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How To Get the Most Productivity From your Bucket Elevators

Dean Wedekind at Maxi-Lift

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Dean Wedekind

Maxi-Lift and DuraPlas

Technical Sales Specialist

Maxi-Lift Inc.®

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Maxi-Lift Inc.®

- Located in Addison TX
- Injection Molding
- Belt slitting and punching
- Warehouse
- Shipping and receiving
- Offices



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I want to give credit to Clayton and Barb Ellsworth who started EBM Corporations for introducing me to industrial agricultural sales and supply.

- Longtime GEAPS member and participant in the “What’s New” program
- Instilled in me the value of employee training
- Believes in hands-on training as well as classroom training
- Published “Understanding the Elevator Leg”
- “As long as the cups go up, nothing is wrong – DO NOT BELIEVE IT!”



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I spent one week in June 1994 as a millwright helper installing oil dust suppression systems in bucket elevators.

- I kept this piece of concrete from the first time I operated a hammer drill
- I worked in four facilities. Everything from new to old, steel to concrete, dry to wet and slimy.
- This is where I started to get my appreciation for the demanding work accomplished by millwrights and maintenance workers.
- Clayton Ellsworth sent me on this project to be a learning experience. This project and a few others were a great education.



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I take bucket elevator inspections seriously!

- Small facility, 12 degrees, ladder and cage on the left
- Large facility for ship loading on the right
- Dusty and dirty isn’t a problem



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Bucket Elevators

How Do You Get The Most Production Possible?

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Factors that affect bucket elevator production

- Original design
- Head section features
- Boot section features
- External features
- Bucket features
- Regular component inspections

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Maxi-Lift Capacity Calculator		

Customer:	COMPANY ABC	
End User:	Plant Manager	
EU Location:		
Contact:		

Select Product	TIGER TUFF LO PRO-20 x 8
Pulley Diameter (IN)	43
Pulley RPM	60
Bucket Spacing (IN)	7
# of Rows	1
Product Density	45
% Fill	100%

Product Information		
Dimensions	Size	20 x 8
	Length	21
	Proj	9.25
	Depth	6.75
Thickness	Back	0.5
	Front Corner	NA
	Front Lip	NA
Punching	Centers	3.5
	Number of Holes	6
	Bolt Size	0.3125
	Top Down	2.5
Plastic Weights	Poly	6.62
	Nylon	6.94
	Urethane	NON-STOCK
Steel Weights	Steel	NA
	Gauge	NA
Capacity	Water Level (In)	646.81
	Usable Capacity (In)	714.73
	Capacity (Cu Ft)	0.37
	Usable Capacity (Cu Ft)	0.41
Spacing	Std Spacing	7
Packaging	Carton Qty	12

Calculations - Capacity	
Belt Foot/Minute	675
Bushels/HR (Grain) - Water Level	20901
Bushels/HR (Grain) - Expected	23095
Cubic Foot/HR - Water Level	26005
Cubic Foot/HR - Expected	28736
Tons/HR - Water Level	585
Tons/HR - Expected	647
Metric Tons/HR - Water Level	531
Metric Tons/HR - Expected	587

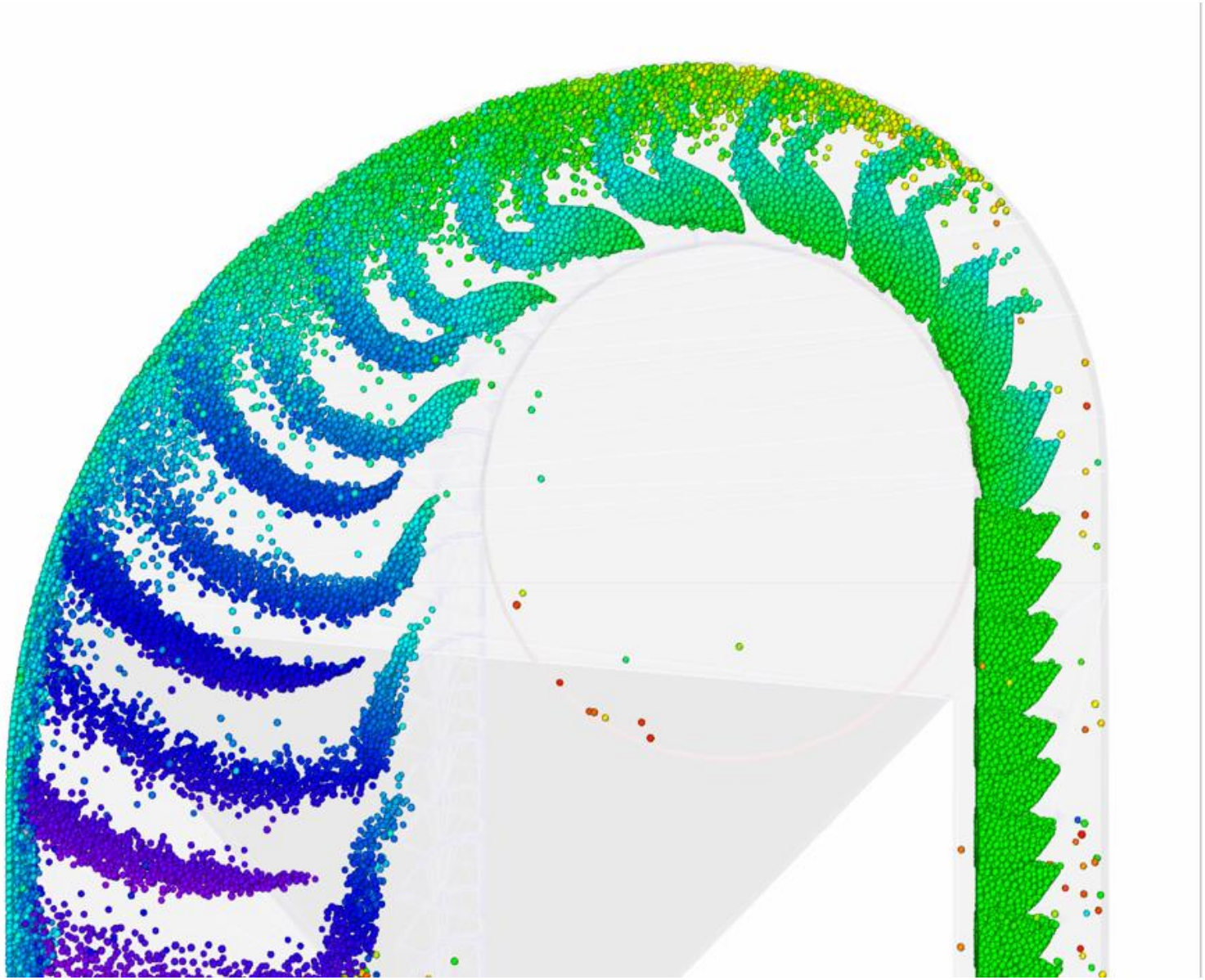
Calculations - Belt	
Belt Selection	RUB3-600
Width (IN)	21
Bucket Type	Poly
Leg Height (FT)	140
Minimum Pulley Recommendation (IN)	42
Max Projection Inches (must be green)	11
Max Belt Workload (must be green)	500
PIW Weight (LBS)	0.205
Bucket Weight (LBS)	6.62
Capacity (Inches)	714.73
Total Belt Weight (1 side)	602.7
Total Belt Length (+15')	306
Total Buckets	519
Total Bucket Weight (1 side)	1717
Total Material Weight (1 side)	4826
Adustment for Digging (15%)	724
Tension LBS	7869
Workload PIW	375
Workload Adjusted PIW (+25%)	468
Theoretical HP Required	91
Adjusted HP Required (+25%)	114

