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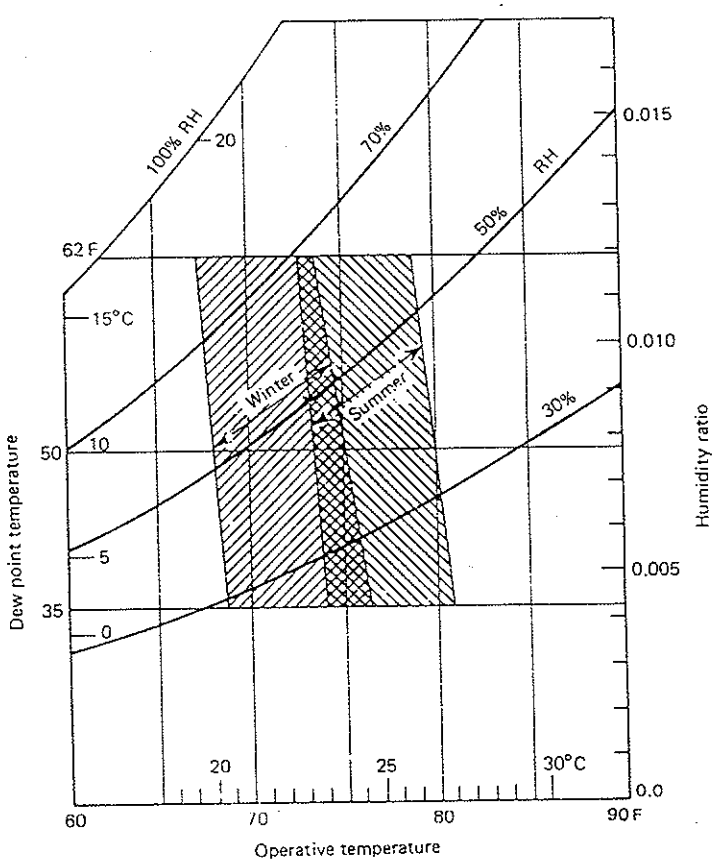
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Lampiran 1 : Kondisi nyaman berdasarkan ASHRAE

Sumber : Faye C. McQuiston, Heating, Ventilating and Air Conditioning, 1982



Acceptable ranges of operative temperature and humidity for persons clothed in typical summer and winter clothing, at light, mainly sedentary, activity. (Adapted by permission from ASHRAE Standard 55-81, 1981.)

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Lampiran 2 : Perolehan kalor matahari melalui kaca biasa

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System I, 1965

TABLE 15—SOLAR HEAT GAIN THRU ORDINARY GLASS (Contd)

Btu/(hr) (sq ft sash area)

10°

10° NORTH LATITUDE

Time of Year	Exposure	AM 6	7	8	9	10	11	Noon	PM 1	2	3	4	5	6
JUNE 21	North	19	44	50	45	44	43	41	43	44	45	50	44	2
	Northeast	55	131	153	140	106	65	28	14	14	13	11	8	2
	East	54	134	155	139	98	41	14	14	14	13	11	8	2
	Southeast	18	49	55	43	25	14	14	14	14	13	11	8	2
	South	2	8	11	13	14	14	14	14	14	13	11	8	2
	Southwest	2	8	8	13	14	14	14	14	25	43	55	49	18
	West	2	8	8	13	14	14	14	41	98	139	155	134	54
	Northwest	2	8	8	13	14	18	26	65	106	140	153	131	55
	Horizontal	4	44	107	166	205	233	243	233	205	166	107	44	4
JULY 23 & MAY 21	North	5	34	39	35	33	31	30	31	33	35	39	34	5
	Northeast	42	127	148	133	109	56	22	14	14	13	11	7	1
	East	50	135	158	142	98	43	14	14	14	13	11	7	1
	Southeast	26	57	66	56	32	14	14	14	14	13	11	7	1
	South	1	7	11	13	14	14	14	14	14	13	11	7	1
	Southwest	1	7	11	13	14	14	14	14	32	56	66	57	26
	West	1	7	11	13	14	14	14	43	98	142	158	135	50
	Northwest	1	7	11	13	14	14	22	56	109	133	148	127	42
	Horizontal	3	42	107	166	210	236	247	236	210	166	107	42	3
AUG 24 & APR 20	North	1	15	16	15	15	14	14	14	15	15	16	15	1
	Northeast	17	113	130	111	80	34	14	14	14	13	11	7	1
	East	25	138	163	149	104	46	14	14	14	13	11	7	1
	Southeast	18	79	94	85	60	27	14	14	14	13	11	7	1
	South	1	7	11	13	14	14	14	14	14	13	11	7	1
	Southwest	1	7	11	13	14	14	14	27	60	85	94	79	18
	West	1	7	11	13	14	14	14	46	80	149	163	138	25
	Northwest	1	7	11	13	14	14	14	34	15	111	130	113	17
	Horizontal	2	38	105	167	213	242	250	242	213	167	105	38	2
SEPT 22 & MAR 22	North	1	6	11	13	14	14	14	14	14	14	13	11	6
	Northeast	1	89	103	80	45	17	14	14	14	14	13	11	6
	East	1	130	164	151	106	47	14	14	14	14	13	11	6
	Southeast	1	97	127	122	94	56	21	14	14	14	13	11	6
	South	1	6	13	19	24	27	28	27	24	19	13	6	1
	Southwest	1	6	11	13	14	14	21	56	94	122	127	97	1
	West	1	6	11	13	14	14	14	47	106	151	164	130	1
	Northwest	1	6	11	13	14	14	14	17	45	80	103	89	1
	Horizontal	1	31	97	160	207	235	247	235	207	160	97	31	1
OCT 23 & FEB 20	North	0	5	10	13	14	14	14	14	14	14	13	10	5
	Northeast	0	58	66	44	28	14	14	14	14	14	13	10	5
	East	0	118	155	145	100	40	14	14	14	14	13	10	5
	Southeast	0	103	147	149	123	81	46	18	14	13	10	5	0
	South	0	18	40	55	65	71	73	71	65	55	40	18	0
	Southwest	0	5	10	13	14	18	46	81	123	149	147	103	0
	West	0	5	10	13	14	14	14	40	100	145	155	118	0
	Northwest	0	5	10	13	14	14	14	14	28	44	66	58	0
	Horizontal	0	22	85	139	193	220	230	220	193	139	85	22	0
NOV 21 & JAN 21	North	0	4	9	12	13	14	14	14	14	13	12	9	4
	Northeast	0	27	37	17	13	14	14	14	14	13	12	9	4
	East	0	99	143	132	93	39	14	14	14	13	12	9	4
	Southeast	0	99	153	161	146	109	70	31	17	12	9	4	0
	South	0	35	65	91	96	104	106	104	96	91	65	35	0
	Southwest	0	4	9	12	17	31	70	109	146	161	153	99	0
	West	0	4	9	12	13	14	14	39	93	132	143	99	0
	Northwest	0	4	9	12	13	14	14	14	13	17	37	27	0
	Horizontal	0	17	62	131	175	202	210	202	175	131	62	17	0
DEC 22	North	0	4	9	12	13	14	14	14	14	13	12	9	4
	Northeast	0	15	28	17	13	14	14	14	14	13	12	9	4
	East	0	86	137	130	91	42	14	14	14	13	12	9	4
	Southeast	0	99	154	163	149	121	79	36	23	12	9	4	0
	South	0	50	74	94	109	116	120	116	109	94	74	50	0
	Southwest	0	4	9	12	23	36	79	121	149	163	154	99	0
	West	0	4	9	12	13	14	14	42	91	130	137	86	0
	Northwest	0	4	9	12	13	14	14	14	13	17	28	15	0
	Horizontal	0	17	62	131	175	202	210	202	175	131	66	14	0

10° SOUTH LATITUDE

Exposure	Time of Year
South, Southeast, East	DEC 22
Northeast, North, Northwest	
West, Southwest, Horizontal	
South, Southeast, East	JAN 21 & NOV 21
Northeast, North, Northwest	
West, Southwest, Horizontal	
South, Southeast, East	FEB 20 & OCT 23
Northeast, North, Northwest	
West, Southwest, Horizontal	
South, Southeast, East	MAR 22 & SEPT 22
Northeast, North, Northwest	
West, Southwest, Horizontal	
South, Southeast, East	APR 20 & AUG 2
Northeast, North, Northwest	
West, Southwest, Horizontal	
South, Southeast, East	MAY & JULY
Northeast, North, Northwest	
West, Southwest, Horizontal	
South, Southeast, East	JU
Northeast, North, Northwest	
West, Southwest, Horizontal	

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Lampiran 3 : Faktor perolehan kalor matahari melalui kaca

