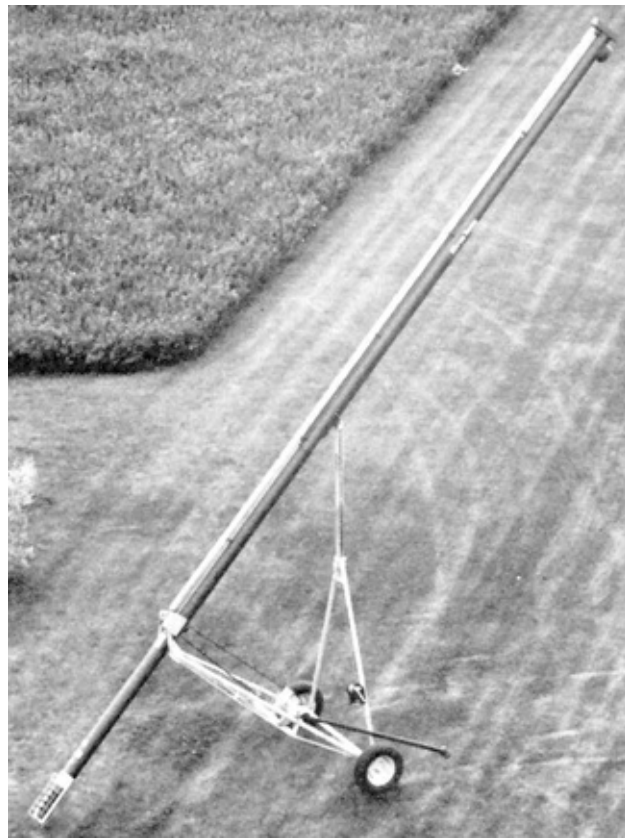


Evaluation Report

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Farm King 8 x 41 Grain Auger

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRRAIRE AGRICULTURAL MACHINERY INSTITUTE

FARM KING 8 x 41 GRAIN AUGER

MANUFACTURER:

Farm King Ltd.
 Box 1450
 Morden, Manitoba
 R0G 1J0

DISTRIBUTORS:

Manitoba and Saskatchewan
 Farm King Ltd.
 Box 1450
 Morden, Manitoba
 R0G 1J0

Alberta
 Renn Sales Ltd.
 12555-127 Avenue
 Edmonton, Alberta
 T5L 3E5

RETAIL PRICE: \$1,895.00 (July 1983, f.o.b. Morden, Manitoba)