The vast majority of bucket elevators will accomplish the capacity as designed

- The many reputable manufacturers here at the GEAPS Exchange will calculate capacity similar to this chart
- Something has changed if a leg doesn't achieve it's rated capacity
- Let's see what those changes might be starting at the head

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Typical throw Pattern for High Speed Grain Leg



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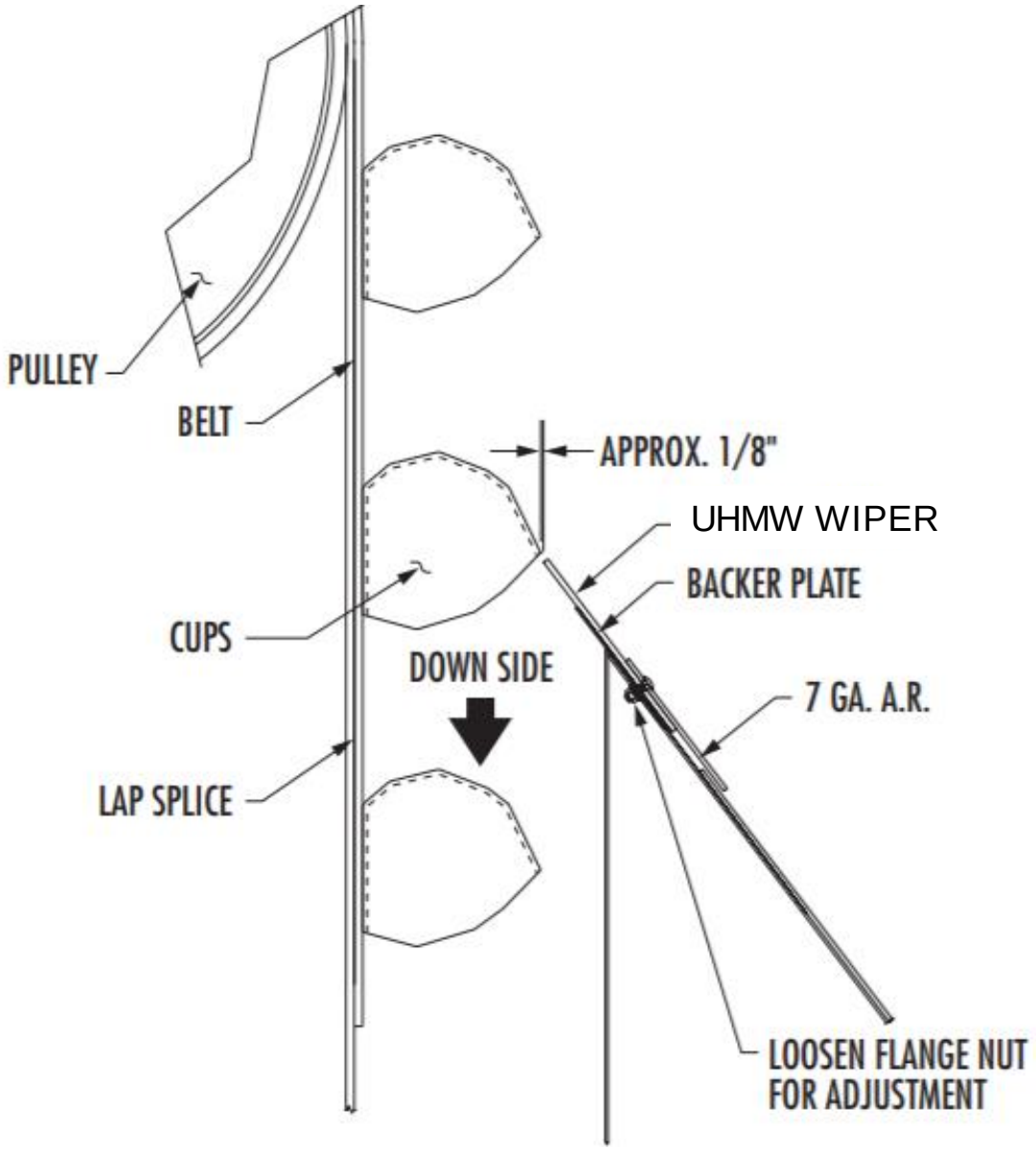
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Understanding The Value of The Throat Plate

This Small Item Is Vital!