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System I, 1965

TABLE 8—STORAGE LOAD FACTORS, SOLAR HEAT GAIN THRU GLASS

WITH BARE GLASS OR WITH EXTERNAL SHADE‡

24 Hour Operation, Constant Space Temperature†

EXPOSURE (North Lat)	WEIGHT§ (lb per sq ft of floor area)	SUN TIME AM 6	7	8	9	10	11	12	PM 1	2	3	4	5	6	7	8	9	10	11	12	AM 1	2	3	4	5	EXPOSURE (South Lat)
Northeast	150 & over	.17	.27	.33	.33	.31	.29	.27	.25	.23	.22	.20	.19	.17	.15	.14	.12	.11	.10	.09	.08	.07	.07	.06	.06	Southeast
	100	.19	.31	.38	.39	.36	.34	.27	.24	.22	.21	.19	.17	.16	.14	.12	.10	.07	.08	.07	.06	.05	.05	.04	.03	
	30	.31	.56	.65	.61	.46	.33	.26	.21	.18	.16	.14	.12	.09	.06	.04	.03	.02	.01	.01	.01	0	0	0	0	
East	150 & over	.16	.26	.34	.39	.40	.38	.34	.30	.28	.26	.23	.22	.20	.18	.16	.14	.13	.12	.10	.09	.08	.08	.07	.06	East
	100	.16	.29	.40	.46	.46	.42	.36	.31	.28	.25	.23	.20	.18	.15	.14	.12	.11	.09	.08	.08	.06	.06	.05	.04	
	30	.27	.50	.67	.73	.68	.53	.38	.27	.22	.18	.15	.12	.09	.06	.04	.03	.02	.01	.01	.01	.01	0	0	.01	
Southeast	150 & over	.08	.14	.22	.31	.38	.43	.44	.43	.39	.35	.32	.29	.26	.23	.21	.19	.15	.15	.13	.12	.11	.10	.09	.06	Northeast
	100	.05	.12	.23	.35	.44	.49	.51	.47	.41	.36	.31	.27	.24	.21	.18	.16	.14	.12	.10	.09	.08	.08	.06	.06	
	30	0	.18	.40	.59	.72	.77	.72	.60	.44	.32	.23	.18	.14	.09	.07	.05	.03	.02	.01	.01	.01	0	0	0	
South	150 & over	.10	.10	.13	.20	.28	.35	.42	.48	.51	.51	.48	.42	.37	.33	.29	.26	.23	.21	.19	.17	.15	.14	.13	.12	North
	100	.07	.06	.12	.20	.30	.39	.48	.54	.58	.57	.53	.45	.37	.31	.27	.23	.20	.18	.16	.14	.12	.11	.10	.08	
	30	0	0	.12	.29	.48	.64	.75	.82	.81	.75	.61	.42	.28	.19	.13	.09	.06	.04	.03	.02	.01	.01	0	0	
Southwest	150 & over	.11	.10	.10	.10	.10	.14	.21	.29	.36	.43	.47	.46	.40	.34	.30	.27	.24	.22	.20	.18	.16	.14	.13	.12	Northwest
	100	.09	.09	.08	.09	.09	.14	.22	.31	.42	.50	.53	.51	.44	.35	.29	.26	.22	.19	.17	.15	.13	.12	.11	.09	
	30	.02	.03	.05	.06	.08	.12	.34	.53	.68	.78	.78	.68	.45	.29	.20	.14	.09	.07	.05	.03	.02	.02	.01	.01	
West	150 & over	.12	.11	.11	.10	.10	.10	.10	.13	.19	.27	.36	.42	.44	.38	.33	.29	.26	.23	.21	.18	.16	.15	.13	.12	West
	100	.09	.09	.09	.09	.09	.09	.10	.12	.19	.30	.40	.48	.51	.42	.35	.30	.25	.22	.19	.16	.14	.13	.11	.09	
	30	.02	.03	.05	.06	.07	.07	.08	.14	.29	.49	.67	.76	.75	.53	.33	.22	.15	.11	.08	.05	.04	.03	.02	.01	
Northwest	150 & over	.10	.10	.10	.10	.10	.10	.10	.10	.12	.17	.25	.34	.39	.34	.29	.26	.23	.20	.18	.16	.14	.13	.12	.10	Southwest
	100	.08	.09	.09	.09	.09	.09	.09	.09	.11	.19	.29	.40	.46	.40	.32	.26	.22	.19	.16	.14	.13	.11	.10	.08	
	30	.02	.04	.05	.07	.08	.09	.09	.10	.13	.27	.48	.65	.73	.49	.31	.21	.16	.10	.07	.05	.04	.03	.02	.01	
North and Shade	150 & over	.16	.23	.33	.41	.47	.52	.57	.61	.66	.69	.72	.74	.59	.52	.46	.42	.37	.34	.31	.27	.25	.23	.21	.17	South and Shade
	100	.11	.33	.44	.51	.57	.62	.66	.70	.74	.76	.79	.80	.60	.51	.44	.37	.32	.29	.27	.23	.21	.18	.16	.13	
	30	0	.48	.66	.76	.82	.87	.91	.93	.95	.97	.98	.98	.52	.34	.24	.16	.11	.07	.05	.04	.02	.02	.01	.01	

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Lampiran 4 : Perbedaan temperatur ekuivalen untuk dinding

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System I, 1965

TABLE 19—EQUIVALENT TEMPERATURE DIFFERENCE (DEG F)

FOR DARK COLORED†, SUNLIT AND SHADED WALLS*

Based on Dark Colored Walls; 95 F db Outdoor Design Temp; Constant 80 F db Room Temp; 20 deg F Daily Range; 24-hour Operation; July and 40° N. Lat.†

EXPOSURE	WEIGHT OF WALL‡ (lb/sq ft)	SUN TIME																								
		AM							PM												AM					
		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
Northeast	20	5	15	22	23	24	19	14	13	12	13	14	14	14	12	10	8	6	4	2	0	−2	−3	−4	−2
	60	−1	−2	−2	5	24	22	20	15	10	11	12	13	14	13	12	11	10	8	6	4	2	1	0	−1
	100	4	3	4	4	4	10	16	15	14	12	10	11	12	12	12	11	10	9	8	7	6	6	5	5
	140	5	5	6	6	6	6	6	10	14	16	14	12	10	10	10	10	10	10	10	9	9	8	7	7
East	20	1	17	30	33	36	35	32	20	12	13	14	14	14	12	10	8	6	4	2	0	−1	−2	−3	−3
	60	−1	−1	0	21	30	31	31	19	14	13	12	13	14	13	12	11	10	8	5	4	3	1	1	0
	100	5	5	6	8	14	20	24	25	24	20	18	16	14	14	14	13	12	11	10	9	8	7	7	6
	140	11	10	10	9	8	9	10	15	18	19	18	17	16	14	12	13	14	14	14	13	13	12	12	12
Southeast	20	10	6	13	19	26	27	28	26	24	19	16	15	14	12	10	8	6	4	2	0	−1	−1	−2	−2
	60	1	1	0	13	20	24	28	26	25	21	18	15	14	13	12	11	10	8	6	5	4	3	3	2
	100	7	7	6	6	6	11	16	17	18	19	18	16	14	13	12	11	10	10	10	9	9	8	8	7
	140	9	8	8	8	8	7	6	11	14	15	16	18	16	15	14	13	12	12	12	11	11	10	10	9
South	20	−1	−2	−4	1	4	14	22	27	30	28	26	20	16	12	10	7	6	3	2	1	1	0	0	−1
	60	−1	−3	−4	−3	−2	7	12	20	24	25	26	23	20	15	12	10	8	6	4	2	1	1	0	−1
	100	4	4	2	2	2	3	4	8	12	15	16	18	18	15	14	11	10	9	8	8	7	6	6	5
	140	7	6	6	5	4	4	4	4	4	7	10	13	14	15	16	16	14	12	10	10	9	9	8	7
Southwest	20	−2	−4	−4	−2	0	4	6	19	26	34	40	41	42	30	24	12	6	4	2	1	1	0	−1	−1
	60	2	1	0	0	0	1	2	8	12	24	32	35	36	35	34	20	10	7	6	5	4	4	3	3
	100	7	5	6	5	4	5	6	7	8	12	14	19	22	23	24	23	22	15	10	10	9	9	8	7
	140	8	8	8	8	8	7	6	6	6	7	8	9	10	15	18	19	20	13	8	8	8	8	8	8
West	20	−2	−3	−4	−2	0	3	6	14	20	32	40	45	48	34	22	14	8	5	2	1	0	0	−1	−1
	60	2	1	0	0	0	2	4	7	10	19	26	34	40	41	36	28	16	10	6	5	4	3	3	2
	100	7	7	6	6	6	6	6	7	8	10	12	17	20	25	28	27	26	19	14	12	11	10	9	8
	140	12	11	10	9	8	8	8	9	10	10	10	11	12	14	16	21	22	23	22	20	18	16	15	13
Northwest	20	−3	−4	−4	−2	0	3	6	10	12	19	24	33	40	37	34	18	6	4	2	0	−1	−1	−2	−2
	60	−2	−3	−4	−3	−2	0	2	6	8	10	12	21	30	31	32	21	12	8	6	4	3	1	0	−1
	100	5	4	4	4	4	4	4	4	4	5	6	9	12	17	20	21	22	14	8	7	7	6	6	5
	140	8	7	6	6	6	6	6	6	6	6	6	7	8	9	10	14	18	19	20	16	13	11	10	9
North (Shade)	20	−3	−3	−4	−3	−2	1	4	8	10	12	14	13	12	10	8	6	4	2	0	0	−1	−1	−2	−2
	60	−3	−3	−4	−3	−2	−1	0	3	6	8	10	11	12	12	12	10	8	6	4	2	1	0	−1	−2
	100	1	1	0	0	0	0	0	1	2	3	4	5	5	5	8	7	6	5	4	3	3	2	2	1
	140	1	1	0	0	0	0	0	0	0	1	2	3	4	5	6	7	8	7	6	4	3	2	2	1
		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
		AM							PM												AM					
		SUN TIME																								

Equation: Heat Gain Thru Walls, Btu/hr = (Area, sq ft) × (equivalent temp diff) × (transmission coefficient U, *Tables 21 thru 25*)

*All values are for both insulated and uninsulated walls.

†For other conditions, refer to corrections on page 64.

‡"Weight per sq ft" values for common types of construction are listed in *Tables 21 thru 25*. For wall constructions less than 20 lb/sq ft, use listed values of 20 lb/sq ft.

