

Supplementary Document

# Comparative Analysis of Cooling Load Calculations: CLTD Method vs. Carrier HAP 5.01 Software for Hotel HVAC Design

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## Appendixes

**Table 1.** Standard CLTD cooling load

Lantai : Lt. 5,6 & 7 Kamar Standart Room  
 Lat : 6° Lintang Selatan  
 Bulan : Mei  
 Jam : 14:00

	Temperatur Bola Kering / DB °F		Temperatur Bola Basah / WB °F		Relative Humidity (RH) %	W gr/lb	W lb/lb
Kondisi Luar	91,4 °F	33,0 °C	80,6 °F	27,0 °C	65	138,18	0,01974
Desain Dalam	78,8 °F	26,0 °C	73,4 °F	23,0 °C	50	114,87	0,01641

Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			Factor	RSHG BTU/hr	
					Table 3.10	Table 3.12	Corr.			
Atap				0,00						
Beban External	Dinding	Utara	0,248	0,00	17	7	21,2	0,65	0,00	
		Timur	0,248	0,00	39	-7	26,4	0,65	0,00	
		Selatan	0,248	0,00	34	-2	26,4	0,65	0,00	
		Barat	0,248	14,2	152,85	20	-2	17,3	0,65	426,26
Beban External	Kaca Konduksi	Utara	1,04	0,00	13		18,6		0,00	
		Timur	1,04	0,00	13		18,6		0,00	
		Selatan	1,04	0,00	13		18,6		0,00	
		Barat	1,04	2	21,53	13		18,6		416,43
Beban External	Kaca Radiasi	Utara	74	0	0,00	1	0,75		0,00	
		Timur	209	0	0,00	1	0,31		0,00	
		Selatan	38	0	0,00	1	0,58		0,00	
		Barat	209	2	21,53	1	0,29		1.304,80	
Beban External	Partisi	0	0	0,00					0,00	
	Ceiling	0,059	22,56	242,83		12,6			179,98	
	Lantai	0		0,00					0,00	
	Pintu	0		0,00					0,00	

Beban Internal	Jumlah	Konversi	Daya Watt	Total Watt	Fu	Fs	Table 4.2	CLF	RSHG BTU/hr
Lampu DL-01 8 W	9	3,41	36,00	324,0	1	1,3	0,55	1	1.436
Lampu LE-02-7.2 W/m	3,2	3,41	18,00	57,6	1	1,3	0,55	1	255
Lampu LE-01-5 W/m	2,2	3,41	32,00	70,4	1	1,3	0,55	1	312

Beban Internal	Jumlah Orang	SHG	LHG	CLF	RSHG BTU/hr	RLHG BTU/hr
Penghuni	2	230		1	460,00	
	2		190	1		380,00

Beban Internal	Jumlah	Daya Watt	Total Watt	Konversi	Cs	CI	CLF	RSHG BTU/hr	RLHG BTU/hr
TV 49"	1	150	150	512	0,33	0,17	1	169	87
Coffe Maker	1	350	350	1.195	0,33	0,17	1	394	203
Mini Kulkas	1	100	100	342	0,33	0,17	1	113	58

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Infiltrasi Sensibel	1,1	0,005	0	0,00	0,0	0,0	0,000	-	-
Infiltrasi Laten	4.840	0,005	0	0,00	0,0	0,0	0,000	-	-
Total Room Heat Gean								5.467,39	728,35

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Ventilasi Sensibel	1,1	0,005	22,56	242,83	1,2	8,5	12,600	117,80	
Ventilasi Laten	4.840	0,005	22,56	242,83	1,2	8,5	0,0033		136,98
Total Sensible Heat (TSH) / Total Laten Heat (TLH) Cooling Load								5.585,19	865,33
Safety Factor 10%								558,519	86,533
TOTAL BTU/hr								7.096	
TOTAL W/hr								2.080	
TON REFRIGERANT (TR)								0,59	

**Table 2.** Mid internal room CLTD cooling load

Lantai : Lt. 5,6 & 7 Mid Type Room Internal  
 Lat : 6° Lintang Selatan  
 Bulan : Mei  
 Jam : 14:00

