

ENVIRONMENTAL AUDIT REPORT
of
Sinhgad Technical Education Society's
SINHGAD ACADEMY OF ENGINEERING
Kondhwa, Pune-411048



Sinhgad Institutes

Year: 2020-21

Prepared by

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MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001:2009 Reg. No. RC 81/2462



Maharashtra Energy Development Agency

(Government of Maharashtra Institution)

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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,
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Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/STESSAOE/20-21/03

Date: 8/9/2021

CERTIFICATE

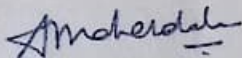
This is to certify that we have conducted Environmental Audit at Sinhgad Technical Education Society's Sinhgad Academy of Engineering, Kondhwa, Pune 411048 in the Academic year 2020-21.

The College has adopted Environment Friendly practices:

- Usage of Energy Efficient LED Fittings
- Installation of 2.5 kWp Roof Top Solar PV Plant
- Installation of Roof Top 12000 LPD Solar Thermal Water Heating System
- Segregation of Waste at source
- Usage of Tumbler Units for conversion of Organic Waste
- Installation of 150 m³/Day Sewage Treatment Plant
- Tree Plantation in the campus
- Creation of Awareness on Resource Conservation by Display of 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 at Enrich Consultants, Pune, express our sincere gratitude to the management of Sinhgad Technical Education Society's Sinhgad Academy of Engineering, Kondhwa, Pune 411048 for awarding us the assignment of Environmental Audit of their Kondhwa Campus for the Year: 2020-21

We are thankful to the Head of Departments & Staff members for helping us during the field study.

No.	Parameter	Range/Standard	CO ₂ Emission
1	Total	1200	25.12
2	Water	500	1.25
3	Electricity	500	1.25
4	Average	600	1.25

4. Physical Measures taken for Energy Conservation

- Usage of LED lights
- Installation of 2 Phase Roof Top Solar PV Panel
- Installation of 12000 LTR Solar Thermal Water Heating System

5. Usage of Renewable Energy & Dual from CO₂ emissions

- The College has installed Roof Top Solar PV Panel of Capacity 20KW
- Energy generated by Roof Top Solar PV Panel is used for
- The Annual Reporting on CO₂ Emission is 25.12

6. Energy Air Quality Parameters

No.	Parameter/Value	AQI	Level	Std. Limit
1	Maximum	100	II	100
2	Minimum	30	II	100

7. Other Relevant Comments

20 Parameter/Value Temperature Humidity Lux Level Noise Level



EXECUTIVE SUMMARY

1. STES's Sinhgad Academy of Engineering, Kondhwa, Pune consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

2. Pollution caused due to College Activities:

- Air pollution: Mainly CO₂ on account of Electricity Consumption
- Solid Waste: Bio degradable Waste, Garden Waste, Recyclable Waste and Human Waste
- Liquid Waste: Human Liquid waste

3. Present Energy Consumption & CO₂ Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO ₂ Emissions, MT
1	Total	82333	74.10
2	Maximum	9241	8.32
3	Minimum	4619	4.16
4	Average	6861.10	6.17

4. Various initiatives taken for Energy Conservation:

- Usage of LED Lights
- Installation of 2.5 kWp Roof Top Solar PV Plant
- Installation of 12000 LPD Solar Thermal Water Heating System.

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

- The College has installed Roof Top Solar PV Plant of Capacity 2.5 kWp.
- Energy generated by Roof Top Solar PV Plant is 3000 kWh.
- The Annual Reduction in CO₂ Emission in 20-21 2.7 MT

6. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	120	63	80
2	Minimum	50	28	31

7. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	29.2	42	198	65
2	Minimum	28.8	39	95	39

8. Waste Management:

8.1 Solid Waste Management:

The Dry and Wet waste is segregated at the source and is handed over to Authorized Agency for further disposal/recycling.

8.2 Organic Waste Management:

The College has Tumbler Unit for conversion of Organic Waste into Bio Compost.

8.3 Liquid Waste Management:

The College has installed 150 m³/Day Sewage Treatment Plant. The treated Water is used for Gardening purpose.

8.4 E-Waste Management:

The E Waste generated is handed over to Authorized Agency for further disposal.

9. Rain Water Management:

The Rain Water falling on the terrace is run down through the Pipes and is used to in recharge the bore well.