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Lampiran 5 : Perbedaan temperatur ekuivalen untuk atap

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System I, 1965

TABLE 20—EQUIVALENT TEMPERATURE DIFFERENCE (DEG F)

FOR DARK COLORED†, SUNLIT AND SHADED ROOFS*

Based on 95 F db Outdoor Design Temp; Constant 80 F db Room Temp; 20 deg F Daily Range; 24-hour Operation; July and 40° N. Lat.†

CONDITION	WEIGHT OF ROOF‡ (lb/sq ft)	SUN TIME: AM 6	7	8	9	10	11	12	PM 1	2	3	4	5	6	7	8	9	10	11	12	AM 1	2	3	4	5
Exposed to Sun	10	−4	−6	−7	−5	−1	7	15	24	32	38	43	46	45	41	35	28	22	16	10	7	3	1	−1	−3
	20	0	−1	−2	−1	2	9	16	23	30	36	41	43	43	40	35	30	25	20	15	12	8	6	4	2
	40	4	3	2	3	6	10	16	23	28	33	38	40	41	39	35	32	28	24	20	17	13	11	9	6
	60	9	8	6	7	8	11	16	22	27	31	35	38	39	38	36	34	31	28	25	22	18	16	13	11
	80	13	12	11	11	12	13	16	22	26	28	32	35	37	37	35	34	34	32	30	27	23	20	18	14
Covered with Water	20	−5	−2	0	2	4	10	16	19	22	20	18	16	14	12	10	6	2	1	1	−1	−2	−3	−4	−5
	40	−3	−2	−1	−1	0	5	10	13	15	15	16	15	15	14	12	10	7	5	3	1	−1	−2	−3	−3
	60	−1	−2	−2	−2	−2	2	5	7	10	12	14	15	16	15	14	12	10	8	6	4	3	2	1	0
Sprayed	20	−4	−2	0	2	4	8	12	15	18	17	16	15	14	12	10	6	2	1	0	−1	−2	−2	−3	−3
	40	−2	−2	−1	−1	0	2	5	9	13	14	14	14	14	13	12	9	7	5	3	1	0	0	−1	−1
	60	−1	−2	−2	−2	−2	0	2	5	8	10	12	13	14	13	12	11	10	8	6	4	2	1	0	−1
Shaded	20	−5	−5	−4	−2	0	2	6	9	12	13	14	13	12	10	8	5	2	1	0	−1	−3	−4	−5	−5
	40	−5	−5	−4	−3	−2	0	2	5	8	10	12	13	12	11	10	8	6	4	2	0	−1	−3	−4	−5
	60	−3	−3	−2	−2	−2	−1	0	2	4	6	8	9	10	10	10	9	8	6	4	2	1	0	−1	−2
		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
		AM							PM												AM				
		SUN TIME																							

Equation: Heat Gain Thru Roofs, Btu/hr = (Area, sq ft) × (equivalent temp diff) × (transmission coefficient U, *Tables 27 or 28*)

*With attic ventilated and ceiling insulated roofs, reduce equivalent temp diff 25%.
For peaked roofs, use the roof area projected on a horizontal plane.

†For other conditions, refer to corrections below and on page 64.

‡"Weight per sq ft" values for common types of construction are listed in *Tables 27 or 28*.

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Lampiran 6 : Angka koreksi untuk temperatur ekuivalen

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System I, 1965

TABLE 20A—CORRECTIONS TO EQUIVALENT TEMPERATURES (DEG F)

OUTDOOR DESIGN FOR MONTH AT 3 P.M. MINUS ROOM TEMP (deg F)	DAILY RANGE (deg F)																
	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
−30	−39	−40	−41	−42	−43	−44	−45	−46	−47	−48	−49	−50	−51	−52	−53	−54	−55
−20	−29	−30	−31	−32	−33	−34	−35	−36	−37	−38	−39	−40	−41	−42	−43	−44	−45
−10	−19	−20	−21	−22	−23	−24	−25	−26	−27	−28	−29	−30	−31	−32	−33	−34	−35
0	−9	−10	−11	−12	−13	−14	−15	−16	−17	−18	−19	−20	−21	−22	−23	−24	−25
5	−4	−5	−6	−7	−8	−9	−10	−11	−12	−13	−14	−15	−16	−17	−18	−19	−20
10	1	0	−1	−2	−3	−4	−5	−6	−7	−8	−9	−10	−11	−12	−13	−14	−15
15	6	5	4	3	2	1	0	−1	−2	−3	−4	−5	−6	−7	−8	−9	−10
20	11	10	9	8	7	6	5	4	3	2	1	0	−1	−2	−3	−4	−5
25	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
30	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5
35	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10
40	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15

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Lampiran 7 : Kebutuhan ventilasi standar

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System I, 1965

TABLE 45—VENTILATION STANDARDS

APPLICATION	SMOKING	CFM PER PERSON		CFM PER SQ FT OF FLOOR
		Recommended	Minimum*	Minimum*
Apartment: Average	Some	20	15	—
Apartment: De Luxe	Some	30	25	.33
Banking Space	Occasional	10	7½	—
Barber Shops	Considerable	15	10	—
Beauty Parlors	Occasional	10	7½	—
Broker's Board Rooms	Very Heavy	50	30	—
Cocktail Bars	Heavy	30	25	—
Corridors (Supply or Exhaust)	—	—	—	.25
Department Stores	None	7½	5	.05
Directors Rooms	Extreme	50	30	—
Drug Stores †	Considerable	10	7½	—
Factories ‡§	None	10	7½	.10
Five and Ten Cent Stores	None	7½	5	—
Funeral Parlors	None	10	7½	—
Garage ‡	—	—	—	1.0
Hospitals: Operating Rooms ‡**	None	—	—	2.0
Hospitals: Private Rooms	None	30	25	.33
Hospitals: Wards	None	20	15	—
Hotel Rooms	Heavy	30	25	.33
Kitchen: Restaurant †	—	—	—	4.0
Kitchen: Residence	—	—	—	2.0
Laboratories †	Some	20	15	—
Meeting Rooms	Very Heavy	50	30	1.25
Office: General	Some	15	10	—
Office: Private	None	25	15	.25
Office: Private	Considerable	30	25	.25
Restaurant: Cafeteria †	Considerable	12	10	—
Restaurant: Dining Room †	Considerable	15	12	—
School Rooms ‡	None	—	—	—
Shop Retail	None	10	7½	—
Theater ‡	None	7½	5	—
Theater	Some	15	10	—
Toilets ‡ (Exhaust)	—	—	—	2.0

*When minimum is used, use the larger.
‡See local codes which may govern.
†May be governed by exhaust.
§Use these values unless governed by other sources of contamination or by local codes.
**All outdoor air is recommended to overcome explosion hazard of anesthetics.

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Lampiran 8 : Perolehan kalor dari penghuni

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System I, 1965

TABLE 48—HEAT GAIN FROM PEOPLE

DEGREE OF ACTIVITY	TYPICAL APPLICATION	Metabolic Rate (Adult Male) Btu/hr	Average Adjusted Metabolic Rate* Btu/hr	ROOM DRY-BULB TEMPERATURE									
				82 F		80 F		78 F		75 F		70 F	
				Btu/hr		Btu/hr		Btu/hr		Btu/hr		Btu/hr	
				Sensible	Latent	Sensible	Latent	Sensible	Latent	Sensible	Latent	Sensible	Latent
Seated at rest	Theater, Grade School	390	350	175	175	195	155	210	140	230	120	260	90
Seated, very light work	High School	450	400	180	220	195	205	215	185	240	160	275	125
Office worker	Offices, Hotels, Apts., College	475	450	180	270	200	250	215	235	245	205	285	165
Standing, walking slowly	Dept., Retail, or Variety Store	550											
Walking, seated	Drug Store	550	500	180	320	200	300	220	280	255	245	290	210
Standing, walking slowly	Bank	550											
Sedentary work	Restaurant†	500	550	190	360	220	330	240	310	280	270	320	230
Light bench work	Factory, light work	800	750	190	560	220	530	245	505	295	455	365	385
Moderate dancing	Dance Hall	900	850	220	630	245	605	275	575	325	525	400	450
Walking, 3 mph	Factory, fairly heavy work	1000	1000	270	730	300	700	330	670	380	620	460	540
Heavy work	Bowling Alley‡, Factory	1500	1450	450	1000	465	985	485	965	525	925	605	845

*Adjusted Metabolic Rate is the metabolic rate to be applied to a mixed group of people with a typical percent composition based on the following factors:
Metabolic rate, adult female = Metabolic rate, adult male × 0.85
Metabolic rate, children = Metabolic rate, adult male × 0.75

†Restaurant—Values for this application include 60 Btu per hr for food per individual (30 Btu sensible and 30 Btu latent heat per hr).

‡Bowling—Assume one person per alley actually bowling and all others sitting, metabolic rate 400 Btu per hr; or standing, 550 Btu per hr.

