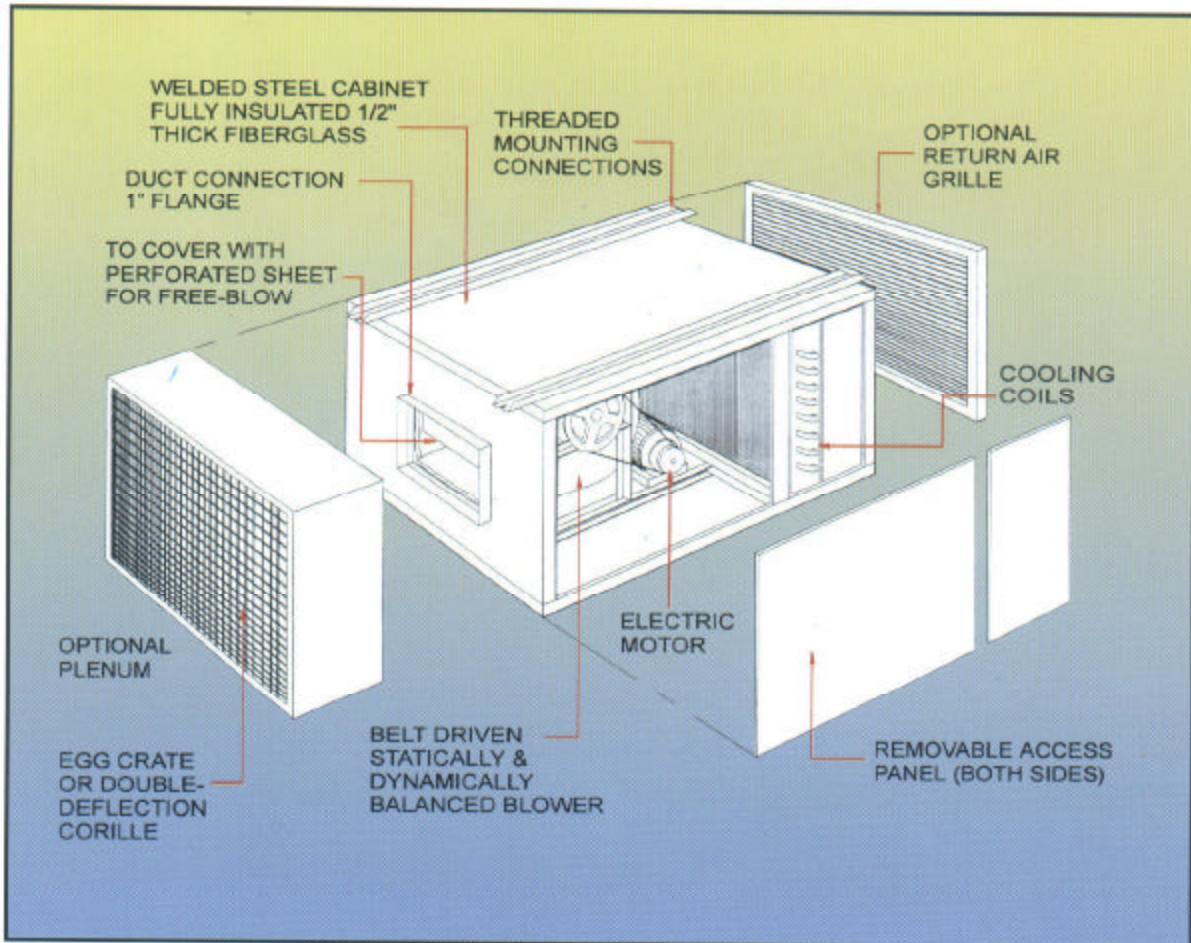# 'CC' COMFORT CONDITIONERS

800 CFM THRU 4000 CFM

DUNHAM-BUSH ®

Products That Perform...By People Who Care

INTRODUCTION

Dunham-Bush, known throughout the industry for reliability and performance offers its line of 'CC' ducted belt driven comfort air conditioners. It features compact, attractive, easy accessible design and other advantages which assure you of a model to best suit your demand. It can be designed for both concealed and exposed ceiling hung installation. Six models (2 to 12 tons of cooling) are designed to deliver 800 to 4000 cfm to satisfy various cooling requirement with a total static pressure capability of up to 2"wg. Multiple units may be used for larger requirements. Every aspect of construction is under close supervision by experience quality control personnel to ensure high performance and reliable finished products.

