

# Evaluation Report

# 415



## Caldwell Model ILC 24-512 In-Line Centrifugal Fan

A Co-operative Program Between



# CALDWELL MODEL ILC 24-512 IN-LINE CENTRIFUGAL FAN

## MANUFACTURER:

Caldwell Manufacturing Company  
A Division of Chief Industries Inc.  
P. O. Box 338  
Kearney, Nebraska 68847-0338

## DISTRIBUTORS:

1. Westland Metals - Edmonton, Alberta  
Saskatoon, Sask.  
Regina, Sask.
2. Frank Flaman - Edmonton, Alberta  
Saskatoon, Sask.  
Prince Albert, Sask.  
Southey, Sask.
3. Denouden Agri - Regina, Sask.
4. Wall Grain Handling - Brandon, Man.

## RETAIL PRICE:

\$1425.00 (February, 1985, f.o.b. Lethbridge, Alberta)

## SUMMARY OF RESULTS

TABLE 1. Caldwell Model ILC 24-512 Performance at Typical Levels of Operation

Static Pressure		Air Flow Rate		Power Consumption		Total Efficiency	Fan Speed
in wg	(Pa)	cfm	(L/s)	kWh	%		rpm
0.5	(125)	5830	2750	4.29	14		3513
1.0	(249)	5760	2720	4.36	17		3510
1.5	(374)	5620	2650	4.52	22		3507
2.0	(497)	5440	2570	4.75	28		3502
2.5	(623)	5250	2480	4.99	33		3496
3.0	(747)	5070	2390	5.22	37		3490
3.5	(872)	4910	2320	5.41	39		3484
4.0	(996)	4760	2250	5.56	41		3479
4.5	(1120)	4610	2170	5.69	43		3475
5.0	(1240)	4440	2100	5.79	45		3471
5.5	(1370)	4220	1990	5.88	46		3468
6.0	(1490)	3920	1850	5.90	47		3467
6.5	(1620)	3470	1640	5.73	47		3472
7.0	(1740)	2830	1340	5.20	44		3486
7.5	(1870)	1820	(858)	4.24	37		3509
8.0	(1990)	512	(241)	3.11	15		3538

Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

## GENERAL DESCRIPTION

The Caldwell Model ILC 24-512 fan is a 15.5 in (394 mm) diameter, single speed, direct drive, in-line centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Caldwell Model ILC 24-512 is equipped with a wire mesh guard grill, an inlet bell, duct mounting flange and a motor control. The aluminium impeller consists of a hub backplate, 9 backward curved blades and a flange. The impeller is directly mounted on the 5 hp (3730 W) single phase, 230 V electric motor. The fan housing, motor mounts, straightening vanes, inlet bell, flanges and mounting legs are of steel construction with an enamel finish for corrosion protection. The motor control enclosure is made of galvalume material.

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

## SCOPE OF TEST

The Caldwell Model ILC 24-512 was tested in the outlet chamber setup (Figure 2) in accordance with test procedures developed by the Machinery Institute. The intent was to determine the performance of the fan in terms of air flow rate, static pressure, input power and total efficiency.

Fan performance was determined at 230V. The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

## RESULTS AND DISCUSSION

### FAN PERFORMANCE

All fan performance results in this report are given at standard

air<sup>1</sup> 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.

