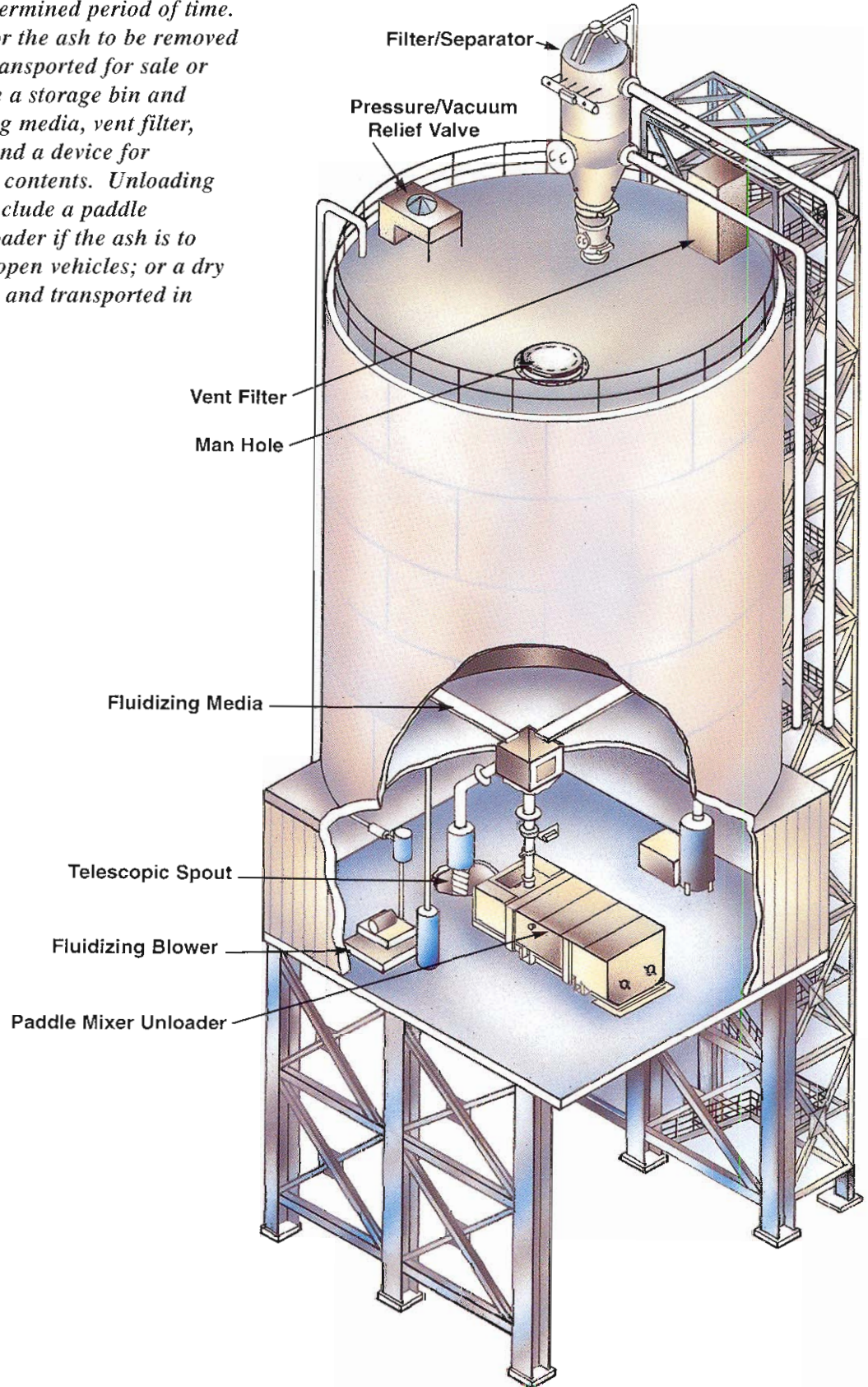


FLY ASH STORAGE AND UNLOADING SYSTEMS



**UNITED
CONVEYOR
CORPORATION**

With any pneumatic system – vacuum, pressure or combination vacuum/pressure – provision must be made to store the fly ash for a pre-determined period of time. The system must also provide for the ash to be removed from storage so that it can be transported for sale or disposal. These systems include a storage bin and its accessories, such as fluidizing media, vent filter, pressure/vacuum relief valve, and a device for measuring the level of the bin's contents. Unloading equipment below the bin may include a paddle mixer/unloader or a rotary unloader if the ash is to be conditioned for transport in open vehicles; or a dry spout if the ash is to be kept dry and transported in a closed vehicle.