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Lampiran 9 : Apparatus dew point temperatur

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System I, 1965

TABLE 65—APPARATUS DEWPOINTS

90 - 80 F DB

ROOM CONDITIONS DB (F)	RH (%)	WB (F)	W (gr/lb)	EFFECTIVE SENSIBLE HEAT FACTOR AND APPARATUS DEWPOINT*									
90	20	62.7	42.0	ESHF	1.00	.96	.92	.90	.88	.86	.84	.82	.81
				ADP	43.5	41	39	37	35	32	29	24	22
	25	65.1	52.7	ESHF	1.00	.96	.92	.88	.84	.82	.80	.78	.75
				ADP	49.6	48	46	44	41	39	36	32	22
	30	67.3	63.6	ESHF	1.00	.92	.87	.83	.80	.76	.74	.72	.70
				ADP	54.5	52	50	48	46	42	38	34	24
	35	69.3	74.2	ESHF	1.00	.92	.85	.81	.76	.73	.71	.69	.66
				ADP	58.8	57	55	53	50	48	45	42	33
	40	71.2	84.8	ESHF	1.00	.92	.83	.78	.74	.69	.66	.63	.62
				ADP	62.4	61	59	57	55	52	48	44	40
	45	73.0	95.5	ESHF	1.00	.92	.82	.76	.70	.66	.62	.60	.58
				ADP	65.8	65	63	61	59	56	52	49	43
	50	74.9	106.4	ESHF	1.00	.92	.78	.68	.64	.60	.58	.56	.54
				ADP	68.9	68	66	63	61	58	56	53	47
	55	76.7	117.5	ESHF	1.00	.92	.76	.68	.64	.57	.54	.52	.50
				ADP	71.6	71	69	67	66	62	59	57	50
	60	78.4	128.4	ESHF	1.00	.86	.68	.60	.56	.52	.50	.48	.46
				ADP	74.2	73	71	69	67	64	62	59	50
	65	80.0	139.6	ESHF	1.00	.75	.68	.62	.55	.50	.47	.45	.43
				ADP	76.8	75	74	73	71	69	66	64	59
	70	81.6	151.0	ESHF	1.00	.78	.66	.60	.52	.47	.43	.41	.39
				ADP	79.0	78	77	76	74	72	69	66	58
85	20	59.6	35.8	ESHF	1.00	.98	.95	.92	.90	.88	.87	.86	.84
				ADP	39.4	38	36	34	32	30	28	26	22
	25	61.7	44.8	ESHF	1.00	.98	.93	.90	.86	.84	.82	.80	.78
				ADP	45.2	44	42	40	37	35	32	28	20
	30	63.7	54.1	ESHF	1.00	.94	.89	.85	.81	.79	.77	.75	.73
				ADP	50.2	48	46	44	40	38	35	31	22
	35	65.5	62.9	ESHF	1.00	.92	.86	.82	.78	.74	.72	.70	.69
				ADP	54.1	52	50	48	45	41	38	32	27
	40	67.4	71.7	ESHF	1.00	.92	.84	.79	.76	.73	.69	.67	.65
				ADP	57.9	56	54	52	50	48	44	40	32
	45	69.1	81.1	ESHF	1.00	.92	.83	.77	.72	.68	.64	.62	.61
				ADP	61.2	60	58	56	54	51	46	41	36
	50	70.8	90.1	ESHF	1.00	.92	.80	.73	.68	.64	.61	.59	.57
				ADP	64.2	63	61	59	57	54	51	48	39
	55	72.3	99.4	ESHF	1.00	.92	.83	.73	.67	.60	.57	.56	.54
				ADP	66.9	66	65	63	61	57	54	52	47
	60	73.9	108.8	ESHF	1.00	.92	.76	.67	.61	.56	.54	.52	.50
				ADP	69.5	69	67	65	63	60	58	55	49
	65	75.5	118.2	ESHF	1.00	.88	.69	.61	.55	.53	.50	.48	.47
				ADP	71.9	71	69	67	65	63	61	58	54
	70	77.0	127.6	ESHF	1.00	.81	.63	.55	.51	.49	.47	.45	.43
				ADP	74.0	73	71	69	67	66	64	62	55

ROOM CONDITIONS DB (F)	RH (%)	WB (F)	W (gr/lb)	EFFECTIVE SENSIBLE HEAT FACTOR AND APPARATUS DEWPOINT*									
82	45	66.7	73.5	ESHF	1.00	.91	.87	.80	.75	.72	.68	.65	.63
				ADP	58.5	57	56	54	52	50	46	41	53
	50	68.3	81.9	ESHF	1.00	.90	.80	.74	.70	.64	.62	.60	.59
				ADP	61.5	60	58	56	54	50	47	42	37
	55	69.8	90.2	ESHF	1.00	.90	.83	.74	.68	.64	.61	.58	.56
				ADP	64.2	63	62	60	58	56	54	50	44
	60	71.3	98.5	ESHF	1.00	.92	.76	.68	.63	.59	.55	.54	.52
				ADP	66.7	66	64	62	60	58	55	52	44
	65	72.8	107.0	ESHF	1.00	.86	.71	.63	.58	.54	.52	.51	.49
				ADP	69.1	68	66	64	62	60	58	56	51
	70	74.2	115.5	ESHF	1.00	.80	.71	.65	.60	.54	.51	.48	.46
				ADP	71.2	70	69	68	67	65	63	60	56
81	35	62.5	55.2	ESHF	1.00	.94	.89	.84	.81	.77	.75	.73	.71
				ADP	50.8	49	47	45	43	39	36	32	21
	40	64.2	63.2	ESHF	1.00	.94	.87	.82	.78	.75	.72	.69	.67
				ADP	54.4	53	51	49	47	45	41	36	23
	45	65.9	71.2	ESHF	1.00	.96	.91	.83	.78	.74	.70	.67	.64
				ADP	57.6	57	56	54	52	50	47	43	36
	50	67.5	79.0	ESHF	1.00	.90	.84	.80	.74	.70	.66	.62	.60
				ADP	60.5	59	58	57	55	53	50	45	38
	55	69.0	87.4	ESHF	1.00	.90	.77	.71	.66	.62	.60	.58	.56
				ADP	63.2	62	60	58	56	53	51	47	35
	60	70.5	95.4	ESHF	1.00	.92	.77	.68	.63	.59	.56	.54	.53
				ADP	65.8	65	63	61	59	56	53	50	46
	65	71.9	103.7	ESHF	1.00	.85	.76	.71	.66	.60	.56	.52	.50
				ADP	68.2	67	66	65	64	62	60	56	52
	70	73.3	111.9	ESHF	1.00	.80	.71	.61	.55	.52	.48	.47	.46
				ADP	70.3	69	68	66	64	62	58	56	52
80	20	56.4	30.4	ESHF	1.00	.98	.95	.93	.91	.89	.88	.87	.86
				ADP	35.4	34	32	30	28	26	24	22	20
	25	58.3	38.0	ESHF	1.00	.96	.93	.90	.88	.86	.84	.82	.81
				ADP	40.9	39	37	35	33	31	28	24	21
	30	60.0	45.6	ESHF	1.00	.96	.91	.88	.85	.83	.80	.78	.76
				ADP	45.7	44	42	40	38	35	32	28	21
	35	61.8	53.5	ESHF	1.00	.94	.88	.85	.82	.79	.77	.73	.72
				ADP	49.8	48	46	44	42	40	37	29	24
	40	63.5	61.2	ESHF	1.00	.94	.90	.84	.80	.76	.73	.70	.68
				ADP	53.5	52	51	49	47	44	41	36	28
	45	65.1	68.9	ESHF	1.00	.96	.87	.81	.76	.73	.70	.67	.64
				ADP	56.8	56	54	52	50	48	45	41	31
	50	66.7	76.7	ESHF	1.00	.89	.80	.74	.70	.66	.64	.62	.61
				ADP	59.7	58	56	54	52	49	46	42	39
	55	68.2	84.6	ESHF	1.00	.89	.82	.74	.69	.65	.61	.59	.57
				ADP	62.3	61	60	58	56	54	50	47	40
	60	69.8	93.0	ESHF	1.00	.91	.83	.72	.66	.62	.59	.57	.54
				ADP	65.1	64	63	61	59	57	54	51	41

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TABLE 65—APPARATUS DEWPOINTS (Continued)

72 - 55 F DB

ROOM CONDITIONS DB (F)	RH (%)	WB (F)	W (gr/lb)	EFFECTIVE SENSIBLE HEAT FACTOR AND APPARATUS DEWPOINT*									
72	65	64.0	76.3	ESHF	1.00	.84	.73	.67	.63	.61	.59	.58	
				ADP	59.5	58	56	54	52	50	48	47	
	70	65.2	82.3	ESHF	1.00	.80	.69	.62	.59	.56	.54	.53	
				ADP	61.6	60	58	56	54	51	48	44	
70	20	49.9	21.6	ESHF	1.00	.98	.96	.94	.93				
				ADP	27.6	26	24	22	21				
	25	51.5	27.0	ESHF	1.00	.97	.94	.92	.90	.88			
				ADP	33.7	31	29	27	25	22			
	30	53.0	32.8	ESHF	1.00	.98	.94	.91	.88	.86	.84	.82	
				ADP	37.1	36	34	32	30	27	25	20	
	35	54.4	38.0	ESHF	1.00	.97	.93	.89	.86	.84	.82	.80	.78
				ADP	41.1	40	38	36	34	32	30	27	22
	40	55.8	43.5	ESHF	1.00	.95	.90	.86	.83	.80	.78	.76	.74
				ADP	44.5	43	41	39	37	35	32	29	22
	45	57.1	49.1	ESHF	1.00	.93	.87	.82	.79	.77	.75	.73	.71
				ADP	47.7	46	44	42	40	38	36	33	27
	50	58.5	54.8	ESHF	1.00	.92	.84	.80	.76	.74	.71	.69	.67
				ADP	50.5	49	47	45	43	41	38	35	25
	55	59.7	60.1	ESHF	1.00	.93	.83	.77	.73	.71	.68	.66	.64
				ADP	53.1	52	50	48	46	44	42	38	32
	60	60.9	65.5	ESHF	1.00	.89	.79	.73	.69	.66	.64	.62	.61
				ADP	55.4	54	52	50	48	46	43	40	36
	65	62.2	71.1	ESHF	1.00	.93	.78	.71	.66	.63	.61	.59	.58
				ADP	57.7	57	55	53	51	49	47	44	40
	70	63.4	76.9	ESHF	1.00	.90	.74	.66	.61	.59	.57	.56	.55
				ADP	59.8	59	57	55	53	51	49	47	45
	75	64.5	82.5	ESHF	1.00	.88	.70	.62	.57	.55	.53	.52	.51
				ADP	61.7	61	59	57	55	53	51	49	44
	80	65.7	88.0	ESHF	1.00	.87	.73	.65	.60	.54	.51	.49	.48
				ADP	63.5	63	62	61	60	58	56	53	49
	85	66.8	93.7	ESHF	1.00	.71	.56	.52	.50	.48	.47	.46	.45
				ADP	65.3	64	62	61	60	59	58	57	54
	90	67.9	99.3	ESHF	1.00	.66	.56	.50	.47	.45	.43	.42	.41
				ADP	66.9	66	65	64	63	62	61	60	56
	95	69.0	105.0	ESHF	1.00	.60	.47	.42	.39	.38	.37		
				ADP	68.5	68	67	66	65	64	62		
65	60	56.6	55.0	ESHF	1.00	.95	.84	.77	.73	.70	.68	.66	.65
				ADP	50.6	50	48	46	44	42	39	36	34
	65	57.7	59.7	ESHF	1.00	.92	.85	.80	.73	.69	.66	.64	.62
				ADP	52.9	52	51	50	48	46	44	41	37
	70	58.9	64.5	ESHF	1.00	.89	.80	.76	.69	.65	.62	.60	.58
				ADP	55.0	54	53	52	50	48	46	43	37
	75	59.9	69.2	ESHF	1.00	.88	.78	.72	.65	.61	.58	.56	.55
				ADP	56.9	56	55	54	52	50	48	45	41
	80	51.0	73.8	ESHF	1.00	.75	.68	.63	.60	.58	.55	.53	.52
				ADP	58.7	57	56	55	54	53	51	48	46
	85	62.0	78.6	ESHF	1.00	.71	.63	.58	.55	.52	.50	.49	
				ADP	60.3	59	58	57	56	54	52	50	
	90	63.0	83.2	ESHF	1.00	.70	.58	.53	.50	.48	.46	.45	
				ADP	61.9	61	60	59	58	57	55	53	
	95	64.0	88.0	ESHF	1.00	.69	.57	.52	.49	.47	.45		
				ADP	63.5	63	62	61	60	59	57		

