# Concordia University

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Department of Mechanical, Industrial and Aerospace Engineering

Heating, Ventilating and Air Conditioning

(Mech-6181)

A

Project report on

Cooling Load Calculations

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# ABSTRACT

Air conditioning has become a major contributor to the physiological comfort and well-being of occupants of a building as well as ensuring that certain equipment and industrial processes are kept or done in optimum condition to enhance productivity. Designing an air-conditioning system for a building requires the determination of the space cooling load, the design of the duct area and the sizing of the cooling equipment. This project involves the determination of the space cooling load, the duct area design and sizing of the cooling equipment for a hospital located in **Dubai, UAE** comprising of 24 different segments which include examination rooms, counselor offices, clerk office, staff room, phlebotomy rooms, first aid room, routine check up room as well as male and female toilets also. The space cooling load calculation was done for 12 hrs, 14 hrs and 16 hrs, which were times of expected peak cooling load. The cooling load values for examination rooms, counselor offices, clerk office, staff room, phlebotomy rooms, first aid room, routine checkup room as well as male and female toilets are calculated using formulas and values from standard tables at 12:00, 14:00 and 16:00 respectively. The individual values are summed up respectively to obtain the total cooling load at stated times. The maximum total cooling load was then used to size the cooling equipment using the psychometric chart. Also, the duct areas for each individual rooms and hallway were calculated using the maximum cooling load per room and the psychometric chart, and all the calculations are done with the help of MS Excel and is attached in the appendix.

It was calculated that the hospital has **86.22 tons** of refrigeration of cooling loads at the 16 hrs which is maximum and at this cooling load it requires **107.77 tons** of refrigerator machine capacity.

# CHAPTER-1
# INTRODUCTION

According to Faye, Cooling Load is the rate at which energy must be removed from a space to maintain the temperature and humidity at the design values while the Heat gain is the rate at which energy is transferred to or generated within a space." The cooling load will generally vary from the Heat gain into space because heat gained via radiation is not transferred to the cooling air directed but rather absorbed by the structure, furniture and doors of the building which is then transferred to the cooling air only when their temperature is greater than that of the cooling air, Faye.

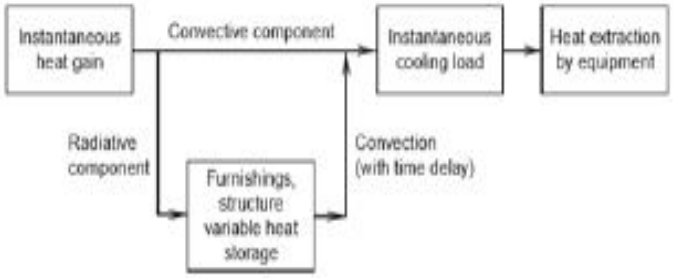



FIGURE 1: SCHEMATIC RELATION OF HEAT GAIN TO COOLING LOAD

This phenomenon is taken care of using the CLTD and CLF, such that it converts the heat gained to the cooling load.

## 1.1. Assumptions:

- The hospital layout considered is located at **$24^0$ N $55.27^0$ E, Dubai, UAE.**
- The hottest month or the peak load is taken in the month of **July**.
- Total **16** operational hours is being taken **(7 hrs to 23 hrs)**
- All values are calculated at 12 hrs, 14 hrs and 16 hrs.
- Inside temperature of hospital is to be maintained at **$22^0$ C** with **60%** relative humidity.
- Outside temperature in the month of July is being taken as **$45^0$ C** with **45%** relative humidity
- The roof of the building is made of **152.4 mm concrete with 25.4 mm insulation without suspended ceiling**.
- The exposed wall is made of **4 in. Concrete + 1 in. or 2 in. Insulation + Finish.**
- The door material is considered as **45 mm wooden solid core flush door with no storm**.
- The partition wall between rooms is made of **1 in. insulation of air space + 4 in. common brick**.
- The movable glass, glass partition and glass window are taken as **double glazing ε=0.60 on surface 2 or 3 6.4 mm air space, Aluminum without thermal break**, which has **semi-open weave and light color fabrics**.
- The finish flooring material is **152.4 mm H.W. concrete + 25.4 mm insulation**.
- Input rating for the ceiling LED light is **10 W/$m^2$**.
- Appliances are being taken as pulse oximeter, stress treadmill, blood warmer, ECG/RESP, computers, printers etc. for different segments.
- Velocity of air inside the duct is **6.8 m/s**.

# CHAPTER-2

# COOLING LOAD CALCULATION FOR EXAMINATION ROOM-1

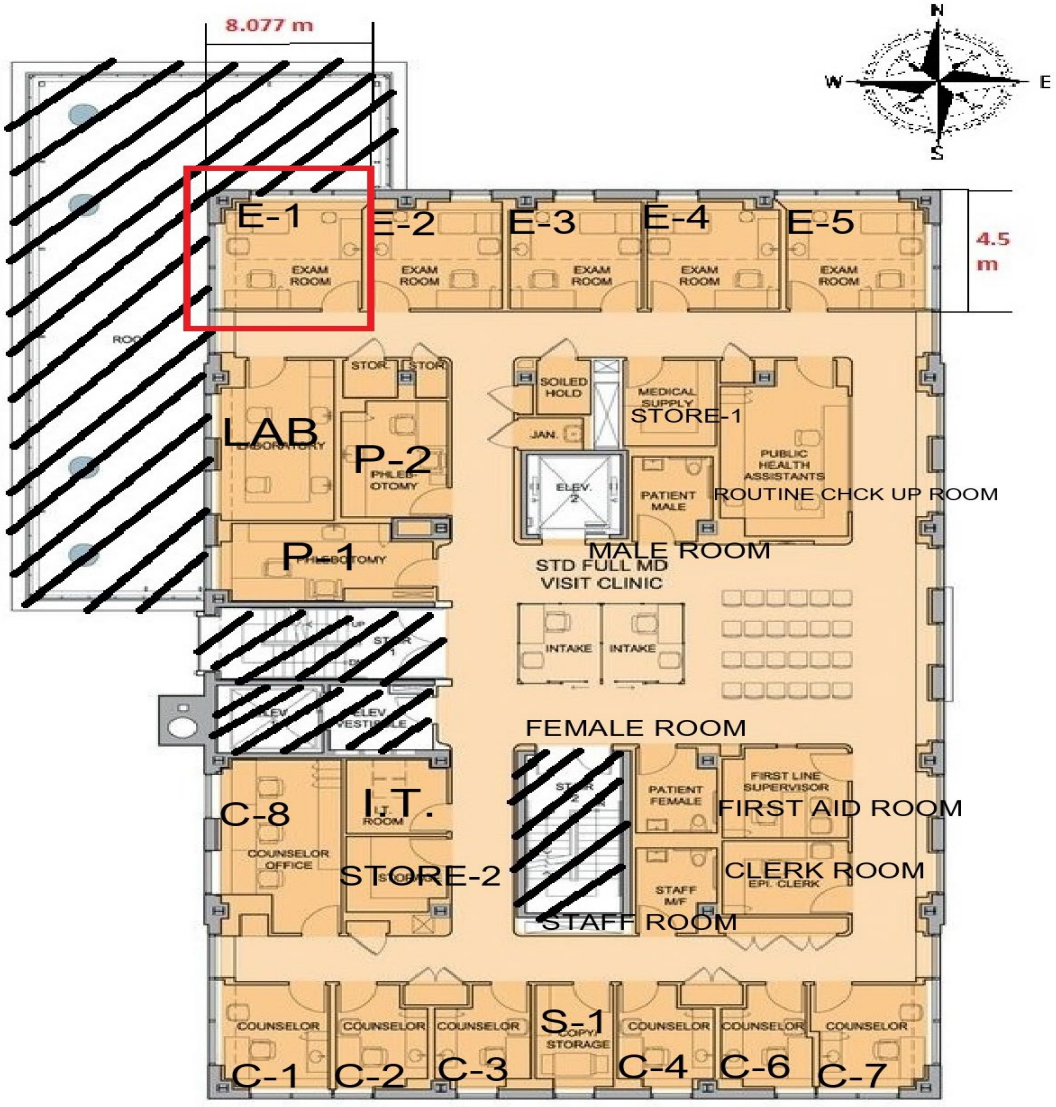



FIGURE 2: DESIGN LAYOUT

| | |
|---|---|
| Place | Dubai, UAE |
| Type of Building | General Hospital |
| No. of working hours | 16 hours, 7 am to 11 pm |

Designing Conditions:

| | |
|---|---|
| Location | 24 $^0$N 55.27 $^0$E |
| Wind velocity | 3.4 m/s |
| Outdoor design dry bulb temp. and relative humidity | 45 $^0$C & 50%R.H. |
| Indoor design dry bulb temp. and relative humidity | 22 $^0$C & 30%R.H. |

Cooling load calculations for examination room-1:

**2.1 ROOF:**

Here the roof is made of 152.4 mm concrete with 25.4 mm insulation with overall heat transfer rate **U = 1.090 W/m$^2$ $^0$C** (Table-5)

$q = U * A * (CLTD)_{corrected}$

Where, $(q)_{roof}$ = Heat load from roof in W

U = Overall heat transfer coefficient for roof in W/m$^2$ $^0$C

A= Area of roof = 8.077 * 4.5 = 36.34 m$^2$

As we are calculating cooling load at 12 hrs, **CLTD = 12**

**$CLTD_{corrected}$ = [(CLTD + LM) * K + (25.5 - $T_R$) + ($T_O$ – 29.4)] * f**

Where, LM = latitude and month correction = 1 (@ 24 $^0$N & July month)

(Table-3.12)

K =1 for dark colored

f = 1 for no attic or ducts

$T_o$ = 45 $^0$C & $T_R$ = 22 $^0$C

$CLTD_{corrected}$ = 32.1

**$q_{roof}$ = 1.090 * 36.34 * 32.1 = 1271.50 W**

Similarly, cooling load is calculated at 14 hrs and 16 hrs.

| **CLTD @14** | **CLTD @16** | **$CLTD_{corrected}$ @14** | **$CLTD_{corrected}$ @16** | **$q_{roof}$ @14** | **$q_{roof}$ @16** |
|---|---|---|---|---|---|
| 17 | 22 | 37.1 | 42.1 | 1469.55 | 1667.61 |

## 2.2 WALLS:

Sunlit walls and construction of walls is given below with over all heat transfer co-efficient and value of U is selected from Table 30 and converted in SI unit.

| Wall material / Code numbers of layer | Overall heat transfer coefficient U ($W/m^2\ ^0C$) |
|---|---|
| 4 in. Concrete + 1 in. or 2 in. Insulation + Finish ($A_0$,$A_1$,$C_5$,$B_2$/$B_3$,$E_1$,$E_0$) (group-D) | 0.9059 |

At 12 hrs,

**$CLTD_{corrected}$ = (CLTD + LM) * K + (25.5 - $T_R$) + ($T_O$ – 29.4)**

Here, K = 1 for dark colored

LM = latitude and month correction zone vise

$T_o$ = 45 $^0$C & $T_R$ = 22 $^0$C

| ZONES | TOTAL WINDOW AND DOOR AREA ($m^2$) | TOTAL WALL AREA ($m^2$) |
|---|---|---|
| North | (1.98*1.37) = 2.7126 | (29.48-2.7126) = 26.76 |
| South | (3.048*1.3) = 3.9624 | (16.425-3.9624) = 12.46 |
| East | 0 | 16.425 |
| West | 0 | 16.425 |

$CLTD_{North}$ = 3.89 $(CLTD_{North})_{CORRECTED}$ = 23.99

$CLTD_{West}$ = 5 $(CLTD_{West})_{CORRECTED}$ = 24.1

**$q_{wall}$ @North = 0.9059*26.76*23.99 = 581.56 W**

**$q_{wall}$ @West = 0.9059*24.1*16.425 = 358.59 W**

The calculation for the 14 hrs and 16 hrs are shown in the table below.

| Zone | CLTD @14 | CLTD @16 | $CLTD_{corrected}$ @14 | $CLTD_{corrected}$ @16 | $q_{wall}$ @14 | $q_{wall}$ @16 |
|---|---|---|---|---|---|---|
| North | 5.56 | 7.22 | 25.66 | 27.32 | 622.05 | 662.29 |
| West | 6.11 | 10 | 25.21 | 29.1 | 375.11 | 432.99 |

## 2.3 GLASS WINDOW:

Due to Conduction,
Over all heat transfer co-efficient for double glazing ε=0.60 on surface 2 or 3 6.4 mm air space, Aluminum without thermal break **U = 4.8 W/m$^2$ k** (Table-5.5 a)

$q_{glass}$ = U*A*(T.D.)
= 4.8*(1.98*1.37)*(45-22)
$q_{glass}$ = 299.47 W

Due to radiation,
Cooling load factor for glass with Interior shading (Table-14)
CLF @12 = 0.89 for North Fenestration
SHGF = 141.62 W/m$^2$ (Table 3.25)
For insulating glass, 6 mm air space (3 mm out & 3 mm in)
Draperies: semi-open weave and light color fabrics
SC = 0.60 (Table-22)

$q_{glass}$ = A*SC*SHGF*CLF
= (1.98*1.37)*0.60*141.62*0.89
= 205.13 W

The calculation for the 14 hrs and 16 hrs are shown in the table below.

