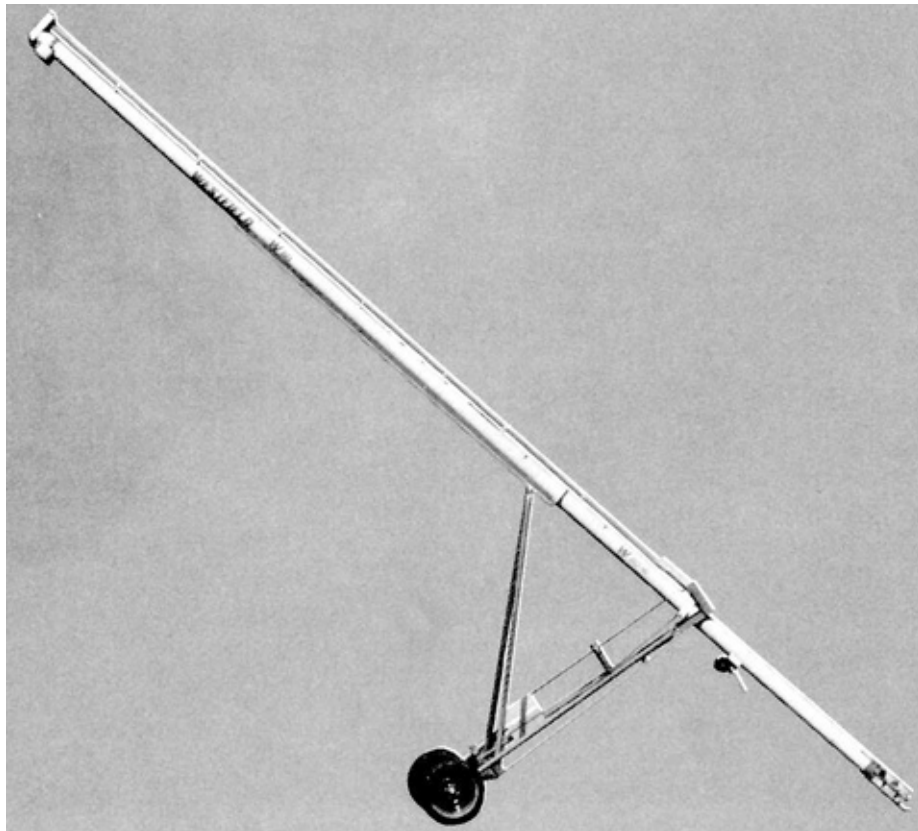


# Evaluation Report

# 165



## Westfield W80-41 Grain Auger

A Co-operative Program Between



ALBERTA  
FARM  
MACHINERY  
RESEARCH  
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

## WESTFIELD W80-41 GRAIN AUGER

### MANUFACTURER:

Westfield Industries Ltd.  
Rosenort, Manitoba  
R0G 1W0

RETAIL PRICE: \$1,589.00 less tires (April 1981, f.o.b. Winnipeg, Manitoba).

