



## **Achieving Maximum Capacity On a New or Existing Bucket Elevator**

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There is a demand for increasing the capacity of new and old elevators particularly for handling grain. Factors that influence the capacity of an elevator are: bucket type, shape and discharge characteristics, optimum speed in relation to pulley size, shape of head and boot, material characteristics such as size, shape and density, angle of repose, coefficient of friction and terminal velocity.

The most common cause for loss of capacity in an elevator is the bucket discharge, which can be caused by the incorrect belt speed in relation to the pulley diameter, the wrong bucket for the material and the wrong head shape. Below is a table showing the three types of discharge and their common characteristics.

Discharge Type	Initial Discharge	Speed	Typical Material Handled	Elevator Bucket Style*
Centrifugal	@ 10 o'clock	Medium to High	Feed and Grain	CC-S, Starco, J Type Steel, GB Spidex Bottomless Buckets
Centri-gravity	@ 12 o'clock	Low to Medium	Seeds, Cement, wood chips, steel shot, sand, glass cullets	Starco Jumbo, Super Starco Steel Buckets
Gravity	@ 2 o'clock	Low	Pellets and fragile materials	AA, MF-Continuous Buckets

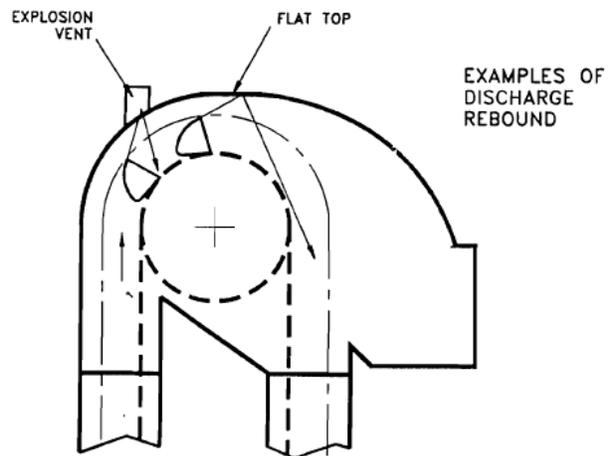
\* Visit [www.go4b.com](http://www.go4b.com) for details on each bucket style

*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.



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

**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 back legging and/or down legging.



**Belt Speed** - There is a minimum and maximum centrifugal belt speed for each different bucket size and pulley diameter. The recommended bucket types for centrifugal discharge are CC-S, J-Steel, Starco, Super Starco and Bottomless buckets. Consult 4B for speed recommendation.

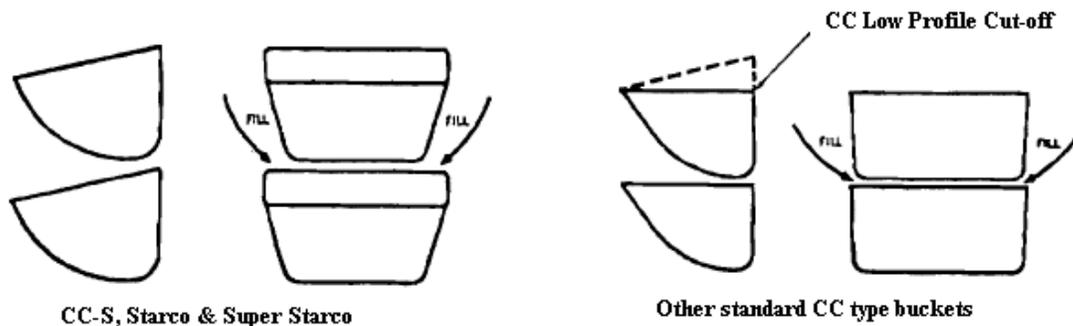
*Centri-gravity discharge* is normally used for discharging powders, pellets, cement and fragile materials at slow speeds. The buckets start to discharge at top dead center (12 o'clock) and continue until approximately 50° afterwards. Recommended bucket types for centri-gravity discharge are Super Starco Steel and Starco Jumbo (SJ) buckets.

*Gravity discharge* is typically used for discharging sluggish, aerated materials which basically fall out of the buckets at around the 2 o'clock position. Slow running continuous buckets 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. As shown below, 4B's CC-S, Starco and Super Starco's buckets have tapered sides which allow them to fully fill and discharge material better than any other CC type bucket.



### BUCKET FILL AREA COMPARISON

**Elevator Head** – To facilitate the discharge of material from the elevator head, the outlet should be large enough for the required capacity and should be at minimum 45° from the head shaft for grain and low friction particles. For other products such as meals, cement, sticky materials, and wood chips, the outlet should be at 50° to 55°.

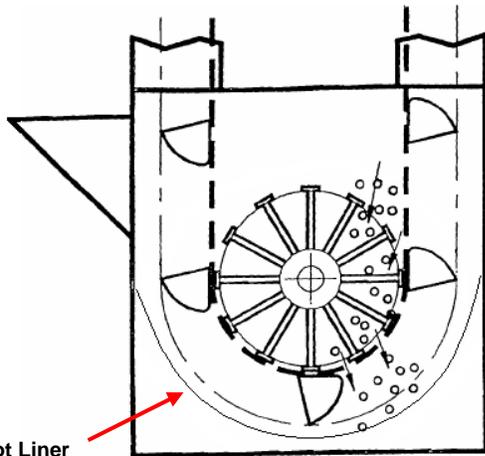
**Elevator Belt** – Maintain proper belt tension to help avoid belt slippage on the drive pulley. A lagged head pulley will help reduce slip and wear on the belt.

**Monitoring** – Always install belt slip, belt misalignment and bearing temperature monitoring systems to help with safety and maintenance requirements.



Lagged Head Pulley

**Elevator Boot** – To ensure an efficient intake and reduce material damage and dust, place the intake 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 line of the boot shaft so that material is directly fed into the buckets. The area of the intake should be large enough for the required volume of material. When handling grain, fitting a liner in the boot 1 to 2 inches from the lower bucket tip will increase the bucket fill, reduce grain damage and the amount of power required.



OPERATION OF WINGED PULLEY

**Boot Pulley** – Most boot pulleys for grain are smooth surfaced, but for sticky meals which 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 ([www.go4b.com/usa/free-design.asp](http://www.go4b.com/usa/free-design.asp)) and we will promptly provide you with engineering information on how to meet your requirements.

4B's Bucket Elevator Engineering Service is 100% free of charge, so take advantage of it!

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