	Temperatur Bola Kering / DB °F		Temperatur Bola Basah / WB °F		Relative Humidity (RH) %	W gr/lb	W lb/lb
Kondisi Luar	91,4 °F	33,0 °C	80,6 °F	27,0 °C	65	138,18	0,01974
Desain Dalam	78,8 °F	26,0 °C	73,4 °F	23,0 °C	50	114,87	0,01641

Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			Factor	RSHG BTU/hr
							Corr.		
Atap				0,00					
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			LM	RSHG BTU/hr
					Table 3.10	Table 3.12	Corr.		
Dinding	Utara	0,248		0,00	17	7	21,2	0,65	0,00
	Timur	0,248		0,00	39	-7	26,4	0,65	0,00
	Selatan	0,248		0,00	34	-2	26,4	0,65	0,00
	Barat	0,248	14,2	152,85	20	-2	17,3	0,65	426,26
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F		RSHG BTU/hr		
					Table 3.23	Corr.			
Kaca Konduksi	Utara	1,04		0,00	13	18,6	0,00		
	Timur	1,04		0,00	13	18,6	0,00		
	Selatan	1,04		0,00	13	18,6	0,00		
	Barat	1,04	4	43,06	13	18,6	832,87		
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F		RSHG BTU/hr		
					Table 3.25 (SHGF) 8°	Table 3.27 (CLF)			
Kaca Radiasi	Utara	74	0	0,00	1	0,75	0,00		
	Timur	209	0	0,00	1	0,31	0,00		
	Selatan	38	0	0,00	1	0,58	0,00		
	Barat	209	4	43,06	1	0,29	2.609,60		
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	Δ		RSHG BTU/hr		
Partisi		0		0,00		12,6	0,00		
Ceiling		0,059	24,71	265,98		12,6	197,14		
Lantai		0		0,00			0,00		
Pintu		0		0,00			0,00		

Beban Internal	Jumlah	Konversi	Daya Watt	Total Watt	Fu	Fs	Table 4.2	CLF	RSHG BTU/hr
Lampu DL-01 8 W	8	3,41	36,00	288,0	1	1,3	0,55	1	1.277
Lampu LE-02-7.2 W/m	11,6	3,41	18,00	208,8	1	1,3	0,55	1	926
Lampu LE-01-5 W/m	1,7	3,41	32,00	54,4	1	1,3	0,55	1	241

Beban Internal	Jumlah Orang	SHG	LHG	CLF	RSHG BTU/hr	RLHG BTU/hr
Penghuni	2	230		1	460,00	
	2		190	1		380,00

Beban Internal	Jumlah	Daya Watt	Total Watt	Konversi	Cs	Cl	CLF	RSHG BTU/hr	RLHG BTU/hr
TV 49"	1	150	150	512	0,33	0,17	1	169	87
Coffe Maker	1	350	350	1.195	0,33	0,17	1	394	203
Mini Kulkas	1	100	100	342	0,33	0,17	1	113	58

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S)		RSHG BTU/hr	RLHG BTU/hr
							ΔW (L)			
Infiltrasi Sensibel	1,1	0,005	0	0,00	0,0	0,0	0,000		-	
Infiltrasi Laten	4.840	0,005	0	0,00	0,0	0,0	0,0000		-	
<b>Total Room Heat Gear</b>									<b>7.645,54</b>	<b>728,35</b>

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S)		RSHG BTU/hr	RLHG BTU/hr
							ΔW (L)			
Ventilasi Sensibel	1,1	0,005	24,71	265,98	1,3	9,3	12,600		129,03	
Ventilasi Laten	4.840	0,005	24,71	265,98	1,3	9,3	0,0033			150,04
<b>Total Sensible Heat (TSH) / Total Laten Heat (TLH) Cooling Load</b>									<b>7.774,56</b>	<b>878,39</b>
<b>Safety Factor 10%</b>									<b>777,456</b>	<b>87,839</b>
<b>TOTAL BTU/hr</b>									<b>9.518</b>	
<b>TOTAL W/hr</b>									<b>2.790</b>	
<b>TON REFRIGERANT (TR)</b>									<b>0,79</b>	

**Table 3.** Mid external room CLTD cooling load

Lantai : Lt. 5,6 & 7 Mid Type Room External  
 Lat : 6° Lintang Selatan  
 Bulan : Mei  
 Jam : 14:00

