A PROJECT REPORT

ON

"DESIGN AND DRAFTING OF HVAC SYSTEM"

Submitted by

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KHAN AQUIB 16ME27

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In partial fulfillment for the award of the Degree

Of

BACHELOR OF ENGINEERING IN

MECHANICAL ENGINEERING UNDER THE GUIDANCE

Of

Prof. RIZWAN SHAIKH

DEPARTMENT OF MECHANICAL ENGINEERING

ANJUMAN-I-ISLAM

KALSEKAR TECHNICAL CAMPUS NEW PANVEL,

NAVI MUMBAI – 410206

UNIVERSITY OF MUMBAI

ACADEMIC YEAR 2019-2020

ANJUMAN-I-ISLAM

KALSEKAR TECHNICAL CAMPUS NEW PANVEL

(Approved by AICTE, recg. By Maharashtra Govt. DTE, Affiliated to Mumbai University)

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CERTIFICATE

This is to certify that the project entitled

"DESIGN AND DRAFTING OF HVAC SYSTEM"

Submitted by

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CHOUDHARY ABDULLAH	**16ME18**
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KHAN MOHAMMED FAIZ ALAM	**16ME31**

To the Kalsekar Technical Campus, New Panvel is a record of bonafide work carried out by him under our supervision and guidance, for partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Mechanical Engineering as prescribed by **University Of Mumbai**, is approved.

Internal Examinar

(Prof. RIZWAN SHAIKH)

Head of Department

(Prof. ZAKIR ANSARI)

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(Dr. ABDULRAZAK HONNUTAGI)

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APPROVAL OF DISSERTATION

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(Internal Examiner) **(External Examiner)**

_____ _____

Date: _____

ACKNOWLEDGEMENT

DESIGN AND DRAFTING OF HVAC SYSTEM

After the completion of this work, we would like to give our sincere thanks to all those who helped us to reach our goal. It's a great pleasure and moment of immense satisfaction for us to express my profound gratitude to our guide **Prof. RIZWAN SHAIKH** whose constant encouragement enabled us to work enthusiastically. His perpetual motivation, patience and excellent expertise in discussion during progress of the project work have benefited us to an extent, which is beyond expression.

We would also like to give our sincere thanks to **Prof. ZAKIR ANSARI**, Head Of Department, **Prof. RIZWAN SHAIKH**, Project Co-Guide and Prof. , Project co-ordinator from Department of Mechanical Engineering, Kalsekar Technical Campus, New Panvel, for their guidance, encouragement and support during a project.

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Last but not the least I would also like to thank all the staffs of Kalsekar Technical Campus (Mechanical Engineering Department) for their valuable guidance with their interest and valuable suggestions brightened us.

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INTRODUCTION

SPLIT SYSTEM

A split system is an air-conditioning or heat pump system that uses refrigerant as the heat exchange fluid and has an evaporator, compressor and condenser as separate components. In most modern commercial application, the compressor and condenser are combined into a single piece of equipment called a condensing unit. Refrigerant piping, custom-designed to meet the physical requirement of each individual application, connects the system component.

A typical residential central air-conditioning system is a split system. The compressor and condenser are combined as a single condensing unit mounted outdoors.The evaporator, a finned coil is mounted in a section of ductwork downstream of a furnace blower. Two flexible refrigerant lines, one for gas and one for liquid, connect the components.

This white paper is intended as a primer on light commercial and industrial split systems. It reviews basic design and installation requirements, equipment, application differentiators, and typical application for split systems.

DUCT SYSTEM

Ducts are conduits or passages used in heating, ventilation, and air conditioning (HVAC) to deliver and remove air. The needed airflows include, for example, supply air, return air, and exhaust air. Ducts commonly also deliver ventilation air as part of the supply air. As such, air ducts are one method of ensuring acceptable indoor air quality as well as thermal comfort.

A duct system is also called ductwork. Planning (laying out), sizing, optimizing, detailing, and finding the pressure losses through a duct system is called duct design.

What is a Duct Air Conditioning system?

Ducted air conditioning is the most efficient cooling system for homes and businesses on the market today. Ducted Air Conditioners can cool every room in your home or office using just one system. Through one system, you can keep you temperature of your bedroom cool and inviting for cosy sleep; living room little balmy for perfect party; your kids room comfortable for their daily activities and much more. In general Ducted AC is the ideal cooling system for Queensland climate and big houses with more than 3 bedrooms. It allows for complete control of the temperature inside the premise. This system can also be combined with a dehumidifier to lower the amount of moisture for maximum comfort.

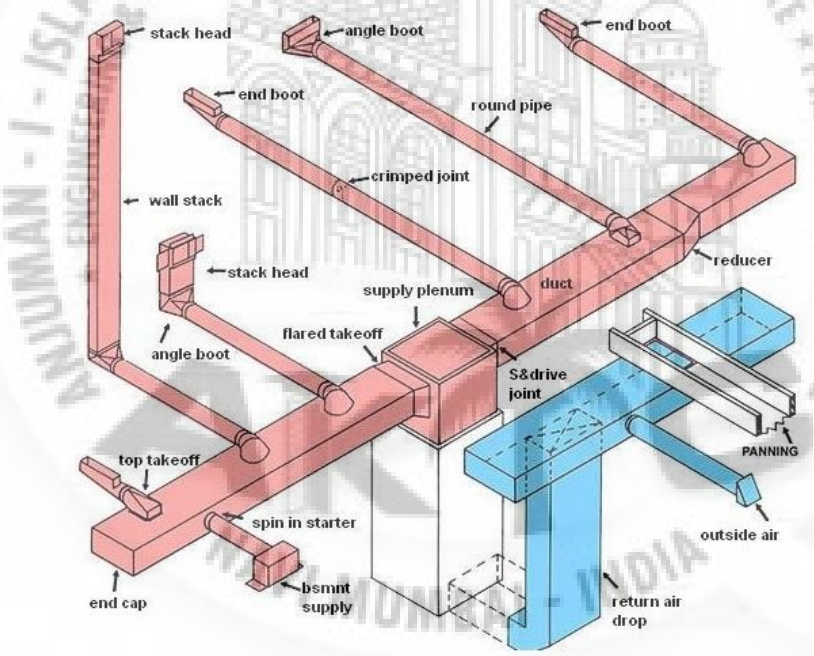

Fig. 1.1 Air Duct Design

How Does Ducted AC Work?

