

Gentle Handling for Wood Pellets©

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Which do you want?

Sawdust

Wood Pellets





$$F = MA \text{ (force = velocity}^2\text{)}$$

If you jump off the Empire State Building,
the long fall doesn't do the damage.
It's the sudden stop at the bottom.

DAMAGE CONTROL

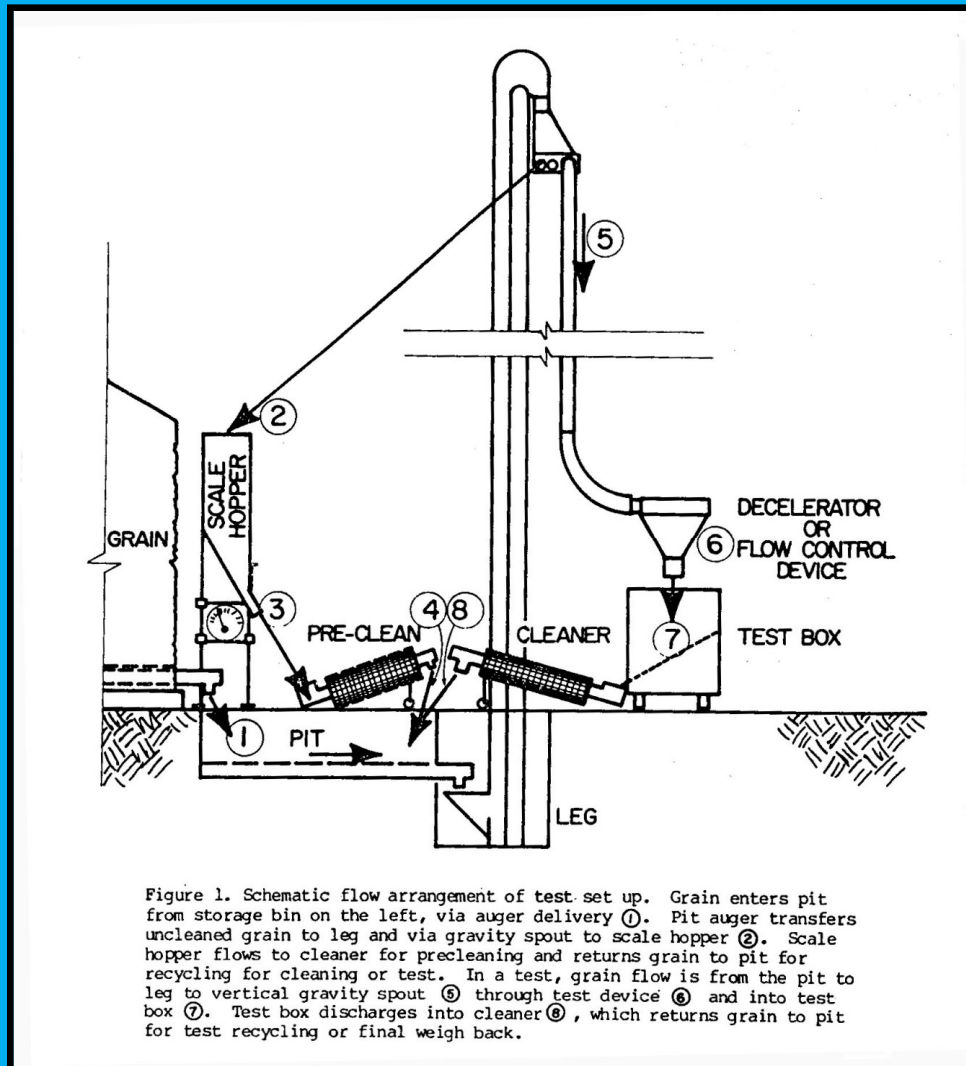
$$\text{Force} = \text{Mass} * \text{velocity}^2$$