ROOM CONDITIONS DB (F)	RH (%)	WB (F)	W (gr/lb)	EFFECTIVE SENSIBLE HEAT FACTOR AND APPARATUS DEWPOINT*									
60	60	52.3	46.2	ESHF	1.00	.94	.89	.81	.77	.74	.72	.70	.68
				ADP	46.0	45	44	42	40	38	36	34	28
	65	53.3	50.0	ESHF	1.00	.91	.86	.78	.74	.70	.69	.67	.65
				ADP	48.1	47	46	44	42	40	39	36	31
	70	54.3	53.9	ESHF	1.00	.89	.83	.74	.70	.67	.65	.63	.62
				ADP	50.1	49	48	46	44	42	40	37	34
	75	55.3	57.8	ESHF	1.00	.79	.74	.71	.68	.64	.62	.60	.59
				ADP	52.0	50	49	48	47	45	43	40	37
	80	56.3	61.7	ESHF	1.00	.85	.76	.70	.66	.61	.59	.57	.56
				ADP	53.8	53	52	51	50	48	46	44	41
	85	57.2	65.5	ESHF	1.00	.75	.67	.63	.57	.56	.54	.53	
				ADP	55.4	54	53	52	50	49	47	45	
	90	58.2	69.4	ESHF	1.00	.72	.62	.57	.54	.52	.50	.49	
				ADP	57.0	56	55	54	53	52	50	47	
	95	59.1	73.5	ESHF	1.00	.69	.55	.49	.47	.46	.45		
				ADP	58.5	58	57	56	55	54	52		
55	60	47.9	38.4	ESHF	1.00	.93	.89	.85	.80	.77	.75	.73	.71
				ADP	41.3	40	39	38	36	34	32	29	23
	65	48.8	41.4	ESHF	1.00	.91	.86	.83	.78	.74	.72	.70	.68
				ADP	43.3	42	41	40	38	36	34	31	24
	70	49.7	44.6	ESHF	1.00	.90	.84	.80	.74	.71	.69	.67	.66
				ADP	45.2	44	43	42	40	38	36	33	31
	75	50.6	48.0	ESHF	1.00	.89	.82	.74	.69	.66	.65	.64	.63
				ADP	47.1	46	45	43	41	39	37	36	34
	80	51.5	51.2	ESHF	1.00	.88	.79	.74	.67	.64	.62	.61	.60
				ADP	48.8	48	47	46	44	42	40	39	37
	85	52.4	54.5	ESHF	1.00	.77	.70	.66	.63	.60	.58	.57	
				ADP	50.4	49	48	47	46	44	42	40	
	90	53.2	57.7	ESHF	1.00	.76	.67	.61	.58	.55	.54	.53	
				ADP	52.0	51	50	49	48	46	44	41	
	95	54.2	61.2	ESHF	1.00	.69	.58	.54	.51	.49			
				ADP	53.6	53	52	51	50	48			

*The values shown in the gray areas indicate the lowest effective sensible heat factor possible without the use of reheat. This limiting condition is the lowest effective sensible heat factor line that intersects the saturation curve. Note that the room dewpoint is equal to the required apparatus dewpoint for an effective sensible heat factor of 1.0.

NOTES FOR TABLE 65:

1. **For Room Conditions Not Given;** The apparatus dewpoint may be determined from the scale on the chart, or may be calculated as shown in the following equation:

$$ESHF = \frac{1}{1 + .628\,\frac{(W_{rm} - W_{adp})}{(t_{rm} - t_{adp})}}$$

This equation in more familiar form is:

$$ESHF = \frac{0.244\,(t_{rm} - t_{adp})}{}$$

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TABLE 65—APPARATUS DEWPOINTS (Continued)

79 - 72 F DB

ROOM CONDITIONS				EFFECTIVE SENSIBLE HEAT FACTOR AND APPARATUS DEWPOINT*									
DB (F)	RH (%)	WB (F)	W (gr/lb)										
79	35	61.0	51.5	ESHF	1.00	.96	.91	.89	.85	.82	.78	.75	.73
				ADP	48.9	48	46	45	43	41	37	32	26
	40	62.7	59.2	ESHF	1.00	.97	.90	.84	.80	.76	.74	.71	.69
				ADP	52.7	52	50	48	46	43	41	36	29
	45	64.3	66.7	ESHF	1.00	.91	.83	.78	.75	.72	.70	.67	.65
				ADP	55.9	54	52	50	48	46	44	39	32
	50	65.9	74.2	ESHF	1.00	.89	.80	.75	.71	.68	.66	.63	.61
				ADP	58.9	57	55	53	51	49	47	42	33
	55	67.4	81.9	ESHF	1.00	.96	.82	.74	.69	.66	.63	.60	.58
				ADP	61.4	61	59	57	55	53	51	47	41
	60	68.8	89.3	ESHF	1.00	.90	.76	.69	.64	.61	.57	.55	.54
				ADP	63.9	63	61	59	57	55	51	47	41
	65	70.2	97.0	ESHF	1.00	.84	.71	.64	.59	.56	.54	.52	.51
				ADP	66.3	65	63	61	59	57	55	51	48
	70	71.6	104.8	ESHF	1.00	.81	.71	.65	.58	.54	.52	.50	.48
				ADP	68.5	67	66	65	63	61	59	57	53
78	35	60.3	50.0	ESHF	1.00	.96	.91	.87	.83	.79	.77	.75	.73
				ADP	48.2	47	45	43	41	37	35	31	22
	40	61.9	57.3	ESHF	1.00	.93	.87	.82	.79	.77	.73	.71	.69
				ADP	51.7	50	48	46	44	42	38	34	25
	45	63.5	64.6	ESHF	1.00	.95	.86	.81	.76	.74	.70	.68	.66
				ADP	55.0	54	52	50	48	46	42	39	34
	50	65.0	71.9	ESHF	1.00	.94	.83	.76	.73	.70	.67	.64	.62
				ADP	57.9	57	55	53	51	49	47	42	36
	55	66.6	79.2	ESHF	1.00	.96	.83	.75	.70	.65	.62	.60	.59
				ADP	60.5	60	58	56	54	51	48	44	41
	60	67.9	86.4	ESHF	1.00	.90	.82	.76	.69	.64	.60	.57	.55
				ADP	63.0	62	61	60	58	56	53	49	42
	65	69.3	93.8	ESHF	1.00	.85	.77	.71	.67	.62	.58	.54	.52
				ADP	65.2	64	63	62	61	59	57	53	48
	70	70.6	101.2	ESHF	1.00	.71	.66	.62	.59	.55	.52	.50	.48
				ADP	67.5	65	64	63	62	60	58	55	48
77	35	59.6	48.3	ESHF	1.00	.96	.91	.87	.83	.79	.77	.75	.74
				ADP	47.3	46	44	42	40	36	33	28	24
	40	61.2	55.5	ESHF	1.00	.96	.89	.84	.81	.78	.76	.73	.70
				ADP	50.9	50	48	46	44	42	40	36	27
	45	62.7	62.4	ESHF	1.00	.94	.86	.81	.77	.74	.72	.69	.66
				ADP	54.1	53	51	49	47	45	43	39	29
	50	64.2	69.7	ESHF	1.00	.94	.84	.77	.73	.70	.68	.65	.63
				ADP	57.0	56	54	52	50	48	46	42	37
	55	65.6	76.6	ESHF	1.00	.95	.83	.75	.70	.67	.63	.61	.59
				ADP	59.6	59	57	55	53	51	48	44	37
	60	67.1	83.6	ESHF	1.00	.89	.82	.77	.73	.67	.62	.58	.56
				ADP	62.0	61	60	59	58	56	53	48	43
	65	68.5	90.8	ESHF	1.00	.84	.72	.64	.60	.57	.55	.54	.53
				ADP	64.4	63	61	59	57	55	53	51	48