### DISTRIBUTORS:

#### Manitoba

Cargill Grain Co. Ltd.  
500- 167 Lombard Avenue  
Winnipeg, Manitoba  
R3B 0V4

Westfield Industries Ltd.  
P.O. Box 39  
Rosenort, Manitoba  
R0G 1W0

#### Alberta

Alteen Distributors Ltd.  
P.O. Box 6450  
Wetaskiwin, Alberta  
T9A 2G2

United Farmers of Alberta  
1016- 6 Avenue  
Calgary, Alberta  
T2J 4J2

#### Saskatchewan

Federated Co-op. Ltd.  
P.O. Box 1050  
Saskatoon, Saskatchewan  
S7K 3M9

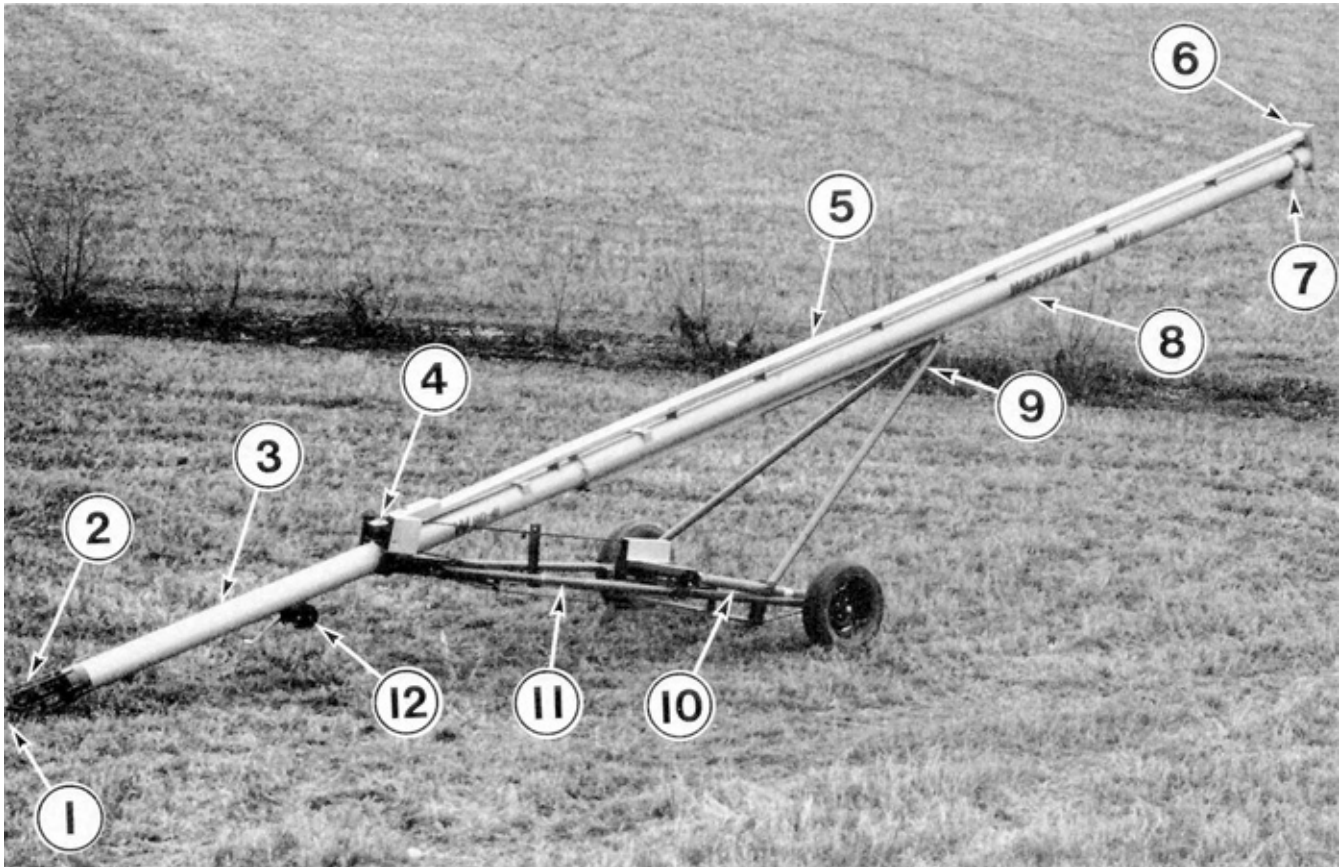


FIGURE 1. Westfield W80-41: (1) Tow Hitch, (2) Inlet, (3) Auger Tube, (4) Gear Box, (5) Drive Shaft, (6) Upper End Drive, (7) Discharge Spout, (8) Elevating Track, (9) Lift Arms, (10) Power Take-off Drive Line, (11) Lower Arms, (12) Cable Winch.

### SUMMARY AND CONCLUSIONS

At a flighting speed of 600 rpm, and a 30° elevation angle corresponding to a discharge height of 6.2 m (20.3 ft), the capacity of the Westfield W80-41 was 52.1 t/h (1910 bu/h) in wheat, 39.8 t/h (2740 bu/h) in oats, 49.8 t/h (1960 bu/h) in corn and 50.5 t/h (2220 bu/h) in rapeseed. Maximum capacities occurred at flighting speeds between 600 and 800 rpm.

Power requirements ranged from 4 to 13.5 kW (5.5 to 17.5 hp) in dry grain. Capacity and power depended on flighting speed, elevation angle, grain type and moisture content. A 15 kW (20 hp) power supply should have ample power reserve in most conditions.

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

The Westfield had a light hitch weight and convenient hand hold which made maneuvering easy.

All pulleys, nip points, rotating drive shafts and the inlet flighting were well guarded in accordance with current safety standards.