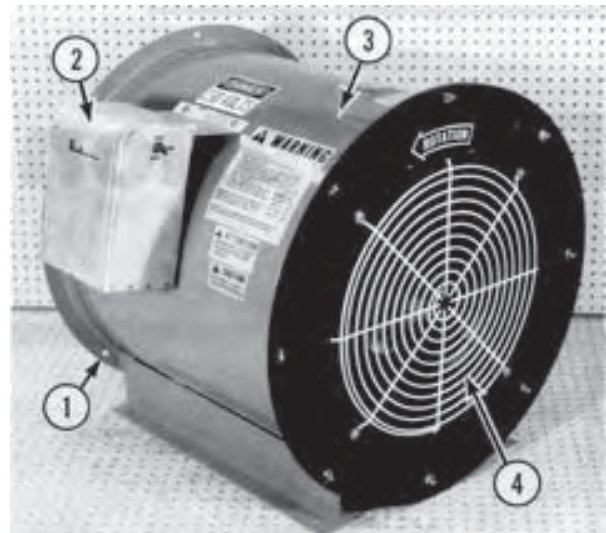


FIGURE 1. Caldwell Model ILC 24-512 Fan: (1) Mounting Flange, (2) Motor Control, (3) Fan Housing, (4) Guard Grill and Inlet Bell.

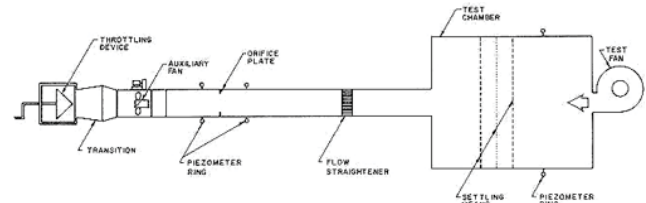


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

**Air Flow Rate:** Fan output at typical levels of operation (i.e. static pressure<sup>2</sup>) are given in TABLE 1. The air flow rate ranged from 512 cfm (241 L/s) at 8 in wg (1990 Pa) to 5830 cfm (2750 L/s) at 0.5 in wg (125 Pa). FIGURE 3 illustrates the fan performance curves for the Caldwell model ILC 24-512 fan and a comparison to the manufacturer's rated performance. The manufacturer's literature provided fan performance information over a range of static pressures from 0 to 8.4 in wg (0 to 2090 Pa). The difference in output depended upon the level of operation. For example, PAMI's measured air flow rate at peak efficiency of 47% was 3750 cfm (1770 L/s) at a static pressure of 6.25 in wg (1560 Pa). This was 3% lower than the manufacturer's rated output of 3880 cfm (1830 L/s) at a static pressure of 6.25 in wg (1560 Pa).

**Power Consumption:** The power consumption is the amount of energy (kWh) used by the fan motor. The power consumed by the fan depended upon the point of operation of the fan. The power consumption varied from 3.11 kWh at maximum static pressure and minimum air flow rate to 5.90 kWh at 6 in wg (1490 Pa) static pressure and an air flow rate of 3920 cfm (1850 L/s). The maximum amperage drawn by the motor was 27.4 amps, which was less than the rated motor amperage of 32 amps.

**Total Efficiency:** Total efficiency is the ratio of air horsepower over the input power. Air horsepower is dependent upon the air flow rate and corresponding total pressure. For typical levels of operation, the total efficiency (TABLE 1) ranged from 14 to 47%. The maximum total efficiency of 47% occurred at 3750 cfm (1770 L/s) at a static pressure of 6.25 in wg (1560 Pa).

## EASE OF OPERATION

**Maintenance:** Seasonal inspection of the switch control box, motor mounts, impeller and fan motor was required. Seasonal

<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 between the pressure inside the building and the pressure on the outside of the building. Static pressure is usually expressed in inches of water gauge (in wg) or Pascals (Pa).

lubrication of the motor was required. During the off season, operation of the fan for 30 minutes every three weeks was required to ensure bearing lubrication.