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Missing throat plate

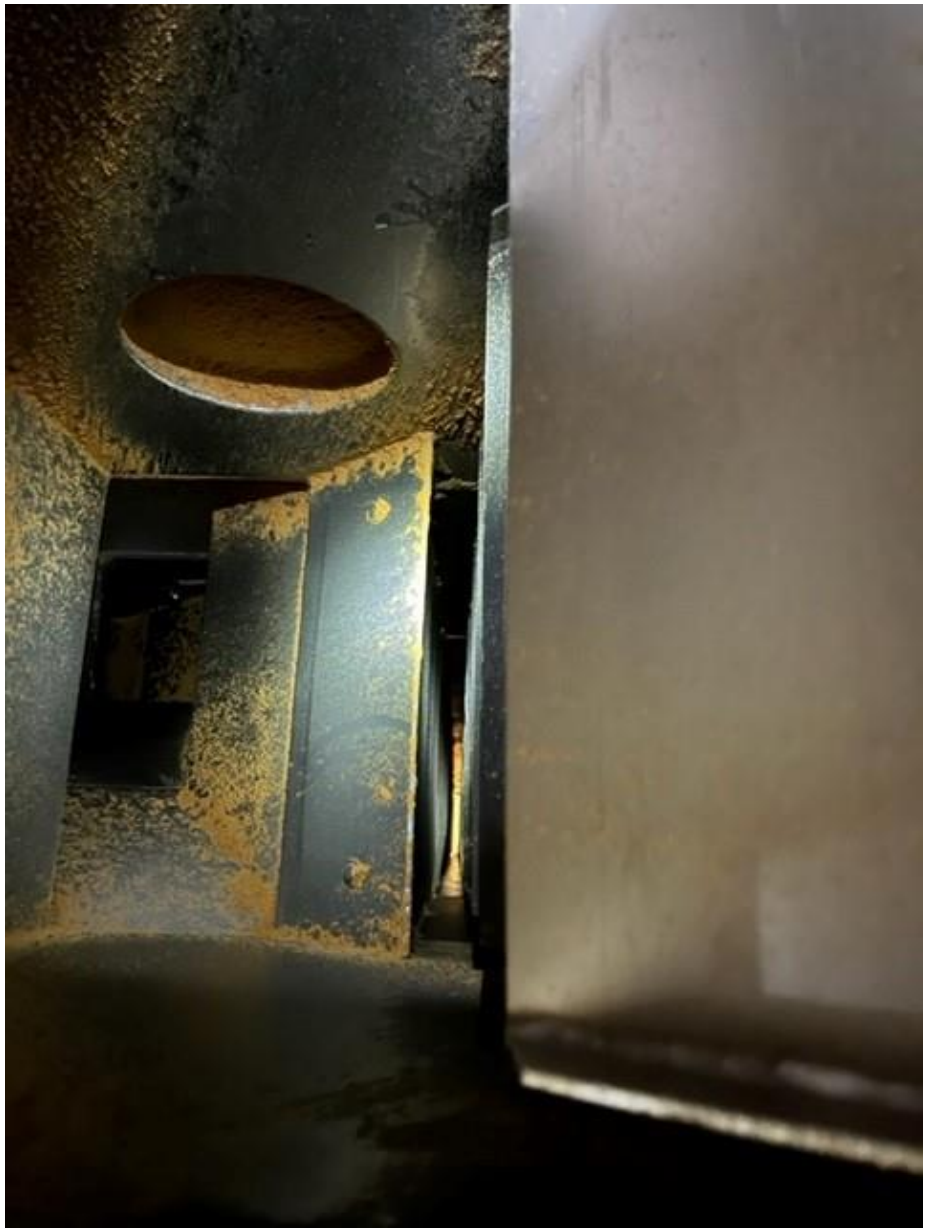
- Product is falling down the down side of the trunking and overloading the boot.
- The gap between the throat plate and the front lip of the buckets should be as little as possible.

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Rubber belt throat plate is worn away but could cause issues blocking bucket discharge on one side.



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Missing thoat plate in a slow speed bucket elevator with MF style steel buckets. Product is falling down the down side trunking and overloading the boot.

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A rubber belt throat plate has been worn away.
Product is falling down the down side trunking and overloading the boot.

In all of these examples the customer was unaware the throat plate was missing. They were only aware the bucket elevator was not getting its rated capacity.

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Video of Missing Throat Plate

- Large gap between buckets and the throat discharge
- Product not flowing out of the discharge
- The missing rubber belt throat wiper is lodged in the discharge
- Air pressure is building up when the leg is receiving product

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This is a great throat plate!

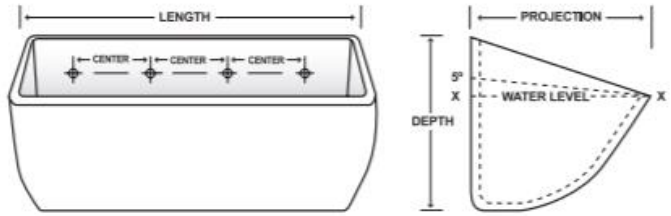
- Hard UHMW material
- Bolted in position
- Slotted holes for adjustment
- Adjusted close to the front lip of the 2 rows of Tiger-Tuff 20X10 low profile cups to help ensure the rated capacity of 60,000 BPH of this leg

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TIGER-TUFF® STANDARD PROFILE

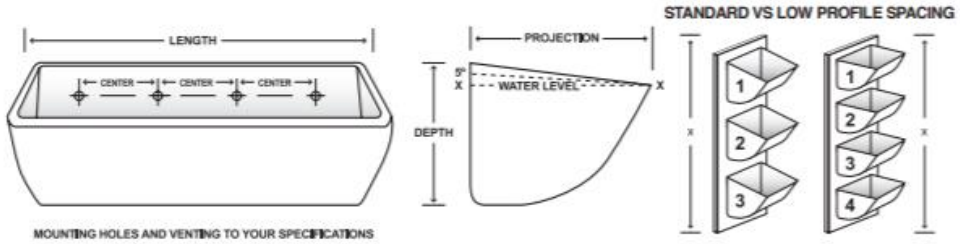
The **TIGER-TUFF** is the original maximum duty elevator bucket, designed and engineered to increase bucket life and reduce breakage. This will reduce down time and lower maintenance costs. The **TIGER-TUFF** bucket has the thickest lip, back wall and corners to extend the life of the bucket. The most common applications include grain, fertilizers, pellets, corn, wheat, soybeans and other agricultural and light industrial applications. This is the best bucket for high volume applications. The recommended belt width for a single row of buckets is actual bucket width plus 1".





TIGER-TUFF® LOW PROFILE

The **TIGER-TUFF Low Profile** has all of the benefits of the original **TIGER-TUFF** bucket, with a reduced height modification for closer vertical spacing on the belt. The low profile system allows more buckets per foot of elevator belt. When upgrading to **TIGER-TUFF Low Profile** buckets, horsepower requirements must be evaluated due to increased capacity.