Ducted air conditioning works by funnelling cool air from a central unit (usually installed in your roof) through a series of ducts to every room in your home. The circulation of air is usually zoned, that allows you to control airflow, temperature and turning off any zones. This reduces the running cost and allows to have temperature of house comfortable for Queensland's climate with hot summers and cold winters.

Unless your home has a ductless system or relies solely on window units for cooling, it has ducts. You probably have a good idea how ducts carry air from the central inside unit of your AC or your heater, but those ducts represent only part of the system. To understand how air moves throughout your home, it's helpful to know about air sources and what your HVAC system does to keep you comfortable.

What is a Split Air Conditioning system?

A split air conditioner consists of an outdoor unit and an indoor unit. The outdoor unit is installed on or near the exterior wall of the room that you wish to cool. This unit houses the compressor, condenser coil and the expansion coil or capillary tubing. The sleek-looking indoor unit contains the cooling coil, a long blower and an air filter.

Why use Split AC?

In a split system (unlike a window unit), the compressor and fan for the condenser are located outside the room being cooled and therefore the major sources of noise are removed. This makes it easy to cool multiple rooms or maintain the temperature throughout a large room via the use of two indoor cooling units.

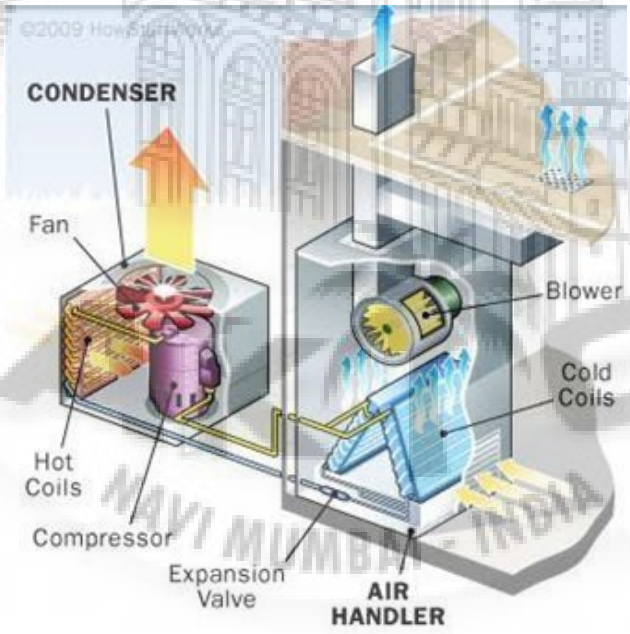

Fig.1.2 Window And Split-System AC Units

1.1 PROBLEM DEFINATION

A right sized HVAC system will provide the desired comfort and will run efficiently. Right-sizing of an HVAC system is the selection of equipment and the design of the air distribution system to meet the accurate predicted heating and cooling loads of the house. Right-sizing the HVAC system begins with an accurate understanding of the heating and cooling loads on a space.

The main purposes of a Heating, Ventilation and Air-Conditioning (HVAC) system are to help maintain good indoor air quality through adequate ventilation with filtration and provide thermal comfort. HVAC systems are among the largest energy consumers in office. The choice and design of the HVAC system can also affect many other high performance goals, including water consumption (water cooled air conditioning equipment) and acoustics.

One of the most common air conditioning problems is improper operation. If your air conditioner is on, be sure to close your home's windows and outside doors. For room air conditioners, isolate the room or a group of connected rooms as much as possible from the rest of your home.

Other common problems with existing air conditioners result from faulty installation, poor service procedures, and inadequate maintenance. Improper installation of a central air conditioner can result in leaky ducts and low airflow.

1. : AIM/OBJECTIVE

- **The aim is to keep it more comfortable inside the house than it is outside. The split air conditioners are used for single rooms or small office spaces.**
- **The aim is to design and control Split AC system such that to minimize the life cycle costs, including capital, operational costs, maintenance and commissioning costs etc.**
- **Air conditioning is the process of removing heat and moisture from the interior of an occupied space to improve the comfort of occupants**
- **The end goal of split air system is to reduce humidity by at least 55%, cool the internal living space and ultimately expel the warm air into the atmosphere.**
- **Promote the project through dedicated dissemination channels and networking in order to rise market awareness and pave the way for subsequent commercial exploitation and wide replication at the European level.**
- **Rise society and consumers awareness about newer and low carbon residential air conditioning technologies, thus trying to encourage changes in consumers' attitudes, inspire more environmentally responsible behaviors and stimulate European investments in innovative eco-friendly technologies.**

Chapter: 02

LITERATURE SURVEY

SR. NO.	TITLE	AUTHER	ABSTRACT
1	Design And Drafting of Hvac, Central Air Conditioning System For An Office Building.	K. Ratna Kumari , A. Raji Reddy , M. Vidya Sagar	The heating, ventilation, and air-conditioning (HVAC) system is arguably the most complex system installed in a building and is responsible for a substantial component of the total building energy use. A right sized HVAC system will provide the desired comfort and will run efficiently. Right-sizing of an HVAC system is the selection of equipment and the design of the air distribution system to meet the accurate predicted heating and cooling loads of the house. Right-sizing the HVAC system begins with an accurate understanding of the heating and cooling loads on a space; however, a full HVAC design involves more than just the load estimate calculation; the load calculation is the first step of the iterative HVAC design procedure. This strategy guideline discusses the information needed to design the air distribution system to deliver the proper amount of conditioned air to a space. Heating and cooling loads are dependent upon the building location, sighting, and the construction of the house, whereas the equipment selection and the air distribution design are dependent upon the loads and each other.

2	Design and Construction of Split Unit Air Conditioner	Akusu O.M., Salisu, S., and Akinfaloye, O.A.	This project study is applicable to the field of heating, ventilation and air conditioning. The design and construction of a split unit air conditioner was carried out to achieve a suitable comfort in an office environment. After a study of existing air-conditioners and survey for availability of materials, the design concept of the split unit air-conditioner was achieved. And the following standard part were estimated as; compressor power rating 2.5hp, condenser power 8KW, evaporator power 5.85KW and power rating of blower as 120watts. And with a working fluid of refrigerant R410A which is weak compared to refrigerant R22 but less hazardous to the environment. The split unit air conditioner was tested for conformance to specification and it was satisfactory.

