Bulletin EC-1
April 2014
Supersedes EC-1
Dated September 2013

EC SERIES
EVAPORATIVE COOLER

ETL Label Available

Cooling Sections for Heating, Ventilating and Make-up Air Units

SIGNIFICANT AMOUNT OF COOLING

LOW ENERGY CONSUMPTION

MATCHING TRANSITIONS TO HASTINGS HEATING, VENTILATING AND MAKE-UP AIR UNITS

10 STANDARD SIZES UP TO 75,000 CFM

FEATURES

Unique Crossfluted 12” Evaporative Media

- **High Capacities**
- **Higher Velocities**
- **Self-cleaning**
- **Long Life**

Distribution Header - Water Splash Tube

Cabinet – Aluminized Steel and Painted

Evaporator Reservoir – Stainless Steel

Factory Packaged and Piped with Pump and Water Controls

What is Evaporative Cooling

Since ancient times, evaporative cooling has been used as an inexpensive and simple method of providing cooler air temperatures. Heat is absorbed whenever water is evaporated and converted to water vapor. Evaporative cooling is essentially adiabatic, following a constant wet bulb line, with no change in total heat. By passing air through or around a wetted surface, sensible heat is removed from the surrounding air in the vaporization of the water. In turn, the added water vapor increases the latent heat and relative humidity, but retains total heat at a constant value. In contrast to compressing a refrigerant, evaporative cooling requires no mechanical work or energy and operates at considerably less cost than cooling by refrigeration.

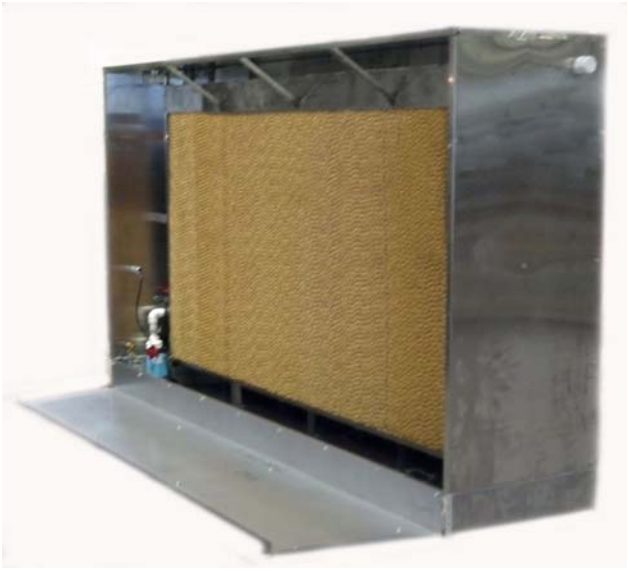
Hastings Evaporative Cooler

Hastings evaporative air coolers provide fresh air which is continuously drawn through special wetted 12" evaporative media. The unique crossfluted design of the media induces highly turbulent mixing of air and water for optimum heat and moisture transfer. Water flows through the length of the distribution heater, is jetted up through small holes spaced along the pipe, impinged on the larger cover pipe and transmitted to the media as a fine water curtain. The media is designed so that water is constantly directed to the air entry side. This results in cooling efficiencies up to 90%. It also allows greater face velocities without water carryover.

Two basic media are available on all EC Series coolers. The standard media is made from a special cellulose paper, impregnated with insoluble anti-rot salts and rigidifying saturants. Optional media made from large glass fibers bound together by inorganic, noncrystalline fillers and UL approved with a UL 900, Class 2 rating can be furnished. Both types of media have the unique crossfluted design.

Evaporative Cooling Considerations

As the total heat – Btuh content – of the air in the conditioned space remains constant during the evaporative cooling process, any decrease in sensible heat is countered by an increase in latent heat. In general, the use of evaporative cooling for conventional air conditioning is limited to locations with summer design wet bulb temperature of 70 degrees or less. However, evaporative cooling can be applied effectively in industrial and commercial applications with higher wet bulb design temperatures.



HASTINGS EVAPORATIVE COOLER SECTION
Air Discharge View

HASTINGS EVAPORATIVE COOLER SECTION
Air Intake View

The primary indicator of the potential effectiveness of evaporative cooling is the wet bulb depression during the peak hours. Normally evaporative cooling will be practical with a web bulb depression (entering dry bulb temperature minus entering wet bulb temperature) of 20 degrees or more. While cooling can be effected with smaller wet bulb depressions, a greater number of air changes are required as well as other application considerations.