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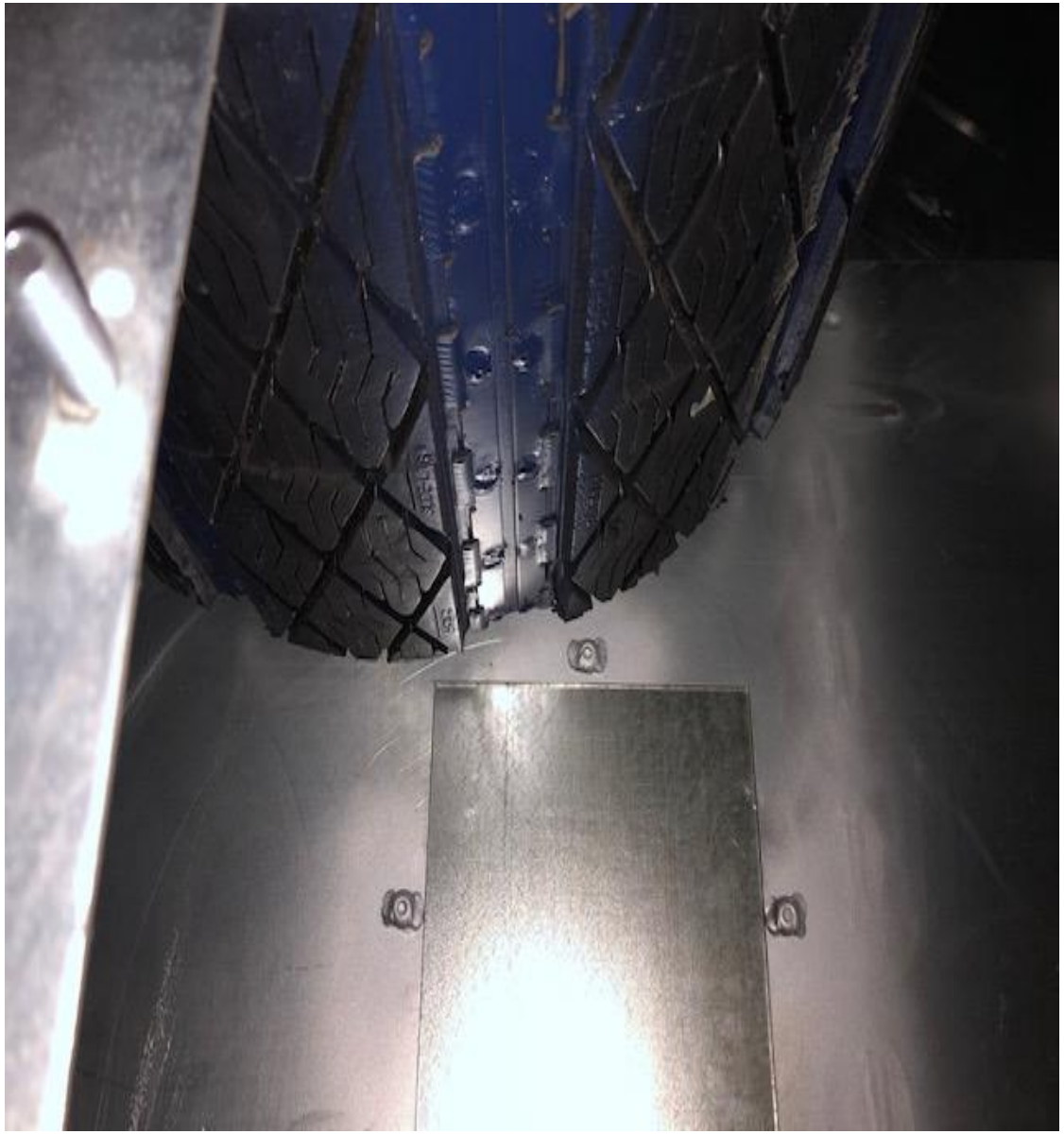
Head Pully Lagging

For Traction and Tracking

Must be SC-OR-FR in Explosive Environments

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The head pulley and boot pulley need to be crowned

- 1/8” per 12 inches of face width
- The belt needs to have a high point in the middle of the pulley to keep tracking in the middle
- The photo on the left shows a field adaptation of how a crown was added to a break-leg pulley (which isn’t recommended)
- This method will add wear to the back of the belt

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Bucket Elevator Boot

Everything Must Start Correctly at the Bottom

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I worked at Schlagel Inc. for seven years. They gave me permission to use this photo of a boot section with many great features.

- Upside and downside inlets in their correct positions
- Magnet with limit switch
- Heavy duty boot pulley take-up
- Tapped boot shaft for a speed switch
- Mounting holes for belt alignment sensors
- Removable panel for a shovel pocket
- Cleanout doors on both ends



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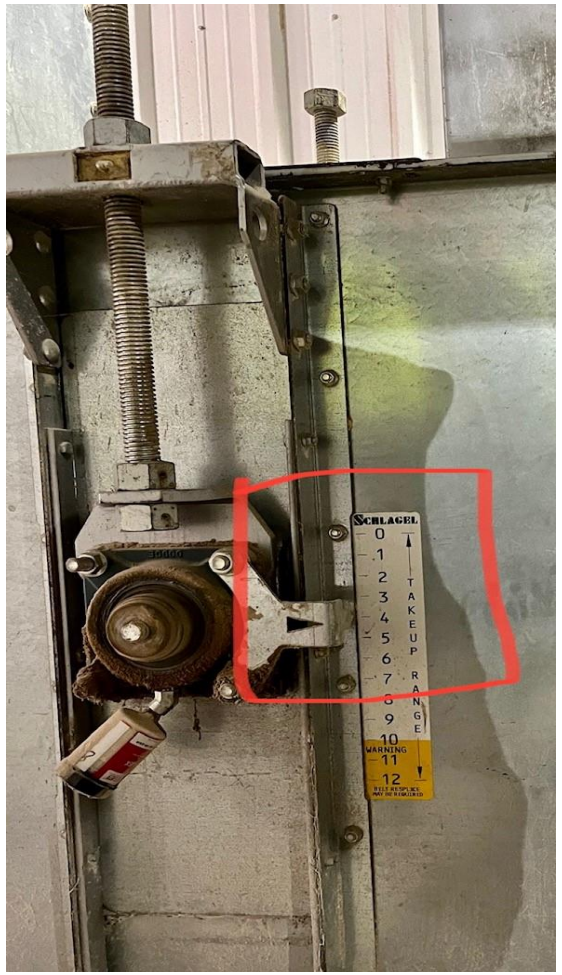
This is what's happening in the boot even though you can't see it.

- In a centrifugal discharge bucket elevator the same action occurs at the head and at the boot
- The buckets will continue to discharge until they're level
- It's physically impossible to get full capacity if the inlet is too low on the upside of a bucket elevator

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This bucket elevator has lost 5 inches of take-up because the upside inlet has been altered and lowered.