WELDED STEEL CABINET FULLY INSULATED 1/2" THICK FIBERGLASS

THREADED MOUNTING CONNECTIONS

OPTIONAL RETURN AIR GRILLE

DUCT CONNECTION 1" FLANGE

TO COVER WITH PERFORATED SHEET FOR FREE-BLOW

COOLING COILS

OPTIONAL PLENUM

ELECTRIC MOTOR

EGG CRATE OR DOUBLE-DEFLECTION CORILLE

BELT DRIVEN STATICALLY & DYNAMICALLY BALANCED BLOWER

REMOVABLE ACCESS PANEL (BOTH SIDES)

FEATURES

CASING

All steel parts are coated with epoxy-acrylic electro-deposition(ED) paint which gives excellent finishing, weatherability and salt-spray test of minimum 840 hours. Before ED coating, the part undergoes a complete pretreatment process which involves degreasing, phosphating and rinsing with deionized water. It increases the paint adhesion effect and rust preventing effect to obtain high quality paint film. ED painting is the best painting system which even can coat the inaccessible places of part like the edges, joints or interior surface of hollow sections. All panels are insulated with 1/2" thick 1 1/2 lb density mat faced linacoustic fiberglass.

COILS

Available for chilled water and DX applications. Each coil consists of staggered rows of 1/2" O.D. seamless copper tubes, mechanically expanded into die-formed aluminium fins spaced 12 fins per inch. Fins are of corrugated design to improve heat transfer. Standard chilled water coils are of 3, 4 and 6 rows design. Standard DX coils are of 4 rows design. All coils are tested under water with 350 psig air pressure. Coils are furnished with a vent and drain connection. Every coil is computer optimised selected to ensure best selection to reduce operating cost and ensure low first cost.

BLOWER ASSEMBLY

Blower wheels are of forward curved double inlet design and are constructed of zinc coated steel. As the blower wheels are statically and dynamically balanced in accordance with AMCA standard prior to and after assembly. They will assure quiet, smooth performance well below the first critical speed at all design conditions. The wheel shafts are made from solid steel and are ground and polished to close tolerances. Bearings are of self aligning, regreaseable ball type and selected for minimum 100,000 operating hours. The adjusted motor pulley on the belt drive system allows air flow and static pressure to be balanced to best suit actual site conditions.

DRAIN PAN

The drain pan is constructed of heavy gauge metal and is internally painted with mastic and externally insulated with minimum 7 mm thick fire-retardant polyurethane foam. As the condensate is prevented to be in contact with the metal the possibility of corrosion is minimised. The unit is designed, when mounted level, to assist condensate draining by having a positive pitch. This in conjunction with an adequately sized drain connection assures rapid condensate runoff.

MOTOR AND DRIVE PACKAGE

3 phase TEFC motors are standard. The motor mounting bracket can be adjusted to ensure proper belt tension and alignment. V-belt and pulleys can be selected to suit various static pressure and cfm required. 1-phase direct driven blowers can be provided upon request.

FILTERS

Standard flat filters are 1" washable type. The filter media is constructed of 75% arrestance efficiency synthetic fiber.

OPTIONS

RETURN AIR GRILLE

Available for applications where the unit is located in exposed areas, the return air grille completely covers the filter compartment. It is designed for minimum return air noise and static pressure losses.

SUPPLY AIR PLENUM

An attractive supply air plenum can be supplied for free blow application. The blade is adjustable to evenly distribute discharge air.

SAMPLE UNIT SELECTION

FORMULAE AND DEFINITIONS

1. LDB = LWB + [(EDB-EWB) x DR]

2. Sensible Heat = 1.08 x SCFM x ✶T

3. Total Heat = 4.5 x SCFM x ✶H

Where:

EDB	=	Entering dry bulb °F
EWB	=	Entering wet bulb °F
DR	=	Depression ratio
LDB	=	Leaving dry bulb °F
LWB	=	Leaving wet bulb °F
SCFM	=	Cubic feet per minute of standard air
✶T	=	EDB minus LDB
✶H	=	Entering air enthalpy minus leaving air enthalpy

EXAMPLE: CHILLED WATER COIL

Required: 1080 SCFM

84 °F dry bulb

71 °F wet bulb

42 °F entering water temp.

8.0 GPM

58,000 Btuh total capacity

26,000 Btuh sensible capacity

A.) Select a unit with a CFM which is close to the required CFM. A model CC1200 has a nominal CFM of 1200.

