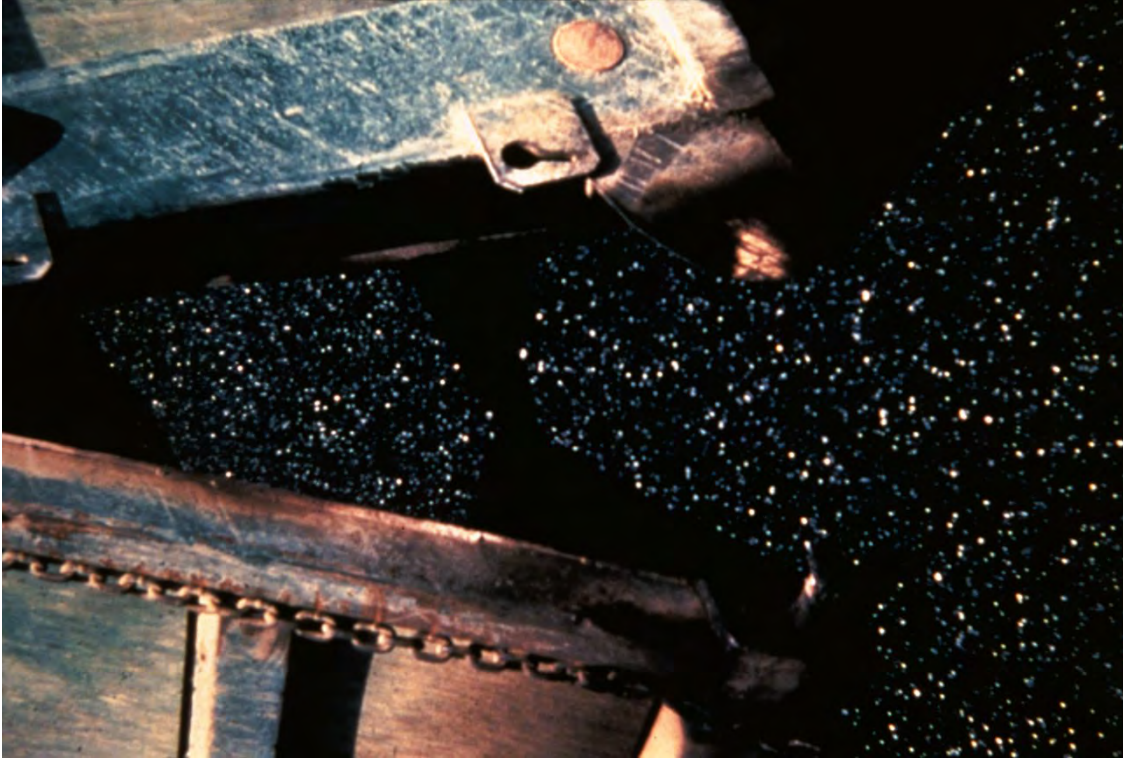
Slide 50



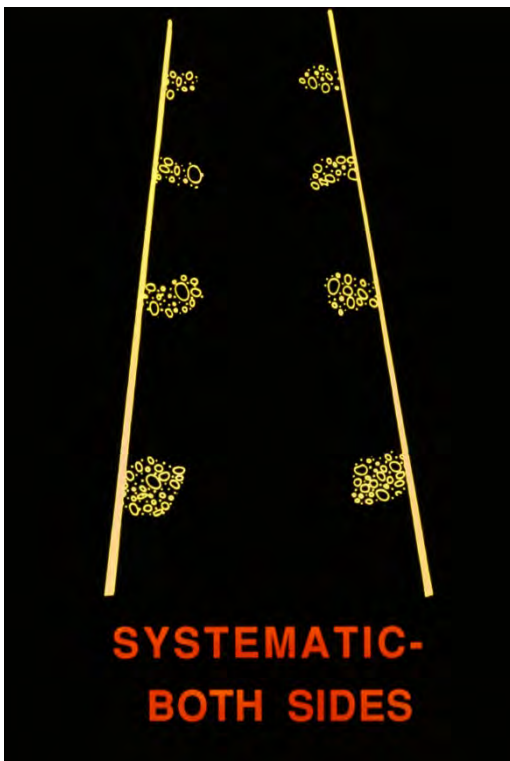
Slide 51



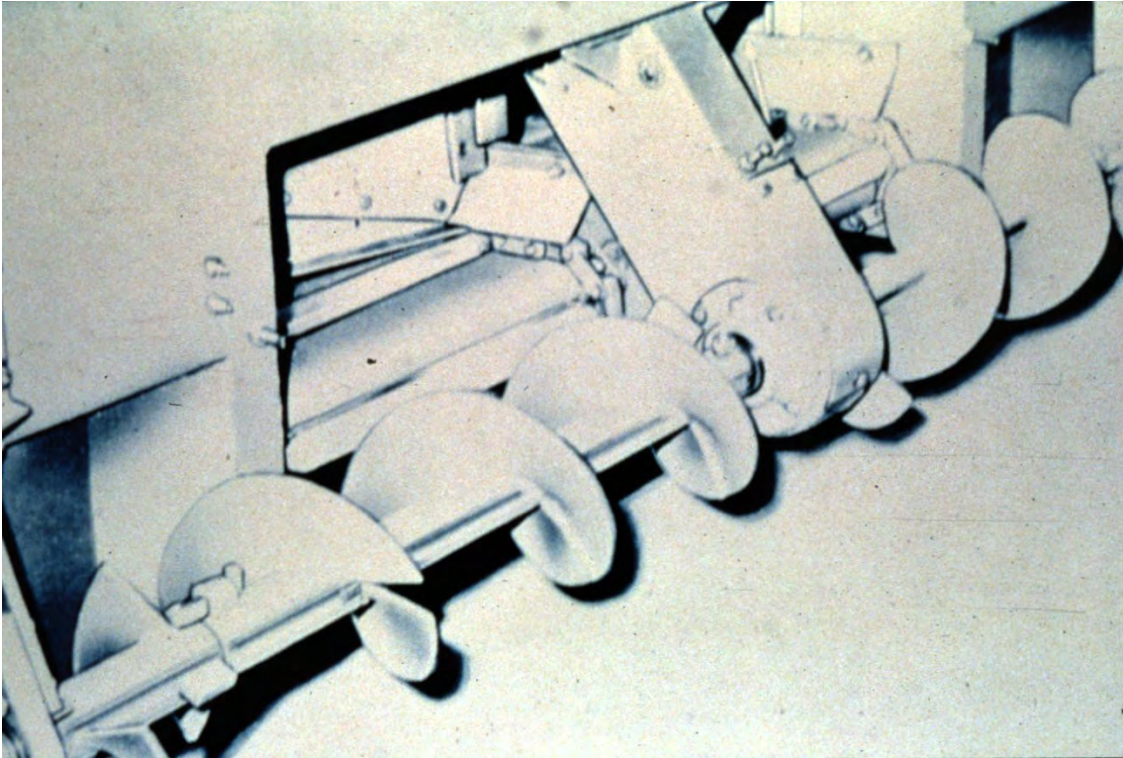
Slide 52



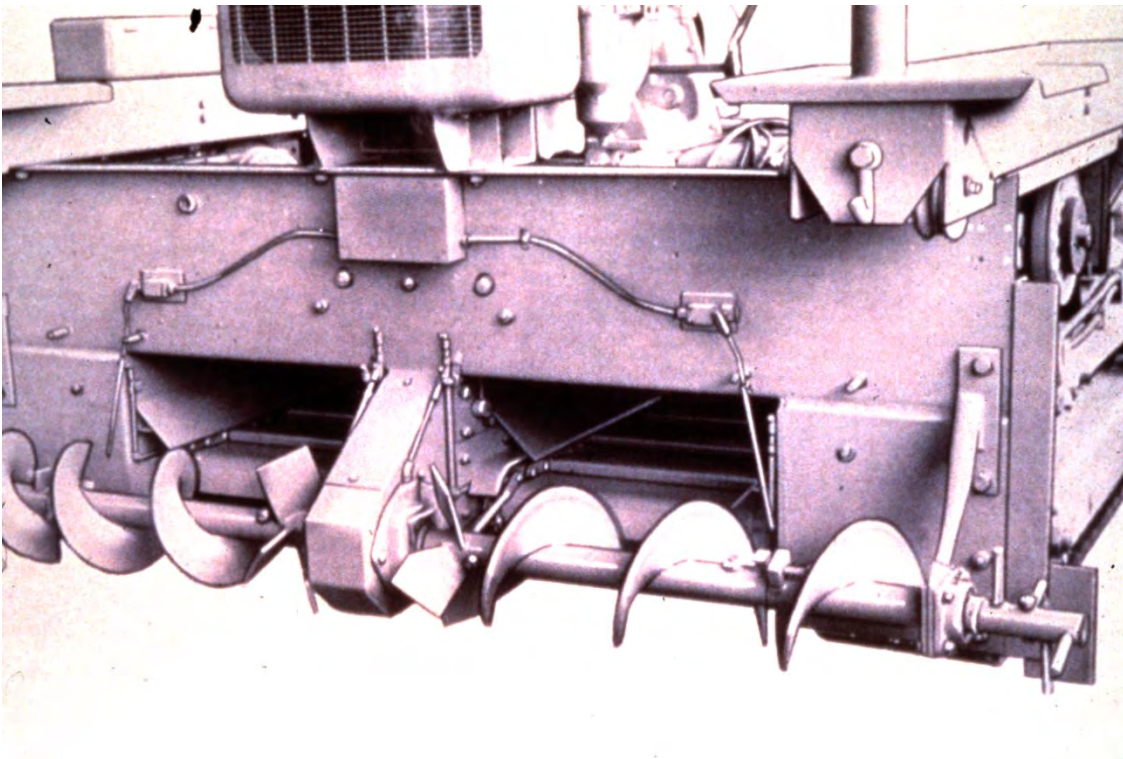
Slide 53



Slide 54



Slide 55



Slide 56



Slide 57

Chapter 9. Air Pollution Control System



AIR POLLUTION CONTROL SYSTEM

