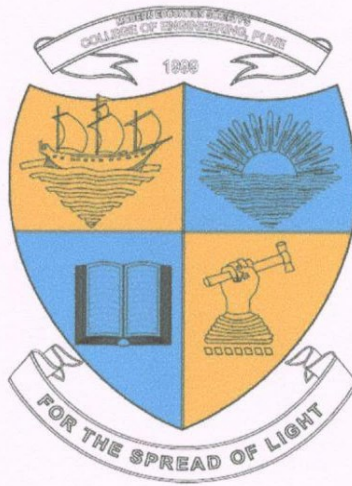


ENVIRONMENTAL AUDIT REPORT
of
Modern Education Society's
College of Engineering, Pune 411 001



Year: 2020-21

Prepared by:

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktagan English School, Parvati, Pune 411009
Phone: 09890444795 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462



Maharashtra Energy Development Agency

(Government of Maharashtra Institution)

Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary,

Aundh, Pune, Maharashtra 411067

Ph No: 020-35000450

Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2021-22/CR-14/1577

22nd April, 2021

**CERTIFICATE OF REGISTRATION
FOR CLASS 'A'**

We hereby certify that, the firm having following particulars is registered with **MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Enrich Consultants
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

Registration Category : *Empanelled Consultant for Energy Conservation
Programme for Class 'A'*

Registration Number : *MEDA/ECN/2021-22/Class A/EA-03*

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **21st April, 2023** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)



Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Mukhtangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/MESCOE/20-21/03

Date: 20/8/2021

CERTIFICATE

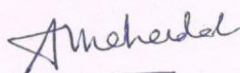
This is to certify that we have conducted Environmental Audit at Modern Education Society's College of Engineering, Pune 411 001, in the Academic year 2020-21.

The College has adopted following Green Initiatives:

- Usage of Energy Efficient LED Light Fitting
- Usage of BEE STAR Rated Energy Efficient Equipment
- Maximum Usage of Day Lighting
- Installation of Roof Top Solar PV Plant of Capacity **8 kWp**.
- Provision of Separate bins for Dry & Wet Waste
- Installation of Vermi Composting Plant
- Tree Plantation in the campus
- Provision of Sanitary Waste Incinerator
- Creation of awareness about Resource Conservation by displaying posters

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

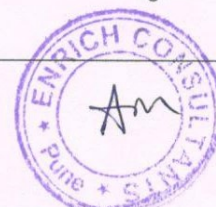


A Y Mehendale,
Certified Energy Auditor
EA-8192



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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Modern Education Society's College of Engineering, Pune 411 001, for awarding us the assignment of Environmental Audit of their Campus for the Academic Year: 2020-21.

We are thankful to:

- Dr. S. S. Sarawade, I/C Principal
- Dr. P. P. Mane, IQAC Coordinator

We are also thankful to other Staff members for helping us during the field study.



EXECUTIVE SUMMARY

1. **Modern Education Society's College of Engineering Pune** consumes Energy in the form of **Electrical Energy** used for various gadgets, office & other facilities

2. Various Pollution due to College Activities:

- **Air pollution:** Mainly CO₂ on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO₂ Emission:

No	Parameter/Value	Energy Consumed, kWh	CO ₂ Emissions, MT
1	Total	46213	41.59
2	Maximum	5925	5.33
3	Minimum	672	0.60
4	Average	3851.08	3.47

4. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient BEE STAR Rated Equipment
- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of Roof Top Solar PV Plant of Capacity **8 kWp**.

5. Usage of Renewable Energy & Reduction in CO₂ Emission:

- The College has installed Roof Top Solar PV Plant of Capacity **8 kWp**.
- The Electrical Energy generated in 20-21 is **9600 kWh**.
- Reduction in CO₂ Emissions in 2020-21 works out to be **8.64 MT**.

6. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	323	172	184
2	Minimum	293	123	139

7. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	20.7	90	789	80
2	Minimum	20.3	73	115	59



8. Waste Management:

8.1 Solid Waste Management:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

8.2 Organic Waste Management:

The College has installed a Vermi Composting Plant and the organic Waste is composted in the Plant, which is further used in the own garden.

