



Appendix 1. Product Selection Guide for Comfort Airconditioning

Types	Non Ducted Airconditioners				Packaged Airconditioners		Central Plants
	Room Airconditioner	Ceiling Suspended	Wall Mounted	Ceiling Concealed	Ducted Splits	Floor Mounted	
Location of Unit	Window or Wall	Ceiling	Wall	Above Ceiling	Ceiling	Floor	Plant room
Capacity Available Tons Refrigeration (TR)	0.5 to 2	1.5 to 3	1.5 to 3	1.5 to 3	3 to 8.3	5 to 16.5	No limit
Floor Space	Not needed	Not needed	Not needed	Not needed	Not needed	Needed	Needed
Direction of Air Flow	Horizontal	Horizontal	Downward	Horizontal & Downwards	Horizontal	Vertical & Horizontal & Downwards	Vertical & Horizontal & Downwards
Ease of Installation	Simple	Simple	Simple	Needs skill	Needs technical / project	Needs technical / project	Needs technical / project
Service Access	Front	Underside	Front	Underside	Underside	Front	All around
Suitability							
Residences	***	**	***	**	*	*	Not recommended
Restaurants	*	*	*	**	**	***	Not recommended
Showrooms	*	**	***	***	***	***	Not recommended
Offices & Banks	*	**	**	**	***	***	Only if part of large complex
Computer/Telecom	*	*	*	*	*	***	Not recommended
Commercial Complexes	Not recommended	*	*	*	**	***	***
Industrial Applications	Not recommended	*	*	*	*	***	***
Hospitals	Not recommended	*	*	*	*	*	***
Hotels	*	*	*	*	*	**	***



Appendix 2. A typical Btu Estimate Sheet



BLUE STAR

BTU ESTIMATE SHEET

CUSTOMER: XYZ, MADRAS
 ADDRESS: _____
 ESTIMATED BY: ABC
 DATE: 16.10.96
 SPACE DIMENSIONS: _____' L X _____' W X _____' H = _____ CUB.FT
 COIL SELECTION: ☐ CHILLED WATER: ☐ DIRECT EXPANSION
 NO. OF ROWS DEEP _____
 BYPASS FACTOR (BF) _____ CONTACT FACTOR (CF) _____

Area
 2400ft²
 Ht 12'

DESIGN CONDITIONS

	DB	%RH	WB	TH	DP	GR/LB
OUTSIDE	103		82	65.2		132
INSIDE	76	55		29.7		74
DIFFERENCE	27	X	X	16.5	X	58

TIME OF PEAK LOAD: _____

1. VENTILATION OR INFILTRATION				VENT	INF
(A) PEOPLE (NOT SMOKING)	X	CFM/PERSON			X
(B) PEOPLE (SMOKING)	X	CFM/PERSON			X
(C) EXHAUST FAN		CFM			
(D) SWINGING/REVOLVING DOORS	PEOPLE X	CFM/PERSON		X	
(E) CRACK	FEET X	CFM/FT		X	
(F)	15 CFM / PERSON X 27				
<input type="checkbox"/> VENTILATION OR <input type="checkbox"/> INFILTRATION			TOTAL CFM	555	
2. INTERNAL SPACE SENSIBLE HEAT GAINS				BTU/HR	
STRUCTURE	SQ. FT.	FACTOR	TEMP. DIFF.		
N WALL	192	X 0.24	(4+12)	1	045
S WALL	92	X 0.24	(16+12)	1	828
E WALL	464	X 0.24	(18+12)	4	783
W WALL	624	X 0.24	(12+12)	5	092
ROOF					
N SUNGLASS	48	X 0.58	39	1	086
S SUNGLASS	48	X 0.58	11		306
E SKYLIGHT GLASS	206	X 0.58	11	1	633
W GLASS	96	X 0.58	158	8	747
ALL GLASS	448	X 1.13		13	668
PARTITION					
CEILING	2400	X 0.4	22	21	120
FLOOR	2400	X 0.82	22	27	456
VENTILATION CFM X 2.4 F DIFF. X 0.15 BF X 1.08				2	428
INFILTRATION CFM X °F DIFF. X 1.08					
PEOPLE (ACTIVE) 37 X 235 SH/PERSON				8	695
PEOPLE (NOT ACTIVE) X SH/PERSON					
LIGHTS 1.5 X 2400 WATTS X 3.41 BTU/HR				12	276
MOTORS HP X BTU/HR					
MISCELLANEOUS 2 KW X 3410				6	820
SENSIBLE HEAT SUBTOTAL					
DEDUCT FOR STORAGE EFFECT					
SENSIBLE HEAT SUBTOTAL				116	893
DUCT HEAT GAIN	% + FAN HP	% + SAFETY FACTOR	10 %	11	689
TOTAL SPACE SENSIBLE HEAT				128	582
3. INTERNAL SPACE LATENT HEAT GAINS				BTU/HR	
VENTILATION 555 CFM X 58 GR/# X 0.15 BF X 0.67				3	235
INFILTRATION CFM X GR/# 0.67					
PEOPLE (ACTIVE) 37 X 215 LH/PERSON				7	955
PEOPLE (NOT ACTIVE) X LH/PERSON					
MISCELLANEOUS X BTU/HR					
LATENT HEAT SUBTOTAL				11	190
SAFETY FACTOR %				1	119
TOTAL SPACE LATENT HEAT				12	309
TOTAL SPACE SENSIBLE HEAT				128	582
4. TOTAL SPACE HEAT				140	891

