# CHAPTER I

**PROJECT LOCATION AND DESIGN BUILDING ORIENTATION**

**Introduction**

A process used to alter properties of air, specifically the temperature and humidity of a certain room into a more comfortable condition is called air conditioning. It either adds or removes moisture in the air that is needed for an area. The purpose of controlling such is to meet the requirements of a system independent of the outside climatic conditions which is significant for the health and comfort of inhabitants. For instance, in hospitals, there are rooms which require higher maintaining temperature or pure fresh air both to meet the comfort state of the room and inhibits bacteria growth. Every establishments have its specific standard condition to meet the convenience of occupants.

City of Lipa, simply Lipa City is a first-class city in Batangas province. It is one of the cities in Batangas including Batangas City and Tanauan. As of 2015, population in Lipa has reached 332,386 according to census which consequently had them build additional establishments. Air conditioning plays an essential part in the development of these buildings thus designing a system is a sophisticated requirement. Ospital ng Lipa located at 347 Balintawak Rd, Lipa City, Batangas is a public hospital which needs to have a good air conditioning system to ensure the health of the people.

To determine the heating and cooling load capacity of an area, an engineering calculation formulated by engineers specialized in Heating, Ventilating and Air Conditioning (HVAC) industries is used. Choosing the right equipment with regards to the computed load is a critical decision for engineers since there are lots of factors which have to be consider in order to satisfy all conditions.

# Objectives of the Design

This design project primarily aims to provide a design of an air conditioning system for the Ospital ng Lipa located in Lipa City, Batangas.

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Specifically, this aims to:

1. Provide the evaluation of the conditions of climate, introduction and components of building, development of materials and all factors that affect the cooling of condition space.
2. Calculate the cooling load of the building upon following the procedures presented in ASHRAE Data Guide Book together with the chosen outside and indoor desired conditions at block load peak hour of the day. Moreover, the computations include:
   1. . external load;
   2. . internal load.
3. Present the psychrometric calculation for selecting equipment.
4. Deciding the most favorable A/C unit from the chosen catalogue with respect to the specific area of the building which corresponds to its computed heat load.
5. Design the correct air conditioning system.

# Significance of the Design Project

This study concerning the air conditioning system of Ospital ng Lipa located at Lipa City, Batangas was done to improve the cooling system appropriate for every rooms. This project will also benefit the following sectors:

To the Ospital ng Lipa of Lipa City, Batangas, this design project will serve as a guide for the fundamentals of their building.

To the Batangas State University, this study can be used as their reference for the next design projects of students similar to this type of building.

To the researchers, this design project will have them familiarized about the equipment used in an air conditioning system and will enhance their technical knowledge about their field. It will also enable them to enhance their engineering decisions when it comes to choosing the right equipment considering its economic viability. Upon the application of theories and principles, the researchers will gain more knowledge which

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will help them to be more competent in their field.

To the future researchers, this study will provide information regarding the fundamentals steps in designing an air conditioning system as well as the aspects that are needed to consider.

# Definition of Terms

This part presents further information about the terms purposely used in the study.

**Air Conditioning.** According to American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), it is process of treating air so as to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the requirements of the conditioned space.

**Climatic Condition.** It is the condition of the area where the building is located which includes temperature, humidity, sunshine, pressure, and air movement.

**Dry Bulb Temperature.** It is the temperature of the air in dry condition which is sensed by the sensitive element of a thermometer.

**Humidity.** It is the presence of moisture of water vapor in the air.

**Latent Heat.** It is the heat being added or removed from a substance so as to cause a change of state.

**Psychrometric Chart.** It is a graph of properties of air which shows various parameters used to determine how these vary upon the increase or decrease of moisture in the air changes.

**Psychrometry.** It is the science and practice which focuses on air and water vapor mixtures and their control.

**Relative Humidity.** The amount of moisture in a given sample of air compared to the amount of moisture the air would hold if totally saturated at the temperature of the sample it is stated in a percentage.

**Sensible Heat.** It is the heat being added or removed from a substance so as to cause a change in temperature.

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**Sensible Heat Ratio.** It is the measure located on the right side of the psychrometric chart which indicates the ratio of sensible heat to the total added heat when moving from one point to another on the psychrometric chart.

**Specific Heat of Air.** It is the amount of heat required to raise the temperature of one pound of air by one-degree Fahrenheit or one kilogram of air by one degree Celsius.

**Ton of Refrigeration.** It is the useful refrigerating effect equal to 12600 kJ per hour (211 kJ per minute).

**Ventilation.** It is the process of supplying of removing air by natural or mechanical means to or from any space, such as air may or may not have been conditioned.

**Weather.** It is the conditions in the atmosphere such as temperature, wind velocity and direction, clouds, moisture, and atmospheric pressure.

**Wet Bulb Temperature.** It is the air temperature taken when evaporation of moisture is experienced.

# Capitalization

According to Arnell Ozaeta on his article about the construction of Ospital ng Lipa, Lipa City Mayor Maynard Sabili was misunderstood by other officials and locals of Lipa City that he loaned Php 900 M for the building. He was accused to have an agreement with Philippine National Bank (PNB) but he cleared out that he wasn’t applying for the loan, perhaps, many banks have already offered him proposals after learning that the city needs to have a new hospital. PNB was only the chosen bank to have the loan since it has the best proposal.

Mayor Maynard Sabili also mentioned that he’s not about to loan Php 900 M for the construction of the building but it is only the maximum amount that PNB offered. In addition to that, he was planning to borrow just Php 200 M for the construction of Ospital ng Lipa and Php 100 M for the hospital equipment for a total of Php 300 M.

PNB has offered him a 3-year moratorium in paying the loan where the capital will be debited to the city’s Internal Revenue Allotment while the interest which is based on 3-month Philippine Dealing System Treasury will be payed from the hospital’s revenue.

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# Ownership

Ospital ng Lipa located at Lipa City, Batangas is a public hospital owned by the government and some non-government officials which was built under the term of Lipa City Mayor Maynard Sabili.

# Location

Ospital ng Lipa is exactly located at 347 Balintawak Rd, Lipa City, Batangas located at Lipa City, Batangas with Batangas State University Lipa Campus as its nearest landmark.

# Climatic Condition of the Locality

The climatic state of Ospital ng Lipa at Lipa, Batangas concerning latitude is about 13°57'24" North latitude on the earth surface, while it was roughly 121°9'44" degrees East longitude on the earth surface. The elevation stands 6 meter above ocean level. The midyear condition is assessed to have 33.9 degree Celsius on dry bulb and 26.7 degree Celsius on wet bulb dependent on psychrometric chart of outside temperature. The percent relative humidity is about half RH. Day by day extend in the region takes 6.7 degree Celsius. Solar haze factor is zero.

# Building Orientation

The front of the building faces north. The building layout is presented in the appendix.

# Vicinity Map

**Figure 1.** Vicinity Map

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# CHAPTER II

**COOLING AND HEATING LOAD CALCULATION**

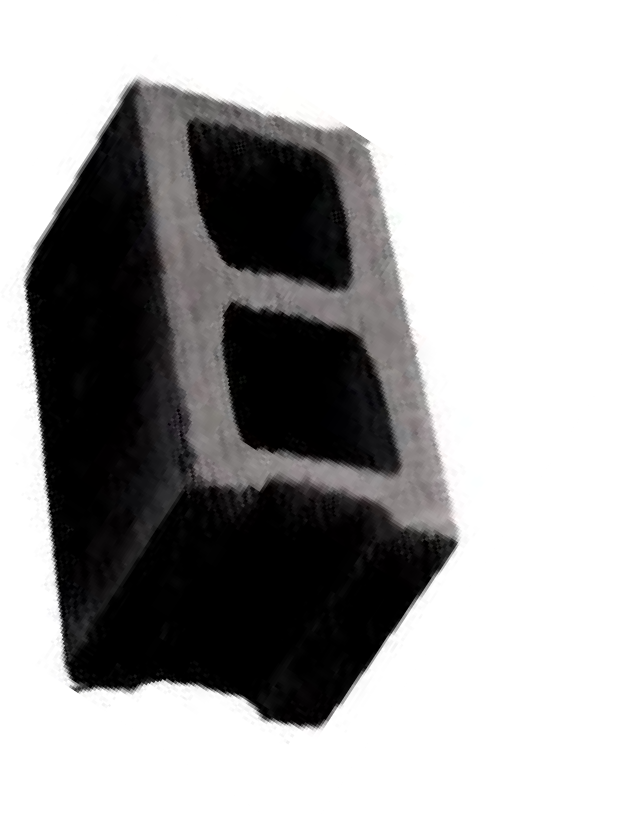
This chapter provides the significant data required to come up with the appropriate air conditioning system which will be used in the design proper. This includes the building components, material construction and the heat load calculation of the building.

# Building Components and Materials Construction

Building boundaries of the building structure consists of a wall section, roof section, glass portion and internal partitions exposed to external condition.

# External Resistances and U-value

* 1. **External Wall**



outside surface resistance

25 mm cement plaster

150 mm CHB

25 mm cement plaster

inside surface resistance

**Figure 2.** External Wall Composition

# Table 1

Properties of Each Components of External Wall

|  |  |  |
| --- | --- | --- |
| **Building Materials** | **R (m2K/W)** | **ρS (kg/m2)** |
| outside surface resistance | 0.0440 | --- |
| 25 mm cement plaster | 0.0347 | 39.95 |
| 150 mm CHB | 0.135 | 147 |
| 25 mm cement plaster | 0.0347 | 39.95 |
| inside surface resistance | 0.12 | --- |
| Total | RT = 0.3684 m2K/W | ρST = 226.3 Kg/m2 |

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|  |  |  |
| --- | --- | --- |
|  | **UW = 2.7144 W/m2K** | **TYPE F** |

Table 1 presents the composition of external wall including the outside and inside surface resistance, 25 mm cement plaster and 150 mm CHB with their corresponding thermal resistivity and surface density. Moreover, the heat transfer coefficient, U, is obtained by getting the inverse of the summation of the resistances of the components. Therefore, use Type F Wall. The height of the wall is 3 meters with permanent light color.

# External Roof



outside surface resistance

13 mm slag or stone

200 mm CHB

25 mm cement plaster inside surface resistance

**Figure 3**. External Roof Composition

# Table 2

Properties of Each Components of External Roof

|  |  |  |
| --- | --- | --- |
| **Building Materials** | **R (m2K/W)** | **ρS (kg/m2)** |
| outside surface resistance | 0.044 | --- |
| 13 mm slag or stone | 0.009 | 881 |
| 10 mm felt membrane | 0.05 | 1121 |
| 150 mm low density concrete | 0.88 | 641 |
| inside surface resistance | 0.12 | --- |

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|  |  |  |
| --- | --- | --- |
| Total | **RT = 1.104 m2K/W** | **ρST = 2643 Kg/m2** |
| **UR = 0.9058 W/m2K** | **TYPE 3** roof with  suspended ceiling |

Table 3 presents the composition of roof including the outside and inside surface resistance, 150 mm low-density concrete with 13 mm slag or stone as aggregate and 10 mm felt membrane with their corresponding thermal resistivity and surface density. Moreover, the heat transfer coefficient, U, is obtained by getting the inverse of the summation of the resistances of the components. Therefore, use Type 3 – Roof Terrace System with suspended ceilings.

# Glass Load



**Figure 4.** Glass Single Glass, Regular Sheet, Light Venetian Blinds Number of panels = two to four panels

Area = depends on the architectural plan Height = 1.6 m

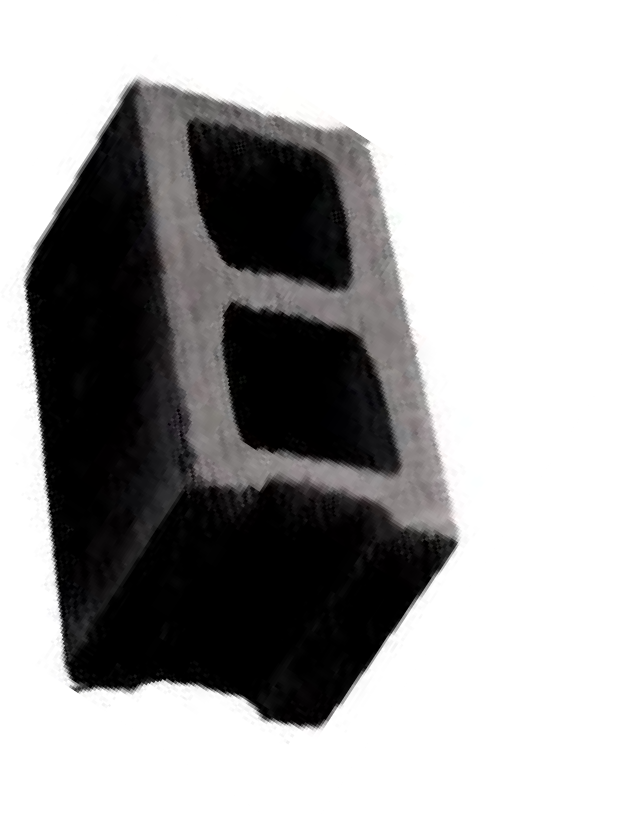
Heat Transfer Coefficient use **U = 2.8211 W/m2K** (fixed)

Heat Transfer Coefficient use **U = 2.8722 W/m2K** (awning, sliding)

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# Internal Resistances and U-value

1. **Partition Wall**



outside surface resistance 15 mm cement plaster 120 mm CHB

15 mm cement plaster inside surface resistance

**Figure 5.** Internal Wall Composition

# Table 3

Properties of each Components of Partition Wall

|  |  |  |
| --- | --- | --- |
| **Building Materials** | **R (m2K/W)** | **ρS (kg/m2)** |
| inside surface resistance | 0.12 | --- |
| 15 mm cement plaster | 0.0208 | 23.97 |
| 120 mm CHB | 0.1080 | 117.6 |
| 15 mm cement plaster | 0.0208 | 23.97 |
| inside surface resistance | 0.12 | --- |
| Total | RT = 0.3896 m2K/W | ρST = 165.54 Kg/m2 |
| **UPW = 2.5667 W/m2K** | |

Table 3 presents the composition of external wall including the outside and inside surface resistance, 15 mm cement plaster and 120 mm CHB with their corresponding thermal resistivity and surface density. Moreover, the heat transfer coefficient, U, is obtained by getting the inverse of the summation of the resistances of the components. The height of the wall is 3 meters with permanent light color.

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# Partition Door

**Table 4**

Schedule of Partition Doors

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **Description** | **Area** | **U** |
| D1 | Single glass door | Powder-coated white aluminum frame single swing door with 6mm thick, clear glass | 1.68 | 2.3576 |
| D2 | Single wood door with glass | Single wood door | 1.68 | 1.6493 |
| D3 | Single wood door | Single wood door | 1.68 | 1.6048 |
| D4 | Double glass door | Powder-coated white aluminum frame double swing door with 6mm thick, clear glass | 4.2 | 2.3576 |
| D4-1 | Double wood door | Double wood door | 4.2 | 1.6048 |
| D5 | Uneven glass door | Powder-coated white aluminum frame uneven swing door with 6mm thick, clear glass | 2.73 | 2.3576 |
| D6 | Kicking door | Double swing door with laminated surface, glass view panel S.S. push and kick plate | 4.2 | 1.5625 |
| D7 | Comfort Room door | Single single fire rated metal door (1hr fire resistance) | 1.68 | 1.6048 |
|  |  | Powder-coated white aluminum frame single swing | 8.4 | 2.3576 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| D8 | Sliding glass door | door with 6mm thick, clear glass |  |  |
| D9 | Metal door | Double swing door fire rated metal door with glass view panel (2hrs fire resistance) | 8.4 | 1.5625 |

# Conditioned Space

The Proposed Design of Ospital ng Lipa is consists of several medical rooms listed in tabulated form with its calculated cooling load per floor. All conditioned spaces are all non-smoking areas.

# Calculation Information

***Maximum Peak Hour Heat Load Calculation*** was selected for the calculation of both internal and external heat loads of each floor. Results of those calculations are tabulated and shown logically in the next pages of this design project.

# HEAT LOAD CALCULATION for GROUND FLOOR

**Details:**

**Location:** 13°57'24" North Latitude 121°9'44" East longitude

**Outdoor Design:** Dry-Bulb Temperature = 33.9°C

Wet-Bulb Temperature = 26.7°C

**Daily Range:** 6.5°C

# Design Month: May

**Indoor Design:** a. Dry-Bulb Temperature = 24⁰C, 50 % RH **Indoor Design:** b. Dry-Bulb Temperature = 22.5⁰C, 50 % RH **Indoor Design:** c. Dry-Bulb Temperature = 22⁰C, 50 % RH **Service Schedule:** 24 hrs

**Wall Construction:** Type F

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Permanent Light Color

**Temperatures:** tav = to – ½ (Daily Range) = 33.9 – ½ (6.5)

**tav = 30.65⁰C**

a. ΔT = (to- ti) = (33.9 – 24) **= 9.9⁰C**

b. ΔT = (to- ti) = (33.9 – 22.5) **= 11.4⁰C**

c. ΔT = (to- ti) = (33.9 – 22) **= 11.9⁰C**

# EXTERNAL HEAT LOADS

Both the walls and roof are light. Use positive ventilation for roof construction.

# EXTERNAL LOAD

𝐐𝐰 = 𝐔𝐀 𝐂𝐋𝐓𝐃𝐚𝐝𝐣

## For 24°C, C.T. Scan, Control Room

* + - **Area (**m2**)**

|  |  |  |
| --- | --- | --- |
| **E** | 12 m2- 3.84 m2 | **8.16 m2** |

# Cooling Load Temperature Difference

𝐂𝐋𝐓𝐃𝐚𝐝𝐣 = (𝐂𝐋𝐓𝐃𝐬𝐞𝐥 + 𝐋𝐌)𝐤 + (𝟐𝟓 − 𝐭𝐢) + (𝐭𝐚𝐯 − 𝟐𝟗)

where 𝐭

𝐚𝐯

= 𝐭𝐨

− 𝟏 (𝐝𝐚𝐢𝐥𝐲 𝐫𝐚𝐧𝐠𝐞) = **30.65°C**

𝟐

|  |  |  |
| --- | --- | --- |
| **E :** | (33 – 0.55)(0.65) + (25-24) + (30.65-29) | **23.7425K** |

# Heat Transfer Coefficient, Uw (W/m2 K)

1 1 𝒘

𝐔 = = RT

0.3684 = 𝟐. 𝟕𝟏𝟒𝟒 𝒎𝟐𝑲

# Thermal Heat Load, Qw (W)

|  |  |  |
| --- | --- | --- |
| **E** | (8.16 m2)(2.7144)(23.7425) | **525.807103 W** |

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## For 22.5°C, Laboratory

* + - **Area (**m2**)**

|  |  |  |
| --- | --- | --- |
| **N** | 18 m2- 7.38 m2- 0.18 m2 | **10.62 m2** |

# Cooling Load Temperature Difference

𝐂𝐋𝐓𝐃𝐚𝐝𝐣 = (𝐂𝐋𝐓𝐃𝐬𝐞𝐥 + 𝐋𝐌)𝐤 + (𝟐𝟓 − 𝐭𝐢) + (𝐭𝐚𝐯 − 𝟐𝟗)

where 𝐭𝐚𝐯 = 𝟑**0.65°C**

|  |  |  |
| --- | --- | --- |
| **N :** | (13 + 2.22)(0.65) + (25-22.5) + (30.65-29) | **12.543K** |

# Heat Transfer Coefficient, Uw (W/m2 K)

𝒘

𝐔 = 𝟐. 𝟕𝟏𝟒𝟒

𝒎𝟐𝑲

# Thermal Heat Load, Qw (W)

|  |  |  |
| --- | --- | --- |
| **N** | (10.62 m2)(2.7144)(12.543) | **361.522875 W** |

## For 22°C, Minor OR 1

* + - **Area (**m2**)**

|  |  |  |
| --- | --- | --- |
| **E** | 12 m2- 2.88 m2 | **9.12 m2** |
| **S** | 15 m2- 13.44 m2 | **1.56 m2** |

# Cooling Load Temperature Difference

𝐂𝐋𝐓𝐃𝐚𝐝𝐣 = (𝐂𝐋𝐓𝐃𝐬𝐞𝐥 + 𝐋𝐌)𝐤 + (𝟐𝟓 − 𝐭𝐢) + (𝐭𝐚𝐯 − 𝟐𝟗)

where 𝐭𝐚𝐯 = **30.65°C**

|  |  |  |
| --- | --- | --- |
| **E :** | (25 – 0.55)(0.65) + (25-22) + (30.65-29) | **20.5425K** |
| **S :** | (22 – 3.88)(0.65) + (25-22) + (30.65-29) | **16.428K** |

# Heat

**Transfer Coefficient, Uw (W/m2 K)**

𝒘

𝐔 = 𝟐. 𝟕𝟏𝟒𝟒

𝒎𝟐𝑲

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# Thermal Heat Load, Qw (W)

|  |  |  |
| --- | --- | --- |
| **E** | (9.12 m2)(2.7144)(20.5425) | **508.461386 W** |
| **S** | (1.56 m2)(2.7144)(16.428) | **69.5535235 W** |
|  | **Qt =** | **578.0149095 W** |

* 1. **Glass Load**

𝐐𝐆 = 𝐔𝐒𝐆 + 𝐔𝐓𝐇

**QSG = (SHGF)(SC)(A)(CLF)**

**Qc = (U)(A)(** **ΔT)**

## For 24°C, C.T. Scan, Control Room

* + - **Area (**m2**)**

|  |  |  |
| --- | --- | --- |
| **N** | (3m)(8m) | **24 m2** |
| **W** | (1.6m)(2.4m) | **3.84 m2** |

# Solar Heat Gain, QSG (W)

|  |  |  |
| --- | --- | --- |
| **N** | (24)(120)(0.91)(0.55) | **1441.4400 W** |
| **W** | (3.84)(685)(0.82)(0.55) | **1186.3104 W** |
|  | **QSG =** | **2627.7504 W** |

* + - **Conduction Heat Load, Qc (W)**

|  |  |  |
| --- | --- | --- |
| **N** | (2.8211)(24)(9.9) | **670.2934 W** |
| **E** | (2.8722)(24)( 9.9) | **109.1896 W** |
|  | **Qc =** | **779.483 W** |

Qg = 2627.7504 W + 779.483 W

# Qg = 3407.2334 W

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## For 22.5°C, Laboratory

* + - **Area (**m2**)**

|  |  |  |
| --- | --- | --- |
| **N** | (1.6m)(4.5m) | **7.2 m2** |

# Solar Heat Gain, QSG (W)

|  |  |  |
| --- | --- | --- |
| **N** | (7.2)(120)(0.91)(0.55) | **432.4320 W** |

* + - **Conduction Heat Load, Qc (W)**

|  |  |  |
| --- | --- | --- |
| **N** | (2.8211)(7.2)(11.4) | **231.5559 W** |

Qg = 432.4320 W + 231.5559 W

# Qg = 663.9879 W

## For 22°C, Minor OR 1

* + - **Area (**m2**)**

|  |  |  |
| --- | --- | --- |
| **S** | (1.6m)(8.4m) | **13.44 m2** |
| **E** | (1.6m)(1.8m) | **2.88m2** |

# Solar Heat Gain, QSG (W)

|  |  |  |
| --- | --- | --- |
| **S** | (13.44)(230)(0.83)(0.55) | **1411.1328 W** |
| **E** | (2.88)(685)(0.8)(0.55) | **868.0320 W** |
|  | **QSG =** | **2279.1648 W** |

* + - **Conduction Heat Load, Qc (W)**

|  |  |  |
| --- | --- | --- |
| **S** | (2.8211)(13.44)(11.9) | **451.1954 W** |
| **E** | (2.8211)(2.88)(11.9) | **36.6847 W** |
|  | **QC =** | **487.8801 W** |

Qg = 2279.1648 W + 487.8801 W

# Qg = 2767.0449 W

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# INFILTRATION LOAD

**QS = 1.232 (L/s) (to- ti)**

**QL = 3000 (L/s) (ωo- ωi)**

## For 24°C, C.T. Scan, Control Room

* **Infiltration Rate, L/s**

L/s = NV / 3.6

*\*wind speed from ASHRAE Meteo, v = 3 m/s*

number of air changes, N = a + bv + c(to – ti) N = 0.15+(0.01)(3)+0.007(33.9-24)

N = 0.2493

volume of conditioned space, V = (floor area)(building height) V = (26 m2)(3 m)

V = 78 m3

L/s = (0.2493)(78) / 3.6

L/s = 5.4015

# Humidity Ratio of Outside Air, ωo

𝛚o =

hWB − CptDB

hDB

where: Cp = 1.0062 kJ/kg K tDB = 33.9°C

hDB = h @ 33.9°C = 2563.42 kJ/kg hWB = h @ 26.7°C = 83.9172 kJ/kg

𝛚o =

83.9172 − 1.0062 (33.9)

2563.42

# ωo = 0.01942991 kg/kg

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# Humidity Ratio of Inside Air, ωi

𝛚i =

0.622(RH)(Psat)

101.325 − (RH)(Psat)

where: Psat = P @ 24°C = 2.982 kPa

𝛚i =

0.622(0.5)(2.982)

101.325 − (0.5)2.982

# ωi = 9.289440471x10-3 kg/kg

* **Sensible Heat Load, Qs (W)**

QS = 1.232(5.4015)(33.9 − 24)

𝐐𝐒 **= 65.8810 W**

# Latent Heat Load, QL (W)

QL = 3000(5.4015)(0.0194299 − 0.00928944 )

𝐐𝐋 **= 164.3212 W**

## For 22.5°C, Laboratory

* **Infiltration Rate, L/s**

L/s = NV / 3.6

*\*wind speed from ASHRAE Meteo, v = 3 m/s*

number of air changes, N = a + bv + c(to – ti) N = 0.15+(0.01)(3)+0.007(33.9-22.5)

N = 0.2598

volume of conditioned space, V = (floor area)(building height) V = (33.8154 m2)(3 m)

V = 101.4462 m3

L/s = (0.2598)(101.4462) / 3.6

L/s = 7.3210

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# Humidity Ratio of Outside Air, ωo

**ωo = 0.01942991 kg/kg**

* **Humidity Ratio of Inside Air, ωi**

𝛚i =

0.622(RH)(Psat)

101.325 − (RH)(Psat)

where: Psat = P @ 22°C = 2.642 kPa

𝛚i =

0.622(0.5)(2.727)

101.325 − (0.5)727

# ωi = 8.484236431x10-3 kg/kg

* **Sensible Heat Load, Qs (W)**

QS = 1.232(7.3210)(33.9 − 22.5)

𝐐𝐒 **= 102.8225 W**

# Latent Heat Load, QL (W)

QL = 3000(7.2310)(0.0194299 − 0.00848424 )

𝐐𝐋 **= 240.4010 W**

## For 22°C, Minor OR 1

* **Infiltration Rate, L/s**

L/s = NV / 3.6

*\*wind speed from ASHRAE Meteo, v = 3 m/s*

number of air changes, N = a + bv + c(to – ti) N = 0.15+(0.01)(3)+0.007(33.9-22)

N = 0.2633

volume of conditioned space, V = (floor area)(building height) V = (20 m2)(3 m)

V = 60 m3

L/s = (0.2633)(60) / 3.6

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L/s = 4.3883

# Humidity Ratio of Outside Air, ωo

**ωo = 0.01942991 kg/kg**

* **Humidity Ratio of Inside Air, ωi**

𝛚i =

0.622(RH)(Psat)

101.325 − (RH)(Psat)

where: Psat = P @ 22°C = 2.642 kPa

𝛚i =

0.622(0.4)(2.642)

101.325 − (0.4)2.642

# ωi = 8.216291348x10-3 kg/kg

* **Sensible Heat Load, Qs (W)**

QS = 1.232(4.3883)(33.9 − 22)

𝐐𝐒 **= 64.3365 W**

# Latent Heat Load, QL (W)

QL = 3000(4.3883)(0.0194299 − 0.00848424 )

𝐐𝐋 **= 240.4010 W**

# VENTILATION LOAD

**QS** = **1**.**232 (L/s)** (**to**- **ti**)

**QL** = **3000 (L/s)** (**ωo**- **ωi**)

## For 24°C, C.T. Scan, Control Room

* **Volume Flow Rate of Outside Air, Q (L/s)**

L/s = N (L/s per person)

where: L/s per person: medical procedure, non-smoking where: L/s per person = 8

N = 5

19

L/s = 5 (8)

L/s = 40

# Sensible Heat Load, Qs (W)

QS = 1.232(40)(33.9 − 24)

𝐐𝐒 **= 487.8720 W**

# Latent Heat Load, QL (W)

QL = 3000(40)(0.0194299 − 0.00928944 )

𝐐𝐋 **= 1216.8563 W**

## For 22.5°C, Laboratory

* **Volume Flow Rate of Outside Air, Q (L/s)**

L/s = N (L/s per person) where: L/s per person: laboratory, non-smoking where: L/s per person = 10

N = 8

L/s = 8 (10)

L/s = 80

# Sensible Heat Load, Qs (W)

QS = 1.232(80)(33.9 − 22.5)

𝐐𝐒 **= 1123.5840 W**

# Latent Heat Load, QL (W)

QL = 3000(80)(0.0194299 − 0.00848424 )

𝐐𝐋 **= 2626.9617 W**

20

## For 22.5°C, Minor OR 1

* **Volume Flow Rate of Outside Air, Q (L/s)**

L/s = N (L/s per person)

where: L/s per person: operating room, non-smoking where: L/s per person = 15

N = 5

L/s = 5 (15)

L/s = 75

# Sensible Heat Load, Qs (W)

QS = 1.232(75)(33.9 − 22)

𝐐𝐒 **= 1099.5600 W**

# Latent Heat Load, QL (W)

QL = 3000(75)(0.0194299 − 0.0065557 )

𝐐𝐋 **= 2896.6942 W**

# INTERNAL LOADS

* 1. **Lighting Load**

**QS =** (**lamp rating**)(**Fu**)(**Fsa**)(**CLF**)

## For 24°C, C.T. Scan, Control Room

where: lamp rating = 240 W Fu = 1.2

Fsa = 0.75

CLF = 0.94

QS = (240)(1.2)(0.8)(0.9)

# QS = 203.0400 W

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## For 22.5°C, Laboratory

where: lamp rating = 156 W Fu = 1.2

Fsa = 0.75

CLF = 0.94

QS = (156)(1.2)(0.8)(0.9)

# QS = 131.9760 W

## For 22°C, Minor OR 1

where: lamp rating = 156 W Fu = 1.2

Fsa = 1

CLF = 0.94

QS = (156)(1.2)(0.8)(0.9)

# QS = 175.9680 W

* 1. **Occupant Load**

**QS =** (**sensible heat gain**)(**no.of people**)**(CLF)**

**QL =** (**latent heat gain**)(**no.of people**)

## For 24°C, C.T. Scan, Control Room

where: N = 5

sensible heat gain = 70 latent heat gain = 45 CLF = 0.96

QS = (5)(70)(0.96) **QS = 336.0000 W** Ql = (5)(45)