The operator manual was clearly written and illustrated. It provided adequate information on assembly, operation and servicing of the machine. A brief safety section was also included in the manual.

No durability problems occurred during the test.

### RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to eliminate interference of the cable clamp with the lift arm slides.
2. Providing a more durable hitch clevis.

3. Providing a caution decal on the driveline advising about alignment and permissible extension of the power take-off line.

Chief Engineer -- E. O. Nyborg  
 Senior Engineer -- J. C. Thauberger  
 Project Engineer -- Carl W. Bolton

### THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. We are presently designing a bracket to eliminate interference of the cable clamp with the lift arm slide.
2. Most 1981 production augers will have a heavy duty clevis to replace the present clevis.
3. The manufacturer of the power take-off shafts has been attaching caution decals on the shaft shield since early 1980. Because the decal cannot be read while the shaft is rotating, we are attaching a separate caution decal near the point where the power take-off shaft is attached to the drive. We have been using a non-separable, pin stop, power take-off shaft on all our power take-off augers, commencing with the 1980 production.

**Note:** This report has been prepared using SI units of measurement. A conversion table is given in APPENDIX III.

### GENERAL DESCRIPTION

The Westfield W80-41 Grain Auger (FIGURE 1) is a 205 mm (8 in) diameter, 12.7 m (41 ft) long, portable auger. The auger tube is mounted on a tubular undercarriage supported by a single axle and two wheels.

A hand operated cable winch adjusts the auger angle to vary the discharge height. The auger fighting assembly is bearing mounted at the discharge end and bushing mounted at the inlet end.

The Westfield may be powered with a tractor power take-off belt drive, power take-off direct drive, gasoline engine or electric motor. The drive shaft is mounted in bearings with a roller chain final drive.

The test machine was equipped with a 540 rpm tractor power take-off belt drive.

Detailed specifications are given in APPENDIX I.

### SCOPE OF TEST

The Westfield was operated for about 10 hours while conveying dry wheat, oats, corn and rapeseed. It was also operated in a standard test material (APPENDIX II) for about one hour. As well, it was transported over gravel and paved highways for a distance of 70 km (45 miles). 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.