Slide 1

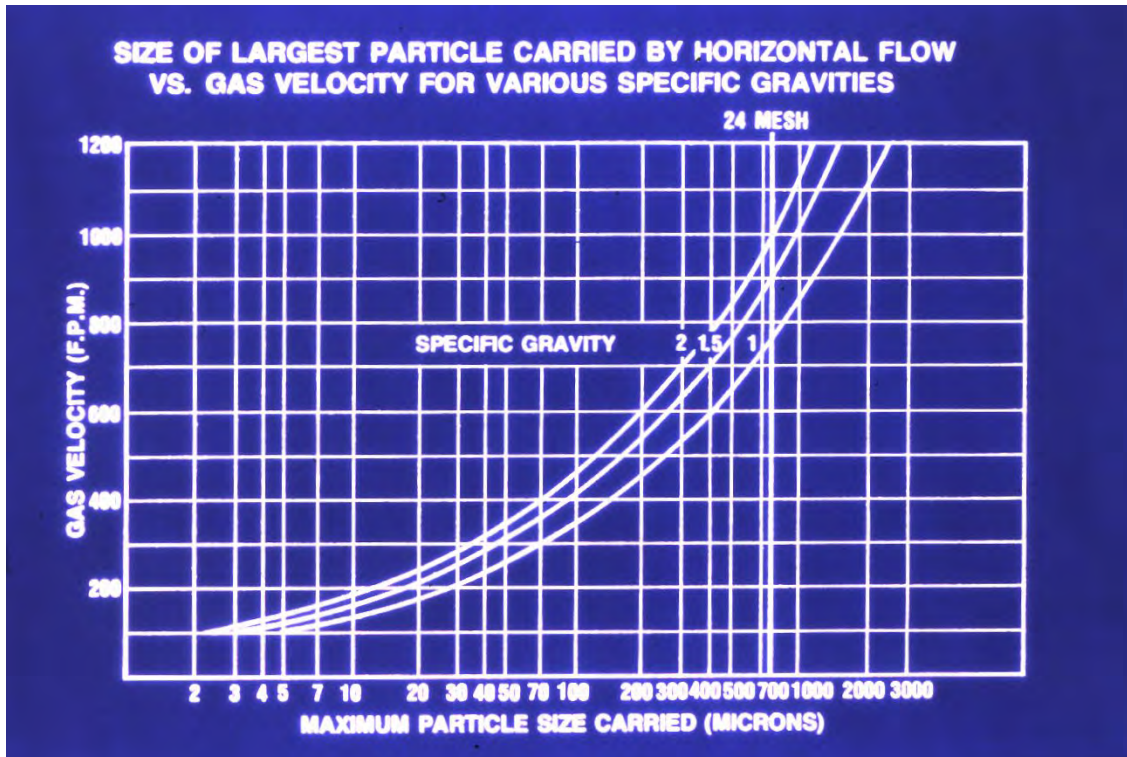
DUST COLLECTORS

- Dry collectors
- Wet collectors
- Fabric filters
- Combinations

Slide 2. Dust Collectors

AIR FLOW = 20,000 - 100,000 cfm

Slide 3. Air Flow



Slide 4. Size of Largest Particle Carried by Horizontal Flow vs. Gas Velocity for Various Specific Gravities [Graph]