B.) To determine the actual unit total capacity, from table 1 select a six (6) row cooling coil as its total capacity is closest to the required total capacity. Through interpolation determine the total capacity for 8 GPM.

Total capacity = 47,000 btuh @ 8 GPM and nominal CFM.

Find the SCFM percentage of nominal CFM

SCFM/Nom.CFM = 1080/1200 = 90%

Enter table 2 under total factor for a 6 row chilled water coil at 90%, read a correction factor of 0.96. Enter table 3 at entering air wet bulb temperature of 71°F and entering water temperature of 42 °F.

Read a correction factor of 1.35.

Actual total capacity = 47,000 Btuh x 0.96 x 1.35

Actual total capacity = 60,900 Btuh

C.) Determine the leaving wet bulb temperature by using formula 3 and the psychometric chart.

Total Heat = 4.5 x SCFM x ✶H

60,900 = 4.5 x 1080 x ✶H

✶H = 12.53

The psychometric chart at 84 °F EDB and 71 °F EWB indicates an entering enthalpy of 35.00. This enthalpy minus the change in enthalpy will provide the leaving enthalpy. 35.00 - 12.53 = 22.47

The psychometric chart for this enthalpy indicates a leaving wet bulb temperature of 53.8 °F.

D.) To determine the leaving dry bulb temperature enter table 2 at the depression ratio for a six row water coil at 90% of nominal CFM. Correction factor is 0.04.

Use formula 1:

LDB = [(EDB-EWB) x DR] + LWB

LDB = [(84° - 71°) x 0.04] + 53.8

= 54.32°F

E.) To determine actual sensible heat, use formula 2.

Sensible Heat = 1.08 x SCFM x (EDB - LDB)

Sensible Heat = 1.08 x 1080 x (84 - 54.32) = 34.62 MBH

F.) To determine the water coil pressure drop, interpolate from table 1 will give 8.1 ft. of water gauge.

TABLE 1   COOLING COIL CAPACITY

CC MODEL	GPM	CHILLED WATER COIL									DX COIL	
		3 ROW COIL			4 ROW COIL			6 ROW COIL			4 ROW	
		WATER P.DROP (FT.WG)	TOTAL MBH	SENSIBLE MBH	WATER P.DROP (FT.WG)	TOTAL MBH	SENSIBLE MBH	WATER P.DROP (FT.WG)	TOTAL MBH	SENSIBLE MBH	TOTAL MBH	SENSIBLE MBH
800	6	13.31	23.1	17.0	7.99	27.0	19.3	3.99	30.9	21.9	30.4	19.8
	8	11.01	23.8	17.3	13.31	29.1	20.1	6.41	33.5	23.0		
1200	6	16.26	32.7	24.8	9.75	37.9	28.0	4.88	42.9	31.6	45.7	29.7
	9	16.17	35.3	25.8	19.94	42.6	29.8	9.75	49.0	34.0		
1600	10	11.72	44.8	33.5	14.45	54.0	38.7	7.05	61.7	43.9	59.3	38.7
	12	16.17	47.0	34.4	19.94	56.8	39.7	9.75	65.3	45.3		
2000	13	7.35	55.3	41.7	12.47	67.8	48.4	12.79	80.6	56.2	74.2	48.4
	16	10.67	58.3	42.8	18.06	71.8	49.9	18.56	85.6	58.3		
3000	18	9.61	83.2	62.6	16.62	101.5	72.6	17.15	120.5	84.2	109.2	71.6
	23	14.90	88.6	64.6	8.89	103.5	73.3	12.36	125.3	86.1		
4000	21	14.96	110.7	83.4	8.98	128.3	94.1	12.63	152.6	109.0	150.4	98.2
	27	10.80	114.3	84.7	14.04	138.0	97.8	19.76	166.6	114.7		

NOTES: 1. WATER COOLING COILS RATED AT 80/ 67°F ENTERING AIR, 45°F ENTERING WATER AT NOMINAL CFM.
2. DX COOLING COILS RATED AT 80/ 67°F ENTERING AIR, 40°F S.S.T. AT NOMINAL CFM, R-22.
3. FOR OTHER CONDITIONS CONTACT DUNHAM-BUSH FOR COMPUTER SELECTION.