| Fenestration | CLF @14 | CLF @16 | $q_{glass}$ @14 | $q_{glass}$ @16 |
|---|---|---|---|---|
| North | 0.86 | 0.75 | 198.23 | 172.87 |

## 2.4 PARTITIONS, CEILINGS AND FLOORS:

I. FLOORING:
Over all heat transfer co-efficient for 152.4 mm H.W. concrete + 25.4 mm insulation **U = 1.090 W/ m$^2$ $^0$C**
For adjacent unconditioned space, $T_0$ = 45-5 = 40 $^0$C
q = U*A*(T.D.)
= 1.090*36.34*(40-22)
= 712.99 W

II. PARTITION WALLS:

Over all heat transfer for partition wall-1 which is common between examination room-1 and examination room-2. (In East direction)
This wall is made up of 1 in. insulation of air space + 4 in. common brick. So, **U = 1.349 W/m$^2$ $^0$C** (Table-30)

For adjacent unconditioned space, $T_0$ = 45-5 = 40 $^0$C
Area of wall = 4.5*3.65 = 16.43 m$^2$
q = U*A*(T.D.)
= 1.349*16.43*(40-22)
= 398.95 W

For the partition wall with door,
Over all heat transfer for 45 mm wooden solid core flush door with no storm **U = 2.27 W/ m$^2$ $^0$C** (Table-5.8)
Wall area = 8.077*3.65 = 29.48 m$^2$
Door area = 3.048*1.3 = 3.962 m$^2$ (in South direction)

$U_{TOTAL}*A_{TOTAL} = U_{WALL}*A_{WALL} + U_{DOOR}*A_{DOOR}$
$U_{TOTAL}*A_{TOTAL}$ = 1.349*16.43 + 2.27*3.962
= 31.16
$U_{TOTAL}$ = 31.16 / (29.48 + 3.962)
**$U_{TOTAL}$ = 0.9318 W/ m$^2$ $^0$C**

For adjacent unconditioned space, $T_0$ = 45-5 = 40 $^0$C
q = U*A*(T.D.)
= 0.9318*29.48*(40-22)
= 494.45 W

## 2.5 INTERNAL LIGHTS:

For room-1,

- Hospital room is open for 16 hours from 7:00 AM TO 11:00 PM
- There are 4 ceiling LED lights in total
- Taking value of a = 0.65 for ordinary furniture with or without carpet (Table-15)
- Value of b = C for 152.4 mm concrete floor with high room air circulation (Table-16)

- Assume rating of ceiling light = 10 W/$m^2$

So, CLF @12 hrs = 0.86 (5 hrs) (Table-4.4E)
$q_{Light}$ = input*CLF
= 4*10*36.34*0.86
$q_{Light}$ = 1250.09 W

The calculation for the 14 hrs and 16 hrs are shown in the table below.

| CLF @14 | CLF @16 | $q_{Light}$ @14 | $q_{Light}$ @16 |
|---|---|---|---|
| 0.88 | 0.89 | 1279.17 | 1293.70 |

## 2.6 PEOPLE:

- Number of people in the room = 2
- One person is admitted to the hospital and another person is doing moderate work, standing and walking.
- Total number of hours people in space = 16

Sensible heat gain (SHG) = 73 W (Table-8.2)

Cooling load factor (CLF) @12 = 0.82 (Table-4.6)

$q_{sensible}$ = No. of people*SHG *CLF

= 2*73*0.82

= 119.72 W

Latent heat gain (LHG) = 59 W (Table-8.2)

$q_{latent}$ = No. of people*LHG

= 2*59

= 118 W

The calculation for the 14 hrs and 16 hrs are shown in the table below.

| CLF @14 | CLF @16 | $q_{sensible}$ @14 | $q_{sensible}$ @16 |
|---|---|---|---|
| 0.87 | 0.9 | 127.02 | 131.4 |

## 2.7 APPLIANCES:

Assume that the all appliances are unhooded and for that
CLF @12 = 0.85 for Blanket warmer, Blood warmer (16 hrs) (Table 4.11)
CLF @12 = 0.23 for Blood Pr. Meter, ECG/RESP and Pulse oximeter (4 hrs) (Table 4.11)
So, $q_{appliances}$ = No. of Appliances*Heat Gain (H.G)*CLF

| Machines | No. of Machines | Sensible Heat (W) | Latent Heat | Heat Load-q (W) |
|---|---|---|---|---|
| Blanket Warmer | 1 | 221 | - | 187.85 |
| Blood Warmer | 1 | 114 | - | 96.9 |
| Blood Pr. Meter | 1 | 29 | - | 6.67 |
| ECG/RESP | 1 | 50 | - | 11.5 |
| Pulse Oximeter | 1 | 20 | - | 4.6 |

Total load of appliances @12 hrs = 187.85+96.9+6.67+11.5+4.6
= **307.52 W**

| | CLF @14 | CLF@16 | $q_{appliances}$ @14 | $q_{appliances}$ @16 |
|---|---|---|---|---|
| Blanket Warmer | 0.87 | 0.9 | 192.27 | 198.9 |
| Blood Warmer | 0.87 | 0.9 | 99.18 | 102.6 |
| Blood Pr. Meter | 0.14 | 0.1 | 4.06 | 2.9 |
| ECG/RESP | 0.14 | 0.1 | 7 | 5 |
| Pulse Oximeter | 0.14 | 0.1 | 2.8 | 2 |
| | | $(q_{appliances})_{Total}$ | **305.31** | **311.4** |

Total load of appliances @14 hrs = **305.21 W**
Total load of appliances @16 hrs = **311.4 W**

## 2.8 VENTILATION AND INFILTRATION:

Assume air change per day= 2
**L/S = (Volume of room * Number of air changes per hour * 1000)/3600**
**$q_{sensible}$ = 1.232*L/S*TD &**

$q_{latent}$ **= 3012*L/S*δω**

Where, TD = Temperature Difference &

δω = Humidity Ratio

So, Volume of room = 8.077*4.5*3.65 = 132.66 $m^3$

L/S = (132.66*2*1000)/3600 = **73.7**

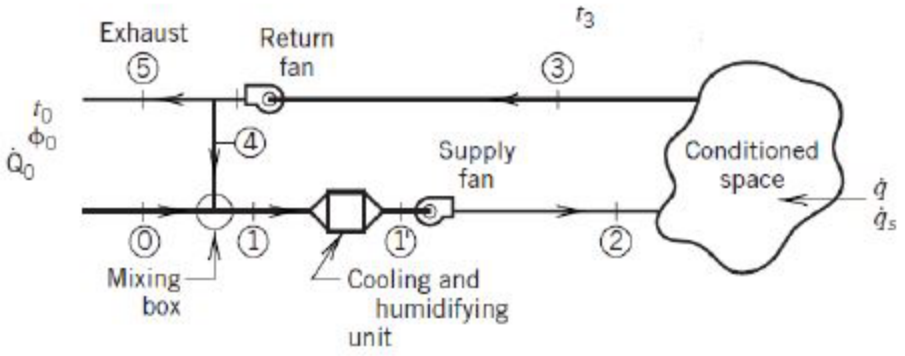
Now, $q_{sensible}$ = 1.232*73.7*(45-22) = **2088.36 W**

$q_{latent}$ = 3012*73.7*(0.0275-0.01) = **3884.73 W**

Total heat load for the 12 hrs, 14 hrs and 16 hrs is shown below.

| | **q @12 hrs** | | **q @14 hrs** | | **q @ 16 hrs** | |
|---|---|---|---|---|---|---|
| | Sensible | Latent | Sensible | Latent | Sensible | Latent |
| ROOF | 1271.5 | - | 1463.55 | - | 1667.61 | - |
| WALL | 940.15 | - | 997.16 | - | 1095.28 | - |
| GLASS | 504.6 | - | 497.7 | - | 472.34 | - |
| PARTITIONS | 1609.39 | - | 1609.39 | - | 1609.39 | - |
| LIGHTS | 1250.09 | - | 1279.17 | - | 1293.70 | - |
| PEOPLE | 119.72 | 118 | 127.02 | 118 | 131.4 | 118 |
| APPLIANCES | 307.52 | - | 305.21 | - | 311.4 | - |
| VENTILATION | 2088.36 | 3884.73 | 2088.36 | 3884.73 | 2088.36 | 3884.73 |
| | 8692.66 | 4002.73 | 8968.89 | 4002.73 | 9270.81 | 4002.73 |
| **Total Heat Load** | **12695.39 W** | | **12971.62 W** | | **13273.54 W** | |

# CHAPTER-3
# CALCULATION FOR COOLING LOAD CAPACITY




Note: Here cooling load at 4 pm time is considered hence cooling load capacity is done for load obtained at 4 pm.
Cooling load at 16 Hrs is **303.22 kW**.
Therefore, Sensible Heat Factor (SHF) = sensible heat load / total heat load = 0.69
From the given conditions the values of inside and outside air conditions are determined.
From psychrometric chart and given data,
$q = m_{a2}*(i3 - i2)$

$m_{a2} = (303.22) / (48-40)$

Assume $Q_0 = 1\ m^3/sec$

$V_2 = 0.832\ m^3/kg$ (from chart shown below)

Therefore, $Q2 = m_2*v_2 = 37.90*0.832 =$ **$31.53\ m^3/sec$**

$m_{a0}+m_{a4} = m_{a1} = m_{a2}$

Now, $m_{a0} = Q_0 / v_0$

From chart $v_0 = 0.94\ m^3/sec$

$m_{a0} = 1 / 0.94 = 1.063\ kg/sec$

Then $m_{a4} = m_{a2} – m_{a0}$

= 37.90 – 1.063 = **36.84 kg/sec**

$m_{a4}*\omega_4 + m_{a0}*\omega_0 = m_{a2}*\omega_1$

$(36.84*0.01) + (1.063*0.0275) = (37.90*\omega_1)$

**$\omega_1$ = 0.010490 kg moisture/kg of dry air**

Now, $i_1$=50 kj/kg & $i_2$=40 kj/kg

***$q_c$* = $m_{a1}*(i_1-i_2)$ = 379 Kw**

***$q_c$* = 107.77 tons of refrigerator**

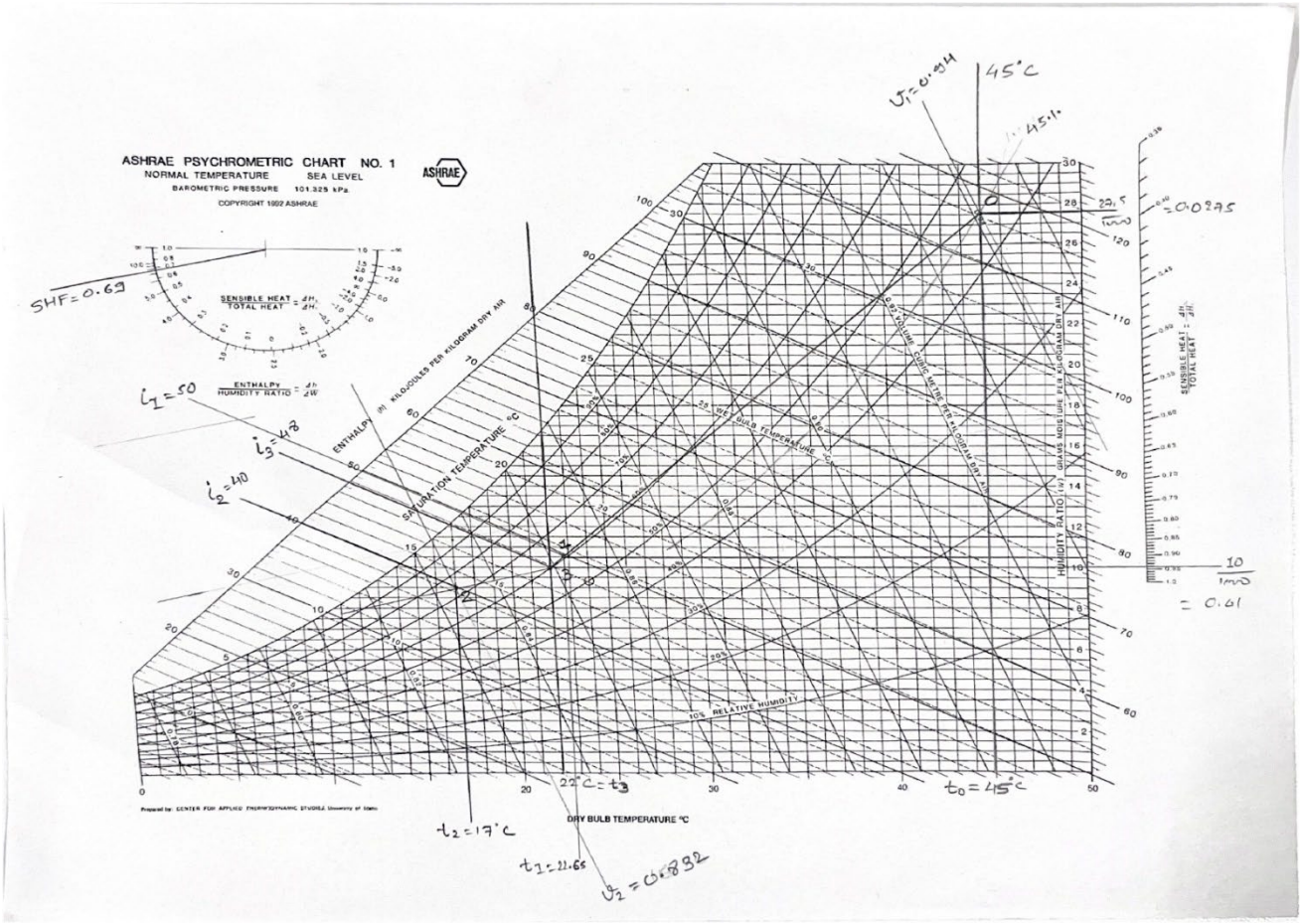



FIGURE 3: PSYCROMETRIC CHART FOR THE COOLING LOAD CAPACITY

# CHAPTER-4
# DUCT SIZING

To design the duct first of all we have to calculate the mass flow rate for each room from the individual cooling load, $Q = m*c_p*\Delta T$

Where $c_p$ = specific heat of air

m = mass flow rate in kg/sec

$\Delta T$ = Temperature difference between design supply and design return air

Temperature = 8 K

Q = Total cooling load

Now, to find the volume flow rate the mass flow rate should be divided by the specific volume at the room temperature which is 0.832 $m^3/kg$.