Chapter: 03

METHODOLOGY

1. **Site visit / site survey.**
2. **Measurement of area.**
3. **Design of plant layout.**
4. **Heat load calculation.**
5. **Equipment selection.**
6. **Location of equipment and clearance of ducting and piping routes.**
7. **Duct sizing and duct designing.**
8. **Diffuser selection.**
9. **Location of supply and return diffuser for architectural asthetic.**

A) Heat load calculation:-

A) Room sensible heat load:-

1) Solar heat gain through glasses.

2) Solar and transmission gain trough wall and roof.

3) Transmission gain except walls and roof.

4) In filteration and outside air.

5) Internal heat.

6) By adding all the above factor we will get room sensible heat total.

B) Room latent heat load:-

1) Outside air.

2) Air

3) By adding all the above the roof factor we will get room latent heat total.

Chapter: 04

Analyzing work

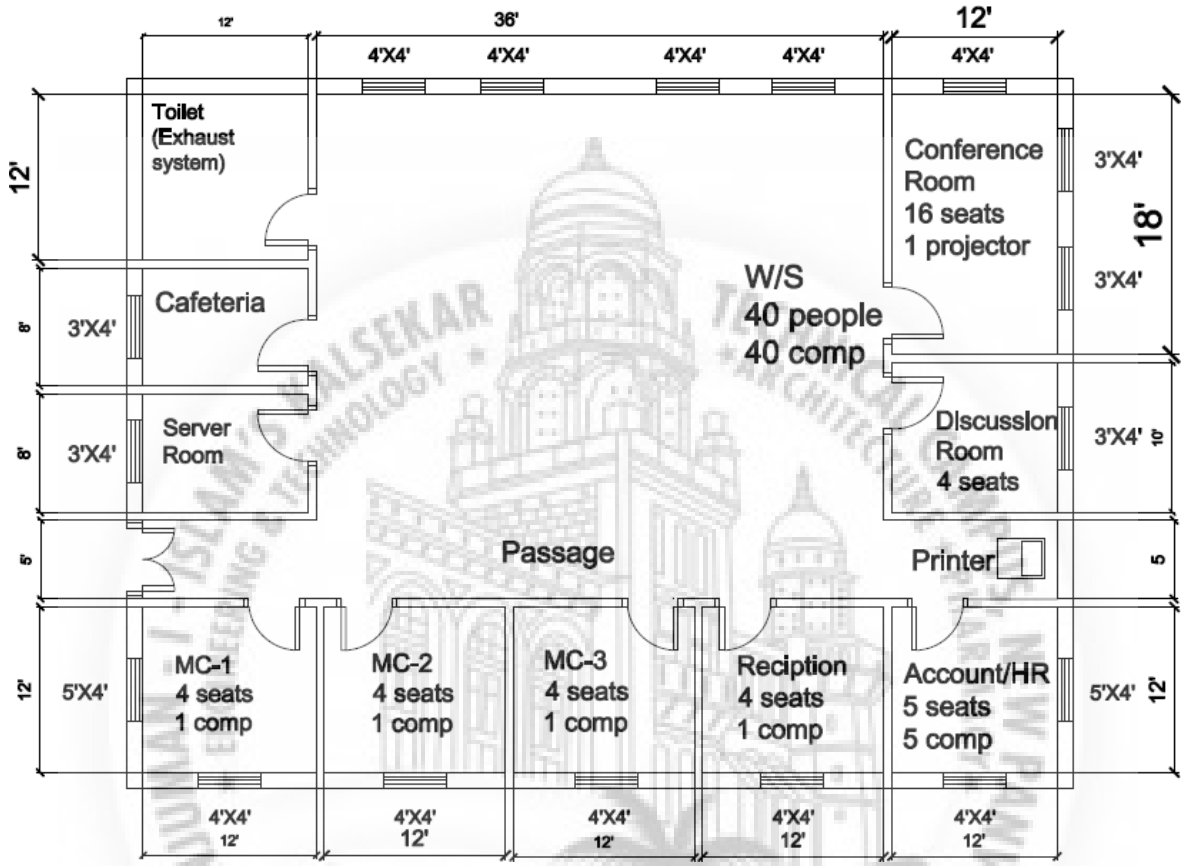

Fig.2.1 OFFICE LAYOUT

DETAIL OF OFFICE LAYOUT

1. The above figure shows the layout of the office.
2. In this figure various room are to be air conditioned.
3. This figure is in direction of N-S-E-W.
4. MC-1 Consist of 4 seats and 1 computer. The exposed walls are in west and south direction. The glass window is attached to both the exposed walls.
5. MC-2 Consist of 4 seats and 1 computer. The exposed wall in south direction. The glass window is attached to the exposed wall 6. MC-3 is same as MC-2.
7. ACCOUNT/HR consist of 5 seats and 5 computer. The exposed wall is in south Direction. The glass window is attached to the exposed wall.
8. Discussion room consist of 4 seats. The exposed wall in east direction. The glass window is attached to the exposed wall.
9. Conference room consist of 16 seats and 1 projector. The exposed wall is in east and North direction. 2 glass window attached to exposed wall in east and 1 glass window attached to exposed wall in north.
10. The toilet area is not required air conditioning.
11. Cafeteria consist of exposed wall in west with glass window attached to it.
12. Server room required air conditioning 24//7 with exposed wall in west. The glass window attached wall.

HEAT LOAD ESTIMATION

DESIGN DATA:-

1. AREA (Manager Cabin)

Area=12′*12′=144 sq.ft.

Height=10.5 feet

Lighting Load=1.25 w/sq.ft.

Computer=200 w

People=4

Weight of the wall=80 lb/sq.ft.

From design data book and psychometric chart.

SPECIFICATION	D.B(F°)	W.B(F°)	R.H(%)	GR/LB
Outside	95	83	60	153
Inside	75	62.5	50	65
Difference	20	20.5	10	88

A)Room sensible heat load:-

***Solar heat gain through glass.**

A) Room total heat load= Room sensible heat total + Room latent heat total.

B) Load on cooling coil.

C) Tonnage

D) Sensible heat factor = (ERSH / ERSH+ERLH)

E) Select ADP

A) Dehumidified rise = (1-B.F)*(I.T-ADP)

B) Total Dehumidified CFM= (RSHT/ 1.08*D.R)

2.AREA (Account/HR)

Area=12′*12′=144 sq.ft.