DRY COLLECTORS

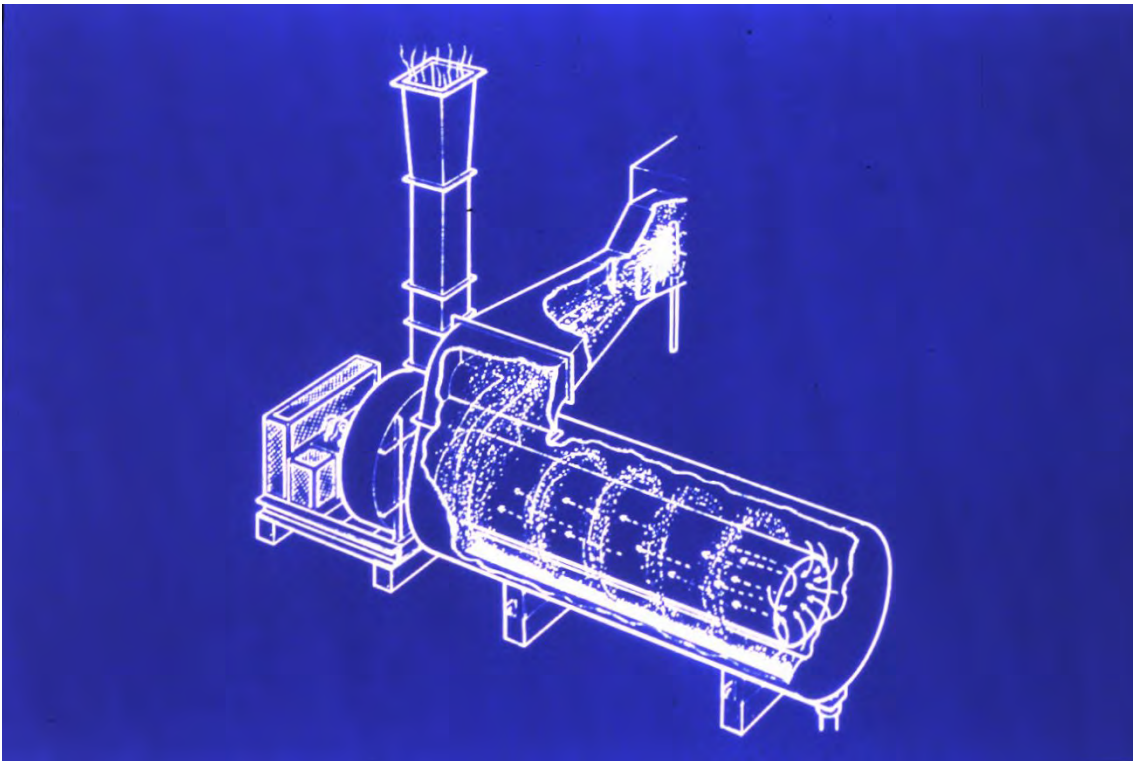
- **Expansion chambers**
- **Quick reduction of gas velocity**
- **Removes largest, heaviest particles**

Slide 5. Dry Collectors

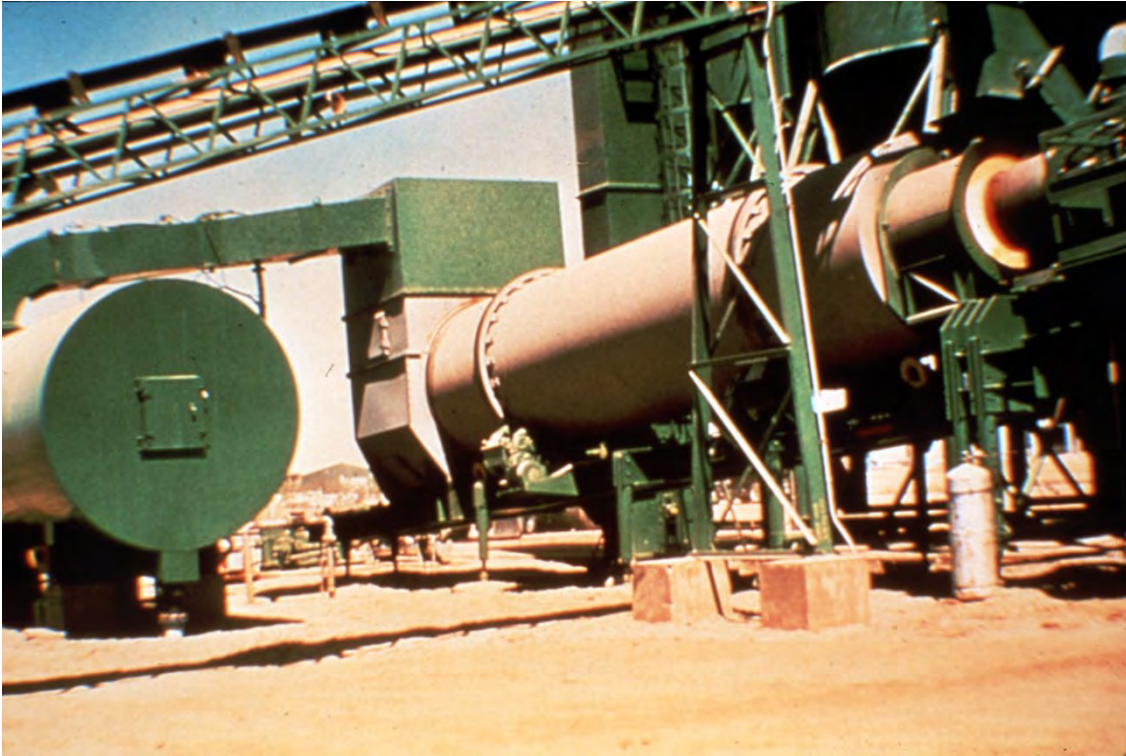
WET COLLECTORS

- "Wet scrubbers"
- Dust particles are wetted
- Wet particles swirled and removed
- Sludge removed to settling pond