If velocity doubles

Force increases 4 times

After 1 second 32 ft. / minute

After 2 seconds 1024 ft. / minute

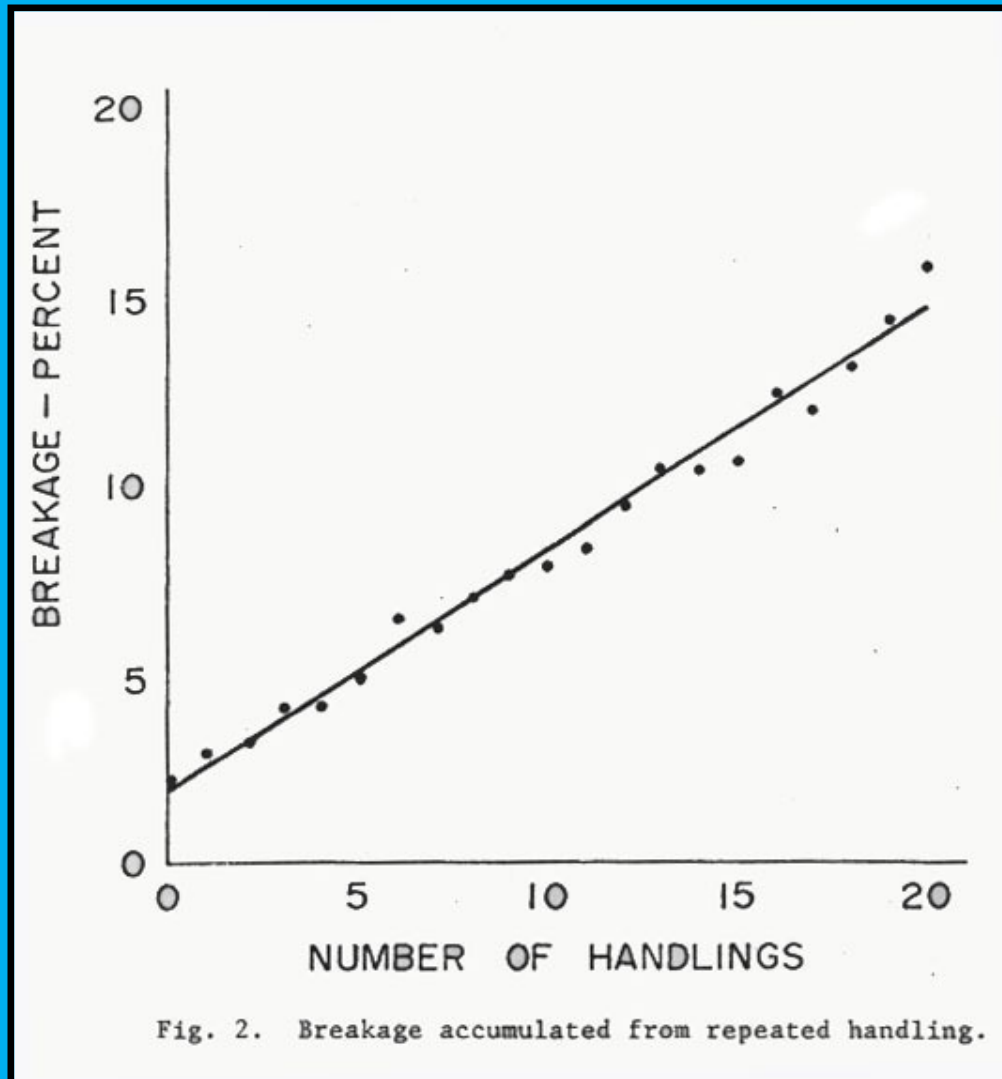


DAMAGE AT DIFFERENT DROP HEIGHTS

Table 1. Breakage In Grain From Free-Fall*

Drop height (feet)	Discharge orifice Diameter	Impact Surface	Corn	
			12.6 at 25	15.2 at 31
100	12	Concrete	12.01	6.87
70	12	Concrete	7.07	2.54
40	12	Concrete	3.59	0.27
100	8	Concrete	13.82	9.55
70	8	Concrete	10.83	5.03
40	8	Concrete	5.86	0.86
100	8	Grain	12.53	7.11
70	8	Grain	7.74	4.00
40	8	Grain	4.35	0.25