8.3 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

9. Rain Water Harvesting:

The College has installed the Rainwater harvesting project, the rain water falling on the terrace is collected and is used for recharging the bore well.

10. Sustainable Initiatives

- Maintenance of Internal Garden: 500 Plus Trees in the campus.
- Provision of Sanitary Waste Incinerator
- Display of Posters on Resource Conservation

11. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg** of **CO₂** into atmosphere
2. Annual Solar Energy Generation Days: **300 Nos.**

12. References:

- For CO₂ Emissions: www.tatapower.com
- For Energy Saved by Solar Thermal Water Heating System: www.mahaurja.com
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI & Water Quality Standards: www.cpcb.com



ABBREVIATIONS

Kg	: Kilo Gram
MSEDCL	: Maharashtra State Distribution Company Limited
MT	: Metric Ton
kWh	: kilo-Watt Hour
LPD	: Liters per Day
LED	: Light Emitting Diode
AQI	: Air Quality Index
PM-2.5	: Particulate Matter of Size 2.5 Micron
PM-10	: Particulate Matter of Size 10 Micron
CPCB	: Central Pollution Control Board
ISHRAE	: The Indian Society of Heating & Refrigerating & Air Conditioning Engineers



CHAPTER-I INTRODUCTION

1.1 Important Definitions:

1.1.1 Environment: Definition as per environment Protection Act: 1986

Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

1.1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are complied with and adequate care has been taken towards environmental protection and preservation

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment"

1.1.3. Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

1.1.4. Relevant Environmental Laws in India: Table No-1:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
1980	The Forest (Conservation) Act
1981	The Air (Prevention and Control of Pollution) Act
1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Some Important Environmental Rules in India: Table No-2:

1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules
2011	E-waste (Management and Handling) Rules



2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules

1.1.6 National Environmental Plans & Policy Documents: Table No-3:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency)
10.	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives:

1. To study Resource Consumption & CO₂ Emissions
2. To Study CO₂ Emission Reduction
3. To study Indoor Air Quality Parameters
4. To study Indoor Comfort Condition Parameters
5. To Study of Waste Management
6. To Study of Rain Water Harvesting
7. To Study of Sustainable Initiatives

1.3 General Details of College: Table No 4:

No	Head	Particulars
1	Name of Institution	Modern Education Society's College of Engineering
2	Address	19, Late Prin. V. K. Joag Path, Wadia College Campus, Pune 411 001
3	Year of Establishment	July 1999
4	Affiliation	Savitribai Phule Pune University



CHAPTER-II

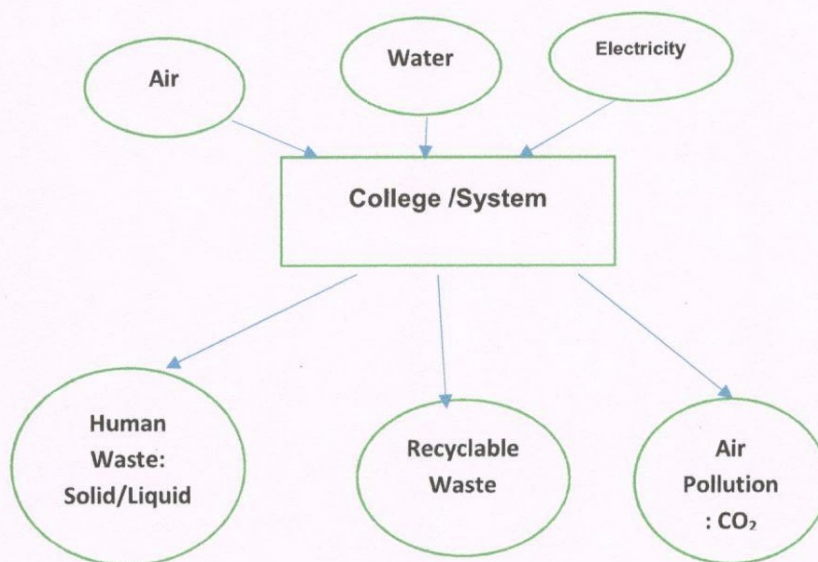
STUDY OF CONSUMPTION OF RECOURCES & CO₂ EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

We try to draw a schematic diagram for the College System & Environment as under.

Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO₂ on account of consumption of Electrical Energy.

The basis of Calculation for CO₂ emissions due to LPG & Electrical Energy are as under

- 1 kWh of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere

Table No 5: Study of Consumption of Electrical Energy & CO₂ Emissions: 20-21:

No	Month	Energy Consumed kWh	CO ₂ Emissions, MT
1	Jul-20	672	0.60
2	Aug-20	1891	1.70
3	Sep-20	2213	1.99
4	Oct-20	4550	4.10
5	Nov-20	3660	3.29
6	Dec-20	3921	3.53



7	Jan-21	4110	3.70
8	Feb-21	5470	4.92
9	Mar-21	5925	5.33
10	Apr-21	4667	4.20
11	May-21	4641	4.18
12	Jun-21	4493	4.04
13	Total	46213	41.59
14	Maximum	5925	5.33
15	Minimum	672	0.60
16	Average	3851.08	3.47

Chart No 2: Month wise CO₂ Emissions:

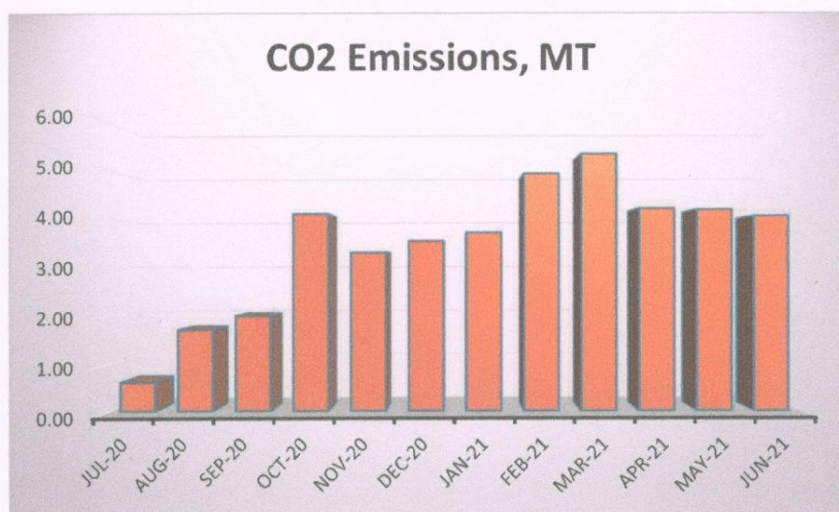


Table No 6: Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO ₂ Emissions, MT
1	Total	46213	41.59
2	Maximum	5925	5.33
3	Minimum	672	0.60
4	Average	3851.08	3.47



CHAPTER III

STUDY OF CO₂ EMISSION REDUCTION

The College has installed Roof Top Solar PV Plant of Capacity **8 kWp**.

In the following Table, we compute the Annual Reduction in CO₂ Emissions due to installation of Roof Top Solar PV Plant.

Table No 7: Computation of Annual Reduction in CO₂ Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	8	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 20-21	9600	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	Qty of CO₂ Saved by Solar PV Plant = (4)*(5) /1000	8.64	MT of CO₂

Photograph of Roof Top Solar PV Plant:



Latitude: 18.533776
Longitude: 73.879439
Elevation: 559.45±3 m
Accuracy: 14.9 m



CHAPTER IV STUDY OF INDOOR AIR QUALITY

4.1 Importance of Air Quality:

Air: The common name given to the atmospheric gases used in breathing and photosynthesis.

By volume, Dry Air contains 78.09% Nitrogen, 20.95% Oxygen, 0.93% Argon, 0.039% carbon dioxide, and small amounts of other gases.