# Ql = 225.0000 W

22

## For 22.5°C, Laboratory

where: N = 8

sensible heat gain = 70 latent heat gain = 45 CLF = 0.96

QS = (8)(70)(0.96) **QS = 537.6000 W** Ql = (8)(45)

# Ql = 360.0000 W

## For 22°C, Minor OR 1

where: N = 5

sensible heat gain = 70 latent heat gain = 45 CLF = 0.96

QS = (5)(70)(0.96) **QS = 336.0000 W** Ql = (5)(45)

# Ql = 225.0000 W

* 1. **Partition Load**

**QS = U A ΔT**

## For 24°C, C.T. Scan, Control Room

where: C.T. Scan and Hallway

A = 4.8 m2 (wall), 4.2 m2 (door) ΔT = 9.9

1 1 w

U= =

R

T

0.3896 =2.5667 m2K (wall)

23

1 w

U= 0.4242 =2.3576 m2K (door)

Q = (2.5667)(4.8)(9.9) + (2.3576)(4.2)(9.9)

# Q = 147.3100 W

## For 22.5°C, Laboratory

where: Laboratory and Hallway

A = 8 m2 (wall)

ΔT = 11.4

w

U = 2.5667 m2K (wall) Q = (2.5667)(8)(11.4)

# Q = 254.1003 W

## For 22°C, Minor OR 1

where: Minor OR 1 and Hallway

A = 7.8 m2 (wall), 4.2 m2 (door)

ΔT = 11.9

w

U = 2.5667 m2K (wall)

1 w

U= 0.64 =1.5625 m2K (door)

Q = (2.5667)(7.8)(11.9) + (1.5625)(4.2)(11.9)

# Q = 316.3348 W

* 1. **Miscellaneous Loads**

𝐐𝐒 = (𝐖)(𝐂𝐬)(𝐂𝐋𝐅)

𝐐𝐥 = (𝐖)(𝐂𝐥)

## For 24°C, C.T. Scan, Control Room

where: W = 570.8

sensible heat gain = 0.33

24

latent heat gain = 0.16 CLF = 0.96

QS = (570.8)(0.33)(0.96)

**QS = 180.8294 W** Ql = (570.8)(0.16) **Ql = 91.33 W**

## For 22.5°C, Laboratory

where: W = 510.4

sensible heat gain = 0.33 latent heat gain = 0.16 CLF = 0.96

QS = (510.4(0.33)(0.96)

**QS = 161.6947 W** Ql = (510.4)(0.16) **Ql = 81.66 W**

## For 22°C, Minor OR 1

where: W = 1575.4

sensible heat gain = 0.33 latent heat gain = 0.16 CLF = 0.96

QS = (1575.4)(0.33)(0.96)

# QS = 499.09 W

Ql = (1575.4)(0.16)

# Ql = 252.06 W

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# A COMPLETE SUMMARY OF HEAT LOAD CALCULATION IN TABULAR FORM FOR GROUND FLOOR:

1. **EXTERNAL LOADS**
   1. **External Wall**

**Table 5**

Summary of Heat Load Calculation for External Wall of the Ground Floor

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Orientation** | **U** | **A (m2)** | **CLTDsel** | **LM** | **k** | **ti** | **tave** | **CLTDadj** | **Q (W)** |

24°C

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
| Canteen | E | 2.714 | 38.6 | 25 | -0.55 | 0.65 | 24 | 30.65 | 18.5425 | 1942.5197 |
| Kitchen | S | 2.714 | 19.41 | 22 | -3.88 | 0.65 | 24 | 30.65 | 14.428 | 760.0489 |
| E | 2.714 | 14.24 | 25 | -0.55 | 0.65 | 24 | 30.65 | 18.5425 | 716.6187 |
| Radiology, DRSG | E | 2.714 | 40 | 25 | -0.55 | 0.65 | 24 | 30.65 | 18.5425 | 2012.9738 |
| C.T. Scan, Control Room | E | 2.714 | 16.16 | 33 | -0.55 | 0.65 | 24 | 30.65 | 23.7425 | 1041.3043 |
| Housekeeping | S | 2.714 | 13.08 | 22 | -3.88 | 0.65 | 24 | 30.65 | 14.428 | 512.1813 |

# TOTAL 6985.6466 W

22.5°C

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 1 | E | 2.714 | 11.08 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 602.7004 |
| DR's Clinic 2 | E | 2.714 | 11.08 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 602.7004 |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 3 | E | 2.714 | 11.08 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 602.7004 |
| DR's Clinic 4 | E | 2.714 | 11.08 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 602.7004 |
| DR's Clinic 5 | E | 2.714 | 11.08 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 602.7004 |
| DR's Clinic 6 | W | 2.714 | 11.08 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 759.0702 |
| DR's Clinic 7 | W | 2.714 | 11.08 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 759.0702 |
| DR's Clinic 8 | W | 2.714 | 11.08 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 759.0702 |
| Dietician | W | 2.714 | 8.08 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 553.5458 |
| Dental Clinic | S | 2.714 | 9.04 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 390.7865 |
| Billing / Cashier | N | 2.714 | 31.36 | 13 | 2.22 | 0.65 | 22.5 | 30.65 | 14.043 | 1195.2143 |
| DSWD Room | E | 2.714 | 8.08 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 439.5144 |
| Chapel | E | 2.714 | 34.24 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 1862.4966 |
| Microbiology Room | W | 2.714 | 8.08 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 553.5458 |
| Laboratory | N | 2.714 | 10.62 | 13 | 2.22 | 0.65 | 22.5 | 30.65 | 12.543 | 361.5229 |
| Pharmacy | W | 2.714 | 24.04 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 1646.9358 |
| Ultrasound | W | 2.714 | 4.275 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 23.7425 | 275.4688 |
| Examination and Treatment Room | E | 2.714 | 27.12 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 1475.2018 |
| Observation Area | E | 2.714 | 27.12 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 1475.2018 |
| Nurse Station | W | 2.714 | 11.625 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 796.4072 |
| Emergency Room | W | 2.714 | 15.8 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 1082.4287 |

|  |
| --- |
| **TOTAL 17398.9830 W** |
| 22.5°C |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Morgue | S | 2.714 | 35 | 22 | -3.88 | 0.65 | 22 | 30.65 | 16.428 | 1560.4957 |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | E | 2.714 | 18.08 | 25 | -0.55 | 0.65 | 22 | 30.65 | 20.5425 | 1008.0024 |
| Cold Storage Room | W | 2.714 | 16.16 | 33 | -0.55 | 0.65 | 22 | 30.65 | 25.7425 | 1129.0207 |
| Minor OR 1 | S | 2.714 | 11.56 | 22 | -3.88 | 0.65 | 22 | 30.65 | 16.428 | 515.4094 |
| S | 2.714 | 11.56 | 22 | -3.88 | 0.65 | 22 | 30.65 | 16.428 | 515.4094 |
| E | 2.714 | 17.12 | 25 | -0.55 | 0.65 | 22 | 30.65 | 20.5425 | 954.4801 |
| Minor OR 2 | W | 2.714 | 12.98 | 33 | -0.55 | 0.65 | 22 | 30.65 | 25.7425 | 906.8496 |

# TOTAL 6589.6675 W

* 1. **Glass Load**

**Table 6**

Summary of Heat Load Calculation for Glass Load of the Ground Floor

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Orientation** | **U** | **to** | **ti** | **A (m2)** | **SGHF** | **SCL** | **SC** | **Qsg (W)** | **Qc (W)** |

24°C

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Canteen | E | 2.8722 | 33.9 | 24 | 14.4 | 685 | 0.8 | 0.55 | 409.4608 | 4340.1600 |
| Kitchen | S | 2.8211 | 33.9 | 24 | 13.44 | 230 | 0.83 | 0.55 | 375.3643 | 1411.1328 |
| E | 2.8722 | 33.9 | 24 | 5.76 | 685 | 0.8 | 0.55 | 163.7843 | 1736.0640 |
| C.T. Scan, Control Room | N | 2.8211 | 33.9 | 24 | 24 | 120 | 0.91 | 0.55 | 670.2934 | 1441.4400 |
| W | 2.8722 | 33.9 | 24 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| Housekeeping | S | 2.8722 | 33.9 | 24 | 1.92 | 230 | 0.83 | 0.55 | 54.5948 | 201.5904 |

# TOTAL 12099.3847 W

22.5°C

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 1 | N | 2.8211 | 33.9 | 22.5 | 15 | 120 | 0.91 | 0.55 | 482.4081 | 900.9000 |
| E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 62.8667 | 578.6880 |
| DR's Clinic 2 | E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 62.8667 | 578.6880 |
| DR's Clinic 3 | E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 62.8667 | 578.6880 |
| DR's Clinic 4 | E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 62.8667 | 578.6880 |
| DR's Clinic 5 | E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 62.8667 | 578.6880 |
| DR's Clinic 6 | N | 2.8211 | 33.9 | 22.5 | 15 | 120 | 0.91 | 0.55 | 482.4081 | 900.9000 |
| W | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.82 | 0.55 | 62.8667 | 593.1552 |
| DR's Clinic 7 | W | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.82 | 0.55 | 62.8667 | 593.1552 |
| DR's Clinic 8 | W | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.82 | 0.55 | 62.8667 | 593.1552 |
| Dietician | W | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.82 | 0.55 | 62.8667 | 593.1552 |
| Dental Clinic | S | 2.8722 | 33.9 | 22.5 | 0.96 | 230 | 0.83 | 0.55 | 31.4334 | 100.7952 |
| Billing / Cashier | N | 2.8211 | 33.9 | 22.5 | 8.64 | 120 | 0.91 | 0.55 | 277.8671 | 518.9184 |
| DSWD Room | N | 2.8211 | 33.9 | 22.5 | 12 | 120 | 0.91 | 0.55 | 385.9265 | 720.7200 |
| Chapel | E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 62.8667 | 578.6880 |
| E | 2.8211 | 33.9 | 22.5 | 5.76 | 685 | 0.8 | 0.55 | 185.2447 | 1736.0640 |
| Microbiology Room | N | 2.8211 | 33.9 | 22.5 | 12 | 120 | 0.91 | 0.55 | 385.9265 | 720.7200 |
| W | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.82 | 0.55 | 62.8667 | 593.1552 |
| Laboratory | N | 2.8211 | 33.9 | 22.5 | 7.2 | 120 | 0.91 | 0.55 | 231.5559 | 432.4320 |
| Radiologist Office | N | 2.8211 | 33.9 | 22.5 | 15 | 120 | 0.91 | 0.55 | 482.4081 | 900.9000 |
| Pharmacy | W | 2.8722 | 33.9 | 22.5 | 0.96 | 685 | 0.82 | 0.55 | 31.4334 | 296.5776 |
| Examination and Treatment Room | E | 2.8722 | 33.9 | 22.5 | 2.88 | 685 | 0.8 | 0.55 | 94.3001 | 868.0320 |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Observation Area | E | 2.8722 | 33.9 | 22.5 | 2.88 | 685 | 0.8 | 0.55 | 94.3001 | 868.0320 |

|  |
| --- |
| **TOTAL 19259.6408 W** |
| 22°C |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Morgue | E | 2.8211 | 33.9 | 22 | 1.92 | 685 | 0.8 | 0.55 | 64.4565 | 578.6880 |
| Cold Storage Room | W | 2.8211 | 33.9 | 22 | 3.84 | 685 | 0.82 | 0.55 | 128.9130 | 1186.3104 |
| Minor OR 1 | S | 2.8211 | 33.9 | 22 | 13.44 | 230 | 0.83 | 0.55 | 451.1954 | 1411.1328 |
| E | 2.8211 | 33.9 | 22 | 2.88 | 685 | 0.8 | 0.55 | 96.6847 | 868.0320 |
| Minor OR 2 | S | 2.8211 | 33.9 | 22 | 13.44 | 230 | 0.83 | 0.55 | 451.1954 | 1411.1328 |
| W | 2.8211 | 33.9 | 22 | 3.84 | 685 | 0.82 | 0.55 | 128.9130 | 1186.3104 |
| **TOTAL 7962.9645 W** | | | | | | | | | | |

# INFILTRATION LOAD

**Table 7**

Summary of Heat Load Calculation for Infiltration Load of the Ground Floor

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **V** | **L/s** | **to** | **ti** | **Wo** | **Wi** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Canteen | 159 | 11.01075 | 33.9 | 24 | 0.01942991 | 0.00928944 | 134.2959 | 334.9625 |
| Kitchen | 131.4 | 9.09945 | 33.9 | 24 | 0.01942991 | 0.00928944 | 110.9842 | 276.8181 |
| Radiology, DRSG | 61.2 | 4.2381 | 33.9 | 24 | 0.01942991 | 0.00928944 | 51.6913 | 128.9290 |
| C.T. Scan, Control Room | 78 | 5.4015 | 33.9 | 24 | 0.01942991 | 0.00928944 | 65.8810 | 164.3212 |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Housekeeping | 45 | 3.11625 | 33.9 | 24 | 0.01942991 | 0.00928944 | 38.0083 | 821.3822 |

# TOTAL 400.8606 W 1726.4130 W

22.5°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 1 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 2 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 3 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 4 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 5 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 6 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 7 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 8 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 9 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| DR's Clinic 10 | 39 | 2.8145 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 39.5291 | 92.4198 |
| Dietician | 30 | 2.165 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 30.4070 | 71.0921 |
| Dental Clinic | 30 | 2.165 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 30.4070 | 71.0921 |
| Billing / Cashier | 120 | 8.66 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 121.6280 | 284.3686 |
| Social Service / Admitting | 45 | 3.2475 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 45.6105 | 106.6382 |
| DSWD Room | 24 | 1.732 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 24.3256 | 56.8737 |
| Chapel | 168 | 12.124 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 170.2792 | 398.1160 |
| Pathologist Area | 31.2 | 2.2516 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 31.6233 | 73.9358 |
| Microbiology Room | 54 | 3.897 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 54.7326 | 127.9659 |
| Laboratory | 101.4462 | 7.3210341 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 102.8225 | 240.4009 |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Extraction | 25.2 | 1.8186 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 25.5419 | 59.7174 |
| Radiologist Office | 100.8522 | 7.2781671 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 102.2204 | 238.9933 |
| Pharmacy | 68.4147 | 4.93726085 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 69.3428 | 162.1249 |
| Ultrasound | 75 | 5.4125 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 76.0175 | 177.7304 |
| 2D - Echo | 75 | 5.4125 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 76.0175 | 177.7304 |
| Isolation Room | 30 | 2.165 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 30.4070 | 71.0921 |
| Examination and Treatment Room | 90 | 6.495 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 91.2210 | 213.2764 |
| Observation Area | 90 | 6.495 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 91.2210 | 213.2764 |
| Hallway | 249 | 17.9695 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 252.3780 | 590.0648 |

# TOTAL 1821.4935 W 4528.6878 W

22°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Morgue | 84 | 6.143666667 | 33.9 | 22 | 0.01942991 | 0.006555714 | 90.0711 | 237.2843 |
| Cold Storage Room | 60 | 4.388333333 | 33.9 | 22 | 0.01942991 | 0.006555714 | 64.3365 | 169.4888 |
| Minor OR 1 | 60 | 4.388333333 | 33.9 | 22 | 0.01942991 | 0.006555714 | 64.3365 | 169.4888 |
| Minor OR 2 | 51 | 3.730083333 | 33.9 | 22 | 0.01942991 | 0.006555714 | 54.6860 | 144.0655 |

# TOTAL 273.4300 W 720.3274 W

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1. **VENTILATION LOAD**

**Table 8**

Summary of Heat Load Calculation for Ventilation Load of the Ground Floor

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **N** | **L/s** | **to** | **ti** | **Wo** | **Wi** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Canteen | 20 | 160 | 33.9 | 24 | 0.01942991 | 0.00928944 | 1951.4880 | 4867.4254 |
| Kitchen | 5 | 40 | 33.9 | 24 | 0.01942991 | 0.00928944 | 487.8720 | 1216.8563 |
| Radiology, DRSG | 5 | 40 | 33.9 | 24 | 0.01942991 | 0.00928944 | 487.8720 | 1216.8563 |
| C.T. Scan, Control Room | 3 | 24 | 33.9 | 24 | 0.01942991 | 0.00928944 | 292.7232 | 730.1138 |
| Housekeeping | 2 | 5 | 33.9 | 24 | 0.01942991 | 0.00928944 | 60.9840 | 152.1070 |

# TOTAL 3280.9392 W 8183.3589 W

22.5°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 1 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| DR's Clinic 2 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| DR's Clinic 3 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| DR's Clinic 4 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| DR's Clinic 5 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| DR's Clinic 6 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| DR's Clinic 7 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| DR's Clinic 8 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| DR's Clinic 9 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 10 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| Dietician | 3 | 7.5 | 24 | 22.5 | 0.01942991 | 0.008484236 | 13.8600 | 246.2777 |
| Dental Clinic | 3 | 7.5 | 24 | 22.5 | 0.01942991 | 0.008484236 | 13.8600 | 246.2777 |
| Billing / Cashier | 3 | 7.5 | 24 | 22.5 | 0.01942991 | 0.008484236 | 13.8600 | 246.2777 |
| Social Service / Admitting | 3 | 7.5 | 24 | 22.5 | 0.01942991 | 0.008484236 | 13.8600 | 246.2777 |
| DSWD Room | 3 | 7.5 | 24 | 22.5 | 0.01942991 | 0.008484236 | 13.8600 | 246.2777 |
| Chapel | 10 | 80 | 24 | 22.5 | 0.01942991 | 0.008484236 | 147.8400 | 2626.9617 |
| Pathologist Area | 3 | 7.5 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 105.3360 | 246.2777 |
| Microbiology Room | 3 | 24 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 337.0752 | 788.0885 |
| Laboratory | 3 | 30 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 421.3440 | 985.1106 |
| Extraction | 2 | 16 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 224.7168 | 525.3923 |
| Radiologist Office | 3 | 24 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 337.0752 | 788.0885 |
| Pharmacy | 4 | 32 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 449.4336 | 1050.7847 |
| Ultrasound | 4 | 32 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 449.4336 | 1050.7847 |
| 2D - Echo | 4 | 32 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 449.4336 | 1050.7847 |
| Isolation Room | 1 | 13 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 182.5824 | 426.8813 |
| Examination and Treatment Room | 6 | 48 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 674.1504 | 1576.1770 |
| Observation Area | 6 | 48 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 674.1504 | 1576.1770 |
| Nurse Station | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| Emergency Room | 6 | 48 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 674.1504 | 1576.1770 |

# TOTAL 6740.9496 W 19111.1461 W

22°C

35

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Morgue | 4 | 14 | 33.9 | 22 | 0.01942991 | 0.006555714 | 205.2512 | 540.7162 |
| Cold Storage Room | 5 | 40 | 33.9 | 22 | 0.01942991 | 0.006555714 | 586.4320 | 1544.9036 |
| Minor OR 1 | 5 | 75 | 33.9 | 22 | 0.01942991 | 0.006555714 | 1099.5600 | 2896.6942 |
| Minor OR 2 | 4 | 60 | 33.9 | 22 | 0.01942991 | 0.006555714 | 879.6480 | 2317.3554 |

# TOTAL 2770.8912 W 7299.6694 W

1. **INTERNAL LOADS**
   1. **Lighting Load**

**Table 9**

Summary of Heat Load Calculation for Lighting Load of the Ground Floor

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **W** | **Fu** | **Fsa** | **CLF** | **Q (W)** |

24°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Canteen | 168 | 1.2 | 0.75 | 0.94 | 142.1280 |
| Kitchen | 168 | 1.2 | 0.75 | 0.94 | 142.1280 |
| Radiology, DRSG | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |
| C.T. Scan, Control Room | 84 | 1.2 | 0.75 | 0.94 | 71.0640 |
| Housekeeping | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |

# TOTAL 646.3440 W

22.5°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DR's Clinic 1 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DR's Clinic 2 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DR's Clinic 3 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |

36

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DR's Clinic 4 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DR's Clinic 5 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DR's Clinic 6 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DR's Clinic 7 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DR's Clinic 8 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DR's Clinic 9 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DR's Clinic 10 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Dietician | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Dental Clinic | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Billing / Cashier | 156 | 1.2 | 1 | 0.94 | 175.9680 |
| Social Service / Admitting | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| DSWD Room | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Chapel | 156 | 1.2 | 1 | 0.94 | 175.9680 |
| Pathologist Area | 80 | 1.2 | 1 | 0.94 | 90.2400 |
| Microbiology Room | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Laboratory | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Extraction | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |
| Radiologist Office | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Pharmacy | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |
| Ultrasound | 40 | 1.2 | 0.75 | 0.94 | 33.8400 |
| 2D - Echo | 84 | 1.2 | 0.5 | 0.94 | 47.3760 |
| Isolation Room | 32 | 1.2 | 0.75 | 0.94 | 27.0720 |
| Examination and Treatment Room | 84 | 1.2 | 1 | 0.94 | 94.7520 |

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Observation Area | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Hallway | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |

# TOTAL 2630.4960 W

22°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Morgue | 84 | 1.2 | 0.5 | 0.94 | 47.3760 |
| Cold Storage Room | 84 | 1.2 | 1 | 0.94 | 94.7520 |
| Minor OR 1 | 156 | 1.2 | 1 | 0.94 | 175.9680 |
| Minor OR 2 | 156 | 1.2 | 1 | 0.94 | 175.9680 |

# TOTAL 494.0640 W

* 1. **Occupant Load**

**Table 10**

Summary of Heat Load Calculation for Occupant Load of the Ground Floor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **N** | **Fu** | **Fsa** | **CLF** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Canteen | 20 | 80 | 80 | 0.96 | 1536.00 | 1600.0000 |
| Kitchen | 5 | 80 | 80 | 0.96 | 384.00 | 400.0000 |
| Radiology, DRSG | 5 | 70 | 45 | 0.96 | 336.00 | 225.0000 |
| C.T. Scan, Control Room | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Housekeeping | 2 | 70 | 45 | 0.96 | 134.40 | 90.0000 |

# TOTAL 2592.0000 W 2450.0000 W

22.5°C

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 1 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 2 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 3 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 4 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 5 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 6 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 7 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 8 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 9 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| DR's Clinic 10 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| Dietician | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Dental Clinic | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Billing / Cashier | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Social Service / Admitting | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| DSWD Room | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Chapel | 10 | 65 | 30 | 0.96 | 624.00 | 300.0000 |
| Pathologist Area | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Microbiology Room | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Laboratory | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Extraction | 2 | 70 | 45 | 0.96 | 134.40 | 90.0000 |
| Radiologist Office | 3 | 70 | 45 | 0.96 | 201.60 | 135.0000 |
| Control Room | 1 | 70 | 45 | 0.96 | 67.20 | 45.0000 |
| Dark Room | 2 | 70 | 45 | 0.96 | 134.40 | 90.0000 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pharmacy | 4 | 75 | 70 | 0.96 | 288.00 | 280.0000 |
| Ultrasound | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| 2D - Echo | 4 | 75 | 55 | 0.96 | 288.00 | 220.0000 |
| Isolation Room | 1 | 70 | 45 | 0.96 | 67.20 | 45.0000 |
| Examination and Treatment Room | 6 | 70 | 45 | 0.96 | 403.20 | 270.0000 |
| Observation Area | 6 | 70 | 45 | 0.96 | 403.20 | 270.0000 |
| Nurse Station | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |
| Emergency Room | 6 | 70 | 45 | 0.96 | 403.20 | 270.0000 |

# TOTAL 7852.8000 W 5255.0000 W

22°C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Morgue | 4 | 75 | 55 | 0.96 | 288.00 | 220.0000 |
| Cold Storage Room | 5 | 75 | 70 | 0.96 | 360.00 | 350.0000 |
| Minor OR 1 | 5 | 70 | 45 | 0.96 | 336.00 | 225.0000 |
| Minor OR 2 | 4 | 70 | 45 | 0.96 | 268.80 | 180.0000 |

# TOTAL 1252.8000 W 975.0000 W

* 1. **Partition Load**

**Table 11**

Summary of Heat Load Calculation for Partition Load of the Ground Floor

40

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **U** | **A** | **ti** | **ti** | **Q (W)** |

24°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wall | Canteen | CR | 2.5667 | 18.75 | 24 | 28 | 192.5025 |
| Kitchen | Hallway | 2.5667 | 5.8125 | 24 | 28 | 59.6758 |
| Radiologist Office | CR | 2.5667 | 4.5 | 24 | 28 | 46.2006 |
| Radiology | CR | 2.5667 | 4.5 | 24 | 28 | 46.2006 |
| Hallway | 2.5667 | 15.9375 | 24 | 28 | 163.6271 |
| CT Scan | Hallway | 2.5667 | 6 | 24 | 28 | 61.6008 |
| Housekeeping | Hallway | 2.5667 | 9.15 | 24 | 28 | 93.9412 |
| Canteen | Hallway | 2.5667 | 29.25 | 24 | 28 | 300.3039 |
| Radiology | CR | 2.5667 | 4.5 | 24 | 28 | 46.2006 |
| Hallway | 2.5667 | 21 | 24 | 28 | 215.6028 |
| Housekeeping | Hallway | 2.5667 | 18.75 | 24 | 28 | 192.5025 |
| Door | Kitchen | Hallway | 1.5625 | 4.2 | 24 | 28 | 26.2500 |
| Housekeeping | Hallway | 1.6048 | 1.68 | 24 | 28 | 10.7843 |
| Canteen | Hallway | 1.5625 | 8.4 | 24 | 28 | 52.5000 |
| Radiology | Hallway | 1.6048 | 4.2 | 24 | 28 | 26.9606 |
| Kitchen | Hallway | 1.5625 | 4.2 | 24 | 28 | 26.2500 |
| Housekeeping | Hallway | 1.6048 | 1.68 | 24 | 28 | 10.7843 |
| Canteen | Hallway | 1.5625 | 8.4 | 24 | 28 | 52.5000 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Radiology | Hallway | 1.6048 | 4.2 | 24 | 28 | 26.9606 |

# TOTAL 2175.9206 W

22.5°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wall | Nurse Station | CR | 2.5667 | 16.65 | 22.5 | 28 | 156.1677 |
| Emergency Room | Hallway | 2.5667 | 6 | 22.5 | 28 | 264.6909 |
| Ultrasound | Hallway | 2.5667 | 18.75 | 22.5 | 28 | 264.6909 |
| Pharmacy | Hallway | 2.5667 | 18.75 | 22.5 | 28 | 264.6909 |
| CR | 2.5667 | 5.8125 | 22.5 | 28 | 76.2310 |
| DR's Clinic 2 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 319.7467 |
| DR's Clinic 3 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 84.7011 |
| DR's Clinic 4 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 182.1074 |
| DR's Clinic 5 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 317.6291 |
| DR's Clinic 6 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 81.5248 |
| DR's Clinic 7 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 89.9949 |
| DR's Clinic 8 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 264.6909 |
| DR's Clinic 9 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 235.0456 |
| DR's Clinic 10 | Hallway | 2.5667 | 7.65 | 22.5 | 28 | 84.7011 |
| Dietician | Hallway | 2.5667 | 5.4 | 22.5 | 28 | 264.6909 |
| Dental Clinic | Hallway | 2.5667 | 13.875 | 22.5 | 28 | 264.6909 |
| Stairs | 2.5667 | 13.875 | 22.5 | 28 | 82.0542 |
| Social Service / Admitting | Information and Reception/Hallway | 2.5667 | 16.65 | 22.5 | 28 | 107.9939 |
| Chapel | E.S.D. / Linen | 2.5667 | 15 | 22.5 | 28 | 107.9939 |

42

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Pathologist Area | Hallway | 2.5667 | 9.75 | 22.5 | 28 | 107.9939 |
| Microbiology | Hallway | 2.5667 | 16.875 | 22.5 | 28 | 107.9939 |
| Laboratory | CR | 2.5667 | 2.4 | 22.5 | 28 | 107.9939 |
| Radiologist Office | Hallway | 2.5667 | 6.99375 | 22.5 | 28 | 107.9939 |
| Pharmacy | Hallway | 2.5667 | 16.65 | 22.5 | 28 | 107.9939 |
| CR | 2.5667 | 4.5 | 22.5 | 28 | 107.9939 |
| 2d - Echo | Hallway | 2.5667 | 13.5 | 22.5 | 28 | 107.9939 |
| Ultrasound | Stairs | 2.5667 | 13.4063 | 22.5 | 28 | 76.2310 |
| Hallway | 2.5667 | 13.5 | 22.5 | 28 | 195.8713 |
| Isolation Room | Hallway | 2.5667 | 15 | 22.5 | 28 | 195.8713 |
| Door | Dental Clinic | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| Billing / Cashier | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| Hallway | 1.605 | 4.2 | 22.5 | 28 | 37.0709 |
| Social Service / Admitting | Hallway | 2.358 | 4.2 | 22.5 | 28 | 54.4606 |
| Pathologist Area | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| Extraction | Hallway | 1.605 | 1.68 | 22.5 | 28 | 14.8284 |
| Emergency Room | Hallway | 1.563 | 4.2 | 22.5 | 28 | 36.0938 |
| DR's Clinic 2 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| DR's Clinic 3 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| DR's Clinic 4 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| DR's Clinic 5 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| DR's Clinic 6 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | DR's Clinic 7 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| DR's Clinic 8 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| DR's Clinic 9 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| DR's Clinic 10 | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| Dietician | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| Social Service /  Admitting | Information and  Reception/Hallway | 1.605 | 1.68 | 22.5 | 28 | 14.8284 |
| Laboratory | CR | 1.605 | 1.68 | 22.5 | 28 | 14.8284 |
| Radiologist Office | Hallway | 1.605 | 1.68 | 22.5 | 28 | 14.8284 |
| Pharmacy | Hallway | 2.358 | 1.68 | 22.5 | 28 | 21.7842 |
| 2d - Echo | Hallway | 2.358 | 4.2 | 22.5 | 28 | 54.4606 |
| Ultrasound | Hallway | 1.605 | 4.2 | 22.5 | 28 | 37.0709 |

# TOTAL 8032.1166 W

22.5°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wall | Morgue | Chapel | 2.5667 | 21 | 22 | 22.5 | 26.9504 |
| Minor Operating Room 1 | Observation Room | 2.5667 | 18.75 | 22 | 22.5 | 24.0628 |
| Minor Operating Room 2 | CR | 2.5667 | 16.65 | 22 | 28 | 256.4133 |
| Cold Storage Room | Pharmacy | 2.5667 | 10.8375 | 22 | 22.5 | 13.9083 |
| CR | 2.5667 | 5.8125 | 22 | 28 | 89.5137 |
| CT Scan | 2.5667 | 12.9375 | 22 | 24 | 66.4134 |
| Control Room | 2.5667 | 5.8125 | 22 | 24 | 29.8379 |
| Morgue | Oxygen Tank Storage/Hallway | 2.5667 | 15 | 22 | 28 | 231.0030 |
| Cold Storage Room | Hallway | 2.5667 | 9.75 | 22 | 28 | 150.1520 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Minor Operating Room 1 | Hallway | 2.5667 | 9.75 | 22 | 28 | 150.1520 |
| Minor Operating Room 2 | Hallway | 2.5667 | 10.65 | 22 | 28 | 164.0121 |
| Door | Minor Operating Room 2 | CR | 1.6048 | 1.68 | 22 | 28 | 16.1764 |
| Cold Storage Room | Pharmacy | 2.3576 | 1.68 | 22 | 24 | 7.9215 |
| Hallway | 2.3576 | 4.2 | 22 | 28 | 59.4115 |
| Minor Operating Room 1 | Hallway | 1.5625 | 4.2 | 22 | 28 | 39.3750 |
| Minor Operating Room 2 | Hallway | 1.5625 | 1.68 | 22 | 28 | 15.7500 |