*From Foster and Holman



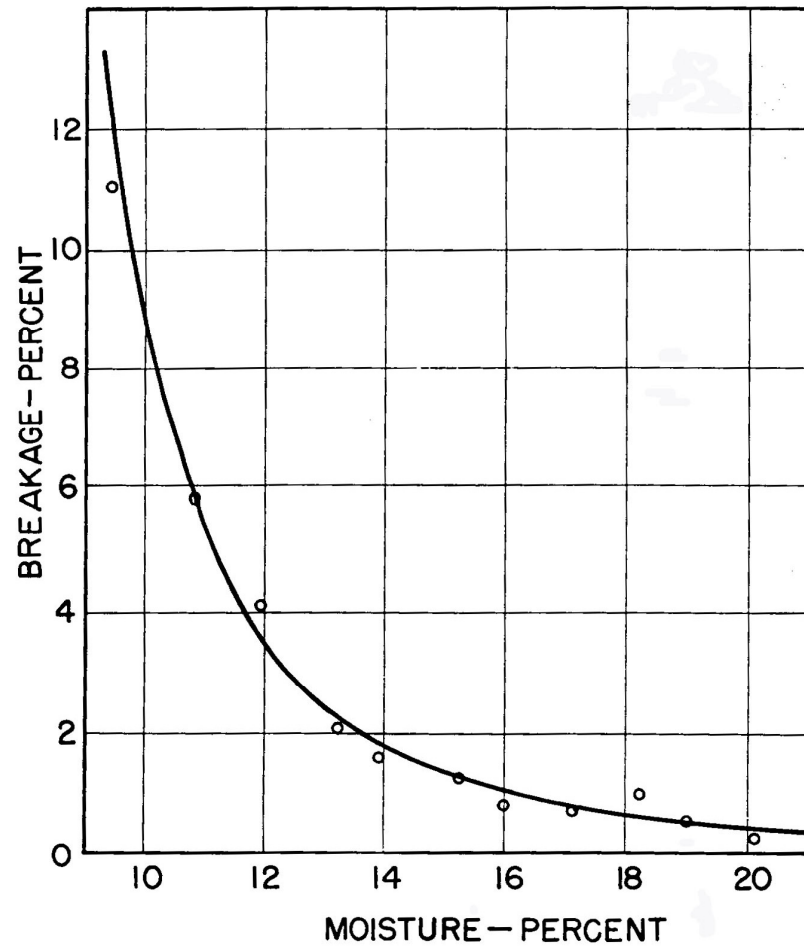
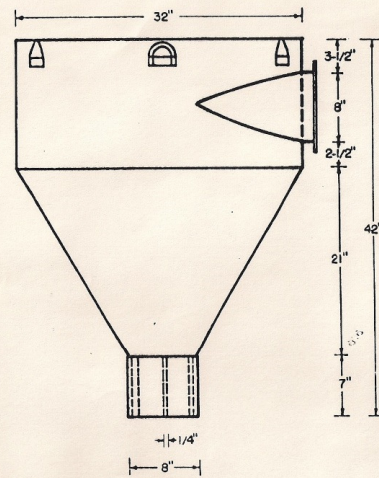


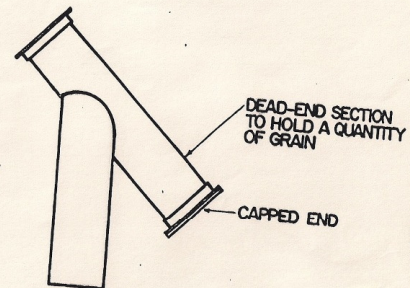
Figure 11.--Effect of moisture content of sample on breakage of corn.

DECELERATION DEVICES



~~Figure 2.~~ Dimensions of cyclone grain decelerator.

Figure 3.



~~Figure 3.~~ Typical 45 degree angle "cushion box" or dead head for use on angled gravity spouts. Capped end section holds a quantity of grain for descending grain to impact onto, to reduce grain velocity and minimize tube wear.