Height=10.5 feet

Lighting Load=1.25 w/sq.ft.

Computer=200 w

People=5

Weight of the wall=80 lb/sq.ft.

From design data book and psychometric chart.

SPECIFICATION	D.B(F°)	W.B(F°)	R.H(%)	GR/LB
Outside	95	83	60	153
Inside	75	62.5	50	65
Difference	20	20.5	10	88

A)Room sensible heat load:-

***Solar heat gain through glass.**

3.AREA (Discussion room)

Area=12′*10′=120 sq.ft.

Height=10.5 feet

Lighting Load=1.25 w/sq.ft.

Computer=200 w

People=4

Weight of the wall=80 lb/sq.ft.

From design data book and psychometric chart.

SPECIFICATION	D.B(F°)	W.B(F°)	R.H(%)	GR/LB
Outside	95	83	60	153
Inside	75	62.5	50	65
Difference	20	20.5	10	88

A)Room sensible heat load:-

***Solar heat gain through glass.**

4.AREA (Conference room)

Area=18′*12′=216 sq.ft.

Height=10.5 feet

Lighting Load=1.25 w/sq.ft.

Computer=200 w

People=16

Weight of the wall=80 lb/sq.ft.

From design data book and psychometric chart.

SPECIFICATION	D.B(F°)	W.B(F°)	R.H(%)	GR/LB
Outside	95	83	60	153
Inside	75	62.5	50	65
Difference	20	20.5	10	88

A)Room sensible heat load:-

***Solar heat gain through glass.**

5.AREA (Cafeteria)

Area=12′*8′=96 sq.ft.

Height=10.5 feet

Lighting Load=1.25 w/sq.ft.

Computer=200 w

People=6

Weight of the wall=80 lb/sq.ft.

From design data book and psychometric chart.

SPECIFICATION	D.B(F°)	W.B(F°)	R.H(%)	GR/LB
Outside	95	83	60	153
Inside	75	62.5	50	65
Difference	20	20.5	10	88

A)Room sensible heat load:-

***Solar heat gain through glass.**

6.AREA (Server room)

Area=12′*8′=96 sq.ft.

Height=10.5 feet

Lighting Load=1.25 w/sq.ft.

Computer=200 w

People=1

Weight of the wall=80 lb/sq.ft.

From design data book and psychometric chart.

SPECIFICATION	D.B(F°)	W.B(F°)	R.H(%)	GR/LB
Outside	95	83	60	153
Inside	75	62.5	50	65
Difference	20	20.5	10	88

A)Room sensible heat load:-

***Solar heat gain through glass.**

7.AREA (Passage)

Area=1452 sq.ft.

Height=10.5 feet

Lighting Load=1.25 w/sq.ft.

Computer=200 w

People=40

Weight of the wall=80 lb/sq.ft.

From design data book and psychometric chart.

SPECIFICATION	D.B(F°)	W.B(F°)	R.H(%)	GR/LB
Outside	95	83	60	153
Inside	75	62.5	50	65
Difference	20	20.5	10	88

A)Room sensible heat load:-

***Solar heat gain through glass.**

*HEAT BALANCE SHEET (MC-1)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: MC-1

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	144.00	1512.00

Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	0	23	0.56	0
E	0	12	0.56	0
S	16	14	0.56	125
W	20	145	0.56	1624
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	0	0	0	0
E	0	0	0	0
S	110	29	0.33	1053
W	106	23.5	0.33	822
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	0.00	37	0.12	0
Trans.Gain except Walls & Roofs.				
All Glass	36	20	1.13	814
Partition	252.00	15	0.33	1247
Ceiling	144.00	15	0.32	691
Floor	144.00	15	0.57	1231
Infiltration & Out side Air				
Infiltration.				
Outside air	28.64	20	0.1296	74
Internal Heat				
People	4	1	245	980
Light (W)	144.00	1.25	3.41	614
Computers (W)	1	200	3.41	682
Equipments (KW)	0	1	3400	0
				9958
Fan Motor Output	5.00%	Safety	5%	996
ROOM SENSIBLE HEAT TOTAL				10953
(B). ROOM LATENT HEAT				
Out Side Air	28.64	88	0.0816	206
People	4	1	205	820
Room Latent Head Sub Total				1026
Safety	5%			51
ROOM LATENT HEAT TOTAL				1077
ROOM TOTAL HEAT (A + B)				12030
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	28.64	20	0.9504	544
Latent	28.64	88	0.5984	1508
Return Duct Heat Gain	5%			548
TONS	GRAND TOTAL HEAT (BTU/HR)			14,631
OTHER HEAT GAINS @ 3%				439
TONS	GRAND TOTAL HEAT (BTU/HR)			15,069

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12

Sensible Heat Factor	0.91
Selected ADP	53.8
Dehumidified rise	18.656
TOTAL D.CFM	543.63
TONNAGE	1.3
SQFT / TR	114.7
SQFT/PERSON	36.0
CFM/SQFT	3.8
CFM/TR	432.9
F.A CHANGES	1.1
R.A CHANGES	21.6

Comments:
1.Outside Condition MUMBAI
2.Weight of Wall = 80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blinds of LIGHT Color.
4. All External walls are considered as exposed.
5.Lighting load considered is 1.25 W/Sqft
6.All data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directly to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

*HEAT BALANCE SHEET (MC-2)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: MC-2

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	144.00	1512.00

Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	0	23	0.56	0
E	0	12	0.56	0
S	16	14	0.56	125
W	0	145	0.56	0
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	0	0	0	0
E	0	0	0	0
S	110	29	0.33	1053
W	0	23.5	0.33	0
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	0.00	37	0.12	0
Trans.Gain except Walls & Roofs.				
All Glass	16	20	1.13	362
Partition	473.00	15	0.33	2341
Ceiling	144.00	15	0.32	691
Floor	144.00	15	0.57	1231
Infiltration & Out side Air				
Infiltration.				
Outside air	28.64	20	0.1296	74
Internal Heat				
People	4	1	245	980
Light (W)	144.00	1.25	3.41	614
Computers (W)	1	200	3.41	682
Equipments (KW)	0	1	3400	0
				8154
Fan Motor Output	5.00%	Safety	5%	815
ROOM SENSIBLE HEAT TOTAL				8969
(B). ROOM LATENT HEAT				
Out Side Air	28.64	88	0.0816	206
People	4	1	205	820
Room Latent Head Sub Total				1026
Safety	5%			51
ROOM LATENT HEAT TOTAL				1077
ROOM TOTAL HEAT (A + B)				10046
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	28.64	20	0.9504	544
Latent	28.64	88	0.5984	1508
Return Duct Heat Gain	5%			448
TONS	GRAND TOTAL HEAT (BTU/HR)			12,547
OTHER HEAT GAINS @ 3%				376
TONS	GRAND TOTAL HEAT (BTU/HR)			12,923