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* Feeding the inlet from an angle will cause poor cup filling and reduced capacity.
* An inlet that doesn't allow clean flow to the buckets will reduce capacity.





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A Problem At The Boot Might Be Caused From a Long Way Away

Performance Can be Influenced by Other Equipment at the Inlet and Discharge

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- A customer had an issue with a new, very light product not feeding into the boot inlet
- Note the feed being blown back out during the short video

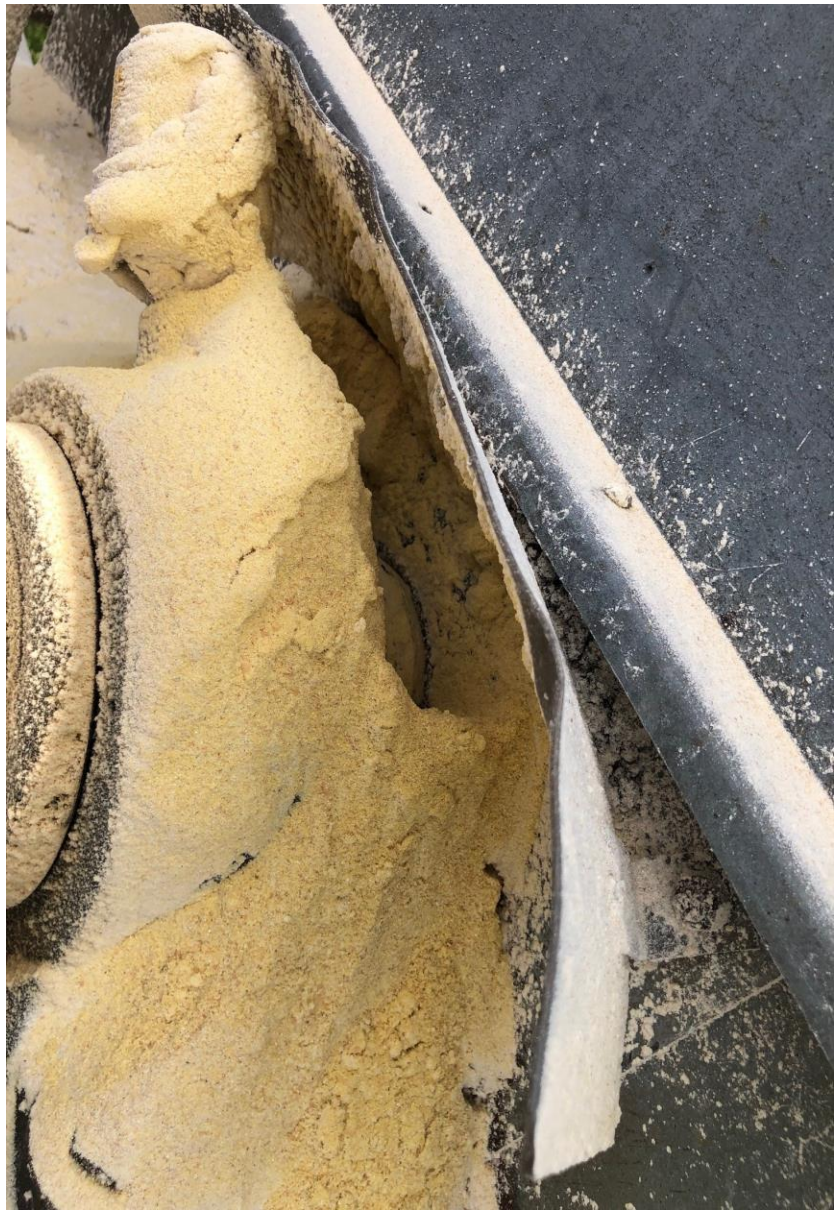
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Mixed feed bucket elevator being fed on the downside

- A lower inlet position is normally okay on the downside
- This inlet is lower than usual
- This lower position could be a factor if the product is going in lower than the buckets can take it away

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Head bearing product buildup

- Feed is being blown out from around the shaft
- The area cleared out around the shaft indicates continuous air pressure blowing product away from that area

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- No air relief on the center bulk bin
- The bin is full of air
- When the light product goes into the bin the air goes up the spout and down into the bucket elevator
- The air tries to get out through the inlet and blocks the lightweight feed coming in
- If the spouting had been designed for the light product it might be larger

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Bucket Venting Can Help Air Flow

It Can Help Bucket Fill and Discharge As Well

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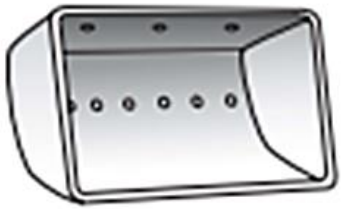
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Bucket Venting

#1 VENT - Same holes in body as bolt mounting holes.



#2 VENT - One row of holes on 1-1/8" centers



#3 VENT - Two rows of holes on 1-1/8" centers



#4 VENT - Same as #3, plus three holes in each end cap.



CUSTOM VENT - Vented as required



- Aids in fill and discharge in light, fluffy or poor flowing material.
- Service is provided at no to minimal cost.
- It is virtually impossible to have too much venting.
- When in doubt, Vent!

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#3 Venting Shown Here



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HD-MAX HEAVY DUTY BUCKETS®

HIGHER CAPACITY MEANS HD-MAX CAN ELEVATE MORE MATERIAL FASTER TO MEET HIGHER CAPACITY DEMANDS.

- Features and Benefits of HD-MAX ® Buckets:
  - Thicker Walls, Heavy Front Lip for Digging
  - Cleaner Discharge
  - High Impact and Abrasion Resistant
  - Non-Corrosive, Non-Sparking
  - Extends Bucket Life
  - Increases Elevator Capacity
  - Lowers Elevator Maintenance
  - Decreases Elevator Down Time

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“Everything’s Fine. We don’t Need An Inspection”

An Inspection is Just The Start. Normally, Action Must Follow!

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New CC-Max buckets damaged when the boot take-up was lowered too much

- Bolt heads in the boot damaged all the buckets
- As the buckets wear away it will reduce capacity
- There should be a low position limit setting on your boot take-ups
- The throat plate is missing
- These feedmill buckets would benefit from being vented

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Belt damage from improper bucket installation

- Nuts installed to tight on the bolts
- The bolt head digs into the belt
- A bulge is created between each bolt
- The belt will wear more quickly in this situation

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This new belt has been damaged because the nuts have been installed too tightly on the bolts.