# TOTAL 2651.3557 W

**Table 12**

Summary of Heat Load Calculation for Partition Ceiling of the Ground Floor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **U** | **A** | **dT** | **Q (W)** |
| Ceiling | Kitchen | Isolation ward / Female Ward 2 | 20 | 25 | 1.5 | 0.892857 |
| Canteen | Female Ward 1 / 2 | 52.5 | 65.625 | 1.5 | 0.892857 |
| DR Clinic | Pediatric Ward | 46.25 | 57.8125 | 1.5 | 0.892857 |
| Pathologist Area / Microbiology Room | CSSR | 28 | 35 | 1.5 | 0.892857 |
| Laboratory / Extraction | Storage | 21.25 | 26.5625 | 1.5 | 0.892857 |
| Radiology | ICU | 25 | 31.25 | 2 | 0.892857 |
| Radiologist Office | ICU | 64 | 80 | 0.5 | 0.892857 |
| CSR | Neonatal ICU | 20 | 25 | 2 | 0.892857 |
| 2D-Echo | Breastfeeding | 25 | 31.25 | 1.5 | 0.892857 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Observation Area / Examination and Treatment Area | Delivery Room | 35 | 43.75 | 1.5 | 0.892857 |
| Oxygen Tank Storage | Pediatrician | 9 | 11.25 | 4 | 0.892857 |
| Morgue | Department Head Office | 28 | 35 | 0.5 | 0.892857 |

# TOTAL 573.6607 W

* 1. **Miscellaneous Load**

**Table 13**

Summary of Heat Load Calculation for Miscellaneous Load of the Ground Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Equipment** | **W** | **Cs** | **Cl** | **CLF** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Canteen | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 1.2W CEILING ORBITAL FAN, 50W EXHAUST FAN, 40W | 256.2 | 0.33 | 0.16 | 0.96 | 81.16416 | 40.9920 |
| Kitchen | HEAT DETECTOR, 0.8W SMOKE DETECTOR, 0.4W COFFEE MAKER, 1050W BLENDER, 250W  RICE COOKER, 450W MICROWAVE, 1000 REFRIGERATOR, 2000W  CEILING ORBITAL FAN, 50W EXHAUST FAN, 40W | 4841.2 | 0.33 | 0.16 | 0.96 | 1533.69216 | 774.5920 |
| Radiology, DRSG | TV, 125W- TELEPHONE, 15W X-RAY MACHINE, 1500W SMOKE DETECTOR, 0.8W | 2640.8 | 0.33 | 0.16 | 0.96 | 836.60544 | 422.5280 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| C.T. Scan, Control Room | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.8W CT X-RAY, 150W COMPUTER, 80W | 570.8 | 0.33 | 0.16 | 0.96 | 180.82944 | 91.3280 |
| Housekeeping | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.04672 | 4.0640 |
| **TOTAL 2640.3379 W 1333.5040 W** | | | | | | | |

22.5°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 1 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| DR's Clinic 2 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| DR's Clinic 3 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| DR's Clinic 4 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| DR's Clinic 5 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| DR's Clinic 6 | TV, 125W- TELEPHONE, 15W SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 7 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| DR's Clinic 8 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| DR's Clinic 9 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| DR's Clinic 10 | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| Dietician | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W | 140.4 | 0.33 | 0.16 | 0.96 | 44.47872 | 22.4640 |
| Billing / Cashier | TV, 125W TELEPHONE, 15W  CASH REGISTER, 100W COMPUTER, 80W  CEILING ORBITAL FAN, 25W | 345 | 0.33 | 0.16 | 0.96 | 109.296 | 55.2000 |
| Social Service / Admitting | SMOKE DETECTOR, 0.4W COMPUTER, 80W | 80.4 | 0.33 | 0.16 | 0.96 | 25.47072 | 12.8640 |
| DSWD Room | SMOKE DETECTOR, 0.4W COMPUTER, 80W | 80.4 | 0.33 | 0.16 | 0.96 | 25.47072 | 12.8640 |
| Chapel | HEAT DETECTOR, 0.16W CEILING ORBITAL FAN, 50W | 50.16 | 0.33 | 0.16 | 0.96 | 15.890688 | 8.0256 |
| Pathologist Area | SMOKE DETECTOR, 0.4W HAEMOCYTOMETER, 500W | 500.4 | 0.33 | 0.16 | 0.96 | 158.52672 | 80.0640 |
| Microbiology Room | SMOKE DETECTOR, 0.4W | 3550.4 | 0.33 | 0.16 | 0.96 | 1124.76672 | 568.0640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | HOT AIR OVEN, 800W DRYING OVEN, 1000W AUTOCLAVE, 1400W MICROBIOLOGICAL INCUBATOR, 150W FRIDGE 200W |  |  |  |  |  |  |
| Laboratory | EXAMINATION LAMP, 50W COMPUTER, 80 W LABORATORY INCUBATORS, 240W  LAB PURIFICATION SYSTEM, SMOKE DETECTOR, 0.8W TV, 125W  TELEPHONE, 15W | 510.4 | 0.33 | 0.16 | 0.96 | 161.69472 | 81.6640 |
| Extraction | SMOKE DETECTOR, 0.4W | 750.4 | 0.33 | 0.16 | 0.96 | 237.72672 | 120.0640 |
| Radiologist Office | TV, 125W TELEPHONE, 15W COMPUTER, 80W  SMOKE DETECTOR, 1.6W CEILING ORBITAL FAN, 25W | 246.6 | 0.33 | 0.16 | 0.96 | 78.12288 | 39.4560 |
| Dark Room | CEILING ORBITAL FAN, 25W | 25 | 0.33 | 0.16 | 0.96 | 7.92 | 4.0000 |
| Film Filling Office | COMPUTER - 80W | 80 | 0.33 | 0.16 | 0.96 | 25.344 | 12.8000 |
| Pharmacy | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W REFRIGERATOR, 150W | 165.4 | 0.33 | 0.16 | 0.96 | 52.39872 | 26.4640 |
| Ultrasound | TV, 125W TELEPHONE, 15W  ULTRASOUND MACHINE, 95W SMOKE DETECTOR, 0.4W | 235.4 | 0.33 | 0.16 | 0.96 | 74.57472 | 37.6640 |
| 2D - Echo | TV, 125W TELEPHONE, 15W | 140.4 | 0.33 | 0.16 | 0.96 | 44.47872 | 22.4640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | SMOKE DETECTOR, 0.4W |  |  |  |  |  |  |
| Isolation Room | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Observation Area | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.04672 | 4.0640 |
| Nurse Station | TV, 125W TELEPHONE, 15W COMPUTER, 80W | 220 | 0.33 | 0.16 | 0.96 | 69.696 | 35.2000 |
| Emergency Room | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Hallway | SMOKE DETECTOR, 0.8W SPEAKER, 4W  FIRE ALARM, 1W | 5.8 | 0.33 | 0.16 | 0.96 | 1.83744 | 0.9280 |
| **TOTAL 3279.5643 W 1656.3456 W** | | | | | | | |

22°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Morgue | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W | 140.4 | 0.33 | 0.16 | 0.96 | 44.47872 | 22.4640 |
| Cold Storage Room | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Minor OR 1 | SMOKE DETECTOR, 0.4W CARDIOPULMONARY BYPASS MACHINE, 150 W  SURGICAL LGHTS, 25W AUTOCLAVE, 1400W | 1575.4 | 0.33 | 0.16 | 0.96 | 499.08672 | 252.0640 |
| Minor OR 2 | SMOKE DETECTOR, 0.4W CARDIOPULMONARY BYPASS MACHINE, 150 W  SURGICAL LGHTS, 25W AUTOCLAVE, 1400W | 1575.4 | 0.33 | 0.16 | 0.96 | 499.08672 | 252.0640 |

# TOTAL 1042.7789 W 526.6560 W

**Table 14**

Summary of Heat Load Calculation for Ground Floor for 24°C

|  |  |  |  |
| --- | --- | --- | --- |
| **HEAT SOURCES** | | **QS (W)** | **QL (W)** |
| External Loads | External Wall | 6985.6466 |  |
| Glass Load | 12099.3847 |  |
| Infiltration Load | | 400.8606 | 1726.4130 |
| Ventilation Load | | 3280.9392 | 8183.3589 |
| Internal Loads | Lighting Load | 646.3400 |  |
| Occupant Load | 2592.0000 | 2450.0000 |
| Partition Load | 2749.5813 |  |
| Miscellaneous Load | 2640.3379 | 1333.5040 |
| **TOTAL** | | **31395.0944** | **13693.2759** |
| **OVERALL TOTAL** | | **45088.3703 W** | |

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# Table 15

Summary of Heat Load Calculation for Ground Floor for 22.5°C

|  |  |  |  |
| --- | --- | --- | --- |
| **HEAT SOURCES** | | **QS (W)** | **QL (W)** |
| External Loads | External Wall | 17398.9831 |  |
| Glass Load | 19259.6408 |  |
| Infiltration Load | | 1821.4935 | 4258.6878 |
| Ventilation Load | | 6740.9496 | 19111.1461 |
| Internal Loads | Lighting Load | 2630.4960 |  |
| Occupant Load | 7852.8000 | 5255.0000 |
| Partition Load | 8605.7773 |  |
| Miscellaneous Load | 3279.5643 | 1656.3456 |
| **TOTAL** | | **67589.7046** | **30281.1794** |
| **OVERALL TOTAL** | | **97870.8840 W** | |

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# Table 16

Summary of Heat Load Calculation for Ground Floor for 22.5°C

|  |  |  |  |
| --- | --- | --- | --- |
| **HEAT SOURCES** | | **QS (W)** | **QL (W)** |
| External Loads | External Wall | 6589.6675 |  |
| Glass Load | 7962.9645 |  |
| Infiltration Load | | 273.4300 | 720.3274 |
| Ventilation Load | | 2770.8912 | 7299.6694 |
| Internal Loads | Lighting Load | 494.0640 |  |
| Occupant Load | 1252.8000 | 975.0000 |
| Partition Load | 3225.0164 |  |
| Miscellaneous Load | 1042.7789 | 526.6560 |
| **TOTAL** | | **23611.6125** | **9521.6528** |
| **OVERALL TOTAL** | | **33133.2652 W** | |

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# A COMPLETE SUMMARY OF HEAT LOAD CALCULATION IN TABULAR FORM FOR SECOND FLOOR:

* + 1. **EXTERNAL LOADS**
       1. **External Wall**

**Table 17**

Summary of Heat Load Calculation for External Wall of the Second Floor

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Orientation** | **U** | **A (m2)** | **CLTDsel** | **LM** | **k** | **ti** | **tave** | **CLTDadj** | **Q (W)** |
| 24°C | | | | | | | | | | |
| Pediatric Ward | W | 2.714 | 30.4 | 33 | -0.55 | 0.65 | 24 | 30.65 | 23.7425 | 1958.8892 |
| Pediatrician | S | 2.714 | 11.12 | 22 | -3.88 | 0.65 | 24 | 30.65 | 14.428 | 435.4324 |
| Central Sterilizing and Supply Room | W | 2.714 | 8.08 | 33 | -0.55 | 0.65 | 24 | 30.65 | 23.7425 | 520.6521 |
| Storage | S | 2.714 | 5.16 | 13 | 2.22 | 0.65 | 24 | 30.65 | 12.543 | 175.6552 |
| Housekeeping | S | 2.714 | 13.08 | 22 | -3.88 | 0.65 | 24 | 30.65 | 14.428 | 512.1813 |
| Neonatal Intensive Care | W | 2.714 | 46.845 | 33 | -0.55 | 0.65 | 24 | 30.65 | 23.7425 | 3018.5581 |
| **TOTAL 6621.3683 W** | | | | | | | | | | |

22.5°C

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | E | 2.714 | 14.7 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 18.5425 | 739.7679 |
| Male Ward 2 | E | 2.714 | 14.7 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 18.5425 | 739.7679 |
| Dialysis | N | 2.714 | 12.48 | 13 | 2.22 | 0.65 | 22.5 | 30.65 | 14.043 | 1085.4498 |

76

54

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dialysis - ROS | E | 2.714 | 4.08 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 439.5144 |
| Female Ward 1 | E | 2.714 | 18.24 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 1862.4966 |
| Female Ward 2 | E | 2.714 | 16.32 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 1758.0576 |
| S | 2.714 | 7.38 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 647.5643 |
| Isolation Ward | W | 2.714 | 20.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 2477.2545 |
| S | 2.714 | 7.38 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 647.5643 |
| Medicine | S | 2.714 | 5.52 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 480.7019 |
| E | 2.714 | 6.48 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 657.0958 |
| Surgery / Anesthesia | S | 2.714 | 6.12 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 264.5590 |
| Department Head Office | E | 2.714 | 7.77 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 808.8588 |
| W | 2.714 | 5.64 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 660.4185 |
| Doctor's Conference | N | 2.714 | 1.56 | 13 | 2.22 | 0.65 | 22.5 | 30.65 | 14.043 | 196.6615 |
| Recovery Room | W | 2.714 | 13.26 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 1689.4109 |
| Labor Room | E | 2.714 | 6.12 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 659.2716 |
| Nurse Station 3 | W | 2.714 | 6.78 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 861.8325 |

# TOTAL 16676.2476 W

22°C

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Delivery Room | E | 2.714 | 16.719 | 25 | -0.55 | 0.65 | 22 | 30.65 | 20.5425 | 1696.2651 |
| Intensive Care Unit | E | 2.714 | 12.33 | 25 | -0.55 | 0.65 | 22 | 30.65 | 20.5425 | 1395.4812 |
| Operating Room 1 | E | 2.714 | 17.601 | 25 | -0.55 | 0.65 | 22 | 30.65 | 20.5425 | 1778.2210 |
| Operating Room 1 | S | 2.714 | 9.24 | 22 | -3.88 | 0.65 | 22 | 30.65 | 16.428 | 857.8268 |
| Operating Room 2 | W | 2.714 | 17.601 | 33 | -0.55 | 0.65 | 22 | 30.65 | 25.7425 | 2228.3488 |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Room 2 | S | 2.714 | 9.24 | 22 | -3.88 | 0.65 | 22 | 30.65 | 16.428 | 857.8268 |
| SSA | S | 2.714 | 9 | 22 | -3.88 | 0.65 | 22 | 30.65 | 16.428 | 411.9709 |

# TOTAL 9225.9406 W

* + - 1. **Glass Load**

**Table 18**

Summary of Heat Load Calculation for Glass Load of the Second Floor

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Orientation** | **U** | **to** | **ti** | **A (m2)** | **SGHF** | **SCL** | **SC** | **Qsg (W)** | **Qc (W)** |

24°C

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pediatric Ward | W | 2.8722 | 33.9 | 24 | 9.6 | 685 | 0.82 | 0.55 | 272.9739 | 2965.7760 |
| N | 2.8211 | 33.9 | 24 | 11.4 | 120 | 0.91 | 0.55 | 318.3893 | 684.6840 |
| Pediatrician | S | 2.8211 | 33.9 | 24 | 2.88 | 230 | 0.83 | 0.55 | 80.4352 | 302.3856 |
| Central Sterilizing and Supply Room | W | 2.8722 | 33.9 | 24 | 1.92 | 685 | 0.82 | 0.55 | 54.5948 | 593.1552 |
| N | 2.8211 | 33.9 | 24 | 12 | 120 | 0.91 | 0.55 | 335.1467 | 720.7200 |
| Storage | N | 2.8211 | 33.9 | 24 | 3.84 | 120 | 0.91 | 0.55 | 107.2469 | 230.6304 |
| Housekeeping | S | 2.8722 | 33.9 | 24 | 1.92 | 230 | 0.83 | 0.55 | 54.5948 | 201.5904 |
| Neonatal Intensive Care | W | 2.8722 | 33.9 | 24 | 9.6 | 685 | 0.82 | 0.55 | 272.9739 | 2965.7760 |
| N | 2.8211 | 33.9 | 24 | 15 | 120 | 0.91 | 0.55 | 418.9334 | 900.9000 |

# TOTAL 11480.9064 W

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 22.5°C | | | | | | | | | | |
| Male Ward 1 | E | 2.8722 | 33.9 | 22.5 | 4.8 | 685 | 0.8 | 0.55 | 157.1668 | 1446.7200 |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | N | 2.8211 | 33.9 | 22.5 | 11.4 | 120 | 0.91 | 0.55 | 366.6302 | 684.6840 |
| Male Ward 2 | E | 2.8722 | 33.9 | 22.5 | 4.8 | 685 | 0.8 | 0.55 | 157.1668 | 1446.7200 |
| Dialysis | N | 2.8211 | 33.9 | 22.5 | 11.52 | 120 | 0.91 | 0.55 | 370.4894 | 691.8912 |
| Dialysis - ROS | E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 62.8667 | 578.6880 |
| Dialysis - ROS | N | 2.8211 | 33.9 | 22.5 | 12 | 120 | 0.91 | 0.55 | 385.9265 | 720.7200 |
| Female Ward 1 | E | 2.8722 | 33.9 | 22.5 | 5.76 | 685 | 0.8 | 0.55 | 188.6001 | 1736.0640 |
| Female Ward 2 | E | 2.8722 | 33.9 | 22.5 | 7.68 | 685 | 0.8 | 0.55 | 251.4669 | 2314.7520 |
| Female Ward 2 | S | 2.8211 | 33.9 | 22.5 | 3.84 | 230 | 0.83 | 0.55 | 123.4965 | 403.1808 |
| Isolation Ward | N | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 125.7334 | 1186.3104 |
| Isolation Ward | S | 2.8211 | 33.9 | 22.5 | 3.84 | 230 | 0.83 | 0.55 | 123.4965 | 403.1808 |
| Medicine | E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 62.8667 | 578.6880 |
| Medicine | S | 2.8211 | 33.9 | 22.5 | 2.88 | 230 | 0.83 | 0.55 | 92.6224 | 302.3856 |
| Surgery / Anesthesia | S | 2.8211 | 33.9 | 22.5 | 2.88 | 230 | 0.83 | 0.55 | 92.6224 | 302.3856 |
| Department Head Office | E | 2.8722 | 33.9 | 22.5 | 2.88 | 685 | 0.8 | 0.55 | 94.3001 | 868.0320 |
| Doctor's Conference | N | 2.8211 | 33.9 | 22.5 | 3.84 | 120 | 0.91 | 0.55 | 123.4965 | 230.6304 |
| Recovery Room | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 125.7334 | 1186.3104 |
| Labor Room | E | 2.8722 | 33.9 | 22.5 | 2.88 | 685 | 0.8 | 0.55 | 94.3001 | 868.0320 |
| Hallway (inside) | W | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.82 | 0.55 | 62.8667 | 593.1552 |

**TOTAL 19604.3783 W**

22°C

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Delivery Room | E | 2.8722 | 33.9 | 22 | 2.88 | 685 | 0.8 | 0.55 | 98.4360 | 868.0320 |
| Intensive Care Unit | E | 2.8722 | 33.9 | 22 | 6.72 | 685 | 0.8 | 0.55 | 229.6841 | 2025.4080 |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Intensive Care Unit | S | 2.8211 | 33.9 | 22 | 24 | 120 | 0.91 | 0.55 | 805.7062 | 1441.4400 |
| Operating Room 1 | E | 2.8211 | 33.9 | 22 | 3.84 | 685 | 0.8 | 0.55 | 128.9130 | 1157.3760 |
| Operating Room 1 | S | 2.8211 | 33.9 | 22 | 5.76 | 230 | 0.83 | 0.55 | 193.3695 | 604.7712 |
| Operating Room 2 | S | 2.8211 | 33.9 | 22 | 5.76 | 230 | 0.83 | 0.55 | 193.3695 | 604.7712 |
| Operating Room 2 | W | 2.8211 | 33.9 | 22 | 3.84 | 685 | 0.82 | 0.55 | 128.9130 | 1186.3104 |

# TOTAL 9666.50000 W

* + 1. **INFILTRATION LOAD**

**Table 19**

Summary of Heat Load Calculation for Infiltration Load of the Second Floor

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **V** | **L/s** | **to** | **ti** | **Wo** | **Wi** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pediatric Ward | 128.175 | 8.87611875 | 33.9 | 24 | 0.01942991 | 0.00928944 | 108.2602452 | 270.0240352 |
| Pediatrician | 23.52 | 1.62876 | 33.9 | 24 | 0.01942991 | 0.00928944 | 19.86565997 | 49.54917345 |
| Central Sterilizing and Supply Room | 84 | 5.817 | 33.9 | 24 | 0.01942991 | 0.00928944 | 70.9487856 | 176.9613338 |
| Storage | 47.4375 | 3.28504687  5 | 33.9 | 24 | 0.01942991 | 0.00928944 | 40.06705973 | 99.93575321 |
| Housekeeping | 45 | 3.11625 | 33.9 | 24 | 0.01942991 | 0.00928944 | 38.008278 | 94.80071451 |
| Neonatal Intensive Care | 182.4375 | 12.6337968  8 | 33.9 | 24 | 0.01942991 | 0.00928944 | 154.0918937 | 384.3378967 |
| Breastfeeding | 75 | 5.19375 | 33.9 | 24 | 0.01942991 | 0.00928944 | 63.34713 | 158.0011908 |

# TOTAL 494.5891 W 1233.6101 W

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22.5°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | 90.3 | 6.51665 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 91.52504592 | 213.987371 |
| Male Ward 2 | 90.3 | 6.51665 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 91.52504592 | 213.987371 |
| Dialysis - RE | 12 | 0.866 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 12.1627968 | 28.43685993 |
| Dialysis | 130.8 | 9.4394 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 132.5744851 | 309.9617733 |
| Dialysis - ROS | 45.6 | 3.2908 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 46.21862784 | 108.0600677 |
| Female Ward 1 | 112.8 | 8.1404 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 114.3302899 | 267.3064834 |
| Female Ward 2 | 112.8 | 8.1404 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 114.3302899 | 267.3064834 |
| Isolation Ward | 112.8 | 8.1404 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 114.3302899 | 267.3064834 |
| Treatment and Medication Area | 51.3 | 3.70215 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 51.99595632 | 121.5675762 |
| Medicine | 23.52 | 1.69736 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 23.83908173 | 55.73624547 |
| OB - Gyne | 16.8 | 1.2124 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 17.02791552 | 39.81160391 |
| Surgery / Anesthesia | 25.2 | 1.8186 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 25.54187328 | 59.71740586 |
| Department Head Office | 114.06 | 8.23133 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 115.6073836 | 270.2923537 |
| Doctor's Conference | 47.4375 | 3.42340625 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 48.0810561 | 112.4144619 |
| Hallway (inside) (inside) | 35.523 | 2.5635765 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 36.00491923 | 84.18021461 |
| Recovery Room | 85.5 | 6.17025 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 86.6599272 | 202.612627 |
| Labor Room | 45 | 3.2475 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 45.610488 | 106.6382247 |
| Hallway (inside) | 176.7 | 12.75185 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 179.0971829 | 418.7327625 |

# TOTAL 1346.4627 W 3148.0564 W

22°C

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Delivery Room | 102.795 | 7.518312083 | 33.9 | 22 | 0.01942991 | 0.006555714 | 110.2244698 | 290.3766796 |
| Intensive Care Unit | 241.875 | 17.69046875 | 33.9 | 22 | 0.01942991 | 0.006555714 | 259.3564243 | 683.2517086 |
| Operating Room 1 | 107.205 | 7.840854583 | 33.9 | 22 | 0.01942991 | 0.006555714 | 114.9532009 | 302.8341061 |
| Operating Room 2 | 107.205 | 7.840854583 | 33.9 | 22 | 0.01942991 | 0.006555714 | 114.9532009 | 302.8341061 |
| SSA | 28.8 | 2.1064 | 33.9 | 22 | 0.01942991 | 0.006555714 | 30.88150912 | 81.35462204 |

# TOTAL 630.3688 W 1660.6512 W

* + 1. **VENTILATION LOAD**

**Table 20**

Summary of Heat Load Calculation for Ventilation Load of the Second Floor

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **N** | **L/s** | **to** | **ti** | **Wo** | **Wi** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pediatric Ward | 12 | 156 | 33.9 | 24 | 0.01942991 | 0.00928944 | 1902.7008 | 4745.7397 |
| Pediatrician | 2 | 5 | 33.9 | 24 | 0.01942991 | 0.00928944 | 60.9840 | 152.1070 |
| Central Sterilizing and Supply Room | 7 | 56 | 33.9 | 24 | 0.01942991 | 0.00928944 | 683.0208 | 1703.5988 |
| Storage | 4 | 10 | 33.9 | 24 | 0.01942991 | 0.00928944 | 121.9680 | 304.2140 |
| Housekeeping | 2 | 5 | 33.9 | 24 | 0.01942991 | 0.00928944 | 60.9840 | 152.1070 |
| Neonatal Intensive Care | 7 | 56 | 33.9 | 24 | 0.01942991 | 0.00928944 | 683.0208 | 1703.598 |
| Breastfeeding | 3 | 7.5 | 33.9 | 24 | 0.01942991 | 0.00928944 | 91.4760 | 228.1605 |

# TOTAL 3604.1544 W 8989.5262 W

60

22.5°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | 5 | 65 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 912.9120 | 2134.4063 |
| Male Ward 2 | 5 | 65 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 912.9120 | 2134.4063 |
| Dialysis - RE | 1 | 8 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 112.3584 | 262.6962 |
| Dialysis | 5 | 40 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 561.7920 | 1313.4808 |
| Dialysis - ROS | 6 | 48 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 674.1504 | 1576.1770 |
| Female Ward 1 | 5 | 65 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 912.9120 | 2134.4063 |
| Female Ward 2 | 5 | 65 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 912.9120 | 2134.4063 |
| Isolation Ward | 5 | 65 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 912.9120 | 2134.4063 |
| Treatment and Medication Area | 5 | 12.5 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 175.5600 | 410.4628 |
| Medicine | 2 | 5 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 70.2240 | 164.1851 |
| OB - Gyne | 2 | 5 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 70.2240 | 164.1851 |
| Surgery / Anesthesia | 2 | 5 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 70.2240 | 164.1851 |
| Department Head Office | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| Doctor's Conference | 5 | 12.5 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 175.5600 | 410.4628 |
| Hallway (inside) (inside) | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |
| Recovery Room | 5 | 40 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 561.7920 | 1313.4808 |
| Labor Room | 5 | 40 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 561.7920 | 1313.4808 |
| Nurse Station 3 | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 140.4480 | 328.3702 |

# TOTAL 8019.5808 W 18749.9388 W

22°C

61

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Delivery Room | 5 | 40 | 33.9 | 22 | 0.01942991 | 0.006555714 | 586.4320 | 1544.9036 |
| Nurse Station / ICU | 4 | 10 | 33.9 | 22 | 0.01942991 | 0.006555714 | 146.6080 | 386.2259 |
| Intensive Care Unit | 3 | 24 | 33.9 | 22 | 0.01942991 | 0.006555714 | 351.8592 | 926.9421 |
| Operating Room 1 | 5 | 75 | 33.9 | 22 | 0.01942991 | 0.006555714 | 1099.5600 | 2896.6942 |
| Operating Room 2 | 5 | 75 | 33.9 | 22 | 0.01942991 | 0.006555714 | 1099.5600 | 2896.6942 |
| SSA | 2 | 5 | 33.9 | 22 | 0.01942991 | 0.006555714 | 73.3040 | 193.1129 |

# TOTAL 3357.3232 W 8844.5729 W

* + 1. **INTERNAL LOADS**
  1. **Lighting Load**

**Table 21**

Summary of Heat Load Calculation for Lighting Load of the Second Floor for 24°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **W** | **Fu** | **Fsa** | **CLF** | **Q (W)** |

24°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pediatric Ward | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |
| Pediatrician | 36 | 1.2 | 0.75 | 0.94 | 30.4560 |
| Central Sterilizing and Supply Room | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |
| 36 | 1.2 | 0.75 | 0.94 | 30.4560 |
| Storage | 84 | 1.2 | 0.5 | 0.94 | 47.3760 |
| 20 | 1.2 | 0.5 | 0.94 | 11.2800 |
| Housekeeping | 84 | 1.2 | 0.5 | 0.94 | 47.3760 |
| Neonatal Intensive Care | 456 | 1.2 | 0.75 | 0.94 | 385.7760 |

62

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Breastfeeding | 84 | 1.2 | 0.75 | 0.94 | 71.0640 |
| 20 | 1.2 | 0.75 | 0.94 | 16.9200 |
| Babies | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Premature | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |

# TOTAL 985.8720 W

22.5°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Male Ward 1 | 120 | 1.2 | 0.75 | 0.94 | 101.5200 |
| Male Ward 2 | 120 | 1.2 | 0.75 | 0.94 | 101.5200 |
| Dialysis - RE | 20 | 1.2 | 0.75 | 0.94 | 16.9200 |
| Dialysis | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |
| Dialysis - ROS | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |
| Female Ward 1 | 120 | 1.2 | 0.75 | 0.94 | 101.5200 |
| Female Ward 2 | 120 | 1.2 | 0.75 | 0.94 | 101.5200 |
| Isolation Ward | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |
| Treatment and Medication Area | 84 | 1.2 | 0.75 | 0.94 | 71.0640 |
| Medicine | 36 | 1.2 | 0.75 | 0.94 | 30.4560 |
| OB - Gyne | 36 | 1.2 | 0.75 | 0.94 | 30.4560 |
| Surgery / Anesthesia | 36 | 1.2 | 0.75 | 0.94 | 30.4560 |
| Department Head Office | 168 | 1.2 | 0.75 | 0.94 | 142.1280 |
| 20 | 1.2 | 0.75 | 0.94 | 16.9200 |
| Doctor's Conference | 84 | 1.2 | 0.5 | 0.94 | 47.3760 |
| Doctor's Conference | 20 | 1.2 | 0.5 | 0.94 | 11.2800 |

63

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Hallway (inside) (inside) | 84 | 1.2 | 1 | 0.94 | 94.7520 |
| Recovery Room | 456 | 1.2 | 0.75 | 0.94 | 385.7760 |
| Labor Room | 84 | 1.2 | 1 | 0.94 | 94.7520 |
| Hallway (inside) | 156 | 1.2 | 1 | 0.94 | 175.9680 |
| Nurse Station 3 | 144 | 1.2 | 1 | 0.94 | 162.432 |

# TOTAL 2112.7440 W

22°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Delivery Room | 456 | 1.2 | 1 | 0.94 | 514.3680 |
| Nurse Station / ICU | 228 | 1.2 | 1 | 0.94 | 257.1840 |
| Intensive Care Unit | 456 | 1.2 | 0.75 | 0.94 | 385.7760 |
| Operating Room 1 | 456 | 1.2 | 1 | 0.94 | 514.3680 |
| Operating Room 2 | 456 | 1.2 | 1 | 0.94 | 514.3680 |
| SSA | 84 | 1.2 | 0.75 | 0.94 | 71.0640 |