ROOM CONDITIONS				EFFECTIVE SENSIBLE HEAT FACTOR AND APPARATUS DEWPOINT*									
DB (F)	RH (%)	WB (F)	W (gr/lb)										
76	35	58.9	46.7	ESHF	1.00	.96	.91	.87	.84	.81	.79	.77	.74
				ADP	46.3	45	43	41	39	37	34	31	21
	40	60.4	53.7	ESHF	1.00	.96	.89	.84	.81	.78	.76	.72	.70
				ADP	49.9	49	47	45	43	41	39	32	22
	45	61.9	60.4	ESHF	1.00	.94	.86	.81	.77	.74	.71	.69	.67
				ADP	53.2	52	50	48	46	44	40	37	31
	50	63.4	67.4	ESHF	1.00	.93	.83	.77	.73	.69	.67	.65	.63
				ADP	56.2	55	53	51	49	46	43	40	32
	55	64.9	74.0	ESHF	1.00	.94	.82	.75	.70	.67	.65	.62	.60
				ADP	58.7	58	56	54	52	50	48	44	38
	60	66.2	80.9	ESHF	1.00	.90	.77	.70	.66	.62	.60	.58	.57
				ADP	61.1	60	58	56	54	52	49	46	43
	65	67.6	87.6	ESHF	1.00	.84	.72	.65	.61	.58	.56	.54	.53
				ADP	63.4	62	60	58	56	54	52	48	43
	70	68.9	94.6	ESHF	1.00	.80	.67	.60	.56	.54	.52	.51	.50
				ADP	65.5	64	62	60	58	56	54	52	49
75	20	53.2	25.7	ESHF	1.00	.98	.96	.94	.92	.90	.89		
				ADP	31.5	30	28	26	24	22	20		
	25	54.8	32.1	ESHF	1.00	.95	.92	.90	.88	.86	.84		
				ADP	36.9	34	32	30	28	25	21		
	30	56.5	38.5	ESHF	1.00	.97	.93	.90	.87	.85	.82	.80	.79
				ADP	41.4	40	38	36	34	32	28	24	20
	35	58.1	45.2	ESHF	1.00	.96	.91	.87	.84	.80	.78	.76	.75
				ADP	45.5	44	42	40	38	34	31	27	22
	40	59.6	51.8	ESHF	1.00	.96	.89	.84	.81	.79	.76	.73	.71
				ADP	49.1	48	46	44	42	40	37	32	24
	45	61.1	58.2	ESHF	1.00	.94	.87	.81	.77	.75	.72	.69	.67
				ADP	52.2	51	49	47	45	43	40	35	21
	50	62.6	65.0	ESHF	1.00	.92	.84	.78	.74	.71	.69	.66	.64
				ADP	55.2	54	52	50	48	46	44	40	34
	55	64.0	71.5	ESHF	1.00	.94	.87	.78	.73	.69	.65	.63	.61
				ADP	57.8	57	56	54	52	50	47	44	39
	60	65.3	77.9	ESHF	1.00	.90	.77	.71	.66	.63	.61	.59	.58
				ADP	60.1	59	57	55	53	51	49	46	43
	65	66.7	84.8	ESHF	1.00	.84	.72	.65	.61	.59	.57	.55	.54
				ADP	62.4	61	59	57	55	53	51	48	44
	70	68.0	91.2	ESHF	1.00	.80	.73	.68	.61	.57	.54	.52	.51
				ADP	64.5	63	62	61	59	57	55	52	49
72	35	55.9	40.8	ESHF	1.00	.98	.93	.89	.86	.83	.81	.79	.77
				ADP	42.8	42	40	38	36	34	31	28	22
	40	57.3	46.7	ESHF	1.00	.95	.92	.87	.84	.81	.77	.75	.73
				ADP	46.3	45	44	42	40	38	34	30	23
	45	58.7	52.7	ESHF	1.00	.94	.87	.82	.79	.76	.74	.71	.69
				ADP	49.5	48	46	44	42	40	38	32	22
	50	60.1	58.8	ESHF	1.00	.92	.88	.81	.77	.73	.70	.68	.66
				ADP	52.4	51	50	48	46	43	40	37	30
	55	61.4	64.4	ESHF	1.00	.93	.83	.77	.72	.68	.66	.64	.63
				ADP	54.9	54	52	50	48	45	42	39	36

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Lampiran 10 : Properti refrigerant R22

Sumber : Faye C. McQuiston, Heating, Ventilating and Air Conditioning, 1982

Celsius Temperature	Pressure Pa	Enthalpy kJ/kg			Entropy kJ/(kg-K)		Specific Volume m^3/kg	
	$P \times 10^{-5}$	i_f	i_{fg}	i_g	s_f	s_g	$v_f \times 10^3$	$v_g \times 10^3$
−40	1.0490	155.624	233.204	388.828	0.82489	1.82512	0.70935	205.841
−35	1.3162	160.923	230.162	391.085	0.84742	1.81388	0.71679	166.470
−30	1.6340	166.291	227.008	393.299	0.86975	1.80337	0.72451	135.907
−28	1.7768	168.458	225.712	394.170	0.87863	1.79934	0.72768	125.613
−26	1.9291	170.636	224.398	395.034	0.88748	1.79542	0.73091	116.262
−24	2.0912	172.826	223.064	395.890	0.89630	1.79160	0.73418	107.747
−22	2.2639	175.027	221.709	396.736	0.90509	1.78786	0.73751	99.9741
−20	2.4472	177.239	220.335	397.574	0.91385	1.78423	0.74090	92.8825
−18	2.6418	179.463	218.939	398.402	0.92259	1.78066	0.74435	86.3881
−16	2.8481	181.698	217.522	399.220	0.93129	1.77719	0.74785	80.4427
−14	3.0666	183.945	216.083	400.028	0.93997	1.77378	0.75142	74.9848
−12	3.2976	186.204	214.622	400.826	0.94862	1.77046	0.75505	69.9736
−10	3.5416	188.473	213.140	401.613	0.95725	1.76720	0.75875	65.3646
−9	3.6686	189.612	212.390	402.002	0.96155	1.76560	0.76062	63.1994
−8	3.7992	190.755	211.634	402.388	0.96585	1.76401	0.76251	61.1184
−7	3.9331	191.900	210.873	402.772	0.97014	1.76245	0.76442	59.1227
−6	4.0708	193.049	210.104	403.153	0.97442	1.76089	0.76635	57.2017
−5	4.2118	194.199	209.332	403.531	0.97870	1.75935	0.76830	55.3612
−4	4.3568	195.354	208.551	403.905	0.98297	1.75782	0.77026	53.5871
−3	4.5054	196.511	207.765	404.277	0.98724	1.75631	0.77225	51.8828
−2	4.6577	197.671	206.974	404.645	0.99150	1.75482	0.77425	50.2452
−1	4.8138	198.834	206.177	405.011	0.99575	1.75334	0.77628	48.6700
0	4.9740	200.000	205.372	405.373	1.00000	1.75187	0.77832	47.1523
1	5.1382	201.170	204.562	405.731	1.00424	1.75041	0.78039	45.6920
2	5.3065	202.343	203.744	406.087	1.00848	1.74896	0.78248	44.2848
3	5.4786	203.517	202.922	406.439	1.01271	1.74753	0.78459	42.9319
4	5.6549	204.696	202.092	406.788	1.01694	1.74612	0.78672	41.6278

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5	5.8360	205.878	201.254	407.132	1.02115	1.74470	0.78887	40.3677
6	6.0207	207.062	200.412	407.474	1.02537	1.74331	0.79105	39.1576
7	6.2100	208.250	199.562	407.812	1.02958	1.74192	0.79325	37.9890
8	6.4036	209.441	198.706	408.147	1.03378	1.74055	0.79548	36.8624
9	6.6020	210.636	197.841	408.477	1.03798	1.73918	0.79773	35.7742
10	6.8045	211.834	196.971	408.804	1.04218	1.73782	0.80001	34.7261
11	7.0123	213.036	196.090	409.126	1.04637	1.73647	0.80231	33.7109
12	7.2239	214.240	195.207	409.447	1.05056	1.73514	0.80464	32.7357
13	7.4408	215.448	194.314	409.761	1.05474	1.73380	0.80699	31.7909
14	7.6626	216.660	193.412	410.072	1.05892	1.73248	0.80937	30.8778
15	7.8890	217.874	192.504	410.378	1.06309	1.73116	0.81179	29.9967
16	8.1203	219.092	191.589	410.681	1.06726	1.72985	0.81423	29.1453
17	8.3566	220.314	190.666	410.979	1.07142	1.72855	0.81670	28.3224
18	8.5980	221.539	189.735	411.274	1.07559	1.72726	0.81920	27.5268
19	8.8446	222.768	188.795	411.563	1.07974	1.72597	0.82173	26.7567
20	9.0967	224.002	187.846	411.847	1.08390	1.72468	0.82430	26.0109
21	9.3535	225.237	186.891	412.128	1.08805	1.72341	0.82689	25.2910
22	9.6158	226.477	185.926	412.403	1.09220	1.72214	0.82953	24.5937
23	9.8840	227.722	184.951	412.673	1.09634	1.72086	0.83219	23.9174
24	10.157	228.970	183.970	412.939	1.10049	1.71960	0.83489	23.2643
25	10.436	230.222	182.978	413.200	1.10463	1.71834	0.83763	22.6307
26	10.720	231.477	181.978	413.455	1.10876	1.71708	0.84041	22.0177
27	11.011	232.738	180.967	413.705	1.11290	1.71582	0.84322	21.4229
28	11.306	234.001	179.949	413.950	1.11703	1.71457	0.84608	20.8476
29	11.608	235.270	178.920	414.190	1.12117	1.71332	0.84897	20.2890
30	11.915	236.543	177.881	414.424	1.12530	1.71207	0.85191	19.7478
31	12.229	237.820	176.831	414.651	1.12943	1.71082	0.85489	19.2222
32	12.549	239.102	175.771	414.873	1.13356	1.70957	0.85791	18.7129
33	12.874	240.389	174.700	415.089	1.13769	1.70832	0.86099	18.2183
34	13.206	241.678	173.621	415.300	1.14181	1.70708	0.86410	17.7397
35	13.544	242.976	172.527	415.502	1.14594	1.70582	0.86727	17.2732
36	13.889	244.276	171.424	415.700	1.15007	1.70457	0.87049	16.8217
37	14.239	245.580	170.310	415.891	1.15420	1.70332	0.87376	16.3832