Evaporative Cooling Applications

1. Comfort Applications

Evaporative coolers are used extensively for comfort air conditioning, rather than mechanical refrigeration in areas with relatively dry climate conditions. A large part of western United States falls in this category. In locations having a summer design wet bulb temperature of 70 degrees or less, evaporative coolers can be used for most comfort cooling applications.

2. Relief Applications

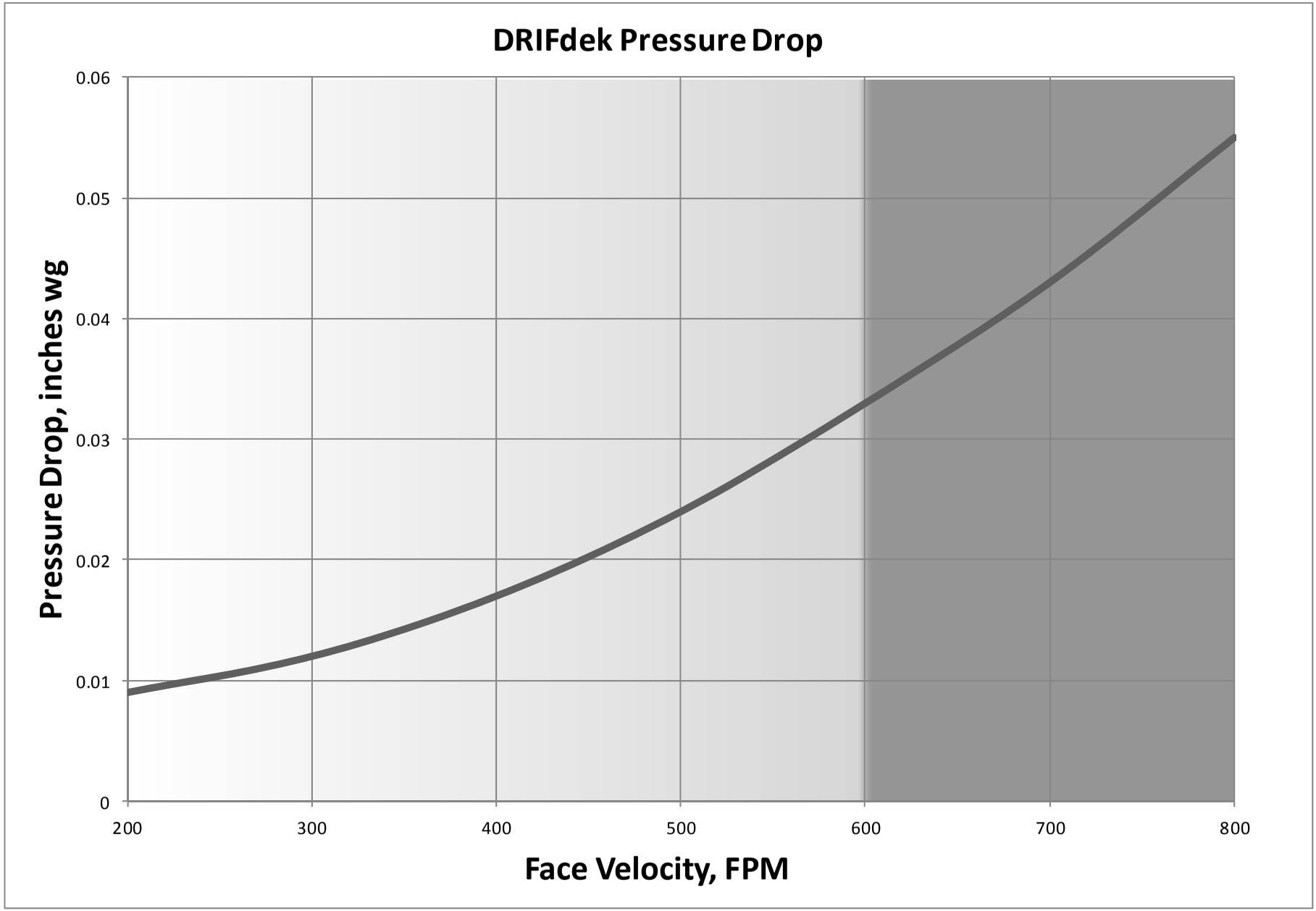
Relief cooling with evaporative coolers can be effectively accomplished for industrial and hot, humid commercial environments with practically no limitations as to design wet bulb temperatures. Many commercial and industrial applications feature high internal sensible and latent loads, often accompanied by large make-up air requirements. In most of these installations, it is not economically feasible to cool with mechanical refrigeration. As evaporative coolers have both low first cost and low operating cost and in turn require 100 percent outside air, they can be used most successfully to provide relief cooling for these applications.