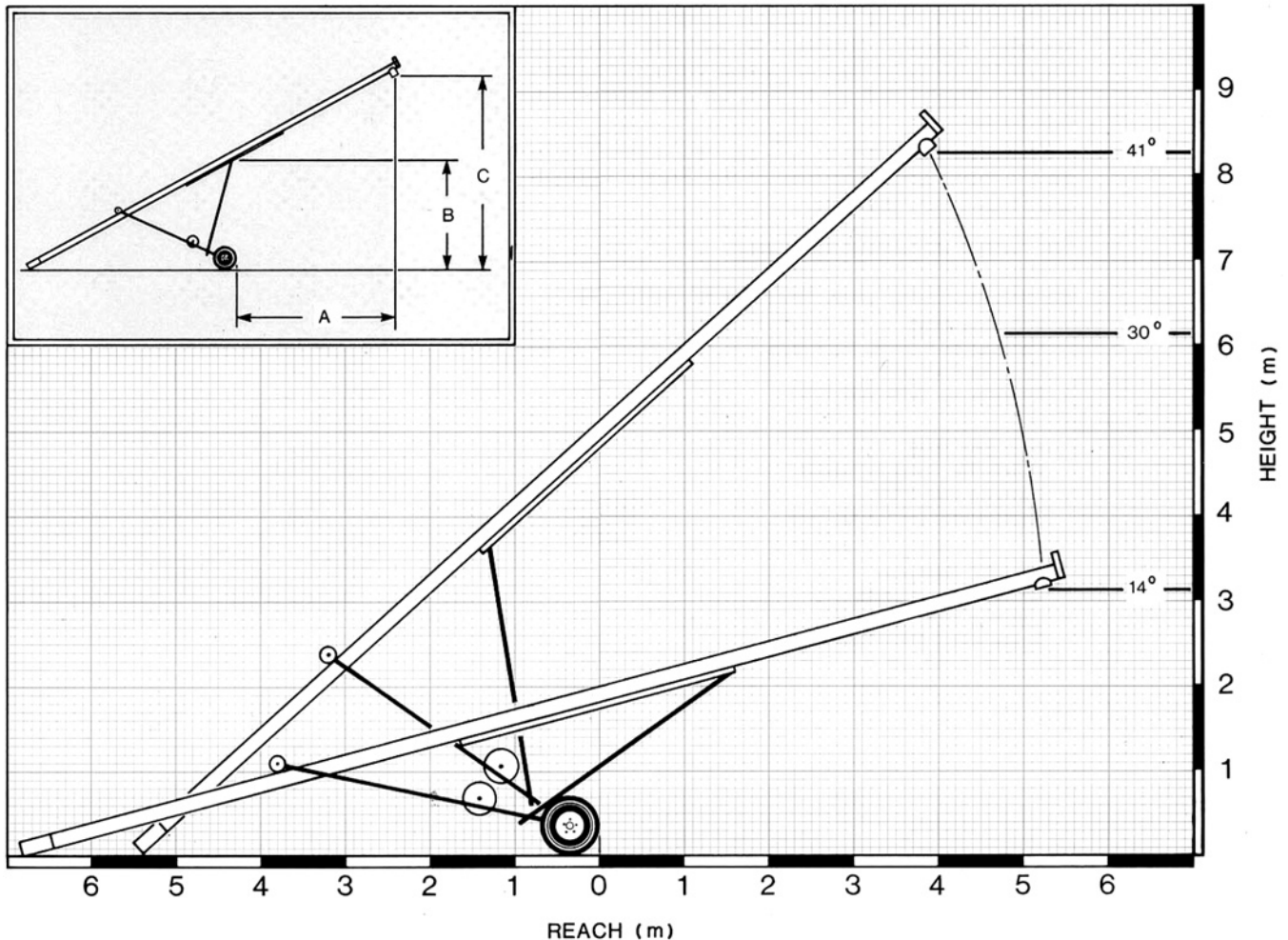


FIGURE 2. Reach and Clearance at Various Heights: (A) Reach, (B) Bin Eave Clearance, (C) Discharge Height.

## RESULTS AND DISCUSSION

### EASE OF OPERATION AND ADJUSTMENT

**Discharge Height:** The discharge height could be varied from 2.9 to 8.1 m (9.6 to 26.7 ft) with the hand operated winch. Corresponding elevation angles ranged from 14° to 41°. At maximum elevation, the lift arm slide interfered with the cable clamp at the anchor point (FIGURE 3). It is recommended that the manufacturer make modifications to eliminate this interference.

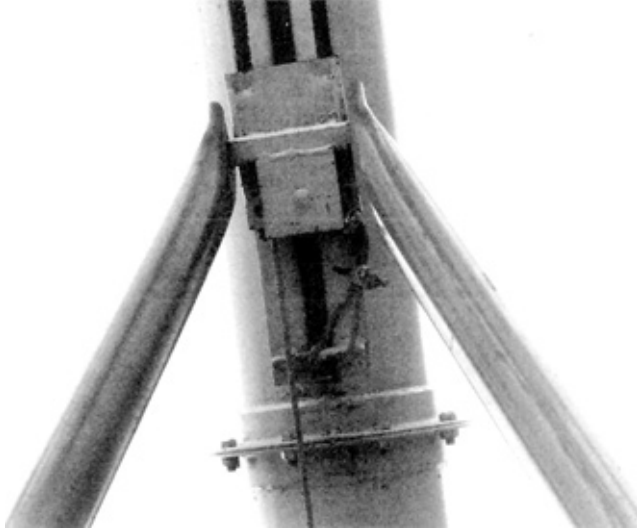


FIGURE 3. Cable Interference at Maximum Elevation.

With the auger empty, and the lift mechanism well lubricated, it took a maximum winch handle force of 100 N (22 lbs) to raise the auger. The winch cable wrapped mainly at the centre of the winch drum causing occasional hesitation and shock loading as consecutive cable turns slipped sideways off one another. The winch was conveniently located at all discharge heights. It took about 125 turns of the winch crank to fully raise or lower the auger.

**Auger Reach:** The bin eave clearance and horizontal reach of the Westfield W80-41 are shown in FIGURE 2. Bin eave clearance, measured from the ground to the foremost part of the undercarriage, varied from 3.7 m (12.1 ft) at 14° to 5.3 m (17.2 ft) at 41° elevation. The reach, measured from the foremost part of the undercarriage to the centre of the discharge, varied from 2.0 m (6.6 ft) at 14° to 3.6 m (11.7 ft) at 41° elevation.