System Components

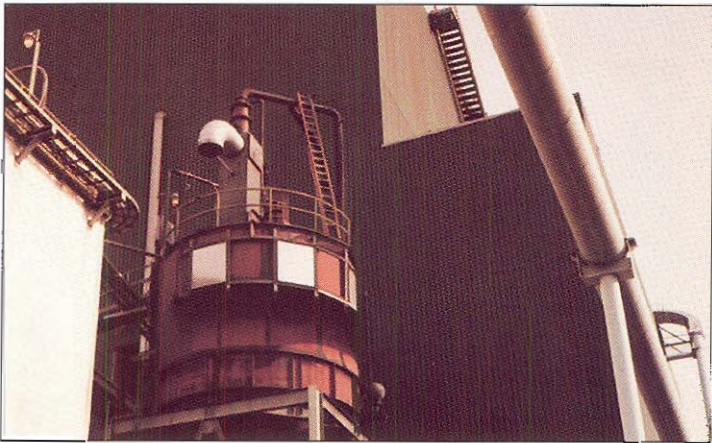


Fly Ash Storage Bin

Fly ash storage bins are fabricated in a range of sizes from 16' to 50' in diameter. Each bin is designed according to job requirements and may be flat-bottom or conical-bottom construction. The capacity of the bin is matched to the individual system where it will be installed. The bin is usually sized to hold a minimum of three days' ash production, so that it need not be emptied over a weekend. Structural considerations include seismic and wind conditions at the installation site; fluidizing pressure; and the expected range of ash density.

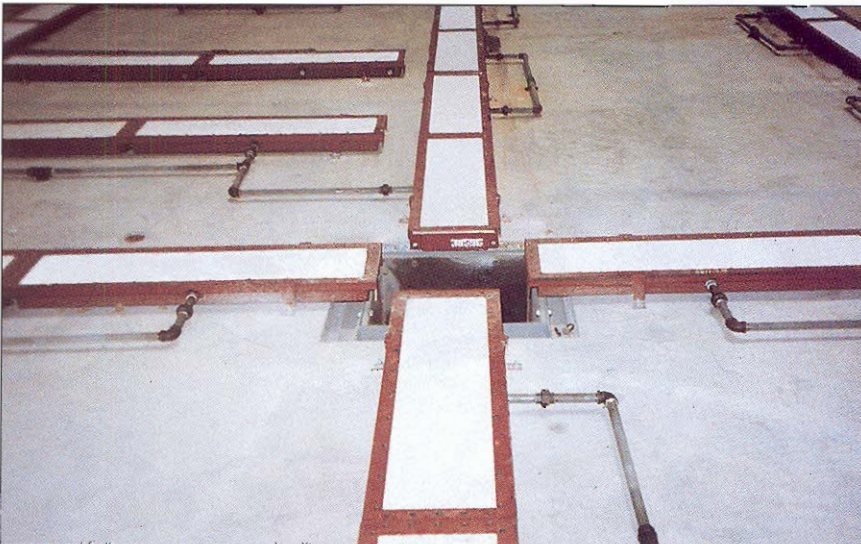
Welded steel plate is one of the standard construction materials for fly ash storage bins. To minimize field erection costs, these bins are first erected in the shop and all plates are match-marked, then knocked down for shipment. The bin is reassembled and welded at the installation site, where it is placed on a steel support structure that includes an unloading area.

For larger installations, a concrete bin can be an economic alternative. A concrete bin can be placed on a steel support structure, similar to a steel bin, when the support is designed to carry the additional weight of the concrete. The bin can also be constructed of concrete from the ground up. When this method of construction is used, an unloading area is integrated into the concrete structure of the bin itself. Whether steel or concrete, access must be provided into the bin for maintenance and inspection. A man hole is installed on the top of the bin for access to the bin interior.



