

# ACHIEVING OPTIMUM BUCKET ELEVATOR CAPACITY



There is a demand for increasing the capacity of bucket elevators, especially those conveying grain commodities. There are many factors that can affect the capacity of a bucket elevator, such as bucket style, belt speed, pulley diameter, head profile, outlet position, material particle size, shape, density, angle of repose, coefficient of friction and terminal velocity.

The most common cause for loss of elevator capacity is discharge inefficiency, typically related to incorrect belt speed, bucket spacing, or head profile design. There are three bucket elevator discharge methods:

Discharge Type	Initial Discharge	Typical Material Conveyed	Typical Bucket Style
Centrifugal	@ 10 o'clock	Feed and Grain	CC-S, Starco, Bottomless
Centri-gravity	@ 12 o'clock	Sand, Cement, Wood Chips	CC-S, Starco, AA, AC
Gravity	@ 2 o'clock	Seeds, Pellets, Fragile Materials	MF, SC

\* Visit [www.go4b.com/usa](http://www.go4b.com/usa) for details on each bucket style

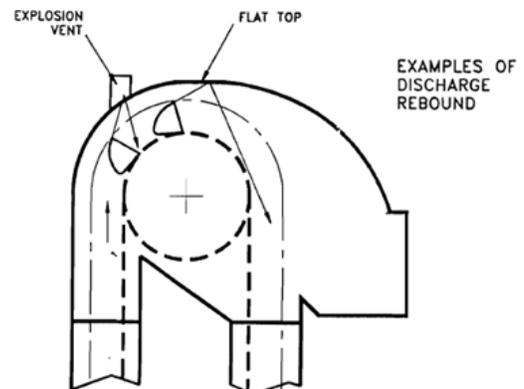
Centrifugal discharge is normally used for grain and other materials which are handled at medium to high belt speeds. The material will start discharging from the bucket at about 10 o'clock from the horizontal and continues discharging around the pulley in arcs towards the head cover and outlet until empty.

**Head Cover** - It is necessary to design the head cover so that the material will slide smoothly along the cover to the outlet, minimizing the amount of dust created and material damage. A flat top cover design as well as any break in the head cover, such as explosion vents or gaps, will make the material rebound onto the pulley and will result in material rebounding and falling down the leg casing.

**Belt Speed** - There is a minimum and maximum centrifugal belt speed for every bucket projection and pulley diameter. The recommended bucket types for centrifugal discharge are CC-S, Starco, and Bottomless buckets. Consult 4B for speed recommendations.



Test Elevator Fitted with Starco Elevator Buckets Showing Initial Discharge at 10 o'clock



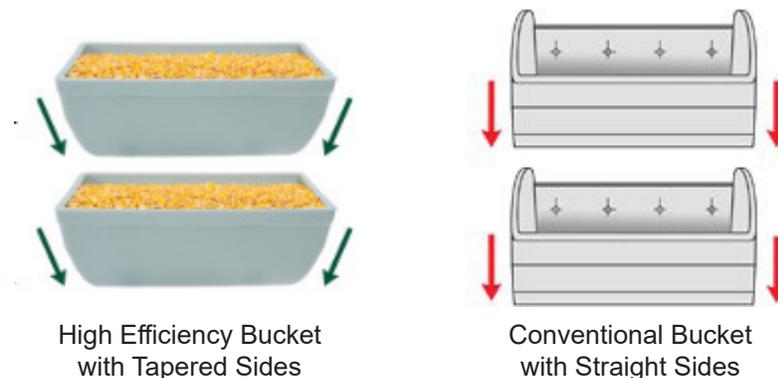
Centri-gravity discharge is normally used for discharging powders, sand, cement and wood chips at slower speeds. The buckets start to discharge at top dead center (12 o'clock) and continue until approximately 50° afterwards. Recommended bucket types for centri-gravity discharge are CC-S, Starco, AA and AC elevator buckets.

Gravity discharge is typically used for discharging fragile materials which basically fall out of the buckets at around the 2 o'clock position. Slow running continuous buckets such as MF and SC can be used for gentle handling of fragile materials.

Along with bucket discharge, there are other factors to consider that can also affect your elevator's capacity.