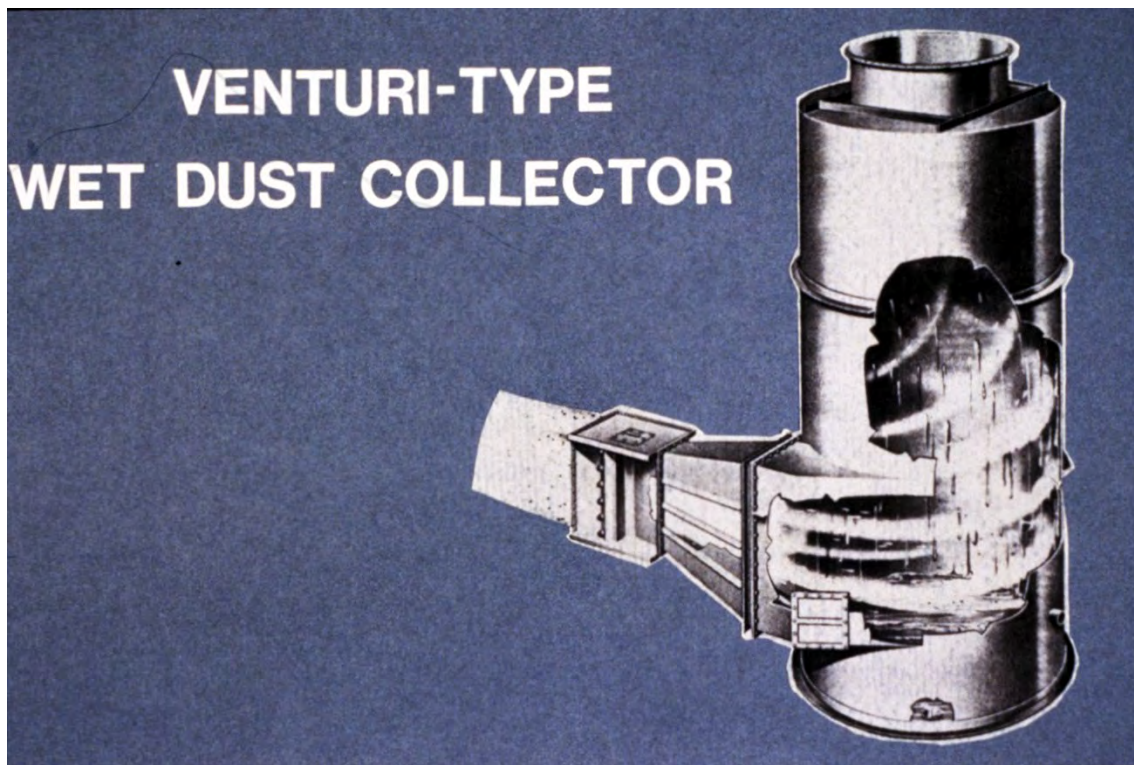
Slide 6. Wet Collectors



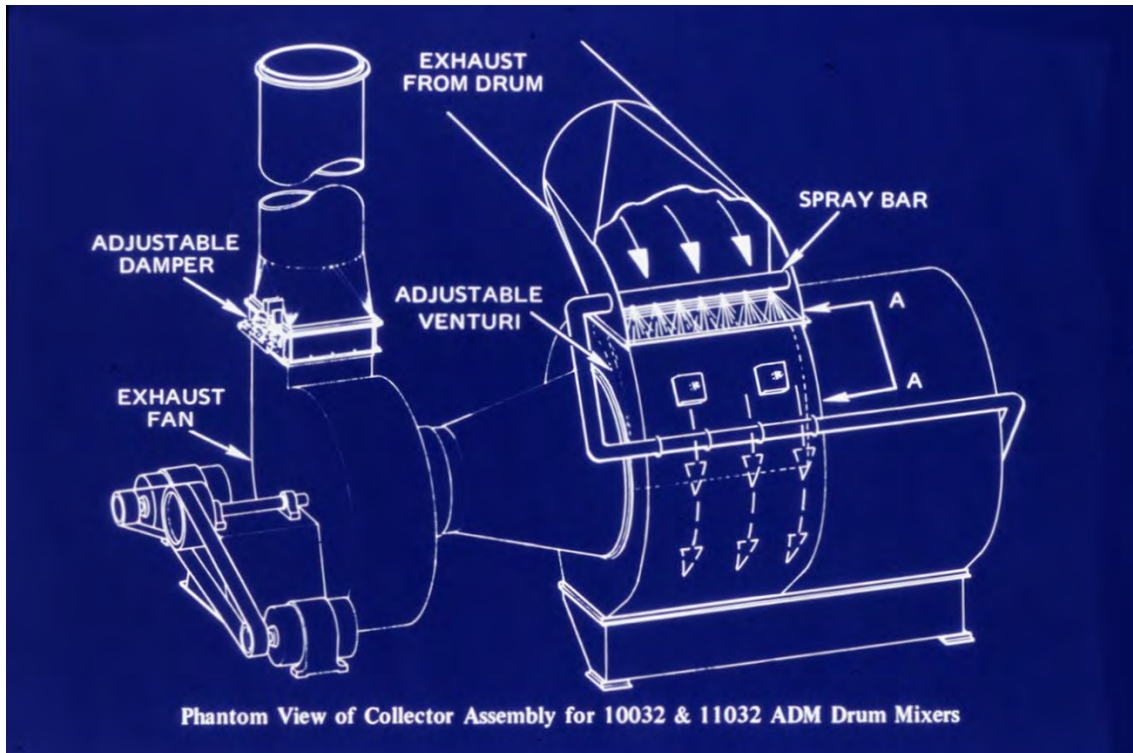
Slide 7



Slide 8



Slide 9. Venturi-Type Wet Dust Collector



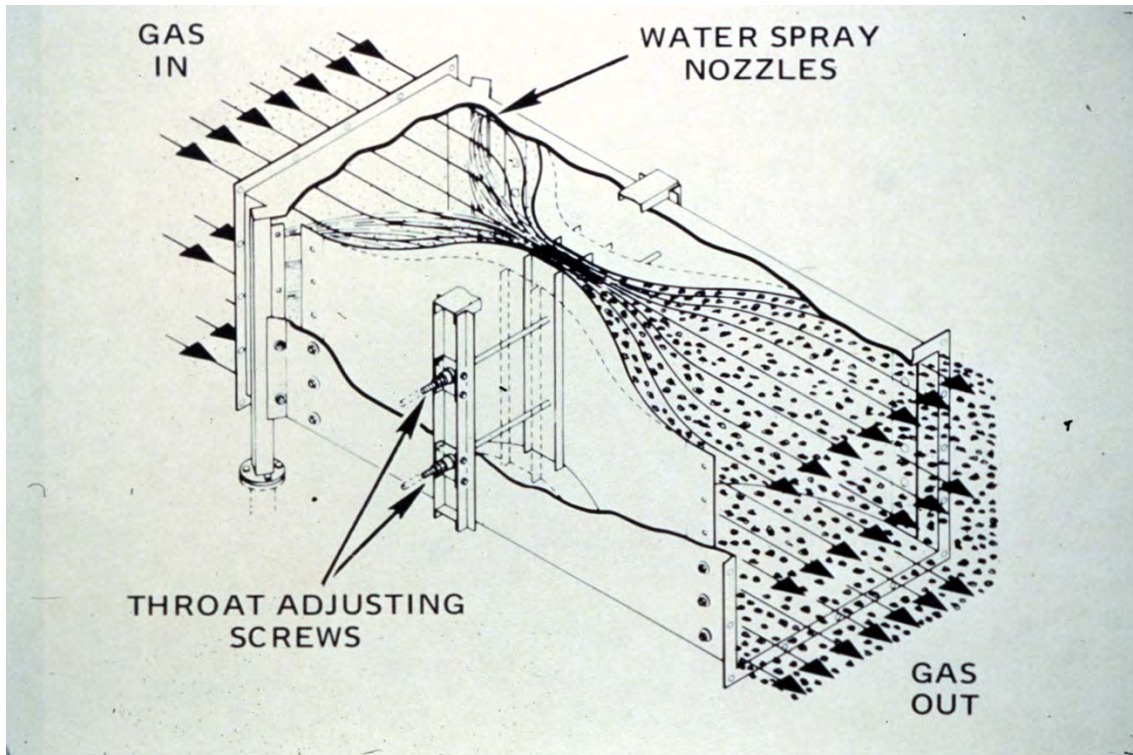
Slide 10. Phantom View of Collector Assembly