Finally, duct area A = (volume flow rate) / velocity

| DUCT SIZING | | | | |
|---|---|---|---|---|
| | **COOLING LOAD (kW)** | **MASS FLOW RATE (kg/sec)** | **VOLUME FLOW RATE (m3/sec)** | **DUCT AREA (m2)** |
| | | | | |
| LABORATORY | 19.86 | 2.42 | 2.01 | 0.296040949 |
| PHELEBOTOMY-2 | 19.57 | 2.38 | 1.98 | 0.29168952 |
| PHELEBOTOMY-1 | 19.05 | 2.32 | 1.93 | 0.28391663 |
| ROUTINE CHECK UP ROOM | 18.33 | 2.23 | 1.86 | 0.273280125 |
| HELP DESK | 8.70 | 1.06 | 0.88 | 0.12973518 |
| STORAGE-2 | 7.86 | 0.96 | 0.80 | 0.117239733 |
| FEMALE TOILET | 6.34 | 0.77 | 0.64 | 0.094528047 |
| MALE TOILET | 6.34 | 0.77 | 0.64 | 0.094528047 |
| MEDICAL STORAGE-1 | 8.54 | 1.04 | 0.87 | 0.127274272 |
| STAFF ROOM | 10.00 | 1.22 | 1.01 | 0.149049179 |
| FIRST-AID ROOM | 10.24 | 1.25 | 1.04 | 0.152713874 |
| CLERK OFFICE | 8.82 | 1.07 | 0.89 | 0.131523371 |
| COUNSELOR OFFICE-1 | 11.91 | 1.45 | 1.21 | 0.177546183 |
| COUNSELOR OFFICE-2 | 11.61 | 1.41 | 1.18 | 0.173057245 |

| | | | | |
|---|---|---|---|---|
| COUNSELOR OFFICE-3 | 11.61 | 1.41 | 1.18 | 0.173057245 |
| COUNSELOR OFFICE-4 | 11.61 | 1.41 | 1.18 | 0.173057245 |
| COUNSELOR OFFICE-6 | 11.61 | 1.41 | 1.18 | 0.173057245 |
| COUNSELOR OFFICE-7 | 11.93 | 1.45 | 1.21 | 0.177874303 |
| COUNSELOR OFFICE-8 | 18.00 | 2.19 | 1.82 | 0.268303999 |
| EXAMINATION ROOM-1 | 13.27 | 1.62 | 1.35 | 0.197862653 |
| EXAMINATION ROOM-2 | 12.01 | 1.46 | 1.22 | 0.178976061 |
| EXAMINATION ROOM-3 | 12.01 | 1.46 | 1.22 | 0.178976061 |
| EXAMINATION ROOM-4 | 12.24 | 1.49 | 1.24 | 0.182446305 |
| EXAMINATION ROOM-5 | 12.93 | 1.58 | 1.31 | 0.192786339 |
| STORAGE-2 | 8.82 | 1.07 | 0.89 | 0.131410809 |

# Chapter 5
# References

[1] McQuiston FC, Parker JD, Spitler JD. Heating, ventilating, and air conditioning: analysis and design. John Wiley & Sons; 2004.

# APPENDIX-A COOLING LOAD CALCULATION FOR INDIVIDUAL SEGMENTS

| LABORATORY | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 8.077 | 5.03 | | 40.63 | 1.00 | | | 12 | 32.1 | | 1421.51 | 17 | 37.1 | | 1642.93 | 22 | 42.1 | | 1864.35 |
| EXPOSED WALL (WEST) | 0.9059 | 8.077 | | 3.65 | 29.48 | 0.00 | | | 5 | 24.1 | | 643.64 | 6.11 | 25.21 | | 673.28 | 10 | 29.1 | | 777.17 |
| FLOOR | 1.09 | 8.077 | 5.03 | | 40.63 | | | | 18 | | | 797.11 | 18 | | | 797.11 | 18 | | | 797.11 |
| PARTITION WALL (EAST) | 1.349 | 8.077 | | 3.65 | 24.06 | | | | 18 | | | 584.25 | 18 | | | 584.25 | 18 | | | 584.25 |
| PARTITION WALL (SOUTH) | 1.349 | | 5.03 | 3.65 | 18.36 | | | | 18 | | | 445.81 | 18 | | | 445.81 | 18 | | | 445.81 |
| PARTITION WALL (NORTH)+DOOR | 1.5124 | | | | 22.32 | | | | 18 | | | 607.66 | 18 | | | 607.66 | 18 | | | 499.80 |
| 2-GLASS WINDOWS (WEST) | 4.8 | 1.37 | 1.98 | | 2.71 | | 670.311 | 0.6 | 18 | | 0.17 | 839.67 | 18 | | 0.53 | 1625.17 | 18 | | 0.82 | 2257.93 |
| | | | | | | | | | | TOTAL | | 5339.64 | | | | 6376.20 | | | | 7226.41 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 5 | 2031.37 | 40.63 | | | 0.8 | 1625.09 | 0.82 | 1665.72 | 0.84 | 1706.35 |
| PEOPLE (S.H.) | 10 | | | | 73 | 0.77 | 562.10 | 0.83 | 605.9 | 0.87 | 635.1 |
| PEOPLE (L.H.) | 10 | | | 59 | | | 590 | | 590 | | 590 |
| HYSTEROSCOPIC PUMP (6 hrs) | 2 | | | | 34 | 0.81 | 55.08 | 0.85 | 57.8 | 0.89 | 60.52 |
| OPTICAL MICROSCOPE (6 hrs) | 5 | | | | 63 | 0.81 | 255.15 | 0.85 | 267.75 | 0.89 | 280.35 |
| LASER SONICS (6 hrs) | 3 | | | | 229 | 0.81 | 556.47 | 0.85 | 583.95 | 0.89 | 611.43 |
| ULTRASOUND SYSTEM (6 hrs) | 2 | | | | 1050 | 0.81 | 1701 | 0.85 | 1785 | 0.89 | 1869 |
| X-RAY SYSTEM (6 hrs) | 1 | | | | 229 | 0.81 | 185.49 | 0.85 | 194.65 | 0.89 | 203.81 |
| | | TOTAL | | | | | 4940.38 | | 5160.77 | | 5366.56 |

| | LENGTH | WIDTH | HEIGHT` | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 8.077 | 5.03 | 3.65 | 148.29 | 82.38 | 23 | | 2334.41 |
| VENTILATION AND INFILTRATION (LATENT) | 8.077 | 5.03 | 3.65 | 148.29 | 82.38 | | 0.0175 | 4342.42 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 12614.43 | 13871.38 | 14927.38 |
| TOTAL LATENT COOLOING LOAD | 4932.42 | 4932.42 | 4932.42 |

## COOLING LOAD CALCULATIONS

| COUNSELOR OFFICE (C-8) | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 8.077 | 5.03 | | 40.63 | 1.00 | | | 12 | 32.1 | | 1421.51 | 17 | 37.1 | | 1642.93 | 22 | 42.1 | | 1864.35 |
| EXPOSED WALL (WEST) | 0.9059 | 8.077 | | 3.65 | 29.48 | 0.00 | | | 5 | 24.1 | | 643.64 | 6.11 | 25.21 | | 673.28 | 10 | 29.1 | | 777.17 |
| FLOOR | 1.09 | 8.077 | 5.03 | | 40.63 | | | | 18 | | | 797.16 | 18 | | | 797.16 | 18 | | | 797.16 |
| PARTITION WALL (EAST) | 1.349 | 8.077 | | 3.65 | 24.06 | | | | 18 | | | 584.25 | 18 | | | 584.25 | 18 | | | 584.25 |
| PARTITION WALL (NORTH)+DOOR | 1.5124 | | | | 22.32 | | | | 18 | | | 607.66 | 18 | | | 607.66 | 18 | | | 499.80 |
| 2-GLASS WINDOWS (WEST) | 4.8 | 1.37 | 1.98 | | 2.71 | | 670.311 | 0.6 | 18 | | 0.17 | 839.67 | 18 | | 0.53 | 1625.17 | 18 | | 0.82 | 2257.93 |
| | | | | | | | | | | TOTAL | | 4893.89 | | | | 5930.45 | | | | 6780.66 |

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 5 | 2031.37 | 40.63 | | | 0.8 | 1625.09 | 0.82 | 1665.72 | 0.84 | 1706.35 |
| PEOPLE (S.H.) | 6 | | | | 72 | 0.77 | 332.64 | 0.83 | 358.56 | 0.87 | 375.84 |
| PEOPLE (L.H.) | 6 | | | 45 | | | 270 | | 270 | | 270 |
| COMPUTER | 4 | | | | 65 | 0.81 | 210.6 | 0.85 | 221 | 0.89 | 231.4 |
| PRINTER | 4 | | | | 550 | 0.81 | 1782 | 0.85 | 1870 | 0.89 | 1958 |
| | | TOTAL | | | | | 3950.33 | | 4115.28 | | 4271.59 |

| | LENGTH | WIDTH | HEIGHT' | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 8.077 | 5.03 | 3.65 | 148.29 | 82.38 | 23 | | 2334.41 |
| VENTILATION AND INFILTRATION (LATENT) | 8.077 | 5.03 | 3.65 | 148.29 | 82.38 | | 0.0175 | 4342.42 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 11178.63 | 12380.14 | 13386.65 |
| TOTAL LATENT COOLOING LOAD | 4612.42 | 4612.42 | 4612.42 |

| PHLEBOTOMY-2 + STORAGE | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 8.077 | 5.03 | | 40.63 | 1.00 | | | 12 | 32.1 | | 1421.51 | 17 | 37.1 | | 1642.93 | 22 | 42.1 | | 1864.35 |
| FLOOR | 1.09 | 8.077 | 5.03 | | 40.63 | | | | 18 | | | 797.16 | 18 | | | 797.16 | 18 | | | 797.16 |
| PARTITION WALL (WEST) | 1.349 | 8.077 | | 3.65 | 24.06 | | | | 18 | | | 584.25 | 18 | | | 584.25 | 18 | | | 584.25 |
| PARTITION WALL (EAST)+DOOR | 1.5124 | | | | 33.44 | | | | 18 | | | 910.43 | 18 | | | 910.43 | 18 | | | 499.80 |
| PARTITION WALL (NORTH) | 1.349 | | 5.03 | 3.65 | 18.36 | | | | 18 | | | 445.81 | 18 | | | 445.81 | 18 | | | 445.81 |
| PARTITION WALL (SOUTH) | 1.349 | | 5.03 | 3.65 | 18.36 | | | | 18 | | | 445.81 | 18 | | | 445.81 | 18 | | | 445.81 |
| 2-GLASS WINDOWS (WEST) | 4.8 | 1.37 | 1.98 | | 2.71 | | 670.311 | 0.6 | 18 | | 0.17 | 839.67 | 18 | | 0.53 | 1625.17 | 18 | | 0.82 | 2257.93 |
| | | | | | | | | | | TOTAL | | 5444.63 | | | | 6451.54 | | | | 6895.10 |