# TOTAL 2257.1280 W

* 1. **Occupant Load**

**Table 22**

Summary of Heat Load Calculation for Occupant Load of the Second Floor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **N** | **Fu** | **Fsa** | **CLF** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pediatric Ward | 12 | 70 | 45 | 0.96 | 806.40 | 540.00 |

64

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pediatrician | 2 | 70 | 45 | 0.96 | 134.40 | 90.00 |
| Central Sterilizing and Supply Room | 7 | 75 | 55 | 0.96 | 504.00 | 385.00 |
| Storage | 4 | 75 | 70 | 0.96 | 288.00 | 280.00 |
| Housekeeping | 2 | 70 | 45 | 0.96 | 134.40 | 90.00 |
| Neonatal Intensive Care | 7 | 70 | 45 | 0.96 | 470.40 | 315.00 |
| Breastfeeding | 3 | 70 | 45 | 0.96 | 201.60 | 135.00 |
| Babies | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Premature | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |

# TOTAL 3211.2000 W 2285.0000 W

22.5°C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Male Ward 2 | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Dialysis - RE | 1 | 70 | 45 | 0.96 | 67.20 | 45.00 |
| Dialysis | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Dialysis - ROS | 6 | 70 | 45 | 0.96 | 403.20 | 270.00 |
| Female Ward 1 | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Female Ward 2 | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Isolation Ward | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Treatment and Medication Area | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Medicine | 2 | 70 | 45 | 0.96 | 134.40 | 90.00 |
| Surgery / Anesthesia | 2 | 70 | 45 | 0.96 | 134.40 | 90.00 |
| Department Head Office | 4 | 70 | 45 | 0.96 | 268.80 | 180.00 |

65

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Doctor's Conference | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Hallway (inside) (inside) | 4 | 75 | 55 | 0.96 | 288.00 | 220.00 |
| Recovery Room | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Labor Room | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Hallway (inside) | 0 | 75 | 55 | 0.96 | 0.00 | 0.00 |
| Nurse Station 3 | 4 | 75 | 55 | 0.96 | 288.00 | 220.00 |

# TOTAL 5078.4000 W 3455.0000 W

22°C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Delivery Room | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Nurse Station / ICU | 4 | 75 | 55 | 0.96 | 288.00 | 220.00 |
| Intensive Care Unit | 3 | 70 | 45 | 0.96 | 201.60 | 135.00 |
| Operating Room 1 | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| Operating Room 2 | 5 | 70 | 45 | 0.96 | 336.00 | 225.00 |
| SSA | 2 | 75 | 55 | 0.96 | 144.00 | 110.00 |

# TOTAL 1641.6000 W 1140.0000 W

* 1. **Partition Load**

**Table 23**

Summary of Heat Load Calculation for Partition Load of the Second Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **U** | **A** | **ti** | **to** | **Q (W)** |

24°C

66

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wall | Pediatric Ward | CR | 2.5667 | 1.92 | 24 | 28 | 24.6403 |
| Central Sterilizing and Supply Room | Hallway | 2.5667 | 22.32 | 24 | 28 | 286.4437 |
| Storage | CR | 2.5667 | 6.6 | 24 | 28 | 84.7011 |
| Hallway | 2.5667 | 10.32 | 24 | 28 | 132.4417 |
| Neonatal CU | CR | 2.5667 | 7.5 | 24 | 28 | 96.2513 |
| Hallway | 2.5667 | 3.3 | 24 | 28 | 42.3506 |
| Housekeeping | Hallway | 2.5667 | 7.32 | 24 | 28 | 93.9412 |
| Breastfeeding Area | Hallway | 2.5667 | 13.32 | 24 | 28 | 170.9422 |
| Pediatric Ward | Hallway | 2.5667 | 18.345 | 24 | 28 | 235.4306 |
| CR | 2.5667 | 6 | 24 | 28 | 77.0010 |
| Pedia | CR | 2.5667 | 6 | 24 | 28 | 77.0010 |
| CSSR | Balcony | 2.5667 | 21 | 24 | 28 | 269.5035 |
| Storage | CR | 2.5667 | 3.42 | 24 | 28 | 43.8906 |
| Housekeeping | Stairs | 2.5667 | 15 | 24 | 28 | 192.5025 |
| Neonatal CU | CR | 2.5667 | 3.345 | 24 | 28 | 42.9281 |
| Hallway | 2.5667 | 15 | 24 | 28 | 192.5025 |
| Door | Pediatric Ward | CR | 1.6048 | 1.68 | 24 | 28 | 10.7843 |
| Storage | Hallway | 1.6048 | 1.68 | 24 | 28 | 10.7843 |
| Housekeeping | Hallway | 1.6048 | 1.68 | 24 | 28 | 10.7843 |
| Breastfeeding Area | Hallway | 1.6493 | 1.68 | 24 | 28 | 11.0833 |
| Neonatal CU | Hallway | 2.3576 | 4.2 | 24 | 28 | 39.6077 |
| CR | 1.6048 | 1.68 | 24 | 28 | 10.7843 |

67

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Storage | CR | 1.6048 | 1.68 | 24 | 28 | 10.7843 |
| Pediatric Ward | Hallway | 2.3576 | 2.73 | 24 | 28 | 25.7450 |
| Central Sterilizing and  Supply Room | Hallway | 2.3576 | 1.68 | 24 | 28 | 15.8431 |

# TOTAL 2208.6721 W

22.5°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wall | Male Ward 1 | CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| Male Ward 2 | CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| Hallway | 2.5667 | 14.25 | 22.5 | 28 | 201.1651 |
| Female Ward 1 | CR | 2.5667 | 12.15 | 22.5 | 28 | 171.5197 |
| CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| Female Ward 2 | CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| Isolation Ward | CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| Hallway | 2.5667 | 18.75 | 22.5 | 28 | 264.6909 |
| Treatment and Medication Area | Hallway | 2.5667 | 14.25 | 22.5 | 28 | 201.1651 |
| CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| Medical Section | CR | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Hallway | 2.5667 | 7.875 | 22.5 | 28 | 111.1702 |
| Dialysis | Hallway | 2.5667 | 24.4875 | 22.5 | 28 | 345.6864 |
| CR | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Department Head's Office | CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| Hallway | 2.5667 | 16.5 | 22.5 | 28 | 232.9280 |

68

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | OB - Gyne | Hallway | 2.5667 | 10.5 | 22.5 | 28 | 148.2269 |
| Doctor's Conference | CR | 2.5667 | 8.25 | 22.5 | 28 | 116.4640 |
| Hallway | 2.5667 | 12.9 | 22.5 | 28 | 182.1074 |
| Nurse Station (inside ICU) | Hallway | 2.5667 | 15.3375 | 22.5 | 28 | 216.5172 |
| DRSG | 2.5667 | 18.75 | 22.5 | 28 | 264.6909 |
| Hallway (inside) | Hallway | 2.5667 | 6 | 22.5 | 28 | 84.7011 |
| Nurse Station (inside) | CR | 2.5667 | 16.65 | 22.5 | 28 | 235.0456 |
| Male Ward 1 | Hallway | 2.5667 | 13.4625 | 22.5 | 28 | 190.0481 |
| CR | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Male Ward 2 | Hallway | 2.5667 | 13.4625 | 22.5 | 28 | 190.0481 |
| CR | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Female Ward 1 | Hallway | 2.5667 | 16.4625 | 22.5 | 28 | 232.3986 |
| CR | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Female Ward 2 | Hallway | 2.5667 | 16.4625 | 22.5 | 28 | 232.3986 |
| Hallway | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Door | Treatment and Medication Area | Hallway | 2.5667 | 4.0875 | 22.5 | 28 | 57.7026 |
| CR | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Isolation Ward | Hallway | 2.5667 | 19.0875 | 22.5 | 28 | 269.4554 |
| CR | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Treatment and Medication Area | CR | 2.5667 | 4.5 | 22.5 | 28 | 63.5258 |
| Medical Record Section | Nurse Station/Hallway | 2.5667 | 14.25 | 22.5 | 28 | 201.1651 |
| CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Stairs | 2.5667 | 18.75 | 22.5 | 28 | 264.6909 |
| Dialysis | CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| CR | 2.5667 | 2.4 | 22.5 | 28 | 33.8804 |
| Dialysis - ROS | Balcony | 2.5667 | 14.25 | 22.5 | 28 | 201.1651 |
| Dialysis - RE | Balcony | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| OB - Gyne | CR | 2.5667 | 7.5 | 22.5 | 28 | 105.8764 |
| Doctor's Conference | CR | 2.5667 | 4.275 | 22.5 | 28 | 60.3495 |
| Nurse Station | 2.5667 | 12.375 | 22.5 | 28 | 174.6960 |
| DRSG | 2.5667 | 6.375 | 22.5 | 28 | 89.9949 |
| Hallway (inside) | CR | 2.5667 | 20.775 | 22.5 | 28 | 293.2776 |
| Male Ward 1 | CR | 1.6493 | 1.68 | 22.5 | 28 | 15.2395 |
| Male Ward 2 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Female Ward 1 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Female Ward 2 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Isolation Ward | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Treatment and Medication Area | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Medical Section | Hallway | 1.6048 | 4.2 | 22.5 | 28 | 37.0709 |
| Dialysis | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Dialysis | Hallway | 2.3576 | 1.68 | 22.5 | 28 | 21.7842 |
| Department Head's Office | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Hallway | 2.3576 | 4.2 | 22.5 | 28 | 54.4606 |
| Doctor's Conference | Hallway | 2.3576 | 1.68 | 22.5 | 28 | 21.7842 |
| Nurse Station (inside) | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Hallway (inside) | Hallway | 1.5625 | 4.2 | 22.5 | 28 | 36.0938 |
| Nurse Station (inside) | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Male Ward 1 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Male Ward 2 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Female Ward 1 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Female Ward 2 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Treatment and  Medication Area | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Isolation Ward | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Dialysis | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Doctor's Conference | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Hallway (inside) | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |

# TOTAL 7390.8403 W

22°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wall | ICU | CR | 2.5667 | 6.6 | 22 | 28 | 127.0517 |
| ICU | Hallway | 2.5667 | 9 | 22 | 28 | 173.2523 |
| SSA | Hallway (inside)(inside) | 2.5667 | 9 | 22 | 22.5 | 14.4377 |
| Operating Room 2 | Recovery Room | 2.5667 | 15 | 22 | 22.5 | 24.0628 |
| ICU | DRSG | 2.5667 | 3.42 | 22 | 22.5 | 5.4863 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | ICU | CR | 2.5667 | 3.12 | 22 | 28 | 60.0608 |
| ICU | Hallway | 2.5667 | 15 | 22 | 28 | 288.7538 |
| ICU | Neonatal CU | 2.5667 | 24 | 22 | 24 | 154.0020 |
| Door | Operating Room 1 | Hallway (inside) (inside) | 2.5667 | 7.8 | 22 | 22.5 | 12.5127 |
| Operating Room 2 | Hallway (inside) (inside) | 2.5667 | 7.8 | 22 | 22.5 | 12.5127 |
| ICU | DRSG | 1.6048 | 1.68 | 22 | 28 | 16.1764 |
| ICU | CR | 1.6048 | 1.68 | 22 | 28 | 16.1764 |
| Operating Room 1 | Hallway (inside) (inside) | 1.5625 | 4.2 | 22 | 24 | 13.1250 |
| Operating Room 2 | Hallway (inside) (inside) | 1.5625 | 4.2 | 22 | 24 | 13.1250 |

# TOTAL 930.7353 W

**Table 24**

Summary of Heat Load Calculation for Partition Ceiling of the Second Floor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **U** | **A** | **dT** | **Q (W)** |
| Ceiling | Pediatric Ward | SP Room 6 / 5 | 40 | 50 | 1.5 | 0.892857 |
| Pediatrician | Library and Board of Directors | 9 | 11.25 | 1.5 | 0.892857 |
| CSSR | Sp Room 7 | 28 | 35 | 1.5 | 0.892857 |
| Storage | P Room 16 | 21.25 | 26.5625 | 1.5 | 0.892857 |
| ICU | P Room 1 / 2 | 40 | 50 | 0.5 | 0.892857 |
| ICU | Hallway | 24 | 30 | 6 | 0.892857 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Neonatal ICU | Treatment Room / P Room 3,4,5 | 20 | 25 | 1.5 | 0.892857 |
| Breastfeeding | P Room 6 | 25 | 31.25 | 1.5 | 0.892857 |
| Delivery Room | P Room 7,8,9 | 35 | 43.75 | 0.5 | 0.892857 |
| OR 1 | P Room 9, 10 | 40 | 50 | 0.5 | 0.892857 |
| OR 2 | P Room 11, 12 | 40 | 50 | 0.5 | 0.892857 |

# TOTAL 1060.68638 W

* 1. **Miscellaneous Load**

**Table 25**

Summary of Heat Load Calculation for Miscellaneous Load of the Second Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Equipment** | **W** | **Cs** | **Cl** | **CLF** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Pediatric Ward | SMOKE DETECTOR, 0.8W CEILING ORBITAL FAN, 50W | 50.8 | 0.33 | 0.16 | 0.96 | 16.09344 | 8.1280 |
| Pediatrician | TELEPHONE, 15W SMOKE DETECTOR, 0.4W | 15.4 | 0.33 | 0.16 | 0.96 | 4.87872 | 2.4640 |
| Central Sterilizing and Supply Room | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.8W  AUTOCLAVE, 1400W FRIDGE 200W | 1740.8 | 0.33 | 0.16 | 0.96 | 551.48544 | 278.5280 |
| Storage | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Housekeeping | TELEPHONE, 15W TV, 125 W  CEILING ORBITAL FAN, 25W | 165 | 0.33 | 0.16 | 0.96 | 52.272 | 26.4000 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Neonatal Intensive Care | INCUBATOR, 150W VENTILATOR, 40W PHOTOTHERAPY, 100W SMOKE DETECTOR, 1.2W TV, 125W - TELEPHONE, 15W | 431.2 | 0.33 | 0.16 | 0.96 | 136.60416 | 68.9920 |
| Breastfeeding | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Babies | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Premature | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |

# TOTAL 761.8406 W 384.7680 W

22.5°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.04672 | 4.0640 |
| Male Ward 2 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.04672 | 4.0640 |
| Dialysis - RE | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Dialysis | TV, 125W TELEPHONE, 15W  SMOKE DETECTOR, 0.4W | 140.4 | 0.33 | 0.16 | 0.96 | 44.47872 | 22.4640 |
| Female Ward 1 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 50W | 50.4 | 0.33 | 0.16 | 0.96 | 15.96672 | 8.0640 |
| Female Ward 2 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 50W | 50.4 | 0.33 | 0.16 | 0.96 | 15.96672 | 8.0640 |
| Isolation Ward | SMOKE DETECTOR, 0.8W CEILING ORBITAL FAN, 50W | 50.8 | 0.33 | 0.16 | 0.96 | 16.09344 | 8.1280 |
| Treatment and Medication Area | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Medicine | TELEPHONE, 15W SMOKE DETECTOR, 0.4W | 15.4 | 0.33 | 0.16 | 0.96 | 4.87872 | 2.4640 |
| OB - Gyne | TELEPHONE, 15W SMOKE DETECTOR, 0.4W | 15.4 | 0.33 | 0.16 | 0.96 | 4.87872 | 2.4640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Surgery / Anesthesia | TELEPHONE, 15W SMOKE DETECTOR, 0.4W | 15.4 | 0.33 | 0.16 | 0.96 | 4.87872 | 2.4640 |
| Department Head Office | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.8W COMPUTER, 80W  WATER DISPENSER 600W | 820.8 | 0.33 | 0.16 | 0.96 | 260.02944 | 131.3280 |
| Doctor's Conference | TELEPHONE, 15W TV, 125 W COMPUTER, 80W  WATER DISPENSER 600W | 820 | 0.33 | 0.16 | 0.96 | 259.776 | 131.2000 |
| Hallway (inside) (inside) | SMOKE DETECTOR, 0.4W SPEAKER, 2W | 2.4 | 0.33 | 0.16 | 0.96 | 0.76032 | 0.3840 |
| Recovery Room | SMOKE DETECTOR, 0.8W | 0.8 | 0.33 | 0.16 | 0.96 | 0.25344 | 0.1280 |
| Labor Room | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |
| Hallway (inside) | SMOKE DETECTOR, 0.8W SPEAKER, 4W  FIRE ALARM, 1W | 5.8 | 0.33 | 0.16 | 0.96 | 1.83744 | 0.9280 |
| **TOTAL 646.3987 W 326.4640 W** | | | | | | | |

22°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Delivery Room | SMOKE DETECTOR, 0.8W | 0.8 | 0.33 | 0.16 | 0.96 | 0.25344 | 0.1280 |
| Intensive Care Unit | TELEPHONE, 15W TV, 125 W  VENTILATOR ICU, 300W  ELECTROCARDIOGRAM, 150 W SMOKE DETECTOR, 1.6W | 1091.6 | 0.33 | 0.16 | 0.96 | 345.81888 | 174.6560 |
| Operating Room 1 | SMOKE DETECTOR, 0.4W CARDIOPULMONARY BYPASS MACHINE, 150 W  SURGICAL LGHTS, 25W AUTOCLAVE, 1400W | 1575.4 | 0.33 | 0.16 | 0.96 | 499.08672 | 252.0640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Room 2 | SMOKE DETECTOR, 0.4W CARDIOPULMONARY BYPASS MACHINE, 150 W  SURGICAL LGHTS, 25W AUTOCLAVE, 1400W | 1575.4 | 0.33 | 0.16 | 0.96 | 499.08672 | 252.0640 |
| SSA | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.12672 | 0.0640 |

# TOTAL 1344.3725 W 678.9760 W

**Table 26**

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Summary of Heat Load Calculation for Second Floor for 24°C

|  |  |  |  |
| --- | --- | --- | --- |
| **HEAT SOURCES** | | **QS (W)** | **QL (W)** |
| External Loads | External Wall | 6621.3683 |  |
| Glass Load | 11480.9064 |  |
| Infiltration Load | | 494.5891 | 1233.6101 |
| Ventilation Load | | 3604.1544 | 8989.5262 |
| Internal Loads | Lighting Load | 985.8720 |  |
| Occupant Load | 3211.2 | 2285 |
| Partition Load | 3269.3585 |  |
| Miscellaneous  Load | 761.8406 | 384.7680 |
| **TOTAL** | | **30429.2893** | **12892.9043** |
| **OVERALL TOTAL** | | **43322.193.67 W** | |

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# Table 27

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Summary of Heat Load Calculation for Second Floor for 22.5°C

|  |  |  |  |
| --- | --- | --- | --- |
| **HEAT SOURCES** | | **QS (W)** | **QL (W)** |
| External Loads | External Wall | 16676.2476 |  |
| Glass Load | 19604.3783 |  |
| Infiltration Load | | 1346.4627 | 3148.0564 |
| Ventilation Load | | 8019.5808 | 18749.9388 |
| Internal Loads | Lighting Load | 2112.7440 |  |
| Occupant Load | 5078.4000 | 6355 |
| Partition Load | 8451.5267 |  |
| Miscellaneous  Load | 646.3987 | 326.464 |
| **TOTAL** | | **61935.7388** | **25679.4592** |
| **OVERALL TOTAL** | | **87315.1980 W** | |

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# Table 28

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Summary of Heat Load Calculation for Second Floor for 22°C

|  |  |  |  |
| --- | --- | --- | --- |
| **HEAT SOURCES** | | **QS (W)** | **QL (W)** |
| External Loads | External Wall | 9225.9406 |  |
| Glass Load | 9665.5000 |  |
| Infiltration Load | | 630.3688 | 1660.6512 |
| Ventilation Load | | 3357.3232 | 8844.5729 |
| Internal Loads | Lighting Load | 2257.1280 |  |
| Occupant Load | 1641.6000 | 1140.0000 |
| Partition Load | 1991.4217 |  |
| Miscellaneous  Load | 1344.3725 | 678.9760 |
| **TOTAL** | | **30114.6548** | **12324.2002** |
| **OVERALL TOTAL** | | **42438.8550 W** | |

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# A COMPLETE SUMMARY OF HEAT LOAD CALCULATION IN TABULAR FORM FOR THIRD FLOOR:

* + 1. **EXTERNAL LOADS**
       1. **External Wall**

**Table 29**

Summary of Heat Load Calculation for External Wall of the Third Floor

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Orientation** | **U** | **A (m2)** | **CLTDsel** | **LM** | **k** | **ti** | **tave** | **CLTDadj** | **Q (W)** |
| 24°C | | | | | | | | | | |
| Housekeeping | S | 2.714 | 7.08 | 22 | -3.88 | 0.65 | 24 | 30.65 | 14.428 | 277.2357514 |
| **TOTAL 277.2358 W** | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 22.5°C | | | | | | | | | | |
| Male Ward 1 | E | 2.714 | 16.29 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 819.7835801 |
| Male Ward 2 | E | 2.714 | 14.37 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 723.1608377 |
| Male Ward 2 | S | 2.714 | 10.98 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 429.9503602 |
| Isolation Ward | W | 2.714 | 16.32 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 1051.614206 |
| Isolation Ward | S | 2.714 | 6.6 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 258.4401072 |
| Ward | S | 2.714 | 13.2 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 516.8802144 |
| SP Room 1 | E | 2.714 | 7.2 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 362.335284 |
| SP Room 2 | E | 2.714 | 7.2 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 362.335284 |
| SP Room 3 | E | 2.714 | 10.2 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 513.308319 |

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|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SP Room 4 | W | 2.714 | 7.2 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 463.947444 | |
| SP Room 5 | W | 2.714 | 7.2 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 463.947444 | |
| SP Room 7 | W | 2.714 | 4.08 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 262.9035516 | |
| Administration Office | N | 2.714 | 7.68 | 13 | 2.22 | 0.65 | 22.5 | 30.65 | 14.043 | 261.4402714 | |
| Chief of Nurse | N | 2.714 | 7.68 | 13 | 2.22 | 0.65 | 22.5 | 30.65 | 14.043 | 261.4402714 | |
| Director's Office | E | 2.714 | 8.16 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 410.6466552 | |
| Director's Office | S | 2.714 | 10.059 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 393.8862179 | |
| Secretary | E | 2.714 | 4.08 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 205.3233276 | |
| Library and Board of Directors | W | 2.714 | 14.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 912.4299732 | |
| P Room 1 | E | 2.714 | 8.16 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 410.6466552 | |
| P Room 2 | E | 2.714 | 8.16 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 410.6466552 | |
| P Room 3 | W | 2.714 | 8.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 525.8071032 | |
| P Room 4 | W | 2.714 | 8.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 525.8071032 | |
| P Room 5 | W | 2.714 | 5.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 332.4956682 | |
| P Room 7 | E | 2.714 | 8.16 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 410.6466552 | |
| P Room 8 | E | 2.714 | 8.16 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 410.6466552 | |
| P Room 9 | E | 2.714 | 8.16 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 410.6466552 |  |
| P Room 10 | E | 2.714 | 8.16 | 25 | -0.55 | 0.65 | 22.5 | 30.65 | 20.0425 | 410.6466552 |
| P Room 10 | S | 2.714 | 10.2 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 399.4074384 | |
| P Room 11 | S | 2.714 | 10.2 | 22 | -3.88 | 0.65 | 22.5 | 30.65 | 15.928 | 399.4074384 | |
| P Room 11 | W | 2.714 | 8.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 525.8071032 | |
| P Room 12 | W | 2.714 | 8.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 525.8071032 | |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P Room 13 | W | 2.714 | 8.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 525.8071032 |
| P Room 14 | W | 2.714 | 8.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 525.8071032 |
| P Room 15 | N | 2.714 | 7.68 | 13 | 2.22 | 0.65 | 22.5 | 30.65 | 14.043 | 261.4402714 |
| P Room 16 | N | 2.714 | 7.68 | 13 | 2.22 | 0.65 | 22.5 | 30.65 | 14.043 | 261.4402714 |
| Isolation Room | W | 2.714 | 8.16 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 525.8071032 |
| Treatment Room | W | 2.714 | 4.08 | 33 | -0.55 | 0.65 | 22.5 | 30.65 | 25.2425 | 262.9035516 |

# TOTAL 16735.3976 W

* + - 1. **Glass Load**

**Table 30**

Summary of Heat Load Calculation for Glass Load of the Third Floor

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Orientation** | **U** | **to** | **ti** | **A (m2)** | **SGHF** | **SCL** | **SC** | **Qsg (W)** | **Qc (W)** |
| 24°C | | | | | | | | | | |
| Housekeeping | S | 2.8722 | 33.9 | 22.5 | 1.92 | 230 | 0.83 | 0.55 | 54.5948 | 201.5904 |
| **TOTAL 256.1852 W** | | | | | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 22.5°C | | | | | | | | | | |
| Male Ward 1 | E | 2.8722 | 33.9 | 22.5 | 5.76 | 685 | 0.8 | 0.55 | 163.7843 | 1736.0640 |
| Male Ward 2 | E | 2.8722 | 33.9 | 22.5 | 7.68 | 685 | 0.8 | 0.55 | 218.3791 | 2314.7520 |
| Male Ward 2 | S | 2.8211 | 33.9 | 22.5 | 3.84 | 230 | 0.83 | 0.55 | 107.2469 | 403.1808 |
| Isolation Ward | W | 2.8211 | 33.9 | 22.5 | 7.68 | 685 | 0.82 | 0.55 | 214.4939 | 2372.6208 |
| Isolation Ward | S | 2.8211 | 33.9 | 22.5 | 4.8 | 230 | 0.83 | 0.55 | 134.0587 | 503.9760 |
| Ward | S | 2.8722 | 33.9 | 22.5 | 4.8 | 230 | 0.83 | 0.55 | 136.4869 | 503.9760 |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SP Room 1 | E | 2.8722 | 33.9 | 22.5 | 4.8 | 685 | 0.8 | 0.55 | 136.4869 | 1446.7200 |
| SP Room 1 | N | 2.8211 | 33.9 | 22.5 | 15 | 120 | 0.91 | 0.55 | 418.9334 | 900.9000 |
| SP Room 2 | E | 2.8722 | 33.9 | 22.5 | 4.8 | 685 | 0.8 | 0.55 | 136.4869 | 1446.7200 |
| SP Room 3 | E | 2.8722 | 33.9 | 22.5 | 4.8 | 685 | 0.8 | 0.55 | 136.4869 | 1446.7200 |
| SP Room 4 | W | 2.8722 | 33.9 | 22.5 | 4.8 | 685 | 0.82 | 0.55 | 136.4869 | 1482.8880 |
| SP Room 4 | N | 2.8211 | 33.9 | 22.5 | 15 | 120 | 0.91 | 0.55 | 418.9334 | 900.9000 |
| SP Room 5 | W | 2.8722 | 33.9 | 22.5 | 4.8 | 685 | 0.82 | 0.55 | 136.4869 | 1482.8880 |
| SP Room 7 | W | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.82 | 0.55 | 54.5948 | 593.1552 |
| SP Room 7 | N | 2.8211 | 33.9 | 22.5 | 6.4 | 120 | 0.91 | 0.55 | 178.7449 | 384.3840 |
| Administration Office | N | 2.8211 | 33.9 | 22.5 | 4.32 | 120 | 0.91 | 0.55 | 120.6528 | 259.4592 |
| Chief of Nurse | N | 2.8211 | 33.9 | 22.5 | 4.32 | 120 | 0.91 | 0.55 | 120.6528 | 259.4592 |
| Chief Medical Room | N | 2.8211 | 33.9 | 22.5 | 12 | 120 | 0.91 | 0.55 | 335.1467 | 720.7200 |
| Conference and Training Room | N | 2.8211 | 33.9 | 22.5 | 30 | 120 | 0.91 | 0.55 | 837.8667 | 1801.8000 |
| Director's Office | E | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.8 | 0.55 | 109.1896 | 1157.3760 |
| Director's Office | S | 2.8722 | 33.9 | 22.5 | 2.88 | 230 | 0.83 | 0.55 | 81.8922 | 302.3856 |
| Secretary | E | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.8 | 0.55 | 54.5948 | 578.6880 |
| Library and Board of Directors | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| P Room 1 | E | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.8 | 0.55 | 109.1896 | 1157.3760 |
| P Room 1 | N | 2.8211 | 33.9 | 22.5 | 15 | 120 | 0.91 | 0.55 | 418.9334 | 900.9000 |
| P Room 2 | E | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.8 | 0.55 | 109.1896 | 1157.3760 |
| P Room 3 | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| P Room 3 | N | 2.8211 | 33.9 | 22.5 | 15 | 120 | 0.91 | 0.55 | 418.9334 | 900.9000 |

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|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P Room 4 | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| P Room 5 | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| P Room 7 | E | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.8 | 0.55 | 109.1896 | 1157.3760 |
| P Room 8 | E | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.8 | 0.55 | 109.1896 | 1157.3760 |
| P Room 9 | E | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.8 | 0.55 | 109.1896 | 1157.3760 |
| P Room 10 | E | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.8 | 0.55 | 109.1896 | 1157.3760 |
| P Room 10 | S | 2.8211 | 33.9 | 22.5 | 4.8 | 230 | 0.83 | 0.55 | 134.0587 | 503.9760 |
| P Room 11 | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| P Room 11 | S | 2.8211 | 33.9 | 22.5 | 4.8 | 230 | 0.83 | 0.55 | 134.0587 | 503.9760 |
| P Room 12 | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| P Room 13 | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| P Room 14 | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| P Room 15 | N | 2.8211 | 33.9 | 22.5 | 4.32 | 120 | 0.91 | 0.55 | 120.6528 | 259.4592 |
| P Room 16 | N | 2.8211 | 33.9 | 22.5 | 4.32 | 120 | 0.91 | 0.55 | 120.6528 | 259.4592 |
| Isolation Room | W | 2.8722 | 33.9 | 22.5 | 3.84 | 685 | 0.82 | 0.55 | 109.1896 | 1186.3104 |
| Treatment Room | W | 2.8722 | 33.9 | 22.5 | 1.92 | 685 | 0.82 | 0.55 | 54.5948 | 593.1552 |

# TOTAL 51970.4222 W

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* + - 1. **Roof Load**

**Table 31**

Summary of Heat Load Calculation for Roof Load of the Third Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **U** | **A (m2)** | **CLTDsel** | **ti** | **tave** | **CLTDadj** | **Q (W)** |

24°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Housekeeping | 0.9058 | 16 | 30 | 24 | 30.65 | 32.65 | 473.1884058 |