5. APPARATUS DEW POINT		TOT. SPACE SENS. HT.	0.91 SHF
SENS HT. RATIO		TOT. SPACE HEAT	58.8
FROM TABLE: APPARATUS DEW POINT ADP			
6. REHEAT (IF REQUIRED)		TOTAL SPACE LAT. HT.	NEW TOTAL SPACE HT.
NEW LAT. HT. RATIO			
MINUS TOTAL SPACE LATENT HEAT			
NEW SPACE SENSIBLE HEAT			
MINUS TOTAL SPACE SENSIBLE HEAT			
MINIMUM REHEAT			BTU/HR
7. DEHUMIDIFIER CFM		TOT. SPACE SENS. HT.	8143 CFM
(REHEAT) + 128582			
(76 °F ISOB 58.8 °F ADP X (-85 CF) X 1.08			
8. FAN CFM		TOTAL SPACE SENS. HT.	CFM
°F RISE AT OUTLET X 1.08			
TOTAL SPACE HEAT (ITEM # 4)		BTU/HR	140 891
9. VENTILATION AIR HEAT		32	905
555 CFM X 5.5 TH. DIFF X 4.5 X 0.85 CF			
REFRIGERATION SUBTOTAL		173	796
RETURN	PUMP	DEHUMID	
DUCT GAIN % + HP	% PIPING GAIN	5 %	8 690
ADD MINIMUM REHEAT (ITEM-6)			
10. REFRIGERATION TOTAL HEAT		182	486
11. REFRIGERATION TONNAGE		BTU/HR = 15.2 TONS	
REFRIG. TOT. HT			
12,000 BTU/HR/TON			
NOTES/ASSUMPTIONS			



Appendix 3. A typical Estimate Sheet (computerised)

Heat load estimate. (Summer & Monsoon)

MAY NOV

Client. : PENTAFOUR SOFTN

Space Used for:

OFFICE

City name. : MADRAS

Engineer. : GS

Floor level. :

Date of print. : 12-03-1996

Enquiry number. : PENTA4

Remarks. :

Date of Heatload. : 12-02-1996

Room	Length(Ft)	Width(Ft)	Height (Ft)	Area(Sqft)	Volume(Cft)	Room no	Total Room(s)	Latitude	Sun Time
	0.00	0.00	11.00	1738.00	20308.40	1	1	13.04	16.00

		DB	WB	RH	DP	GR/Lbs	Enthalpy
		F	F	%	F		Btu/Lb
Temp rise.	= (1 - DF) * (Ra DB - AMP)	Summer >	103.00	82.00	41.00	75.00	132.00
Dehumidified Cfm.	= ERSN / (1.08 * Temp rise)	Monsoon >	83.00	80.00	88.00	79.00	152.00
Outlet td.	= RSH / (1.08 * De.Hum CFM)	Room >	75.00	63.96	55.00	57.76	71.25
Supply air Cfm.	= RSH / (1.08 * Desired td)	Diff >	28.00				60.75

Item	Area / Qty	Sun Gain	Factor	Summer	Monsoon	Outdoor air details
	Sq.ft / ft	TB		Btu/Hour	Btu/Hour	

(Solar heat gain through glasses)						Fresh air Cfm	Fresh air changes
East >	39.00	12.00	0.36	262.08	174.72	341.81	1.00
S.West >	57.00	85.00	0.56	2713.20	4596.48		
N.West >	148.00	138.00	0.56	11437.44	2134.88		