## Other Considerations

**Bucket Fill** – Material enters an elevator bucket through the front and the sides. Buckets with straight sides do not fill as well as buckets with tapered sides. 4B's High Efficiency elevator buckets have tapered sides which allow them to fully fill and discharge more efficiently than any other CC style bucket.



**Elevator Outlet**– For proper discharge of material the elevator outlet should be sized and positioned low enough for the required capacity and should be at minimum 45° from the head shaft for grain and free flowing particles. For other products such as meals, cement, sticky materials, and wood chips, the outlet should be at 50° to 55°.

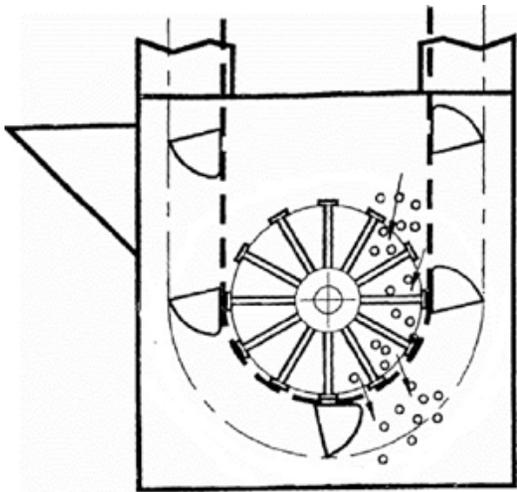
**Elevator Belt** – Maintain proper belt tension to avoid slippage on the drive pulley. A lagged head pulley will help reduce slip and wear on the belt.

**Monitoring** – Always install belt slip, belt misalignment and bearing temperature monitoring systems for a safe and efficient operation.



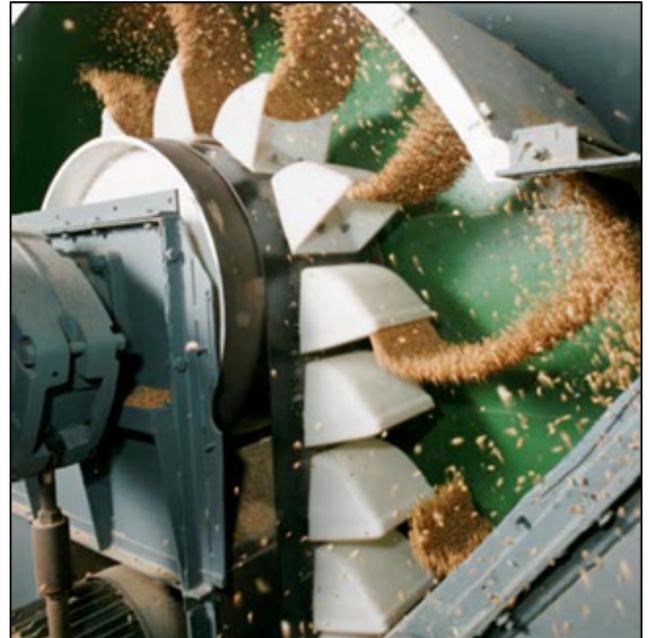
Lagged Head Pulley

**Elevator Inlet** – To ensure an efficient intake and reduce material damage and dust, place the inlet at a minimum angle of 45° from horizontal when handling grain, 50° for meals or pellets and 55° for industrial materials, to a point at least 4 inches above the centerline of the boot shaft so that material is directly fed into the buckets. The inlet should be large enough for the required volume of material.



OPERATION OF WINGED PULLEY

**Boot Pulley** – Most boot pulleys for grain are smooth surfaced, but for sticky meals which can build up on the inside of the belt and cause belt stretch as well as other belt issues; a wing type pulley is best as it allows the surplus material to fall through the wings instead of building up between the pulley and the belt. A wing type pulley also reduces damage to pellets.



Centrifugal Discharge of CC-S Buckets  
Shown Handling Grain

4B Components can help you trace the faults in underachieving elevators. Complete our online bucket elevator questionnaire (<https://www.go4b.com/usa/technical-support/elevator-design-service.asp>) and we will promptly provide you with engineering information on how to meet your requirements.

The Bucket Elevator Engineering Service is 100% free of charge, so take advantage of it!