

Table (4-1) Heating & cooling load for Basement floor

	DESIGN COOLING		
	COOLING DATA AT Jul 1500		
	COOLING OA DB / WB 44.0 °C / 24.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	10 m²	185	-
Wall Transmission	45 m²	986	-
Roof Transmission	0 m²	0	-
Window Transmission	10 m²	627	-
Skylight Transmission	0 m²	0	-
Door Loads	0 m²	0	-
Floor Transmission	89 m²	0	-
Partitions	148 m²	1525	-
Ceiling	101 m²	1096	-
Overhead Lighting	1328 W	1328	-
Task Lighting	97 W	96	-
Electric Equipment	8430 W	8430	-
People	39	2800	2343
Infiltration	-	2218	46
Miscellaneous	-	0	0
Safety Factor	10% / 10%	1929	239
>> Total Zone Loads	-	21221	2628
Zone Conditioning	-	20636	2628
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Exhaust Fan Load	131 L/s	0	-
Ventilation Load	131 L/s	2881	24
Ventilation Fan Load	131 L/s	61	-
Space Fan Coil Fans	-	191	-
Duct Heat Gain / Loss	0%	0	-
>> Total System Loads	-	23769	2652
Cooling Coil	-	3074	0
Terminal Unit Cooling	-	20694	2652
Terminal Unit Heating	-	0	-
>> Total Conditioning	-	23768	2652

Table (4-2) Heating & cooling load for ground floor

	DESIGN COOLING		
	COOLING DATA AT Aug 1500		
	COOLING OA DB / WB 44.0 °C / 24.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	7 m²	174	-
Wall Transmission	79 m²	1756	-
Roof Transmission	0 m²	0	-
Window Transmission	7 m²	439	-
Skylight Transmission	0 m²	0	-
Door Loads	0 m²	0	-
Floor Transmission	107 m²	0	-
Partitions	175 m²	1798	-
Ceiling	107 m²	1178	-
Overhead Lighting	1724 W	1723	-
Task Lighting	94 W	94	-
Electric Equipment	14250 W	14249	-
People	73	5241	4386
Infiltration	-	3395	8
Miscellaneous	-	0	60
Safety Factor	10% / 10%	3005	445
>> Total Zone Loads	-	33053	4899
Zone Conditioning	-	32100	4899
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Exhaust Fan Load	243 L/s	113	-
Ventilation Load	243 L/s	5222	19
Ventilation Fan Load	243 L/s	113	-
Space Fan Coil Fans	-	288	-
Duct Heat Gain / Loss	0%	0	-
>> Total System Loads	-	37835	4918
Cooling Coil	-	5720	0
Terminal Unit Cooling	-	32111	4929
Terminal Unit Heating	-	0	-
>> Total Conditioning	-	37831	4929

Table (4-3) Heating & cooling load for first floor

	DESIGN COOLING		
	COOLING DATA AT Jul 1500		
	COOLING OA DB / WB 44.0 °C / 24.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m²	0	-
Wall Transmission	64 m²	1450	-
Roof Transmission	0 m²	0	-
Window Transmission	0 m²	0	-
Skylight Transmission	0 m²	0	-
Door Loads	3 m²	249	-
Floor Transmission	0 m²	0	-
Partitions	242 m²	2492	-
Ceiling	162 m²	1784	-
Overhead Lighting	1826 W	1825	-
Task Lighting	166 W	166	-
Electric Equipment	16250 W	16249	-
People	58	3997	2539
Infiltration	-	2286	48
Miscellaneous	-	0	90
Safety Factor	10% / 10%	3050	268
>> Total Zone Loads	-	33549	2945
Zone Conditioning	-	32499	2945
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Exhaust Fan Load	225 L/s	104	-
Ventilation Load	225 L/s	4832	163
Ventilation Fan Load	225 L/s	104	-
Space Fan Coil Fans	-	291	-
Duct Heat Gain / Loss	0%	0	-
>> Total System Loads	-	37831	3109
Cooling Coil	-	5302	0
Terminal Unit Cooling	-	32528	3186
Terminal Unit Heating	-	0	-
>> Total Conditioning	-	37830	3186

Heating & cooling load for second floor

	DESIGN COOLING		
	COOLING DATA AT Jun 1600		
	COOLING OA DB / WB 43.0 °C / 23.9 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m²	0	-
Wall Transmission	76 m²	1696	-
Roof Transmission	0 m²	0	-
Window Transmission	0 m²	0	-
Skylight Transmission	0 m²	0	-
Door Loads	3 m²	236	-
Floor Transmission	0 m²	0	-
Partitions	279 m²	2739	-
Ceiling	179 m²	1886	-
Overhead Lighting	2499 W	2499	-
Task Lighting	203 W	203	-
Electric Equipment	14629 W	14628	-
People	74	5168	3625
Infiltration	-	2171	163
Miscellaneous	-	0	0
Safety Factor	10% / 10%	3123	379
>> Total Zone Loads	-	34348	4167
Zone Conditioning	-	33463	4167
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Exhaust Fan Load	274 L/s	0	-
Ventilation Load	274 L/s	5719	308
Ventilation Fan Load	274 L/s	127	-
Space Fan Coil Fans	-	302	-
Duct Heat Gain / Loss	0%	0	-
>> Total System Loads	-	39610	4474
Cooling Coil	-	6117	0
Terminal Unit Cooling	-	33493	4422
Terminal Unit Heating	-	0	-
>> Total Conditioning	-	39610	4422