Bin with Damage Limiting Construction

For those installations where combustible material is likely to carry over into the storage bin, such as bark or wood fired boilers, UCC designs damage limiting bins. These specialized bins include explosion relief panels at the upper perimeter, designed per NFPA guidelines. Should an explosion occur inside the bin, one or more of the panels will give way to relieve the pressure, preventing major structural damage to the bin. The panel or panels can be replaced and the bin put back into service without need for major repair.



Bin Fluidizing

Fly ash bins are usually designed with a flat bottom for maximum storage capacity. To assist ash flow to the bin outlet, fluidizing equipment is installed on the floor of the bin. Fluidizing media include diffuser stones, stainless steel or fabric elements, depending on operating parameters. These are arranged so that the aerated ash will move toward the outlet. Motor driven rotary blowers or compressors supply fluidizing air, which may be heated depending upon site conditions.

NOTE: For further information regarding the design and operation of filter/seperator units, see the Vacuum Fly Ash Systems section.

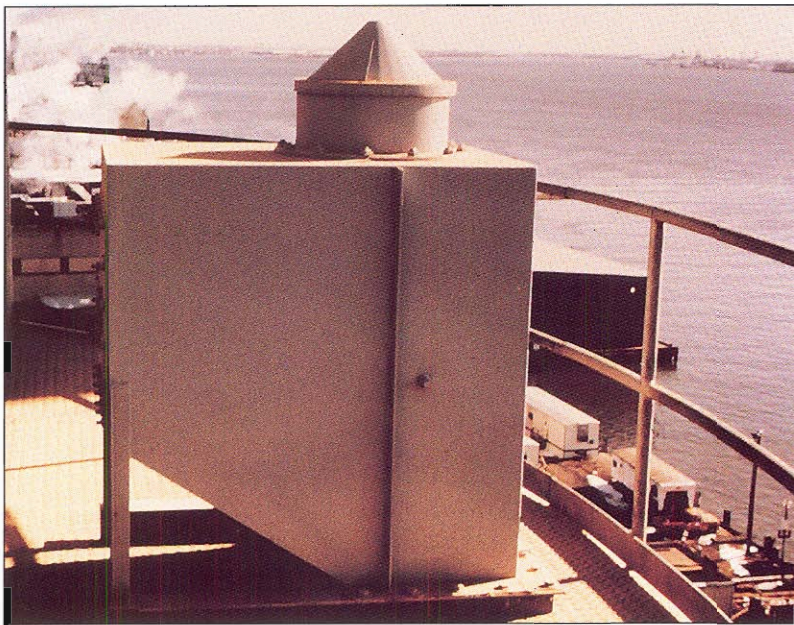


Vent Filter

Conveying air, fluidizing air and air displaced by ash is vented through a bin vent filter. A pulse-jet cleaned vent filter prevents fugitive dust from entering the atmosphere and keeps the bin pressure below that of the relief valve setting. The air, carrying the finer ash particles, rises into the bag area. As the air passes through the bags, dust is captured and collected on the bags' exterior surfaces. The air passes into the clean air plenum, then is vented into the atmosphere. To clean the bags, pulses of high-pressure air are directed into the filter bags to dislodge the dust particles back into the bin.

A range of filter sizes is available to meet specific requirements. A variety of filter bag media are available; the filter bags are selected to maximize service life under the varying operating conditions.

For installations where temperatures below 0°F are expected, an optional winterizing kit can be added to the filter to prevent elastomers in the valves from becoming brittle.



Pressure/Vacuum Relief Valve

All UCC fly ash storage bins include a top mount relief valve to protect the bin from potential damage due to excessive vacuum or pressure. If a system upset causes negative pressure (vacuum) within the bin to exceed a pre-set point, the relief valve allows air to enter the bin. Likewise, if pressure exceeds a pre-set limit, due to an upset condition, the relief valve allows air to escape from the bin.



Level Detection Equipment

In order to determine the amount of material stored in the bin, a level indicator is often installed in the bin roof. The unit provides continuous indication of the depth of material, and can be linked to a remote control panel.

The unit shown uses an ultrasonic sensor which is placed in the bin roof. Because it operates with sound waves, there is no physical contact with the ash. There are two mechanical alternatives, both of which make contact with ash stored in the bin. One employs a paddle wheel that stops turning when the ash reaches it; the other works like a plumb bob, stopping when it reaches the ash. The paddle wheel registers ash at a specific distance from the bin roof, while the plumb bob can calculate various levels of ash in the bin.