Hitch weight varied from 30 kg (66 lb) at minimum elevation to 41 kg (90 lb) at maximum elevation.

**Adjustments:** Drive belt tension was easily adjusted with a threaded rod to position the pivoting drive line frame.

**Transporting:** The Westfield transported well and was stable at speeds up to 100 km/h (60 mph) on paved highways and up to 50 km/h (30 mph) on gravel roads. The clevis hitch bent while transporting on rough roads. It is recommended that the manufacturer modify the hitch so that it can sustain the transport load.

The operator should use a suitable hitch pin and safety chain to prevent accidental unhitching when transporting on public roads.

To prevent possible separation during transport, the power take-off drive line had to be fully retracted and pinned in place with the female knuckle butted against the undercarriage members.

Clearance under power lines was adequate. The transport height was 3.3 m (10.8 ft) when fully lowered.

### RATE OF WORK

**Capacity:** FIGURE 4 shows the capacities of the Westfield W80-41 in dry wheat, oats, corn and rapeseed at a 30° elevation angle. Maximum capacities were 54.2, 39.8, 51.3 and 53.3 t/h (1990, 2740, 2040 and 2350 bu/h) in wheat, oats, corn and rapeseed, respectively. Lower capacities can be expected in tough or damp grains. Maximum capacities occurred at flighting speeds ranging from 600 to 800 rpm.

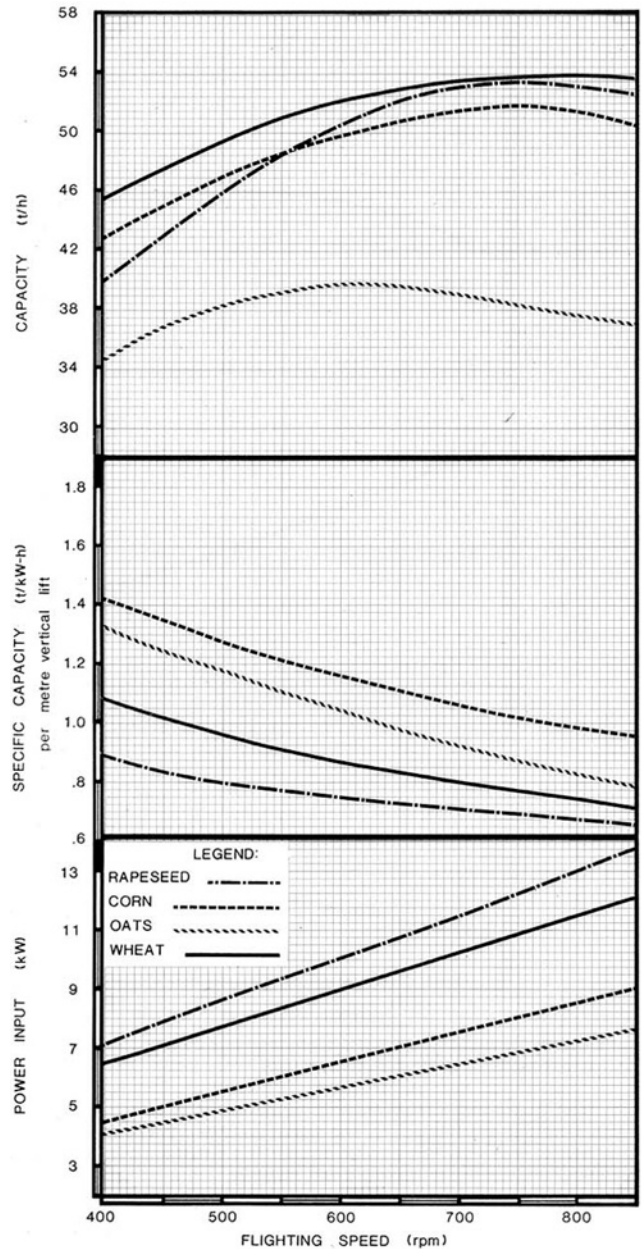


FIGURE 4. Capacity, Specific Capacity and Power Input for Various Flighting Speeds at a 30° Elevation Angle.

**Specific Capacity:** The specific capacity, per metre of vertical lift, is a method of determining the efficiency of a grain auger. A low specific capacity indicates inefficient power use, while a high specific capacity indicates efficient operation. Specific capacities vary, depending on grain type. In general, when the flighting speed is increased, the capacity increases at a lower rate than the increase in power, leading to an overall decrease in specific capacity.