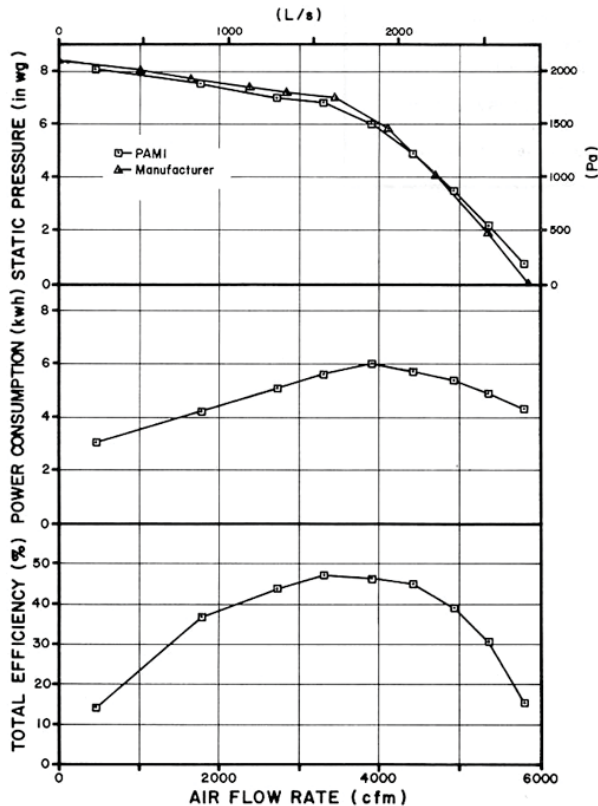


FIGURE 3. Caldwell Model ILC 24-512 Fan Performance Curves.

### 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 Caldwell ILC 24-512 was CSA approved.

The noise level of the Caldwell ILC 24-512, at a distance of 4.9 ft (1.5 m) from the centre of the fan inlet, while operating at a 1 in wg (249 Pa) static pressure, was 87 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Caldwell ILC 24-512 falls within range 4 of the PAMI noise level range classification (APPENDIX II).

The noise level produced could damage hearing, depending on exposure time. Ear protection is definitely recommended.

### OPERATOR'S MANUAL

The operator's manual was very informative and contained detailed illustrations and information on operation, specifications, installations, wiring, maintenance, safety, performance, service and trouble shooting.

### APPENDIX I SPECIFICATIONS

**MAKE:** Caldwell  
**MODEL:** ILC 24-512  
**SERIAL NUMBER:** 84H197  
**MANUFACTURER:** Caldwell Manufacturing Company  
 P. O. Box 336  
 Kearney, Nebraska 68847-0336

#### OVERALL DIMENSIONS:

- housing width 30 in (762 mm)
- housing depth 25 in (635 mm)
- housing height 27.25 in (692 mm)
- inlet bell diameter 9.25 in (235 mm)
- guard grill diameter 17.5 in (445 mm)
- grill opening 0.125 in (3 mm) diameter, spaced at 0.75 in (19 mm) in a spiral pattern discharge opening 24.25 in (616 mm)

#### IMPELLERS:

- diameter 15.5 in (394 mm)
- inside flange diameter 10.6 in (270 mm)
- number of blades 9
- blade angle 86 degrees

#### WEIGHT:

219 lb (99.5 kg)

#### MOTOR NAMEPLATE DATA:

- make Baldor
- model 36053W571
- frame 184Z
- class F
- code H
- design L
- duty continuous
- rpm 3450 rpm
- service factor 1
- ambient temperature rise 40°C
- volts 230 V
- amps 32 A
- phase 1
- cycles 60 Hz
- horsepower 5 hp (3730 W)

### 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.

### SUMMARY CHART CALDWELL MODEL ILC 24-512 IN-LINE CENTRIFUGAL FAN

**RETAIL PRICE:** \$1425.00 (February, 1985, f.o.b. Lethbridge)  
**FAN DESCRIPTION:** 15.5 in (394 mm) single speed, direct drive, 5 hp (3730 W) electric motor.  
**FAN SPEED:** 3467 to 3538 rpm  
**MAXIMUM EFFICIENCY:** 47%  
**AIR FLOW RATE:**  
 -range 512 to 5830 cfm (241 to 2750 L/s)  
 -at maximum efficiency 3750 cfm (1750 L/s) at a 6.25 in wg (1560 Pa) static pressure  
**POWER CONSUMPTION:** 3.11 to 5.90 kWh  
**OPERATOR SAFETY:** guard grill provided CSA approved Noise level: 87 dB(A) at 4.9 ft (1.5 m) from fan inlet  
**OPERATOR'S MANUAL:** complete and very informative



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