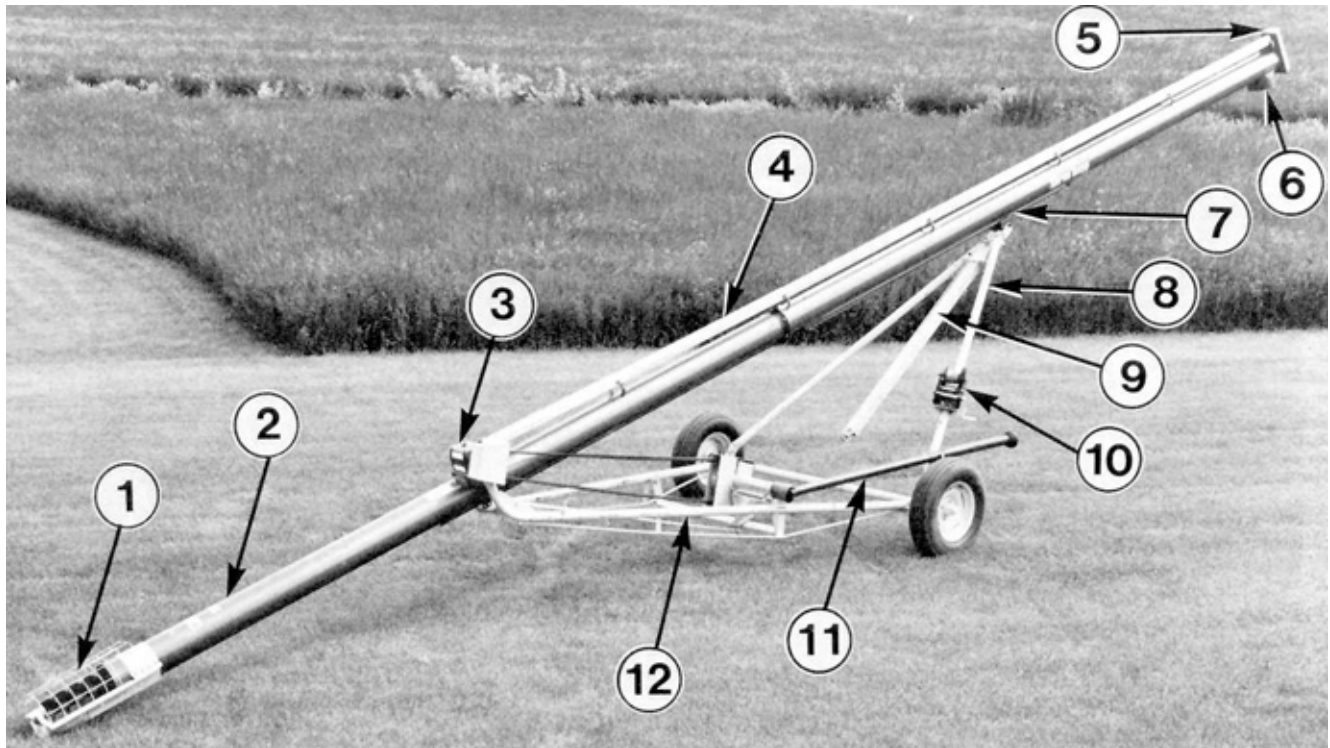


FIGURE 1. Farm King 8 x 41 Grain Auger: (1) Inlet, (2) Auger Tube, (3) Gear Box, (4) Drive Shaft, (5) Upper End Drive, (6) Discharge Spout, (7) Elevating Track, (8) Lift Arms, (9) Telescoping Mast, (10) Cable Winch, (11) Power Take-off Drive Line, (12) Lower Arms.

SUMMARY AND CONCLUSIONS

Overall Performance: The performance of the Farm King 8 x 41 Grain Auger was very good¹. At 30° elevation angle, corresponding to a discharge height of 20 ft (6.0 m), and at the manufacturer's recommended flighting speed of 535 rpm, capacities were 2640 bu/h (72.0 t/h) in wheat, 3150 bu/h (48.9 t/h) in oats, 2360 bu/h (60.0 t/h) in corn and 2290 bu/h (52.0 t/h) in rapeseed. Maximum capacities were obtained at flighting speeds between 600 and 700 rpm.

Power Requirement: This ranged from 5 to 18 hp (4 to 13 kW) in dry grain. Capacity and power depended on flighting speed, elevation angle, grain type and moisture content.

Grain Damage: In dry wheat damage was less than 0.2% for each pass through the auger.

Maneuverability: This was very good due to the light hitch weight. Caution was necessary when using additional spouting on the discharge end of the auger to prevent "upending" of the auger.

Safety: All pulleys, nip points, rotating drive shafts and inlet flighting were guarded, in accordance with current safety standards².

Operator Manual: The manual provided contained adequate instructions for operating the machine.

Durability: No durability problems occurred during the test.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Repositioning the mechanical stop on the elevating track to eliminate interference of the cable clamp with the cable pulley.
2. Providing a cable winch that requires fewer turns to raise and lower the auger.
3. Providing a method of securing the power take off drive line in its holding bracket during transport.

Senior Engineer -- G. M. Omichinski

Project Engineer -- C. W. Boiton

¹ See rating table APPENDIX III.

² American Society of Agricultural Engineers Tentative Standard ASAE S361.1 T "Safety for Agricultural Auger Conveying Equipment," December 1981.

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. We will be increasing the distance between the mechanical stop and the cable pulley to eliminate interference with the cable clamps on the 1984 models.
2. There is very little that can be done with regard to the number of turns on the winch because we are restricted to 50 lbs. force on the winch handle. Although we are under this restriction, we are having difficulty obtaining a winch that is faster yet still meets this standard.
3. We have provided a pin through the P.T.O. drive line bracket to secure the P.T.O. drive line on all 1983 production models.