Deceleration Devices

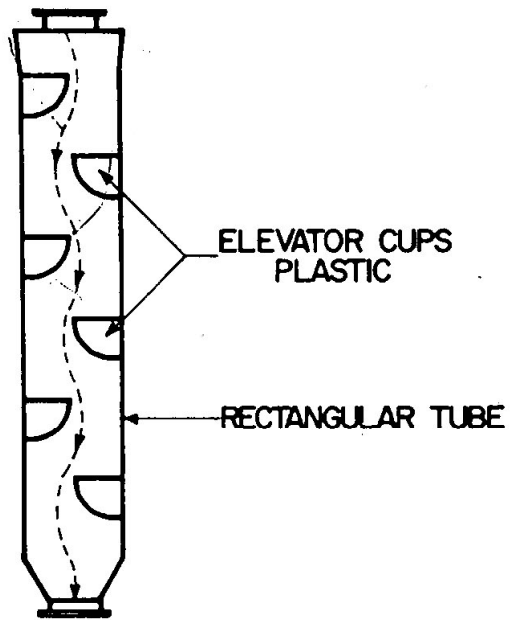


Figure 4. Schematic section of bucket cascade flow retarder. Grain enters at the top and is deflected by alternate spaced and positioned buckets into a serpentine path. Dimensions shown are not to scale.

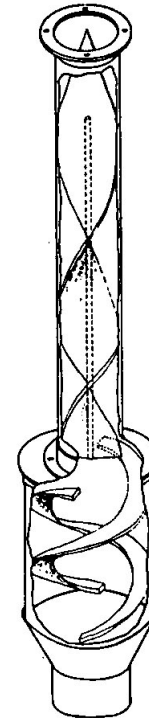


Figure 5. The grain brake with extension and guide vanes.

drag caused by centrifugal and gravitational forces acting on the grain stream as it turned. The elbow was tested without the cyclone to identify this initial deceleration. To control the high velocity horizontal discharge from the elbow and direct it into the container box, a tubular rubber sleeve was telescoped over the free end of the elbow.

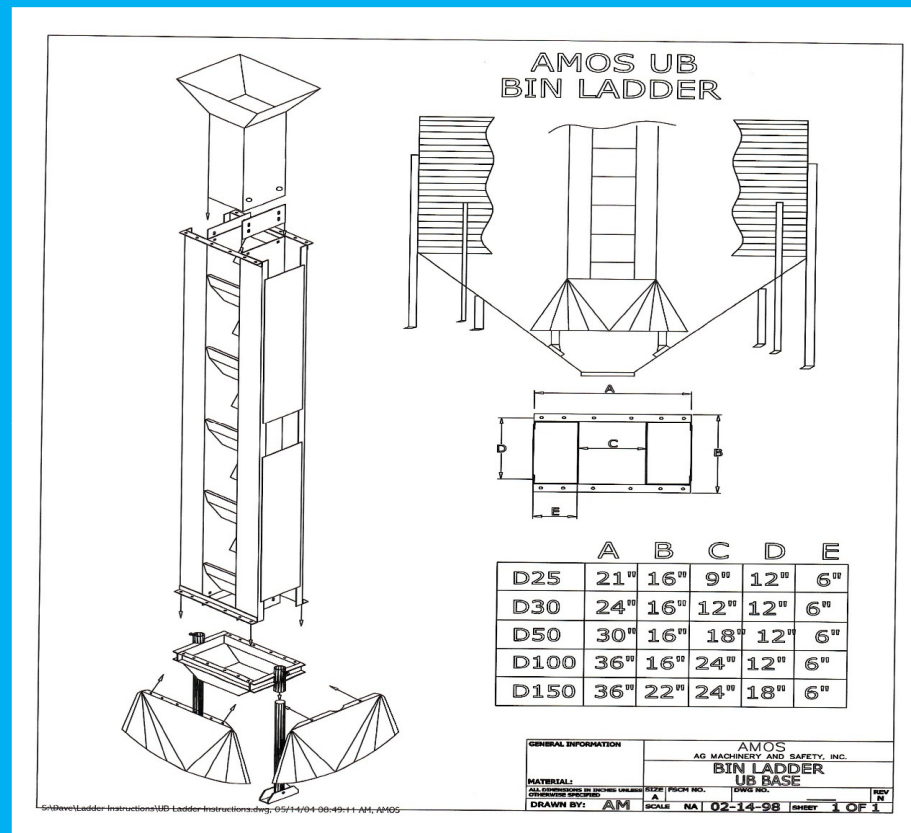
Table 2. Summary of Corn Breakage in 1977 Drop Tests Using Various Spout-end Decelerating Devices.