(Solar heat & Transmission gain through walls & roof)						(ESHF)	(ADP)	(Dehum rise)	(Dehum CFM)	(Supply CFM)	(Bypass)
East >	115.58	31.00	0.36	1289.87	437.70	0.93	56.00	16.72	8216.73	8216.73	0.00
West >	0.00	25.00	0.36	0.00	0.00	0.92	56.00	16.72	6701.28	8216.73	1515.46
South West >	167.20	27.00	0.36	1623.18	421.34						
North West >	610.74	19.00	0.36	4177.46	-219.87						
Roof Sun >	1738.00	43.00	0.12	9385.20	5214.00						

(Transmission gain - Except walls & roof)						Full Height. Ft >	11.00
Gl Exposed >	244.00	28.00	1.10	7515.20	2147.20		
(Internal heat gain)						Height above F/C >	0.00
						Height below F/F >	0.00

People >	50	285.00		14250.00	14250.00
Equipment >	26.90	2345.00	1.00	68460.30	68460.30
Lights >	2173	3.40	1.25	9235.25	9235.25
Sub total >				130351.39	104892.20
S.Factor I >	5.00			6517.57	5344.61
Room sensible Heat >				136868.95	112236.81
SA Duct I >	2.50			3421.72	2803.92
SA Fan gain >	5.00			6843.45	5611.84
Fresh air >	341.81	0.12	28.00	1240.35	354.39
Reheat >	0.00	0.00		0.00	0.00
Effective room sensible heat >				148374.47	121008.96

Latent heat					
People >	50	165.00		8250.00	8250.00
Sub total >				8250.00	8250.00
S.Factor I >	5.00			412.50	412.50
Room latent heat >				8662.50	8662.50
Fresh air >	341.81	0.12	60.75	1694.40	2252.23
Effective room latent heat >				10356.90	10914.73
Effective room total heat >				158731.38	131923.69

Outdoor Air Heat					
F.air Sen >	341.81	0.88	28.00	9095.89	2598.82
F.air Lat >	341.81	0.88	60.75	12425.63	16516.37
RA Gain >				0.00	0.00
RA Fan gain >				0.00	0.00
Grand total >				180252.89	151038.89
Tons >				15.02	12.39

**Appendix 4. Cooling Capacities Converter**

Refrigeration Tons	1000's Kcal/hr	1000's BTU/hr	Refrigeration Tons	1000's Kcal/hr	1000's BTU/hr
1/2	1.51	6.0	95	287.2	1140.0
3/4	2.27	9.0	100	302.3	1200.0
1	3.02	12.0	105	317.4	1260.0
2	6.04	24.0	110	332.5	1320.0
3	9.06	36.0	115	347.6	1380.0
4	12.09	48.0	120	362.8	1440.0
5	15.12	60.0	125	377.9	1500.0
7 1/2	22.67	90.0	130	392.9	1560.0
10	30.23	120.0	135	408.1	1620.0
15	45.30	180.0	140	423.2	1680.0
20	60.50	240.0	145	438.3	1740.0
25	75.60	300.0	150	453.4	1800.0
30	90.70	390.0	155	468.6	1860.0
35	105.80	420.0	160	483.7	1920.0
40	120.90	480.0	165	498.8	1980.0
45	136.00	540.0	170	513.9	2040.0
50	151.20	600.0	175	529.0	2100.0
55	166.30	660.0	180	544.1	2160.0
60	181.40	720.0	185	559.2	2220.0
65	196.50	780.0	190	574.4	2280.0
70	211.60	840.0	195	589.4	2340.0
75	226.70	900.0	200	604.6	2400.0
80	241.80	960.0	300	906.9	3900.0
85	256.90	1020.0	400	1209.2	4800.0
90	272.10	1080.0	500	1511.4	6000.0