Relief or comfort cooling using evaporative coolers is accomplished in two ways. First by lowering the dry bulb temperature of the air and secondly, by the movement of air over individuals. Generally comfort cooling for hot industrial applications is achieved by either space cooling or spot cooling. Air quantities vary dependent upon wet bulb depression and the internal heat source. In addition to industrial comfort cooling and industrial process cooling, evaporative coolers provide relief in such applications as laundries and restaurant kitchens. They have also proven practical for greenhouse as well as animal barn and poultry house cooling.

EVAPORATIVE COOLER SELECTION TABLE

MODEL NO.	ITEM	OPERATING DATA										
EC-40	CFM	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
	VEL. (FPM)	250	292	333	375	417	458	500	542	583	625	667
	EFF.	.92	.91	.90	.90	.89	.89	.89	.88	.88	.87	.87
	AIR PD (IN)	.06	.08	.10	.12	.15	.18	.21	.25	.29	.32	.36
EC-80	CFM	4000	4250	4500	4750	5000	5500	6000	6500	7000	7500	8000
	VEL. (FPM)	333	354	375	396	417	458	500	542	583	625	667
	EFF.	.90	.90	.90	.90	.89	.89	.89	.88	.88	.87	.87
	AIR PD (IN)	.10	.11	.12	.14	.15	.18	.21	.25	.29	.32	.36
EC-120	CFM	8000	8250	8500	8750	9000	9500	10000	10500	11000	11500	12000
	VEL. (FPM)	444	458	472	486	500	528	556	583	611	639	667
	EFF.	.89	.89	.89	.89	.89	.88	.88	.88	.87	.87	.87
	AIR PD (IN)	.17	.18	.14	.20	.21	.23	.26	.29	.31	.34	.36
EC-160	CFM	12000	12250	12500	12750	13000	13500	14000	14500	15000	15500	16000
	VEL. (FPM)	500	510	521	531	542	562	583	604	625	646	667
	EFF.	.89	.88	.88	.88	.88	.88	.88	.87	.87	.87	.87
	AIR PD (IN)	.21	.22	.23	.24	.25	.27	.29	.30	.32	.34	.36
EC-220	CFM	16000	16500	17000	17500	18000	18500	19000	19500	20000	21000	22000
	VEL. (FPM)	500	516	531	547	562	578	594	609	625	656	688
	EFF.	.89	.88	.88	.88	.88	.88	.88	.87	.87	.87	.87
	AIR PD (IN)	.21	.22	.24	.25	.27	.28	.30	.31	.32	.35	.38
EC-300	CFM	22000	22500	23000	23500	24000	25000	26000	27000	28000	29000	30000
	VEL. (FPM)	489	500	511	522	533	556	578	600	622	644	667
	EFF.	.89	.89	.88	.88	.88	.88	88	.88	.87	.87	.87
	AIR PD (IN)	.20	.21	.22	.23	.24	.26	.28	.30	.32	.34	.36
EC-400	CFM	30000	31000	32000	33000	34000	35000	36000	37000	38000	39000	40000
	VEL. (FPM)	500	517	533	550	567	583	600	617	633	650	667
	EFF.	.89	.88	.88	.88	.88	.88	.88	.87	.87	.87	.87
	AIR PD (IN)	.21	.22	.24	.25	.27	.29	.30	.31	.33	.35	.36
EC-500	CFM	40000	41000	42000	43000	44000	45000	46000	47000	48000	49000	50000
	VEL. (FPM)	571	586	600	614	629	643	657	671	686	700	714
	EFF.	.88	.88	.88	.87	.87	.87	.87	.87	.87	.87	.87
	AIR PD (IN)	.27	.29	.30	.31	.33	.34	.35	.37	.38	.40	.41
EC-600	CFM	50000	51000	52000	53000	54000	55000	56000	57000	58000	59000	60000
	VEL. (FPM)	595	607	619	631	643	655	667	679	690	702	714
	EFF.	.88	.87	.87	.87	.87	.87	.87	.87	.87	.87	.87
	AIR PD (IN)	.30	.31	.32	.33	.34	.35	.36	.38	.39	.40	.41
EC-750	CFM	60000	62000	64000	66000	68000	70000	71000	72000	73000	74000	75000
	VEL. (FPM)	556	574	593	611	630	648	657	667	676	685	694
	EFF.	.88	.88	.88	.87	.87	.87	.87	.87	.87	.87	.87
	AIR PD (IN)	.26	.28	.30	.31	.33	.34	.35	.36	.37	.38	.39

Drift Elimator in shaded areas recommended—see page 3.