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12		
Sensible Heat Factor			0.89
Selected ADP			53
Dehumidified rise			19.36
TOTAL D.CFM			428.95
TONNAGE			1.1
SQFT / TR			133.7
SQFT/PERSON			36.0
CFM/SQFT			3.0
CFM/TR			398.3
F.A CHANGES			1.1
R.A CHANGES			17.0

Comments:
1.Outside Condition MUMBAI
2.Weight of Wall = 80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blind of LIGHT Color.
4. All External walls are considered as exposed.
5.Lighting load considered is 1.25 W /Sqft
6.All data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directly to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

*HEAT BALANCE SHEET (MC-3)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: MC-3

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	144.00	1512.00
Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	0	23	0.56	0
E	0	12	0.56	0
S	16	14	0.56	125
W	0	145	0.56	0
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	0	0	0	0
E	0	0	0	0
S	110	29	0.33	1053
W	0	23.5	0.33	0
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	0.00	37	0.12	0
Trans.Gain except Walls & Roofs.				
All Glass	16	20	1.13	362
Partition	473.00	15	0.33	2341
Ceiling	144.00	15	0.32	691
Floor	144.00	15	0.57	1231
Infiltration & Out side Air				
Infiltration.				
Outside air	28.64	20	0.1296	74
Internal Heat				
People	4	1	245	980
Light (W)	144.00	1.25	3.41	614
Computers (W)	1	200	3.41	682
Equipments (KW)	0	1	3400	0
				8154
Fan Motor Output	5.00%	Safety	5%	815
ROOM SENSIBLE HEAT TOTAL				8969
(B). ROOM LATENT HEAT				
Out Side Air	28.64	88	0.0816	206
People	4	1	205	820
Room Latent Head Sub Total				1026
Safety	5%			51
ROOM LATENT HEAT TOTAL				1077
ROOM TOTAL HEAT (A + B)				10046
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	28.64	20	0.9504	544
Latent	28.64	88	0.5984	1508
Return Duct Heat Gain	5%			448
TONS	GRAND TOTAL HEAT (BTU/HR)			12,547
OTHER HEAT GAINS @ 3%				376
TONS	GRAND TOTAL HEAT (BTU/HR)			12,923

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12
Sensible Heat Factor	0.89
Selected ADP	53
Dehumidified rise	19.36
TOTAL D.CFM	428.95
TONNAGE	1.1
SQFT / TR	133.7
SQFT/PERSON	36.0
CFM/SQFT	3.0
CFM/TR	398.3
F.A CHANGES	1.1
R.A CHANGES	17.0

Comments:
1. Outside Condition MUMBAI
2. Weight of Wall = 80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blind of LIGHT Color.
4. All External walls are considered as exposed.
5. Lighting load considered is 1.25 W /Sqft
6. All data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directly to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

*HEAT BALANCE SHEET (ACCOUNT/HR)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: ACCOUNT/HR

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	144.00	1512.00

Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	0	23	0.56	0
E	20	13	0.56	146
S	16	14	0.56	125
W	0	145	0.56	0
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	0	0	0	0
E	106	25.5	0.33	892
S	110	29	0.33	1053
W	0	23.5	0.33	0
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	144.00	37	0.12	639
Trans.Gain except Walls & Roofs.				
All Glass	36	20	1.13	814
Partition	473.00	15	0.33	2341
Ceiling	0.00	15	0.32	0
Floor	144.00	15	0.57	1231
Infiltration & Out side Air				
Infiltration.				
Outside air	33.64	20	0.1296	87
Internal Heat				
People	5	1	245	1225
Light (W)	144.00	1.25	3.41	614
Computers (W)	5	200	3.41	3410
Equipments (KW)	0	1	3400	0
				12577
Fan Motor Output	5.00%	Safety	5%	1258
ROOM SENSIBLE HEAT TOTAL				13835
(B). ROOM LATENT HEAT				
Out Side Air	33.64	88	0.0816	242
People	5	1	205	1025
Room Latent Head Sub Total				1267
Safety	5%			63
ROOM LATENT HEAT TOTAL				1330
ROOM TOTAL HEAT (A + B)				15165
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	33.64	20	0.9504	639
Latent	33.64	88	0.5984	1771
Return Duct Heat Gain	5%			692
TONS	GRAND TOTAL HEAT (BTU/HR)			18,267
OTHER HEAT GAINS @ 3%				548
TONS	GRAND TOTAL HEAT (BTU/HR)			18,816

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12		
Sensible Heat Factor			0.91
Selected ADP			53.8
Dehumidified rise			18.656
TOTAL D.CFM			686.65
TONNAGE			1.6
SQFT / TR			91.8
SQFT/PERSON			28.8
CFM/SQFT			4.8
CFM/TR			437.9
F.A CHANGES			1.3
R.A CHANGES			27.2

Comments:
1. Outside Condition MUMBAI
2. Weight of Wall = 80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blind of LIGHT Color.
4. All External walls are considered as exposed.
5. Lighting load considerd is 1.25W/Sqft
6. Alll data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directly to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