Slide 11



Slide 12



Slide 13

SETTLING PONDS

- Decreases water requirements
- Dust settles near sludge entry
- Water reused from far side
- Large, deep ponds allow greater separation

Slide 14. Settling Ponds



Slide 15



Slide 16



Slide 17



Slide 18



Slide 19



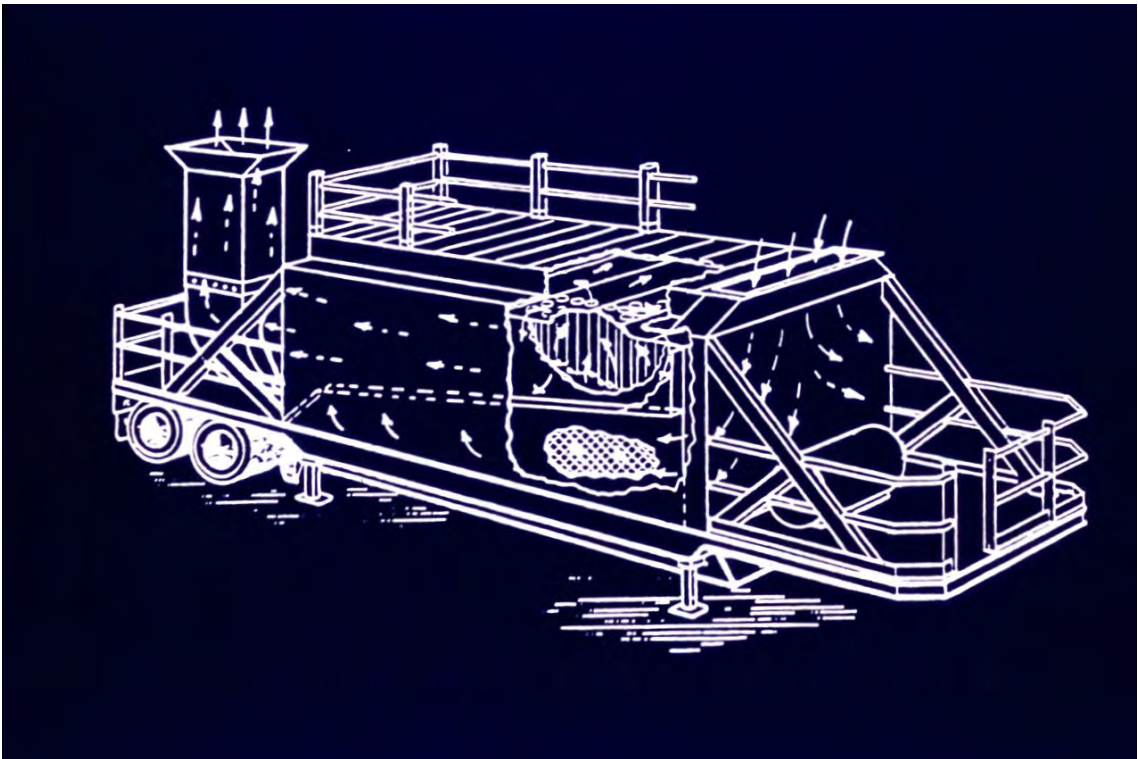
Slide 20



Slide 21



Slide 22



Slide 23

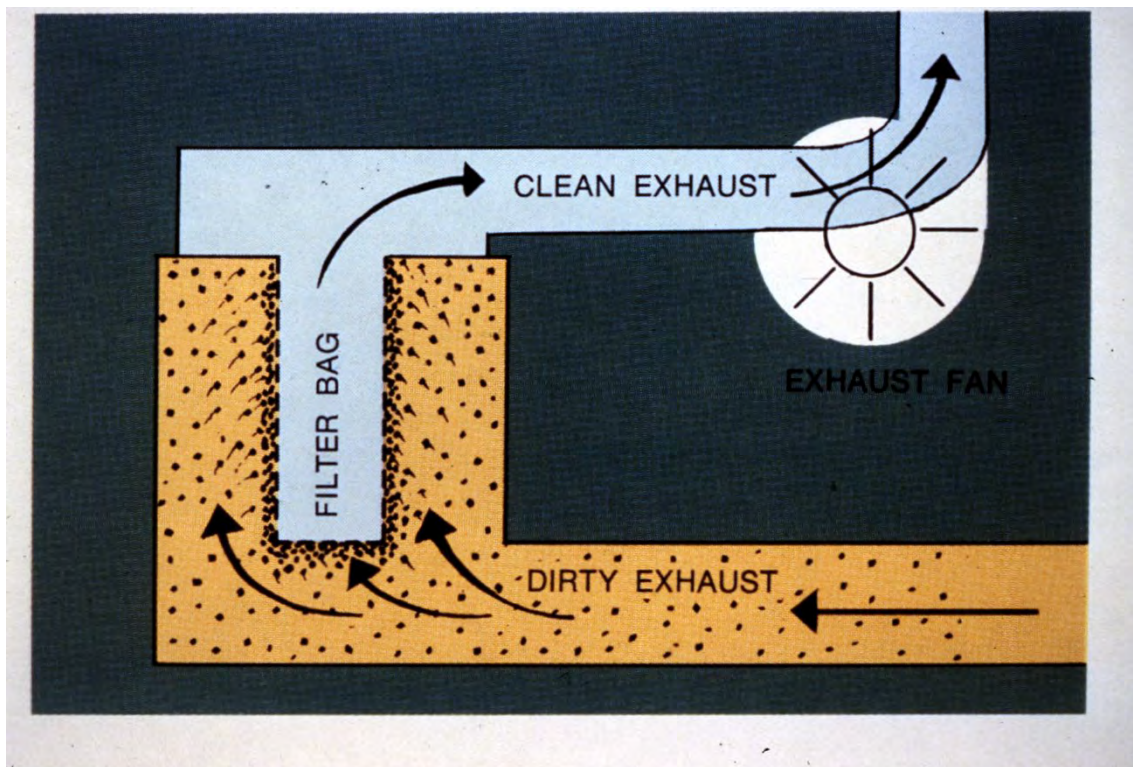


Slide 24

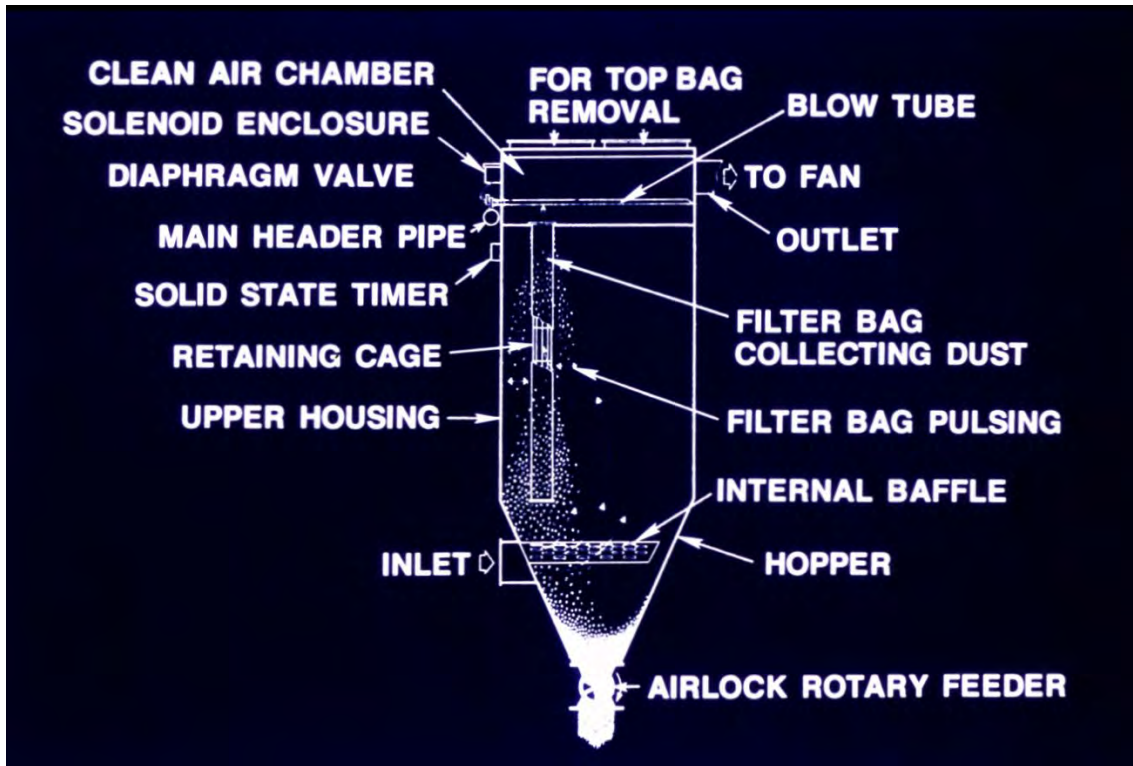
FABRIC FILTERS

- "Bag houses"
- Dust-laden air pulled through fabric
- Fabric on circular metal frame
- Closed on bottom, open on top
- 200 - 800 bags