	Temperatur Bola Kering / DB °F	Temperatur Bola Basah / WB °F	Relative Humidity (RH) %	W gr/lb	W lb/lb		
Kondisi Luar	91,4 °F	33,0 °C	65	138,18	0,01974		
Desain Dalam	78,8 °F	26,0 °C	73,4 °F	23,0 °C	50	114,87	0,01641

Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			Factor	RSHG BTU/hr
					Table 3.10	Table 3.12	Corrr.		
Atap				0,00					
Dinding	Utara	0,248	19,52	210,11	17	7	21,2	0,65	718,04
	Timur	0,248		0,00	39	-7	26,4	0,65	0,00
	Selatan	0,248		0,00	34	-2	26,4	0,65	0,00
	Barat	0,248	14,2	152,85	20	-2	17,3	0,65	426,26
Kaca Konduksi	Utara	1,04	4	43,06	13		18,6		832,87
	Timur	1,04		0,00	13		18,6		0,00
	Selatan	1,04		0,00	13		18,6		0,00
	Barat	1,04	2	21,53	13		18,6		416,43
Kaca Radiasi	Utara	74	4	43,06	1		0,75		2.389,59
	Timur	209	0	0,00	1		0,31		0,00
	Selatan	38	0	0,00	1		0,58		0,00
	Barat	209	2	21,53	1		0,29		1.304,80
Partisi		0		0,00					0,00
Ceiling		0,059	25,16	270,82			12,6		200,73
Lantai		0		0,00					0,00
Pintu		0		0,00					0,00

Beban Internal	Jumlah	Konversi	Daya Watt	Total Watt	Fu	Fs	Table 4.2	CLF	RSHG BTU/hr
Lampu DL-01 8 W	8	3,41	36,00	288,0	1	1,3	0,55	1	1.277
Lampu LE-02-7.2 W/m	9,7	3,41	18,00	174,6	1	1,3	0,55	1	774
Lampu LE-01-5 W/m	1	3,41	32,00	32,0	1	1,3	0,55	1	142

Beban Internal	Jumlah Orang	SHG	LHG	CLF	RSHG BTU/hr	RLHG BTU/hr
Penghuni	2	230		1	460,00	
	2		190	1		380,00

Beban Internal	Jumlah	Daya Watt	Total Watt	Konversi	Cs	CI	CLF	RSHG BTU/hr	RLHG BTU/hr
TV 49"	1	150	150	512	0,33	0,17	1	169	87
Coffe Maker	1	350	350	1.195	0,33	0,17	1	394	203
Mini Kulkas	1	100	100	342	0,33	0,17	1	113	58

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Infiltrasi Sensibel	1,1	0,005	0	0,00	0,0	0,0	0,000	-	-
Infiltrasi Laten	4.840	0,005	0	0,00	0,0	0,0	0,0000	-	-
<b>Total Room Heat Gear</b>								<b>9.617,48</b>	<b>728,35</b>

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Ventilasi Sensibel	1,1	0,005	25,16	270,82	1,4	9,5	12,600	131,37	
Ventilasi Laten	4.840	0,005	25,16	270,82	1,4	9,5	0,0033		152,77
<b>Total Sensible Heat (TSH) / Total Laten Heat (TLH) Cooling Load</b>								<b>9.748,86</b>	<b>881,12</b>
<b>Safety Factor 10%</b>								<b>974,886</b>	<b>88,112</b>
<b>TOTAL BTU/hr</b>								<b>11.693</b>	
<b>TOTAL W/hr</b>								<b>3.427</b>	
<b>TON REFRIGERANT (TR)</b>								<b>0,97</b>	

**Table 4.** CLTD cooling loads for suite living rooms

Lantai : Lt. 5,6 & 7 Suite Type Living Room  
 Lat : 6° Lintang Selatan  
 Bulan : Mei  
 Jam : 14:00

	Temperatur Bola Kering / DB °F		Temperatur Bola Basah / WB °F		Relative Humidity (RH) %	W gr/lb	W lb/lb
Kondisi Luar	91,4 °F	33,0 °C	80,6 °F	27,0 °C	65	138,18	0,01974
Desain Dalam	78,8 °F	26,0 °C	73,4 °F	23,0 °C	50	114,87	0,01641

Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			Factor	RSHG BTU/hr
					Table 3.10	Table 3.12	Corr.		
Atap				0,00					
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			LM	RSHG BTU/hr
					Table 3.10	Table 3.12	Corr.		
Dinding	Utara	0,248		0,00	17	7	21,2	0,65	0,00
	Timur	0,248	16	172,22	39	-7	26,4	0,65	732,92
	Selatan	0,248	0	0,00	34	-2	26,4	0,65	0,00
	Barat	0,248		0,00	20	-2	17,3	0,65	0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			RSHG BTU/hr	
					Table 3.23	Corr.			
Kaca Konduksi	Utara	1,04		0,00	13		18,6		0,00
	Timur	1,04	16	172,22	13		18,6		3.331,47
	Selatan	1,04		0,00	13		18,6		0,00
	Barat	1,04		0,00	13		18,6		0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			RSHG BTU/hr	
					Table 3.25 (SHGF) 8°	Table 3.18 (SC)	Table 3.27 (CLF)		
Kaca Radiasi	Utara	74	0	0,00	1		0,75		0,00
	Timur	209	16	172,22	1		0,31		11.158,30
	Selatan	38	0	0,00	1		0,58		0,00
	Barat	209	0	0,00	1		0,29		0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	TA			RSHG BTU/hr	
Partisi		0		0,00					0,00
Ceiling		0,059	31,56	339,71			12,6		251,78
Lantai		0		0,00					0,00
Pintu		0		0,00					0,00

Beban Internal	Jumlah	Konversi	Daya Watt	Total Watt	Fu	Fs	Table 4.2	CLF	RSHG BTU/hr
Lampu DL-01 8 W	9	3,41	36,00	324,0	1	1,3	0,55	1	1.436
Lampu LE-02-7.2 W/m	11	3,41	18,00	198,0	1	1,3	0,55	1	878
Lampu LE-01-5 W/m	5,7	3,41	32,00	182,4	1	1,3	0,55	1	809

Beban Internal	Jumlah Orang	SHG	LHG	CLF	RSHG BTU/hr	RLHG BTU/hr
Peghuni	2	230		1	460,00	
	2		190	1		380,00

Beban Internal	Jumlah	Daya Watt	Total Watt	Konversi	Cs	Cl	CLF	RSHG BTU/hr	RLHG BTU/hr
TV 49"	1	150	150	512	0,33	0,17	1	169	87
Coffe Maker	1	350	350	1.195	0,33	0,17	1	394	203
Mini Kulkas	1	100	100	342	0,33	0,17	1	113	58

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Infiltrasi Sensibel	1,1	0,005	0	0,00	0,0	0,0	0,000	-	-
Infiltrasi Laten	4.840	0,005	0	0,00	0,0	0,0	0,0000	-	-
<b>Total Room Heat Gean</b>								<b>19.733,29</b>	<b>728,35</b>

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Ventilasi Sensibel	1,1	0,005	31,56	339,71	1,7	11,9	12,600	164,79	
Ventilasi Laten	4.840	0,005	31,56	339,71	1,7	11,9	0,0033		191,63
<b>Total Sensible Heat (TSH) / Total Laten Heat (TLH) Cooling Load</b>								<b>19.898,08</b>	<b>919,98</b>
<b>Safety Factor 10%</b>								<b>1.989,808</b>	<b>91,998</b>
<b>TOTAL BTU/hr</b>								<b>22.900</b>	
<b>TOTAL W/hr</b>								<b>6.711</b>	
<b>TON REFRIGERANT (TR)</b>								<b>1,91</b>	

**Table 5. CLTD cooling loads for bedroom suite rooms**

Lantai : Lt. 5,6 & 7 Suite Type Bedroom  
 Lat : 6° Lintang Selatan  
 Bulan : Mei  
 Jam : 14:00

	Temperatur Bola Kering / DB °F		Temperatur Bola Basah / WB °F		Relative Humidity (RH) %	W gr/lb	W lb/lb
Kondisi Luar	91,4 °F	33,0 °C	80,6 °F	27,0 °C	65	138,18	0,01974
Desain Dalam	78,8 °F	26,0 °C	73,4 °F	23,0 °C	50	114,87	0,01641

Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			Factor	RSHG BTU/hr
							Corrr.		
Atap				0,00					
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			LM	RSHG BTU/hr
					Table 3.10	Table 3.12	Corrr.		
Dinding	Utara	0,248		0,00	17	7	21,2	0,65	0,00
	Timur	0,248	0	0,00	39	-7	26,4	0,65	0,00
	Selatan	0,248	21,6	232,50	34	-2	26,4	0,65	989,45
	Barat	0,248		0,00	20	-2	17,3	0,65	0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			RSHG BTU/hr	
					Table 3.23		Corrr.		
Kaca Konduksi	Utara	1,04		0,00	13		18,6		0,00
	Timur	1,04	13,6	146,39	13		18,6		2.831,75
	Selatan	1,04	2	21,53	13		18,6		416,43
	Barat	1,04		0,00	13		18,6		0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			RSHG BTU/hr	
					Table 3.25 (SHGF) 8"	Table 3.18 (SC)	Table 3.27 (CLF)		
Kaca Radiasi	Utara	74	0	0,00	1		0,75		0,00
	Timur	209	13,6	146,39	1		0,31		9.484,55
	Selatan	38	2	21,53	1		0,58		474,47
	Barat	209	0	0,00	1		0,29		0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	TA			RSHG BTU/hr	
Partisi		0		0,00					0,00
Ceiling		0,059	24,93	268,34			12,6		198,89
Lantai		0		0,00					0,00
Pintu		0		0,00					0,00

Beban Internal	Jumlah	Konversi	Daya Watt	Total Watt	Fu	Fs	Table 4.2	CLF	RSHG BTU/hr
Lampu DL-01 8 W	10	3,41	36,00	360,0	1	1,3	0,55	1	1.596
Lampu LE-02-7.2 W/m	10,5	3,41	18,00	189,0	1	1,3	0,55	1	838
Lampu LE-01-5 W/m	2	3,41	32,00	64,0	1	1,3	0,55	1	284

Beban Internal	Jumlah Orang	SHG	LHG	CLF	RSHG BTU/hr	RLHG BTU/hr
Penghuni	2	230		1	460,00	
	2		190	1		380,00

Beban Internal	Jumlah	Daya Watt	Total Watt	Konversi	Cs	Cl	CLF	RSHG BTU/hr	RLHG BTU/hr
TV 49"	1	150	150	512	0,33	0,17	1	169	87
Coffe Maker	1	350	350	1.195	0,33	0,17	1	394	203
Mini Kulkas	1	100	100	342	0,33	0,17	1	113	58

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT		RSHG BTU/hr	RLHG BTU/hr
							(S)	(L)		
Infiltrasi Sensibel	1,1	0,005	0	0,00	0,0	0,0	0,000		-	-
Infiltrasi Laten	4.840	0,005	0	0,00	0,0	0,0	0,0000			
<b>Total Room Heat Gean</b>									<b>18.249,19</b>	<b>728,35</b>

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT		RSHG BTU/hr	RLHG BTU/hr
							(S)	(L)		
Ventilasi Sensibel	1,1	0,005	24,93	268,34	1,3	9,4	12,600		130,17	
Ventilasi Laten	4.840	0,005	24,93	268,34	1,3	9,4	0,0033			151,37
<b>Total Sensible Heat (TSH) / Total Laten Heat (TLH) Cooling Load</b>									<b>18.379,36</b>	<b>879,72</b>
<b>Safety Factor 10%</b>									<b>1.837,936</b>	<b>87,972</b>
<b>TOTAL BTU/hr</b>									<b>21.185</b>	
<b>TOTAL W/hr</b>									<b>6.209</b>	
<b>TON REFRIGERANT (TR)</b>									<b>1,77</b>	

**Table 6.** Owner suite bedroom CLTD cooling loads

Lantai : Lt. 5,6 & 7 Owner's Suite Living Room  
 Lat : 6° Lintang Selatan  
 Bulan : Mei  
 Jam : 14:00

	Temperatur Bola Kering / DB °F		Temperatur Bola Basah / WB °F		Relative Humidity (RH) %	W gr/lb	W lb/lb
Kondisi Luar	91,4 °F	33,0 °C	80,6 °F	27,0 °C	65	138,18	0,01974
Desain Dalam	78,8 °F	26,0 °C	73,4 °F	23,0 °C	50	114,87	0,01641

Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			Factor	RSHG BTU/hr						
					Table 3.10	Table 3.12	Corrr.								
Atap				0,00											
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			LM	RSHG BTU/hr						
					Table 3.10	Table 3.12	Corrr.								
					Utara	0,248	16			172,22	17	7	21,2	0,65	0,00
					Timur	0,248	0			0,00	39	-7	26,4	0,65	732,92
Selatan	0,248	0	0,00	34	-2	26,4	0,65	0,00							
Barat	0,248	0	0,00	20	-2	17,3	0,65	0,00							
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			RSHG BTU/hr							
					Table 3.23	Corrr.									
					Utara	1,04	16		172,22	13	18,6	0,00	3.331,47		
					Timur	1,04	0		0,00	13	18,6	0,00	0,00		
Selatan	1,04	0	0,00	13	18,6	0,00	0,00								
Barat	1,04	0	0,00	13	18,6	0,00	0,00								
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			RSHG BTU/hr							
					Table 3.25 (SHGF) 8°	Table 3.18 (SC)	Table 3.27 (CLF)								
					Utara	74	0		0,00	1	0,75	0,00	11.158,30		
					Timur	209	16		172,22	1	0,31	0,00	0,00		
Selatan	38	0	0,00	1	0,58	0,00	0,00								
Barat	209	0	0,00	1	0,29	0,00	0,00								
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	TA		RSHG BTU/hr								
Partisi		0		0,00			0,00								
Ceiling		0,059	31,56	339,71		12,6	251,78								
Lantai		0		0,00			0,00								
Pintu		0		0,00			0,00								

Beban Internal	Jumlah	Konversi	Daya Watt	Total Watt	Fu	Fs	Table 4.2	CLF	RSHG BTU/hr
Lampu DL-01 8 W	9	3,41	36,00	324,0	1	1,3	0,55	1	1.436
Lampu LE-02-7.2 W/m	11	3,41	18,00	198,0	1	1,3	0,55	1	878
Lampu LE-01-5 W/m	5,7	3,41	32,00	182,4	1	1,3	0,55	1	809

Beban Internal	Jumlah Orang	SHG	LHG	CLF	RSHG BTU/hr	RLHG BTU/hr
Penghuni	2	230		1	460,00	
	2		190	1		380,00

Beban Internal	Jumlah	Daya Watt	Total Watt	Konversi	Cs	CI	CLF	RSHG BTU/hr	RLHG BTU/hr
TV 49"	1	150	150	512	0,33	0,17	1	169	87
Coffe Maker	1	350	350	1.195	0,33	0,17	1	394	203
Mini Kulkas	1	100	100	342	0,33	0,17	1	113	58

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Infiltrasi Sensibel	1,1	0,005	0	0,00	0,0	0,0	0,000	-	-
Infiltrasi Laten	4.840	0,005	0	0,00	0,0	0,0	0,0000	-	-
<b>Total Room Heat Gear</b>								<b>19.733,29</b>	<b>728,35</b>

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Ventilasi Sensibel	1,1	0,005	31,56	339,71	1,7	11,9	12,600	164,79	
Ventilasi Laten	4.840	0,005	31,56	339,71	1,7	11,9	0,0033		191,63
<b>Total Sensible Heat (TSH) / Total Laten Heat (TLH) Cooling Load</b>								<b>19.898,08</b>	<b>919,98</b>
<b>Safety Factor 10%</b>								<b>1.989,808</b>	<b>91,998</b>
<b>TOTAL BTU/hr</b>								<b>22.900</b>	
<b>TOTAL W/hr</b>								<b>6.711</b>	
<b>TON REFRIGERANT (TR)</b>								<b>1,91</b>	

**Table 7.** CLTD cooling loads for owner suite living rooms

Lantai : Lt. 5,6 & 7 Owner's Suite Living Room  
 Lat : 6° Lintang Selatan  
 Bulan : Mei  
 Jam : 14:00

	Temperatur Bola Kering / DB °F		Temperatur Bola Basah / WB °F		Relative Humidity (RH) %	W gr/lb	W lb/lb
Kondisi Luar	91,4 °F	33,0 °C	80,6 °F	27,0 °C	65	138,18	0,01974
Desain Dalam	78,8 °F	26,0 °C	73,4 °F	23,0 °C	50	114,87	0,01641

Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			Factor	RSHG BTU/hr
					Table 3.10	Table 3.12	Corr.		
Atap				0,00					
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			LM	RSHG BTU/hr
					Table 3.10	Table 3.12	Corr.		
Dinding	Utara	0,248		0,00	17	7	21,2	0,65	0,00
	Timur	0,248	0	0,00	39	-7	26,4	0,65	0,00
	Selatan	0,248	21,6	232,50	34	-2	26,4	0,65	989,45
	Barat	0,248		0,00	20	-2	17,3	0,65	0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			RSHG BTU/hr	
					Table 3.23	Corr.			
Kaca Konduksi	Utara	1,04		0,00	13		18,6		0,00
	Timur	1,04	13,6	146,39	13		18,6		2.831,75
	Selatan	1,04	2	21,53	13		18,6		416,43
	Barat	1,04		0,00	13		18,6		0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	CLTD °F			RSHG BTU/hr	
					Table 3.25 (SHGF) 8°	Table 3.18 (SC)	Table 3.27 (CLF)		
Kaca Radiasi	Utara	74	0	0,00	1		0,75		0,00
	Timur	209	13,6	146,39	1		0,31		9.484,55
	Selatan	38	2	21,53	1		0,58		474,47
	Barat	209	0	0,00	1		0,29		0,00
Beban External	Letak	U BTU/(hr.ft².°F)	Luas m²	Luas ft²	TA			RSHG BTU/hr	
Partisi		0		0,00					0,00
Ceiling		0,059	24,93	268,34			12,6		198,89
Lantai		0		0,00					0,00
Pintu		0		0,00					0,00

Beban Internal	Jumlah	Konversi	Daya Watt	Total Watt	Fu	Fs	Table 4.2	CLF	RSHG BTU/hr
Lampu DL-01 8 W	10	3,41	36,00	360,0	1	1,3	0,55	1	1.596
Lampu LE-02-7.2 W/m	10,5	3,41	18,00	189,0	1	1,3	0,55	1	838
Lampu LE-01-5 W/m	2	3,41	32,00	64,0	1	1,3	0,55	1	284

Beban Internal	Jumlah Orang	SHG	LHG	CLF	RSHG BTU/hr	RLHG BTU/hr
Peghuni	2	230		1	460,00	
	2		190	1		380,00

Beban Internal	Jumlah	Daya Watt	Total Watt	Konversi	Cs	Cl	CLF	RSHG BTU/hr	RLHG BTU/hr
TV 49"	1	150	150	512	0,33	0,17	1	169	87
Coffe Maker	1	350	350	1.195	0,33	0,17	1	394	203
Mini Kulkas	1	100	100	342	0,33	0,17	1	113	58

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Infiltrasi Sensibel	1,1	0,005	0	0,00	0,0	0,0	0,000	-	-
Infiltrasi Laten	4.840	0,005	0	0,00	0,0	0,0	0,0000	-	-
<b>Total Room Heat Gean</b>								<b>18.249,19</b>	<b>728,35</b>

Beban Internal	BTU/H per scfm	5 Person / 1000 ft²	Luas m²	Luas ft²	CFM	Q CFM	ΔT (S) ΔW (L)	RSHG BTU/hr	RLHG BTU/hr
Ventilasi Sensibel	1,1	0,005	24,93	268,34	1,3	9,4	12,600	130,17	
Ventilasi Laten	4.840	0,005	24,93	268,34	1,3	9,4	0,0033		151,37
<b>Total Sensible Heat (TSH) / Total Laten Heat (TLH) Cooling Load</b>								<b>18.379,36</b>	<b>879,72</b>
<b>Safety Factor 10%</b>								<b>1.837,936</b>	<b>87,972</b>
<b>TOTAL BTU/hr</b>								<b>21.185</b>	
<b>TOTAL W/hr</b>								<b>6.209</b>	
<b>TON REFRIGERANT (TR)</b>								<b>1,77</b>	

**Table 8.** HAP 5.01 standard room cooling load

Standard Type Room	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Feb 1900			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 85,2 °F / 78,5 °F			HEATING OA DB / WB 71,0 °F / 59,3 °F		
	OCCUPIED T-STAT 73,4 °F			OCCUPIED T-STAT 70,0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	11 ft²	446	-	11 ft²	-	-
Wall Transmission	142 ft²	1537	-	142 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	11 ft²	127	-	11 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	243 ft²	219	-	243 ft²	0	-
Overhead Lighting	588 W	2005	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	600 W	2047	-	0	0	-
People	2	460	240	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	684	24	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>7525</b>	<b>264</b>	-	<b>0</b>	<b>0</b>