GENERAL DESCRIPTION

The Farm King 8 x 41 Grain Auger (FIGURE 1) is an 8 in (203 mm)³ diameter, 41 ft (12.5 m) long portable screw conveyor. The auger tube is mounted on a tubular undercarriage with a telescoping mast arrangement. A hand-operated cable winch is used to adjust the discharge height.

The test machine was equipped with a 540 rpm tractor power take-off belt drive. The Farm King may also be equipped with a power take-off direct drive, gasoline engine or electric motor.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST⁴

The Farm King was operated for about 15 hours while conveying dry wheat, oats, corn and rapeseed. A standard test material

(APPENDIX II) was also used. The machine was transported over gravel and paved highways for a distance of 30 miles (50 km). It was evaluated for ease of operation and adjustment, rate of work, power requirements, quality of work, operator safety and suitability of the operator manual.

RESULTS AND DISCUSSION

EASE OF OPERATION AND ADJUSTMENT

Discharge Height: The discharge height could be varied from 9.5 to 29.5 ft (2.9 to 9.0 m) with the hand operated cable winch. Corresponding elevation angles varied from 13° to 49°. The clamped cable end interfered with the cable pulley. This caused the cable clamp to occasionally jam in the pulley causing momentary cable slack followed by a sudden drop of the auger. It is recommended that the manufacturer modify the mechanical stop on the track to eliminate interference of the cable clamp and cable pulley.

With the auger empty, and the lift mechanism well lubricated, it took a maximum winch handle force of 16 lb (71 N) to raise the auger. It took about 300 turns of the winch crank to fully raise or lower the auger. It is recommended that the manufacturer consider using a winch that requires fewer turns to raise the auger.

Auger Reach: The bin eave clearance and horizontal reach of the Farm King 8 x 41 are shown in FIGURE 2. Bin eave clearance, measured from the ground to the foremost part of the undercarriage, varied from 7.0 ft (2.1 m) at 13° to 17.8 ft (5.4 m) at 49° elevation. The reach measured from the foremost part of the undercarriage to the centre of the discharge, ranged from 11.5 ft (3.5 m) to 16.3 ft (4.9 m).

Maneuverability: Hitch weight varied from 13 lb (5.9 kg) at minimum elevation to 67 lb (30.5 kg) at maximum elevation. This