*HEAT BALANCE SHEET (DISCUSSION ROOM)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: DISCUSSION ROOM

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	120.00	1260.00

Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	0	23	0.56	0
E	12	13	0.56	87
S	0	14	0.56	0
W	0	145	0.56	0
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	0	0	0	0
E	93	25.5	0.33	783
S	0	29	0.33	0
W	0	23.5	0.33	0
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	120.00	37	0.12	533
Trans.Gain except Walls & Roofs.				
All Glass	12	20	1.13	271
Partition	473.00	15	0.33	2341
Ceiling	0.00	15	0.32	0
Floor	120.00	15	0.57	1026
Infiltration & Out side Air				
Infiltration.				
Outside air	27.2	20	0.1296	71
Internal Heat				
People	4	1	245	980
Light (W)	120.00	1.25	3.41	512
Computers (W)	0	200	3.41	0
Equipments (KW)	0	1	3400	0
				6603
Fan Motor Output	5.00%	Safety	5%	660
ROOM SENSIBLE HEAT TOTAL				7264
(B). ROOM LATENT HEAT				
Out Side Air	27.2	88	0.0816	195
People	4	1	205	820
Room Latent Head Sub Total				1015
Safety	5%			51
ROOM LATENT HEAT TOTAL				1066
ROOM TOTAL HEAT (A + B)				8330
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	27.2	20	0.9504	517
Latent	27.2	88	0.5984	1432
Return Duct Heat Gain	5%			363
TONS	GRAND TOTAL HEAT (BTU/HR)			10,642
OTHER HEAT GAINS @ 3%				319
TONS	GRAND TOTAL HEAT (BTU/HR)			10,962

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12	
Sensible Heat Factor		0.87
Selected ADP		53
Dehumidified rise		19.36
TOTAL D.CFM		347.40
TONNAGE		0.9
SQFT / TR		131.4
SQFT/PERSON		30.0
CFM/SQFT		2.9
CFM/TR		380.3
F.A CHANGES		1.3
R.A CHANGES		16.5

Comments:
1.Outside Conditioiion MUMBAI
2.Weight of Wall = 80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blinds of LIGHT Color.
4. All External walls are considered as exposed.
5. Lighting load considerd is 1.25W/Sqft
6.Alll data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directly to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

*HEAT BALANCE SHEET (CONFERENCE ROOM)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: CONFERENCE ROOM

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	216.00	2268.00

Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	16	13	0.56	116
E	24	13	0.56	175
S	0	14	0.56	0
W	0	145	0.56	0
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	110	14.5	0.33	526
E	165	25.5	0.33	1388
S	0	29	0.33	0
W	0	23.5	0.33	0
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	144.00	37	0.12	639
Trans.Gain except Walls & Roofs.				
All Glass	24	20	1.13	542
Partition	336.00	15	0.33	1663
Ceiling	0.00	15	0.32	0
Floor	216.00	15	0.57	1847
Infiltration & Out side Air				
Infiltration.				
Outside air	92.96	20	0.1296	241
Internal Heat				
People	16	1	245	3920
Light (W)	216.00	1.25	3.41	921
Computers (W)	0	200	3.41	0
Equipments (KW)	1	1	3400	3400
				15379
Fan Motor Output	5.00%	Safety	5%	1538
ROOM SENSIBLE HEAT TOTAL				16917
(B). ROOM LATENT HEAT				
Out Side Air	92.96	88	0.0816	668
People	16	1	205	3280
Room Latent Head Sub Total				3948
Safety	5%			197
ROOM LATENT HEAT TOTAL				4145
ROOM TOTAL HEAT (A + B)				21062
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	92.96	20	0.9504	1767
Latent	92.96	88	0.5984	4895
Return Duct Heat Gain	5%			846
TONS	GRAND TOTAL HEAT (BTU/HR)			28,570
OTHER HEAT GAINS @ 3%				857
TONS	GRAND TOTAL HEAT (BTU/HR)			29,427

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12
Sensible Heat Factor	0.80
Selected ADP	51
Dehumidified rise	21.12
TOTAL D.CFM	741.68
TONNAGE	2.5
SQFT / TR	88.1
SQFT/PERSON	13.5
CFM/SQFT	3.4
CFM/TR	302.4
F.A CHANGES	2.5
R.A CHANGES	19.6

Comments:
1. Outside Condition MUMBAI
2. Weight of Wall =80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blind of LIGHT Color.
4. All External walls are considered as exposed.
5. Lighting load considerd is 1.25W/Sqft
6. Alll data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directly to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

*HEAT BALANCE SHEET (CAFETERIA)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: CAFETERIA

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	96.00	1008.00

Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	0	23	0.56	0
E	0	13	0.56	0
S	0	14	0.56	0
W	12	145	0.56	974
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	0	0	0	0
E	0	25.5	0.33	0
S	0	29	0.33	0
W	72	23.5	0.33	558
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	0.00	37	0.12	0
Trans.Gain except Walls & Roofs.				
All Glass	12	20	1.13	271
Partition	473.00	15	0.33	2341
Ceiling	96.00	15	0.32	461
Floor	96.00	15	0.57	821
Infiltration & Out side Air				
Infiltration.				
Outside air	35.76	20	0.1296	93
Internal Heat				
People	6	1	245	1470
Light (W)	96.00	1.25	3.41	409
Computers (W)	1	50	3.41	171
Equipments (KW)	0	1	3400	0
				7569
Fan Motor Output	5.00%	Safety	5%	757
ROOM SENSIBLE HEAT TOTAL				8326
(B). ROOM LATENT HEAT				
Out Side Air	35.76	88	0.0816	257
People	6	1	205	1230
Room Latent Head Sub Total				1487
Safety	5%			74
ROOM LATENT HEAT TOTAL				1561
ROOM TOTAL HEAT (A + B)				9887
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	35.76	20	0.9504	680
Latent	35.76	88	0.5984	1883
Return Duct Heat Gain	5%			416
TONS	GRAND TOTAL HEAT (BTU/HR)			12,866
OTHER HEAT GAINS @ 3%				386
TONS	GRAND TOTAL HEAT (BTU/HR)			13,252

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12	
Sensible Heat Factor		0.84
Selected ADP		51.8
Dehumidified rise		20.416
TOTAL D.CFM		377.62
TONNAGE		1.1
SQFT / TR		86.9
SQFT/PERSON		16.0
CFM/SQFT		3.9
CFM/TR		341.9
F.A CHANGES		2.1
R.A CHANGES		22.5

Comments:
1. Outside Condition MUMBAI
2. Weight of Wall =80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blin of LIGHT Color.
4. All External walls are considered as exposed.
5. Lighting load considerd is 1.25W/Sqft
6. Alll data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directl to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