**Table 9.** HAP Cooling Load 5.01 Internal Mid Room

Mid Type Room Interna <sup>1</sup>	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Feb 1600			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 89,6 °F / 79,9 °F			HEATING OA DB / WB 71,0 °F / 59,3 °F		
	OCCUPIED T-STAT 73,4 °F			OCCUPIED T-STAT 70,0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	43 ft²	3016	-	43 ft²	-	-
Wall Transmission	110 ft²	742	-	110 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	43 ft²	625	-	43 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	266 ft²	236	-	266 ft²	0	-
Overhead Lighting	717 W	2445	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	600 W	2047	-	0	0	-
People	2	460	240	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	957	24	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>10529</b>	<b>264</b>	-	<b>0</b>	<b>0</b>



Table 10. HAP 5.01 mid external room cooling load

Mid Type Room External	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT May 1600			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 82,6 °F / 76,8 °F			HEATING OA DB / WB 71,0 °F / 59,3 °F		
	OCCUPIED T-STAT 73,4 °F			OCCUPIED T-STAT 70,0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	54 ft²	2816	-	54 ft²	-	-
Wall Transmission	309 ft²	1942	-	309 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	54 ft²	390	-	54 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	271 ft²	192	-	271 ft²	0	-
Overhead Lighting	643 W	2194	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	600 W	2047	-	0	0	-
People	2	460	240	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	1004	24	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>11045</b>	<b>264</b>	-	<b>0</b>	<b>0</b>

Table 11. HAP 5.01 suite living room cooling load

Suite Type Living Room	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Feb 0900			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 80,1 °F / 76,9 °F			HEATING OA DB / WB 71,0 °F / 59,3 °F		
	OCCUPIED T-STAT 73,4 °F			OCCUPIED T-STAT 70,0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	172 ft²	10612	-	172 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	172 ft²	1210	-	172 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	340 ft²	193	-	340 ft²	0	-
Overhead Lighting	916 W	3124	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	600 W	2047	-	0	0	-
People	2	460	240	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	1765	24	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>19412</b>	<b>264</b>	-	<b>0</b>	<b>0</b>

Table 12. HAP 5.01 bedroom suite room cooling load

Suite Type Bedroom	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jan 0900			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 80,1 °F / 76,9 °F			HEATING OA DB / WB 71,0 °F / 59,3 °F		
	OCCUPIED T-STAT 73,4 °F			OCCUPIED T-STAT 70,0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	157 ft²	9213	-	157 ft²	-	-
Wall Transmission	222 ft²	829	-	222 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	157 ft²	1104	-	157 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	268 ft²	153	-	268 ft²	0	-
Overhead Lighting	797 W	2719	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	600 W	2047	-	0	0	-
People	2	460	240	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	1652	24	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>18177</b>	<b>264</b>	-	<b>0</b>	<b>0</b>

Table 13. HAP 5.01 owner suite living room cooling load

Owner Suite Living Room	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Feb 0900			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 80,1 °F / 76,9 °F			HEATING OA DB / WB 71,0 °F / 59,3 °F		
	OCCUPIED T-STAT 73,4 °F			OCCUPIED T-STAT 70,0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	172 ft²	10612	-	172 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	172 ft²	1210	-	172 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	340 ft²	193	-	340 ft²	0	-
Overhead Lighting	916 W	3124	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	600 W	2047	-	0	0	-
People	2	460	240	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	1765	24	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>19412</b>	<b>264</b>	-	<b>0</b>	<b>0</b>

**Table 14.** HAP 5.01 owner suite bedroom cooling load

Owner Suite Bedroom	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jan 0900			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 80,1 °F / 76,9 °F			HEATING OA DB / WB 71,0 °F / 59,3 °F		
	OCCUPIED T-STAT 73,4 °F			OCCUPIED T-STAT 70,0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	157 ft²	9213	-	157 ft²	-	-
Wall Transmission	222 ft²	829	-	222 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	157 ft²	1104	-	157 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	268 ft²	153	-	268 ft²	0	-
Overhead Lighting	797 W	2719	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	600 W	2047	-	0	0	-
People	2	460	240	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	1652	24	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>18177</b>	<b>264</b>	-	<b>0</b>	<b>0</b>