10. Environment Friendly Practices:

- Well maintained garden.
- Creation of Awareness on Resource Conservation by Display of Posters

11. Notes & Assumptions:

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

12. References:

1. For CO₂ calculations: www.tatapower.com
2. For Roof Top Solar PV Plant Energy generation: www.solarroftop.gov.in
3. For Various Indoor Air Parameters: www.ishrae.com
4. For AQI & Water Quality Standards: www.cpcb.com



ABBREVIATIONS

STES	: Sinhgad Technical Education Society
AQI	: Air Quality Index
LED	: Light Emitting Diode
kWh	: kilo-Watt Hour
MT	: Metric Ton
CO ₂	: Carbon Di Oxide
MEDA	: Maharashtra Energy Development Agency
ISHRAE	: The Indian Society of Heating, Refrigerating & Air conditioning Engineers
CPCB	: Central Pollution Control Board
LPD	: Liters Per Day
NSS	: National Service Scheme
PM	: Particulate Matter



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

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

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

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 present level of Energy Consumption & CO₂ emissions
2. To Study Usage of Renewable Energy
3. To Study Waste Management Practices
4. To Study Rain Water Harvesting
5. To study Environment Friendly Initiatives

1.3 Table No 4: General Details of College:

No	Head	Particulars
1	Name of Institution	Sinhgad Technical Education Society's Sinhgad Academy of Engineering
2	Address	Danny Mehta Nagar, Kondhwa, Pune 411 048
3	Affiliation	Savitribai Phule Pune University

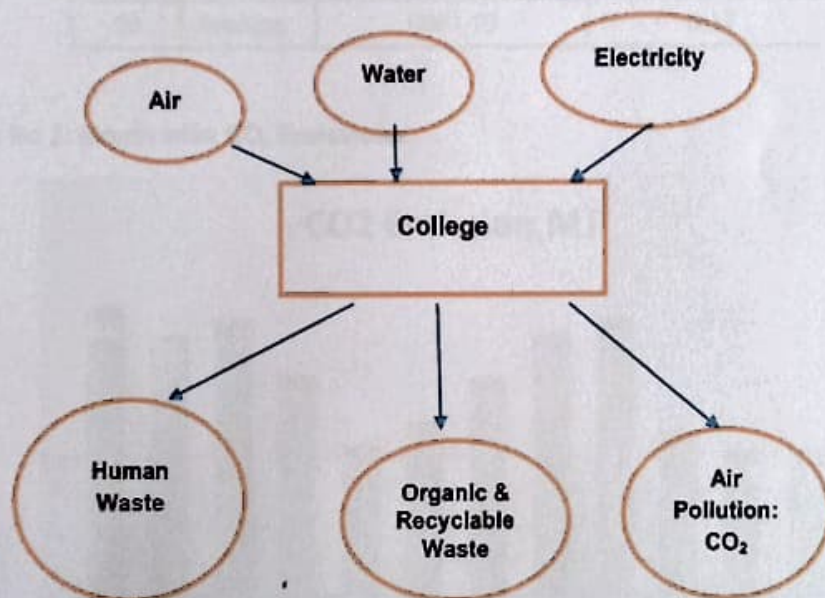
CHAPTER-II STUDY OF RESOURCE CONSUMPTION & CO₂ EMISSION

The Institute consumes following Natural/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

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

Chart No: 1: Representation of College as System:



Now we compute the Generation of CO₂ on account of consumption of Electrical Energy. The basis of Calculation for CO₂ emissions due to Electrical Energy is 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 Purchased, kWh	CO ₂ Emissions, MT
1	Jul-20	9241	8.32
2	Aug-20	8306	7.48
3	Sep-20	8803	7.92
4	Oct-20	7029	6.33

5	Nov-20	4803	4.32
6	Dec-20	5578	5.02
7	Jan-21	6924	6.23
8	Feb-21	8319	7.49
9	Mar-21	8827	7.94
10	Apr-21	5263	4.74
11	May-21	4619	4.16
12	Jun-21	4621	4.16
13	Total	82333	74.10
14	Maximum	9241	8.32
15	Minimum	4619	4.16
16	Average	6861.10	6.17

Chart No 2: Month wise CO₂ Emissions:

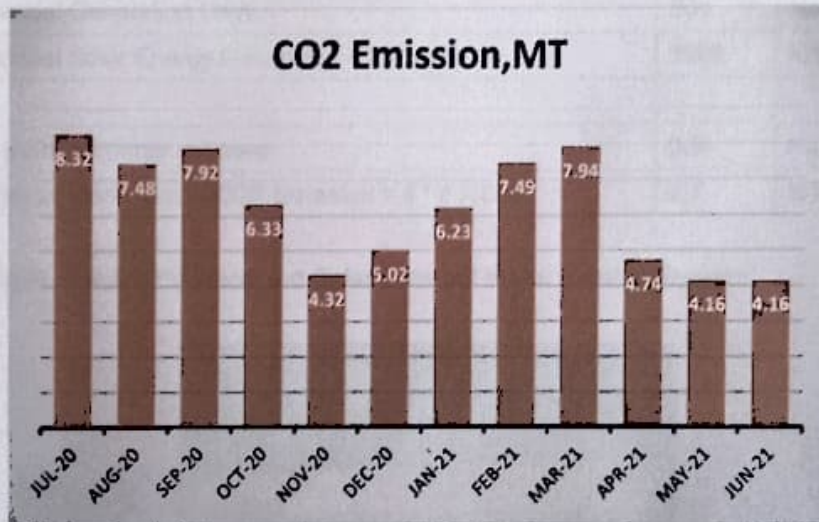


Table No 6: Various Important Parameters:

No	Parameter/ Value	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	82333	74.10
2	Maximum	9241	8.32
3	Minimum	4619	4.16
4	Average	6861.10	6.17

CHAPTER III STUDY OF CO₂ EMISSION REDUCTION

The College has installed:

- 2.5 kWp Roof Top Solar PV Plant
- 12000 LPD Solar Thermal Water Heating Plant at the Hostel Blocks.