*HEAT BALANCE SHEET (SERVER ROOM)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: SERVER ROOM

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	96.00	1008.00

Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	0	23	0.56	0
E	0	13	0.56	0
S	0	14	0.56	0
W	12	145	0.56	974
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	0	0	0	0
E	0	25.5	0.33	0
S	0	29	0.33	0
W	72	23.5	0.33	558
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	0.00	37	0.12	0
Trans.Gain except Walls & Roofs.				
All Glass	12	20	1.13	271
Partition	473.00	15	0.33	2341
Ceiling	96.00	15	0.32	461
Floor	96.00	15	0.57	821
Infiltration & Out side Air				
Infiltration.				
Outside air	10.76	20	0.1296	28
Internal Heat				
People	1	1	245	245
Light (W)	96.00	1.25	3.41	409
Computers (W)	1	200	3.41	682
Equipments (KW)	1	2	3400	6800
				13591
Fan Motor Output	5.00%	Safety	5%	1359
ROOM SENSIBLE HEAT TOTAL				14950
(B). ROOM LATENT HEAT				
Out Side Air	10.76	88	0.0816	77
People	1	1	205	205
Room Latent Head Sub Total				282
Safety	5%			14
ROOM LATENT HEAT TOTAL				296
ROOM TOTAL HEAT (A + B)				15246
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	10.76	20	0.9504	205
Latent	10.76	88	0.5984	567
Return Duct Heat Gain	5%			748
TONS	GRAND TOTAL HEAT (BTU/HR)			16,765
OTHER HEAT GAINS @ 3%				503
TONS	GRAND TOTAL HEAT (BTU/HR)			17,268

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12	
Sensible Heat Factor		0.98
Selected ADP		54.6
Dehumidified rise		17.952
TOTAL D.CFM		771.09
TONNAGE		1.4
SQFT / TR		66.7
SQFT/PERSON		96.0
CFM/SQFT		8.0
CFM/TR		535.9
F.A CHANGES		0.6
R.A CHANGES		45.9

Comments:
1. Outside Condition MUMBAI
2. Weight of Wall =80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blind of LIGHT Color.
4. All External walls are considered as exposed.
5. Lighting load considerd is 1.25W/Sqft
6. Alll data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directly to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

*HEAT BALANCE SHEET (PASSAGE)

HEAT LOAD CALCULATIONS

Date: 27-02-2020
Area: PASSAGE

Length	Width	Height (F.C)	Area	Volume
0	0	10.5	1452.00	15246.00

Item	Area/Qty	Sun Gain/ Temp Diff. Btu/hr/sqft	Factor	BTU/HOUR
(A) .ROOM SENSIBLE LOADS				
Solar gain-GLASS				
N	64	13	0.56	466
E	0	13	0.56	0
S	24	14	0.56	188
W	0	145	0.56	0
NE	0	12	0.56	0
SE	0	12	0.56	0
SW	0	100	0.56	0
NW	0	138	0.56	0
Solar &Trans. Gain-Wall & roofs				
N	314	14.5	0.33	1502
E	0	25.5	0.33	0
S	102	29	0.33	976
W	0	23.5	0.33	0
NE	0	0	0	0
SE	0	0	0	0
SW	0	0	0	0
NW	0	0	0	0
Roof Exp.	1452.00	37	0.12	6447
Trans.Gain except Walls & Roofs.				
All Glass	88	20	1.13	1989
Partition	1400.00	15	0.33	6930
Ceiling	0.00	15	0.32	0
Floor	1452.00	15	0.57	12415
Infiltration & Out side Air				
Infiltration.				
Outside air	287.12	20	0.1296	744
Internal Heat				
People	40	1	245	9800
Light (W)	1452.00	1.25	3.41	6189
Computers (W)	40	200	3.41	27280
Equipments (KW)	1	1	3400	3400
				78326
Fan Motor Output	5.00%	Safety	5%	7833
ROOM SENSIBLE HEAT TOTAL				86159
(B). ROOM LATENT HEAT				
Out Side Air	287.12	88	0.0816	2062
People	40	1	205	8200
Room Latent Head Sub Total				10262
Safety	5%			513
ROOM LATENT HEAT TOTAL				10775
ROOM TOTAL HEAT (A + B)				96934
OUT SIDE AIR SEN / LAT HEAT (LOAD ON COOLING COIL)				
Sensible	287.12	20	0.9504	5458
Latent	287.12	88	0.5984	15120
Return Duct Heat Gain	5%			4308
TONS	GRAND TOTAL HEAT (BTU/HR)			121,819
OTHER HEAT GAINS @ 3%				3,655
TONS	GRAND TOTAL HEAT (BTU/HR)			125,473

Conditions	DBT	WBT	% RH	GR/LB
Outside	95	83	60	153
Room	75	62.5	50	65
Difference	20	20.5	10	88

B . F .	0.12

Sensible Heat Factor	0.89
Selected ADP	51.2
Dehumidified rise	20.944
TOTAL D.CFM	3,809.05
TONNAGE	10.5

SQFT / TR	138.9
SQFT/PERSON	36.3
CFM/SQFT	2.6
CFM/TR	364.3
F.A CHANGES	1.1
R.A CHANGES	15.0

Comments:
1. Outside Condition MUMBAI
2. Weight of Wall =80lb/sqft
3. Exposed glass are considered of Ordinary Type with 45 Deg Venetian Blinc of LIGHT Color.
4. All External walls are considered as exposed.
5. Lighting load considerd is 1.25W/Sqft
6. Alll data is according to 3pm for the month of May
7. Indoor Room Temperature considered : 25 Deg C and 50-60% RH level.
8. The space into consideration has been considered as roof exposed directl to sun.
9. The Top side of the drawing provided is considered as NORTH.

Values given
Values taken from ASHRAE handbook
Calculated values from given and ASHRAE handbook

CALCULATIONS

Manager cabin.