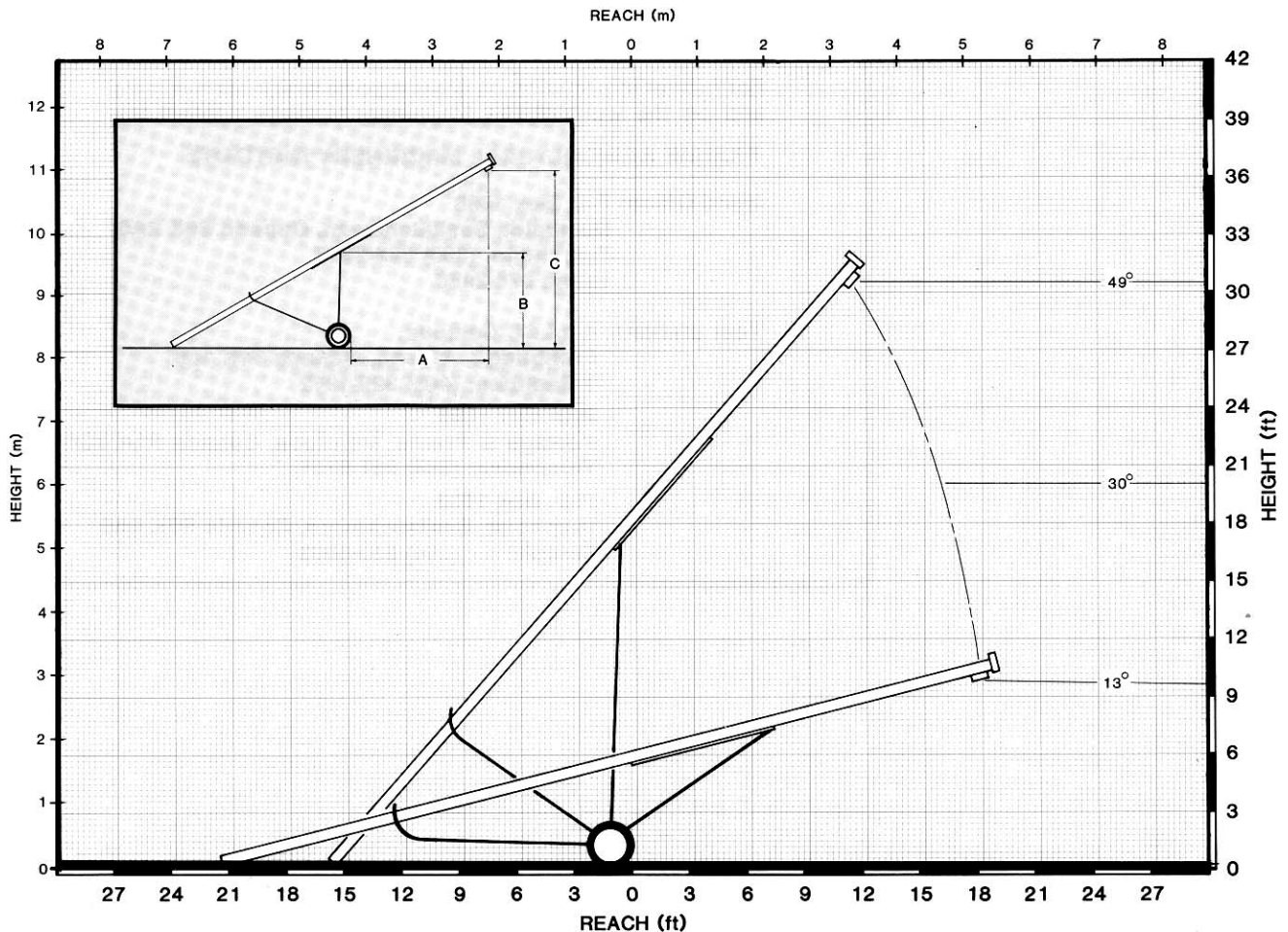


FIGURE 2. Reach and clearance at various heights: (A) Reach, (B) Bin Eave Clearance, (C) Discharge Height.

³A conversion table is provided in APPENDIX IV.

⁴Prairie Agricultural Machinery Institute Detailed Test Procedures for Grain Augers.

range of hitch height allowed very good maneuverability of the auger. The Farm King transported well and was stable at speeds up to 50 mph (80 km/h) on paved highways and up to 30 mph (50 km/h) on gravel roads. The single tongue hitch provided a reliable coupling to the tow vehicle. The operator should use a suitable hitch pin and safety chain to prevent accidental unhitching when transporting on public roads. When travelling on rough roads, the power take-off drive line occasionally bounced out of its holding bracket. It is recommended that the manufacturer provide a method of securing the power take-off drive line in place.

Clearance under power lines was adequate. The transport height was 11.0 ft (3.4 m) when fully lowered.

Adjustments: Drive belt tension was easily adjusted with a telescoping rod.

RATE OF WORK

Capacity: FIGURE 3 shows the capacities⁵ of the Farm King 8 x 41 in various grains at 30° elevation angle. Maximum capacities were 2700, 3180, 2400 and 2380 bu/h (73.6, 49.1, 61.1 and 54.0 t/h) in dry wheat, oats, corn and rapeseed respectively. As flighting speeds are increased, the capacity of screw conveyors increases