Celsius Temperature	Pressure Pa	Enthalpy kJ/kg			Entropy kJ/(kg-K)		Specific Volume m^3/kg	
	$P \times 10^{-5}$	i_f	i_{fg}	i_g	s_f	s_g	$v_f \times 10^3$	$v_g \times 10^3$
38	14.597	246.892	169.182	416.074	1.15833	1.70206	0.87708	15.9564
39	14.960	248.207	168.044	416.251	1.16246	1.70080	0.88046	15.5425
40	15.331	249.530	166.890	416.419	1.16659	1.69953	0.88390	15.1396
41	15.708	250.857	165.725	416.581	1.17073	1.69826	0.88739	14.7482
42	16.092	252.190	164.546	416.735	1.17487	1.69699	0.89095	14.3677
43	16.483	253.528	163.355	416.882	1.17901	1.69571	0.89457	13.9980
44	16.881	254.873	162.148	417.020	1.18315	1.69442	0.89825	13.6380
45	17.286	256.223	160.927	417.150	1.18730	1.69312	0.90201	13.2880
46	17.698	257.581	159.690	417.271	1.19145	1.69181	0.90583	12.9471
47	18.117	258.944	158.440	417.384	1.19561	1.69050	0.90973	12.6157
48	18.543	260.314	157.173	417.487	1.19977	1.68918	0.91371	12.2929
49	18.977	261.692	155.889	417.581	1.20394	1.68784	0.91777	11.9784
50	19.418	263.073	154.594	417.667	1.20811	1.68650	0.92190	11.6731
52	20.323	265.866	151.938	417.804	1.21648	1.68377	0.93044	11.0839
54	21.258	268.686	149.214	417.900	1.22488	1.68099	0.93936	10.5251
56	22.227	271.546	146.400	417.946	1.23334	1.67812	0.94869	9.99235
58	23.227	274.441	143.502	417.943	1.24183	1.67518	0.95847	9.48558
60	24.260	277.373	140.514	417.887	1.25038	1.67215	0.96874	9.00332
62	25.326	280.348	137.423	417.771	1.25899	1.66903	0.97957	8.54301
64	26.428	283.373	134.216	417.589	1.26768	1.66577	0.99101	8.10286
66	27.566	286.451	130.883	417.334	1.27647	1.66238	1.00314	7.68155
68	28.740	289.585	127.417	417.002	1.28535	1.65884	1.01604	7.27841
70	29.952	292.786	123.795	416.581	1.29436	1.65512	1.02983	6.89127
75	33.153	301.133	113.925	415.058	1.31757	1.64480	1.06911	5.98528
80	36.614	310.139	102.511	412.650	1.34222	1.63249	1.11803	5.15095

*Abstracted by permission from "Thermodynamic Table for Refrigerant R22 in SI-Units," International Institute of Refrigeration, Paris.

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Lampiran 11 : Sifat termodinamika refrigerant R22

Sumber : Faye C. McQuiston, Heating, Ventilating and Air Conditioning, 1982

Celsius Temperature	Viscosity, μ (N-s)/m²			Thermal Conductivity, k W/(m-K)			Specific Heat, c_p kJ/(kg-K)			Kelvin Temperature
	Saturated Liquid $\mu \times 10^3$	Saturated Vapor $\mu \times 10^3$	Gas $P = 101.33$ kPa $\mu \times 10^5$	Saturated Liquid	Saturated Vapor	Gas $P = 101.33$ kPa $k \times 10$	Saturated Liquid	Saturated Vapor	Gas $P = 0$	
−73	0.4766			0.137			1.07		0.5275	200
−62	0.4142			0.131			1.07		0.5409	211
−51	0.365			0.125			1.08	0.582	0.5543	222
−40	0.326	0.0100	1.00	0.120	0.0069	0.0699	1.10	0.611	0.5677	233
−29	0.294	0.0105	1.05	0.114	0.0076	0.0767	1.11	0.636	0.5811	244
−18	0.267	0.0110	1.10	0.109	0.0083	0.0832	1.13	0.662	0.5945	255
−7	0.245	0.0115	1.14	0.103	0.0090	0.0900	1.16	0.691	0.6079	266
4	0.226	0.0121	1.19	0.0980	0.0097	0.0966	1.18	0.733	0.6213	277
16	0.210	0.0126	1.24	0.0924	0.010	0.103	1.22	0.783	0.6343	289
27	0.196	0.0133	1.28	0.0869	0.011	0.110	1.26	0.854	0.6473	300
38	0.184	0.0140	1.33	0.0815	0.012	0.117	1.31	0.946	0.6603	311
49	0.174	0.0149	1.38	0.0760	0.012	0.123	1.39	1.06	0.6732	322
60	0.160	0.0158	1.42	0.0704	0.013	0.130	1.49	1.21	0.6858	333
71	0.141	0.0170	1.46	0.0642	0.015	0.137	1.63	1.39	0.6984	344
82	0.118	0.019	1.51	0.0550	0.018	0.143	1.81		0.7105	355
88	0.101	0.020	1.53	0.0498	0.021	0.147			0.7168	361
94	0.075	0.024	1.55	0.0412	0.024	0.150			0.7226	367
96	0.031	0.031	1.57	0.0306	0.031	0.152			0.7256	369
105			1.60			0.157			0.7344	378
116			1.65			0.163			0.7461	389
127			1.69			0.170			0.7578	400
138			1.73			0.1767			0.7687	411
149			1.77			0.1833			0.7800	422
160			1.81			0.190			0.7905	433
171			1.86			0.197			0.8009	444
183			1.90			0.204			0.8110	456
194			1.94			0.209			0.8206	467
205			1.98			0.216			0.8302	478
216			2.03			0.223			0.8395	489
227			2.07			0.230			0.8482	500

*Adapted by permission from *ASHRAE Handbook of Fundamentals*, 1972.

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Lampiran 12 : Tabel pemilihan pipa tembaga

Sumber : Willliam S. Janna, Process Heat Transfer, 1986

	Outside diameter			Internal diameter		Flow area	
Standard size	in.	cm	Type	ft	cm	ft^2	cm^2
$\frac{1}{4}$	0.375	0.953	K	0.02542	0.775	0.0005074	0.4717
			L	0.02625	0.801	0.0005412	0.5039
$\frac{3}{8}$	0.500	1.270	K	0.03350	1.022	0.0008814	0.8203
			L	0.03583	1.092	0.001008	0.9366
			M	0.03750	1.142	0.001104	1.024
$\frac{1}{2}$	0.625	1.588	K	0.04392	1.340	0.001515	1.410
			L	0.04542	1.384	0.001620	1.505
			M	0.04742	1.446	0.001766	1.642
$\frac{5}{8}$	0.750	1.905	K	0.05433	1.657	0.002319	2.156
			L	0.05550	1.691	0.002419	2.246
$\frac{3}{4}$	0.875	2.222	K	0.06208	1.892	0.003027	2.811
			L	0.06542	1.994	0.003361	3.123
			M	0.06758	2.060	0.003587	3.333
1	1.125	2.858	K	0.08292	2.528	0.005400	5.019
			L	0.08542	2.604	0.005730	5.326
			M	0.08792	2.680	0.006071	5.641
$1\frac{1}{4}$	1.375	3.493	K	0.1038	2.163	0.008454	7.858
			L	0.1054	3.213	0.008728	8.108
			M	0.1076	3.279	0.009090	8.444
$1\frac{1}{2}$	1.625	4.128	K	0.1234	3.762	0.01196	11.12
			L	0.1254	3.824	0.01235	11.48
			M	0.1273	3.880	0.01272	11.82
2	2.125	5.398	K	0.1633	4.976	0.02093	11.95
			L	0.1654	5.042	0.02149	19.97
			M	0.1674	5.102	0.02201	20.44
$2\frac{1}{2}$	2.625	6.668	K	0.2029	6.186	0.03234	30.05
			L	0.2054	6.262	0.03314	30.80
			M	0.2079	6.338	0.03395	40.17
3	3.125	7.938	K	0.2423	7.384	0.04609	42.82
			L	0.2454	7.480	0.04730	43.94
			M	0.2484	7.572	0.04847	45.03
$3\frac{1}{2}$	3.625	9.208	K	0.2821	8.598	0.06249	58.06
			L	0.2854	8.700	0.06398	59.45
			M	0.2883	8.786	0.06523	60.63
4	4.125	10.48	K	0.3214	9.800	0.08114	75.43
			L	0.3254	9.922	0.08317	77.32
			M	0.3279	9.998	0.08445	78.51
5	5.125	13.02	K	0.4004	12.21	0.1259	117.10
			L	0.4063	12.38	0.1296	120.50
			M	0.4089	12.47	0.1313	122.10

* Dimensions in English units obtained from ANSI/ASTM B88-78, "Standard Specifications for Seamless

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Lampiran 13 : Sifat termodinamika material

Sumber : William S. Janna, Process Heat Transfer, 1986

Thermal Properties of selected metallic elements at 293 K (20°C) or 528°R (68°F).