DRIFdek Pressure Drop
Pressure Drop, inches wg
0.06
0.05
0.04
0.03
0.02
0.01
0
200
300
400
500
600
700
800
Face Velocity, FPM

EVAPORATIVE COOLER PERFORMANCE DATA

Discharge Air Temperature

Hastings evaporative coolers reduce the dry bulb temperature of the intake or outside air from 87 to 92 percent of the wet bulb depression. The percentage is shown as efficiency in the selection table on page 3. As evaporative cooling is essentially adiabatic with no change in total heat, the wet bulb temperature will remain constant through the cooling process. Discharge dry bulb temperature can be determined by applying FORMULA A.

Discharge Air Quantity

A practical method of determining the required evaporative cooler air supply is the employment of air change calculations as shown in FORMULA B. Excessive interior heat loads and humid conditions having low design web bulb depressions will require more air changes and, in turn, a larger air quantity. It is important that evaporative coolers not be undersized. Also room air should not be circulated through the evaporator and all air from the evaporative cooler must be exhausted.

FORMULA A

Evaporative cooler leaving air dry bulb can be calculated from formula:

$$T2 = T1 - (T1 - T3)(E)$$

Where: T2 = Leaving dry bulb

T1 = Entering Dry bulb } Wet Bulb Depression

T3 = Entering wet bulb } Wet Bulb Depression

E = Efficiency

FORMULA B

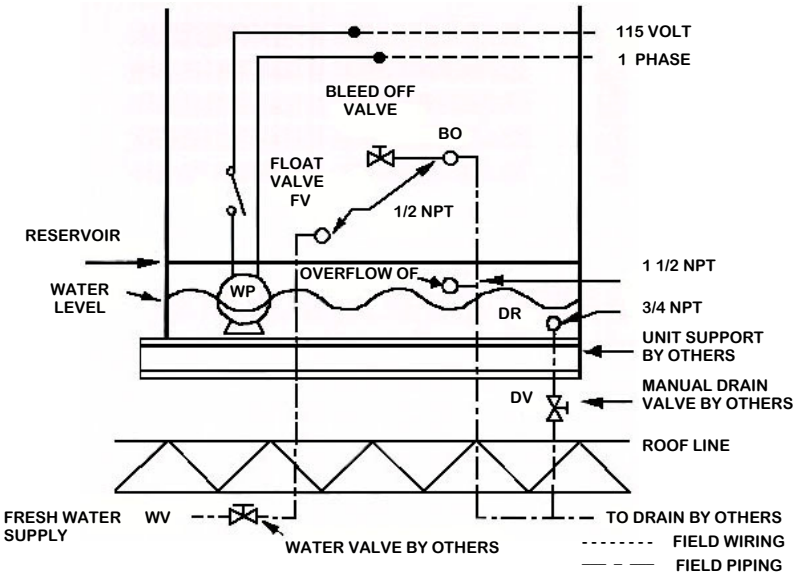
Evaporative cooler size for summer operation can be determined from CFM required by a two step process:

(1) Minutes per air change $= \frac{\text{Design dry bulb} - \text{Design wet bulb}}{10}$

(2) CFM required $= \frac{\text{Building volume in cubic feet}}{\text{Minutes per air change}}$

Increase CFM up to 50% for heavy loads or humid area

WATER PIPING AND CONTROLS



STANDARD UNIT

1. MANUAL SHUT OFF VALVE (WV) IS OPENED.
2. MANUAL DRAIN VALVE (DV) IS CLOSED.
3. FLOAT VALVE (FV) ALLOWS FRESH WATER TO ENTER RESERVOIR.
4. WATER PUMP (WP) WILL START AS SOON AS FLOAT SWITCH (FL) CLOSES. IF WATER IS TOO LOW PUMP WON'T RUN, WATER PUMP (WP) SHOULD BE WIRED SO THAT PUMP CANNOT RUN WITHOUT BLOWER MOTOR IN OPERATION.
5. BLEED-OFF (BO) TO PREVENT SCALE FORMATION, A BLEED-OFF AT THE RATE OF 3-6% IS REQUIRED. THE EXACT AMOUNT WILL DEPEND ON THE pH AND HARDNESS OF THE WATER, AND THE INTENSITY OF EVAPORATION.
6. UNIT CAN BE USED WITH BLOWER ON AND EVAPORATIVE COOLER PUMP OFF.