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CC MAX®

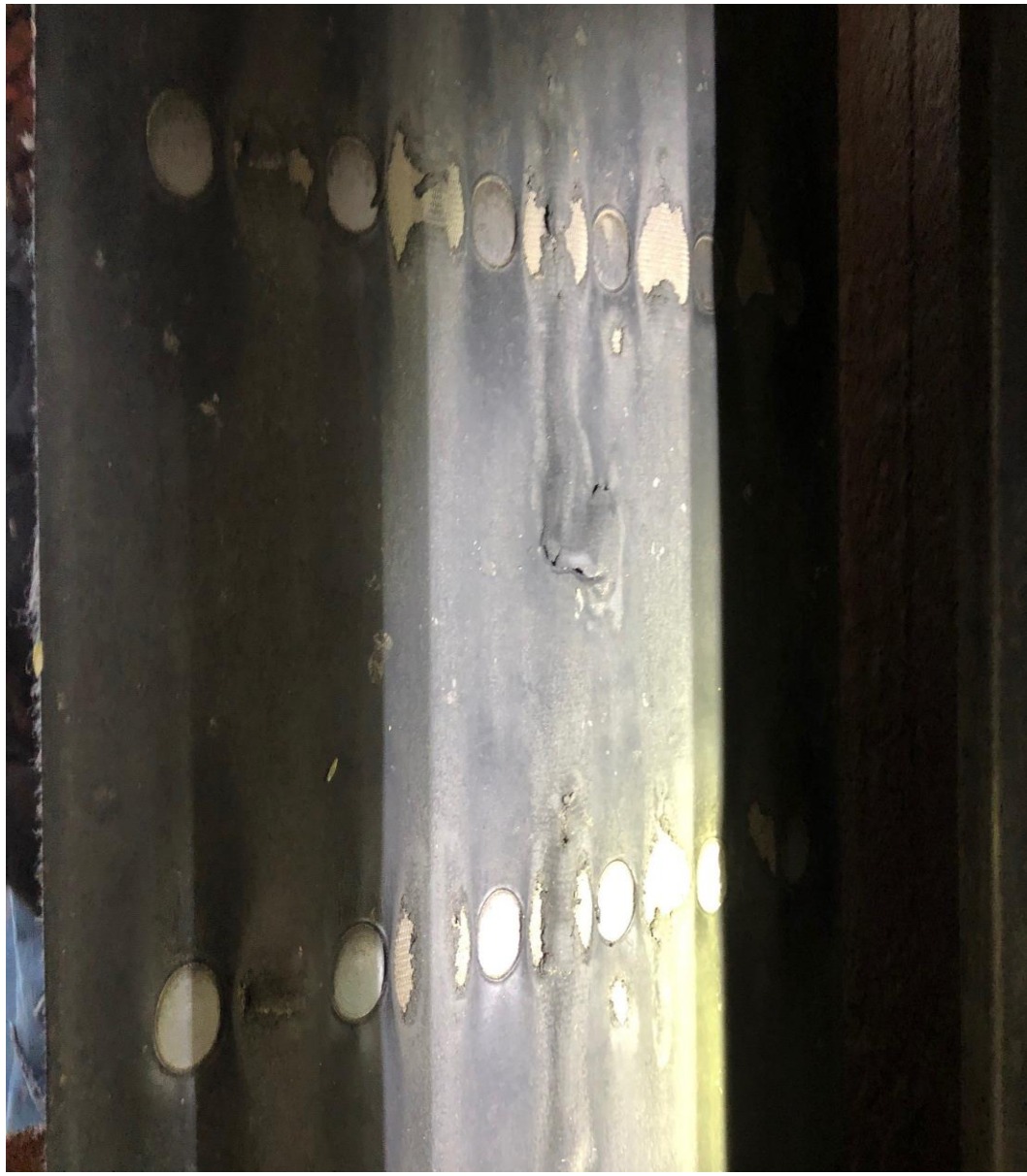
Traditional CC Style with Thicker Wear Points

- Features and Benefits of CC-MAX ® Buckets:
  - Typically the “starter” bucket
  - Thicker Lip – Up to 20%
  - More Capacity – Up to 5%
  - Clean Discharge
  - Resists Hang-Ups
  - High Impact & Abrasion Resistant
  - Non-Corrosive, Non-Sparking
  - Extends Bucket Life
  - Decreases Elevator Downtime
  - Increase and Maintain Capacity Longer

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This belt has had a long life but it needs to be replaced.
The covers of a belt are where you have the SC-OR-FR characteristics.
This belt is an active liability in the facility it's operating in.



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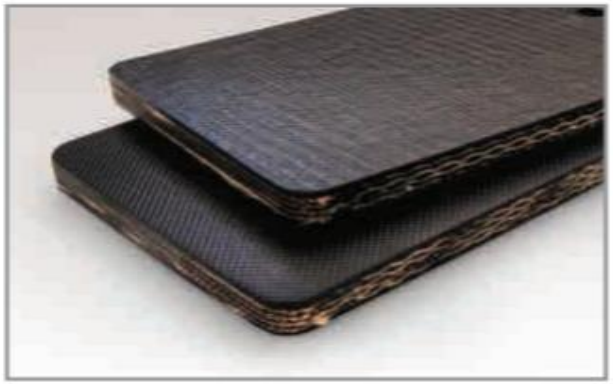
Product Construction: Plied Polyester/Nylon fabric w/ NBR formulated Grain Handling Compound.
Special Standards: Fire resistant to MSHA 2G/ASTM D378. Static Resistivity to ISO 284.
Top / Bottom Cover: 1/16" Smooth Rubber, Black



RUB 220 2 PLY, 1/16 x 1/16 SOR-SC-FR
(EP400/2 1.5 + 1.5 NBR)



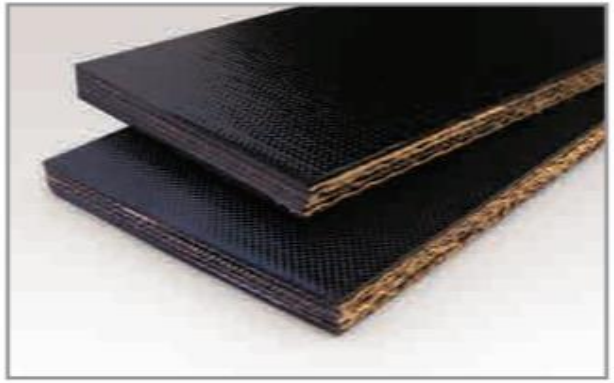
RUB 330 3 PLY, 1/16 x 1/16 SOR-SC-FR
(EP600/3 1.5 + 1.5 NBR)