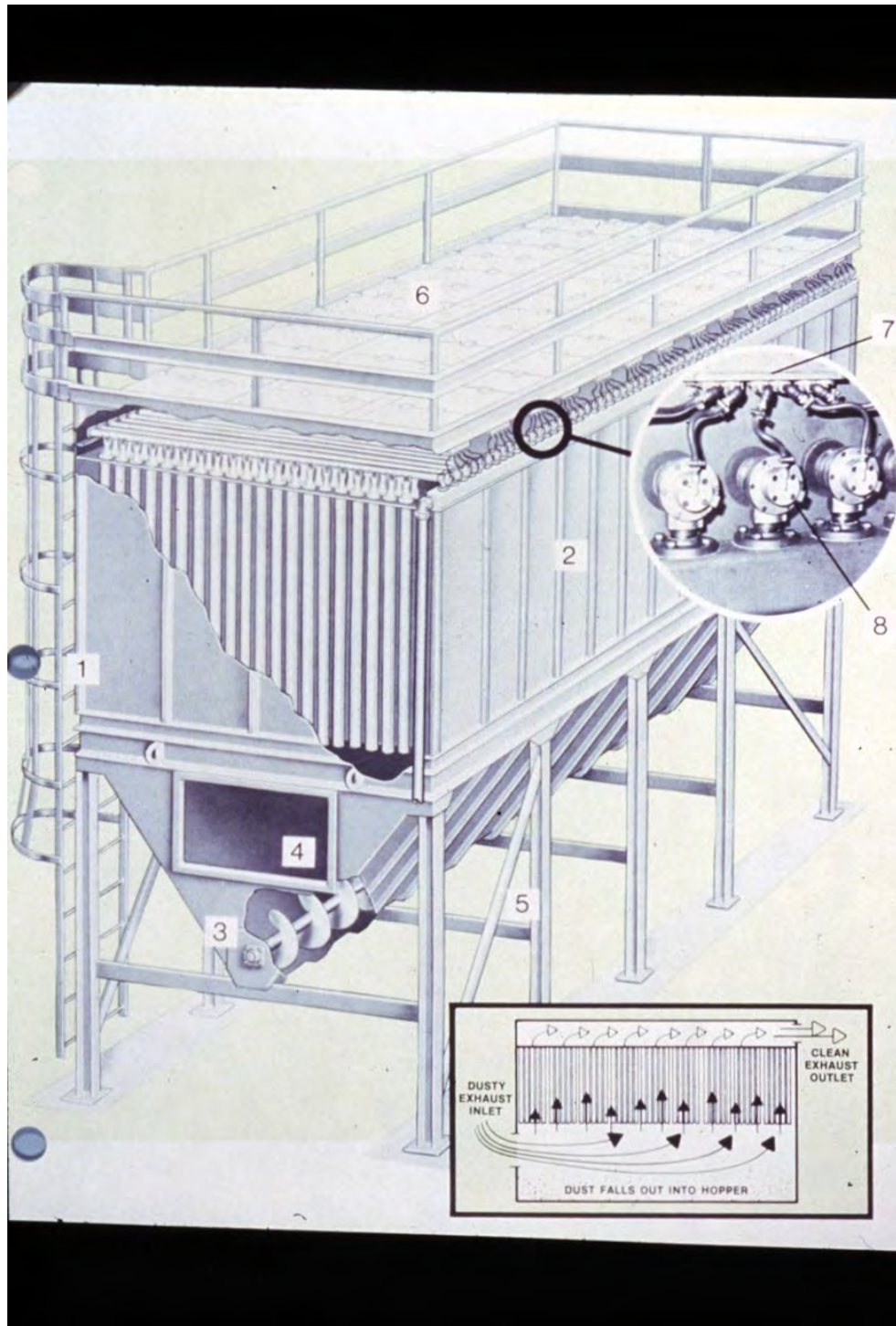
Slide 25. Fabric Filters



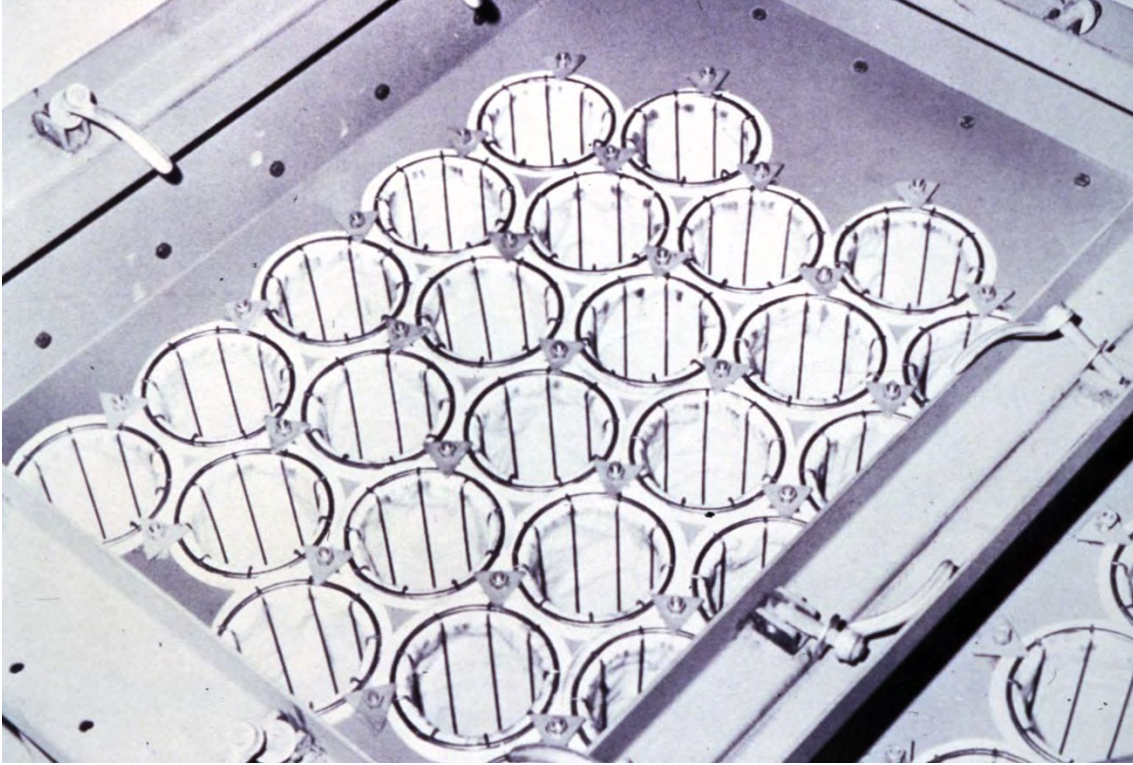
Slide 26



Slide 27



Slide 28



Slide 29

6:1 RATIO