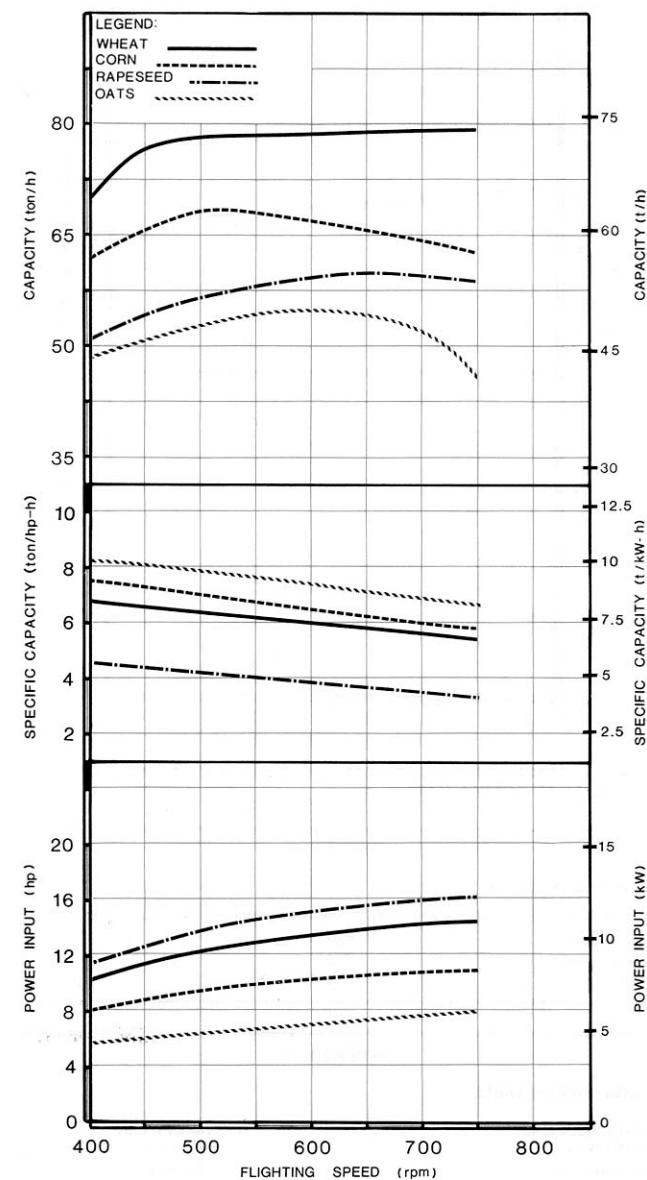


FIGURE 3. Capacity, specific capacity and power requirement for various flighting speeds at 30° elevation angle.

⁵ Since the capacity is greatly dependent up on grain properties, such as variety and moisture content, FIGURE 3 should not be used for comparing different augers. The data presented in FIGURE 5, APPENDIX II, using a standard medium, may be used for comparisons of different augers.

to a peak, then levels off or decreases. Maximum or peak capacities for the Farm King 8 x 41 occurred at flighting speeds ranging from 600 to 700 rpm which corresponded to power take-off speeds at 540 to 635 rpm.

Table 1 illustrates the effect of elevation angle on capacity, Peak capacities in wheat dropped 35%, from 3210 bu/h (87.6 t/h) at 20° elevation to 2010 bu/h (54.9 t/h) at maximum elevation.

TABLE 1. Peak Capacity, Specific Capacity and Power Requirement vs Elevation Angle (Wheat).

ELEV. ANGLE DEG.	DISCHARGE HEIGHT		PEAK CAPACITY BU/H (T/H)	SPECIFIC CAPACITY		POWER INPUT HP (KW)
	FT.	(M)		TON HP.H	(T) (KW.H)	
20	14	(05)	3210 (88)	7.9	(9.7)	12 (09)
30	25	(06)	2700 (74)	5.2	(7.2)	14 (11)
40	26	(08)	2380 (65)	5.0	(6.1)	14 (11)
49	31	(09)	2010 (55)	4.6	(5.7)	13 (10)

Specific Capacity: Specific capacity is the amount of grain moved per horsepower hour (kilowatt hour). A high specific capacity indicates an efficient use of energy. In general, specific capacity decreases (less grain moved per horsepower hour) with increasing flighting speed and elevation angle. FIGURE 3 shows that at 30° elevation, specific capacity ranged from 8.25 to 3.52 ton/hp-h (10.0 to 4.3 t/kW-h) in wheat, oats, corn and rapeseed. TABLE 1 indicates the effect of elevation angle on peak and specific capacities for the Farm King 8 x 41.