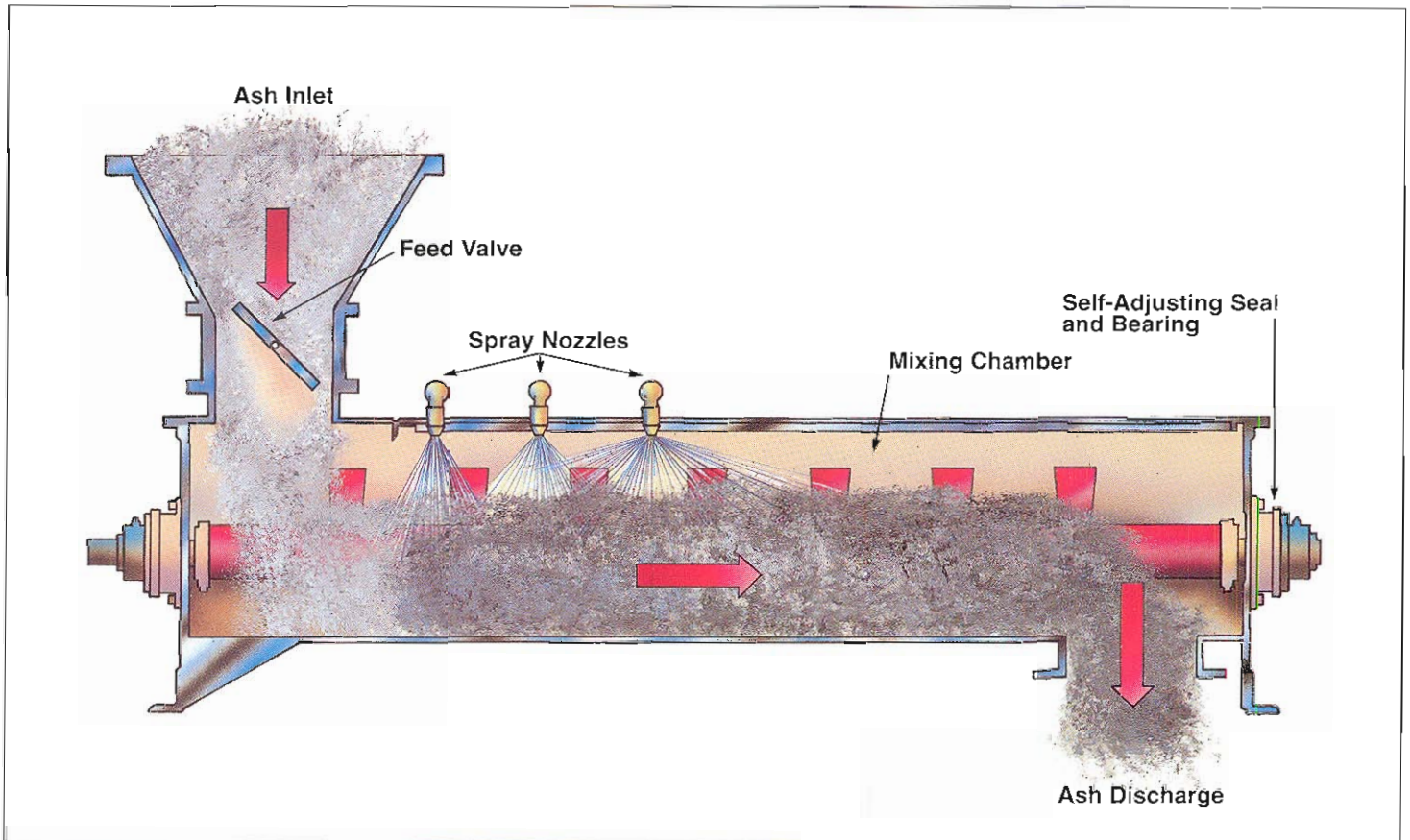
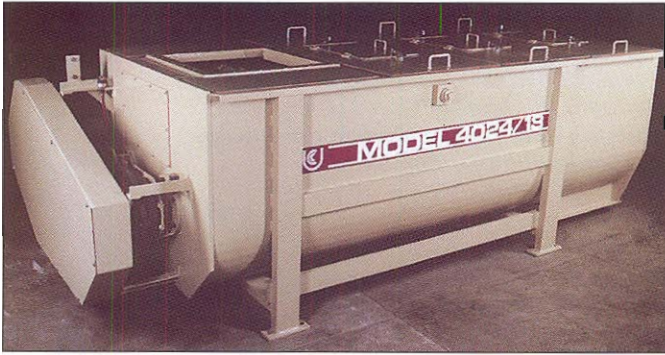
As an alternative to bin roof units, a high level sensor can be installed on the side of the bin to alert the operator when the bin is nearly full, or several sensors can be used at various levels.