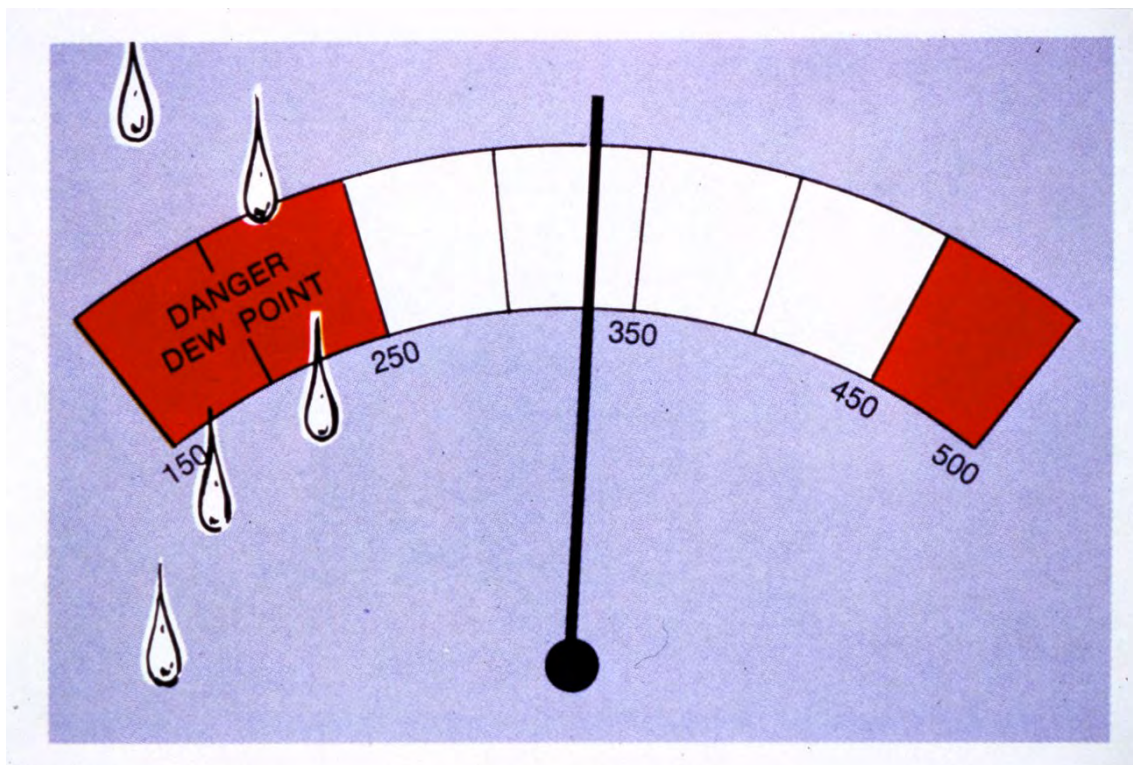
6cfm: 1sf of filter

Slide 30. 6:1 Ratio

BAG TEMPERATURE

- **Pre-heat ($>200^{\circ}\text{F}$) bags to eliminate mud buildup**
- **Bags should be below 450°F**