# TOTAL 473.1884 W

22.5°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | 0.9058 | 36.75 | 30 | 22.5 | 30.65 | 34.15 | 1136.786685 |
| Male Ward 2 | 0.9058 | 36.75 | 30 | 22.5 | 30.65 | 34.15 | 1136.786685 |
| Isolation Ward | 0.9058 | 40 | 30 | 22.5 | 30.65 | 34.15 | 1237.318841 |
| Ward | 0.9058 | 27.475 | 30 | 22.5 | 30.65 | 34.15 | 849.8833786 |
| SP Room 1 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| SP Room 2 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| SP Room 3 | 0.9058 | 25 | 30 | 22.5 | 30.65 | 34.15 | 773.3242754 |
| SP Room 4 | 0.9058 | 25 | 30 | 22.5 | 30.65 | 34.15 | 773.3242754 |
| SP Room 5 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| SP Room 6 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| SP Room 7 | 0.9058 | 28 | 30 | 22.5 | 30.65 | 34.15 | 866.1231884 |
| Administration Office | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| Chief of Nurse | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Chief Medical Room | 0.9058 | 28 | 30 | 22.5 | 30.65 | 34.15 | 866.1231884 |
| Conference and Training Room | 0.9058 | 90 | 30 | 22.5 | 30.65 | 34.15 | 2783.967391 |
| Director's Office | 0.9058 | 18.7616 | 30 | 22.5 | 30.65 | 34.15 | 580.3504823 |
| Secretary | 0.9058 | 8.626 | 30 | 22.5 | 30.65 | 34.15 | 266.827808 |
| Library and Board of Directors | 0.9058 | 24.7385 | 30 | 22.5 | 30.65 | 34.15 | 765.2353034 |
| P Room 1 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 2 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 3 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 4 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 5 | 0.9058 | 15 | 30 | 22.5 | 30.65 | 34.15 | 463.9945652 |
| P Room 6 | 0.9058 | 25 | 30 | 22.5 | 30.65 | 34.15 | 773.3242754 |
| P Room 7 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 8 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 9 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 10 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 11 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 12 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 13 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 14 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 15 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| P Room 16 | 0.9058 | 20 | 30 | 22.5 | 30.65 | 34.15 | 618.6594203 |
| Isolation Room | 0.9058 | 25 | 30 | 22.5 | 30.65 | 34.15 | 773.3242754 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment Room | 0.9058 | 10 | 30 | 22.5 | 30.65 | 34.15 | 309.3297101 |

# TOTAL 26729.2127 W

* + 1. **INFILTRATION LOAD**

**Table 32**

Summary of Heat Load Calculation for Infiltration Load of the Third Floor

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **V** | **L/s** | **to** | **ti** | **Wo** | **Wi** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Housekeeping | 48 | 3.464 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 48.6512 | 105.3798 |

# TOTAL 48.6512 W 105.3798 W

22.5°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | 103.05 | 7.436775 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 104.4480 | 244.2015 |
| Male Ward 2 | 103.05 | 7.436775 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 104.4480 | 244.2015 |
| Isolation Ward | 112.8 | 8.1404 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 114.3303 | 267.3065 |
| Ward | 75.225 | 5.4287375 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 76.2455 | 178.2636 |
| SP Room 1 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| SP Room 2 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| SP Room 3 | 67.8 | 4.8929 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 68.7198 | 160.6683 |
| SP Room 4 | 67.8 | 4.8929 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 68.7198 | 160.6683 |
| SP Room 5 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| SP Room 6 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| SP Room 7 | 76.8 | 5.5424 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 77.8419 | 181.9959 |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Administration Office | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| Chief of Nurse | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| Chief Medical Room | 76.8 | 5.5424 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 77.8419 | 181.9959 |
| Conference and Training Room | 234 | 16.887 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 237.1745 | 554.5188 |
| Director's Office | 56.28465 | 4.061875575 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 57.0482 | 133.3799 |
| Secretary | 25.878 | 1.867529 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 26.2291 | 61.3241 |
| Library and Board of Directors | 58.6581 | 4.23315955 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 59.4539 | 139.0043 |
| P Room 1 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 2 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 3 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 4 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 5 | 37.8 | 2.7279 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 38.3128 | 89.5761 |
| P Room 6 | 67.8 | 4.8929 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 68.7198 | 160.6683 |
| P Room 7 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 8 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 9 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 10 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 11 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 12 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 13 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 14 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| P Room 15 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P Room 16 | 52.8 | 3.8104 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 53.5163 | 125.1222 |
| Isolation Room | 67.8 | 4.8929 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 68.7198 | 160.6683 |
| Treatment Room | 30 | 2.165 | 33.9 | 22.5 | 0.01942991 | 0.008484236 | 30.4070 | 71.0921 |

# TOTAL 2348.9865 W 5491.9770 W

* + 1. **VENTILATION LOAD**

**Table 33**

Summary of Heat Load Calculation for Ventilation Load of the Third Floor

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **N** | **L/s** | **to** | **ti** | **Wo** | **Wi** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Housekeeping | 1 | 2.5 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 35.1120 | 76.0535 |

# TOTAL 35.1120 W 76.0535 W

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 22.5°C | | | | | | | | |
| Male Ward 1 | 9 | 117 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 1643.2416 | 3559.3048 |
| Male Ward 2 | 9 | 117 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 1643.2416 | 3559.3048 |
| Isolation Ward | 7 | 91 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 1278.0768 | 2768.3482 |
| Ward | 7 | 91 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 1278.0768 | 2768.3482 |
| SP Room 1 | 4 | 52 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 730.3296 | 1581.9132 |
| SP Room 2 | 4 | 52 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 730.3296 | 1581.9132 |
| SP Room 3 | 4 | 52 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 730.3296 | 1581.9132 |
| SP Room 4 | 4 | 52 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 730.3296 | 1581.9132 |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SP Room 5 | 4 | 52 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 730.3296 | 1581.9132 |
| SP Room 6 | 4 | 52 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 730.3296 | 1581.9132 |
| SP Room 7 | 6 | 78 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 1095.4944 | 2372.8699 |
| Administration Office | 3 | 7.5 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 105.3360 | 228.1606 |
| Chief of Nurse | 3 | 7.5 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 105.3360 | 228.1606 |
| Chief Medical Room | 4 | 10 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 140.4480 | 304.2141 |
| Conference and Training Room | 20 | 50 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 702.2400 | 1521.0704 |
| Director's Office | 3 | 7.5 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 105.3360 | 228.1606 |
| Secretary | 1 | 2.5 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 35.1120 | 76.0535 |
| Library and Board of Directors | 4 | 32 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 449.4336 | 973.4851 |
| P Room 1 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 2 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 3 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 4 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 5 | 2 | 26 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 365.1648 | 790.9566 |
| P Room 6 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 7 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 8 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 9 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 10 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 11 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 12 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P Room 13 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 14 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 15 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| P Room 16 | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| Isolation Room | 3 | 39 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 547.7472 | 1186.4349 |
| Treatment Room | 2 | 26 | 33.9 | 22.5 | 0.01942991 | 0.00928944 | 365.1648 | 790.9566 |

**TOTAL 22457.6352 W 48643.8323 W**

* + 1. **INTERNAL LOADS**
  1. **Lighting Load**

**Table 34**

Summary of Heat Load Calculation for Lighting Load of the Third Floor

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **W** | **Fu** | **Fsa** | **CLF** | **Q (W)** |

24°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Housekeeping | 84 | 1.2 | 0.5 | 0.94 | 47.3760 |

# TOTAL 47.3760 W

22.5°C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Male Ward 1 | 120 | 1.2 | 0.75 | 0.94 | 101.5200 |
| Male Ward 2 | 120 | 1.2 | 0.75 | 0.94 | 101.5200 |
| 0 | 0 | 0 | 0 | 0.0000 |
| Isolation Ward | 156 | 1.2 | 0.75 | 0.94 | 131.9760 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 0 | 0 | 0 | 0.0000 | |
| Ward | 72 | 1.2 | 0.75 | 0.94 | 60.9120 | |
| SP Room 1 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 | |
| 0 | 0 | 0 | 0 | 0.0000 | |
| SP Room 2 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 | |
| SP Room 3 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 | |
| SP Room 4 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 | |
| 0 | 0 | 0 | 0 | 0.0000 | |
| SP Room 5 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 | |
| SP Room 6 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 | |
| SP Room 7 | 120 | 1.2 | 0.75 | 0.94 | 101.5200 | |
| 0 | 0 | 0 | 0 | 0.0000 | |
| Administration Office | 48 | 1.2 | 0.5 | 0.94 | 27.0720 | |
| Chief of Nurse | 48 | 1.2 | 0.5 | 0.94 | 27.0720 | |
| Chief Medical Room | 120 | 1.2 | 0.5 | 0.94 | 67.6800 | |
| Conference and Training Room | 284 | 1.2 | 0.5 | 0.94 | 160.1760 | |
| 10 | 1.2 | 0.5 | 0.94 | 5.6400 | |
| Director's Office | 84 | 1.2 | 0.5 | 0.94 | 47.3760 | |
| 36 | 1.2 | 0.5 | 0.94 | 20.3040 |  |
| Secretary | 96 | 1.2 | 0.5 | 0.94 | 54.1440 |
| Library and Board of Directors | 156 | 1.2 | 0.75 | 0.94 | 131.9760 | |
| 80 | 1.2 | 0.75 | 0.94 | 67.6800 | |
| P Room 1 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 | |

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 0 | 0 | 0 | 0 | 0.0000 |
| P Room 2 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 3 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| 0 | 0 | 0 | 0 | 0.0000 |
| P Room 4 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 5 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 6 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 7 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 8 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 9 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 10 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| 0 | 0 | 0 | 0 | 0.0000 |
| P Room 11 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| 0 | 0 | 0 | 0 | 0.0000 |
| P Room 12 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 13 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 14 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 15 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| P Room 16 | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Isolation Room | 48 | 1.2 | 0.75 | 0.94 | 40.6080 |
| Treatment Room | 84 | 1.2 | 0.75 | 0.94 | 71.0640 |
| **TOTAL 2111.6160 W** | | | | | |

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# Occupant Load

**Table 35**

Summary of Heat Load Calculation for Occupant Load of the Third Floor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **N** | **Fu** | **Fsa** | **CLF** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Housekeeping | 1 | 70 | 45 | 0.96 | 67.2000 | 45.0000 |

# TOTAL 67.2000 W 45.0000 W

22.5°C

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | 9 | 70 | 45 | 0.96 | 604.8000 | 405.0000 |
| Male Ward 2 | 9 | 70 | 45 | 0.96 | 604.8000 | 405.0000 |
| Isolation Ward | 7 | 70 | 45 | 0.96 | 470.4000 | 315.0000 |
| Ward | 7 | 70 | 45 | 0.96 | 470.4000 | 315.0000 |
| SP Room 1 | 4 | 70 | 45 | 0.96 | 268.8000 | 180.0000 |
| SP Room 2 | 4 | 70 | 45 | 0.96 | 268.8000 | 180.0000 |
| SP Room 3 | 4 | 70 | 45 | 0.96 | 268.8000 | 180.0000 |
| SP Room 4 | 4 | 70 | 45 | 0.96 | 268.8000 | 180.0000 |
| SP Room 5 | 4 | 70 | 45 | 0.96 | 268.8000 | 180.0000 |
| SP Room 6 | 4 | 70 | 45 | 0.96 | 268.8000 | 180.0000 |
| SP Room 7 | 6 | 70 | 45 | 0.96 | 403.2000 | 270.0000 |
| Administration Office | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| Chief of Nurse | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| Chief Medical Room | 4 | 70 | 45 | 0.96 | 268.8000 | 180.0000 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Conference and Training Room | 20 | 75 | 70 | 0.96 | 1440.0000 | 1400.0000 |
| Director's Office | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| Director's Office | 0 | 0 | 0 | 0 | 0.0000 | 0.0000 |
| Secretary | 1 | 70 | 45 | 0.96 | 67.2000 | 45.0000 |
| P Room 1 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 2 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 3 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 4 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 5 | 2 | 70 | 45 | 0.96 | 134.4000 | 90.0000 |
| P Room 6 | 3 | 70 | 45 | 0.96 |  | 135.0000 |
| P Room 7 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 8 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 9 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 10 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 11 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 12 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 13 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 14 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 15 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| P Room 16 | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| Isolation Room | 3 | 70 | 45 | 0.96 | 201.6000 | 135.0000 |
| Treatment Room | 2 | 70 | 45 | 0.96 | 134.4000 | 90.0000 |

# TOTAL 10310.4000 W 7340.0000 W

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* 1. **Partition Load**

**Table 36**

Summary of Heat Load Calculation for Partition Load of the Ground Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **U** | **A** | **ti** | **to** | **Q (W)** |

24°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wall | Housekeeping | Hallway | 2.5667 | 7.32 | 24 | 28 | 93.9412 |
| Door | Housekeeping | Hallway | 1.6048 | 1.68 | 24 | 28 | 10.7843 |

# TOTAL 104.7255 W

22.5°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wall | SP Room 1 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| SP Room 2 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| SP Room 3 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Hallway | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| Male Ward 1 | CR | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Male Ward 2 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Isolation Ward | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| SP Room 6 | Hallway | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| SP Room 5 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| SP Room 4 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Administrator Office | CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| Chief of Nurse | CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| Chief Medical Room | CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| Ward | CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 9.69 | 24 | 28 | 99.5238 |
| Conference & Training Room | CR | 2.57 | 4.46 | 24 | 28 | 45.8156 |
| CR | 2.57 | 4.46 | 24 | 28 | 45.8156 |
| Hallway | 2.57 | 27 | 24 | 28 | 277.2036 |
| Secretary | Hallway | 2.57 | 10.9 | 24 | 28 | 112.1520 |
| Library & Board of Directors | Pantry | 2.57 | 10.5 | 24 | 28 | 108.0324 |
| CR | 2.57 | 8.7 | 24 | 28 | 89.3597 |
| Hallway | 2.57 | 19.2 | 24 | 28 | 197.3921 |
| SP Room 7 | CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| P Room 15 | CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 12.9 | 24 | 28 | 132.4417 |
| P Room 16 | CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 12.9 | 24 | 28 | 132.4417 |
| P Room 1 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 2 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Nurse Station | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| P Room 6 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Hallway | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| P Room 7 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 8 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 9 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 10 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 11 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 12 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 13 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 14 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Isolation Room | Hallway | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Treatment Room | Hallway | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| P Room 3 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 4 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 5 | CR | 2.57 | 4.65 | 24 | 28 | 47.7406 |
| SP Room 1 | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| SP Room 2 | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| SP Room 3 | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 16.7 | 24 | 28 | 170.9422 |
| Male Ward 2 | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 16.7 | 24 | 28 | 170.9422 |
| Isolation Ward | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| SP Room 4 | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| SP Room 5 | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| SP Room 6 | Cr | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Administrator Office | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Chief of Nurse | CR | 2.57 | 16.7 | 24 | 28 | 170.9422 |
| Chief Medical Room | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Sink | 2.57 | 10.1 | 24 | 28 | 103.9514 |
| Conference & Training Room | CR | 2.57 | 22.5 | 24 | 28 | 231.0030 |
| Ward | Nurse Station | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Stairs | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| SP Room 7 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| P Room 15 | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| P Room 15 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P Room 16 | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| P Room 16 | CR | 2.57 | 2.4 | 24 | 28 | 24.6403 |
| Nurse Station | 2.57 | 18.8 | 24 | 28 | 192.5025 |
| P Room 1 | Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 2 | Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 6 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 7 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 8 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 9 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 10 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 11 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 12 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 13 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | P Room 14 | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Isolation Room | Hallway | 2.57 | 15.3 | 24 | 28 | 157.4670 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| Treatment Room | Hallway | 2.57 | 4.09 | 24 | 28 | 41.9655 |
| P Room 3 | Hallway | 2.57 | 7.84 | 24 | 28 | 80.4660 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 4 | Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| CR | 2.57 | 7.5 | 24 | 28 | 77.0010 |
| P Room 5 | Hallway | 2.57 | 11.6 | 24 | 28 | 118.9665 |
| CR | 2.57 | 4.5 | 24 | 28 | 46.2006 |
| Door | SP Room 1 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| SP Room 2 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| SP Room 3 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Male Ward 1 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Male Ward 2 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Isolation Ward | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| SP Room 6 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| SP Room 5 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| SP Room 4 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Administrator Office | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Chief of Nurse | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Chief Medical Room | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ward | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Conference & Training Room | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Hallway | 2.3576 | 8.4 | 22.5 | 28 | 108.9211 |
| Secretary | Hallway | 2.3576 | 4.2 | 22.5 | 28 | 54.4606 |
| Library & Board of Directors | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Hallway | 2.3576 | 1.68 | 22.5 | 28 | 21.7842 |
| SP Room 7 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 15 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 16 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 1 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 2 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 6 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 7 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 8 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 9 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 10 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 11 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 12 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 13 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 14 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| Isolation Room | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 3 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| P Room 4 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 | |
| P Room 5 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 | |
| SP Room 1 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| SP Room 2 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| SP Room 3 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| Male Ward 1 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| Male Ward 2 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| Isolation Ward | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| SP Room 4 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| SP Room 5 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| SP Room 6 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| Administrator Office | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 | |
| Chief of Nurse | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 | |
| Chief Medical Room | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 | |
| Ward | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 | |
| SP Room 7 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |  |
| P Room 15 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 16 | CR | 1.6048 | 1.68 | 22.5 | 28 | 14.8284 |
| P Room 1 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| P Room 2 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| P Room 6 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| P Room 7 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |
| P Room 8 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 | |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | P Room 9 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |  |
| P Room 10 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 11 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 12 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 13 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 14 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Isolation Room | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| Treatment Room | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 3 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 4 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |
| P Room 5 | Hallway | 2.3576 | 2.73 | 22.5 | 28 | 35.3994 |

# TOTAL 12897.2403 W

**Table 37**

Summary of Heat Load Calculation for Partition Ceiling Load of the Ground Floor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **U** | **A** | **dT** | **Q (W)** |
| Ceiling | Pediatric Ward | SP Room 6 / 5 | 40 | 50 | 1.5 | 0.892857 |
| Pediatrician | Library and Board of Directors | 9 | 11.25 | 1.5 | 0.892857 |
| CSSR | SP Room 7 | 28 | 35 | 1.5 | 0.892857 |
| Storage | P Room 16 | 21.25 | 26.5625 | 1.5 | 0.892857 |
| ICU | P Room 1 / 2 | 40 | 50 | 0.5 | 0.892857 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Hallway | 24 | 30 | 6 | 0.892857 |
| Neonatal ICU | Treatment Room / P  Room 3,4,5 | 20 | 25 | 1.5 | 0.892857 |
| Breastfeeding | P Room 6 | 25 | 31.25 | 1.5 | 0.892857 |
| Delivery Room | P Room 7,8,9 | 35 | 43.75 | 0.5 | 0.892857 |
| OR 1 | P Room 9, 10 | 40 | 50 | 0.5 | 0.892857 |
| OR 2 | P Room 11, 12 | 40 | 50 | 0.5 | 0.892857 |

# TOTAL 473.1884 W

* 1. **Miscellaneous Load**

**Table 38**

Summary of Heat Load Calculation for Miscellaneous Load of the Third Floor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Equipment** | **W** | **Cs** | **Cl** | **CLF** | **Qs (W)** | **Ql (W)** |

24°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Housekeeping | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.04672 | 4.0640 |

# TOTAL 8.0467 W 4.0640 W

22.5°C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Male Ward 1 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 50W | 50.4 | 0.33 | 0.16 | 0.96 | 15.9667 | 8.0640 |
| Male Ward 2 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 50W | 50.4 | 0.33 | 0.16 | 0.96 | 15.9667 | 8.0640 |
| Isolation Ward | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 50W | 50.4 | 0.33 | 0.16 | 0.96 | 15.9667 | 8.0640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ward | CEILING ORBITAL FAN, 25W | 25 | 0.33 | 0.16 | 0.96 | 7.9200 | 4.0000 |
| SP Room 1 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.0467 | 4.0640 |
| SP Room 2 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.0467 | 4.0640 |
| SP Room 3 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.0467 | 4.0640 |
| SP Room 4 | SMOKE DETECTOR, 0.4W, CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.0467 | 4.0640 |
| SP Room 5 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.0467 | 4.0640 |
| SP Room 6 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 25W | 25.4 | 0.33 | 0.16 | 0.96 | 8.0467 | 4.0640 |
| SP Room 7 | SMOKE DETECTOR, 0.4W CEILING ORBITAL FAN, 50W | 50.4 | 0.33 | 0.16 | 0.96 | 15.9667 | 8.0640 |
| Administration Office | TELEPHONE, 15W SMOKE DETECTOR, 0.4W | 15.4 | 0.33 | 0.16 | 0.96 | 4.8787 | 2.4640 |
| Chief of Nurse | TELEPHONE, 15W SMOKE DETECTOR, 0.4W | 15.4 | 0.33 | 0.16 | 0.96 | 4.8787 | 2.4640 |
| Chief Medical Room | TELEPHONE, 30W SMOKE DETECTOR, 0.4W | 30.4 | 0.33 | 0.16 | 0.96 | 9.6307 | 4.8640 |
| Conference and Training Room | TELEPHONE, 15W TV, 125 W COMPUTER, 80W  WATER DISPENSER 600W FRIDGE, 200W  SMOKE DETECTOR, 1.2W | 1021.2 | 0.33 | 0.16 | 0.96 | 323.5162 | 163.3920 |
| Director's Office | TELEPHONE, 15W TV, 125 W COMPUTER, 80W  SMOKE DETECTOR, 0.4W | 220.4 | 0.33 | 0.16 | 0.96 | 69.8227 | 35.2640 |
| Secretary | TELEPHONE, 15W TV, 125 W | 220.4 | 0.33 | 0.16 | 0.96 | 69.8227 | 35.2640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | COMPUTER, 80W SMOKE DETECTOR, 0.4W |  |  |  |  |  |  |
| Library and Board of Directors | TELEPHONE, 15W TV, 125 W COMPUTER, 80W  SMOKE DETECTOR, 0.4W | 220.4 | 0.33 | 0.16 | 0.96 | 69.8227 | 35.2640 |
| P Room 1 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 2 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 3 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 4 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 5 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 6 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 7 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | WALL FAN, 25W |  |  |  |  |  |  |
| P Room 8 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 9 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 10 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 11 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 12 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 13 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 14 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| P Room 15 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| P Room 16 | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| Isolation Room | TELEPHONE, 15W TV, 125 W  SMOKE DETECTOR, 0.4W WALL FAN, 25W | 165.4 | 0.33 | 0.16 | 0.96 | 52.3987 | 26.4640 |
| Treatment Room | SMOKE DETECTOR, 0.4W | 0.4 | 0.33 | 0.16 | 0.96 | 0.1267 | 0.0640 |

# TOTAL 1563.3446 W 789.5680 W

**Table 39**

Summary of Heat Load Calculation for Third Floor

|  |  |  |  |
| --- | --- | --- | --- |
| **HEAT SOURCES** | | **QS (W)** | **QL (W)** |
| External Loads | External Wall | 277.2358 |  |
| Roof Load | 473.1884 |  |
| Glass Load | 256.1852 |  |
| Infiltration Load | | 48.6512 | 105.3798 |
| Ventilation Load | | 35.1120 | 76.0535 |
| Internal Loads | Lighting Load | 47.3760 |  |
| Occupant Load | 67.2000 | 45.0000 |
| Partition Load | 104.7255 |  |
| Miscellaneous  Load | 8.0467 |  |
| **TOTAL** | | **1317.7207** | **230.4972** |
| **OVERALL TOTAL** | | **1548.2180** | |

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# Table 40

Summary of Heat Load Calculation for Third Floor

|  |  |  |  |
| --- | --- | --- | --- |
| **HEAT SOURCES** | | **QS (W)** | **QL (W)** |
| External Loads | External Wall | 16735.3976 |  |
| Roof Load | 26729.2127 |  |
| Glass Load | 51970.4222 |  |
| Infiltration Load | | 2348.9865 | 5491.9770 |
| Ventilation Load | | 22457.6352 | 48643.8323 |
| Internal Loads | Lighting Load | 4111.6160 |  |
| Occupant Load | 10310.4000 | 7340.0000 |
| Partition Load | 13957.9267 |  |
| Miscellaneous  Load | 1563.3446 | 789.5680 |
| **TOTAL** | | **150184.9417** | **62265.3773** |
| **OVERALL TOTAL** | | **212450.3190 W** | |

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# PSYCHROMETRIC METHOD OF A/C EQUIPMENT SELECTION

The data below shows the values that will be used in Psychrometric Calculation leading to Equipment Selection.

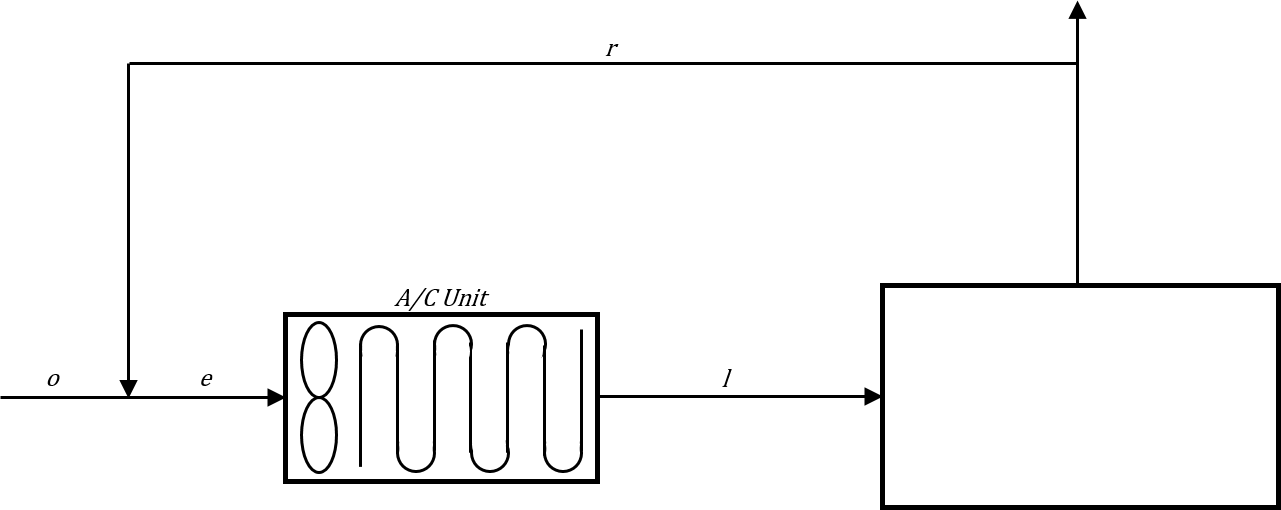
# GROUND FLOOR

*For 24°C, 50% RH:*

Total Sensible Heat load = 31395.0944 W Total Latent Heat Load = 13693.5040 W Total Heat Load = 45088.3703 W

Sensible Heat Ratio, SHR = 0.696301378 ≈ 0.70

# SCHEMATIC DIAGRAM:



**33.9 °CDB & 26.7 °CWB**

**24 °CDB & 50% RH QS = 31395.0944 W QT = 45088.3703 W**

**Figure 6.** Schematic Diagram of Air-conditioning System for Ground Floor, 24°C

# Psychrometric Calculation: GROUND FLOOR:

QS = 31395.0944 W QT = 45088.37032 W

QS

SHF =

QT

31395.0944

=

45088.3703

= 𝟎. 𝟔𝟗𝟔𝟑𝟎𝟏𝟑𝟕𝟖 ≈ 𝟎. 𝟕𝟎

*@* Outdoor Condition: **33.9 CDB** and **26.7 CWB**

hWB = Cpt + ωo(hgDB)

# ho @ 26.7 CWB = 80.777 kJ/kg

111

# hg @ 33.9 CDB = 2567.2 kJ/kg

𝛚o =

80.777 − 1.0062 (36)

2567.2

**ωo = 0.01925366 kgwv/kgda**

𝝎𝐨

= 0.622 Ps

101.325−Ps

= 𝟎. 𝟎𝟏𝟕𝟗𝟖𝟕𝟔𝟗𝟐𝟖𝟐 𝐤𝐠

𝐰𝐯

⁄𝐤𝐠

𝐝𝐚

Ps = 2.750423568 kPa

Then,

𝑣o =

0.287 (36 + 273)

101.325 − 2.750423568 kPa

𝐦𝟑

𝒗𝐨 = 𝟎. 𝟖𝟗𝟔𝟒𝟑𝟗𝟓𝟐𝟐 𝐤𝐠

For return air condition: @ **24CDB**, **50% RH**

0.622 PS

ωR =

PT − PS

ωR =

0.622 (0.5 × 2.982 kPa)

101.325 − (0.5 × 2.982 kPa)

𝛚𝐑 = 𝟎. 𝟎𝟎𝟗𝟐𝟖𝟗𝟒𝟒𝟎𝟒𝟕𝟏 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

hR= Cpt + WR hg @ 24 C

hR = 1.0062 (24 C) + (0.009289440471 kgwv⁄kgda) (2545.5 kJ⁄kg)

𝐡𝐑 = 𝟒𝟕. 𝟕𝟗𝟓𝟎𝟕𝟎𝟕𝟐 𝐤𝐉⁄𝐤𝐠

# Ventilation Load:

L

Q = 269 ×

s

1m3 1000 L

m3

= 0.269

s

m3

0.269

s

mo = m3

0.896439522 kg

112

Then,

𝐦𝐨 = 𝟎. 𝟑𝟎𝟎𝟎𝟕𝟔𝟎𝟏𝟔

𝐤𝐠

𝐬

Qs = meCp∆T

𝑚𝑒 = 𝑚𝑎

kJ

31.3950944 kW = ma (1.0062 kg − K)(33.9 − 24)K

𝐦𝐚 = 𝟑. 𝟏𝟓𝟏𝟔𝟖𝟏𝟐𝟑𝟐

𝒎𝒐 0.300076016 kg/s

𝐤𝐠

𝐬

=

𝒎𝒂

3.151681232 kg/s

𝑥 100%

𝒎𝒐

𝒎𝒂

= 𝟗. 𝟓𝟐𝟏𝟏𝟒𝟏𝟎𝟓𝟏 %

Since, 𝒎𝒐 is less than 10% then, use 10% as the value of 𝒎𝒐.