## COOLING LOAD CALCULATIONS

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 8 | 3250.18 | 40.63 | | | 0.8 | 2600.15 | 0.82 | 2665.15 | 0.84 | 2730.16 |
| PEOPLE (S.H.) | 10 | | | | 72 | 0.77 | 554.40 | 0.83 | 597.6 | 0.87 | 626.4 |
| PEOPLE (L.H.) | 10 | | | 45 | | | 450 | | 450 | | 450 |
| COMPUTER | 4 | | | | 65 | 0.81 | 210.6 | 0.85 | 221 | 0.89 | 231.4 |
| PRINTER | 4 | | | | 550 | 0.81 | 1782 | 0.85 | 1870 | 0.89 | 1958 |
| | | TOTAL | | | | | 5147.15 | | 5353.75 | | 5545.96 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 8.077 | 5.03 | 3.65 | 148.29 | 82.38 | 23 | | 2334.41 |
| VENTILATION AND INFILTRATION (LATENT) | 8.077 | 5.03 | 3.65 | 148.29 | 82.38 | | 0.0175 | 4342.42 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 12926.18 | 14139.70 | 14775.46 |
| TOTAL LATENT COOLOING LOAD | 4792.42 | 4792.42 | 4792.42 |

| PHLEBOTOMY-1 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 5.03 | 10.06 | | 50.60 | 1.00 | | | 12 | 32.1 | | 1770.51 | 17 | 37.1 | | 2046.29 | 22 | 42.1 | | 2322.07 |
| EXPOSED WALL (WEST) | 0.9059 | 5.03 | | 3.65 | 18.36 | 0.00 | | | 5 | 24.1 | | 400.83 | 6.11 | 25.21 | | 419.29 | 10 | 29.1 | | 483.99 |
| FLOOR | 1.09 | 5.03 | 10.06 | | 50.60 | | | | 18 | | | 992.81 | 18 | | | 992.81 | 18 | | | 992.81 |
| PARTITION WALL (NORTH) | 1.349 | 5.03 | | 3.65 | 18.36 | | | | 18 | | | 445.81 | 18 | | | 445.81 | 18 | | | 445.81 |
| PARTITION WALL (EAST)+DOOR | 1.5124 | | | | 22.32 | | | | 18 | | | 607.66 | 18 | | | 607.66 | 18 | | | 499.80 |
| GLASS WINDOWS (WEST) | 4.8 | 1.37 | 1.98 | | 2.71 | | 670.31 | 0.6 | 18 | | 0.17 | 419.83 | 18 | | 0.53 | 812.58 | 18 | | 0.82 | 1128.97 |
| | | | | | | | | | | TOTAL | | 4637.44 | | | | 5324.43 | | | | 5873.43 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 8 | 4048.14 | 50.60 | | | 0.8 | 3238.52 | 0.82 | 3319.48 | 0.84 | 3400.44 |
| PEOPLE (S.H.) | 10 | | | | 73 | 0.77 | 562.10 | 0.83 | 605.9 | 0.87 | 635.1 |
| PEOPLE (L.H.) | 10 | | | 59 | | | 590 | | 590 | | 590 |
| COMPUTER | 4 | | | | 65 | 0.81 | 210.6 | 0.85 | 221 | 0.89 | 231.4 |
| | | TOTAL | | | | | 4011.22 | | 4146.38 | | 4266.94 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 5.03 | 10.06 | 3.65 | 184.70 | 102.61 | 23 | | 2907.53 |
| VENTILATION AND INFILTRATION (LATENT) | 5.03 | 10.06 | 3.65 | 184.70 | 102.61 | | 0.0175 | 5408.53 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 11556.19 | 12378.35 | 13047.91 |
| TOTAL LATENT COOLOING LOAD | 5998.53 | 5998.53 | 5998.53 |

## COOLING LOAD CALCULATIONS

| ROUTINE CHECK UP ROOM | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 8.077 | 5.03 | | 40.63 | 1.00 | | | 12 | 32.1 | | 1421.51 | 17 | 37.1 | | 1642.93 | 22 | 42.1 | | 1864.35 |
| EXPOSED WALL (EAST) | 0.9059 | 8.077 | | 3.65 | 29.48 | -3.00 | | | 15 | 31.10 | | 830.58 | 17.78 | 33.88 | | 904.77 | 18.33 | 34.43 | | 919.61 |
| FLOOR | 1.09 | 8.077 | 5.03 | | 40.63 | | | | 18 | | | 797.11 | 18 | | | 797.11 | 18 | | | 797.11 |
| PARTITION WALL (WEST) | 1.349 | 8.077 | | 3.65 | 29.48 | | | | 18 | | | 715.86 | 18 | | | 715.86 | 18 | | | 715.86 |
| PARTITION WALL (NORTH)+DOOR | 1.5124 | | | | 22.32 | | | | 18 | | | 607.66 | 18 | | | 607.66 | 18 | | | 499.80 |
| 2-GLASS WINDOWS (EAST) | 4.8 | 1.37 | 1.98 | | 2.71 | | 670.311 | 0.6 | 18 | | 0.27 | 1057.86 | 18 | | 0.22 | 948.76 | 18 | | 0.17 | 839.67 |
| | | | | | | | | | | TOTAL | | 5430.58 | | | | 5617.09 | | | | 5636.39 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 21 (12 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 8 | 3250.18 | 40.63 | | | 0.81 | 2632.65 | 0.84 | 2730.16 | 0.86 | 2795.16 |
| PEOPLE (S.H.) | 8 | | | | 73 | 0.79 | 461.36 | 0.84 | 490.56 | 0.88 | 513.92 |
| PEOPLE (L.H.) | 8 | | | 59 | | | 472 | | 472 | | 472 |
| COMPUTER | 4 | | | | 65 | 0.82 | 213.2 | 0.86 | 223.6 | 0.89 | 231.4 |
| PRINTER | 4 | | | | 550 | 0.82 | 1804 | 0.86 | 1892 | 0.89 | 1958 |
| PULSE OXIMETER | 3 | | | | 20 | 0.69 | 41.4 | 0.77 | 46.2 | 0.82 | 49.2 |
| | | TOTAL | | | | | 5152.61 | | 5382.52 | | 5547.68 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 8.077 | 5.03 | 3.65 | 148.29 | 82.38 | 23 | | 2334.41 |
| VENTILATION AND INFILTRATION (LATENT) | 8.077 | 5.03 | 3.65 | 148.29 | 82.38 | | 0.0175 | 4342.42 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 12917.60 | 13334.02 | 13518.48 |
| TOTAL LATENT COOLOING LOAD | 4814.42 | 4814.42 | 4814.42 |

| HELP DESK | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 3.23 | 5.03 | | 16.25 | 1.00 | | | 12 | 32.1 | | 568.46 | 17 | 37.1 | | 657.01 | 22 | 42.1 | | 745.55 |
| FLOOR | 1.09 | 3.23 | 5.03 | | 40.63 | | | | 18 | | | 797.16 | 18 | | | 797.16 | 18 | | | 797.16 |
| PARTITION WALL (WEST) | 1.349 | 3.23 | | 3.65 | 11.79 | | | | 18 | | | 286.27 | 18 | | | 286.27 | 18 | | | 286.27 |
| PARTITION WALL (EAST)+DOOR | 1.5124 | | | | 15.75 | | | | 18 | | | 428.81 | 18 | | | 428.81 | 18 | | | 499.80 |
| PARTITION WALL (SOUTH) | 1.349 | 3.23 | | 3.65 | 11.79 | | | | 18 | | | 286.27 | 18 | | | 286.27 | 18 | | | 499.80 |
| PARTITION WALL (NORTH ) | 1.7935 | | | | 21.07 | | | | 18 | | | 680.20 | 18 | | | 680.20 | 18 | | | 499.80 |
| GLASS WINDOWS (NORTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 141.615 | 0.6 | 18 | | 0.89 | 439.50 | 18 | | 0.86 | 432.59 | 18 | | 0.75 | 407.23 |
| | | | | | | | | | | TOTAL | | 3486.68 | | | | 3568.31 | | | | 3735.62 |

## COOLING LOAD CALCULATIONS

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 7 TO 11 (16 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 2 | 324.94 | 16.25 | | | 0.86 | 279.45 | 0.88 | 285.95 | 0.89 | 289.19 |
| PEOPLE (S.H.) | 3 | | | | 72 | 0.82 | 177.12 | 0.87 | 187.92 | 0.9 | 194.4 |
| PEOPLE (L.H.) | 3 | | | 45 | | | 135 | | 135 | | 135 |
| COMPUTER | 3 | | | | 65 | 0.85 | 165.75 | 0.89 | 173.55 | 0.91 | 177.45 |
| PRINTER | 3 | | | | 550 | 0.85 | 1402.5 | 0.89 | 1468.5 | 0.91 | 1501.5 |
| | | TOTAL | | | | | 2024.82 | | 2115.92 | | 2162.54 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 3.23 | 5.03 | 3.65 | 59.30 | 32.95 | 23 | | 933.53 |
| VENTILATION AND INFILTRATION (LATENT) | 3.23 | 5.03 | 3.65 | 59.30 | 32.95 | | 0.0175 | 1736.54 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 6445.03 | 6617.76 | 6831.70 |
| TOTAL LATENT COOLOING LOAD | 1871.54 | 1871.54 | 1871.54 |

| STORE-2 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/T D @12 | CLTD (COR R) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/T D @14 | CLTD (COR R) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/T D @16 | CLTD (COR R) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.039 | 5.03 | | 20.32 | 1.00 | | | 12 | 32.1 | | 710.84 | 17 | 37.1 | | 821.57 | 22 | 42.1 | | 932.29 |
| FLOOR | 1.09 | 4.039 | 5.03 | | 40.63 | | | | 18 | | | 797.16 | 18 | | | 797.16 | 18 | | | 797.16 |
| PARTITION WALL (WEST) | 1.349 | 4.039 | | 3.65 | 14.74 | | | | 18 | | | 357.97 | 18 | | | 357.97 | 18 | | | 357.97 |
| PARTITION WALL (EAST)+DOOR | 1.5124 | | | | 15.75 | | | | 18 | | | 428.81 | 18 | | | 428.81 | 18 | | | 499.80 |
| PARTITION WALL (NORTH) | 1.349 | 3.23 | | 3.65 | 11.79 | | | | 18 | | | 286.27 | 18 | | | 286.27 | 18 | | | 499.80 |
| PARTITION WALL (SOUTH ) | 1.7935 | | | | 21.07 | | | | 18 | | | 680.20 | 18 | | | 680.20 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 144.762 | 0.6 | 18 | | 0.83 | 429.92 | 18 | | 0.68 | 394.58 | 18 | | 0.35 | 316.83 |
| | | | | | | | | | | | TOTAL | 3691.18 | | | | 3766.56 | | | | 3903.65 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 2 | 406.32 | 20.32 | | | 0.8 | 325.06 | 0.82 | 333.19 | 0.84 | 341.31 |
| PEOPLE (S.H.) | 1 | | | | 72 | 0.77 | 55.44 | 0.83 | 59.76 | 0.87 | 62.64 |
| PEOPLE (L.H.) | 1 | | | 45 | | | 45 | | 45 | | 45 |
| COMPUTER | 3 | | | | 65 | 0.81 | 157.95 | 0.85 | 165.75 | 0.89 | 173.55 |
| | | TOTAL | | | | | 538.45 | | 558.70 | | 577.50 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.039 | 5.03 | 3.65 | 74.15 | 41.20 | 23 | | 1167.35 |
| VENTILATION AND INFILTRATION (LATENT) | 4.039 | 5.03 | 3.65 | 74.15 | 41.20 | | 0.0175 | 2171.48 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 5396.98 | 5492.61 | 5648.51 |
| TOTAL LATENT COOLOING LOAD | 2216.48 | 2216.48 | 2216.48 |

## COOLING LOAD CALCULATIONS

**FEMALE TOILET**

| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROOF | 1.09 | 4.04 | 3.96 | | 16.00 | 1.00 | | | 12 | 32.1 | | 559.77 | 17 | 37.1 | | 646.96 | 22 | 42.1 | | 734.15 |
| FLOOR | 1.09 | 4.04 | 3.96 | | 16.00 | | | | 18 | | | 313.89 | 18 | | | 313.89 | 18 | | | 313.89 |
| PARTITION WALL (SOUTH) | 1.349 | | 3.96 | 3.65 | 14.45 | | | | 18 | | | 350.97 | 18 | | | 350.97 | 18 | | | 350.97 |
| PARTITION WALL (NORTH)+DOOR | 1.5467 | | | | 18.42 | | | | 18 | | | 512.82 | 18 | | | 512.82 | 18 | | | 499.80 |
| PARTITION WALL (WEST) | 1.4339 | | | | 1.43 | | | | 18 | | | 37.01 | 18 | | | 37.01 | 18 | | | 499.80 |
| PARTITION WALL (EAST) | 1.349 | 4.04 | | 3.65 | 14.75 | | | | 18 | | | 358.06 | 18 | | | 358.06 | 18 | | | 499.80 |
| GLASS WINDOWS (WEST) | 4.8 | 0.61 | 0.61 | | 0.37 | | 67 0.31 1 | 0.6 | 18 | | 0.17 | 57.59 | 18 | | 0.53 | 111.47 | 18 | | 0.82 | 154.87 |
| | | | | | | | | | | TOTAL | | 2190.11 | | | | 2331.18 | | | | 3053.28 |

**a=0.65 and b=C FROM Table-16**

| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LIGHTS | 2 | 319.97 | 16.00 | | | 0.86 | 275.17 | 0.88 | 281.57 | 0.89 | 284.77 |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.82 | 179.58 | 0.87 | 190.53 | 0.9 | 197.1 |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 |
| | | TOTAL | | | | | 454.75 | | 454.75 | | 481.87 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.04 | 3.96 | 3.65 | 58.39 | 32.44 | 23 | | 919.25 |
| VENTILATION AND INFILTRATION (LATENT) | 4.04 | 3.96 | 3.65 | 58.39 | 32.44 | | 0.0175 | 1709.98 |
| | | | | | | | | |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 3564.12 | 3705.19 | 4454.40 |
| TOTAL LATENT COOLOING LOAD | 1886.98 | 1886.98 | 1886.98 |
| | | | |