OPTIONAL AUTOMATIC DRAIN VALVE KIT

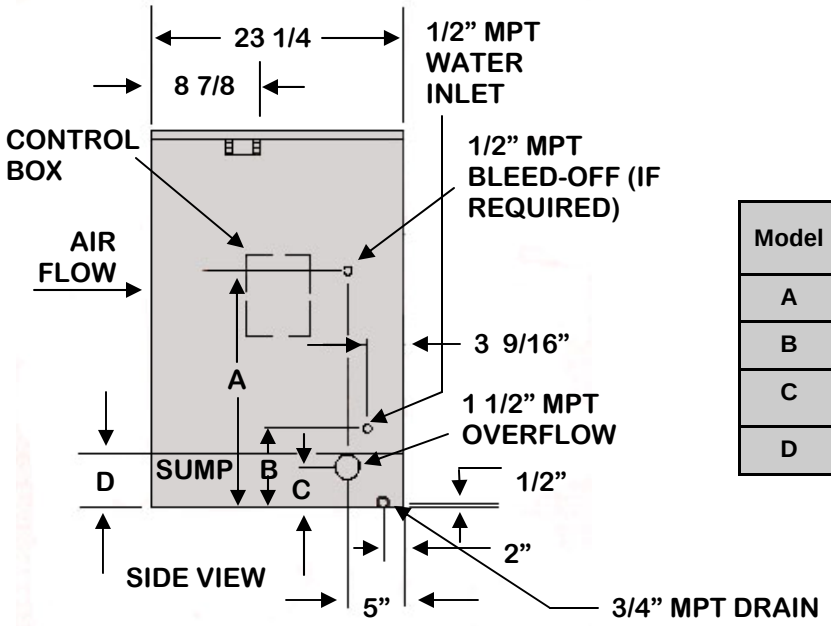
Adds water conservation solenoid valve, solenoid drain valve and adjustable 24 hour timer. Replaces constant bleed-off system to provide periodic sediment and hard water deposit removal.

OPTIONAL AUTOMATIC DRAIN VALVE PLUS FREEZE PROTECTION KIT

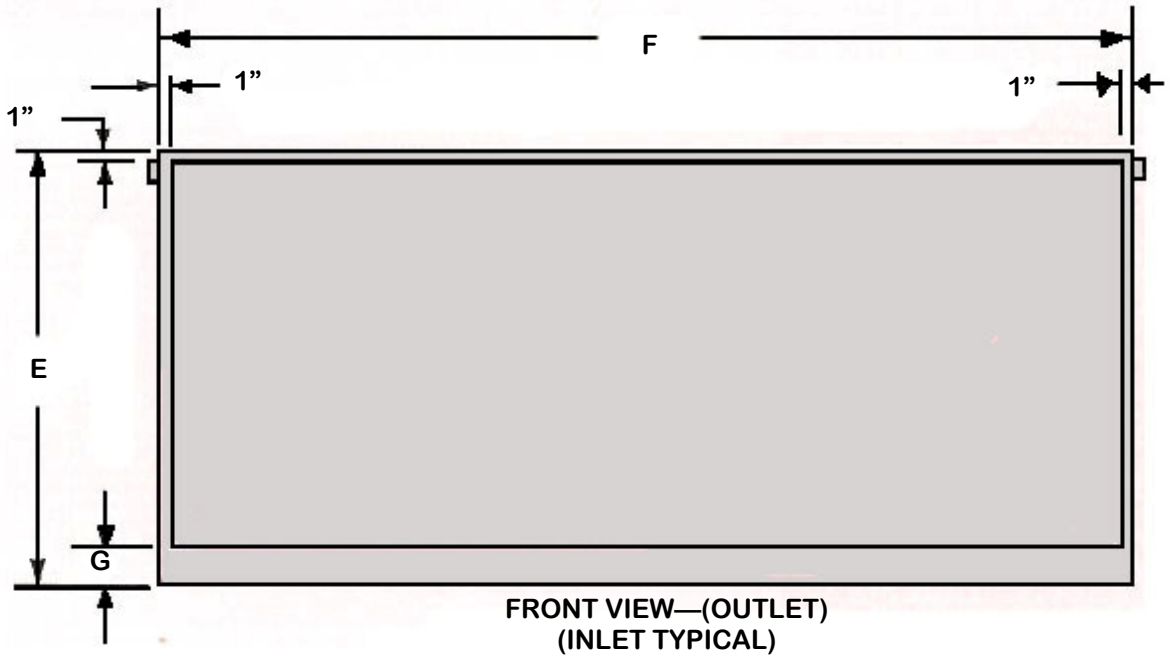
Adds motorized drain valve adjustable 24 hour timer, outdoor freeze protection thermostat and indoor solenoid 3-way fill valve. Replaces constant bleed-off system and maintains an empty reservoir during freezing weather preventing ice expansion damage to water system and pump.