Table(4-4)

Heating & cooling load for third floor

	DESIGN COOLING		
	COOLING DATA AT Aug 1500		
	COOLING OA DB / WB 44.0 °C / 24.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	2 m²	71	-
Wall Transmission	8 m²	208	-
Roof Transmission	0 m²	0	-
Window Transmission	2 m²	125	-
Skylight Transmission	0 m²	0	-
Door Loads	0 m²	0	-
Floor Transmission	0 m²	0	-
Partitions	144 m²	1513	-
Ceiling	74 m²	844	-
Overhead Lighting	890 W	890	-
Task Lighting	0 W	0	-
Electric Equipment	6000 W	6000	-
People	23	1594	1059
Infiltration	-	0	0
Miscellaneous	-	0	0
Safety Factor	10% / 10%	1125	106
>> Total Zone Loads	-	12371	1164
Zone Conditioning	-	12004	1164
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Exhaust Fan Load	69 L/s	0	-
Ventilation Load	69 L/s	1512	64
Ventilation Fan Load	69 L/s	32	-
Space Fan Coil Fans	-	110	-
Duct Heat Gain / Loss	0%	0	-
>> Total System Loads	-	13658	1229
Cooling Coil	-	1615	0
Terminal Unit Cooling	-	12043	1219
Terminal Unit Heating	-	0	-
>> Total Conditioning	-	13658	1219

Table(4-5)

Heating & cooling load for operation room-01

	DESIGN COOLING		
	COOLING DATA AT Aug 1500		
	COOLING OA DB / WB 44.0 °C / 24.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	2 m²	52	-
Wall Transmission	43 m²	991	-
Roof Transmission	0 m²	0	-
Window Transmission	2 m²	126	-
Skylight Transmission	0 m²	0	-
Door Loads	0 m²	0	-
Floor Transmission	0 m²	0	-
Partitions	53 m²	552	-
Ceiling	40 m²	447	-
Overhead Lighting	600 W	600	-
Task Lighting	400 W	400	-
Electric Equipment	2000 W	2000	-
People	5	359	301
Infiltration	-	0	0
Miscellaneous	-	20	10
Safety Factor	10% / 10%	555	31
>> Total Zone Loads	-	6101	342
Zone Conditioning	-	5924	342
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Return Fan Load	563 L/s	282	-
Ventilation Load	535 L/s	11877	3498
Supply Fan Load	563 L/s	282	-
Space Fan Coil Fans	-	0	-
Duct Heat Gain / Loss	5%	305	-
>> Total System Loads	-	18669	3840
Central Cooling Coil	-	18669	3840
>> Total Conditioning	-	18669	3840

Table(4-6)

Heating & cooling load for operation room-02

	DESIGN COOLING		
	COOLING DATA AT Jul 1500		
	COOLING OA DB / WB 44.0 °C / 24.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	4 m²	98	-
Wall Transmission	31 m²	752	-
Roof Transmission	0 m²	0	-
Window Transmission	4 m²	251	-
Skylight Transmission	0 m²	0	-
Door Loads	0 m²	0	-
Floor Transmission	0 m²	0	-
Partitions	40 m²	421	-
Ceiling	24 m²	268	-
Overhead Lighting	360 W	360	-
Task Lighting	240 W	240	-
Electric Equipment	2000 W	2000	-
People	5	359	301
Infiltration	-	0	0
Miscellaneous	-	20	10
Safety Factor	10% / 10%	477	31
>> Total Zone Loads	-	5245	342
Zone Conditioning	-	5150	342
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Return Fan Load	506 L/s	253	-
Ventilation Load	480 L/s	10695	2902
Supply Fan Load	506 L/s	253	-
Space Fan Coil Fans	-	0	-
Duct Heat Gain / Loss	5%	262	-
>> Total System Loads	-	16613	3243
Central Cooling Coil	-	16613	3243
>> Total Conditioning	-	16613	3243

Table(4-7)