𝒎𝒂 𝒎𝒂

mo𝛚𝐨 + mR𝛚𝐑 = me𝛚𝐞

(0.10m

) (0.01925366 kgwv) + (0.90m

) ( 0.009289440471 kgwv) = (m

) (𝛚 )

a kgda a

kgda

a 𝐞

𝛚𝐞 = 𝟎. 𝟎𝟏𝟎𝟐𝟖𝟓𝟖𝟔𝟐 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

moho + mRhR = mehe

(0.10ma)(80.777 kJ⁄kg) + (0.90ma)( 47.79507072 kJ⁄kg) = (ma) (he)

𝐡𝐞 = 𝟓𝟏. 𝟒𝟎𝟕𝟐𝟖𝟑𝟔𝟓 𝐤𝐉⁄𝐤𝐠

moto + mRtR = mete

(0.10ma)(33.9 ℃) + (0.90ma)( 24 ℃) = (ma)(te)

𝐭𝐞 = 𝟐𝟒. 𝟗𝟗 ****𝐂

From Psychrometric Chart:

For Capacity of Cooling Coil,

𝐓𝐋 = 𝟏𝟎****𝐂

Capacity = me(he − hL)

Solving for hL:

𝑆𝐻𝐹 =

𝐶𝑝(𝑡𝑅 − 𝑡𝐿) ℎ𝑅 − ℎ𝐿

113

0.696301378 =

1.0062(24 − 10)

47.79507072 − ℎ𝐿

𝒉𝑳 = 𝟐𝟕. 𝟑𝟗𝟕𝟏𝟕𝟕𝟔𝟏 𝐤𝐉⁄𝐤𝐠

Then, substituting,

A⁄ Capacity = 𝟑. 𝟏𝟓𝟏𝟔𝟖𝟏𝟐𝟑𝟐 𝐤𝐠 (𝟓𝟏. 𝟒𝟎𝟕𝟐𝟖𝟑𝟔𝟓 − 𝟐𝟕. 𝟑𝟗𝟕𝟏𝟕𝟕𝟔) 𝐤𝐉⁄𝐤𝐠

𝐶 𝐬

A/C Capacity = 𝟕𝟓. 𝟔𝟕𝟐𝟐𝟎𝟎𝟓𝟔 𝐤𝐖 ∗ 𝟏 𝐓𝐎𝐑

𝟑.𝟓𝟏𝟔𝟕 𝐤𝐖

= 𝟐𝟏. 𝟓𝟏𝟕𝟗𝟓𝟕𝟑𝟒 𝑻𝑶𝑹

# For C.T. Scan, Control Room:

75.67220056 kW x 32 m2 = 16.13264769 kW ( 1 TOR )

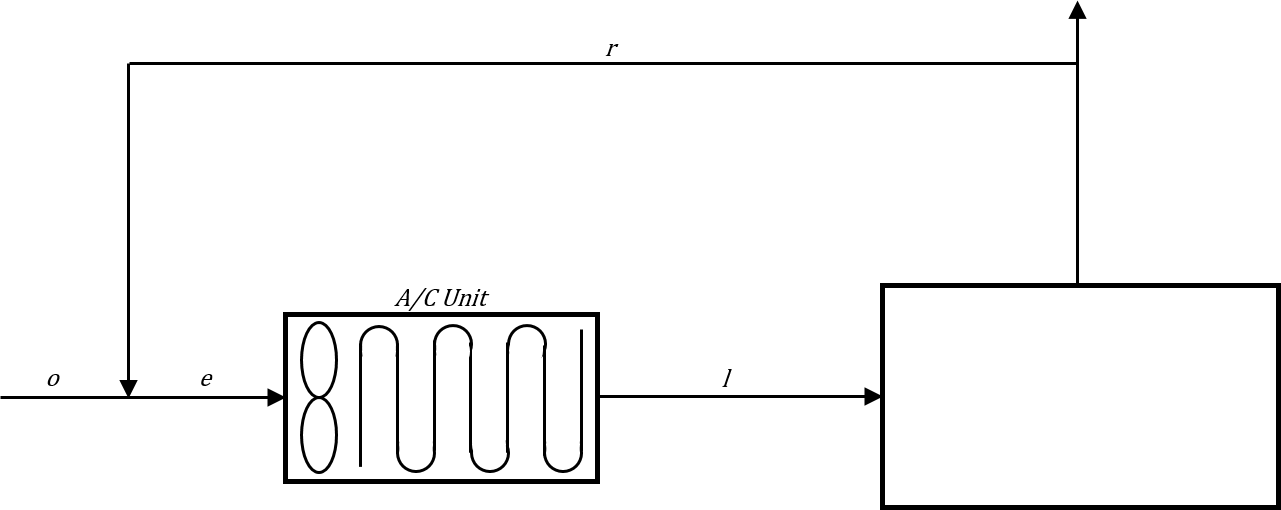
150.05 m2 3.5167 kW

= 𝟐𝟒. 𝟓𝟖𝟕𝟒𝟑𝟗𝟐𝟕𝟐 𝐓𝐎𝐑

*For 22.5°C, 50% RH:*

|  |  |  |
| --- | --- | --- |
| Total Sensible Heat load | = | 67589.7046 W |
| Total Latent Heat Load | = | 30281.17944 W |
| Total Heat Load | = | 97870.8840 W |
| Sensible Heat Ratio, SHR | = | 0.690600736 ≈ 0.69 |

# SCHEMATIC DIAGRAM:



**33.9 °CDB & 26.7 °CWB**

**22.5 °CDB & 50% RH QS = 67589.7046 W QT = 97870.8840 W**

**Figure 7.** Schematic Diagram of Air-conditioning System for Ground Floor, 22.5°C

# Psychrometric Calculation: GROUND FLOOR:

QS = 67589.7046 W QT = 97870.8840 W

114

QS

SHF =

QT

67589.7046

=

97870.8840

= 𝟎. 𝟔𝟗𝟎𝟔𝟎𝟎𝟎𝟕𝟑𝟗 ≈ 𝟎. 𝟔𝟗

*@* Outdoor Condition: **33.9 CDB** and **26.7 CWB**

**ωo = 0.01925366 kgwv/kgda**

𝐦𝟑

𝒗𝐨 = 𝟎. 𝟖𝟗𝟔𝟒𝟑𝟗𝟓𝟐𝟐 𝐤𝐠

For return air condition: @ **22.5CDB**, **50% RH**

0.622 PS

ωR =

PT − PS

ωR =

0.622 (0.5 × 2.982 kPa)

101.325 − (0.5 × 2.982 kPa)

𝛚𝐑 = 𝟎. 𝟎𝟎𝟖𝟒𝟖𝟒𝟐𝟑𝟔 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

hR= Cpt + WR hg @ 24 C

hR = 1.0062 (22.5 C) + (0.009289440471 kgwv⁄kgda) (2545.5 kJ⁄kg)

𝐡𝐑 = 𝟒𝟒. 𝟐𝟏𝟐𝟕𝟗𝟐𝟏𝟖 𝐤𝐉⁄𝐤𝐠

# Ventilation Load:

L

Q = 632 ×

s

1m3 1000 L

m3

= 0.632

s

m3

0.632

s

mo = m3

0.896439522 kg

Then,

𝐦𝐨 = 𝟎. 𝟕𝟎𝟓𝟎𝟏𝟏𝟑𝟎𝟖

𝐤𝐠

𝐬

Qs = meCp∆T

𝑚𝑒 = 𝑚𝑎

kJ

67.5897046 kW = ma (1.0062 kg − K)(33.9 − 22.5)K

𝐦𝐚 = 𝟓. 𝟖𝟗𝟐𝟑𝟖𝟖𝟔𝟒𝟔

𝐤𝐠

𝐬

115

𝒎𝒐

=

𝒎𝒂

0.705011308 kg/s

5.892388646 kg/s

𝑥 100%

𝒎𝒐

𝒎𝒂

= 𝟏𝟏. 𝟗𝟔𝟒𝟕𝟕𝟗𝟒𝟗 %

Since, 𝒎𝒐 is greater than 10% then, use the actual value of 𝒎𝒐.

𝒎𝒂 𝒎𝒂

mo𝛚𝐨 + mR𝛚𝐑 = me𝛚𝐞

kgwv

(0.1196477949m ) (0.01925366 ) + (0.88035221m

) ( 0.008484236 kgwv)

a

= (ma) (𝛚𝐞)

kgda

a kgda

𝛚𝐞 = 𝟎. 𝟎𝟎𝟗𝟕𝟕𝟐𝟕𝟕𝟒 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

moho + mRhR = mehe

(0.1196477949ma)(80.777 kJ⁄kg) + (0.88035221ma)( 44.21279218 kJ⁄kg) = (ma) (he)

𝐡𝐞 = 𝟒𝟖. 𝟗𝟔𝟑𝟑𝟑𝟕𝟎𝟑 𝐤𝐉⁄𝐤𝐠

moto + mRtR = mete

(0.1196477949ma)(33.9 ℃) + (0.88035221ma)( 22.5 ℃) = (ma)(te)

𝐭𝐞 = 𝟐𝟑. 𝟖𝟔𝟑𝟗𝟖𝟒𝟖𝟔 ****𝐂

From Psychrometric Chart:

For Capacity of Cooling Coil,

𝐓𝐋 = 𝟗****𝐂

Capacity = me(he − hL)

Solving for hL:

𝑆𝐻𝐹 =

𝐶𝑝(𝑡𝑅 − 𝑡𝐿) ℎ𝑅 − ℎ𝐿

0.690600736 =

1.0062(22.5 − 9)

47.79507072 − ℎ𝐿

𝒉𝑳 = 𝟐𝟒. 𝟓𝟒𝟑𝟑𝟗𝟓𝟐𝟔 𝐤𝐉⁄𝐤𝐠

Then, substituting,

A⁄ Capacity = 𝟓. 𝟖𝟗𝟐𝟑𝟖𝟖𝟔𝟒𝟔 𝐤𝐠 (𝟒𝟖. 𝟗𝟔𝟑𝟑𝟑𝟕𝟎𝟑 − 𝟐𝟒. 𝟓𝟒𝟑𝟑𝟗𝟓𝟐𝟔) 𝐤𝐉⁄𝐤𝐠

𝐶 𝐬

A/C Capacity = 𝟏𝟒𝟑. 𝟖𝟗𝟏𝟕𝟖𝟕𝟔 𝐤𝐖 ∗ 𝟏 𝐓𝐎𝐑

𝟑.𝟓𝟏𝟔𝟕 𝐤𝐖

= 𝟒𝟎. 𝟗𝟏𝟔𝟕𝟎𝟖𝟏𝟔 𝑻𝑶𝑹

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# For Laboratory:

143.8917876 kW x 40 m2 = 8.736599124 kW ( 1 TOR )

658.8 m2 3.5167 kW

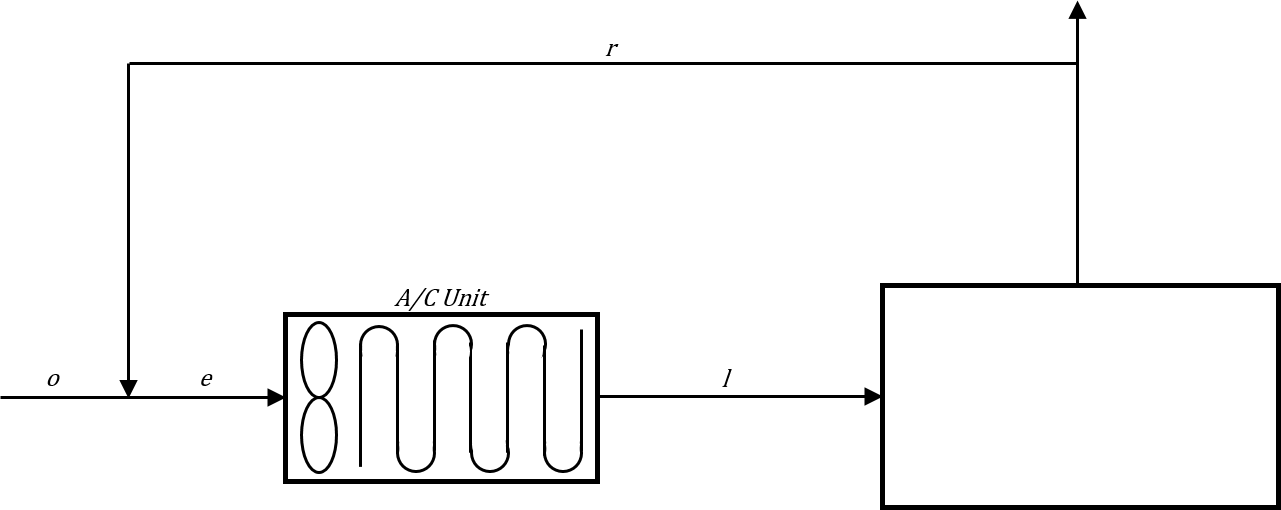
= 𝟐. 𝟒𝟖𝟒𝟑𝟏𝟕𝟒𝟑𝟓 𝐓𝐎𝐑

*For 22°C, 40% RH:*

Total Sensible Heat load = 23611.6125 W Total Latent Heat Load = 9521.6528 W Total Heat Load = 33133.2652 W

Sensible Heat Ratio, SHR = 0.712625584 ≈ 0.71

# SCHEMATIC DIAGRAM:



**33.9 °CDB & 26.7 °CWB**

**22°CDB & 40% RH QS = 23611.6125 W QT = 33133.2652 W**

**Figure 8.** Schematic Diagram of Air-conditioning System for Ground Floor, 22°C

# Psychrometric Calculation: GROUND FLOOR:

QS = 23611.6125 W QT = 33133.2652 W

QS

SHF =

QT

23611.6125

=

33133.2652

= 𝟎. 𝟕𝟏𝟐𝟔𝟐𝟓𝟓𝟖𝟒 ≈ 𝟎. 𝟕𝟏

*@* Outdoor Condition: **33.9 CDB** and **26.7 CWB**

**ωo = 0.01925366 kgwv/kgda**

𝐦𝟑

𝒗𝐨 = 𝟎. 𝟖𝟗𝟔𝟒𝟑𝟗𝟓𝟐𝟐 𝐤𝐠

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For return air condition: @ **22CDB**, **40% RH**

0.622 PS

ωR =

PT − PS

ωR =

0.622 (0.5 × 2.982 kPa)

101.325 − (0.5 × 2.982 kPa)

𝛚𝐑 = 𝟎. 𝟎𝟎𝟔𝟓𝟓𝟓𝟕𝟏𝟒 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

hR= Cpt + WR hg @ 24C

hR = 1.0062 (22.5 C) + (0.009289440471 kgwv⁄kgda) (2545.5 kJ⁄kg)

𝐡𝐑 = 𝟑𝟖. 𝟕𝟗𝟗𝟕𝟏𝟐𝟕𝟕 𝐤𝐉⁄𝐤𝐠

# Ventilation Load:

L

Q = 189 ×

s

1m3 1000 L

m3

= 0.189

s

m3

0.189

s

mo = m3

0.896439522 kg

Then,

𝐦𝐨 = 𝟎. 𝟐𝟏𝟎𝟖𝟑𝟒𝟎𝟕𝟖

𝐤𝐠

𝐬

Qs = meCp∆T

𝑚𝑒 = 𝑚𝑎

kJ

33.13326522 kW = ma (1.0062 kg − K)(33.9 − 22)K

𝒎𝒐

𝒎𝒂

𝐦𝐚 = 𝟏. 𝟗𝟕𝟏𝟗𝟒𝟑𝟎𝟔𝟖

0.210834078 kg/s

=

1.971943068 kg/s

𝒎𝒐

𝐤𝐠

𝐬

𝑥 100%

𝒎𝒂

= 𝟏𝟎. 𝟔𝟗𝟏𝟔𝟗𝟏𝟗𝟑 %

Since, 𝒎𝒐 is greater than 10% then, use the actual value of 𝒎𝒐.

𝒎𝒂 𝒎𝒂

mo𝛚𝐨 + mR𝛚𝐑 = me𝛚𝐞

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kgwv

(0.1069169193m ) (0.01925366 ) + (0.89308308m

) ( 0.006555714 kgwv)

a

= (ma) (𝛚𝐞)

kgda

a kgda

𝛚𝐞 = 𝟎. 𝟐𝟏𝟏𝟕𝟎𝟗𝟎𝟎𝟑 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

moho + mRhR = mehe

(0.1069169193ma)(80.777 kJ⁄kg) + (0.89308308ma)( 38.79971277 kJ⁄kg) = (ma) (he)

𝐡𝐞 = 𝟒𝟑. 𝟔𝟐𝟑𝟓𝟑𝟓𝟓𝟏 𝐤𝐉⁄𝐤𝐠

moto + mRtR = mete

(0.1069169193ma)(33.9 ℃) + (0.89308308ma)( 22℃) = (ma)(te)

𝐭𝐞 = 𝟐𝟐𝟑. 𝟐𝟕𝟐𝟑𝟏𝟏𝟑𝟒 ****𝐂

From Psychrometric Chart:

For Capacity of Cooling Coil,

𝐓𝐋 = 𝟓****𝐂

Capacity = me(he − hL)

Solving for hL:

𝑆𝐻𝐹 =

𝐶𝑝(𝑡𝑅 − 𝑡𝐿) ℎ𝑅 − ℎ𝐿

0.690600736 =

1.0062(22.5 − 9)

47.79507072 − ℎ𝐿

𝒉𝑳 = 𝟏𝟒. 𝟕𝟗𝟔𝟑𝟔𝟒𝟔 𝐤𝐉⁄𝐤𝐠

Then, substituting,

A⁄ Capacity = 𝟏. 𝟗𝟕𝟏𝟗𝟒𝟑𝟎𝟔𝟖 𝐤𝐠 (𝟒𝟑. 𝟔𝟐𝟑𝟓𝟑𝟓𝟓𝟏 − 𝟏𝟒. 𝟕𝟗𝟔𝟑𝟔𝟒𝟔) 𝐤𝐉⁄𝐤𝐠

𝐶 𝐬

A/C Capacity = 𝟓𝟔. 𝟖𝟒𝟓𝟓𝟑𝟗𝟖𝟓 𝐤𝐖 ∗ 𝟏 𝐓𝐎𝐑

𝟑.𝟓𝟏𝟔𝟕 𝐤𝐖

= 𝟏𝟔. 𝟏𝟔𝟒𝟒𝟓𝟓𝟐𝟕 𝑻𝑶𝑹

# For Minor OR 1:

56.84553985 kW x 20 m2 = 1.725729807 kW ( 1 TOR )

85 m2 3.5167 kW

= 𝟎. 𝟒𝟗𝟎𝟕𝟐𝟒𝟐𝟎𝟒 𝐓𝐎𝐑

119

# Table 41

Summary of TOR Capacity for Ground Floor

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Area** | **A/C Capacity** | **KW** | **TOR** |
| **24C** | | | | |
| Canteen | 53 | 75.6722 | 26.7197 | 7.5979 |
| Kitchen | 43.8 | 75.6722 | 22.0816 | 6.2791 |
| Radiology, DRSG | 21.25 | 75.6722 | 10.7131 | 3.0463 |
| C.T. Scan, Control Room | 32 | 75.6722 | 16.1326 | 4.5874 |
| Housekeeping | 15 | 75.6722 | 7.5622 | 2.1504 |
| **22.5C** | | | | |
| DR's Clinic 1 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 2 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 3 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 4 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 5 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 6 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 7 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 8 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 9 | 13 | 143.8918 | 2.8394 | 0.8074 |
| DR's Clinic 10 | 13 | 143.8918 | 2.8394 | 0.8074 |
| Dietician | 10 | 143.8918 | 2.1841 | 0.6211 |
| Dental Clinic | 10 | 143.8918 | 2.1841 | 0.6211 |
| Business Office | 40 | 143.8918 | 8.7366 | 2.4843 |
| Social Service / Admitting | 15 | 143.8918 | 3.2762 | 0.9316 |
| DSWD Room | 8 | 143.8918 | 1.7473 | 0.4969 |
| Chapel | 56 | 143.8918 | 12.2312 | 3.4780 |
| Pathologist Area | 10.4 | 143.8918 | 2.2715 | 0.6459 |
| Microbiology Room | 18 | 143.8918 | 3.9315 | 1.1179 |
| Laboratory | 40 | 143.8918 | 8.7366 | 2.4843 |
| Extraction | 8.4 | 143.8918 | 1.8347 | 0.5217 |
| Radiologist Office | 40 | 143.8918 | 8.7366 | 2.4843 |
| Dark Room | 6 | 143.8918 | 1.3105 | 0.3726 |
| Film Filling Office | 14 | 143.8918 | 3.0578 | 0.8695 |
| Pharmacy | 25 | 143.8918 | 5.4604 | 1.5527 |
| Ultrasound | 25 | 143.8918 | 5.4604 | 1.5527 |
| 2D - Echo | 25 | 143.8918 | 5.4604 | 1.5527 |
| Isolation Room | 10 | 143.8918 | 2.1841 | 0.6211 |

120

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Examination and Treatment Room | 30 | 143.8918 | 6.5524 | 1.8632 |
| Observation Area | 30 | 143.8918 | 6.5524 | 1.8632 |
| Nurse Station | 15 | 143.8918 | 3.2762 | 0.9316 |
| Emergency Room | 20 | 143.8918 | 4.3683 | 1.2422 |
| Hallway | 17 | 143.8918 | 3.7131 | 1.0558 |

# 22C

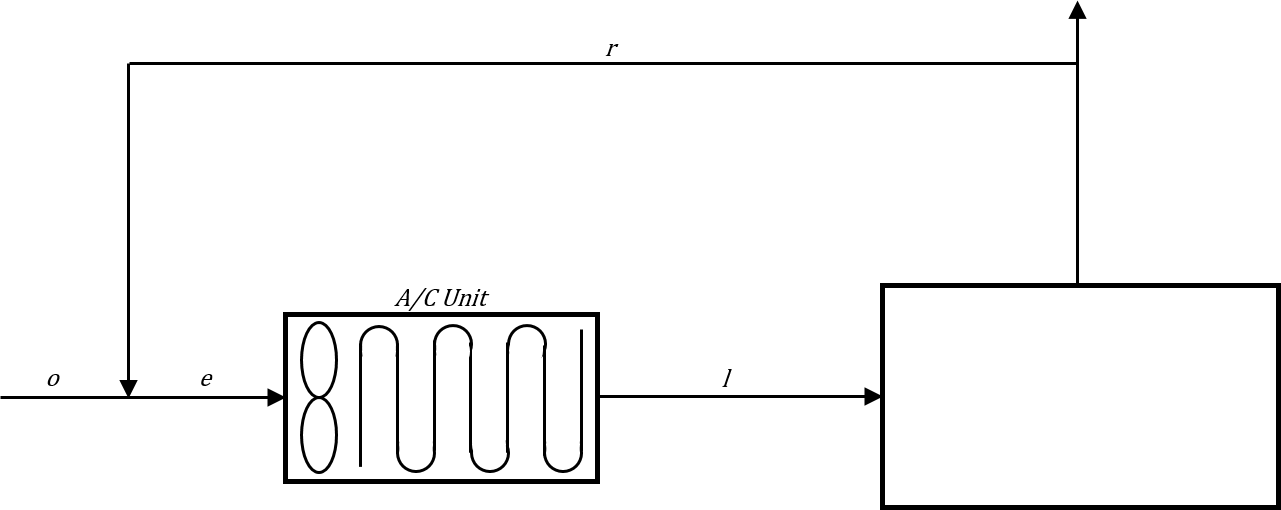
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Morgue | 28 | 56.8455 | 2.4160 | 0.6870 |
| Cold Storage Room | 20 | 56.8455 | 1.7257 | 0.4907 |
| Minor OR 1 | 20 | 56.8455 | 1.7257 | 0.4907 |
| Minor OR 2 | 17 | 56.8455 | 1.4669 | 0.4171 |

**SECOND FLOOR**

*For 24°C, 50% RH:*

|  |  |  |
| --- | --- | --- |
| Total Sensible Heat load | = | 30429.2893 W |
| Total Latent Heat Load | = | 12892.9043 W |
| Total Heat Load | = | 43322.1937 W |
| Sensible Heat Ratio, SHR | = | 0.702395 ≈ 0.70 |

# SCHEMATIC DIAGRAM:



**33.9 °CDB & 26.7 °CWB**

**24 °CDB & 50% RH QS = 30429.2893 W QT = 43322.1967 W**

**Figure 9.** Schematic Diagram of Air-conditioning System for Second Floor, 24°C

# Psychrometric Calculation: SECOND FLOOR:

QS = 30429.2893 W QT = 43322.1937 W

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QS

SHF =

QT

330429.2893

=

43322.1937

= 𝟎. 𝟕𝟎𝟐𝟑𝟗𝟓 ≈ 𝟎. 𝟕𝟎

*@* Outdoor Condition: **33.9 CDB** and **26.7 CWB**

**ωo = 0.01925366 kgwv/kgda**

𝐦𝟑

𝒗𝐨 = 𝟎. 𝟖𝟗𝟔𝟒𝟑𝟗𝟓𝟐𝟐 𝐤𝐠

For return air condition: @ **24CDB**, **50% RH**

0.622 PS

ωR =

PT − PS

ωR =

0.622 (0.5 × 2.982 kPa)

101.325 − (0.5 × 2.982 kPa)

𝛚𝐑 = 𝟎. 𝟎𝟎𝟗𝟐𝟖𝟗𝟒𝟒 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

hR= Cpt + WR hg @ 24 C

hR = 1.0062 (24 C) + (0.009289440471 kgwv⁄kgda) (2545.5 kJ⁄kg)

𝐡𝐑 = 𝟒𝟕. 𝟕𝟗𝟓𝟎𝟕𝟎𝟕𝟐 𝐤𝐉⁄𝐤𝐠

# Ventilation Load:

L

Q = 295.5 ×

s

1m3 1000 L

m3

= 0.2955

s

m3

0.2955

s

mo = m3

0.896439522 kg

Then,

𝐦𝐨 = 𝟎. 𝟑𝟐𝟗𝟔𝟑𝟕𝟒𝟎𝟕

𝐤𝐠

𝐬

Qs = meCp∆T

𝑚𝑒 = 𝑚𝑎

kJ

30.429358485 kW = ma (1.0062 kg − K)(33.9 − 24)K

𝐦𝐚 = 𝟑. 𝟎𝟓𝟒𝟕𝟐𝟔𝟐𝟖𝟔

𝒎𝒐 0.329637407 kg/s

𝐤𝐠

𝐬

=

𝒎𝒂

3.054726286 kg/s

𝑥 100%

122

𝒎𝒐

𝒎𝒂

= 𝟏𝟎. 𝟕𝟗𝟏𝟎𝟔𝟐 %

Since, 𝒎𝒐 is greater than 10% then, use the actual value of 𝒎𝒐.

𝒎𝒂 𝒎𝒂

mo𝛚𝐨 + mR𝛚𝐑 = me𝛚𝐞

kgwv

(0.10791062m ) (0.01925366 ) + (0.89208938m

) ( 0.009289440471 kgwv)

a

= (ma) (𝛚𝐞)

kgda a

kgda

𝛚𝐞 = 𝟎. 𝟎𝟏𝟎𝟑𝟔𝟒𝟔𝟖𝟔 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

moho + mRhR = mehe

(0.10791062ma)(80.777 kJ⁄kg) + (0.89208938ma)( 47.79527072 kJ⁄kg) = (ma) (he)

𝐡𝐞 = 𝟓𝟓𝟏. 𝟔𝟗𝟑𝟎𝟑𝟐𝟎𝟗 𝐤𝐉⁄𝐤𝐠

moto + mRtR = mete

(0.10791062ma)(33.9 ℃) + (0.89208938ma)( 24 ℃) = (ma)(te)

𝐭𝐞 = 𝟐𝟓. 𝟎𝟔𝟖𝟑𝟏𝟓𝟏𝟒****𝐂

From Psychrometric Chart:

For Capacity of Cooling Coil,

𝐓𝐋 = 𝟏𝟎. 𝟓****𝐂

Capacity = me(he − hL)

Solving for hL:

𝑆𝐻𝐹 =

𝐶𝑝(𝑡𝑅 − 𝑡𝐿) ℎ𝑅 − ℎ𝐿

0.702395 =

1.0062(24 − 10.5)

47.79507072 − ℎ𝐿

𝒉𝑳 = 𝟐𝟖. 𝟒𝟓𝟓𝟗𝟓𝟎𝟓𝟖 𝐤𝐉⁄𝐤𝐠

Then, substituting,

A⁄ Capacity = 𝟑. 𝟎𝟓𝟒𝟕𝟐𝟔𝟐𝟖𝟔 𝐤𝐠 (𝟓𝟏. 𝟔𝟗𝟑𝟎𝟑𝟐𝟎𝟗 − 𝟐𝟖. 𝟒𝟓𝟓𝟗𝟓𝟎𝟓𝟖) 𝐤𝐉⁄𝐤𝐠

𝐶 𝐬

A/C Capacity = 𝟕𝟎. 𝟗𝟖𝟐𝟗𝟐𝟑𝟔𝟖 𝐤𝐖 ∗ 𝟏 𝐓𝐎𝐑

𝟑.𝟓𝟏𝟔𝟕 𝐤𝐖

= 𝟐𝟎. 𝟏𝟖𝟒𝟓𝟐𝟔𝟑𝟏 𝑻𝑶𝑹

123

# For Pediatric Ward:

70.98292368 kW x 45.125 m2 = 15.77883956 kW ( 1 TOR )

202.965 m2 3.5167 kW

= 𝟒. 𝟒𝟖𝟔𝟖𝟑𝟏𝟐𝟖 𝐓𝐎𝐑

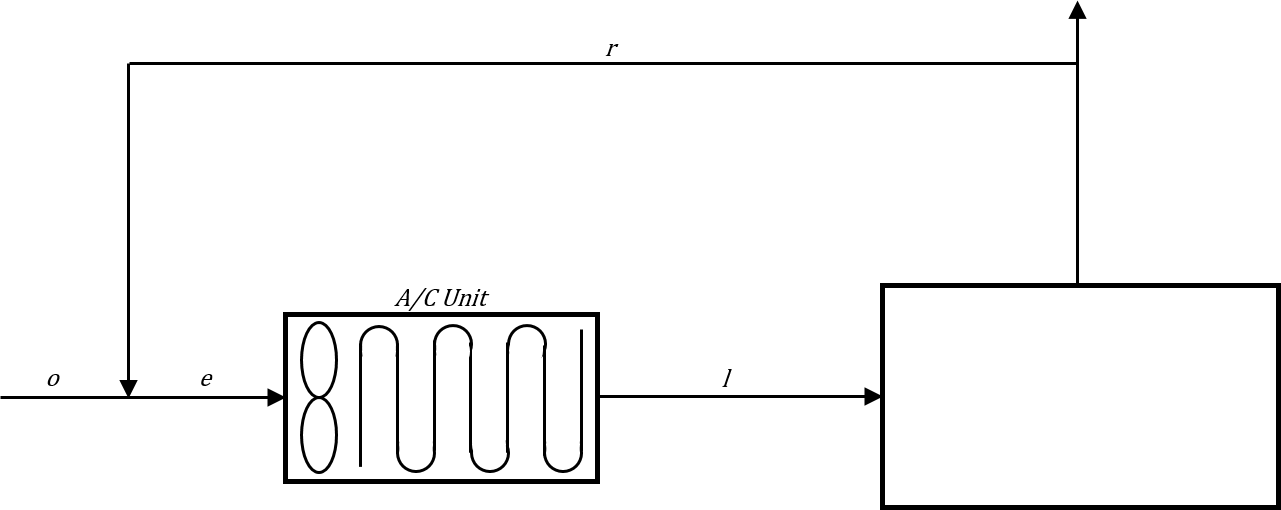
*or 22.5°C, 50% RH:*

*F*

Total Sensible Heat load = 61935.73875 W Total Latent Heat Load = 25679.45919 W Total Heat Load = 87615.1980

Sensible Heat Ratio, SHR = 0.706906 ≈ 0.71

# SCHEMATIC DIAGRAM:



**33.9 °CDB & 26.7 °CWB**

**22.5 °CDB & 50% RH QS = 61935.7388 W QT = 87615.1980 W**

**Figure 10.** Schematic Diagram of Air-conditioning System for Second Floor, 22.5°C

# Psychrometric Calculation: SECOND FLOOR:

QS = 61935.7388 W QT = 87615.1980 W

QS

SHF =

QT

67589.7046

=

97870.8840

= 𝟎. 𝟕𝟎𝟔𝟗𝟎𝟔 ≈ 𝟎. 𝟕𝟏

*@* Outdoor Condition: **33.9 CDB** and **26.7 CWB**

**ωo = 0.01925366 kgwv/kgda**

𝐦𝟑

𝒗𝐨 = 𝟎. 𝟖𝟗𝟔𝟒𝟑𝟗𝟓𝟐𝟐 𝐤𝐠

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For return air condition: @ **22.5CDB**, **50% RH**

0.622 PS

ωR =

PT − PS

ωR =

0.622 (0.5 × 2.982 kPa)

101.325 − (0.5 × 2.982 kPa)

𝛚𝐑 = 𝟎. 𝟎𝟎𝟖𝟒𝟖𝟒𝟐𝟑𝟔 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

hR= Cpt + WR hg @ 24 C

hR = 1.0062 (22.5 C) + (0.008484236 kgwv⁄kgda) (2545.5 kJ⁄kg)

𝐡𝐑 = 𝟒𝟒. 𝟐𝟏𝟐𝟕𝟗𝟐𝟏𝟖 𝐤𝐉⁄𝐤𝐠

# Ventilation Load:

L

Q = 571 ×

s

1m3 1000 L

m3

= 0.571

s

m3

0.571

s

mo = m3

0.896439522 kg

Then,

𝐦𝐨 = 𝟎. 𝟔𝟑𝟔𝟗𝟔𝟒𝟑𝟑

𝐤𝐠

𝐬

Qs = meCp∆T

𝑚𝑒 = 𝑚𝑎

kJ

61.93573875 kW = ma (1.0062 kg − K)(33.9 − 22.5)K

𝐦𝐚 = 𝟓. 𝟑𝟗𝟗𝟒𝟖𝟐𝟕𝟒𝟕

𝒎𝒐 0.63696433 kg/s

𝐤𝐠

𝐬

=

𝒎𝒂

5.399482747 kg/s

𝑥 100%

𝒎𝒐

𝒎𝒂

= 𝟏𝟏. 𝟕𝟗𝟔𝟕𝟔𝟓𝟕𝟑 %

Since, 𝒎𝒐 is greater than 10% then, use the actual value of 𝒎𝒐.