Test No.	Test Date	Test Device	Breakage*	
			Amount (lbs)	Reduction** (%)
4	7/03/77	None-straight drop	19.3	--
7	7/21/77	None-straight drop	25.3	--
		STRAIGHT DROP AVERAGE	22.3	--
6	7/21/77	<u>45° cushion box</u>	22.3	0
3	7/03/77	<u>Parallel (vertical) cushion box</u>	19.3	13
9	8/23/77	Grain brake	13.0	42
5	7/05/77	Bucket cascade	12.5	44
2	6/17/77	90° elbow-rubber sock	12.4	44
1	6/15/77	90° elbow-30" cyclone	10.2	54
8	8/16/77	90° involute-belt deflector	5.1	77

*Breakage separated from approximately 2000 lbs of corn by a rotating cleaner with a 5-mesh hardware cloth screen.

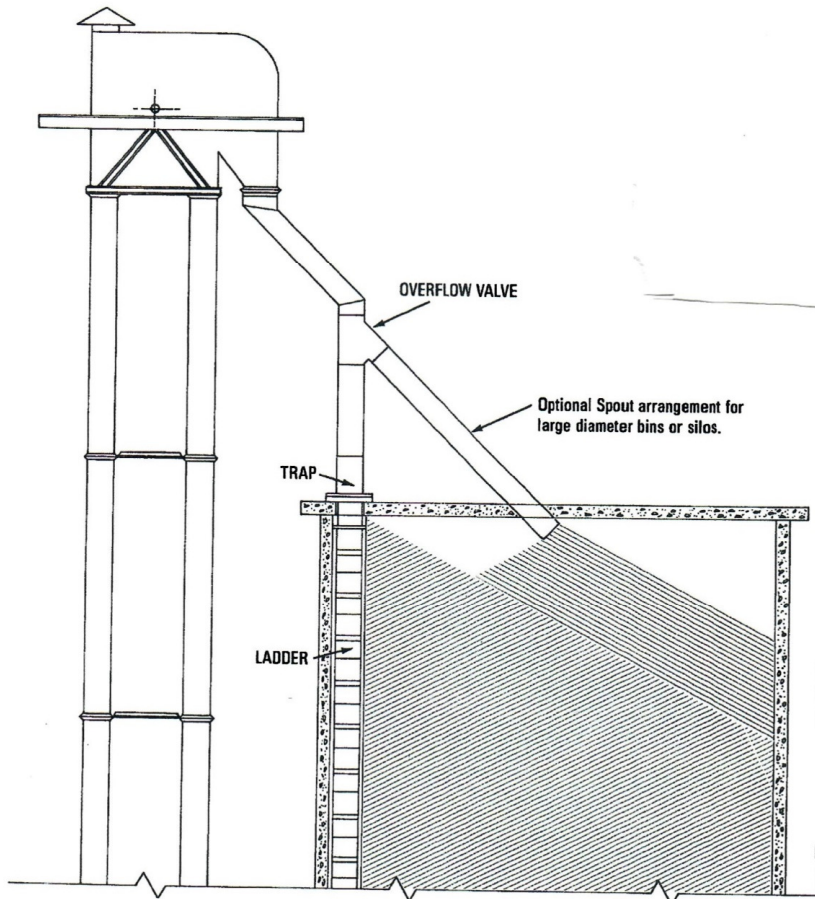
**Percentage reduction from average breakage without a decelerator.

AMOS Center Mounted Bin Ladder



Installation Showing Exterior Mounting Legs





When bin fills to top of ladder on the side wall, the overflow valve permits filling balance of bin.

FOR SIDE WALL INSTALLATION ONLY
(Do not mount directly above hopper bottom discharge outlet.)