On average, a person inhales about **14,000 liters** of air every day. Therefore, poor air quality may affect the quality of life now and for future generations by affecting the health, the environment, the economy and the city's livability.

Rapid urbanization and industrialization has added other elements/compounds to the pure air and thus caused the increase in pollution. In order to prevent, control and abate air pollution, the Air (Prevention and Control of Pollution) Act was enacted in 1981.

Air quality is a measure of the suitability of air for breathing by people, plants and animals.

According to Section 2(b) of Air (Prevention and control of pollution) Act, 1981 'air pollution' has been defined as 'the presence in the atmosphere of any air pollutant.'

4.2 Air Quality Index:

An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population. As the AQI increases, it means that a large percentage of the population will experience severe adverse health effects. The measurement of the **AQI** requires an **air monitor** and an **air pollutant** concentration over a specified **averaging period**.

We present herewith following important Parameters.

1. AQI- Air Quality Index
2. PM-2.5- Particulate Matter of Size 2.5 micron
3. PM-10- Particulate Matter of Size 10 micron

Table No 8: Indoor Air Quality Parameters:

No	Location	AQI	PM2.5	PM10
1	Porch	320	172	184
2	First Floor	313	136	156
3	Second Floor	293	123	148
4	Third Floor	304	126	141
5	Fourth Floor	307	127	139
	Maximum	323	172	184
	Minimum	293	123	139



CHAPTER V

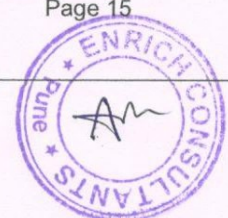
STUDY OF INDOOR COMFORT CONDITION PARAMETERS

In this Chapter, we present the various Indoor Comfort Parameters measured during the Audit.
The Parameters include:

1. Temperature
2. Humidity
3. Lux Level
4. Noise Level.

Table No 9: Study of Indoor Comfort Condition Parameters:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Porch	20.3	83	115	79
2	First Floor	20.6	90	478	75
3	Second Floor	20.7	73	148	69
4	Third Floor	20.7	73	789	80
5	Porch	20.3	83	115	79
6	Fourth Floor	20.4	84	175	59
	Maximum	20.7	90	789	80
	Minimum	20.3	73	115	59



CHAPTER VI STUDY OF WASTE MANAGEMENT

6.1 Solid Waste Management:

The Waste is segregated at source and the recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

Photograph of Waste Collection Bins:



6.2 Organic Waste Management:

The Bio degradable waste like leafy waste is composted in a Vermi composting Plant.

Photograph of Vermi Composting Plant:



6.3 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

CHAPTER-VII

STUDY OF RAIN WATER HARVESTING

The College has implemented the Rain Water Harvesting Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is used to increase the underground water level.

Photograph of Rain water Harvesting Pipe:



Photograph of Rain water Harvesting Recharging Well Section:



CHAPTER-VIII

STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

8.1 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

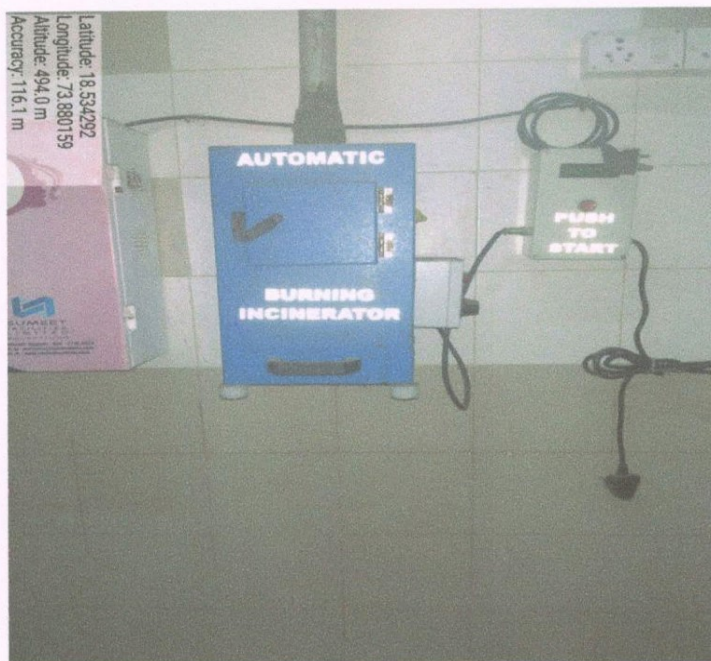
Photograph of Tree plantation:



