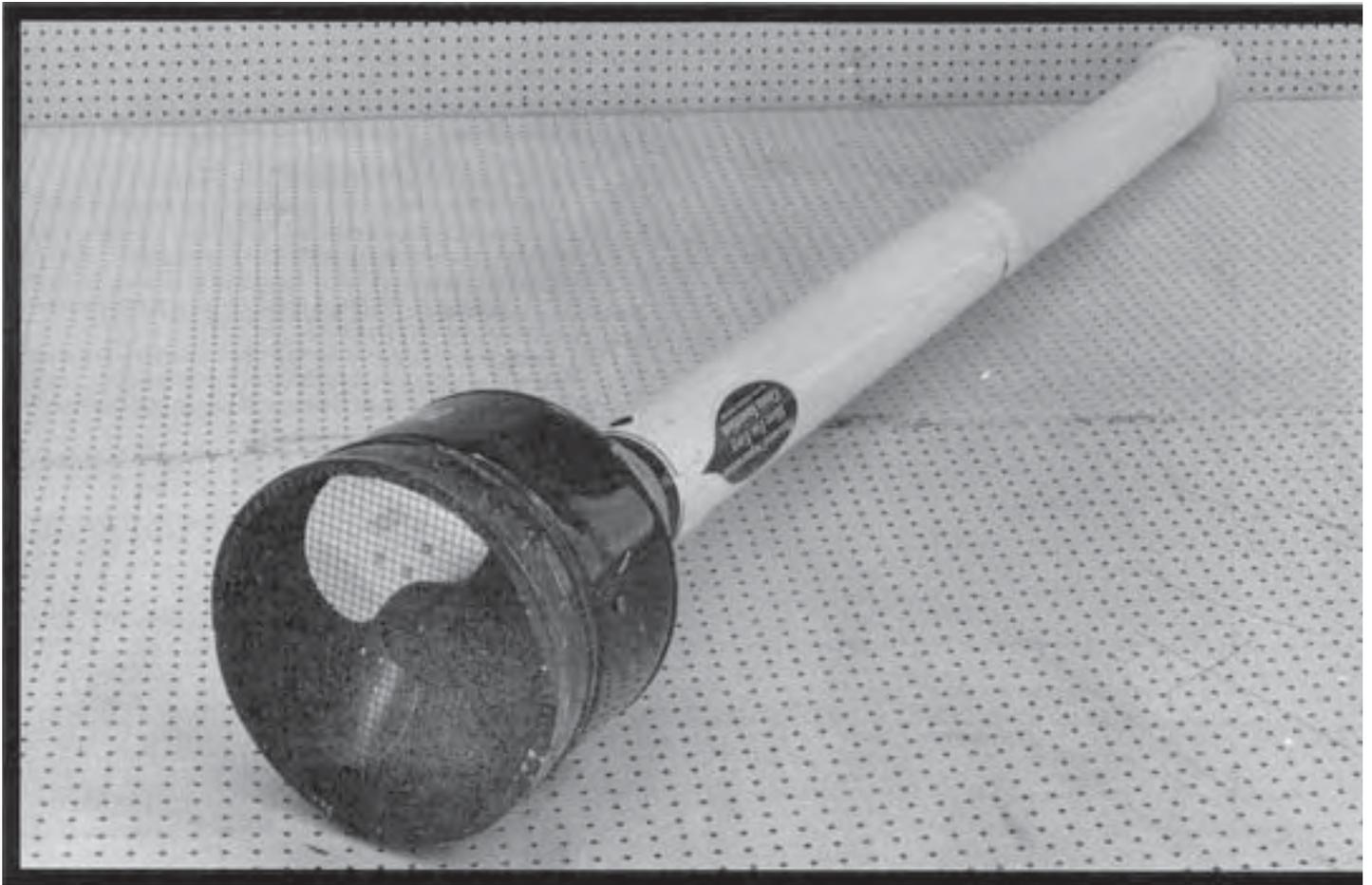


# Evaluation Report

# 505



## B & W Model 128 Grain Aerator and Dryer

A Co-operative Program Between



## B & W MODEL 128 GRAIN AERATOR AND DRYER

### MANUFACTURER:

B & W Manufacturing Co. Inc,  
Highway 30 East. RR. #7  
Columbus, Nebraska 68601