Heating & cooling load for CCU-ICU

	DESIGN COOLING		
	COOLING DATA AT Aug 1500		
	COOLING OA DB / WB 44.0 °C / 24.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	4 m²	105	-
Wall Transmission	30 m²	672	-
Roof Transmission	0 m²	0	-
Window Transmission	4 m²	251	-
Skylight Transmission	0 m²	0	-
Door Loads	0 m²	0	-
Floor Transmission	0 m²	0	-
Partitions	61 m²	646	-
Ceiling	44 m²	491	-
Overhead Lighting	540 W	540	-
Task Lighting	140 W	140	-
Electric Equipment	2390 W	2390	-
People	10	696	477
Infiltration	-	0	0
Miscellaneous	-	0	0
Safety Factor	10% / 10%	593	48
>> Total Zone Loads	-	6523	524
Zone Conditioning	-	6339	524
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Return Fan Load	461 L/s	0	-
Ventilation Load	266 L/s	5923	2003
Supply Fan Load	461 L/s	0	-
Space Fan Coil Fans	-	0	-
Duct Heat Gain / Loss	0%	0	-
>> Total System Loads	-	12262	2527
Central Cooling Coil	-	12262	2527
Preheat Coil	-	0	-
>> Total Conditioning	-	12262	2527

Table(4-8)

Heating & cooling load for fourth floor

	DESIGN COOLING		
	COOLING DATA AT Jul 1500		
	COOLING OA DB / WB 44.0 °C / 24.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m²	0	-
Wall Transmission	91 m²	2026	-
Roof Transmission	0 m²	0	-
Window Transmission	0 m²	0	-
Skylight Transmission	0 m²	0	-
Door Loads	0 m²	0	-
Floor Transmission	0 m²	0	-
Partitions	260 m²	2768	-
Ceiling	158 m²	1768	-
Overhead Lighting	2373 W	2373	-
Task Lighting	258 W	258	-
Electric Equipment	13000 W	12999	-
People	98	6605	3450
Infiltration	-	0	0
Miscellaneous	-	0	0
Safety Factor	10% / 10%	2880	345
>> Total Zone Loads	-	31677	3795
Zone Conditioning	-	30786	3795
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Exhaust Fan Load	359 L/s	0	-
Ventilation Load	359 L/s	7879	310
Ventilation Fan Load	359 L/s	166	-
Space Fan Coil Fans	-	275	-
Duct Heat Gain / Loss	0%	0	-
>> Total System Loads	-	39106	4105
Cooling Coil	-	8436	0
Terminal Unit Cooling	-	30670	4089
Terminal Unit Heating	-	0	-
>> Total Conditioning	-	39106	4089

Table(4-9)

Heating & cooling load for fifth floor

	DESIGN COOLING		
	COOLING DATA AT Aug 1400		
	COOLING OA DB / WB 43.6 °C / 23.9 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m²	0	-
Wall Transmission	111 m²	2450	-
Roof Transmission	153 m²	6149	-
Window Transmission	0 m²	0	-
Skylight Transmission	0 m²	0	-
Door Loads	0 m²	0	-
Floor Transmission	0 m²	0	-
Partitions	242 m²	2465	-
Ceiling	153 m²	1651	-
Overhead Lighting	2049 W	2048	-
Task Lighting	0 W	0	-
Electric Equipment	18284 W	18283	-
People	67	6018	9032
Infiltration	-	0	0
Miscellaneous	-	145	80
Safety Factor	10% / 10%	3921	911
>> Total Zone Loads	-	43130	10023
Zone Conditioning	-	42151	10023
Plenum Wall Load	0%	0	-
Plenum Roof Load	0%	0	-
Plenum Lighting Load	0%	0	-
Exhaust Fan Load	330 L/s	0	-
Ventilation Load	330 L/s	7154	-178
Ventilation Fan Load	330 L/s	153	-
Space Fan Coil Fans	-	376	-
Duct Heat Gain / Loss	0%	0	-
>> Total System Loads	-	49835	9845
Cooling Coil	-	7595	0
Terminal Unit Cooling	-	42243	9941
Terminal Unit Heating	-	0	-
>> Total Conditioning	-	49837	9941

Table (4-10)

The total heat load for the hospital

Floor	Sensible heat(Qs)(watt)	Latent heat(Ql)(watt)
Basement	24102	2652
Ground	38275	4918
First	38381	3108
Second	40067	4475
Third	31752	2436
Fourth	39556	4105
Fifth	50284	9845
total	262417	31539

Total heat load (Qt) = sensible heat(Qs)+ latent heat(Ql)

$$= 262417 + 31539 = 293956 \text{ watt}$$

$$= 293.956 \text{ Kw}$$

$$Q_t = 293.956 / 3.5 = 83.987 \text{ TR}$$

$$Q_{S.H.F} = \frac{Q_S}{Q_S + Q_L}$$

$$Q_{S.H.F} = 262417 / 293956 = 0.8927$$

Cooling load calculations:

Spaces	sensible Cooling load(Qs)(watt)	Latent cooling load(Ql) (watt)
Basement	23768	2668
Ground	37831	4929
First	37830	3186
Second	39610	422
Third	61252	10479
Fourth	39106	4089
Fifth	49837	9941
total	289237	39717

Total plant load= sensible Cooling load(Qs)(watt)+ Latent cooling load(Ql)
(watt)

=289.237+39.717=328.9Kw

=328.9/3.5 = 93.97 TR