Critical Speeds: At certain critical flighting speeds, auger vibration becomes excessive. This phenomenon, known as resonance, is common to all augers and varies with grain type and operating conditions. Care should be taken not to operate at or near critical speeds.

Power Requirements: FIGURE 3 gives the power inputs for the Farm King in dry wheat, oats, corn and rapeseed at a 30° elevation angle. As flighting speed was increased, more power was required. Power requirements ranged from 5 to 18 hp (4 to 13 kW). More power would be needed in high moisture grain.

QUALITY OF WORK

Grain Damage: Damage in dry wheat was less than 0.2% for each pass through the auger. This was insignificant as long as the same grain was not augered many times. Crackage would be lower at higher moisture contents.

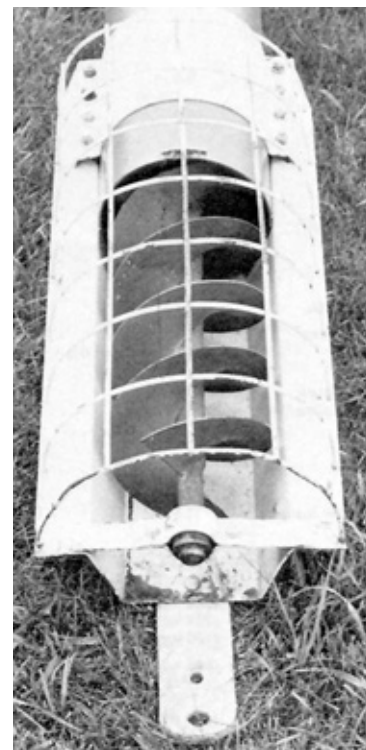


FIGURE 4. Inlet safety guard.

OPERATOR SAFETY

The Farm King 8 x 41 met current safety standards² for grain augers. It was safe to operate if normal precautions were observed.

Shielding was provided for all rotating shafts, pulleys and pinch points. An adequate inlet safety guard (FIGURE 4) was provided. All capacities were determined with this inlet safety guard. The Institute strongly recommends that grain augers be operated with all safety equipment in place. Safety signs were appropriately displayed, alerting the operator of potentially hazardous areas.

Caution is necessary to prevent the auger from tipping if additional spouting is used.

OPERATOR MANUAL

An operator manual was provided with the Farm King. It contained appropriate operating, servicing and safety instructions.

DURABILITY RESULTS

The Farm King was operated for about 15 hours. The intent of the test was evaluation of overall performance. An extended durability evaluation was not conducted. No mechanical problems occurred during the test.

APPENDIX I

SPECIFICATIONS

MAKE:	Farm King		
MODEL:	8 x 41		
OVERALL DIMENSIONS:			
-- length	42.0 ft.	(12.8 m)	
-- width	80 ft	(2.4 m)	
-- transport height	11.0 ft	(3.4 m)	
DRIVE:			
-- 540 rpm tractor power take-off			
-- belt drive			
-- auxiliary drives			
-- belts	2 (B-199)		
-- chains	1 (#60)		
-- gearboxes	1		
-- power take-off to flighting speed ratio	1:1.07		
LUBRICATION:			
-- pressure grease fittings	2		
-- sealed bearings	7		
-- packed wheel bearings	2		
AUGER TUBE:			
-- inside diameter	8.0 in	(205 mm)	
-- material thickness	0.125 in	(3.2mm)	
-- discharge spout	10.0 in dia	(250 mm)	
FLIGHTING			
-- diameter	7.0 in	(180 mm)	
-- pitch			
-- exposed (double)	7.5 in	(190 mm)	
-- covered	7.5 in	(190 mm)	
-- exposed length	14.0 in	(356 mm)	
INLET SAFETY GUARD:			
-- material dimensions	0.20 in dia.	(51 mm)	
-- overall size	24 in L x 13 in dia	(610 mm x 305 mm)	
-- grill openings			
-- maximum open area	9.75 in ²	(62.9 cm ²)	
-- maximum open dimension	3.25 in	(83.0 mm)	
WINCH:			
-- make:	Work Winch		
-- model:	K-2500		
-- maximum handle force	15.9 lb	(70.8 N)	
WEIGHT:			
	Maximum Elevation		Minimum Elevation
-- right wheel	493 lb (225 kg)	520 lb (236 kg)	
-- left wheel	553 lb (251 kg)	580 lb (264 kg)	
-- hitch	67 lb (30 kg)	13 lb (6kg)	
TOTAL	1113 lb (506 kg)	1113 lb (506 kg)	
OPTIONAL EQUIPMENT:			
-- various drive kits			
-- flex spouts			