DIMENSIONS

Evaporative Cooler Section



Model	EC-40 THRU 220	EC-300 THRU 750
A	22 1/2	23 1/2
B	8	9
C	4 3/8	5 3/8
D	5 1/2	6 1/2

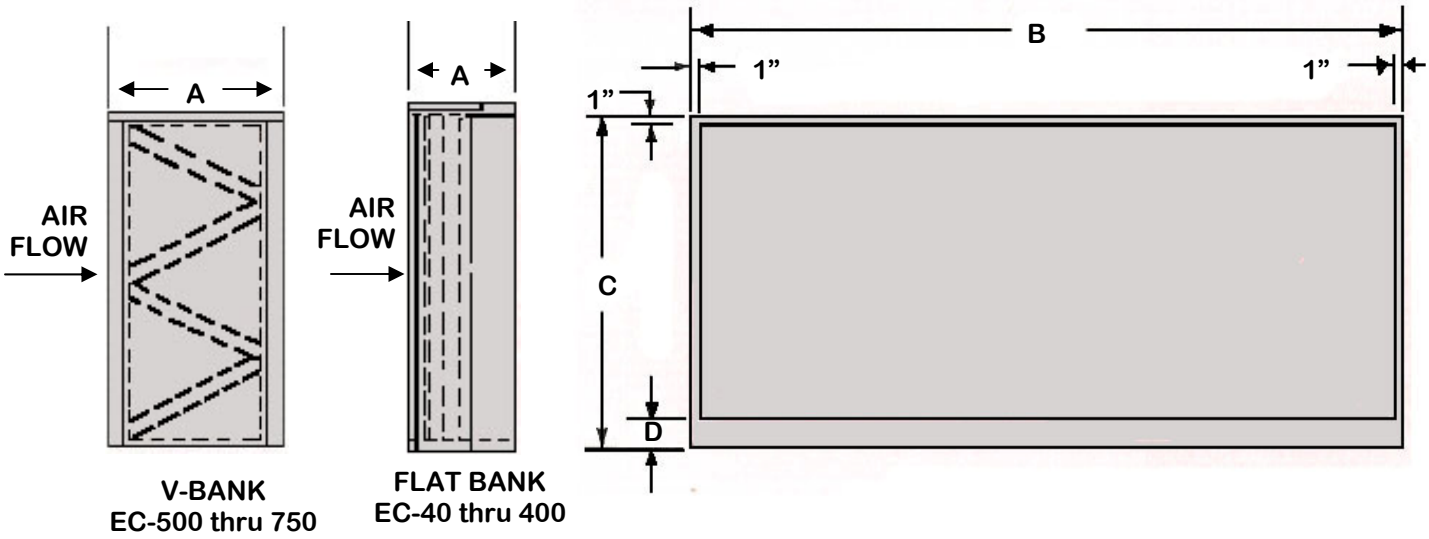


Model	EC-40	EC-80	EC-120	EC-160	EC-220	EC-300	* EC-400	* EC-500	* EC-600	* EC-750
E	36	48	48	48	60	73	73	73	85	85
F	45	57	81	105	105	117	162	186	186	234
G	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2

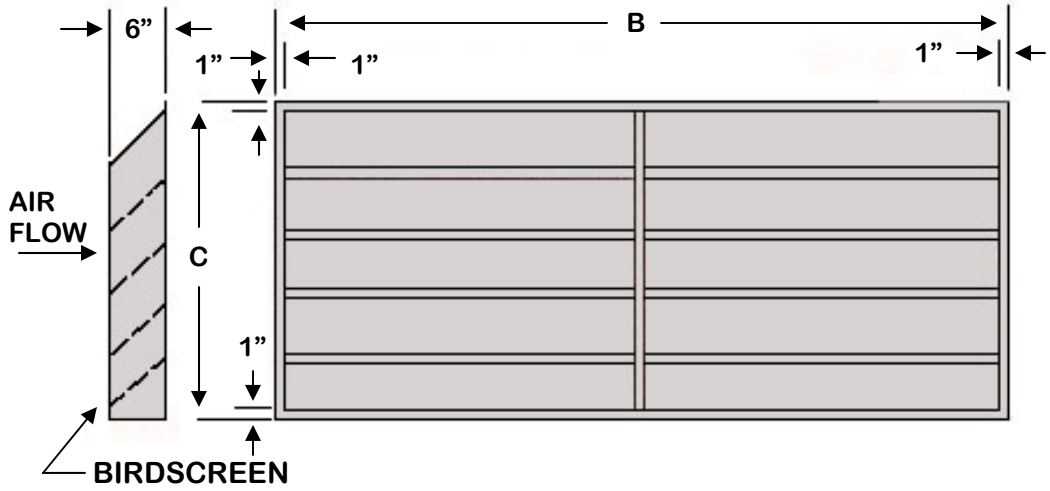
* Two smaller cabinets bolted together.
All dimensions in inches.