TABLE 2   AIR VOLUME CAPACITY CORRECTION FACTORS

	COIL TYPE	PERCENT (%) NOMINAL CFM					
		70	80	90	100	110	120
TOTAL FACTOR	CHILLED WATER 3 ROW	0.90	0.94	0.97	1.00	1.03	1.05
	CHILLED WATER 4 ROW	0.89	0.93	0.97	1.00	1.03	1.06
	CHILLED WATER 6 ROW	0.88	0.92	0.96	1.00	1.04	1.07
	DX 4 ROW	0.90	0.94	0.97	1.00	1.03	1.05
DEPRESSION RATIO	CHILLED WATER 3 ROW	0.16	0.18	0.20	0.22	0.24	0.25
	CHILLED WATER 4 ROW	0.09	0.10	0.12	0.13	0.14	0.15
	CHILLED WATER 6 ROW	0.03	0.04	0.04	0.05	0.05	0.06
	DX 4 ROW	0.13	0.15	0.16	0.18	0.20	0.21

TABLE 3   TOTAL CAPACITY CORRECTION FACTORS

ENT'G W.B.(°F)	DX COIL						CHILLED WATER COIL						
	SATURATED SUCTION TEMPERATURE °F						ENTERING WATER TEMPERATURE °F						
	36	38	40	42	44	46	40	42	44	45	46	48	50
63	0.94	0.87	0.80	0.74	0.67	0.60	0.95	0.89	0.82	0.78	0.75	0.67	0.61
65	1.04	0.97	0.90	0.84	0.77	0.70	1.06	0.99	0.92	0.89	0.85	0.78	0.70
67	1.14	1.07	1.00	0.94	0.87	0.80	1.18	1.11	1.04	1.00	0.96	0.88	0.79
69	1.24	1.17	1.10	1.04	0.97	0.90	1.30	1.22	1.15	1.12	1.08	1.00	0.91
71	1.34	1.27	1.20	1.14	1.07	1.00	1.42	1.35	1.28	1.24	1.20	1.11	1.00

TABLE 4   APPROXIMATE SHIPPING WEIGHTS - LBS.*

| ROWS OF COIL	MODEL					
	CC 800	CC 1200	CC 1600	CC 2000	CC 3000	CC 4000
3	220	260	310	353	412	535
4	230	270	320	360	424	545
6	250	290	350	373	467	565

*Includes motor

TABLE 5:   BLOWER PERFORMANCE

AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) FOR 4-ROW COIL

RPM	CFM										FAN MODEL
	ESP	BHP	ESP	BHP	ESP	BHP	ESP	BHP	ESP	BHP	
CC 800											
	600		700		800		900		950		
1000	0.27	0.17	0.17	0.20	-	-	-	-	-	-	KAT 9/9
1100	0.43	0.23	0.33	0.24	0.23	0.28	0.13	0.31	-	-	
1200	0.62	0.28	0.51	0.31	0.40	0.34	0.29	0.38	0.23	0.39	
1300	0.83	0.35	0.70	0.38	0.60	0.40	0.48	0.44	0.41	0.47	
CC 1200											
	1000		1100		1200		1300		1400		
1000	0.30	0.28	0.31	0.32	0.27	0.35	0.19	0.39	0.11	0.42	KAT 9/9
1100	0.39	0.35	0.42	0.38	0.43	0.42	0.38	0.46	0.31	0.50	
1200	0.54	0.42	0.52	0.46	0.55	0.50	0.55	0.54	0.53	0.58	
1300	0.69	0.48	0.66	0.54	0.66	0.58	0.68	0.63	0.70	0.68	
CC 1600											
	1400		1500		1600		1700		1800		
900	0.41	0.39	0.38	0.43	0.34	0.47	0.27	0.50	0.21	0.54	KAT 10/10
1000	0.60	0.48	0.58	0.51	0.56	0.55	0.51	0.60	0.46	0.64	
1100	0.78	0.58	0.78	0.63	0.77	0.66	0.74	0.70	0.71	0.76	
1200	0.98	0.68	0.99	0.74	0.98	0.79	0.96	0.84	0.95	0.88	
CC 2000											
	1600		1800		2000		2100		2200		
900	0.49	0.47	0.40	0.54	0.30	0.63	0.24	0.68	0.18	0.74	KAT 10/10
1000	0.71	0.55	0.65	0.64	0.55	0.74	0.50	0.79	0.44	0.86	
1100	0.92	0.66	0.90	0.76	0.83	0.87	0.78	0.92	0.71	0.98	
1100	1.13	0.79	1.14	0.88	1.10	1.01	1.07	1.09	1.02	1.15	
CC 3000											
	2600		2800		3000		3200		3400		
800	0.48	0.83	0.42	0.91	0.36	1.01	0.29	1.11	0.21	1.22	KAT 12/12
900	0.74	1.01	0.71	1.11	0.65	1.22	0.58	1.34	0.51	1.45	
1000	0.99	1.21	0.98	1.33	0.97	1.46	0.90	1.58	0.83	1.72	
1100	1.21	1.43	1.24	1.57	1.25	1.70	1.23	1.86	1.19	2.01	
CC 4000											
	3200		3600		4000		4400		4600		
800	0.50	1.11	0.39	1.33	0.24	1.58	-	-	-	-	KAT 12/12
900	0.79	1.34	0.69	1.58	0.58	1.86	0.42	2.17	0.31	2.33	
1000	1.11	1.58	1.02	1.86	0.91	2.17	0.78	2.52	0.71	2.68	
1100	1.44	1.86	1.37	2.17	1.27	2.51	1.15	2.90	1.09	3.07	