Specific gravity	Specific heat, c_p		Thermal conductivity, k		Diffusivity, α		Melting temperature	
	J/(kg·K)	BTU/lbm·°R	W/(m·K)	BTU/hr·ft·°R	$m^2/s \times 10^6$	$ft^2/s \times 10^3$	K	°R
2.702	896	0.214	236	136	97.5	1.05	933	1,680
1.850	1750	0.418	205	118	63.3	0.681	1 550	2,790
7.160	440	0.105	91.4	52.8	29.0	0.312	2 118	3,812
8.933	383	0.0915	399	231	116.6	1.26	1 356	2,441
19.300	129	0.0308	316	183	126.9	1.37	1 336	2,405
7.870	452	0.108	31.1	18.0	22.8	0.245	1 810	3,258
11.340	129	0.0308	35.3	20.4	24.1	0.259	601	1,082
1.740	1017	0.243	156	90.1	88.2	0.949	923	1,661
7.290	486	0.116	7.78	4.50	2.2	0.0236	1 517	2,731
10.240	251	0.0600	138	79.7	53.7	0.578	2 883	5,189
8.900	446	0.107	91	52.6	22.9	0.246	1 726	3,107
21.450	133	0.0318	71.4	41.2	25.0	0.269	2 042	3,676
0.860	741	0.177	103	59.6	161.6	1.74	337	607
2.330	703	0.168	153	88.4	93.4	1.01	1 685	3,033
10.500	234	0.0559	427	247	173.8	1.87	1 234	2,221
5.750	227	0.0542	67.0	38.7	51.3	0.552	505	909
4.500	611	0.146	22.0	12.7	8.0	0.0861	1 953	3,515
19.300	134	0.0320	179	103	69.2	0.745	3 653	6,575
19.070	113	0.0270	27.4	15.8	12.7	0.137	1 407	2,533
6.100	502	0.120	31.4	18.1	10.3	0.111	2 192	3,946
7.140	385	0.0920	121	69.9	44.0	0.474	693	1,247

om several sources.

ty = ρ = specific gravity × 62.4 lbm/ft^3 = specific gravity × 1 000 kg/m^3
ty = α; for aluminum, α m^2/s × 10^6 = 97.5; so $\alpha = 97.5 \times 10^{-6}$ m^2/s
$\alpha = k/\rho c_p$

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Lampiran 14 : Sifat termodinamika udara

Sumber : Faye C. McQuiston, Heating, Ventilating and Air Conditioning, 1982

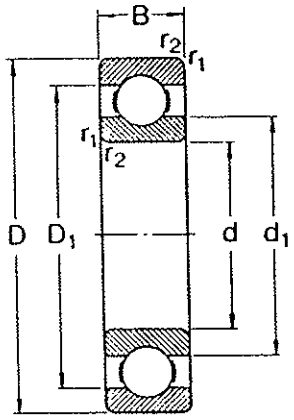
Celsius Temperature	Viscosity, μ (N-s)/m²			Thermal Conductivity, k W/(m-K)			Specific Heat, c_p kJ/(kg-K)			Kelvin Temperature
	Saturated Liquid $\mu \times 10^3$	Saturated Vapor $\mu \times 10^3$	Gas $P = 101.33$ kPa $\mu \times 10^6$	Saturated Liquid	Saturated Vapor	Gas $P = 101.33$ kPa	Saturated Liquid	Saturated Vapor	Gas $P = 0$	Gas $P = 101.33$ kPa	
−213	0.325			0.180	0.0054						60
−203	0.221			0.163	0.0064						70
−193	0.165	0.0055		0.145	0.0075		1.963		1.002		80
−183	0.132	0.0065	6.35	0.128	0.0086	0.0083	2.077	1.12	1.002		90
−173	0.1101	0.0075	7.06	0.110	0.0101	0.0092	2.205	1.21	1.002	1.028	100
−163	0.0949	0.0086	7.75	0.093	0.0122	0.0102	2.421	1.44	1.002	1.022	110
−153	0.0750	0.0102	8.43	0.076	0.0154	0.0111	2.80	2.00	1.002	1.017	120
−143	0.0420	0.0143	9.09	0.054	0.021	0.0120			1.002	1.014	130
−140	0.0207	0.0207	9.29	0.034	0.034	0.0123			1.002	1.013	133
−133			9.74			0.0129			1.002	1.012	140
−123			10.38			0.0138			1.002	1.011	150
−113			11.0			0.0146			1.002	1.009	160
−93			12.2			0.0164			1.002	1.007	180
−73			13.4			0.0181			1.002	1.006	200
−53			14.5			0.0198			1.003	1.006	220
−33			15.5			0.0215			1.003	1.005	240
−13			16.6			0.0231			1.003	1.005	260
7			17.6			0.0246			1.004	1.006	280
27			18.5			0.0261			1.005	1.006	300
47			19.5			0.0276			1.006	1.007	320
67			20.4			0.0290			1.007	1.008	340
87			21.3			0.0304			1.009	1.010	360
107			22.1			0.0317			1.011	1.012	380
127			22.9			0.0331			1.013	1.014	400
147			23.8			0.0344			1.016	1.017	420
167			24.5			0.0357			1.019	1.020	440
187			25.3			0.0370			1.022	1.023	460
207			26.1			0.0383			1.025	1.026	480
227			26.8			0.0395			1.029	1.030	500
327			30.3			0.0456			1.051	1.052	600

*Reprinted by permission from *ASHRAE Handbook of Fundamentals*, 1972.

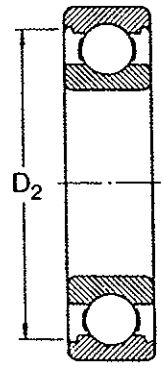
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Lampiran 15 : Spesifikasi bantalan bola untuk poros kompresor

Sumber : SKF General Catalogue



With full outer ring shoulders



With recessed outer ring shoulders

Principal dimensions			Basic load ratings dynamic	static	Fatigue load limit	Speed ratings Lubrication grease	oil	Mass	Designation
d	D	B	C	C_0	P_u				
mm			N		N	r/min		kg	–
15	24	5	1 560	800	34	28 000	34 000	0,0074	61802
	28	7	4 030	2 040	85	24 000	30 000	0,016	61902
	32	8	5 590	2 850	120	22 000	28 000	0,025	16002
	32	9	5 590	2 850	120	22 000	28 000	0,030	6002
	35	11	7 800	3 750	160	19 000	24 000	0,045	6202
	42	13	11 400	5 400	228	17 000	20 000	0,082	6302
17	26	5	1 680	930	39	24 000	30 000	0,0082	61803
	30	7	4 360	2 320	98	22 000	28 000	0,018	61903
	35	8	6 050	3 250	137	19 000	24 000	0,032	16003
	35	10	6 050	3 250	137	19 000	24 000	0,039	6003
	40	12	9 560	4 750	200	17 000	20 000	0,065	6203
	47	14	13 500	6 550	275	16 000	19 000	0,12	6303
	62	17	22 900	10 800	455	12 000	15 000	0,27	6403
20	32	7	2 700	1 500	63	19 000	24 000	0,018	61804
	37	9	6 370	3 650	156	18 000	22 000	0,038	61904
	42	8	6 890	4 050	173	17 000	20 000	0,050	16004
	42	12	9 360	5 000	212	17 000	20 000	0,069	6004
	47	14	12 700	6 550	280	15 000	18 000	0,11	6204
	52	15	15 900	7 800	335	13 000	16 000	0,14	6304
	72	19	30 700	15 000	640	10 000	13 000	0,40	6404
25	37	7	4 360	2 600	125	17 000	20 000	0,022	61805
	42	9	6 630	4 000	176	16 000	19 000	0,045	61905
	47	8	7 610	4 750	212	14 000	17 000	0,060	16005
	47	12	11 200	6 550	275	15 000	18 000	0,080	6005
	52	15	14 000	7 800	335	12 000	15 000	0,13	6205
	62	17	22 500	11 600	490	11 000	14 000	0,23	6305
	80	21	35 800	19 300	815	9 000	11 000	0,53	6405
30	42	7	4 490	2 900	146	15 000	18 000	0,027	61806
	47	9	7 280	4 550	212	14 000	17 000	0,051	61906

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Lampiran 16 : Persentase area ducting dalam percabangan

Sumber : Carrier Air Conditioning Company, Handbook of Air Conditioning System II, 1965

TABLE 13—PERCENT SECTION AREA IN BRANCHES FOR MAINTAINING EQUAL FRICTION

CFM CAPACITY %	DUCT AREA %	CFM CAPACITY %	DUCT AREA %	CFM CAPACITY %	DUCT AREA %	CFM CAPACITY %	DUCT AREA %
1	2.0	26	33.5	51	59.0	76	81.0
2	3.5	27	34.5	52	60.0	77	82.0
3	5.5	28	35.5	53	61.0	78	83.0
4	7.0	29	36.5	54	62.0	79	84.0
5	9.0	30	37.5	55	63.0	80	84.5
6	10.5	31	39.0	56	64.0	81	85.5
7	11.5	32	40.0	57	65.0	82	86.0
8	13.0	33	41.0	58	65.5	83	87.0
9	14.5	34	42.0	59	66.5	84	87.5
10	16.5	35	43.0	60	67.5	85	88.5
11	17.5	36	44.0	61	68.0	86	89.5
12	18.5	37	45.0	62	69.0	87	90.0
13	19.5	38	46.0	63	70.0	88	90.5
14	20.5	39	47.0	64	71.0	89	91.5
15	21.5	40	48.0	65	71.5	90	92.0
16	23.0	41	49.0	66	72.5	91	93.0
17	24.0	42	50.0	67	73.5	92	94.0
18	25.0	43	51.0	68	74.5	93	94.5
19	26.0	44	52.0	69	75.5	94	95.0
20	27.0	45	53.0	70	76.5	95	96.0
21	28.0	46	54.0	71	77.0	96	96.5
22	29.5	47	55.0	72	76.0	97	97.5
23	30.5	48	56.0	73	79.0	98	98.0
24	31.5	59	57.0	74	80.0	99	99.0
25	32.5	50	58.0	75	80.5	100	100.0