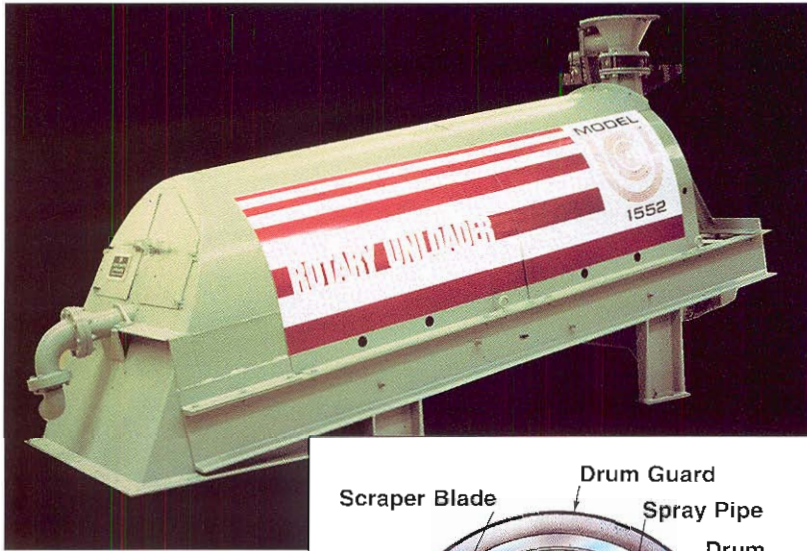
Paddle Mixer Unloader

When ash in the storage bin will be unloaded into open vehicles, it should be conditioned with water to prevent release of fugitive dust. One of the standard methods is a twin-paddle mixer unloader, which provides a very clean unloading operation. This unit has two horizontal shafts with abrasion-resistant paddles attached. The paddles rotate in opposite directions as three sets of nozzles spray water on the ash. The mixer creates a homogeneous mixture of water and ash, which moves toward the discharge chute.

The rate of flow from the bin into the mixer unloader must be controlled. Fly ash bins use a specialized butterfly feed valve to control flow. When the storage bin contains a mixture of fly ash and bottom ash, a rotary vane feeder will more precisely control the material feed rate into the mixing chamber. Due to a relatively long retention time, the consistency of the ash/water mix is not significantly affected by moderate fluctuations in ash and water feed rates.

The twin paddle mixer unloader is a volumetric unit; therefore, throughput (in tons) will vary depending upon the density of the ash. UCC manufactures several sizes of mixers, with capacities ranging from 1200 to 16,000 cubic feet per hour, and nominal output of 20 to 400 tons per hour. For small bins with low volume unloading requirements, a single-shaft unit is also available with a capacity of 750 cubic feet per hour, and nominal output of 10 tons per hour.