### DISTRIBUTOR:

Frank Flaman Sales Ltd.  
Agri-Products Division  
P.O. Box 280  
Souhey, Saskatchewan S0G 4P0  
Telephone: (306) 726-4403

### RETAIL PRICE:

\$195.00 (February 1989. f.o.b. Humboldt. Saskatchewan)

### SUMMARY AND CONCLUSIONS

**Aeration Performance:** The B & W Model 128 could cool a 1300 bu (47.3 m<sup>3</sup>) grain bin by 9°F (5°C) in 9 days if the outside temperature was 28°F (16°C) cooler than the grain. Complete cooling would take 20 to 40 days.

Airflow with the B & W Model 128 at the top centre of the bin was about 55 cfm (26 L/s). These airflows were at the lower range of airflows recommended for aeration and were not adequate for grain drying.

Air distribution tests indicated that with the B & W Model 128 installed in the top centre of the grain, the last grain to change temperature was near the centre of the bin and about 4 ft (1.2 m) above the bin floor.

**Fan Performance:** Fan performance results at standard air conditions are given in TABLE 1.

**Installation:** Ease of installation was good. Installing the B & W Model 128 at the top centre of the grain was easy, but installation into the auger chute of the bin was difficult. Monitoring aeration progress required temperature sensors or probing.

**Safety:** The B & W Model 128 was CSA approved, Noise level around the fan was 73 dBA. Caution was required when carrying the fan unit up to the top of the bin.

**Operator's Manual:** The operator's manual was fair. The installation sheet provided diagrams and brief installation instructions.

**Mechanical History:** The screen collapsed once during installation into the auger chute.

TABLE 1. Fan Performance at Typical Levels of Operation

Setting	Static Pressure		Airflow		Input Power kW	Total Efficiency %	Fan Speed rpm
	in wg	(Pa)	cfm	(L/s)			
Fan with Bin Duct	0.0	(0.0)	187	(88)	0.18	0	1634
	0.05	(12.4)	176	(83)	0.18	1	1622
	0.1	(24.9)	166	(78)	0.18	1	1617
	0.15	(37.4)	152	(72)	0.18	1	1602
	0.2	(49.8)	138	(65)	0.18	2	1593
	0.25	(62.3)	124	(58)	0.18	2	1591
	0.3	(74.7)	110	(62)	0.18	2	1590
	0.4	(99.6)	78	(37)	0.18	2	1582
	0.5	(125.0)	38	(18)	0.18	1	1572

### RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying a more detailed operator's manual containing information on installation, operation, maintenance, rated performance, safety aspects and troubleshooting.
2. Improve tube strength to prevent collapse during insertion into the auger chute.

Senior Engineer: J. D. Wassermann

Project Engineers: D. E. Lischynski & K. Shimek

Project Technologist: W. F. Stock

### THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. A new instruction brochure has been developed that will be provided with all future units. Also all new units have a label that includes instructions for cleaning, servicing and safety.
2. Less than 0.2% of our units have been returned due to collapsed tubes. We do not feel this return rate warrants increasing tube strength.

### Manufacturer's Additional Comments:

1. The Model 128 is no longer being manufactured, and has been replaced by the Model 130. This new model incorporates some design changes and new safety features.
2. Although the instructions indicate that the unit can be inserted into the auger chute of the bin, we estimate that about 95% of all units are operated by inserting them into the top of the grain. We feel the unit operates much more effectively in this location.
3. Many operators are using two or three units placed close together in a grain bin to increase the total airflow and serve as an alternative to more expensive in-bin systems.
4. We have investigated supply of a carrying handle for the fan unit, but the additional benefits are not adequate to justify the extra costs.

### GENERAL DESCRIPTION

The B & W Model 128 Grain Aerator and Dryer consists of a fan unit, screened duct and an insertion bar. The fan unit includes a three-blade aluminium propeller directly driven by a 0.08 hp (62 W), single phase, 115 V AC electric motor. The duct consists of a steel tube that is partially perforated. The tube is pointed and has flighting welded on to it to aid insertion into the grain.

The duct is screwed into the grain through a bin opening with the help of an insertion bar. The fan unit is then connected to the end of the duct. The B & W Model 128 is specifically set up to draw air through the grain and exhaust it outside.

FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX I.

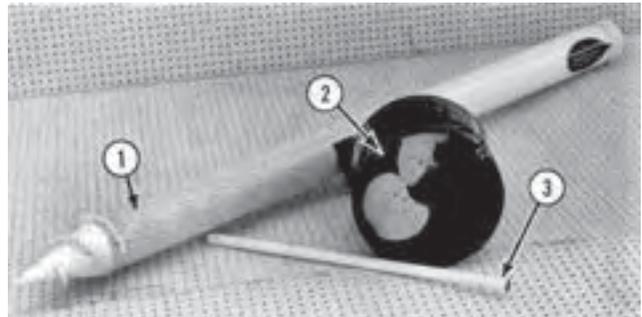


FIGURE 1. B & W Model 128 Grain Aerator and Dryer: (1) Screened Duct, (2) Fan Unit, (3) Insertion Bar.

### SCOPE OF TEST

#### AERATION PERFORMANCE

The B & W Model 128 was operated according to the manufacturer's instruction sheet in a bin of levelled wheat for about 45 days to evaluate aeration time, air flow and air distribution. Tests were done with the unit in the top centre of the grain with the bin door open and repeated with the bin door closed. In addition, the unit was also tested while inserted in the auger chute of the bin.

#### FAN PERFORMANCE

Fan performance for the B & W Model 128 was tested in the inlet chamber setup (FIGURE 2) in accordance with test procedures developed by PAMI<sup>1</sup>. The intent was to determine the performance of the fan in terms of airflow rate, static pressure, input power and total efficiency.

Fan performance was determined at 120 V AC. The bin duct was standard equipment and an integral part of the fan unit so the test was performed with the duct in place.

The entire unit was evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

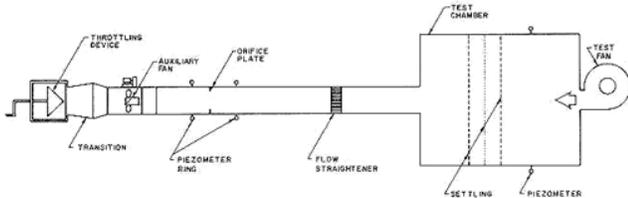


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

## RESULTS AND DISCUSSION

### AERATION PERFORMANCE

**Aeration Time:** With the B & W Model 128 installed in the top centre of the grain and the bin door closed, it took 9 days to cool a 1300 bu (47.3 m<sup>3</sup>) bin by 9oF (5°C) if the outside air was 28°F (16°C) cooler than the grain. The time to cause this same cooling with the B & W Model 128 in the same location with the bin door open was also 9 days. With the unit installed in the auger chute, the time to cause this temperature change was 12 days. At this rate, it would take 20 to 40 days to completely cool this amount of grain to outside temperature. Different times could be expected with different sized bins and operating conditions.

These times compare to a typical aeration system where complete cooling would take 10 to 20 days. With a typical natural air drying aeration system, complete cooling would take 1 to 2 days.

If the B & W Model 128 was used to warm grain, times similar to when cooling could be expected.

**Airflow:** Airflow with the B & W Model 128 inserted in the top centre of a 1300 bu (47.3 m<sup>3</sup>) bin of wheat with the door closed was about 55 cfm (26 L/s). This represents 0.06 cfm/bu (0.7 L/s•m<sup>3</sup>). Having the bin door open did not affect airflow.

Airflow with the B & W Model 128 inserted in the auger chute of a 1300 bu (47.3 m<sup>3</sup>) bin of wheat was about 42 cfm (20 L/s). This represents 0.04 cfm/bu (0.5 L/s•m<sup>3</sup>).

The above airflows are at the lower range of airflows recommended for aerating grain to remove temperature differences and much below the recommended airflow rates for drying. To do any significant grain drying, the B & W Model 128 would have to be used in a much smaller bin or a much larger fan would be needed.

**Air Distribution:** Air distribution tests with the B & W Model 128 installed in the top centre of the grain and the bin door closed indicated that the last grain to cool was near the centre of the bin and about 4 ft (1.2 m) above the bin floor. FIGURE 3 contains lines, which show the time required for the respective locations in the bin to cool by 9°F (5°C).

Opening the door with the unit installed in the top centre of the grain did not affect the air distribution.