𝒎𝒂 𝒎𝒂

mo𝛚𝐨 + mR𝛚𝐑 = me𝛚𝐞

125

kgwv

(0.1179676753m ) (0.01925366 ) + (0.88203234m

) ( 0.008484236 kgwv)

a

= (ma) (𝛚𝐞)

kgda

a kgda

𝛚𝐞 = 𝟎. 𝟎𝟎𝟗𝟕𝟓𝟒𝟔𝟖 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

moho + mRhR = mehe

(0.1179676753ma)(80.777 kJ⁄kg) + (0.88203234ma)( 44.21279218 kJ⁄kg) = (ma) (he)

𝐡𝐞 = 𝟒𝟖. 𝟖𝟗𝟔𝟔𝟐𝟖𝟏𝟔 𝐤𝐉⁄𝐤𝐠

moto + mRtR = mete

(0.1179676753ma)(33.9 ℃) + (0.88203234ma)( 22.5 ℃) = (ma)(te)

𝐭𝐞 = 𝟐𝟑. 𝟖𝟒𝟒𝟖𝟑𝟏𝟐𝟗 ****𝐂

From Psychrometric Chart:

For Capacity of Cooling Coil,

𝐓𝐋 = 𝟗****𝐂

Capacity = me(he − hL)

Solving for hL:

𝑆𝐻𝐹 =

𝐶𝑝(𝑡𝑅 − 𝑡𝐿) ℎ𝑅 − ℎ𝐿

0.706906 =

1.0062(22.5 − 9)

48.89662816 − ℎ𝐿

𝒉𝑳 = 𝟐𝟒. 𝟗𝟗𝟕𝟎𝟗𝟐𝟑𝟔 𝐤𝐉⁄𝐤𝐠

Then, substituting,

A⁄ Capacity = 𝟓. 𝟑𝟗𝟗𝟒𝟖𝟐𝟕𝟒𝟕 𝐤𝐠 (𝟒𝟖𝟑𝟖𝟗𝟔𝟔𝟐𝟖𝟏𝟔 − 𝟐𝟒. 𝟗𝟗𝟕𝟎𝟗𝟐𝟑𝟔) 𝐤𝐉⁄𝐤𝐠

𝐶 𝐬

A/C Capacity = 𝟏𝟐𝟗. 𝟎𝟒𝟓𝟏𝟑𝟏𝟐 𝐤𝐖 ∗ 𝟏 𝐓𝐎𝐑

𝟑.𝟓𝟏𝟔𝟕 𝐤𝐖

= 𝟑𝟔. 𝟔𝟗𝟒𝟗𝟓𝟎𝟏𝟔 𝑻𝑶𝑹

# For Male Ward 1:

129.0451312kW x 32.5 m2 = 9.531742646 kW ( 1 TOR )

440.371 m2 3.5167 kW

= 𝟐. 𝟕𝟏𝟎𝟒𝟐𝟐𝟒𝟓𝟓 𝐓𝐎𝐑

*For 22°C, 40% RH:*

Total Sensible Heat load = 30371.4678 W

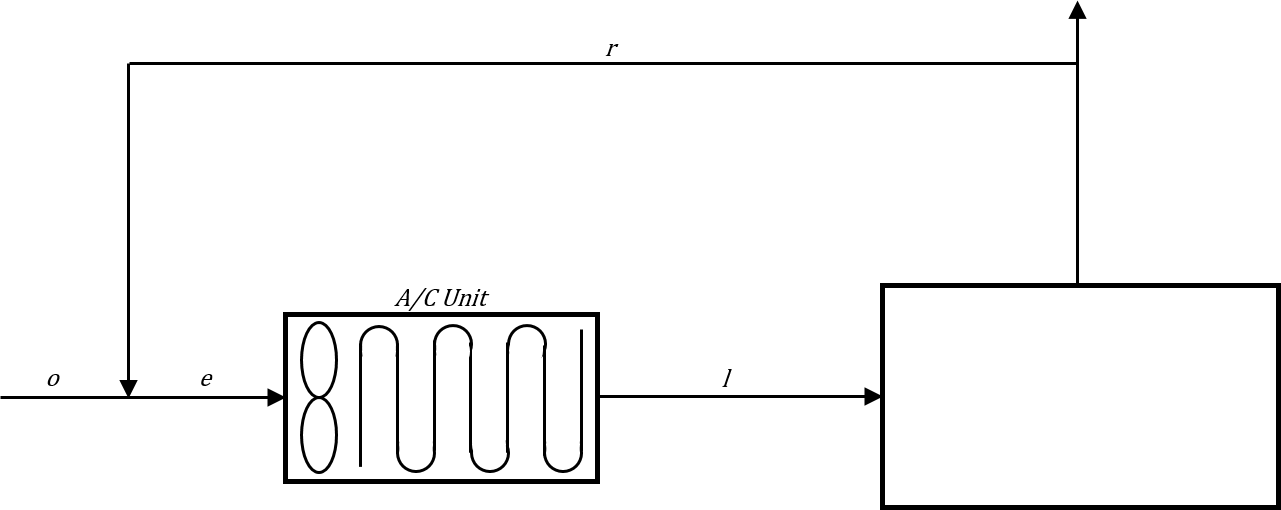
126

Total Latent Heat Load = 12324.2002 W

Total Heat Load = 42695.6680 W Sensible Heat Ratio, SHR = 0.711348 ≈ 0.71

# CHEMATIC DIAGRAM:

**S**



**33.9 °CDB & 26.7 °CWB**

**22°CDB & 40% RH QS = 30371.4678 W QT = 42695.6680 W**

**Figure 11.** Schematic Diagram of Air-conditioning System for Second Floor, 22°C

# Psychrometric Calculation: SECOND FLOOR:

QS = 30371.4678 W QT = 42695.6680 W

QS

SHF =

QT

23611.6125

=

33133.2652

= 𝟎. 𝟕𝟏𝟏𝟑𝟒𝟖 ≈ 𝟎. 𝟕𝟏

*@* Outdoor Condition: **33.9 CDB** and **26.7 CWB**

**ωo = 0.01925366 kgwv/kgda**

𝐦𝟑

𝒗𝐨 = 𝟎. 𝟖𝟗𝟔𝟒𝟑𝟗𝟓𝟐𝟐 𝐤𝐠

For return air condition: @ **22CDB**, **40% RH**

0.622 PS

ωR =

PT − PS

ωR =

0.622 (0.5 × 2.982 kPa)

101.325 − (0.5 × 2.982 kPa)

𝛚𝐑 = 𝟎. 𝟎𝟎𝟔𝟓𝟓𝟓𝟕𝟏𝟒 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

127

hR= Cpt + WR hg @ 24C

hR = 1.0062 (22.5 C) + (0.009289440471 kgwv⁄kgda) (2545.5 kJ⁄kg)

𝐡𝐑 = 𝟑𝟖. 𝟕𝟗𝟗𝟕𝟏𝟐𝟕𝟕 𝐤𝐉⁄𝐤𝐠

# Ventilation Load:

L

Q = 229 ×

s

1m3 1000 L

m3

= 0.229

s

m3

0.229

s

mo = m3

0.896439522 kg

Then,

𝐦𝐨 = 𝟎. 𝟐𝟓𝟓𝟒𝟓𝟓𝟎𝟒𝟕

𝐤𝐠

𝐬

Qs = meCp∆T

𝑚𝑒 = 𝑚𝑎

kJ

30.3714678 kW = ma (1.0062 kg − K)(33.9 − 22)K

𝒎𝒐

𝒎𝒂

𝐦𝐚 = 𝟐. 𝟓𝟑𝟔𝟒𝟗𝟕𝟗

0.255455047 kg/s

=

2.5364979 kg/s

𝐤𝐠

𝐬

𝑥 100%

𝒎𝒐

𝒎𝒂

= 𝟏𝟎. 𝟎𝟕𝟏𝟏𝟕𝟏𝟐𝟑 %

Since, 𝒎𝒐 is greater than 10% then, use the actual value of 𝒎𝒐.

𝒎𝒂 𝒎𝒂

mo𝛚𝐨 + mR𝛚𝐑 = me𝛚𝐞

kgwv

(0.1007117123m ) (0.01925366 ) + (0.8992882877m

) ( 0.007834546 kgwv)

a

= (ma) (𝛚𝐞)

kgda a

𝛚𝐞 = 𝟎. 𝟎𝟎𝟕𝟖𝟑𝟒𝟓𝟒𝟔 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

kgda

moho + mRhR = mehe

(0.1007117123ma)(80.777 kJ⁄kg) + (0.8992882877ma)(38.79971277 kJ⁄kg)

= (ma) (he)

𝐡𝐞 = 𝟒𝟑. 𝟑𝟒𝟑𝟓𝟕𝟐𝟏𝟔 𝐤𝐉⁄𝐤𝐠

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moto + mRtR = mete

(0.1007117123ma)(33.9 ℃) + (0.8992882877ma)( 22℃) = (ma)(te)

𝐭𝐞 = 𝟐𝟑. 𝟏𝟗𝟖𝟒𝟔𝟗𝟑𝟖 ****𝐂

From Psychrometric Chart:

For Capacity of Cooling Coil,

𝐓𝐋 = 𝟓****𝐂

Capacity = me(he − hL)

Solving for hL:

𝑆𝐻𝐹 =

𝐶𝑝(𝑡𝑅 − 𝑡𝐿) ℎ𝑅 − ℎ𝐿

0.711348 =

1.0062(22.5 − 9)

43.34357216 − ℎ𝐿

𝒉𝑳 = 𝟏𝟒. 𝟕𝟓𝟑𝟐𝟒𝟔𝟒𝟏 𝐤𝐉⁄𝐤𝐠

Then, substituting,

A⁄ Capacity = 𝟐. 𝟓𝟑𝟔𝟒𝟗𝟕𝟗 𝐤𝐠 (𝟒𝟑. 𝟑𝟒𝟑𝟓𝟕𝟐𝟏𝟔 − 𝟏𝟒. 𝟕𝟓𝟑𝟐𝟒𝟔𝟒𝟏) 𝐤𝐉⁄𝐤𝐠

𝐶 𝐬

A/C Capacity = 𝟕𝟐. 𝟓𝟏𝟗𝟑𝟎𝟏𝟐𝟐 𝐤𝐖 ∗ 𝟏 𝐓𝐎𝐑

𝟑.𝟓𝟏𝟔𝟕 𝐤𝐖

= 𝟐𝟎. 𝟔𝟐𝟏𝟒𝟎𝟔𝟕𝟖 𝑻𝑶𝑹

# For Delivery Room:

72.51930122 kW x 34.265 m2 = 12.1807542 kW ( 1 TOR )

204.335 m2 3.5167 kW

= 𝟑. 𝟒𝟔𝟑𝟔𝟖𝟖𝟕𝟒𝟐 𝐓𝐎𝐑

# Table 42

Summary of TOR Capacity for Second Floor

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Area** | **A/C Capacity** | **KW** | **TOR** |

# 24C

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pediatric Ward | 45.125 | 70.9829 | 15.7788 | 4.4868 |
| Pediatrician | 7.84 | 70.9829 | 2.7414 | 0.7795 |
| Central Sterilizing and Supply Room | 28 | 70.9829 | 9.7907 | 2.7841 |
| Storage | 20 | 70.9829 | 6.9934 | 1.9886 |
| Housekeeping | 15 | 70.9829 | 5.2450 | 1.4915 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Neonatal Intensive Care | 65 | 70.9829 | 22.7285 | 6.4630 |
| Breastfeeding | 10 | 70.9829 | 3.4967 | 0.9943 |
| Babies | 12 | 70.9829 | 4.1960 | 1.1932 |
| **22.5C** | | | | |
| Male Ward 1 | 32.5 | 129.0451 | 9.5317 | 2.7104 |
| Male Ward 2 | 32.5 | 129.0451 | 9.5317 | 2.7104 |
| Dialysis - RE | 4 | 129.0451 | 1.1731 | 0.3336 |
| Dialysis | 40 | 129.0451 | 11.7314 | 3.3359 |
| Dialysis - ROS | 15.2 | 129.0451 | 4.4579 | 1.2676 |
| Female Ward 1 | 40 | 129.0451 | 11.7314 | 3.3359 |
| Female Ward 2 | 40 | 129.0451 | 11.7314 | 3.3359 |
| Isolation Ward | 40 | 129.0451 | 11.7314 | 3.3359 |
| Treatment and Medication Area | 19.5 | 129.0451 | 5.7190 | 1.6263 |
| Medicine | 7.84 | 129.0451 | 2.2993 | 0.6538 |
| OB - Gyne | 5.6 | 129.0451 | 1.6424 | 0.4670 |
| Surgery / Anesthesia | 8.4 | 129.0451 | 2.4636 | 0.7005 |
| Department Head Office | 20.59 | 129.0451 | 6.0387 | 1.7172 |
| Doctor's Conference | 20 | 129.0451 | 5.8657 | 1.6680 |
| Hallway (inside) (inside) | 11.841 | 129.0451 | 3.4728 | 0.9875 |
| Recovery Room | 28.5 | 129.0451 | 8.3586 | 2.3768 |
| Labor Room | 15 | 129.0451 | 4.3993 | 1.2510 |
| Hallway (inside) | 44.4 | 129.0451 | 13.0218 | 3.7029 |
| Nurse Station 3 | 14.5 | 129.0451 | 4.2526 | 1.2093 |
| **22C** | | | | |
| Delivery Room | 34.265 | 72.5193 | 12.1808 | 3.4637 |
| Nurse Station / ICU | 25 | 72.5193 | 8.8872 | 2.5271 |
| Intensive Care Unit | 64 | 72.5193 | 22.7512 | 6.4695 |
| Operating Room 1 | 35.735 | 72.5193 | 12.7033 | 3.6123 |
| Operating Room 2 | 35.735 | 72.5193 | 12.7033 | 3.6123 |
| SSA | 9.6 | 72.5193 | 3.4127 | 0.9704 |

# THIRD FLOOR

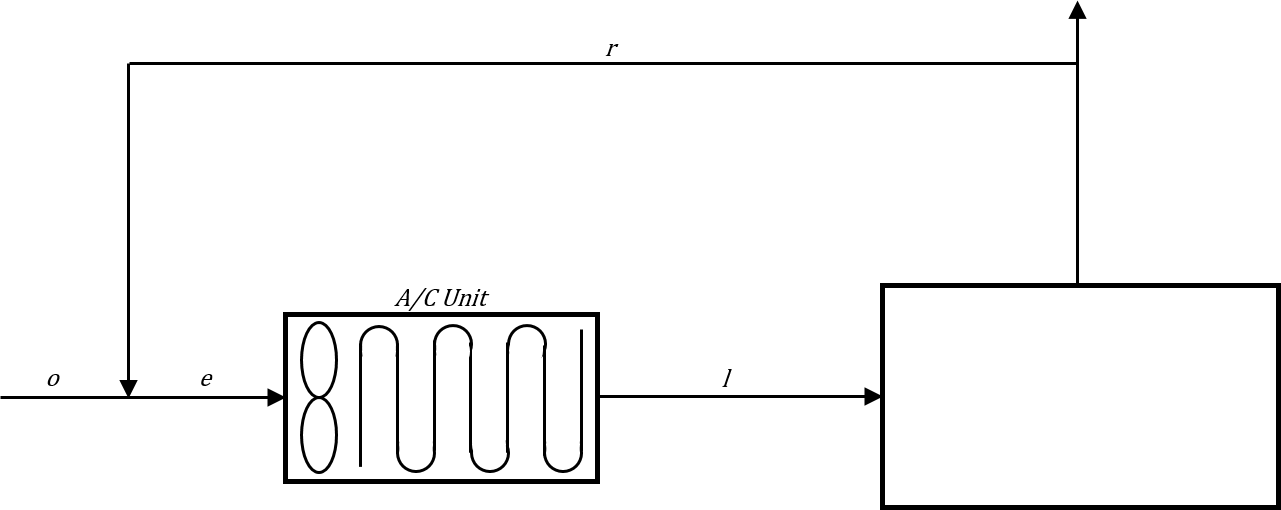
*For 24°C, 50% RH:*

|  |  |  |
| --- | --- | --- |
| Total Sensible Heat load | = | 1317.7207 W |
| Total Latent Heat Load | = | 230.4973 W |

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Total Heat Load = 1548.2180 W Sensible Heat Ratio, SHR = 0.851120914 ≈ 0.85

# SCHEMATIC DIAGRAM:



**33.9 °CDB & 26.7 °CWB**

**24 °CDB & 50% RH QS = 1317.7207 W QT = 1548.2178 W**

**Figure 12.** Schematic Diagram of Air-conditioning System for Third Floor, 24°C

# Psychrometric Calculation: THIRD FLOOR:

QS = 1317.7207 W QT = 1548.2178 W

QS

SHF =

QT

1317.7207

=

1548.2178

= 𝟎. 𝟖𝟓𝟏𝟏𝟐𝟎𝟗 ≈ 𝟎. 𝟖𝟓

*@* Outdoor Condition: **33.9 CDB** and **26.7 CWB**

**ωo = 0.01925366 kgwv/kgda**

𝐦𝟑

𝒗𝐨 = 𝟎. 𝟖𝟗𝟔𝟒𝟑𝟗𝟓𝟐𝟐 𝐤𝐠

For return air condition: @ **24CDB**, **50% RH**

0.622 PS

ωR =

PT − PS

ωR =

0.622 (0.5 × 2.982 kPa)

101.325 − (0.5 × 2.982 kPa)

𝛚𝐑 = 𝟎. 𝟎𝟎𝟗𝟐𝟖𝟗𝟒𝟒 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

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hR= Cpt + WR hg @ 24 C

hR = 1.0062 (24 C) + (0.009289440471 kgwv⁄kgda) (2545.5 kJ⁄kg)

𝐡𝐑 = 𝟒𝟕. 𝟕𝟗𝟓𝟎𝟕𝟎𝟕𝟐 𝐤𝐉⁄𝐤𝐠

# Ventilation Load:

L

Q = 2.5 ×

s

1m3 1000 L

m3

= 0.0025

s

m3

0.0025

s

mo = m3

0.896439522 kg

Then,

𝐦𝐨 = 𝟎. 𝟎𝟎𝟐𝟕𝟖𝟖𝟖𝟏𝟏

𝐤𝐠

𝐬

Qs = meCp∆T

𝑚𝑒 = 𝑚𝑎

kJ

1.548218 kW = ma (1.0062 kg − K)(33.9 − 24)K

𝐦𝐚 = 𝟎. 𝟏𝟑𝟐𝟐𝟖𝟐𝟗𝟒𝟗

𝒎𝒐 0.002788811 kg/s

𝐤𝐠

𝐬

=

𝒎𝒂

0.132282949 kg/s

𝑥 100%

𝒎𝒐

𝒎𝒂

= 𝟐. 𝟏𝟎𝟖𝟐𝟏𝟔𝟐𝟎𝟐 %

Since, 𝒎𝒐 is less than 10% then, use 10 % as the value of 𝒎𝒐.

𝒎𝒂 𝒎𝒂

mo𝛚𝐨 + mR𝛚𝐑 = me𝛚𝐞

(0.10m

) (0.01925366 kgwv) + (0.90m

) (0.00928944 kgwv) = (m

) (𝛚 )

a kgda a

kgda

a 𝐞

𝛚𝐞 = 𝟎. 𝟎𝟏𝟎𝟐𝟖𝟓𝟖𝟔𝟐 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

moho + mRhR = mehe

(0.10ma)(80.777 kJ⁄kg) + (0.90ma)(47.7957072kJ⁄kg) = (ma) (he)

𝐡𝐞 = 𝟓𝟏. 𝟒𝟎𝟕𝟐𝟖𝟑𝟔𝟓 𝐤𝐉⁄𝐤𝐠

moto + mRtR = mete

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(0.10ma)(33.9 ℃) + (0.90ma)( 24 ℃) = (ma)(te)

𝐭𝐞 = 𝟐𝟒. 𝟗𝟗****𝐂

From Psychrometric Chart:

For Capacity of Cooling Coil,

𝐓𝐋 = 𝟏𝟓****𝐂

Capacity = me(he − hL)

Solving for hL:

𝑆𝐻𝐹 =

𝐶𝑝(𝑡𝑅 − 𝑡𝐿) ℎ𝑅 − ℎ𝐿

0.851120914 =

1.0062(24 − 15)

47.79507072 − ℎ𝐿

𝒉𝑳 = 𝟑𝟕. 𝟏𝟓𝟓𝟐𝟏𝟗𝟑𝟕 𝐤𝐉⁄𝐤𝐠

Then, substituting,

A⁄ Capacity = 𝟎. 𝟏𝟑𝟐𝟐𝟖𝟐𝟗𝟒𝟗 𝐤𝐠 (𝟓𝟏. 𝟒𝟎𝟕𝟐𝟖𝟑𝟔𝟓 − 𝟑𝟕. 𝟏𝟓𝟓𝟐𝟏𝟗𝟑𝟕) 𝐤𝐉⁄𝐤𝐠

𝐶 𝐬

A/C Capacity = 𝟏. 𝟖𝟖𝟓𝟑𝟎𝟓𝟎𝟖𝟓 𝐤𝐖 ∗ 𝟏 𝐓𝐎𝐑

𝟑.𝟓𝟏𝟔𝟕 𝐤𝐖

= 𝟎. 𝟓𝟑𝟔𝟏𝟎𝟎𝟔𝟑 𝑻𝑶𝑹

# For Housekeeping:

1.885305085 kW x 16 m2 = 0.53610063 kW ( 1 TOR )

16 m2 3.5167 kW

= 𝟎. 𝟓𝟑𝟔𝟏𝟎𝟎𝟔𝟑 𝐓𝐎𝐑

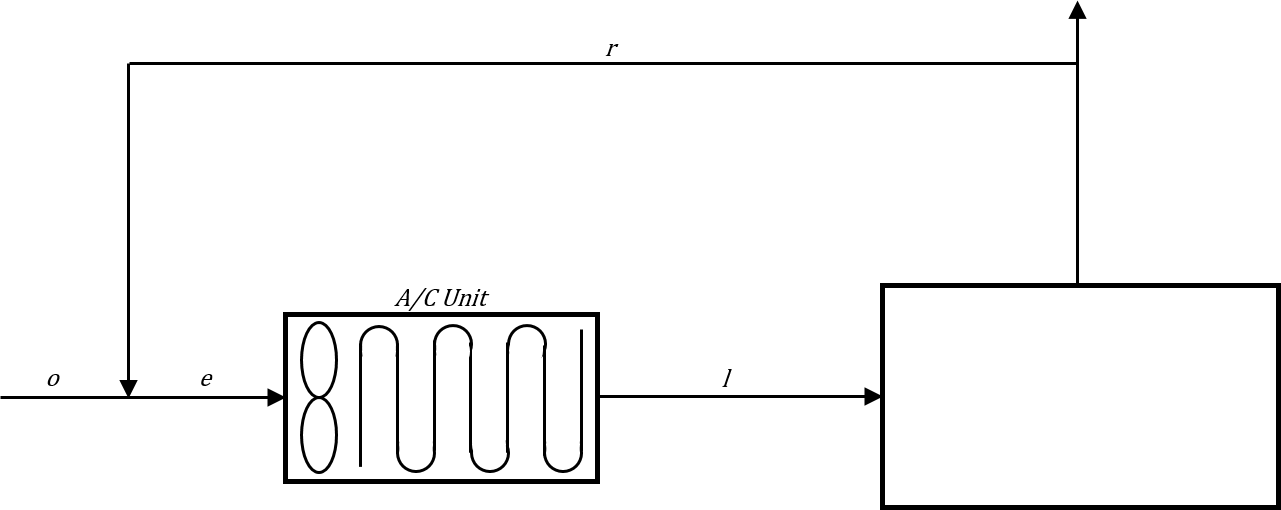
*For 22.5°C, 50% RH:*

Total Sensible Heat load = 150184.9417 W Total Latent Heat Load = 62265.3773 W Total Heat Load = 212450.319 W

Sensible Heat Ratio, SHR = 0.706917939 ≈ 0.71

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# SCHEMATIC DIAGRAM:



**33.9 °CDB & 26.7 °CWB**

**22.5 °CDB & 50% RH QS = 150184.9417 W QT = 212450.319 W**

**Figure 13.** Schematic Diagram of Air-conditioning System for Third Floor, 22.5°C

# Psychrometric Calculation: SECOND FLOOR:

QS = 150184.9417 W QT = 212450.319 W

QS

SHF =

QT

150184.9417 W

=

212450.319 W

= 𝟎. 𝟕𝟎𝟔𝟗𝟏𝟕𝟗𝟒 ≈ 𝟎. 𝟕𝟏

*@* Outdoor Condition: **33.9 CDB** and **26.7 CWB**

**ωo = 0.01925366 kgwv/kgda**

𝐦𝟑

𝒗𝐨 = 𝟎. 𝟖𝟗𝟔𝟒𝟑𝟗𝟓𝟐𝟐 𝐤𝐠

For return air condition: @ **22.5CDB**, **50% RH**

0.622 PS

ωR =

PT − PS

ωR =

0.622 (0.5 × 2.982 kPa)

101.325 − (0.5 × 2.982 kPa)

𝛚𝐑 = 𝟎. 𝟎𝟎𝟖𝟒𝟖𝟒𝟖𝟐𝟑𝟔 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

hR= Cpt + WR hg @ 24 C

hR = 1.0062 (22.5 C) + (0.008484236 kgwv⁄kgda) (2545.5 kJ⁄kg)

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𝐡𝐑 = 𝟒𝟒. 𝟐𝟏𝟐𝟕𝟗𝟐𝟏𝟖 𝐤𝐉⁄𝐤𝐠

# Ventilation Load:

L

Q = 1599 ×

s

1m3 1000 L

m3

= 1.599

s

m3

1.599

s

mo = m3

0.896439522 kg

Then,

𝐦𝐨 = 𝟏. 𝟕𝟖𝟑𝟕𝟐𝟑𝟐𝟑

𝐤𝐠

𝐬

Qs = meCp∆T

𝑚𝑒 = 𝑚𝑎

kJ

61.93573875 kW = ma (1.0062 kg − K)(33.9 − 22.5)K

𝐦𝐚 = 𝟏𝟑. 𝟎𝟗𝟐𝟗𝟒𝟏𝟒𝟓

𝒎𝒐 1.78372323 kg/s

𝐤𝐠

𝐬

=

𝒎𝒂

13.09294145 kg/s

𝑥 100%

𝒎𝒐

𝒎𝒂

= 𝟏𝟑. 𝟔𝟐𝟑𝟓𝟒𝟖𝟓𝟏 %

Since, 𝒎𝒐 is greater than 10% then, use the actual value of 𝒎𝒐.