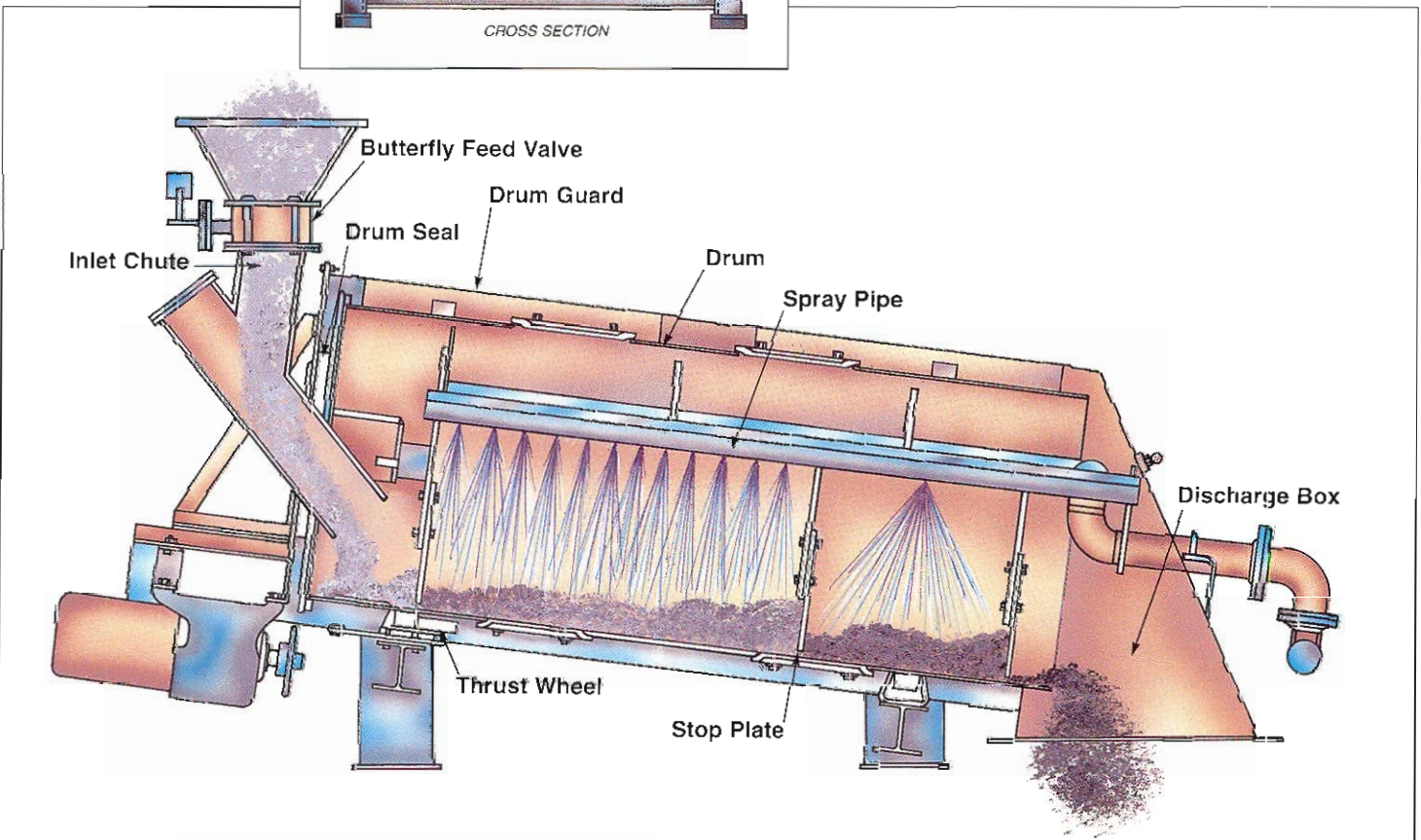
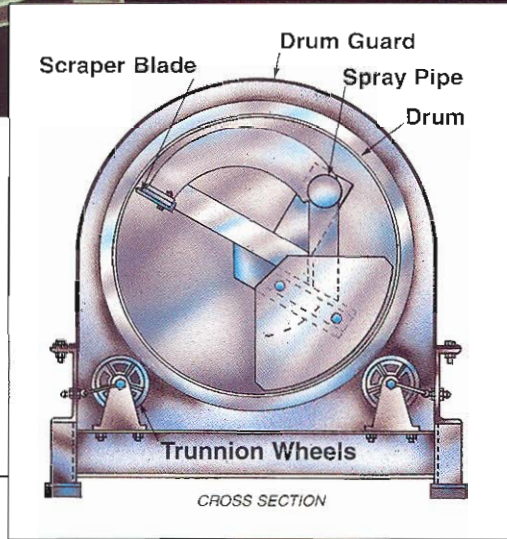
Rotary Unloader