Air distribution tests with the B & W Model 128 installed in the auger chute indicated that the last grain to change temperature was at the bottom centre of the bin. A diagram of the constant temperature lines occurring in the bin at specified times is given in FIGURE 4. The manufacturer suggests that the area of influence of a B & W Model 128 is about 15 ft (4.6 m) in diameter and 8 to 10 ft (2.4 to 3.0 m) deep. This would allow about 1100 to 1400 bu (40 to 51 m<sup>3</sup>) of grain to be aerated per unit.

### FAN PERFORMANCE

All fan performance results in this report are given at standard air conditions so that direct comparisons can be made with other fan test reports. Fan performance under actual operating conditions could differ from these results by up to 10%, depending on such things as temperature, barometric pressure, humidity, and elevation above sea level.

**Airflow:** Fan output over the range of operation (i.e. static pressure<sup>2</sup>) are given in TABLE 1. The airflow ranged from 38 cfm (18 L/s) at 0.5 in•wg (125 Pa) to 187 cfm (88 L/s) at 0 in•wg (0 Pa). FIGURE 5 illustrates the fan performance curves for the

<sup>1</sup>Standard air is air with a density of 0.075 lb/ft<sup>3</sup> (1.2 kg/m<sup>3</sup>) which occurs at 68°F (20°C), 50% relative humidity and a barometric pressure of 29.92 in•Hg (101.325 kPa).

<sup>2</sup>Static pressure is a measure of the pressure difference across the fan. Static pressure is usually expressed in inches of water gauge (in•wg) or Pascals (Pa).

B & W Model 128.

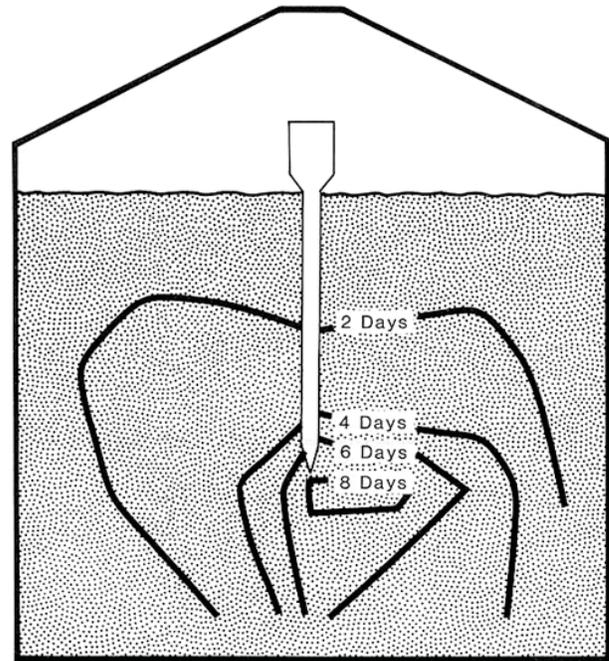


FIGURE 3. Air Distribution with B & W Model 128 in Top Centre of Bin. [Outside air 28°F (16°C) cooler than initial grain temperature]

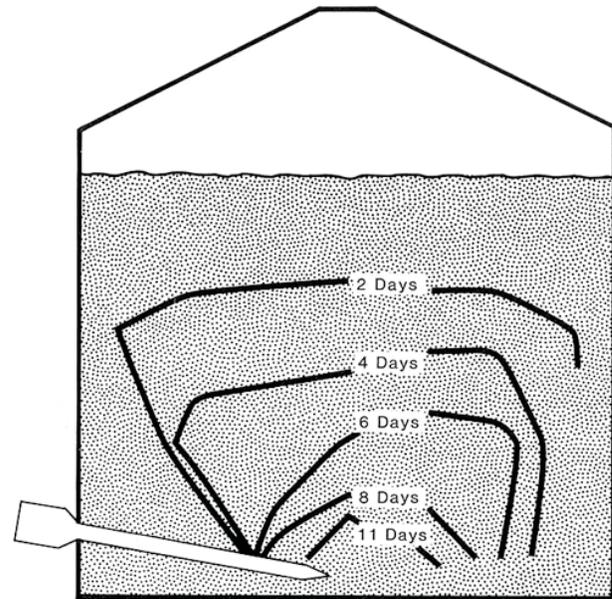


FIGURE 4. Air Distribution With B & W Model 128 in Auger Chute. [Outside air 28°F (16°C) cooler than initial grain temperature]

**Power Consumption:** The power consumption numbers given in TABLE 1 can be used to calculate the cost of operating the fan. To calculate the cost of fan operation, multiply the power consumption (kW) by the number of hours of fan operation times the cost per kilowatt hour.