𝒎𝒂 𝒎𝒂

mo𝛚𝐨 + mR𝛚𝐑 = me𝛚𝐞

kgwv

(0.1362354851m ) (0.01925366 ) + (0.8637645149m

) (0.008484236 kgwv)

a

= (ma) (𝛚𝐞)

kgda

a kgda

𝛚𝐞 = 𝟎. 𝟎𝟎𝟗𝟗𝟓𝟏𝟒𝟏𝟒 𝐤𝐠𝐰𝐯⁄𝐤𝐠𝐝𝐚

moho + mRhR = mehe

(0.1362354851ma)(80.777 kJ⁄kg) + (0.8637645149ma)(44.21279218 kJ⁄kg)

= (ma) (he)

𝐡𝐞 = 𝟓𝟎. 𝟎𝟑𝟔𝟗𝟔𝟓𝟗𝟐 𝐤𝐉⁄𝐤𝐠

moto + mRtR = mete

(0.1362354851ma)(33.9 ℃) + (0.8637645149ma)( 22.5 ℃) = (ma)(te)

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From Psychrometric Chart:

For Capacity of Cooling Coil,

𝐭𝐞 = 𝟐𝟒. 𝟎𝟓𝟑𝟎𝟖𝟒𝟓𝟑 ****𝐂

𝐓𝐋 = 𝟗****𝐂

Capacity = me(he − hL)

Solving for hL:

𝑆𝐻𝐹 =

𝐶𝑝(𝑡𝑅 − 𝑡𝐿) ℎ𝑅 − ℎ𝐿

0.706917939 =

1.0062(22.5 − 9)

44.21279218 − ℎ𝐿

𝒉𝑳 = 𝟐𝟒. 𝟗𝟗𝟕𝟒𝟎𝟕𝟕 𝐤𝐉⁄𝐤𝐠

Then, substituting,

A⁄ Capacity = 𝟏𝟑. 𝟎𝟗𝟐𝟗𝟒𝟏𝟒𝟓 𝐤𝐠 (𝟓𝟎. 𝟎𝟑𝟔𝟗𝟔𝟓𝟗𝟐 − 𝟐𝟒. 𝟗𝟗𝟕𝟒𝟎𝟕𝟕) 𝐤𝐉⁄𝐤𝐠

𝐶 𝐬

A/C Capacity = 𝟑𝟐𝟕. 𝟖𝟒𝟏𝟒𝟔𝟗𝟖 𝐤𝐖 ∗ 𝟏 𝐓𝐎𝐑

𝟑.𝟓𝟏𝟔𝟕 𝐤𝐖

= 𝟗𝟑. 𝟐𝟐𝟒𝟏𝟕𝟖𝟖𝟔 𝑻𝑶𝑹

# For SP Room 1:

327.8414698 KW x 20 m2 = 7.588923 kW ( 1 TOR )

864.1 m2 3.5167 kW

= 𝟐. 𝟏𝟓𝟕𝟗𝟔𝟕𝟏𝟎𝟑 𝐓𝐎𝐑

# Table 43

Summary of TOR Capacity for Third Floor

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Area** | **A/C Capacity** | **KW** | **TOR** |
| **24C** | | | | |
| Housekeeping | 16 | 1.8853 | 1.8853 | 0.5361 |
| **22.5C** | | | | |
| Male Ward 1 | 36.75 | 327.8415 | 13.9446 | 3.9653 |
| Male Ward 2 | 36.75 | 327.8415 | 13.9446 | 3.9653 |
| Isolation Ward | 40 | 327.8415 | 15.1778 | 4.3159 |
| Ward | 27.475 | 327.8415 | 10.4253 | 2.9645 |
| SP Room 1 | 20 | 327.8415 | 7.5889 | 2.1580 |
| SP Room 2 | 20 | 327.8415 | 7.5889 | 2.1580 |

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SP Room 3 | 25 | 327.8415 | 9.4862 | 2.6975 |
| SP Room 4 | 25 | 327.8415 | 9.4862 | 2.6975 |
| SP Room 5 | 20 | 327.8415 | 7.5889 | 2.1580 |
| SP Room 6 | 20 | 327.8415 | 7.5889 | 2.1580 |
| SP Room 7 | 28 | 327.8415 | 10.6245 | 3.0212 |
| Administration Office | 20 | 327.8415 | 7.5889 | 2.1580 |
| Chief of Nurse | 20 | 327.8415 | 7.5889 | 2.1580 |
| Chief Medical Room | 28 | 327.8415 | 10.6245 | 3.0212 |
| Conference and Training Room | 90 | 327.8415 | 34.1502 | 9.7109 |
| Director's Office | 18.7616 | 327.8415 | 7.1190 | 2.0243 |
| Secretary | 8.626 | 327.8415 | 3.2731 | 0.9307 |
| Library and Board of Directors | 24.7385 | 327.8415 | 9.3869 | 2.6692 |
| P Room 1 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 2 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 3 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 4 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 5 | 15 | 327.8415 | 5.6917 | 1.6185 |
| P Room 6 | 25 | 327.8415 | 9.4862 | 2.6975 |
| P Room 7 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 8 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 9 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 10 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 11 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 12 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 13 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 14 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 15 | 20 | 327.8415 | 7.5889 | 2.1580 |
| P Room 16 | 20 | 327.8415 | 7.5889 | 2.1580 |
| Isolation Room | 25 | 327.8415 | 9.4862 | 2.6975 |
| Treatment Room | 10 | 327.8415 | 3.7945 | 1.0790 |

# PIPING CALCULATIONS

* **Computing for L/s (Canteen)**

L = Cooling Capacity (V12°C)

s Cpwater (tl - te)

where: Cooling Capacity = 3.157 kW

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V12°C = 0.0010004 m3/kg

Cpwater = 4.187 kJ/kg te = 12°C

tl = 7°C

L 3.157 kW (0.0010004 m3/kg) s = 4.187 kJ/kg (12°C - 7°C)

L

s = 0.1680 L/s

# Table 44

Summary of L/s from Chiller

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **TOR** | **kW** | **L/s** |  | **TOR** | **kW** | **L/s** |
| Housekeeping | 1 | 3.5167 | 0.1680 | P Room 1 | 2.5 | 8.7918 | 0.4201 |
| Male Ward 1 | 4 | 14.0668 | 0.6722 | P Room 2 | 2.5 | 8.7918 | 0.4201 |
| Male Ward 2 | 4 | 14.0668 | 0.6722 | P Room 3 | 2.5 | 8.7918 | 0.4201 |
| Isolation Ward | 4.5 | 15.8252 | 0.7562 | P Room 4 | 2.5 | 8.7918 | 0.4201 |
| Ward | 3 | 10.5501 | 0.5041 | P Room 5 | 2 | 7.0334 | 0.3361 |
| SP Room 1 | 2.5 | 8.7918 | 0.4201 | P Room 6 | 3 | 10.5501 | 0.5041 |
| SP Room 2 | 2.5 | 8.7918 | 0.4201 | P Room 7 | 2.5 | 8.7918 | 0.4201 |
| SP Room 3 | 3 | 10.5501 | 0.5041 | P Room 8 | 2.5 | 8.7918 | 0.4201 |
| SP Room 4 | 3 | 10.5501 | 0.5041 | P Room 9 | 2.5 | 8.7918 | 0.4201 |
| SP Room 5 | 2.5 | 8.7918 | 0.4201 | P Room 10 | 2.5 | 8.7918 | 0.4201 |
| SP Room 6 | 2.5 | 8.7918 | 0.4201 | P Room 11 | 2.5 | 8.7918 | 0.4201 |
| SP Room 7 | 3 | 10.5501 | 0.5041 | P Room 12 | 2.5 | 8.7918 | 0.4201 |
| Administration Office | 2.5 | 8.7918 | 0.4201 | P Room 13 | 2.5 | 8.7918 | 0.4201 |
| Chief of Nurse | 2.5 | 8.7918 | 0.4201 | P Room 14 | 2.5 | 8.7918 | 0.4201 |
| Chief Medical Room | 3 | 10.5501 | 0.5041 | P Room 15 | 2.5 | 8.7918 | 0.4201 |
| Conference and Training Room | 10 | 35.1670 | 1.6805 | P Room 16 | 2.5 | 8.7918 | 0.4201 |
| Director's Office | 2 | 7.0334 | 0.3361 | Isolation Room | 3 | 10.5501 | 0.5041 |
| Secretary | 1 | 3.5167 | 0.1680 | Treatment Room | 1 | 3.5167 | 0.1680 |
| Library and Board of Directors | 3 | 10.5501 | 0.5041 |  |  |  |  |

# TOTAL A = 17.00096135 L/s

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Pediatric Ward | 5 | 17.5835 | 0.8402 | Female Ward 2 | 4 | 14.0668 | 0.6722 |
| Pediatrician | 1 | 3.5167 | 0.1680 | Isolation Ward | 4 | 14.0668 | 0.6722 |
| Central Sterilizing and Supply Room | 3 | 10.5501 | 0.5041 | Treatment and Medication Area | 2 | 7.0334 | 0.3361 |
| Storage | 2 | 7.0334 | 0.3361 | Medicine | 1 | 3.5167 | 0.1680 |
| Housekeeping | 2 | 7.0334 | 0.3361 | OB - Gyne | 1 | 3.5167 | 0.1680 |
| Breastfeeding | 1 | 3.5167 | 0.1680 | Surgery / Anesthesia | 1 | 3.5167 | 0.1680 |
| Babies | 1.5 | 5.2751 | 0.2521 | Department Head Office | 2 | 7.0334 | 0.3361 |
| Male Ward 1 | 3 | 10.5501 | 0.5041 | Doctor's Conference | 2 | 7.0334 | 0.3361 |
| Male Ward 2 | 3 | 10.5501 | 0.5041 | Hallway 2 (inside) | 1 | 3.5167 | 0.1680 |
| Dialysis - RE | 1 | 3.5167 | 0.1680 | Recovery  Room | 2.5 | 8.7918 | 0.4201 |
| Dialysis | 4 | 14.0668 | 0.6722 | Labor Room | 1.5 | 5.2751 | 0.2521 |
| Dialysis - ROS | 1.5 | 5.2751 | 0.2521 | Hallway (inside) | 4 | 14.0668 | 0.6722 |
| Female Ward 1 | 4 | 14.0668 | 0.6722 | Nurse Station 3 | 1 | 3.5167 | 0.1680 |

# TOTAL B = 16.32974639 L/s

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| DR's Clinic 1 | 1.5 | 5.27505 | 0.2521 | DR's Clinic 8 | 1.5 | 5.27505 | 0.2521 |
| DR's Clinic 2 | 1.5 | 5.27505 | 0.2521 | DR's Clinic 9 | 1.5 | 5.27505 | 0.2521 |
| DR's Clinic 3 | 1.5 | 5.27505 | 0.2521 | DR's Clinic 10 | 1.5 | 5.27505 | 0.2521 |
| DR's Clinic 4 | 1.5 | 5.27505 | 0.2521 | Canteen | 8 | 28.1336 | 1.3444 |
| DR's Clinic 5 | 1.5 | 5.27505 | 0.2521 | Kitchen | 6 | 21.1002 | 1.0083 |
| DR's Clinic 6 | 1.5 | 5.27505 | 0.2521 | Dietician | 1 | 3.5167 | 0.1680 |
| DR's Clinic 7 | 1.5 | 5.27505 | 0.2521 |  |  |  |  |

**TOTAL C = 5.04147124 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Dental Clinic | 1 | 3.5167 | 0.1680 | Business Office | 2.5 | 8.79175 | 0.4201 |

**TOTAL D = 0.588171645 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Social Service  / Admitting | 1 | 3.5167 | 0.1680 | DSWD Room | 1 | 3.5167 | 0.1680 |

**TOTAL E = 0.336098083 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Chapel | 4 | 14.0668 | 0.6722 | Morgue | 1 | 3.5167 | 0.1680 |

**TOTAL F = 0.840245207 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Pathologist Area | 1 | 3.5167 | 0.1680 | Microbiology Room | 1.5 | 5.27505 | 0.2521 |

**TOTAL G = 0.420122603 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Laboratory | 2.5 | 8.79175 | 0.4201 |  |  |  |  |

**TOTAL H = 0.42012263 L/s**

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Housekeeping | 2 | 7.0334 | 0.3361 |  |  |  |  |

# TOTAL I = 0.3360980826 L/s

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Extraction | 1 | 3.5167 | 0.1680 |  |  |  |  |

**TOTAL J = 0.168049041 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2D - Echo | 2 | 7.0334 | 0.3361 |  |  |  |  |

**TOTAL K = 0.336098083 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Radiology, DRSG | 3 | 10.5501 | 0.5041 | Pharmacy | 2 | 7.0334 | 0.3361 |

**TOTAL L = 0.840245207 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Radiologist Office | 2.5 | 8.79175 | 0.4201 | Cold Storage Room | 1.5 | 5.27505 | 0.2521 |

**TOTAL M = 0.672196165 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| C.T. Scan, Control Room | 5 | 17.5835 | 0.8402 | Film Filling Office | 1 | 3.5167 | 0.1680 |

**TOTAL N = 1.008294248 L/s**

## For Chiller to A:

* **Pipe Diameter (m)**

Nominal Diameter (m) = Found in Figure 7-6 Figure 7-6, Nominal Diameter = 150 mm

Inside Diameter (m) = Found in Table

Table: Dimension of Steel Pipe, Schedule 40, Inside Diameter = 154.1 mm

# Water Velocity (m/s)

Q

v = A =

Q (W)

π D 2

4 i

where: Q = 46.0657 L/s = 0.0460657 m3/s Di = 154.1 m

0.0460657 m3/s

v = π (154.1mm)2

4

v = 2.4699 m/s

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# Pressure Gradient (Pa/m)

Pressure Gradient (Pa/m) = Found in Figure 8 Figure 7-6, Pressure Gradient = 310 Pa/m

# Equivalent Length (m)

Equivalent Length = Total Length of Pipe Pressure Loss on Converging or Diverging Nozzle or Reducer *For welded pipe and flange connected pipe DN ≥ 60*

v12 ρ

A1 2

P1 - P2 =

[ ( )

A2

2

-1]

where: v1 = 2.4699 m/s

ρ = 1000 kg/m3

D1 = 154.1 mm = 0.1541 m

D2 = 128.2 mm = 0.1281 m

Pressure Gradient = 310 Pa/m (2.4699m/s)2(1000kg/m3)

0.1541 m 4

P1 - P2 =

2 [ (0.1281 m)

- 1]

length =

3317.564505 Pa

310 Pa/m

length = 10.70197981 m

Equivalent Length = 8.8 m+(3\*6.1)+50 m+5.4 m+10.70197981 m Equivalent Length = 93.2020 m

# Pressure Drop (m)

Pressure Drop = Pressure Gradient \* Equivalent Length where: Pressure Gradient = 310 Pa/m

Equivalent Length = 93.2020 m Pressure Drop = (310 Pa/m)(93.2020m)

Pressure Drop = 28892.6137 Pa

141

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# Table 45

Summary of Piping Calculations

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pipe Run** | **L/s** | **Nominal Diameter (mm)** | **Inside Diameter (mm)** | **Velocity (m/s)** | **Pres. Grad. (Pa/m)** | **Equivalent Length (m)** | | | **Pressure Drop (Pa)** |
| Pump - Chiller | 46.0657 | 150 | 154.1 | 2.4699 | 310 | 8+(4)(6.1)+50+5.4+5.4+5.4+25 | = | 123.6000 | 38316.0000 |
| Chiller - A | 46.0657 | 150 | 154.1 | 2.4699 | 310 | 8.8+(3)(6.1)+50+5.4+10.70197981 | = | 93.2020 | 28892.6137 |
| A - B | 29.0647 | 125 | 128.2 | 2.2516 | 310 | 3.8+1.5+11.99053415 | = | 17.2905 | 5360.0656 |
| B - C | 12.7350 | 75 | 102.3 | 1.5494 | 300 | 3.8+0.9+7.886007655+3+9.075 | = | 24.6610 | 7398.3023 |
| C - D | 7.6935 | 50 | 77.92 | 1.6134 | 550 | 9.8+0.6 | = | 10.4000 | 5720.0000 |
| D - E | 7.1054 | 50 | 77.92 | 1.4900 | 490 | 4.7+0.6 | = | 5.3000 | 2597.0000 |
| E - F | 6.7693 | 50 | 77.92 | 1.4196 | 450 | 7.625+0.6 | = | 8.2250 | 3701.2500 |
| F - G | 5.9290 | 50 | 77.92 | 1.2434 | 350 | 8+0.6 | = | 8.6000 | 3010.0000 |
| G - H | 5.5089 | 50 | 52.51 | 2.5438 | 1200 | 5.6+0.6 | = | 6.2000 | 7440.0000 |
| H - I | 5.0888 | 50 | 52.51 | 2.3498 | 1000 | 3.2+0.6 | = | 3.8000 | 3800.0000 |
| I - J | 4.7527 | 50 | 52.51 | 2.1946 | 950 | 2.3+0.6 | = | 2.9000 | 2755.0000 |
| J - K | 4.5846 | 50 | 52.51 | 2.1170 | 810 | 1.85+0.6 | = | 2.4500 | 1984.5000 |
| K -L | 4.2485 | 50 | 52.51 | 1.9618 | 800 | 8+2.1+0.6 | = | 10.7000 | 8560.0000 |
| L - M | 3.4083 | 50 | 52.51 | 1.5738 | 490 | 5.25+0.6 | = | 5.8500 | 2866.5000 |
| M - N | 2.7361 | 50 | 52.51 | 1.2634 | 350 | 3.25+0.6 | = | 3.8500 | 1347.5000 |
| N - FCU | 1.7278 | 50 | 52.51 | 0.7978 | 150 | 3.5+2.1+2.1 | = | 7.7000 | 1155.0000 |



# DUCTING CALCULATIONS

* **Computing for L/s (Minor OR 1)**

L Cooling Capacity (v)

s = 𝜌 (t - t )

o

i

where: Cooling Capacity = 3.157 kW

𝜌 = 1.225 kg/m3 v = 0.78 m3/kg to = 33.9°C

ti = 22°C

L 3.157 kW (0.78 m3/kg)(1000L/m3) s = 1.225 kg/m3 (33.9°C - 22°C)

L

s = 188.1685 L/s

# Table 46

Summary of L/s from Air Handling Unit

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **TOR** | **kW** | **L/s** |  | **TO R** | **kW** | **L/s** |
| Operating Room 1 | 4 | 14.0668 | 752.6739 | Hallway (inside) (inside) | 1 | 3.5167 | 188.1685 |
| Operating Room 2 | 4 | 14.0668 | 752.6739 | SSA | 1 | 3.5167 | 188.1685 |
| Delivery  Room | 3.5 | 12.3085 | 658.5924 | Hallway  (inside) | 4 | 14.0668 | 752.6739 |
| Recovery Room | 2.5 | 8.7918 | 470.4239 | Nurse Station ICU | 2.5 | 8.7918 | 470.4239 |
| Labor Room | 1.5 | 5.2751 | 282.2554 | ICU | 6.5 | 22.8586 | 1223.0978 |
| Breast- feeding | 1 | 3.5167 | 188.1685 | Neonatal ICU | 6.5 | 22.8586 | 1223.0978 |
| Nurse Station | 1 | 3.5167 | 188.1685 |  |  |  |  |

# TOTAL A = 7338.5867 L/s

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Isolation Room | 1 | 3.5167 | 188.1685 | Examinati on and Treatmen t Room | 2 | 7.0034 | 374.7317 |

**TOTAL B = 562.9002 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Emergency Room | 1.5 | 5.2751 | 282.2554 | Hallway | 1 | 3.5167 | 188.1685 |

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# TOTAL C = 470.4239 L/s

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Observation Area | 2 | 7.0034 | 374.7317 | Nurse Station | 1 | 3.5167 | 188.1685 |

**TOTAL D = 562.9002 L/s**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Minor OR 1 | 1 | 3.5167 | 188.1685 | Minor OR 2 | 1 | 3.5167 | 188.1685 |

**TOTAL E = 376.337 L/s**

## From A to B:

* **Pipe Diameter (m)**

Nominal Diameter (m) = Found in Figure 8

Figure 8, Nominal Diameter = 650 mm

# Water Velocity (m/s)

Q

v = A =

Q (W)

π D 2

4 i

where: Q = 2575.1782 L/s = 2.5751782 m3/s Di = 0.65 m

2.5751782 m3/s

v = π (650 mm)2

4

v = 7.760367005 m/s

# Pressure Gradient (Pa/m)

Pressure Gradient (Pa/m) = Found in Figure 8 Figure 8, Pressure Gradient = 0.9 Pa/m

# Equivalent Length (m)

Equivalent Length = Total Length of Pipe Pressure Loss on Converging or Diverging Nozzle or Reducer

*For welded pipe and flange connected pipe DN ≥ 60*

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v12 ρ

A1 2

P1 - P2 =

[ ( )

A2

2

-1]

where: v1 = 7.760367005 m/s ρ = 1.225 kg/m3

D1 = 650 mm = 0.650 m

D2 = 550 mm = 0.550 m

Pressure Gradient = 0.9 Pa/m (7.760367005m/s)2(1.225kg/m3)

0.650 m 4

P1 - P2 =

2 [ (

)

0.550 m

- 1]

length =

35.07026993 Pa

0.9 Pa/m

length = 38.96696659 m

Branch Take Off

*For straight through section*

𝑃𝑙𝑜𝑠𝑠 =

where: vd = 7.882807051 m/s vu = 7.760367005 m/s

ρ = 1.225 kg/m3

0.4vd2 ρ

2 [1 −

vd 2

]

v

u

Pressure Gradient = 0.9 Pa/m

(0.4)(7.882807051 m/s)2 (1.225 kg/m3)

7.882807051 m/s 2

Ploss =

length =

0.003789748 Pa

0.9 Pa/m

2 [1- 7.760367005 m/s]

length = 0.004210831 m

Turns

*For 90° Elbow of Circular Duct*

Ploss =

v2

2 (Geometry factor)

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where: v = 7.760367005 m/s

geometry factor = 0.24 (From Figure 6-8)

Ploss =

Pressure Gradient = 0.9 Pa/m

(7.760367005 m/s)2

2 (0.24)

8.8528459 Pa

length =

* 1. Pa/m

length = 9.836471687 m

Equivalent Length = 3.8+1+1.218+16.1881+9+38.967+0.0042+4(9.8365)

Equivalent Length = 109.5232 m

# Pressure Drop (m)

Pressure Drop = Pressure Gradient \* Equivalent Length where: Pressure Gradient = 0.9 Pa/m

Equivalent Length = 109.5232 m Pressure Drop = (0.9 Pa/m)(109.5232 m) Pressure Drop = 98.5708 Pa

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# Table 47

Summary of Ducting Calculations

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Duct Run** | **L/s** | **Nominal Diameter (mm)** | **Velocity (m/s)** | **Pres. Grad. (Pa/m)** | **Equivalent Length (m)** | **Pressure Drop (Pa)** |

# Supply Duct Works

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| AHU - A | 12173.3333 | 1200 | 10.7636 | 0.9 | 1+837.0572+1.2763+18.9230 = 858.2565 | 772.4308 |
| A - B | 2575.1282 | 650 | 7.7604 | 0.9 | 3.8+1+1.218+16.1881+9+38.967+0.0042+39.3459 = 109.5232 | 98.5708 |
| B - C | 1872.8205 | 550 | 7.8828 | 1.15 | 3+40.7579+0.0508 = 43.8087 | 50.3800 |
| C - D | 1170.5128 | 450 | 7.3597 | 1.25 | 3+45.9854+0.5327 = 49.5181 | 61.8976 |
| D - E | 468.2051 | 350 | 4.8664 | 0.8 | 5+15.4594+0.3428 = 20.8022 | 16.6418 |
| E - Diffuser | 234.1026 | 300 | 3.3119 | 0.49 | 4+3.2906 = 7.2906 | 3.5724 |

**TOTAL 1003.4934**

**Return Duct Works**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| INTAKE - B | 3745.6410 | 550 | 7.8828 | 1.15 | 3+110.9969 = 113.9969 | 131.0965 |
| B - A | 3745.6410 | 650 | 7.7604 | 0.9 | 3.8+1.218+16.1881+9+39.3459+0.0089 = 70.5609 | 63.5045 |
| A - AHU | 12173.3333 | 1200 | 10.7636 | 0.9 | 1+18.9230 = 19.9230 | 17.9307 |

**TOTAL 185.9735**

**CHAPTER III**

**ENGINEERING ECONOMIC ANALYSIS, OBSERVATIONS, COMMENTS AND RECOMMENDATIONS**

An air-conditioning system designed for a building is a sophisticated process for it requires satisfaction of all factors including the design of the building itself, economical viability and maintaining conditions of each facility of the building. When it comes to economical viability, it’s not only the cost installation that should be considered but as well as the maintenance cost. The space for ductworks must also be observed since some establishments allot just a little space for it and it will not be adjusted based on the design.

Hospital HVAC system designs demands a more challenge to engineers because of its sensitiveness to the environment. The selection process is not straightforward since there is an increased level of demand, a variety of thermal conditions and codes regarding reliability and hygiene.

A careful decision was done in choosing the appropriate air conditioning design and other equipment upon obtaining the values from the calculations and analysis of Ospital ng Lipa. A certain methodology was followed to properly compute the cooling load of each room which were then projected in the psychrometric chart to obtain the air conditioning capacity together with the cooling coil conditions. These values obtained served as the basis in selecting appropriate equipment taken from a specific catalogue. The capacity was rounded up before selecting the available equipment in the catalogue.

After having the A/C capacity of each floor’s air conditioning unit, the next step would be the equipment selection. A catalogue of A/C unit serves as the basis of choosing equipment appropriate for each area which is presented at the appendix. A combination of fan coil units and hair-handling units are selected with respect to their capacity.

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# Table 48

Summary of A/C Capacity for each floor

|  |  |  |  |
| --- | --- | --- | --- |
| **Floor** | **Design Temperature** | | |
| **24C** | **22.5C** | **22C** |
| Ground Floor | 83.2092 KW or  23.6612 TOR | 143.8918 KW or  40.9167 TOR | 7.3344 KW or  2.0856 TOR |
| Second Floor | 70.9707 KW or  20.1815 TOR | 129.1539 KW or  36.7259 TOR | 72.6384 KW or  20.6553 TOR |
| 3rd Floor | 1.8853 KW or  0.5361 TOR | 327.8798 KW or  94.3073 TOR | - |

The computed total capacity of Ospital ng Lipa is 878.68 kW. Air-cooled air- conditioning system was chosen to be installed in the building since individual room control is needed in an economic manner using room thermostats. Moreover, this system is typically used in structures which requires a more critical indoor maintaining conditions. The list of equipment needed each floor is presented below in tabular for including the quantity of the specific model of each unit, its capacity and the description of the unit.

From the thorough analysis of the building, it is observed that the rooms which require similar maintaining condition stays together. For instance, all the clean rooms are on the right wing of the building which consequently had the ductworks easy to construct. When it comes to ceiling height designed for the building, it provides enough space for ductworks so there were only few adjustments done to properly layout ductworks.

Based on the results obtained from the calculations and careful selection of equipment for Ospital ng Lipa, it is recommended to have a broader knowledge in making engineering decisions to satisfy all the requirements that the building demands. Also, it would be better if the catalogue chosen has a complete specification and price for further evaluation of the equipment.

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# EQUIPMENT SCHEDULE

**Table 49**

Schedule of Outdoor Unit for Ground Floor

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TAG No. | Quantity | Description | Make/Model | Capacity | No. of Indoor Units  Connected | Electrical Data | | | Remarks |
| V | Φ | Hz |
| CH - 1 | 1 | Air-cooled VSD Screw Chiller | YORK YVAA 1093 | 964 KW | 1 x AHU  86 x FCU | - | - | - | see attached catalogue for equipment detailed specification |

# Table 50

Schedule of Outdoor Unit for Ground Floor

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TAG No. | Quantity | Description | Make/Model | Capacity | No. of Indoor  Units Connected | Electrical Data | | | Remarks |
| V | Φ | Hz |
| AHU - 1 | 1 | Standard Series AHU | Daikin/AHUR80DBV | 964 KW | 1 x AHU  86 x FCU | - | - | - | see attached catalogue for equipment detailed specification |

# Table 51

Schedule of Indoor Unit for Ground Floor

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TAG No. | Quantity | Description | Maker/Model | Capacity (TOR) | Area Served | Electrical Data | | | Remarks |
| V | Φ | Hz |
| FCU-A1 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 48R1A | 4 | Canteen | 220-  230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FCU-A2 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Kitchen | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A3 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Radiology, DRSG | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A4 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 28MCHW | 2.5 | C.T. Scan, Control Room | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-A5 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Housekeeping | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A6 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 1 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A7 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 2 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A8 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 3 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A9 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 4 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A10 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 5 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-A11 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 6 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A12 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 7 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FCU-A13 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 8 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A14 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 9 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A15 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | DR's Clinic 10 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-A16 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Dietician | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A17 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Dental Clinic | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A18 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Social Service / Admitting | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A19 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 4 | Chapel | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A20 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Pathologist Area | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A21 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | Microbiology Room | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-A22 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 28MCHW | 2.5 | Laboratory | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A23 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Extraction | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FCU-A24 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 28MCHW | 2.5 | Radiologist Office | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A25 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Film Filling Office | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A26 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Pharmacy | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-A27 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Ultrasound | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A28 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | 2D - Echo | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A29 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Morgue | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A30 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | Cold Storage Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A31 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 28MCHW | 2.5 | Billing and Cashier | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-A29 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | DSWD Room | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |

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# Table 52

Schedule of Indoor Unit for Second Floor

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TAG No. | Quantity | Description | Maker/Model | Capacity (TOR) | Area Served | Electrical Data | | | Remarks |
| V | Φ | Hz |
| FCU-B1 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 28MCHW | 2.5 | Pediatric Ward | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-B2 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Pediatrician | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B3 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Central Sterilizing and Supply Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B4 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Storage | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B5 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Housekeeping | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCUB-6 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Male Ward 1 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B7 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Male Ward 2 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-B8 | 2 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Dialysis - RE | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B9 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Dialysis | 230 | 60 | 1 | see attached catalogue for equipment deta  specification |

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FCU-B10 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 20MCHW | 1.5 | Dialysis - ROS | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B11 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Female Ward 1 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B12 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Female Ward 2 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-B13 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Isolation Ward | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B14 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Treatment and Medication Area | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B15 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Medicine | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B16 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | OB - Gyne | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B17 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Surgery / Anesthesia | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-B18 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Department Head Office | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-B19 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Doctor's Conference | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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# Table 53

Schedule of Indoor Unit for Third Floor

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TAG No. | Quantity | Description | Maker/Model | Capacity (TOR) | Area Served | Electrical Data | | | Remarks |
| V | Φ | Hz |
| FCU-C1 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Housekeeping | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-C2 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Male Ward 1 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C3 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Male Ward 2 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C4 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW,  Koppel/KCA- 24MCHW | 2, 2.5 | Isolation Ward | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C5 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Ward | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C6 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | SP Room 1 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C7 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | SP Room 2 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-C8 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | SP Room 3 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FCU-C9 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | SP Room 4 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C10 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | SP Room 5 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C11 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | SP Room 6 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-C12 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | SP Room 7 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C13 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | Administration Office | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C14 | 2 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | Chief of Nurse | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C15 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Chief Medical Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C16 | 4 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | Conference and Training Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C17 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | Director's Office | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-C18 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Secretary | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C19 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Library and Board of Directors | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FCU-C20 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 1 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C21 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 2 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C22 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 3 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-C23 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 4 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C24 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2 | P Room 5 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C25 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | P Room 6 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C26 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 7 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C27 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 8 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C28 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 9 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-C29 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 10 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C30 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 11 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FCU-C31 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 12 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C32 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 13 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C33 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 14 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| FCU-C34 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 15 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C35 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 24MCHW | 2.5 | P Room 16 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C36 | 1 | Ceiling Cassette Chilled Water Fan Coil Unit | Koppel/KCA- 36MCHW | 3 | Isolation Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| FCU-C37 | 1 | Wall Mounted Fan Coil Unit | Koppel/KSW- 10MCHW | 1 | Treatment Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

# Table 54

Schedule of Diffuser for First and Second Floor

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TAG No. | Quantity | Description | Maker/Model | Capacity (TOR) | Area Served | Electrical Data | | | Remarks |
| V | Φ | Hz |

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| D-1 | 4 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Operating Room 1 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-2 | 4 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Operating Room 2 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-3 | 4 | Square multidirectional diffusers with removable  central core | Ecoclima/EDQ11 | 1 | Delivery Room | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| D-4 | 3 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Recovery Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-5 | 2 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Labor Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-6 | 1 | Square multidirectional diffusers with removable  central core | Ecoclima/EDQ11 | 1 | Breastfeeding | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| D-7 | 1 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Nurse Station | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-8 | 1 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Hallway (inside)(inside) | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-9 | 1 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | SSA | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-10 | 4 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Hallway (inside) | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-11 | 3 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Nurse Station ICU | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| D-12 | 6 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | ICU | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-13 | 7 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Neonatal ICU | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-14 | 1 | Square multidirectional diffusers with removable  central core | Ecoclima/EDQ11 | 1 | Isolation Room | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| D-15 | 2 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Examination and Treatment Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-16 | 2 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Emergency Room | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-17 | 1 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Hallway | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-18 | 2 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Observation Area | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-19 | 1 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Nurse Station | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |
| D-20 | 1 | Square multidirectional diffusers with removable  central core | Ecoclima/EDQ11 | 1 | Minor OR 1 | 230 | 60 | 1 | see attached catalogue for equipment detailed  specification |
| D-21 | 1 | Square multidirectional diffusers with removable central core | Ecoclima/EDQ11 | 1 | Minor OR 2 | 230 | 60 | 1 | see attached catalogue for equipment detailed specification |

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