Anheuser Busch Malt Data

ASSORTMENT TESTS

BEFORE LADDER INSTALLATION

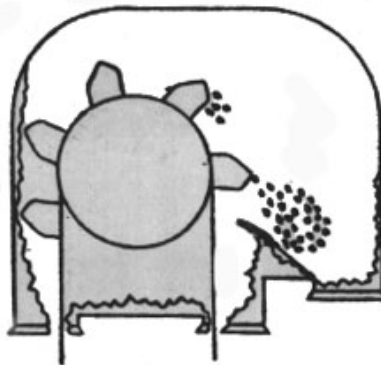
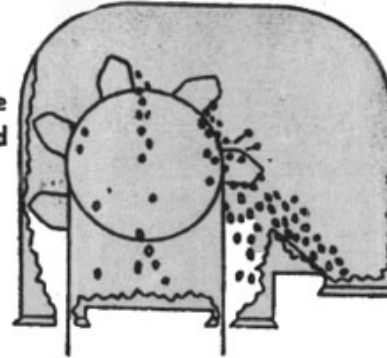
PIECE NO	SCREEN SIZE	KILN MALT SAMPLER	INTO MALT HOLDING BIN	OUT OF MALT HOLDING BIN
91104-2	ON 7/64	64.5%	61.9%	49.5%
	ON 6/64	27.6%	28.6%	34.8%
	THRU 5/64	0.2%	0.2%	0.1%
91107-2	ON 7/64	72.9%	68.7%	57.8%
	ON 6/64	21.5%	24.0%	32.5%
	THRU 5/64	0.8%	1.6%	1.2%

AFTER LADDER INSTALLATION

92144-2	ON 7/64	70.9%	64.3%	60.2%
	ON 6/64	22.9%	27.0%	27.7%
	THRU 5/64	1.1%	1.7%	3.6%
92150-2	ON 7/64	78.8%	74.8%	74.9%
	ON 6/64	17.5%	20.7%	20.8%
	THRU 5/64	1.1%	1.1%	0.8%

TOO SLOW – spillage

Cups spill the grain into the upleg and downleg. Breakage occurs when the kernels strike the cups ahead, when tumbled within the pulley and when re-elevated.



OPTIMUM – recommended speed

Cups fill and carry perfectly, then discharge directly into the throat – no spillage – no breakage.

TOO FAST – critical when commodities are damageable by rough or fast handling

Cups lose all holding and discharge control, resulting in gross inefficiency, excessive breakage and undue head wear of the head liner.

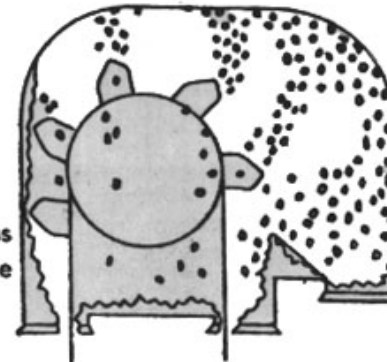
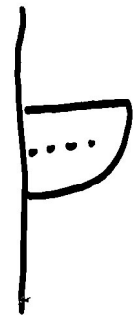
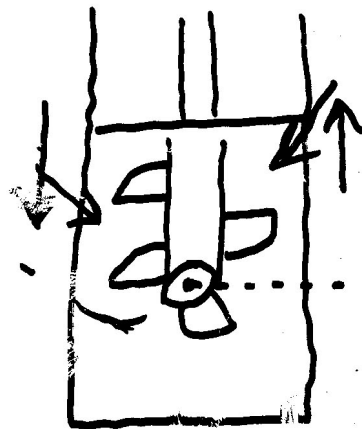


Figure 75—Diagram of seed discharge from the buckets of elevators operated at optimum belt speed, belt speed too slow, and belt speed too fast. (A. T. Ferrell & Co.)

Bucket Elevators



	% Cup Filling	<u>damage</u>
1/2		2.68%
Full		<u>2.39%</u>
		0.29%



Up Log	% damage
	2.83%
down log	<u>2.24%</u>
	0.59%

Questions?