DIMENSIONS

Pre-Filter Section



Inlet Louver and Screen



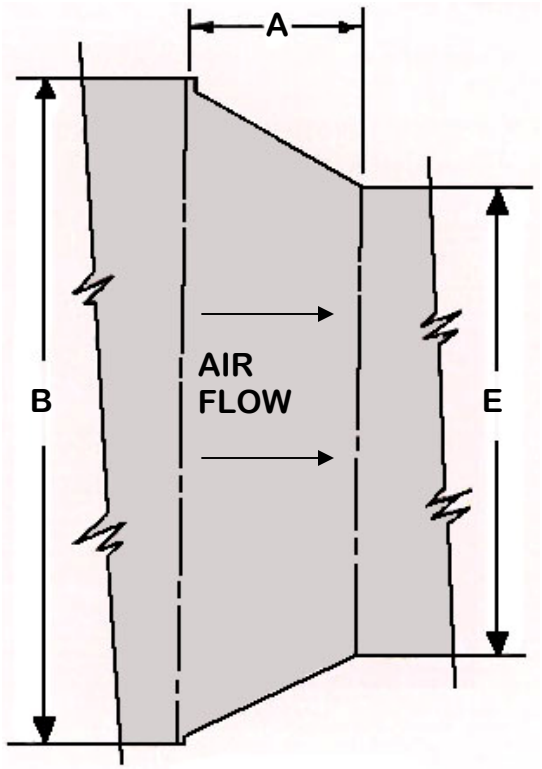
Model	EC-40	EC-80	EC-120	EC-160	EC-220	EC-300	* EC-400	* EC-500	* EC-600	* EC-750
A	12	12	12	12	12	12	12	19 1/4	20 3/4	20 3/4
B	45	57	81	105	105	117	162	186	186	234
C	36	48	48	48	60	73	73	73	85	85
D	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2
Filters	4)16 x 20 x 2	1)16 x 25 x 2 1)16 x 20 x 2 2)20 x 25 x 2 2)20 x 20 x 2	4)20 x 25 x 2 4)20 x 20 x 2	5)20 x 25 x 2 5)20 x 20 x 2	15)20 x 20 x 2	2)16 x 25 x 2 1)16 x 20 x 2 10)20 x 25 x 2 5)20 x 20 x 2	16)20 x 25 x 2 8)20 x 20 x 2	24)20 x 25 x 2 8)16 x 20 x 2	30)20 x 25 x 2 10)16 x 20 x 2	40)20 x 25 x 2 10)16 x 20 x 2

*Two smaller cabinets bolted together (access both end).
All dimensions in inches.