The power consumed by the fan was relatively constant at 0.18 kW. The maximum amperage drawn by the motor was 2.1 A which did not exceed the rated motor amperage of 2.4 A.

**Total Efficiency:** Total efficiency is the ratio of air horsepower over the input power. Air horsepower is dependent upon the airflow rate and corresponding total pressure. For typical levels of operation, the total efficiency (TABLE 1), ranged from 0 to 2%. The maximum total efficiency of 2% occurred over a range of airflow rates from 78 cfm (37 L/s) at 0.4 in•wg (99.6 Pa) to 138 cfm (65 L/s) at 0.2 in•wg (49.8 Pa).

### EASE OF OPERATION

**Installation:** Ease of installation was good. Installing the B &

W Model 128 in the top centre of the bin was easily done. However, carrying the fan unit up to the top of the bin was awkward, as no handle was supplied.

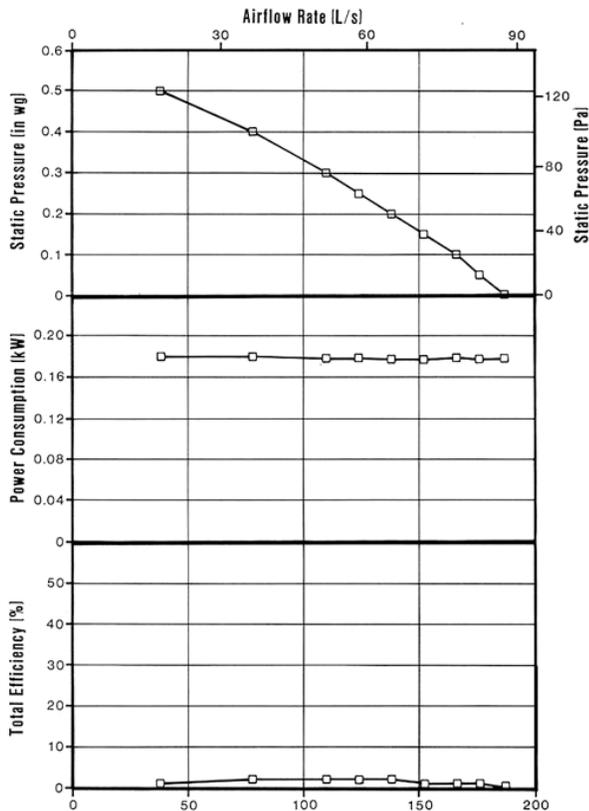


FIGURE 5. Fan Performance Curves.

Installing the B & W Model 128 in the auger chute was difficult, as a large torque was required to screw the duct into the more densely compacted grain at the bottom of the bin. This made it difficult to ensure that the unit would not be damaged. In this location, the duct could easily catch on the auger chute or hit the bin floor without being detected.

The duct fit in a Westeel-Rosco auger inlet. Insertion into auger inlets of other bin makes was not investigated. If insertion into the auger chute is being considered, the operator should ensure that the duct can be properly installed before filling the bin.

The duct was easily extracted from either location using the provided insertion bar.

**Monitoring:** Determining the progress of the operation required monitoring the grain temperature near the bottom centre of the bin. This could be done by probing with a grain thermometer probe, measuring a probed sample's temperature, or with remote temperature sensors located at the bottom centre of the bin.

**Maintenance:** No maintenance instructions were supplied. The guard grill was easily removed for cleaning.

#### OPERATOR SAFETY

The guard grill provided adequate protection from the fan blades. The motor was a totally enclosed unit and presented no safety hazards. The B & W Model 128 was CSA approved.

The noise level of the B & W Model 128, at a distance of 4.9 ft (1.5 m) from the centre of the fan outlet, while operating at 0.125 in wg (31.1 Pa) static pressure, was 73 dBA. Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The B & W Model 128 falls within Range 3 of the PAMI noise level range classification (APPENDIX II). The noise level produced by this fan can be considered annoying and be detrimental to hearing and operator performance under continuous exposure. Ear protection should be considered if working near the fan for prolonged periods.