NOTES: 1.) VALUES BASED ON FOUR ROW WET COIL AND STANDARD WASHABLE FILTER.
         2.) FOR EACH ADDITIONAL ROW OF WET COIL, ADD 0.05 SP.

TABLE 6 DIMENSIONS IN INCHES
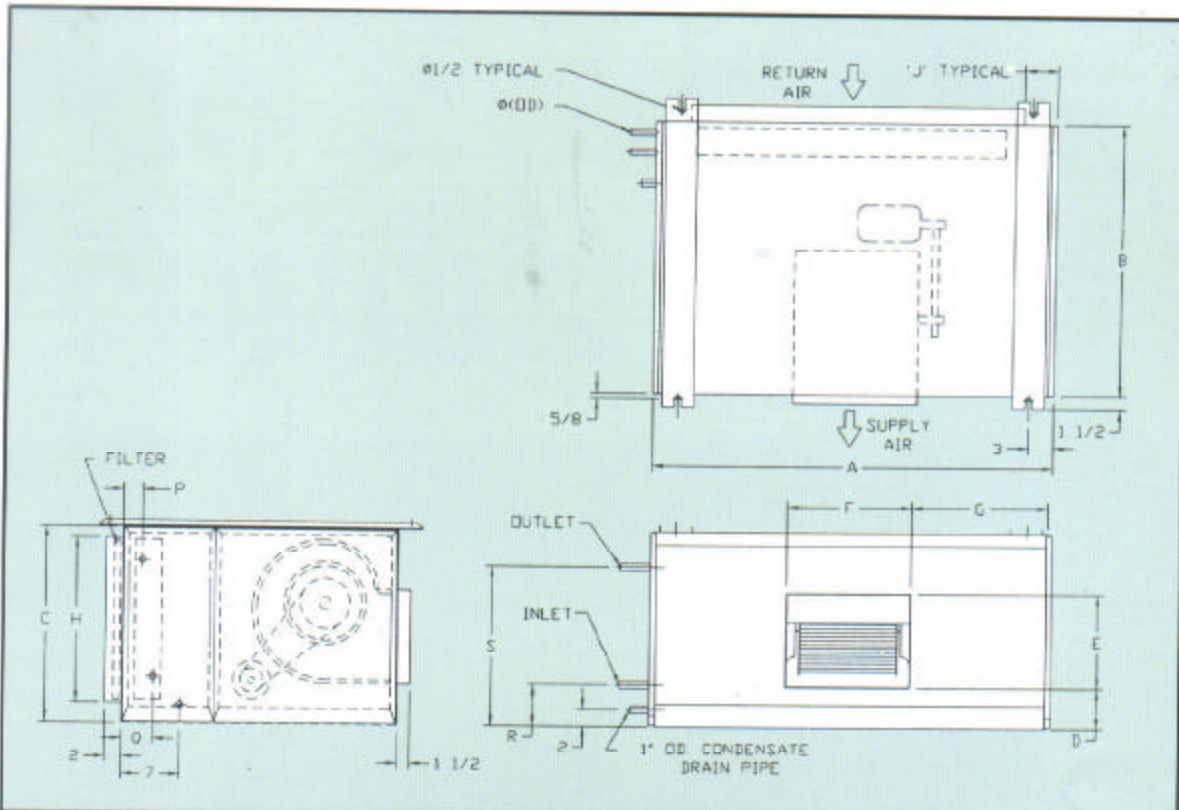
Model		CC 800	CC 1200	CC 1600	CC 2000	CC 3000	CC 4000
A		27	35	35	41	47	59
B		39	39	44	44	45	45
C		18 1/2	18 1/2	22	22	26 1/2	26 1/2
D		2 1/2	2 1/2	3 1/2	3 1/2	3 1/2	3 1/2
E		10 1/2	10 1/2	11 1/2	11 1/2	13 1/2	13 1/2
F		11 7/8	11 7/8	13 1/2	13 1/2	15 5/8	15 5/8
G		7 9/16	7 9/16	10 3/4	13 3/4	15 11/16	21 11/16
H		16	16	20	20	25	25
J		3 7/16	4 15/16	4 15/16	4 5/8	3 5/8	4 5/8
o		3/4	7/8	1 1/8	1 1/8	1 3/8	1 5/8
Fan (Qty)		9 x 9 (1)	9 x 9 (1)	10 x 10 (1)	10 x 10 (1)	12 x 12 (1)	12 x 12 (1)
Filter	1" Thick	16 x 20 (1)	16 x 25 (1)	20 x 25 (1)	16 x 20 (2)	20x25 (2)	25 x 25 (2)
3 ROW Coil	P	3	3	3	3	3	3
	Q	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4
	R	4 1/2	4 1/2	5	5	5 1/2	5 1/2
	S	13 1/2	13 1/2	18	18	23	23
	Operating Weight (LBS)	224	266	319	364	428	556
4 Row Coil	P	3	3	3	3	3	3
	Q	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4
	R	4 1/2	4 1/2	5	5	5 1/2	5 1/2
	S	13 1/2	13 1/2	18	18	23	23
	Operating Weight (LBS)	236	279	331	374	445	574
6 Row Coil	P	3	3	3	3	3	3
	Q	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2
	R	4 1/2	4 1/2	5	5	5 1/2	5 1/2
	S	13 1/2	13 1/2	18	18	23	23
	Operating Weight (LBS)	259	303	367	394	499	609
Optional	Plenum (K)	12	12	12	12	16	16