As shown in FIGURE 4, the specific capacity<sup>1</sup> ranged from 0.65 to 1.40 t/kW-h per metre of vertical lift when operating at a 30° elevation angle in dry wheat, oats, corn and rapeseed.

<sup>1</sup>Since the specific capacity is greatly dependent upon grain properties, such as variety and moisture content, FIGURE 4 should not be used for comparing efficiencies of different augers. The data presented in FIGURE 6, APPENDIX II, using a standard medium, may be used for comparisons of different augers.



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

**POWER REQUIREMENTS**

FIGURE 4 gives the power requirements for the Westfield in dry wheat, oats, corn and rapeseed at a 30° elevation angle. Power requirements ranged from 4 to 13.5 kW (5.5 to 17.5 hp). More power would be needed in high moisture grain. In general, a 15 kW (20 hp) power supply would have ample reserve power to operate the Westfield in most conditions.

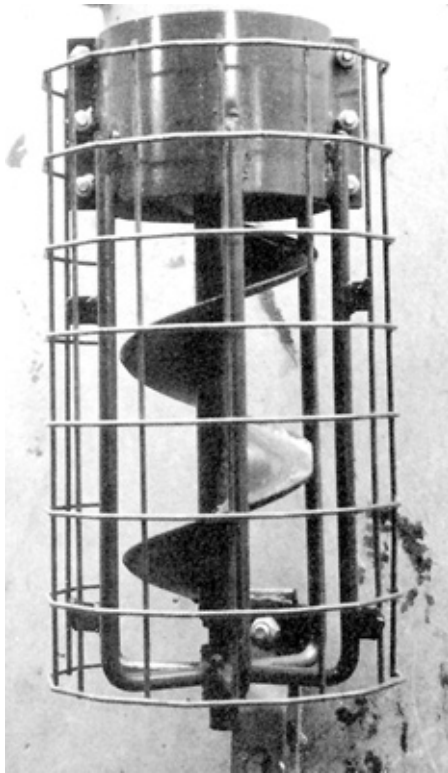
**QUALITY OF WORK**

**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 with grain of higher moisture content.

**OPERATOR SAFETY**

The Westfield W80-41 met current safety standards<sup>2</sup> for grain augers. It was safe to operate if normal precautions were observed.

An adequate inlet safety guard (FIGURE 5) was provided. Shields covered all rotating shafts, pulleys and pinch points. Appropriate warning and caution signs were placed on the auger.



**FIGURE 5.** Inlet Safety Guard

Care had to be used in raising and lowering the auger. At high elevations, the left arm sometimes wedged in the elevating track, causing momentary cable slack. The wrapping of the winch cable also caused hesitation and shock loading.

The power take-off drive line could separate if the tractor was placed too far away from the auger. It is recommended that a caution decal be placed on the drive line advising on alignment and possible drive line extension.

<sup>2</sup>American Society of Agricultural Engineers Standard: ASAE Standard S318.6, "Safety for Agricultural Equipment".

**OPERATOR MANUAL**

The operator manual contained clear pictorial and written information on assembly, operation, safety and servicing.

**DURABILITY RESULTS**

The Westfield was operated for about 10 hours. The intent of the test was evaluation of functional performance. An extended durability evaluation was not conducted. No mechanical problems occurred during the test.