Caution was required when carrying the fan unit up to the top of the bin. No carrying handle was provided, making the procedure awkward, and allowing only one hand to be used when climbing the

ladder.

Caution should be exercised when entering the top of a bin of grain as bridged grain could collapse and cause suffocation.

#### OPERATOR'S MANUAL

The operator's manual was fair.

The installation sheet provided diagrams and brief instructions for installation. It is recommended that the manufacturer consider providing a more detailed operator's manual including information on maintenance, installation, operation, rated performance, safety guidelines and troubleshooting.

#### MECHANICAL HISTORY

During insertion into the auger chute, an unwelded section of the screen seam caught on the door, causing the tube to come apart and collapse. Repair involved straightening the duct and welding a new section of screen. It is recommended that the manufacturer consider strengthening the tube to prevent collapse during insertion into the auger chute.

**APPENDIX I  
SPECIFICATIONS**

<b>MAKE:</b>	B & W Grain Aerator and Dryer
<b>MODEL:</b>	128
<b>MANUFACTURER:</b>	B & W Manufacturing Co. Inc. Highway 30 East R.R #7 Columbus, Nebraska 68601
<b>OVERALL DIMENSIONS:</b>	
<b>Fan:</b>	
-- housing diameter	12.8 in (324 mm)
-- housing length	19.3 in (489 mm)
-- inlet diameter	44 in (111 mm)
-- guard grill diameter	11.8 in (298 mm)
-- grill opening	1.32 in (1 mm) wire at 0.25 in (6 mm) square spacing
<b>Duct:</b>	
-- diameter	4.9 in (124 mm)
-- total length	79.3 in (2013 mm)
-- perforated length	34.5 in (876 mm)
-- tip length	83 in (210 mm)
-- perforation diameter	0.09 in (2 mm)
-- intake area	3.7 ft (1.34 m)
<b>IMPELLER:</b>	
-- diameter	11.9 in (302 mm)
-- hub diameter	3 in (76 mm)
-- number of blades	3
-- blade angle	28
<b>WEIGHT:</b>	
-- fan	13.7 lb (62 kg)
-- duct	11.5 lb (5.2 kg)
<b>MOTOR NAMEPLATE DATA:</b>	
-- make	General Electric
-- rpm	1550
-- volts	115 V AC
-- amps	24A
-- phase	1
-- cycles	60 Hz
-- horsepower	0.08 hp (62W)

**APPENDIX II  
NOISE LEVEL RANGES**

Range	(dBA)	Comments
1	up to 45	Tolerable, low level background noise.
2	45 to 60	Dominating background noise that would interfere with normal conversation.
3	60 to 85	Could be annoying and be detrimental to hearing and operator performance under long-term continuous exposure. Ear protection should be considered.
4	over 85	Could damage hearing, depending on level and exposure time. Ear protection is definitely recommended.

**APPENDIX III  
MACHINE RATINGS**

The following rating scale is used in PAMI Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

**SUMMARY CHART  
B & W MODEL 128 GRAIN AERATOR AND DRYER**

<b>RETAIL PRICE</b>	\$195.00 (February, 1989, f.o.b. Humboldt)
<b>AERATION PERFORMANCE</b>	
-Aeration Time	Cooled grain by 9°F (5°C) in 9 days if outside air was 28°F (16°C) cooler than grain.
-Airflow	Airflow at the lower range of recommendation for aeration: not adequate for grain drying. Last grain to cool near bottom centre of bin.
-Air Distribution	
<b>FAN PERFORMANCE</b>	
	38 to 187 cfm (18 to 88 L/s) at 0.5 to 0 in•wg (125 to 0 Pa): 2% maximum efficiency.
<b>INSTALLATION</b>	
	Good; easy at top centre of grain. Difficult in auger chute.
<b>SAFETY</b>	
	CSA approved: noise level = 73 dBA. Carrying fan unit up bin requires caution
<b>OPERATOR'S MANUAL</b>	
	Fair; diagrams and brief installation instructions
<b>MECHANICAL HISTORY</b>	
	Screen collapsed when inserting into auger chute



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