A] Room sensible heat load:-

1) Solar heat gain through glass:-

***Solar heat gain through exposed glass in south.**

Q=U×A×ΔT

Q=0.56×20×14

Q=125 Btu/hr

***Solar heat gain through exposed glass in west.**

Q=U×A×ΔT

Q=0.56×20×145

Q=1624 Btu/hr

1) Solar heat gain through walls and roof:-

***Solar heat gain by exposed wall in south.**

Q=U×A×ΔT

Q=0.33×110×29

Q=1053 Btu/hr

***Solar heat gain through exposed wall in west.**

Q=U×A×ΔT

Q=0.33×106×23.5

Q=822 Btu/hr

1) Transmission gain except walls and roof:-

***Transmission gain through all glasses.**

Q=U×A×ΔT

Q=1.13×36×20

Q=813 Btu/hr

***Transmission gain through partition.**

Q=U×A×ΔT

Q=0.33×252×15

Q=1247 Btu/hr

***Transmission gain through ceiling.**

Q=U×A×ΔT

Q=0.32×144×15

Q=691 Btu/hr

***Transmission gain through floor.**

Q=U×A×ΔT

Q=0.57×144×15

Q=1231 Btu/hr

=>Infilteration and outside air:-

***Infilteration there is no filteration.**

***Outside air.**

Q=U×A×ΔT

Q=0.1296×28.64×20

Q=74 Btu/hr

=>Internal heat:-

***Heat gain by people.**

Q=Btu/hr 1 person × number of people occupied

Q=245×4

Q=980 Btu/hr

***Heat gain by lighting.**

Q=Dissipation in watt × total area × 3.41

Q=1.25×144×3.41

Q=613 Btu/hr

***Heat gain by computer.**

Q=Dissipation in watt × 3.41

Q=200×3.41

Q=628 Btu/hr

=>Sub total of RSHL= 9985

AC Fan motor + safety of factor =10%= 998.5

Room sensible heat total = 10953

B] Room latent heat load:-

***** Outside air.**

Q=U×A×ΔT

Q=0.0816×28.64×88

Q=206 Btu/hr

***Heat gain by people.**

Q=Btu/hr 1 person × number of people

Q=205×4

Q=820 Btu/hr

=>Sub total of RLHL= 1026

Duct leak loss = 5% = 51

Room latent heat total = 1077 Btu/ hr

Room latent heat load [A+B] = 12030 Btu/hr

***Outside air sensible/latent heat (load on cooling coil)**

Sensible heat load.

$Q=U\times A\times \Delta T$

$Q=0.9504\times 28.64\times 20$

Q=544 Btu/hr

Latent heat load.

$Q=U\times A\times \Delta T$

$Q=0.5984\times 28.64\times 88$

Q=1508 Btu/hr

Return duct= 5% = 518

Tons [grand total heat (Btu/hr)] = 14631

Other heat gain @ =3%= 439

Tons [grand total heat Btu/hr)] = 15069

Tonnage = (15069/12000) = 1.3 T.R

SelectedADP = 53.8

Dehumidified rise = (1-0.12)×(75-53.8) = 18.65

Sensible heat factor =ERSH/(ERSH+ERLH) = 0.91

Total Dehumidified CFM = RSHT/(1.08×18.65) = 544

Chapter: 05
OUTCOME

Split and multi type split air conditioning system offer superior performance, energy efficiency, and comfort in stylish solution conforming to all interior spaces and lifestyles. An extensive product line up utilizes split technology for lower costs and environmental impact.

Chapter: 06
RESULT

1. **Total tonnage required for Manager Cabin-1 is 1.3 tons of refrigeration.**
   Total dehumidified Cubic Air Flow per minute is 544.
2. **Total tonnage required for Manager Cabin-2 is 1.1 tons of refrigeration.**
   Dehumidified Cubic Air Flow per minute is 429.
3. **Total tonnage required for ACCOUNT/HR is 1.6 tons of refrigeration.**
   Total dehumidified Cubic Air Flow per minute is 686.
4. **Total tonnage required for Discussion Room is 0.91 tons of refrigeration.**
   Total dehumidified Cubic Air Flow per minute is 347.
5. **Total tonnage required for Conference Room is 2.5 tons of refrigeration.**
   Total dehumidified Cubic Air Flow per minute is 742.
6. **Total tonnage required for Cafeteria is 1.1 tons of refrigeration.**
   Total dehumidified Cubic Air Flow per minute is 377.
7. **Total tonnage required for Server Room is 0.97 tons of refrigeration.**
   Total dehumidified Cubic Air Flow per minute is 771.
8. **Total tonnage required for Passage is 10.5 tons of refrigeration.**
   Total dehumidified Cubic Air Flow per minute is 3809.05.

Chapter: 07
CONCLUSION

- **The rate of change in our industry will be exponential. Some changes will be caused by improvements in technology whereas others will be the result of influences outside our immediate control. As engineers, we have an obligation to be proactive in encouraging changes that are of benefit to the society we serve. This in turn will have direct benefit to our industry and to each of us individually. You can be part of that positive change by sharing your knowledge with other engineers through publications, serving with standard writing organizations and participating in technical societies. We are a "peopleoriented" profession. Our designs have a direct impact on the people who occupy our buildings. We will continue to discover ways to assure their comfort and health, while reducing our impact on the environment and natural resources. Changes will occur and for the better. Our vision for our industry can be fulfilled as we take action through our contributions to the technology of HVAC.**
- **Air condition system makes our life very comfortable.**
- **We can protect Hot and Cold weather by Air Conditioning System.**
- **Refrigeration and Air Conditioning has become a necessity in every sphere of human utility and industrial set-up.**
- **There is a great difference in the theoretical knowledge and actual execution of any work. The theoretical knowledge is not sufficient for a worker. The execution of this knowledge provides self confidence and opportunity for success in future. In this way our project to say that without this type of activity in a technical institution a student may be graduated by not educated. A technical may launch an in industry in future if he not unemployed.**

Chapter: 08
FUTURE SCOPE

The split systems that are out today will undoubtedly be improved as the popularity of this system continues to increase and competition exists between manufacturers to produce the best product. In the meantime, it is best to study the operating principles of what's already out there so that the performance of these installed systems can be optimized through proper design, installation and commissioning.

The scope of HVAC industry is promising and has a lot for the future as the office construction industry is increasingly showing a shift towards intelligent office infrastructure. The rapid emergence of such infrastructure suggests that in the near future smart buildings will outnumber other kinds of buildings.

Being in the Heating, Ventilation and Air Conditioning (HVAC) industry these days is a good place to be. With growth predicted as high as 5.7% by 2018, it's a potential $120 billion industry. The global economy is on the up too, which makes for the first major growth factor. New markets are opening themselves up to air conditioning or heating systems. The HVAC industry is growing fast owing to the current technological developments in controlling climate along with government's stringent rules and regulations to make HVAC products and equipment more environmental friendly and energy efficient.

The HVAC scope of work document ensures that all of your project requirements are defined well before would-be contractors submit their proposal. For example, with stringent scope of work documents, you will only get contractors capable of the work — and that too within your stated budget and timeline — contacting you. However, for contractors, aligning with stringent HVAC requirements isn't a trivial task.

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