**MALE TOILET**

| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROOF | 1.09 | 4.04 | 3.96 | | 16.00 | 1.00 | | | 12 | 32.1 | | 559.77 | 17 | 37.1 | | 646.96 | 22 | 42.1 | | 734.15 |
| FLOOR | 1.09 | 4.04 | 3.96 | | 16.00 | | | | 18 | | | 313.89 | 18 | | | 313.89 | 18 | | | 313.89 |
| PARTITION WALL (NORTH) | 1.349 | | 3.96 | 3.65 | 14.45 | | | | 18 | | | 350.97 | 18 | | | 350.97 | 18 | | | 350.97 |
| PARTITION WALL (SOUTH)+DOOR | 1.5467 | | | | 18.42 | | | | 18 | | | 512.82 | 18 | | | 512.82 | 18 | | | 499.80 |
| PARTITION WALL (WEST) | 1.4339 | | | | 1.43 | | | | 18 | | | 37.01 | 18 | | | 37.01 | 18 | | | 499.80 |
| PARTITION WALL (EAST) | 1.349 | 4.04 | | 3.65 | 14.75 | | | | 18 | | | 358.06 | 18 | | | 358.06 | 18 | | | 499.80 |
| GLASS WINDOWS (WEST) | 4.8 | 0.61 | 0.61 | | 0.37 | | 67 0.31 1 | 0.6 | 18 | | 0.17 | 57.59 | 18 | | 0.53 | 111.47 | 18 | | 0.82 | 154.87 |
| | | | | | | | | | | TOTAL | | 2190.11 | | | | 2331.18 | | | | 3053.28 |

## COOLING LOAD CALCULATIONS

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 2 | 319.97 | 16.00 | | | 0.86 | 275.17 | 0.88 | 281.57 | 0.89 | 284.77 |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.82 | 179.58 | 0.87 | 190.53 | 0.9 | 197.1 |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 |
| | | TOTAL | | | | | 454.75 | | 472.10 | | 481.87 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.04 | 3.96 | 3.65 | 58.39 | 32.44 | 23 | | 919.25 |
| VENTILATION AND INFILTRATION (LATENT) | 4.04 | 3.96 | 3.65 | 58.39 | 32.44 | | 0.0175 | 1709.98 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 3564.12 | 3722.54 | 4454.40 |
| TOTAL LATENT COOLOING LOAD | 1886.98 | 1886.98 | 1886.98 |

| MEDICAL STORE-1 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/T D @12 | CLTD (COR R) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/T D @14 | CLTD (COR R) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/T D @16 | CLTD (COR R) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.04 | 3.96 | | 16.00 | 1.00 | | | 12 | 32.1 | | 559.77 | 17 | 37.1 | | 646.96 | 22 | 42.1 | | 734.15 |
| FLOOR | 1.09 | 4.04 | 3.96 | | 16.00 | | | | 18 | | | 313.89 | 18 | | | 313.89 | 18 | | | 313.89 |
| PARTITION WALL (EAST) | 1.349 | 4.04 | | 3.65 | 14.75 | | | | 18 | | | 358.06 | 18 | | | 358.06 | 18 | | | 358.06 |
| PARTITION WALL (NORTH)+DOOR | 1.5467 | | | | 18.42 | | | | 18 | | | 512.82 | 18 | | | 512.82 | 18 | | | 499.80 |
| PARTITION WALL (WEST) | 1.4339 | | | | 1.43 | | | | 18 | | | 37.01 | 18 | | | 37.01 | 18 | | | 499.80 |
| PARTITION WALL (SOUTH) | 1.5676 | 4.04 | | 3.65 | 15.75 | | | | 18 | | | 444.41 | 18 | | | 444.41 | 18 | | | 499.80 |
| GLASS WINDOWS (WEST) | 4.8 | 1 | 1 | | 1.00 | | 670.31 | 0.6 | 18 | | 0.17 | 154.77 | 18 | | 0.53 | 299.56 | 18 | | 0.82 | 416.19 |
| | | | | | | | | | | TOTAL | | 2380.74 | | | | 2612.72 | | | | 3321.69 |

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 2 | 319.97 | 16.00 | | | 0.86 | 275.17 | 0.88 | 281.57 | 0.89 | 284.77 |
| PEOPLE (S.H.) | 5 | | | | 73 | 0.82 | 299.30 | 0.87 | 317.55 | 0.9 | 328.5 |
| PEOPLE (L.H.) | 5 | | | 59 | | | 295 | | 295 | | 295 |
| COMPUTER | 3 | | | | 65 | 0.85 | 165.75 | 0.89 | 173.55 | 0.91 | 177.45 |
| PRINTER | 3 | | | | 550 | 0.85 | 1402.5 | 0.89 | 1468.5 | 0.91 | 1501.5 |
| | | TOTAL | | | | | 2142.72 | | 2241.17 | | 2292.22 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.04 | 3.96 | 3.65 | 58.39 | 32.44 | 23 | | 919.25 |
| VENTILATION AND INFILTRATION (LATENT) | 4.04 | 3.96 | 3.65 | 58.39 | 32.44 | | 0.0175 | 1709.98 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 5442.71 | 5773.14 | 6533.17 |
| TOTAL LATENT COOLOING LOAD | 2004.98 | 2004.98 | 2004.98 |

## COOLING LOAD CALCULATIONS

| STAFF ROOM | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.04 | 3.96 | | 16.00 | 1.00 | | | 12 | 32.1 | | 559.77 | 17 | 37.1 | | 646.96 | 22 | 42.1 | | 734.15 |
| FLOOR | 1.09 | 4.04 | 3.96 | | 16.00 | | | | 18 | | | 313.89 | 18 | | | 313.89 | 18 | | | 313.89 |
| PARTITION WALL (NORTH) | 1.349 | | 3.96 | 3.65 | 14.45 | | | | 18 | | | 350.97 | 18 | | | 350.97 | 18 | | | 350.97 |
| PARTITION WALL (SOUTH)+DOOR | 1.5467 | | | | 18.42 | | | | 18 | | | 512.82 | 18 | | | 512.82 | 18 | | | 499.80 |
| PARTITION WALL (EAST) | 1.349 | 4.04 | | 3.65 | 14.75 | | | | 18 | | | 358.06 | 18 | | | 358.06 | 18 | | | 499.80 |
| PARTITION WALL (WEST) | 1.5676 | 4.04 | | 3.65 | 15.75 | | | | 18 | | | 444.41 | 18 | | | 444.41 | 18 | | | 499.80 |
| GLASS WINDOWS (WEST) | 4.8 | 1 | 1 | | 1.00 | | 670.31 | 0.6 | 18 | | 0.17 | 154.77 | 18 | | 0.53 | 299.56 | 18 | | 0.82 | 416.19 |
| | | | | | | | | | | TOTAL | | 2694.70 | | | | 2926.68 | | | | 3314.60 |

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 2 | 319.97 | 16.00 | | | 0.8 | 255.97 | 0.82 | 262.37 | 0.84 | 268.77 |
| PEOPLE (S.H.) | 5 | | | | 73 | 0.74 | 270.10 | 0.8 | 292 | 0.85 | 310.25 |
| PEOPLE (L.H.) | 5 | | | 59 | | | 295 | | 295 | | 295 |
| COMPUTER | 3 | | | | 65 | 0.81 | 157.95 | 0.85 | 165.75 | 0.89 | 173.55 |
| PRINTER | 3 | | | | 550 | 0.81 | 1336.5 | 0.85 | 1402.5 | 0.89 | 1468.5 |
| COFFEE BREWER | 1 | | | 560 | 1100 | 0.81 | 1451 | 0.85 | 1495 | 0.89 | 1539 |
| | | TOTAL | | | | | 3471.52 | | 3617.62 | | 3760.07 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.04 | 3.96 | 3.65 | 58.39 | 32.44 | 23 | | 919.25 |
| VENTILATION AND INFILTRATION (LATENT) | 4.04 | 3.96 | 3.65 | 58.39 | 32.44 | | 0.0175 | 1709.98 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7085.48 | 7463.56 | 7993.93 |
| TOTAL LATENT COOLOING LOAD | 2004.98 | 2004.98 | 2004.98 |

| FIRST-AID ROOM | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.04 | 5.03 | | 20.32 | 1.00 | | | 12 | 32.1 | | 711.02 | 17 | 37.1 | | 821.77 | 22 | 42.1 | | 932.52 |
| EXPOSED WALL (EAST) | 0.9059 | 4.04 | 5.03 | | 16.36 | 0.00 | | | 15 | 34.1 | | 505.34 | 17.78 | 36.88 | | 546.51 | 18.33 | 37.43 | | 554.74 |
| FLOOR | 1.09 | 4.04 | 5.03 | | 20.32 | | | | 18 | | | 398.70 | 18 | | | 398.70 | 18 | | | 398.70 |
| PARTITION WALL (EAST) | 1.349 | 4.04 | | 3.65 | 14.75 | | | | 18 | | | 358.06 | 18 | | | 358.06 | 18 | | | 358.06 |
| PARTITION WALL (WEST)+DOOR | 1.5441 | | | | 18.71 | | | | 18 | | | 520.02 | 18 | | | 520.02 | 18 | | | 499.80 |
| PARTITION WALL (SOUTH) | 1.349 | | 5.03 | 3.65 | 18.36 | | | | 18 | | | 445.81 | 18 | | | 445.81 | 18 | | | 499.80 |
| PARTITION WALL (NORTH) | 1.4964 | | 5.03 | 3.65 | 19.36 | | | | 18 | | | 521.47 | 18 | | | 521.47 | 18 | | | 499.80 |
| GLASS WINDOWS (NORTH) | 4.8 | 1 | 1 | | 1.00 | | 141.62 | 0.6 | 18 | | 0.89 | 162.02 | 18 | | 0.86 | 159.47 | 18 | | 0.75 | 150.13 |
| | | | | | | | | | | TOTAL | | 3622.44 | | | | 3771.81 | | | | 3893.55 |

## COOLING LOAD CALCULATIONS

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 2 | 406.42 | 20.32 | | | 0.86 | 349.52 | 0.88 | 357.65 | 0.89 | 361.72 |
| PEOPLE (S.H.) | 5 | | | | 73 | 0.85 | 310.25 | 0.89 | 324.85 | 0.92 | 335.8 |
| PEOPLE (L.H.) | 5 | | | 59 | | | 295 | | 295 | | 295 |
| COMPUTER | 3 | | | | 65 | 0.87 | 169.65 | 0.9 | 175.5 | 0.93 | 181.35 |
| PRINTER | 3 | | | | 550 | 0.87 | 1435.5 | 0.9 | 1485 | 0.93 | 1534.5 |
| BLOOD PRESSURE METER | 2 | | | | 29 | 0.87 | 50.46 | 0.9 | 52.2 | 0.93 | 53.94 |
| BLOOD WARMER | 2 | | | | 114 | 0.87 | 198.36 | 0.9 | 205.2 | 0.93 | 212.04 |
| PULSE OXIMETER | 2 | | | | 20 | 0.87 | 34.8 | 0.9 | 36 | 0.93 | 37.2 |
| | | TOTAL | | | | | 2548.54 | | 2636.40 | | 2716.55 |

| | LENGTH | WIDTH | HEIGHT' | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.04 | 5.03 | 3.65 | 74.17 | 41.21 | 23 | | 1167.64 |
| VENTILATION AND INFILTRATION (LATENT) | 4.04 | 5.03 | 3.65 | 74.17 | 41.21 | | 0.0175 | 2172.01 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7338.62 | 7575.85 | 7777.74 |
| TOTAL LATENT COOLOING LOAD | 2467.01 | 2467.01 | 2467.01 |

| CLERK ROOM | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.04 | 5.03 | | 20.32 | 1.00 | | | 12 | 32.1 | | 711.02 | 17 | 37.1 | | 821.77 | 22 | 42.1 | | 932.52 |
| EXPOSED WALL (EAST) | 0.9059 | 4.04 | 5.03 | | 16.36 | 0.00 | | | 15 | 34.1 | | 505.34 | 17.78 | 36.88 | | 546.51 | 18.33 | 37.43 | | 554.74 |
| FLOOR | 1.09 | 4.04 | 5.03 | | 20.32 | | | | 18 | | | 398.70 | 18 | | | 398.70 | 18 | | | 398.70 |
| PARTITION WALL (EAST) | 1.349 | 4.04 | | 3.65 | 14.75 | | | | 18 | | | 358.06 | 18 | | | 358.06 | 18 | | | 358.06 |
| PARTITION WALL (WEST)+DOOR | 1.5441 | | | | 18.71 | | | | 18 | | | 520.02 | 18 | | | 520.02 | 18 | | | 499.80 |
| PARTITION WALL (NORTH) | 1.349 | | 5.03 | 3.65 | 18.36 | | | | 18 | | | 445.81 | 18 | | | 445.81 | 18 | | | 499.80 |
| PARTITION WALL (SOUTH) | 1.4964 | | 5.03 | 3.65 | 19.36 | | | | 18 | | | 521.47 | 18 | | | 521.47 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1 | 1 | | 1.00 | | 144.76 | 0.6 | 18 | | 0.83 | 158.49 | 18 | | 0.68 | 145.46 | 18 | | 0.35 | 116.80 |
| | | | | | | | | | | TOTAL | | 3618.91 | | | | 3757.80 | | | | 3860.22 |

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 2 | 406.42 | 20.32 | | | 0.86 | 349.52 | 0.88 | 357.65 | 0.89 | 361.72 |
| PEOPLE (S.H.) | 10 | | | | 73 | 0.85 | 620.50 | 0.89 | 649.7 | 0.92 | 671.6 |
| PEOPLE (L.H.) | 10 | | | 59 | | | 590 | | 590 | | 590 |
| | | TOTAL | | | | | 970.02 | | 1007.35 | | 1033.32 |

| | LENGTH | WIDTH | HEIGHT' | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.04 | 5.03 | 3.65 | 74.17 | 41.21 | 23 | | 1167.64 |
| VENTILATION AND INFILTRATION (LATENT) | 4.04 | 5.03 | 3.65 | 74.17 | 41.21 | | 0.0175 | 2172.01 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 5756.57 | 5932.79 | 6061.18 |
| TOTAL LATENT COOLOING LOAD | 2762.01 | 2762.01 | 2762.01 |