Slide 31. Bag Temperature



Slide 32

FILTER

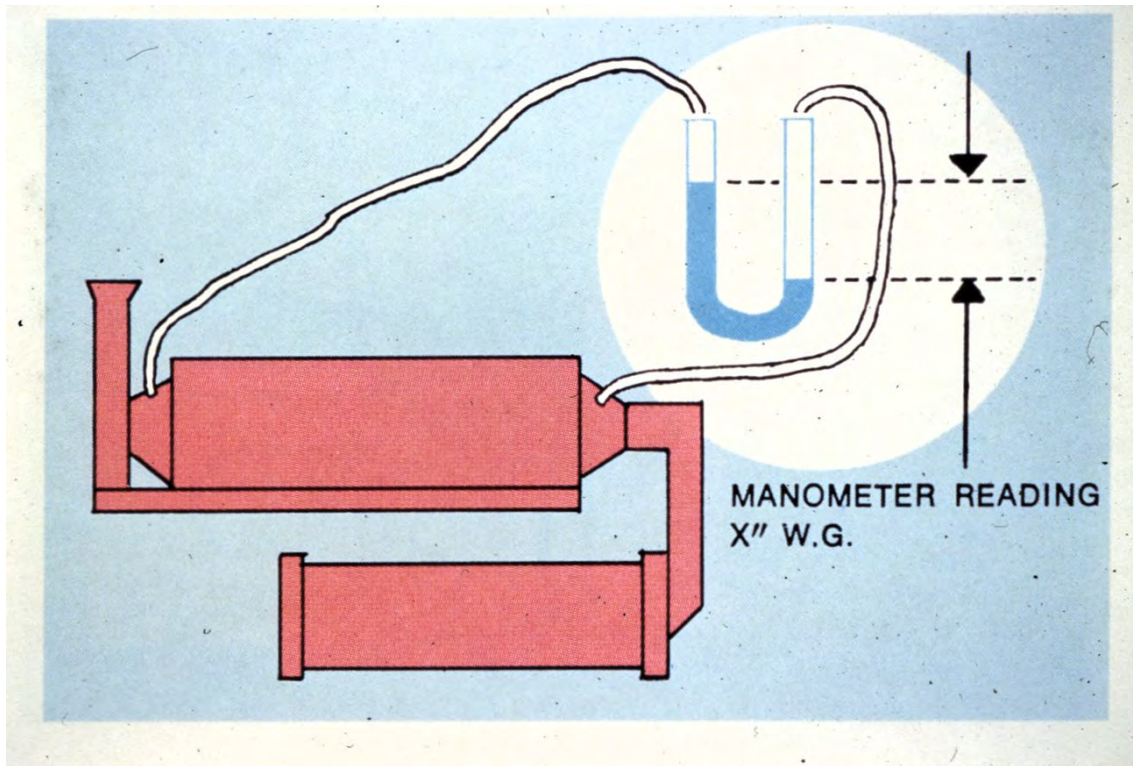
- **Needs coating to remove finer particles**
- **Blinded filter will not function**

Slide 33. Filter

BAG HOUSE EFFICIENCY

- **Up to 99.9%**
- **Measured in pressure drop**
 - 2 - 6 inches (water)**
 - 2 inches - bags too clean**
 - 6 inches - bags blinded**

Slide 34. Bag House Efficiency

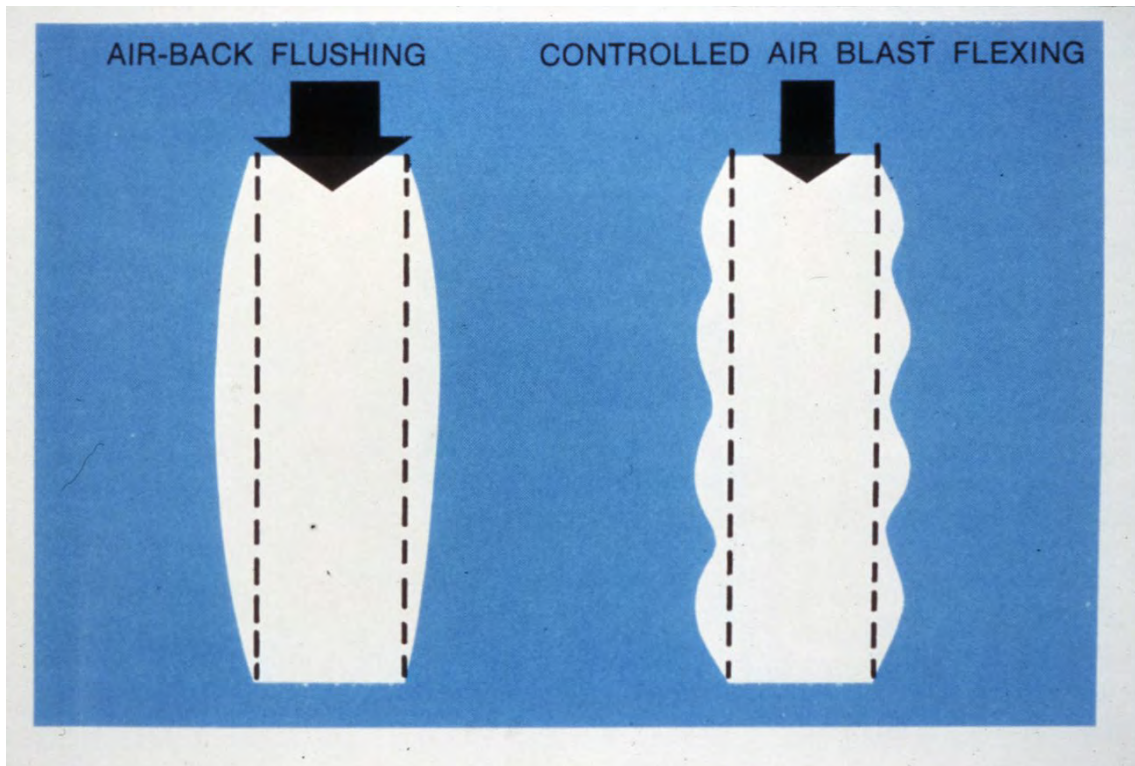


Slide 35

BAG CLEANING

- Done in groups
- Flexing or shaking
- Back flushing with air
- Combination

Slide 36. Bag Cleaning



Slide 37



Slide 38

COMBINATION DUST COLLECTORS

- **Primary - dry collectors**
- **Secondary - wet or dry collectors**

Slide 39. Combination Dust Collectors