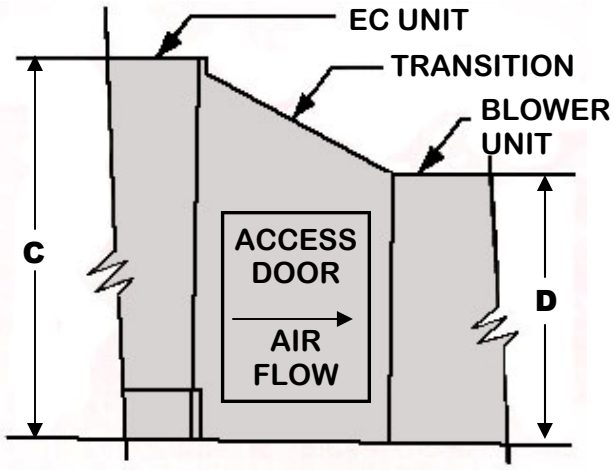
DIMENSIONS

Model	Blower Size*	Dimensions in Inches				
		A	B	C	D	E
EC-40	SB-112	20	45	36	26 1/2	33
	SB-115	20	45	36	35	40
	LU-112	20	45	36	25 3/8	30 1/4
	MB-112	20	45	36	36 1/4	28 3/4
	MB-114A	20	45	36	36 1/4	39 1/2
	MB-114B	20	45	36	36 1/4	50 1/4
	MB-214	20	45	36	36 1/4	63 3/4
EC-80	SB-115	20	57	48	35	40
	SB-215	20	57	48	35	75 1/8
	LU-115	30	57	48	25 3/8	30 1/4
	LU-215	31 1/8	57	48	25 3/8	60
	MB-114A	20	57	48	36 1/4	39 1/2
	MB-114B	20	57	48	36 1/4	50 1/4
	MB-214	20	57	48	36 1/4	63 3/4
	MB-218	24	57	48	41	129
EC-120	SB-215	20	81	48	35	75 1/8
	SB-218	20	81	48	39	79 1/8
	LU-215	31 1/8	81	48	25 3/8	60
	MB-218	26	81	48	41	129
EC-160	SB-215	20	105	48	35	75 1/8
	SB-218	20	105	48	39	79 1/8
	LU-218	30	105	48	31 1/4	68 1/8
	MB-218	24	105	48	41	129
EC-220	SB-218	20	105	60	39	79 1/8
	SB-222	20	105	60	49	96 5/8
	LU-218	48	105	60	31 1/4	68 1/8
	MB-218	32	105	60	41	129
EC-300	SB-222	36 1/8	117	73	49	96 5/8
	SB-227	20	117	73	58	114 3/8
	MB-218	65	117	73	41	129
EC-400	SB-222	39 3/4	162	73	49	96 5/8
	SB-227	48 1/4	162	73	58	114 3/8
EC-500	SB-227	39 3/4	186	73	58	114 3/8
	SB-233	44 7/8	186	73	67	141
EC-600	SB-227	39 3/4	186	85	58	114 3/8
	SB-233	44 7/8	186	85	67	141
EC-750	SB-233	39 3/4	234	85	67	141

Evaporative Cooler Transitions



PLAIN VIEW (Typical)



SIDE VIEW (Typical)

***Other configurations available**

SPECIFICATIONS											
Model		**EC-40**	**EC-80**	**EC-120**	**EC-160**	**EC-220**	**EC-300**	**EC-400**	**EC-500**	**EC-600**	**EC-750**
Evaporating Area – Sq. Ft.		6	12	18	24	32	45	60	70	84	108
Pump Motor	**Number**	1	1	1	1	1	1	2	2	2	2
	HP	1/50	1/6	1/6	1/6	1/6	1/6	(2) 1/6	(2) 1/6	(2) 1/6	(2) 1/6
	Amps	1.1	5.0	5.0	5.0	5.0	5.0	5.0 (ea.)	5.0 (ea.)	5.0 (ea.)	5.0 (ea.)
	Voltage	115 Volts – 1 Phase – 60 Hertz									
Construction	**Reservoir**	Stainless Steel									
	Cabinet	Aluminized steel – exterior painted									
Evaporative Media		12” Celdek									
Water System		Schedule 40 PVC Pipe									
Shipping Weight – lbs.		110	176	225	271	310	373	634	726	845	1067
Operating Weight – lbs.		335	560	650	825	880	1135	1680	1930	2085	2635

Standard Equipment Engineers Specifications

Furnish and install the following Hastings evaporative cooling section:

Model Number	**CFM**	**115/60/1 Pump Voltage**

The evaporative cooler shall have 12” Celdek evaporative media, submersible water pump, schedule 40 P.V.C. water distribution system with splash tube spray over media, cast brass float type fill valve and manual bleed-off valve for constant sediment drainage. Cabinet to be constructed of 18 gauge aluminized steel with painted exterior. Reservoir to be 20 gauge stainless steel.

Options and Accessories

- Automatic drain valve kit.
- Automatic drain valve plus freeze protection kit.
- Insulated transitions to Hastings blower sections.
- 12” Glasdek media UL approved, UL900, Class 2 rating.
- Drift Eliminator. – Recommended at 600 FPM to 699 FPM. – Required above 700 FPM
- Flatbank or V-bank pre-filter section.
- 2” cleanable or extended surface filters.
- Intake louver with birdscreen.
- Step down transformer for either 208 Volt 3 Ph. Or 230/460 V. 3 Ph.
- Matching base rail for use with Hastings blower section.
- U.L. Label Panel

In order to maintain our policy of continuous product improvement, we reserve the right to change prices, specifications, ratings or dimensions without notice or obligation.

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