8.2 Provision of Sanitary Waste Incinerator:

For disposal of Sanitary Waste, a Sanitary Waste Incinerator is installed in the campus.

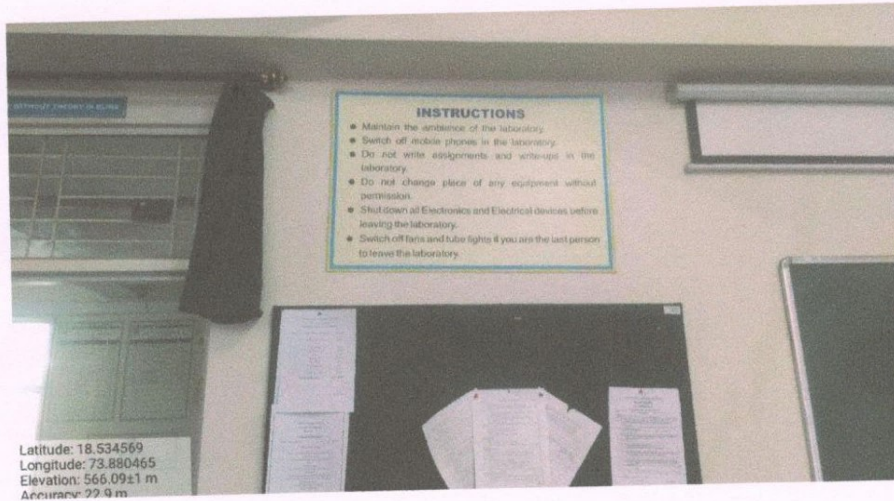
Photograph of Sanitary Waste Incinerator:



8.3 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation.

Photograph of Poster on Energy Conservation:



ANNEXURE-I:
VARIOUS AIR QUALITY, WATER QUALITY, NOISE & INDOOR COMFORT STANDARDS:

1. Category Wise Air Quality Index Values & Concentration of PM 2.5 & PM10:

No	Category	AQI Value	Concentration Range, PM 2.5	Concentration Range, PM 10
1	Good	0 to 50	0 to 30	0 to 50
2	Satisfactory	51 to 100	31 to 60	51 to 100
3	Moderately Polluted	101 to 200	61 to 90	101 to 250
4	Poor	201 to 300	91 to 120	251 to 350
5	Very Poor	301 to 400	121 to 250	351 to 430
6	Severe	401 to 500	250 +	430 +

2. Recommended Water Quality Standards:

No	Designated Best Use	Criteria
1	Drinking Water Source without conventional Treatment but after disinfection	pH between 6.5 to 8.5 Dissolved Oxygen 6 mg/l or more
2	Drinking water source after conventional treatment and disinfection	pH between 6 to 9 Dissolved Oxygen 4 mg/l or more
3	Outdoor Bathing (Organized)	pH between 6.5 to 8.5 Dissolved Oxygen 5 mg/l or more
4	Controlled Waste Disposal	pH between 6 to 8.5



3. Recommended Noise Level Standards:

No	Location	Noise Level dB
1	Auditoriums	20-25
2	Outdoor Playground	55
3	Occupied Class Room	40-45
4	Un occupied Class Room	35
5	Apartment, Homes	35-40
6	Offices	45-50
7	Libraries	35-40
8	Restaurants	50-55

4. Thermal Comfort Conditions: For Non-conditioned Buildings:

No	Parameter	Value
1	Temperature	Less Than 33° C
2	Humidity	Less Than 70%