APPENDIX I		
<b>SPECIFICATIONS</b>		
<b>Serial Number:</b>	B5204	
<b>Make:</b>	Westfield	
<b>Model:</b>	W80-41	
<b>Dimensions:</b>		
-- length	12,700 mm	
-- width	2420 mm	
<b>Auger Tube:</b>		
-- inside diameter	199 mm	
-- inlet length	370 mm	
-- material thickness	2.0 mm	
-- outlet size	elliptical 240 mm x 210 mm	
<b>Flighting:</b>		
-- diameter	188 mm	
-- pitch -- exposed inlet	180 mm cupped	
-- -- covered	180 mm	
-- material thickness	2.3 mm to 5.2 mm	
-- exposed length	370 mm	
-- core diameter	42 mm	
<b>Elevating Height:</b>		
-- maximum (41°)	8125 mm	
-- minimum (14°)	2925 mm	
<b>Lubrication Points:</b>		
-- pressure grease fittings	3	
-- sealed bearings	11	
-- bushings	1	
-- wheel bearings (packed)	2	
<b>Drive:</b>		
-- 540 rpm tractor power take-off		
-- power take-off flighting speed ratio	1:1.08	
-- auxiliary drives		
-- V-belt	2 (B-210)	
-- roller chain	1 (60-38P)	
-- gear boxes	1	
<b>Winch:</b>		
-- make and model	Work Winch K-1500	
<b>Bin Eave Clearance @ Maximum Elevation:</b>	5300 mm	
<b>Reach at maximum elevation:</b>	3600 mm	
<b>Tires :</b>		
--size	G78-15, 4 ply, tubeless	
--tread width	2215 mm	
<b>Inlet Safety Shield:</b>		
-- type of grill	rod	
-- material dimensions	5.2 mm dia	
-- grill openings	72 mm x 67 mm	
-- maximum open area	48 cm <sup>2</sup>	
-- maximum open dimension	72 mm	
-- overall size	530 mm L x 310 mm dia	
<b>Weight: (PTO Drive)</b>		
	<u>maximum elevation</u>	<u>minimum elevation</u>
-- right wheel	225 kg	230 kg
-- left wheel	205 kg	210 kg
-- hitch point	40 kg	30 kg
Total	470 kg	470 kg
<b>Optional Equipment:</b>		
-- grain hoppers		
-- discharge spouts		
-- various drives		

APPENDIX II

PERFORMANCE WITH STANDARD TEST MATERIAL<sup>3</sup>

(a) Capacity and Power Requirements: FIGURE 6 gives the capacity, specific capacity and power requirements for the Westfield W80-41 in a standard test material. These data may be used for comparisons of different grain augers.

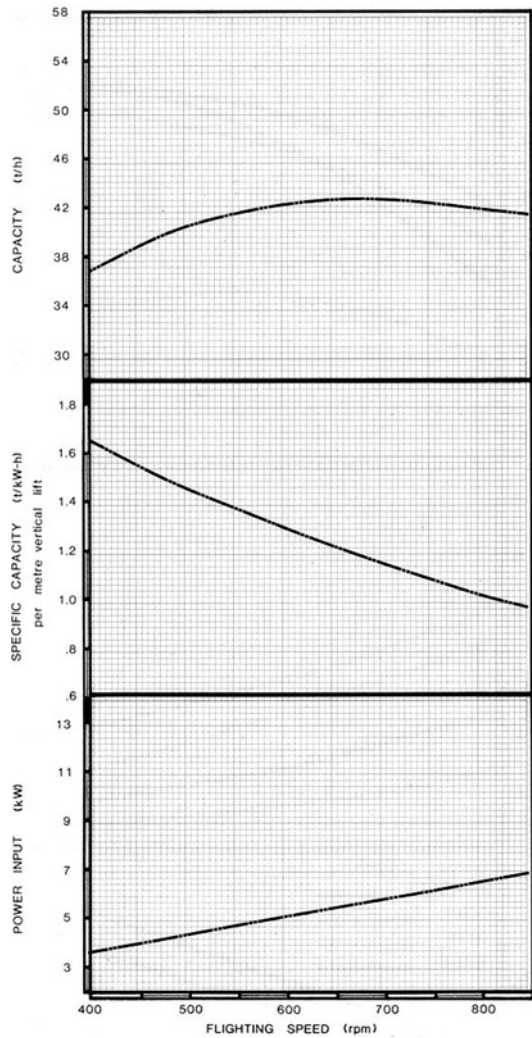


FIGURE 6. Capacity, Specific Capacity and Input Power with a Standard Test Material at 30° Elevation Angle.

(b) Inlet Guard Index: This index is an indication of how freely grain flows through the inlet guard. The higher the index, the less restrictive the guard. Free flow has a value of one. The Westfield guard had an index of 0.50, with the standard test material.

APPENDIX III

CONVERSION TABLE

1 tonne (t)	= 2200 pounds mass (lb)
1 metre (m)	= 3.3 feet (ft)
1 kilowatt (kW)	= 1.3 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds mass (lb)
11 newton (N)	= 0.2 pounds force (lb)

<sup>3</sup>The standard test material is a high density granular polyethylene. This material is consistent and not subject to damage or changes in physical properties as are grains.



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