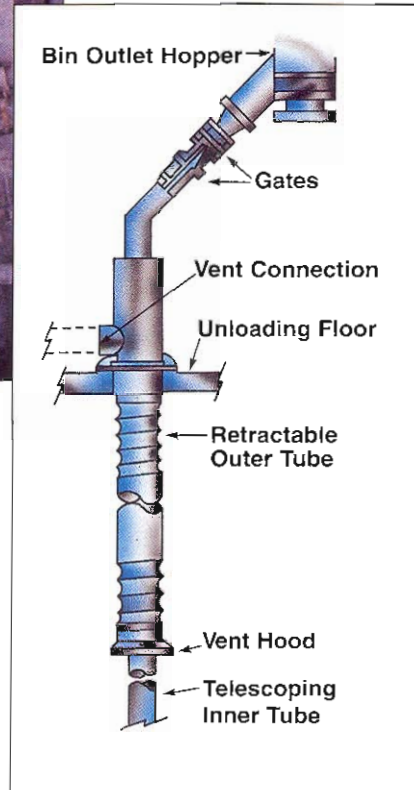
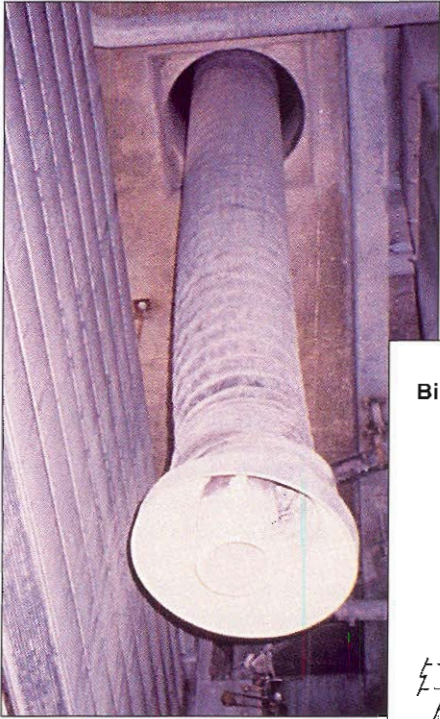
UCC also manufactures a rotary drum unloader. This unit mixes the ash and water with a tumbling action. Inside the rotary drum, a stationary scraper bar removes wetted material from the surface of the drum causing the tumbling action and resultant mixing. The scraper bar edge is fitted with tungsten carbide tiles to prevent rapid wear of the bar itself.

A butterfly feed valve regulates the flow of dry ash into the unloader. The ash is mixed with water as it progresses to the discharge end of the drum. Stop plates inside the drum prevent direct downhill flow of the unconditioned material.

By adjusting water flow, the unloader can condition either low or high calcium ash. High-flow or low-flow nozzles can be furnished to provide correct water flow depending upon the available water pressure. Properly conditioned ash exits the drum through the discharge box and falls through a chute to the transport vehicle.

Throughput of the rotary unloader will vary depending upon the type and density of ash to be conditioned. The 38" diameter unit will process up to 8000 cubic feet per hour, with a nominal discharge rate of 250 tons per hour. The 30" diameter unit will process up to 1440 cubic feet per hour, with a nominal discharge rate of 45 tons per hour. Only the larger unit is recommended for use with high calcium ash.





Dry Unloading Spout

When fly ash will be sold, or discharged dry for any reason, UCC can provide a dry unloading spout to empty the storage bin. It consists of a telescoping tube inside a flexible, retractable outer tube. The outer tube connects to the inlet flange of a closed carrier such as a tank truck or hopper type rail car. An electric winch raises and lowers the telescoping tube for coupling with the vehicle.

Ash discharges from the bin through the inner, telescoping tube into the vehicle. Displaced air from the vehicle vents through the open space between the concentric tubes, minimizing fugitive dust. An electric powered fan is often used to assist venting of the displaced air back into the bin. Since dry spouts provide direct discharge from the bin, they are capable of very high unloading rates.

Other related literature available from UCC:

- M1091-709 SS Fluidizer Assemblies
- M107-719 Rotary Unloader
- M1192-730 20" Rotary Vane Feeder
- M018-720 Radio Frequency Level Detector
- M095-713 Pressure/Vacuum Relief Valve
- M1091-726 Utility Mixer Unloader
- M0194-722 Industrial Mixer Unloader
- M0695-733 Midrange Mixer Unloader
- M119-724 Filter/Separator
- M1092-728 Bin Vent Filter