## COOLING LOAD CALCULATIONS

| COUNSELOR OFFICE-1 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 5.45 | 6.02 | | 32.81 | 1.00 | | | 12 | 32.1 | | 1147.95 | 17 | 37.1 | | 1326.76 | 22 | 42.1 | | 1505.57 |
| EXPOSED WALL (WEST) | 0.9059 | 5.45 | | 3.65 | 19.89 | 0.00 | | | 5 | 24.1 | | 434.30 | 6.11 | 25.21 | | 454.30 | 10 | 29.1 | | 524.40 |
| EXPOSED WALL (SOUTH) | 0.9059 | | 6.02 | 3.65 | 19.26 | -6.00 | | | 5 | 18.10 | | 315.81 | 8.89 | 21.99 | | 383.66 | 13.33 | 26.43 | | 461.21 |
| FLOOR | 1.09 | 5.45 | 6.02 | | 32.81 | | | | 18 | | | 643.71 | 18 | | | 643.71 | 18 | | | 643.71 |
| PARTITION WALL (EAST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (NORTH)+DOOR | 1.4899 | | | | 25.94 | | | | 18 | | | 695.53 | 18 | | | 695.53 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 144.762 | 0.6 | 18 | | 0.83 | 429.92 | 18 | | 0.68 | 394.58 | 18 | | 0.35 | 316.83 |
| | | | | | | | | | | TOTAL | | 4018.65 | | | | 4249.97 | | | | 4302.95 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 | |
| LIGHTS | 4 | 1312.36 | 32.81 | | | 0.8 | 1049.89 | 0.82 | 1076.14 | 0.84 | 1102.38 | |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.77 | 168.63 | 0.83 | 181.77 | 0.87 | 190.53 | |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 | |
| COMPUTER | 1 | | | | 65 | 0.81 | 52.65 | 0.85 | 55.25 | 0.89 | 57.85 | |
| PRINTER | 1 | | | | 550 | 0.81 | 445.5 | 0.85 | 467.5 | 0.89 | 489.5 | |
| STRESS TREADMILL | 1 | | | | 173 | 0.81 | 140.13 | 0.85 | 147.05 | 0.89 | 153.97 | |
| ECG/RESP | 1 | | | | 50 | 0.81 | 40.5 | 0.85 | 42.5 | 0.89 | 44.5 | |
| | | TOTAL | | | | | 1897.30 | | 1970.21 | | 2038.73 | |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | 23 | | 1885.18 |
| VENTILATION AND INFILTRATION (LATENT) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | | 0.0175 | 3506.76 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7801.12 | 8105.35 | 8226.85 |
| TOTAL LATENT COOLOING LOAD | 3683.76 | 3683.76 | 3683.76 |

| COUNSELOR OFFICE-2 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 5.45 | 6.02 | | 32.81 | 1.00 | | | 12 | 32.1 | | 1147.95 | 17 | 37.1 | | 1326.76 | 22 | 42.1 | | 1505.57 |
| EXPOSED WALL (SOUTH) | 0.9059 | | 6.02 | 3.65 | 19.26 | -6.00 | | | 5 | 18.10 | | 315.81 | 8.89 | 21.99 | | 383.66 | 13.33 | 26.43 | | 461.21 |
| FLOOR | 1.09 | 5.45 | 6.02 | | 32.81 | | | | 18 | | | 643.71 | 18 | | | 643.71 | 18 | | | 643.71 |
| PARTITION WALL (EAST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (WEST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (NORTH)+DOOR | 1.4899 | | | | 25.94 | | | | 18 | | | 695.53 | 18 | | | 695.53 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 144.762 | 0.6 | 18 | | 0.83 | 429.92 | 18 | | 0.68 | 394.58 | 18 | | 0.35 | 316.83 |
| | | | | | | | | | | TOTAL | | 3935.77 | | | | 4147.09 | | | | 4129.97 |

## COOLING LOAD CALCULATIONS

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 1312.36 | 32.81 | | | 0.8 | 1049.89 | 0.82 | 1076.14 | 0.84 | 1102.38 |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.77 | 168.63 | 0.83 | 181.77 | 0.87 | 190.53 |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 |
| COMPUTER | 1 | | | | 65 | 0.81 | 52.65 | 0.85 | 55.25 | 0.89 | 57.85 |
| PRINTER | 1 | | | | 550 | 0.81 | 445.5 | 0.85 | 467.5 | 0.89 | 489.5 |
| BLOOD PRESSURE METER | 1 | | | | 29 | 0.81 | 23.49 | 0.85 | 24.65 | 0.89 | 25.81 |
| ECG/RESP | 1 | | | | 50 | 0.81 | 40.5 | 0.85 | 42.5 | 0.89 | 44.5 |
| | | TOTAL | | | | | 1780.66 | | 1847.81 | | 1910.57 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | 23 | | 1885.18 |
| VENTILATION AND INFILTRATION (LATENT) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | | 0.0175 | 3506.76 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7601.61 | 7880.07 | 7925.72 |
| TOTAL LATENT COOLOING LOAD | 3683.76 | 3683.76 | 3683.76 |

| COUNSELOR OFFICE-3 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 5.45 | 6.02 | | 32.81 | 1.00 | | | 12 | 32.1 | | 1147.95 | 17 | 37.1 | | 1326.76 | 22 | 42.1 | | 1505.57 |
| EXPOSED WALL (SOUTH) | 0.9059 | | 6.02 | 3.65 | 19.26 | -6.00 | | | 5 | 18.10 | | 315.81 | 8.89 | 21.99 | | 383.66 | 13.33 | 26.43 | | 461.21 |
| FLOOR | 1.09 | 5.45 | 6.02 | | 32.81 | | | | 18 | | | 643.71 | 18 | | | 643.71 | 18 | | | 643.71 |
| PARTITION WALL (EAST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (WEST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (NORTH)+DOOR | 1.4899 | | | | 25.94 | | | | 18 | | | 695.53 | 18 | | | 695.53 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 14 4.76 2 | 0.6 | 18 | | 0.83 | 429.92 | 18 | | 0.68 | 394.58 | 18 | | 0.35 | 316.83 |
| | | | | | | | | | | TOTAL | | 3935.77 | | | | 4147.09 | | | | 4129.97 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 1312.36 | 32.81 | | | 0.8 | 1049.89 | 0.82 | 1076.14 | 0.84 | 1102.38 |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.77 | 168.63 | 0.83 | 181.77 | 0.87 | 190.53 |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 |
| COMPUTER | 1 | | | | 65 | 0.81 | 52.65 | 0.85 | 55.25 | 0.89 | 57.85 |
| PRINTER | 1 | | | | 550 | 0.81 | 445.5 | 0.85 | 467.5 | 0.89 | 489.5 |
| BLOOD PRESSURE METER | 1 | | | | 29 | 0.81 | 23.49 | 0.85 | 24.65 | 0.89 | 25.81 |
| ECG/RESP | 1 | | | | 50 | 0.81 | 40.5 | 0.85 | 42.5 | 0.89 | 44.5 |
| | | TOTAL | | | | | 1780.66 | | 1847.81 | | 1910.57 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | 23 | | 1885.18 |
| VENTILATION AND INFILTRATION (LATENT) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | | 0.0175 | 3506.76 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7601.61 | 7880.07 | 7925.72 |
| TOTAL LATENT COOLOING LOAD | 3683.76 | 3683.76 | 3683.76 |

## COOLING LOAD CALCULATIONS

| COUNSELOR OFFICE-4 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 5.45 | 6.02 | | 32.81 | 1.00 | | | 12 | 32.1 | | 1147.95 | 17 | 37.1 | | 1326.76 | 22 | 42.1 | | 1505.57 |
| EXPOSED WALL (SOUTH) | 0.9059 | | 6.02 | 3.65 | 19.26 | -6.00 | | | 5 | 18.10 | | 315.81 | 8.89 | 21.99 | | 383.66 | 13.33 | 26.43 | | 461.21 |
| FLOOR | 1.09 | 5.45 | 6.02 | | 32.81 | | | | 18 | | | 643.71 | 18 | | | 643.71 | 18 | | | 643.71 |
| PARTITION WALL (EAST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (WEST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (NORTH)+DOOR | 1.4899 | | | | 25.94 | | | | 18 | | | 695.53 | 18 | | | 695.53 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 14.762 | 0.6 | 18 | | 0.83 | 429.92 | 18 | | 0.68 | 394.58 | 18 | | 0.35 | 316.83 |
| | | | | | | | | | TOTAL | | | 3935.77 | | | | 4147.09 | | | | 4129.97 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 1312.36 | 32.81 | | | 0.8 | 1049.89 | 0.82 | 1076.14 | 0.84 | 1102.38 |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.77 | 168.63 | 0.83 | 181.77 | 0.87 | 190.53 |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 |
| COMPUTER | 1 | | | | 65 | 0.81 | 52.65 | 0.85 | 55.25 | 0.89 | 57.85 |
| PRINTER | 1 | | | | 550 | 0.81 | 445.5 | 0.85 | 467.5 | 0.89 | 489.5 |
| BLOOD PRESSURE METER | 1 | | | | 29 | 0.81 | 23.49 | 0.85 | 24.65 | 0.89 | 25.81 |
| ECG/RESP | 1 | | | | 50 | 0.81 | 40.5 | 0.85 | 42.5 | 0.89 | 44.5 |
| | | TOTAL | | | | | 1780.66 | | 1847.81 | | 1910.57 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | 23 | | 1885.18 |
| VENTILATION AND INFILTRATION (LATENT) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | | 0.0175 | 3506.76 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7601.61 | 7880.07 | 7925.72 |
| TOTAL LATENT COOLOING LOAD | 3683.76 | 3683.76 | 3683.76 |

| COUNSELOR OFFICE-6 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 5.45 | 6.02 | | 32.81 | 1.00 | | | 12 | 32.1 | | 1147.95 | 17 | 37.1 | | 1326.76 | 22 | 42.1 | | 1505.57 |
| EXPOSED WALL (SOUTH) | 0.9059 | | 6.02 | 3.65 | 19.26 | -6.00 | | | 5 | 18.10 | | 315.81 | 8.89 | 21.99 | | 383.66 | 13.33 | 26.43 | | 461.21 |
| FLOOR | 1.09 | 5.45 | 6.02 | | 32.81 | | | | 18 | | | 643.71 | 18 | | | 643.71 | 18 | | | 643.71 |
| PARTITION WALL (EAST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (WEST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (NORTH)+DOOR | 1.4899 | | | | 25.94 | | | | 18 | | | 695.53 | 18 | | | 695.53 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 14.762 | 0.6 | 18 | | 0.83 | 429.92 | 18 | | 0.68 | 394.58 | 18 | | 0.35 | 316.83 |
| | | | | | | | | | TOTAL | | | 3935.77 | | | | 4147.09 | | | | 4129.97 |

## COOLING LOAD CALCULATIONS

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 1312.36 | 32.81 | | | 0.8 | 1049.89 | 0.82 | 1076.14 | 0.84 | 1102.38 |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.77 | 168.63 | 0.83 | 181.77 | 0.87 | 190.53 |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 |
| COMPUTER | 1 | | | | 65 | 0.81 | 52.65 | 0.85 | 55.25 | 0.89 | 57.85 |
| PRINTER | 1 | | | | 550 | 0.81 | 445.5 | 0.85 | 467.5 | 0.89 | 489.5 |
| BLOOD PRESSURE METER | 1 | | | | 29 | 0.81 | 23.49 | 0.85 | 24.65 | 0.89 | 25.81 |
| ECG/RESP | 1 | | | | 50 | 0.81 | 40.5 | 0.85 | 42.5 | 0.89 | 44.5 |
| | | TOTAL | | | | | 1780.66 | | 1847.81 | | 1910.57 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | 23 | | 1885.18 |
| VENTILATION AND INFILTRATION (LATENT) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | | 0.0175 | 3506.76 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7601.61 | 7880.07 | 7925.72 |
| TOTAL LATENT COOLOING LOAD | 3683.76 | 3683.76 | 3683.76 |

| COUNSELOR OFFICE-7 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 5.45 | 6.02 | | 32.81 | 1.00 | | | 12 | 32.1 | | 1147.95 | 17 | 37.1 | | 1326.76 | 22 | 42.1 | | 1505.57 |
| EXPOSED WALL (EAST) | 0.9059 | 5.45 | | 3.65 | 19.89 | 0.00 | | | 15 | 34.1 | | 614.50 | 17.78 | 36.88 | | 664.56 | 18.33 | 37.43 | | 674.57 |
| EXPOSED WALL (SOUTH) | 0.9059 | | 6.02 | 3.65 | 19.26 | -6.00 | | | 5 | 18.10 | | 315.81 | 8.89 | 21.99 | | 383.66 | 13.33 | 26.43 | | 461.21 |
| FLOOR | 1.09 | 5.45 | 6.02 | | 32.81 | | | | 18 | | | 643.71 | 18 | | | 643.71 | 18 | | | 643.71 |
| PARTITION WALL (WEST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (NORTH)+DOOR | 1.4899 | | | | 25.94 | | | | 18 | | | 695.53 | 18 | | | 695.53 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 14 4.762 | 0.6 | 18 | | 0.83 | 859.85 | 18 | | 0.68 | 394.58 | 18 | | 0.35 | 316.83 |
| | | | | | | | | | | TOTAL | | 4628.78 | | | | 4460.23 | | | | 4453.12 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 1312.36 | 32.81 | | | 0.8 | 1049.89 | 0.82 | 1076.14 | 0.84 | 1102.38 |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.77 | 168.63 | 0.83 | 181.77 | 0.87 | 190.53 |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 |
| COMPUTER | 1 | | | | 65 | 0.81 | 52.65 | 0.85 | 55.25 | 0.89 | 57.85 |
| PRINTER | 1 | | | | 550 | 0.81 | 445.5 | 0.85 | 467.5 | 0.89 | 489.5 |
| BLOOD PRESSURE METER | 1 | | | | 29 | 0.81 | 23.49 | 0.85 | 24.65 | 0.89 | 25.81 |
| ECG/RESP | 1 | | | | 50 | 0.81 | 40.5 | 0.85 | 42.5 | 0.89 | 44.5 |
| | | TOTAL | | | | | 1780.66 | | 1847.81 | | 1910.57 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | 23 | | 1885.18 |
| VENTILATION AND INFILTRATION (LATENT) | 5.45 | 6.02 | 3.65 | 119.75 | 66.53 | | 0.0175 | 3506.76 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 8294.61 | 8193.21 | 8248.87 |
| TOTAL LATENT COOLOING LOAD | 3683.76 | 3683.76 | 3683.76 |