RUB 440 4 PLY, 1/16 x 1/16 SOR-SC-FR
(EP600/3 1.5 + 1.5 NBR)



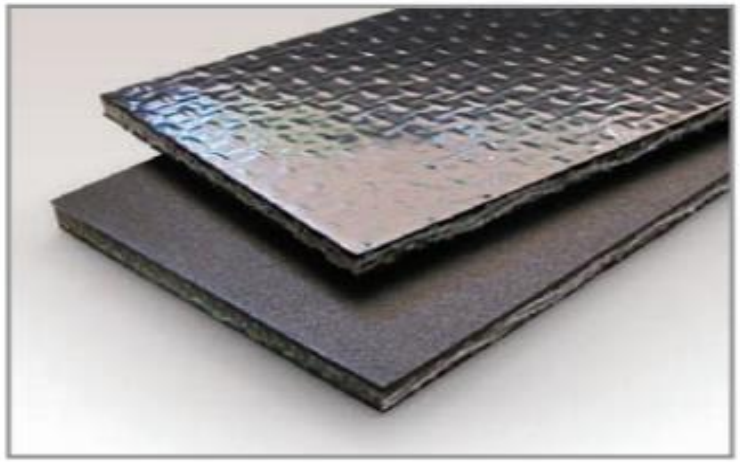
RUB 600 3 PLY, 1/16 x 1/16 SOR-SC-FR
(EP1050/3 1.5 + 1.5 NBR)



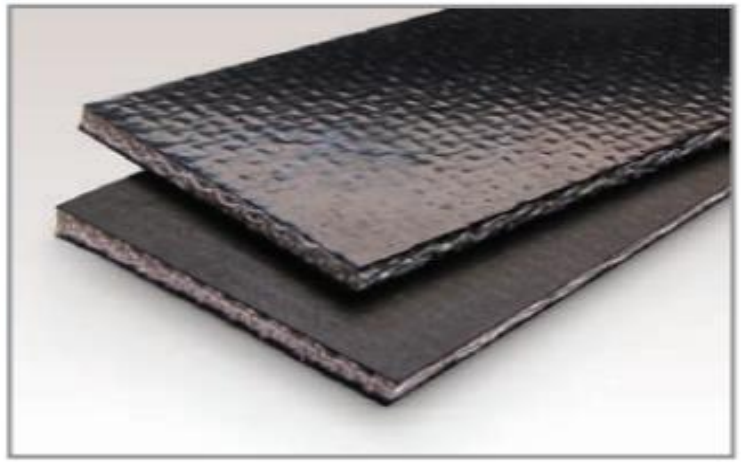
RUB 800 4 PLY, 1/16 x 1/16 SOR-SC-FR
(EP1400/4 1.5 + 1.5 NBR)

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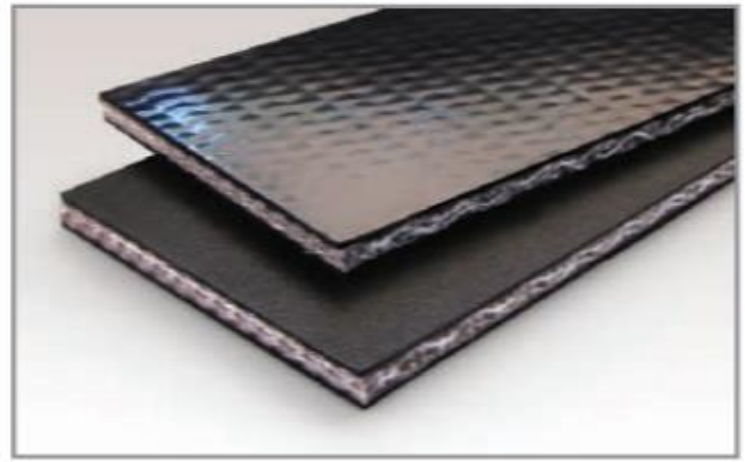
Product Construction: Solid woven polyester carcass with black PVC top and bottom covers.
Special Standards: Fire resistant to MSHA 2G/ASTM D378. Static conductive to OSHA 29 CFR.
Top / Bottom Cover: Smooth PVC, Black