NOTE: FOR STANDARD UNIT, MOTOR IS LOCATED ON THE LEFT HAND SIDE VIEWING FROM THE RETURN AIR SIDE.

TABLE 7 COMPONENT PRESSURE DROP (IN.WG) AT VARYING CFM

Model	Face Area	Component	Component Resistance Inches Water				
CC 800	1.67 Sq.Ft.	CFM	600	700	800*	900	950
		Unit and Filter	0.07	0.09	0.11	0.13	0.14
		Supply Plenum	0.01	0.01	0.02	0.03	0.03
		Return Grille	0.02	0.03	0.04	0.05	0.06
CC 1200	2.50 Sq.Ft.	CFM	1000	1100	1200*	1300	1400
		Unit and Filter	0.14	0.17	0.19	0.22	0.24
		Supply Plenum	0.03	0.04	0.05	0.06	0.07
		Return Grille	0.03	0.04	0.05	0.06	0.07
CC 1600	3.33 Sq.Ft.	CFM	1400	1500	1600*	1700	1800
		Unit and Filter	0.08	0.11	0.15	0.21	0.26
		Supply Plenum	0.03	0.04	0.04	0.04	0.05
		Return Grille	0.03	0.04	0.04	0.04	0.05
CC 2000	4.17 Sq.Ft.	CFM	1600	1800	2000*	2100	2200
		Unit and Filter	0.15	0.19	0.24	0.3	0.36
		Supply Plenum	0.04	0.05	0.06	0.07	0.09
		Return Grille	0.03	0.04	0.05	0.06	0.07
CC 3000	6.25 Sq.Ft.	CFM	2600	2800	3000*	3200	3400
		Unit and Filter	0.12	0.14	0.16	0.18	0.2
		Supply Plenum	0.04	0.05	0.06	0.07	0.08
		Return Grille	0.04	0.04	0.05	0.06	0.06
CC 4000	8.33 Sq.Ft.	CFM	3200	3600	4000*	4400	4600
		Unit and Filter	0.08	0.11	0.15	0.21	0.26
		Supply Plenum	0.01	0.02	0.02	0.02	0.03
		Return Grille	0.03	0.04	0.05	0.06	0.07

* NOMINAL CFM

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