## COOLING LOAD CALCULATIONS

| EXAMINATION ROOM-2 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.5 | 8.077 | | 36.35 | 1.00 | | | 12 | 32.1 | | 1271.73 | 17 | 37.1 | | 1469.82 | 22 | 42.1 | | 1667.90 |
| EXPOSED WALL (NORTH) | 0.9059 | 4.5 | | 3.65 | 13.71 | 1.00 | | | 3.89 | 23.99 | | 297.99 | 5.56 | 25.66 | | 318.69 | 7.22 | 27.32 | | 339.40 |
| FLOOR | 1.09 | 4.5 | 8.077 | | 36.35 | | | | 18 | | | 713.12 | 18 | | | 713.12 | 18 | | | 713.12 |
| PARTITION WALL (EAST) | 1.349 | 4.5 | | 3.65 | 11.01 | | | | 18 | | | 267.22 | 18 | | | 267.22 | 18 | | | 267.22 |
| PARTITION WALL (WEST) | 1.349 | 4.5 | | 3.65 | 11.01 | | | | 18 | | | 267.22 | 18 | | | 267.22 | 18 | | | 267.22 |
| PARTITION WALL (SOUTH)+DOOR | 0.9318 | | | | 29.48 | | | | 18 | | | 494.47 | 18 | | | 494.47 | 18 | | | 499.80 |
| GLASS WINDOWS (NORTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 141.615 | 0.6 | 18 | | 0.89 | 439.50 | 18 | | 0.86 | 432.59 | 18 | | 0.75 | 407.23 |
| | | | | | | | | | | TOTAL | | 3751.25 | | | | 3963.13 | | | | 4161.90 |

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 | |
| LIGHTS | 4 | 1453.86 | 36.35 | | | 0.86 | 1250.32 | 0.88 | 1279.40 | 0.89 | 1293.94 | |
| PEOPLE (S.H.) | 2 | | | | 73 | 0.82 | 119.72 | 0.87 | 127.02 | 0.9 | 131.4 | |
| PEOPLE (L.H.) | 2 | | | 59 | | | 118 | | 118 | | 118 | |
| BLANKET WARMER | 1 | | | | 221 | 0.85 | 187.85 | 0.87 | 192.27 | 0.9 | 198.9 | |
| BLOOD WARMER | 1 | | | | 114 | 0.85 | 96.9 | 0.87 | 99.18 | 0.9 | 102.6 | |
| BLOOOD PRESSURE METER | 1 | | | | 29 | 0.23 | 6.67 | 0.14 | 4.06 | 0.1 | 2.9 | |
| ECG/RESP | 1 | | | | 50 | 0.23 | 11.5 | 0.14 | 7 | 0.1 | 5 | |
| PULSE OXIMETER | 1 | | | | 20 | 0.23 | 4.6 | 0.14 | 2.8 | 0.1 | 2 | |
| ANESTHESIA SYSTEM | 1 | | | | 166 | 0.23 | 38.18 | 0.14 | 23.24 | 0.1 | 16.6 | |
| | | TOTAL | | | | | 1715.74 | | 1734.97 | | 1753.34 | |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.5 | 8.077 | 3.65 | 132.66 | 73.70 | 23 | | 2088.44 |
| VENTILATION AND INFILTRATION (LATENT) | 4.5 | 8.077 | 3.65 | 132.66 | 73.70 | | 0.0175 | 3884.87 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7555.43 | 7786.54 | 8003.67 |
| TOTAL LATENT COOLOING LOAD | 4002.87 | 4002.87 | 4002.87 |

| EXAMINATION ROOM-3 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (CORR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (CORR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (CORR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.5 | 8.077 | | 36.35 | 1.00 | | | 12 | 32.1 | | 1271.73 | 17 | 37.1 | | 1469.82 | 22 | 42.1 | | 1667.90 |
| EXPOSED WALL (NORTH) | 0.9059 | 4.5 | | 3.65 | 13.71 | 1.00 | | | 3.89 | 23.99 | | 297.99 | 5.56 | 25.66 | | 318.69 | 7.22 | 27.32 | | 339.40 |
| FLOOR | 1.09 | 4.5 | 8.077 | | 36.35 | | | | 18 | | | 713.12 | 18 | | | 713.12 | 18 | | | 713.12 |
| PARTITION WALL (EAST) | 1.349 | 4.5 | | 3.65 | 11.01 | | | | 18 | | | 267.22 | 18 | | | 267.22 | 18 | | | 267.22 |
| PARTITION WALL (WEST) | 1.349 | 4.5 | | 3.65 | 11.01 | | | | 18 | | | 267.22 | 18 | | | 267.22 | 18 | | | 267.22 |
| PARTITION WALL (SOUTH)+DOOR | 0.9318 | | | | 29.48 | | | | 18 | | | 494.47 | 18 | | | 494.47 | 18 | | | 499.80 |
| GLASS WINDOWS (NORTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 141.615 | 0.6 | 18 | | 0.89 | 439.50 | 18 | | 0.86 | 432.59 | 18 | | 0.75 | 407.23 |
| | | | | | | | | | | TOTAL | | 3751.25 | | | | 3963.13 | | | | 4161.90 |

## COOLING LOAD CALCULATIONS

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 1453.86 | 36.35 | | | 0.86 | 1250.32 | 0.88 | 1279.40 | 0.89 | 1293.94 |
| PEOPLE (S.H.) | 2 | | | | 73 | 0.82 | 119.72 | 0.87 | 127.02 | 0.9 | 131.4 |
| PEOPLE (L.H.) | 2 | | | 59 | | | 118 | | 118 | | 118 |
| BLANKET WARMER | 1 | | | | 221 | 0.85 | 187.85 | 0.87 | 192.27 | 0.9 | 198.9 |
| BLOOD WARMER | 1 | | | | 114 | 0.85 | 96.9 | 0.87 | 99.18 | 0.9 | 102.6 |
| BLOOOD PRESSURE METER | 1 | | | | 29 | 0.23 | 6.67 | 0.14 | 4.06 | 0.1 | 2.9 |
| ECG/RESP | 1 | | | | 50 | 0.23 | 11.5 | 0.14 | 7 | 0.1 | 5 |
| PULSE OXIMETER | 1 | | | | 20 | 0.23 | 4.6 | 0.14 | 2.8 | 0.1 | 2 |
| ANESTHESIA SYSTEM | 1 | | | | 166 | 0.23 | 38.18 | 0.14 | 23.24 | 0.1 | 16.6 |
| | | TOTAL | | | | | 1715.74 | | 1734.97 | | 1753.34 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.5 | 8.077 | 3.65 | 132.66 | 73.70 | 23 | | 2088.44 |
| VENTILATION AND INFILTRATION (LATENT) | 4.5 | 8.077 | 3.65 | 132.66 | 73.70 | | 0.0175 | 3884.87 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7555.43 | 7786.54 | 8003.67 |
| TOTAL LATENT COOLOING LOAD | 4002.87 | 4002.87 | 4002.87 |

| EXAMINATION ROOM-4 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.5 | 8.077 | | 36.35 | 1.00 | | | 12 | 32.1 | | 1271.73 | 17 | 37.1 | | 1469.82 | 22 | 42.1 | | 1667.90 |
| EXPOSED WALL (NORTH) | 0.9059 | 4.5 | | 3.65 | 13.71 | 1.00 | | | 3.89 | 23.99 | | 297.99 | 5.56 | 25.66 | | 318.69 | 7.22 | 27.32 | | 339.40 |
| FLOOR | 1.09 | 4.5 | 8.077 | | 36.35 | | | | 18 | | | 713.12 | 18 | | | 713.12 | 18 | | | 713.12 |
| PARTITION WALL (EAST) | 1.349 | 4.5 | | 3.65 | 11.01 | | | | 18 | | | 267.22 | 18 | | | 267.22 | 18 | | | 267.22 |
| PARTITION WALL (WEST) | 1.349 | 4.5 | | 3.65 | 11.01 | | | | 18 | | | 267.22 | 18 | | | 267.22 | 18 | | | 267.22 |
| PARTITION WALL (SOUTH)+DOOR | 0.9318 | | | | 29.48 | | | | 18 | | | 494.47 | 18 | | | 494.47 | 18 | | | 499.80 |
| GLASS WINDOWS (NORTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 141.615 | 0.6 | 18 | | 0.89 | 439.50 | 18 | | 0.86 | 432.59 | 18 | | 0.75 | 407.23 |
| | | | | | | | | | | TOTAL | | 3751.25 | | | | 3963.13 | | | | 4161.90 |

| a=0.65 and b=C FROM Table-16 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 1453.86 | 36.35 | | | 0.86 | 1250.32 | 0.88 | 1279.40 | 0.89 | 1293.94 |
| PEOPLE (S.H.) | 4 | | | | 73 | 0.82 | 239.44 | 0.87 | 254.04 | 0.9 | 262.8 |
| PEOPLE (L.H.) | 4 | | | 59 | | | 236 | | 236 | | 236 |
| BLANKET WARMER | 1 | | | | 221 | 0.85 | 187.85 | 0.87 | 192.27 | 0.9 | 198.9 |
| BLOOD WARMER | 1 | | | | 114 | 0.85 | 96.9 | 0.87 | 99.18 | 0.9 | 102.6 |
| BLOOOD PRESSURE METER | 1 | | | | 29 | 0.23 | 6.67 | 0.14 | 4.06 | 0.1 | 2.9 |
| ECG/RESP | 1 | | | | 50 | 0.23 | 11.5 | 0.14 | 7 | 0.1 | 5 |
| PULSE OXIMETER | 1 | | | | 20 | 0.23 | 4.6 | 0.14 | 2.8 | 0.1 | 2 |
| | | TOTAL | | | | | 1797.28 | | 1838.75 | | 1868.14 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.5 | 8.077 | 3.65 | 132.66 | 73.70 | 23 | | 2088.44 |
| VENTILATION AND INFILTRATION (LATENT) | 4.5 | 8.077 | 3.65 | 132.66 | 73.70 | | 0.0175 | 3884.87 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 7636.97 | 7890.32 | 8118.47 |
| TOTAL LATENT COOLOING LOAD | 4120.87 | 4120.87 | 4120.87 |

## COOLING LOAD CALCULATIONS

| EXAMKINATION ROOM-5 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 4.5 | 8.077 | | 36.35 | 1.00 | | | 12 | 32.1 | | 1271.73 | 17 | 37.1 | | 1469.82 | 22 | 42.1 | | 1667.90 |
| EXPOSED WALL (EAST) | 0.9059 | 4.5 | | 3.65 | 16.43 | 0.00 | | | 15 | 34.1 | | 507.39 | 17.78 | 36.88 | | 548.72 | 18.33 | 37.43 | | 556.99 |
| EXPOSED WALL (SOUTH) | 0.9059 | | 8.077 | 3.65 | 26.77 | -6.00 | | | 5 | 18.10 | | 438.92 | 8.89 | 21.99 | | 533.22 | 13.33 | 26.43 | | 641.00 |
| FLOOR | 1.09 | 4.5 | 8.077 | | 36.35 | | | | 18 | | | 713.12 | 18 | | | 713.12 | 18 | | | 713.12 |
| PARTITION WALL (WEST) | 1.349 | 4.5 | | 3.65 | 11.01 | | | | 18 | | | 267.22 | 18 | | | 267.22 | 18 | | | 267.22 |
| PARTITION WALL (SOUTH)+DOOR | 0.9318 | | | | 29.48 | | | | 18 | | | 494.47 | 18 | | | 494.47 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 141.615 | 0.6 | 18 | | 0.89 | 439.50 | 18 | | 0.86 | 432.59 | 18 | | 0.75 | 407.23 |
| | | | | | | | | | | TOTAL | | 4132.34 | | | | 4459.15 | | | | 4753.26 |