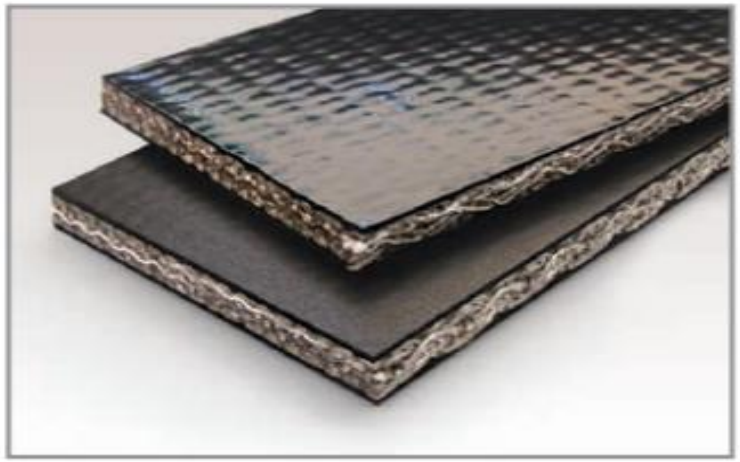
PVC 200 Black PVC Cover x Cover



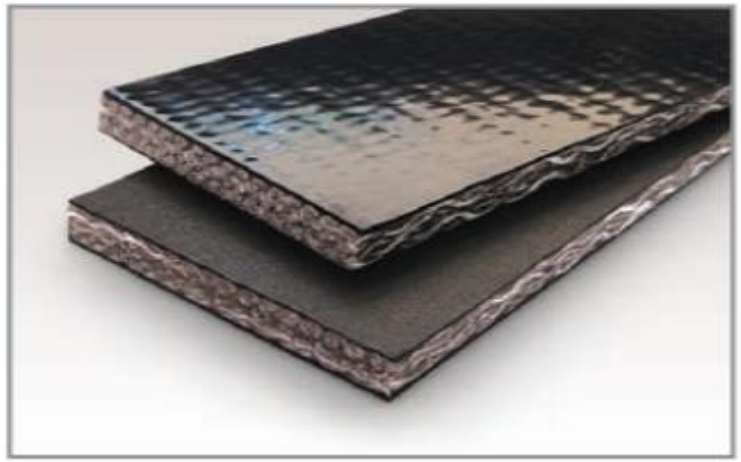
PVC 250 Black PVC Cover x Cover



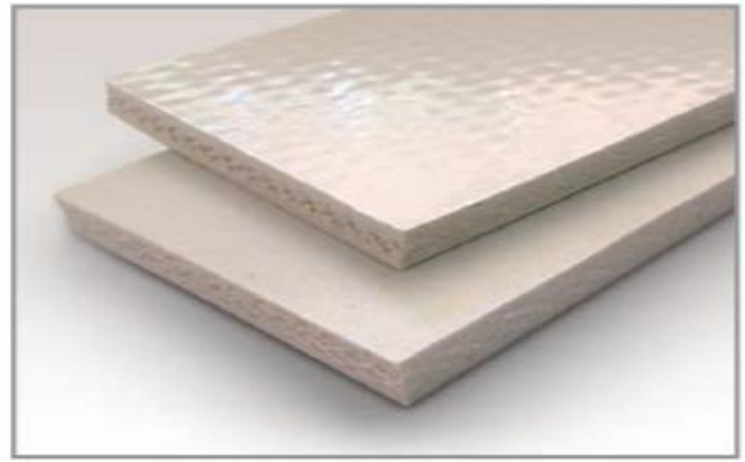
PVC 350 Black PVC Cover x Cover



PVC 450 Black PVC Cover x Cover



PVC 600 Black PVC Cover x Cover



PVC 200, 350, 450 White PVC Cover x Cover
Also available in FDA White

Lap Splice

- Different opinions on the length of the lap
- Two layers of belt go around the pulleys at different speeds
- Creates a lot of stress on the belt, bolts and buckets
- There’s a vibration bump each time the lap contacts and leaves the head pulley and boot pulley
- The throat plate must be further away to allow clearance for just a small percentage of the length of the belt



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Maxi-Splice AB Non-Sparking Mechanical Belt Fasteners

- Designed to match the belt PIW
- Template tape and instructions provided
- Installation video available

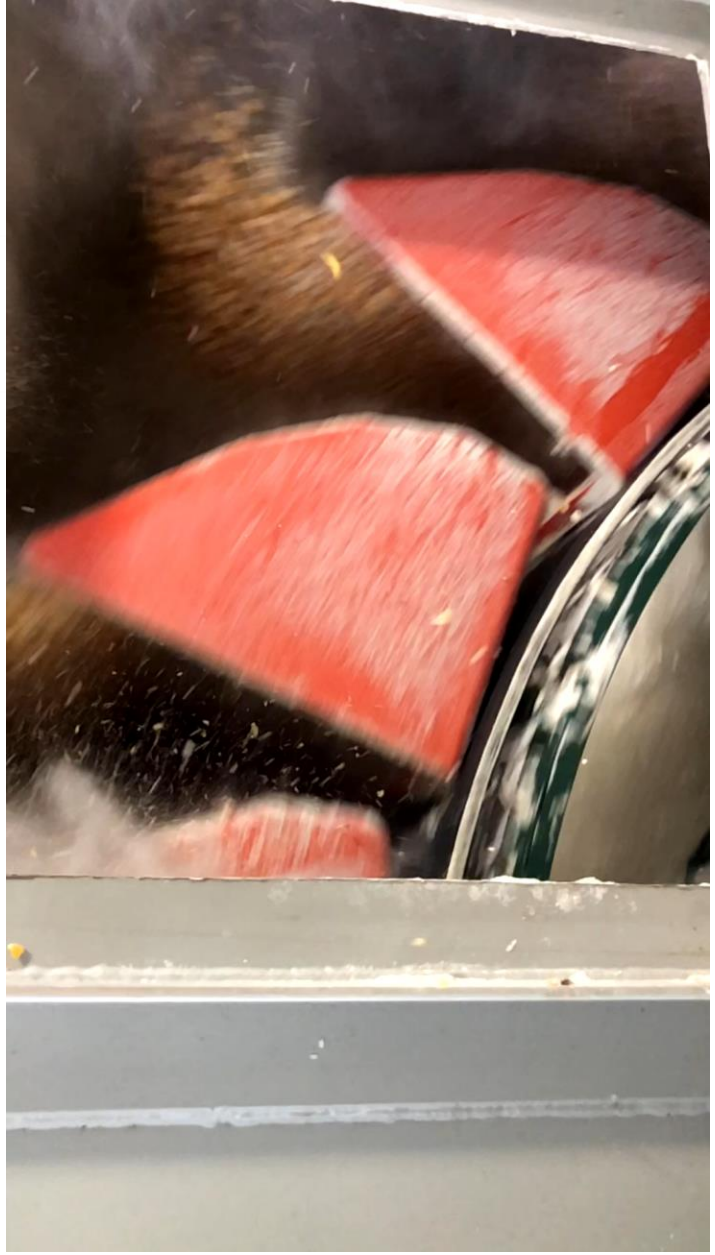
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Use Your Smart Phone to Inspect Moving Buckets

The Slow-Motion Video Feature is Value

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“One or Two Buckets Break Once In A While”

Diagnosing Problems Can Be Difficult

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One broken or badly damaged HD-Max bucket and the rest are all in good shape.





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Compare the boot shaft to the downside inlet position of E4 and E5.
Tramp metal is damaging buckets in E5.
They're too close to the bottom of the boot.
Need to shorten the belt in E5 and install a magnet on their receiving leg.





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Maxi-Lift Inc.®

ELEVATOR BUCKETS & ACCESSORIES

MAKE THE ULTIMATE UPGRADE TO MAXILIFT

SINGLE SOURCE OF ELEVATOR BUCKETS

AGRICULTURAL

A COMPLETE RANGE OF AGRICULTURAL BUCKETS:

TIGER-TUFF MAXIMUM DUTY
TIGER-CC MAXIMUM DUTY
HD-MAX HEAVY DUTY
CC-MAX HEAVY DUTY
DURA-BUKET STANDARD DUTY
AND MORE...



SCAN ME

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Dean Wedekind



Watch Our ProTips!

Add me on LinkedIn!

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Win a GEAPS Prize Bundle!

How to Get the Most from Bucket Elevators - Post Survey

SCAN FOR SURVEY

Please take a short survey for this session to help us plan for next year.

For every survey you submit you will be entered into a drawing.

GEAPS Prize Bundle

- $200 Visa Gift card and free registration to Leadership Conference
- Raffle will be drawn at Closing Celebration, Tue 2/28

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