Appendix 5. Useful Conversion Factors

Multiply	By	To Get	Multiply	By	To Get	Multiply	By	To Get	Multiply	By	To Get
mm	0.0393	in	in	25.4	mm	m ² /s	2119.5	cfm	cfm	0.00047	m ³ /s
m	3.2807	ft	ft	0.3048	m	m ³	35.315	cu ft	cu ft	0.02832	m ³
kg	2.2046	lb	lb	0.4536	kg	m ³ /h	4.403	GPM	US GPM	0.2268	m ³ /h
Kcal/h	3.968	BTU/hr	BTU/hr	0.2519	Kcal/h	m ³ /s	15873	GPM	US GPM	0.000063	m ³ /s
Watts	3.412	BTU/hr	BTU/hr	0.2931	Watts	l/s	15.87	GPM	US GPM	0.063	l/s
Kcal/h	0.00033	Ref ton	Ref ton	3022.8	Kcal/h	kG/cm ²	14.223	psi	psi	0.0703	kG/cm ²
KW	0.284	Ref ton	Ref ton	3.517	KW	kPa	0.145	psi	psi	6.894	kPa
m/s	3.2807	fps	fps	0.3048	m/s	kW	1.359	HP metric	HP metric	0.7354	kW
m/s	196.8	fpm	fpm	0.00508	m/s	cfm	1.341	HP UK	HP UK	0.7457	kW
			m ³ /h	0.5886	cfm		1.6986	m ³ /h			



Appendix 6. Temperature Converter

To °C	From	To °F	To °C	From	To °F	To °C	From	To °F
-40.00	-40	-40.0	-9.44	+15	+59.0	+21.11	+70	+158.0
-39.44	-39	-38.2	-8.89	+16	+60.8	+21.67	+71	+159.8
-38.89	-38	-36.4	-8.33	+17	+62.6	+22.22	+72	+161.6
-38.78	-37	-34.6	-7.78	+18	+64.4	+22.78	+73	+163.4
-37.78	-36	-32.8	-7.22	+19	+66.2	+23.33	+74	+165.2
-37.22	-35	-31.0	-6.67	+20	+68.0	+23.89	+75	+167.0
-36.67	-34	-29.2	-6.11	+21	+69.8	+24.44	+76	+168.8
-36.11	-33	-27.4	-5.56	+22	+71.6	+25.00	+77	+170.6
-35.56	-32	-25.6	-5.00	+23	+73.4	+25.56	+78	+172.4
-35.00	-31	-23.8	-4.44	+24	+75.2	+26.11	+79	+174.2
-34.44	-30	-22.0	-3.89	+25	+77.0	+26.67	+80	+176.0
-33.89	-29	-20.2	-3.33	+26	+78.8	+27.22	+81	+177.8
-33.33	-28	-18.4	-2.78	+27	+80.6	+27.78	+82	+179.6
-32.78	-27	-16.6	-2.22	+28	+82.4	+28.33	+83	+181.4
-32.22	-26	-14.8	-1.67	+29	+84.4	+28.89	+84	+183.2
-31.67	-25	-13.0	-1.11	+30	+86.0	+29.44	+85	+185.0
-31.11	-24	-11.2	-0.56	+31	+87.8	+30.00	+86	+186.8
-30.56	-23	-9.4	-0.00	+32	+89.6	+30.56	+87	+188.6
-30.00	-22	-7.6	+0.56	+33	+91.4	+31.11	+88	+190.4
-29.44	-21	-5.8	+1.11	+34	+93.2	+31.67	+89	+192.2
-28.89	-20	-4.0	+1.67	+35	+95.0	+32.22	+90	+194.0
-28.33	-19	-2.2	+2.22	+36	+96.8	+32.78	+91	+195.8
-27.78	-18	-0.4	+2.78	+37	+98.6	+33.33	+92	+197.6
-27.22	-17	-1.4	+3.33	+38	+100.4	+33.89	+93	+199.4
-26.67	-16	-3.2	+3.89	+39	+102.2	+34.44	+94	+201.2
-26.11	-15	-5.0	+4.44	+40	+104.0	+35.00	+95	+203.0
-25.56	-14	-6.8	+5.00	+41	+105.8	+35.56	+96	+204.8
-25.00	-13	-8.6	+5.56	+42	+107.6	+36.11	+97	+206.6
-24.44	-12	+10.4	+6.11	+43	+109.4	+36.67	+98	+208.4
-23.89	-11	+12.2	+6.67	+44	+111.2	+37.22	+99	+210.2
-23.33	-10	+14.0	+7.22	+45	+113.0	+37.78	+100	+212.0
-22.78	-9	+15.8	+7.78	+46	+114.8	+38.33	+101	+213.8
-22.22	-8	+17.6	+8.33	+47	+116.6	+38.89	+102	+215.6
-21.67	-7	+19.4	+8.89	+48	+118.4	+39.44	+103	+217.4
-21.11	-6	+21.2	+9.44	+49	+120.2	+40.00	+104	+219.2
-20.56	-5	+23.0	+10.00	+50	+122.0	+40.56	+105	+221.0
-20.00	-4	+24.8	+10.56	+51	+123.8	+41.11	+106	+222.8
-19.44	-3	+26.6	+11.11	+52	+125.6	+41.67	+107	+224.6
-18.89	-2	+28.4	+11.67	+53	+127.4	+42.22	+108	+226.4
-18.33	-1	+30.2	+12.22	+54	+129.2	+42.78	+109	+228.2
-17.78	0	+32.0	+12.78	+55	+131.0	+43.33	+110	+230.0
-17.22	+1	+33.8	+13.33	+56	+132.8	+43.89	+111	+231.8
-16.67	+2	+35.6	+13.89	+57	+134.6	+44.44	+112	+233.6
-16.11	+3	+37.4	+14.44	+58	+136.4	+45.00	+113	+235.4
-15.56	+4	+39.2	+15.00	+59	+138.2	+45.56	+114	+237.2
-15.00	+5	+41.0	+15.56	+60	+140.0	+46.11	+115	+239.0
-14.44	+6	+42.8	+16.11	+61	+141.8	+46.67	+116	+240.8
-13.89	+7	+44.6	+16.67	+62	+143.6	+47.22	+117	+242.6
-13.33	+8	+46.4	+17.22	+63	+145.4	+47.78	+118	+244.4
-12.78	+9	+48.2	+17.78	+64	+147.2	+48.33	+119	+246.2
-12.22	+10	+50.0	+18.33	+65	+149.0	+48.89	+120	+248.0
-11.67	+11	+51.8	+18.89	+66	+150.8	+49.44	+121	+249.8
-11.11	+12	+53.6	+19.44	+67	+152.6	+50.00	+122	+251.6
-10.56	+13	+55.4	+20.00	+68	+154.4	+50.56	+123	+253.4
-10.00	+14	+57.2	+20.56	+69	+156.2	+51.11	+124	+255.2