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 1453.86 | 36.35 | | | 0.8 | 1163.09 | 0.82 | 1192.17 | 0.84 | 1221.24 |
| PEOPLE (S.H.) | 3 | | | | 73 | 0.77 | 168.63 | 0.83 | 181.77 | 0.87 | 190.53 |
| PEOPLE (L.H.) | 3 | | | 59 | | | 177 | | 177 | | 177 |
| COMPUTER | 1 | | | | 65 | 0.81 | 52.65 | 0.85 | 55.25 | 0.89 | 57.85 |
| PRINTER | 1 | | | | 550 | 0.81 | 445.5 | 0.85 | 467.5 | 0.89 | 489.5 |
| BLOOD PRESSURE METER | 1 | | | | 29 | 0.81 | 23.49 | 0.85 | 24.65 | 0.89 | 25.81 |
| ECG/RESP | 1 | | | | 50 | 0.81 | 40.5 | 0.85 | 42.5 | 0.89 | 44.5 |
| | | TOTAL | | | | | 1893.86 | | 1963.84 | | 2029.43 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 4.5 | 8.077 | 3.65 | 132.66 | 73.70 | 23 | | 2088.44 |
| VENTILATION AND INFILTRATION (LATENT) | 4.5 | 8.077 | 3.65 | 132.66 | 73.70 | | 0.0175 | 3884.87 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 8114.64 | 8511.43 | 8871.13 |
| TOTAL LATENT COOLOING LOAD | 4061.87 | 4061.87 | 4061.87 |

| STORAGE | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL HEAT TRANSFER COEFFICIENT (U) | LENGTH | WIDTH | HEIGHT | EFFECTIVE AREA | LM | SHGF | SC | CLTD/TD @12 | CLTD (COR) @12 | CLF @12 | COOLING LOAD q @12 | CLTD/TD @14 | CLTD (COR) @14 | CLF @14 | COOLING LOAD q @14 | CLTD/TD @16 | CLTD (COR) @16 | CLF @16 | COOLING LOAD q @16 |
| ROOF | 1.09 | 5.45 | 4.27 | | 23.27 | 1.00 | | | 12 | 32.1 | | 814.25 | 17 | 37.1 | | 941.08 | 22 | 42.1 | | 1067.91 |
| EXPOSED WALL (SOUTH) | 0.9059 | | 4.27 | 3.65 | 12.87 | -6.00 | | | 5 | 18.10 | | 211.07 | 8.89 | 21.99 | | 256.42 | 13.33 | 26.43 | | 308.25 |
| FLOOR | 1.09 | 5.45 | 6.02 | | 32.81 | | | | 18 | | | 643.71 | 18 | | | 643.71 | 18 | | | 643.71 |
| PARTITION WALL (EAST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (WEST) | 1.349 | 5.45 | | 3.65 | 14.47 | | | | 18 | | | 351.42 | 18 | | | 351.42 | 18 | | | 351.42 |
| PARTITION WALL (NORTH)+DOOR | 1.4899 | | | | 25.94 | | | | 18 | | | 695.53 | 18 | | | 695.53 | 18 | | | 499.80 |
| GLASS WINDOWS (SOUTH) | 4.8 | 1.37 | 1.98 | | 2.71 | | 144.762 | 0.6 | 18 | | 0.83 | 429.92 | 18 | | 0.68 | 394.58 | 18 | | 0.35 | 316.83 |
| | | | | | | | | | | TOTAL | | 3497.33 | | | | 3634.17 | | | | 3539.35 |

## COOLING LOAD CALCULATIONS

| a=0.65 and b=C FROM Table-16 (OPERATIONAL HOURS 9 TO 19 (10 HRS)) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QUANTITY | INPUT | AREA | L.H.G | S.H.G. | CLF @12 | COOLING LOAD @12 | CLF @14 | COOLING LOAD @14 | CLF @16 | COOLING LOAD @16 |
| LIGHTS | 4 | 930.86 | 23.27 | | | 0.8 | 744.69 | 0.82 | 763.31 | 0.84 | 781.92 |
| PEOPLE (S.H.) | 1 | | | | 73 | 0.77 | 56.21 | 0.83 | 60.59 | 0.87 | 63.51 |
| PEOPLE (L.H.) | 1 | | | 59 | | | 59 | | 59 | | 59 |
| COMPUTER | 1 | | | | 65 | 0.81 | 52.65 | 0.85 | 55.25 | 0.89 | 57.85 |
| PRINTER | 1 | | | | 550 | 0.81 | 445.5 | 0.85 | 467.5 | 0.89 | 489.5 |
| | | TOTAL | | | | | 1299.05 | | 1346.65 | | 1392.78 |

| | LENGTH | WIDTH | HEIGHT | VOLUME | L/S | TD | HUMIDITY DIFFERENCE | COOLING LOAD |
|---|---|---|---|---|---|---|---|---|
| VENTILATION AND INFILTRATION (SENSIBLE) | 5.45 | 4.27 | 3.65 | 84.94 | 47.19 | 23 | | 1337.16 |
| VENTILATION AND INFILTRATION (LATENT) | 5.45 | 4.27 | 3.65 | 84.94 | 47.19 | | 0.0175 | 2487.35 |

| | q @12 hrs | q @14 hrs | q @16 hrs |
|---|---|---|---|
| TOTAL SENSIBLE COOLOING LOAD | 6133.54 | 6317.97 | 6269.29 |
| TOTAL LATENT COOLOING LOAD | 2546.35 | 2546.35 | 2546.35 |

# APPENDIX-B TOTAL COOLING LOAD AND SENSIBLE COOLING LOAD

| TOTAL COOLING LOAD | | | |
|---|---|---|---|
| | **q @ 12 HRS** | **q @ 14 HRS** | **q @16 HRS** |
| | | | |
| LABORATORY | 17546.85 | 18803.80 | 19859.79 |
| PHELEBOTOMY-2 | 17718.60 | 18932.12 | 19567.88 |
| PHELEBOTOMY-1 | 17554.72 | 18376.88 | 19046.44 |
| ROUTINE CHECK UP ROOM | 17732.02 | 18148.43 | 18332.89 |
| HELP DESK | 8316.57 | 8489.29 | 8703.23 |
| STORAGE-2 | 7613.46 | 7709.09 | 7864.98 |
| FEMALE TOILET | 5451.10 | 5592.16 | 6341.38 |
| MALE TOILET | 5451.10 | 5609.51 | 6341.38 |
| MEDICAL STORAGE-1 | 7447.69 | 7778.12 | 8538.15 |
| STAFF ROOM | 9090.46 | 9468.53 | 9998.91 |
| FIRST-AID ROOM | 9805.64 | 10042.86 | 10244.75 |
| CLERK OFFICE | 8518.59 | 8694.80 | 8823.19 |
| COUNSELOR OFFICE-1 | 11484.88 | 11789.12 | 11910.62 |
| COUNSELOR OFFICE-2 | 11285.37 | 11563.84 | 11609.48 |
| COUNSELOR OFFICE-3 | 11285.37 | 11563.84 | 11609.48 |
| COUNSELOR OFFICE-4 | 11285.37 | 11563.84 | 11609.48 |
| COUNSELOR OFFICE-6 | 11285.37 | 11563.84 | 11609.48 |
| COUNSELOR OFFICE-7 | 11978.37 | 11876.98 | 11932.63 |
| COUNSELOR OFFICE-8 | 15791.04 | 16992.55 | 17999.07 |
| EXAMINATION ROOM-1 | 12695.39 | 12971.62 | 13273.54 |
| EXAMINATION ROOM-2 | 11558.30 | 11789.40 | 12006.54 |
| EXAMINATION ROOM-3 | 11558.30 | 11789.40 | 12006.54 |
| EXAMINATION ROOM-4 | 11757.84 | 12011.18 | 12239.34 |
| EXAMINATION ROOM-5 | 12176.50 | 12573.29 | 12933.00 |
| STORAGE-2 | 8679.89 | 8864.33 | 8815.64 |
| | | | |
| **TOTAL COOLING LOAD** | **285068.77** | **294558.82** | **303217.81** |

| SENSIBLE COOLING LOAD | | | |
|---|---|---|---|
| | **q @ 12 HRS** | **q @ 14 HRS** | **q @16 HRS** |
| | | | |
| LABORATORY | 6133.54 | 6317.97 | 6269.29 |
| PHELEBOTOMY-2 | 12926.18 | 14139.70 | 14775.46 |
| PHELEBOTOMY-1 | 11556.19 | 12378.35 | 13047.91 |
| ROUTINE CHECK UP ROOM | 12917.60 | 13334.02 | 13518.48 |
| HELP DESK | 6445.03 | 6617.76 | 6831.70 |
| STORAGE-2 | 5396.98 | 5492.61 | 5648.51 |
| FEMALE TOILET | 3564.12 | 3705.19 | 4454.40 |
| MALE TOILET | 3564.12 | 3722.54 | 4454.40 |
| MEDICAL STORAGE-1 | 5442.71 | 5773.14 | 6533.17 |
| STAFF ROOM | 7085.48 | 7463.56 | 7993.93 |
| FIRST-AID ROOM | 7338.62 | 7575.85 | 7777.74 |
| CLERK OFFICE | 5756.57 | 5932.79 | 6061.18 |
| COUNSELOR OFFICE-1 | 7801.12 | 8105.35 | 8226.85 |
| COUNSELOR OFFICE-2 | 7601.61 | 7880.07 | 7925.72 |
| COUNSELOR OFFICE-3 | 7601.61 | 7880.07 | 7925.72 |
| COUNSELOR OFFICE-4 | 7601.61 | 7880.07 | 7925.72 |
| COUNSELOR OFFICE-6 | 7601.61 | 7880.07 | 7925.72 |
| COUNSELOR OFFICE-7 | 8294.61 | 8193.21 | 8248.87 |
| COUNSELOR OFFICE-8 | 11178.63 | 12380.14 | 13386.65 |
| EXAMINATION ROOM-1 | 8692.66 | 8968.89 | 9270.81 |
| EXAMINATION ROOM-2 | 7555.43 | 7786.54 | 8003.67 |
| EXAMINATION ROOM-3 | 7555.43 | 7786.54 | 8003.67 |
| EXAMINATION ROOM-4 | 7636.97 | 7890.32 | 8118.47 |
| EXAMINATION ROOM-5 | 8114.64 | 8511.43 | 8871.13 |
| STORAGE-2 | 6133.54 | 6317.97 | 6269.29 |
| | | | |
| **TOTAL SENSIBLE COOLING LOAD** | **191496.61** | **199914.15** | **207468.46** |

# APPENDIX-C DUCT SIZING

| DUCT SIZING | | | | |
|---|---|---|---|---|
| | **COOLING LOAD (kW)** | **MASS FLOW RATE (kg/sec)** | **VOLUME FLOW RATE (m3/sec)** | **DUCT AREA (m2)** |
| | | | | |
| LABORATORY | 19.86 | 2.42 | 2.01 | 0.296040949 |
| PHELEBOTOMY-2 | 19.57 | 2.38 | 1.98 | 0.29168952 |
| PHELEBOTOMY-1 | 19.05 | 2.32 | 1.93 | 0.28391663 |
| ROUTINE CHECK UP ROOM | 18.33 | 2.23 | 1.86 | 0.273280125 |
| HELP DESK | 8.70 | 1.06 | 0.88 | 0.12973518 |
| STORAGE-2 | 7.86 | 0.96 | 0.80 | 0.117239733 |
| FEMALE TOILET | 6.34 | 0.77 | 0.64 | 0.094528047 |
| MALE TOILET | 6.34 | 0.77 | 0.64 | 0.094528047 |
| MEDICAL STORAGE-1 | 8.54 | 1.04 | 0.87 | 0.127274272 |
| STAFF ROOM | 10.00 | 1.22 | 1.01 | 0.149049179 |
| FIRST-AID ROOM | 10.24 | 1.25 | 1.04 | 0.152713874 |
| CLERK OFFICE | 8.82 | 1.07 | 0.89 | 0.131523371 |
| COUNSELOR OFFICE-1 | 11.91 | 1.45 | 1.21 | 0.177546183 |
| COUNSELOR OFFICE-2 | 11.61 | 1.41 | 1.18 | 0.173057245 |
| COUNSELOR OFFICE-3 | 11.61 | 1.41 | 1.18 | 0.173057245 |
| COUNSELOR OFFICE-4 | 11.61 | 1.41 | 1.18 | 0.173057245 |
| COUNSELOR OFFICE-6 | 11.61 | 1.41 | 1.18 | 0.173057245 |
| COUNSELOR OFFICE-7 | 11.93 | 1.45 | 1.21 | 0.177874303 |
| COUNSELOR OFFICE-8 | 18.00 | 2.19 | 1.82 | 0.268303999 |
| EXAMINATION ROOM-1 | 13.27 | 1.62 | 1.35 | 0.197862653 |
| EXAMINATION ROOM-2 | 12.01 | 1.46 | 1.22 | 0.178976061 |
| EXAMINATION ROOM-3 | 12.01 | 1.46 | 1.22 | 0.178976061 |
| EXAMINATION ROOM-4 | 12.24 | 1.49 | 1.24 | 0.182446305 |
| EXAMINATION ROOM-5 | 12.93 | 1.58 | 1.31 | 0.192786339 |
| STORAGE-2 | 8.82 | 1.07 | 0.89 | 0.131410809 |