APPENDIX II

PERFORMANCE WITH STANDARD TEST MATERIAL

The standard test material is a high density granular polyethylene. The material is consistent and not subject to damage or changes in physical properties as are grains.

FIGURE 5 gives the capacity, specific capacity, and power requirements for the Farm King 8 x 41 in a standard test material. These data may be used for comparison of different grain augers.

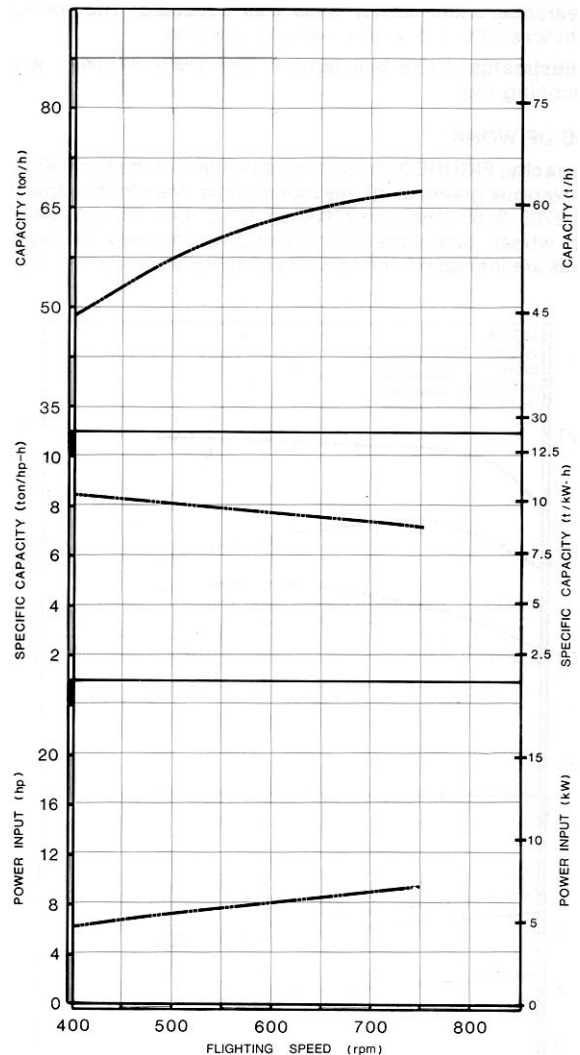


FIGURE 5. Capacity, specific capacity and power requirement with a standard test material at a 30° elevation angle.

APPENDIX III

MACHINE RATINGS

The following rating scale is used in Machinery Institute Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

APPENDIX IV

CONVERSION TABLE

Acre (ac) x 0.40	= Hectare (ha)
Foot (ft) x 0.305	= Metre (m)
Inches (in) x 25.4	= Millimetres (mm)
Horsepower (hp) x 0.75	= Kilowatt (kW)
Miles/Hour (mph) x 1.61	= Kilometre/Hour (km/h)
Pounds Force (lb) x 4.45	= Newton (N)
Pounds Force/Foot (lb/ft) x 14.6	= Newton/Metre (N/m)
Pounds Force-Feet (lb-ft) x 1.36	= Newton-Metre (N-m)
Pounds Force/Square Inch (psi) x 6.89	= Kilopascal (kPa)
Pounds Mass (lb) x 0.454	= Kilogram (kg)
Tons Mass (ton) x 1.1	= Tonnes (t)



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