°C = 5/9 (°F-32); °F = 9/5°C + 32

**Blue Star Addresses**

Bangalore	11-A, Magarath Road, Bangalore 560 025.	080	5584728
Bhopal	219 Zone-1, Maharana Pratap Nagar, Bhopal 462 011.	0755	553378
Bhubaneshwar	75A, BJB Nagar, Bhubaneshwar 751 014.	0674	310144
Chandigarh	1, Madhya Marg, Sector 26, Chandigarh 160 019.	0172	791101
Chennai	104, 'Garuda Building', Cathedral Road, Chennai - 600 086.	044	8116668
GOA	Flat No.1, Vaibhav Apts., 1st Floor, Vidya Nagar Colony, Miramar, Panjim, Goa 403 001.	0832	424187
Indore	350, Saket Nagar, Flat 201, Basera Apartments, Indore 452 001.	0731	(PP)565944
Jaipur	33, Kiram Path, Suraj Nagar West, Civil Lines, Jaipur 302 006.	0141	225963
Kochi	XXXIX/4080, Meenakshi Mandiram, M.G. Road, Kochi 682 016.	0484	352069
Kolkata	7, Hare Street, Kolkata 700 001.	033	2480131
Lucknow	B-140, Nirala Nagar, Lucknow 226 007.	0522	786171
Mumbai	Blue Star House, 9-A, Ghatkopar Link Road, Saki Naka, Mumbai 400 072.	022	8523600
Nagpur	19, Ramakrishna Nagar, Wardha Road, Nagpur 440 015.	0712	238788
New Delhi	Block 2-A, DLF Corporate Park, DLF Qutab Enclave, Phase-III, Mehrauli, Gurgaon Road, Gurgaon 122 002.	0124	6359001
Pune	201/A, Nityanand Complex, 1st Flr, 247/A, Bund Garden Road, Pune 411 011.	020	6127230
Secunderabad	207, Sikh Road, Bantia Estate, Secunderabad 500 003.	040	7842057
Thiruvananthapuram	T.C.IX/1490, 'Chandrika', Sasthamangalam, Trivandrum 695 010.	0471	320025
Vadodara	Ramakrishna Chambers, 7th Floor, Productivity Road, Alkapuri, Vadodara 390 005.	0265	332021
Visakhapatnam	47-12-6/7, 2nd Floor, Amaravathi Complex, Dwarakanagar, Visakhapatnam 530 016.	0891	748433