Due to COVID-19, Lockdown, the Hostel blocks were not used, hence we do not take into account the Energy saved by the Solar Thermal Water Heating Plant in the Year: 20-21. In the following Table, we present the Reduction in Annual CO₂ Emission due to usage of Roof Top Solar PV Plant.

Table No 7: Computation of Reduction in Annual CO₂ Emission in 20-21:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Capacity	2.5	kWp
2	Average Energy Generated per kWp per Day	4	kWh/kWp
3	Annual Generation Days	300	Nos
4	Annual Solar Energy Generated = 2*3*4	3000	kWh/Annum
5	1 kWh of Energy releases	0.9	Kg of CO ₂
6	Annual Reduction in CO ₂ Emission = 4 * 5 /1000	2.7	MT

Photograph of Solar PV Plant and Solar Thermal Water Heating System:



CHAPTER IV STUDY OF INDOOR AIR QUALITY

5.1 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.'

As per Section 2(a) of Air (Prevention and control of pollution) Act, 1981 'air pollutant' has been defined as 'any solid, liquid or gaseous substance [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment

5.2 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
3. PM 2.5- Particulate Matter of Size 2.5

Table No 8: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
1	Basement			
1	Electrical Dept(Central Store)	63	38	54
2	Transportation Engg. Lab	100	61	76

3	Boys Common Room	120	63	80
4	Library	71	44	52
5	Fluid Mech.& Machine lab	106	63	79
2	Ground Floor			
1	Survey Lab	80	50	61
2	Classroom011	81	50	61
3	Tutorial Room I	85	51	62
4	Refrigeration & AC Lab	80	49	58
5	DOM Lab	80	50	62
3	First Floor			
1	Comp. project Lab	80	48	57
2	Civil Class Room	65	38	49
3	Principal Cabin	75	46	56
4	Administrative Office	56	34	38
5	Civil Staff Room	63	38	43
4	Second Floor			
1	Research Lab	76	46	54
2	Tutorial Room	71	40	48
3	Class Room	75	45	52
4	Network Theory Lab	71	43	52
5	Computer Lab	80	48	58
5	Third Floor			
1	F E Coordinator Cabin	60	37	40
2	Class Room	60	36	49
3	Staff Room	50	28	31
4	HOD IT Dept.	70	39	49
5	Software Lab	60	33	39
	Maximum	120	63	80
	Minimum	50	28	31

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	Basement				
1	Electrical Dept(Central Store)	29	40	95	41
2	Transportation Engg. Lab	29.1	39	105	42.3
3	Boys Common Room	29	42	126	45
4	Library	29.1	42	102	50.1
5	Fluid Mech.& Machine lab	29.1	40	98	52
2	Ground Floor				
1	Survey Lab	29.2	41	123	52.3
2	Classroom011	29.2	41	145	56.4
3	Tutorial Room I	29.1	42	156	54
4	Refrigeration & AC Lab	29.2	40	148	59.1
5	DOM Lab	29.1	40	123	56
3	First Floor				
1	Comp. project Lab	28.9	41	156	61
2	Civil Class Room	28.9	41	136	60.3
3	Principal Cabin	29	40	139	64
4	Administrative Office	29	42	140	65
5	Civil Staff Room	29.1	42	123	60.7
4	Second Floor				
1	Research Lab	29	41	159	39
2	Tutorial Room	29	39	198	41
3	Class Room	29.1	39	168	45
4	Network Theory Lab	29.2	40	136	46
5	Third Floor				
1	F E Coordinator Cabin	28.9	41	102	41
2	Class Room	28.8	41	190	45
3	Staff Room	28.8	42	134	47
4	HOD IT Dept.	28.9	42	157	49
	Maximum	29.2	42	198	65
	Minimum	28.8	39	95	39

CHAPTER VI STUDY OF WASTE MANAGEMENT

6.1 Solid Waste Management:

The Dry recyclable Waste & Wet Waste are collected on daily basis, and further given to Authorized Waste Collector for further disposal/Recycling.

Photograph of Waste Collection Bins:



6.2 Organic Waste Management:

The College has Tumbler Units for conversion of Organic Waste into Bio Compost

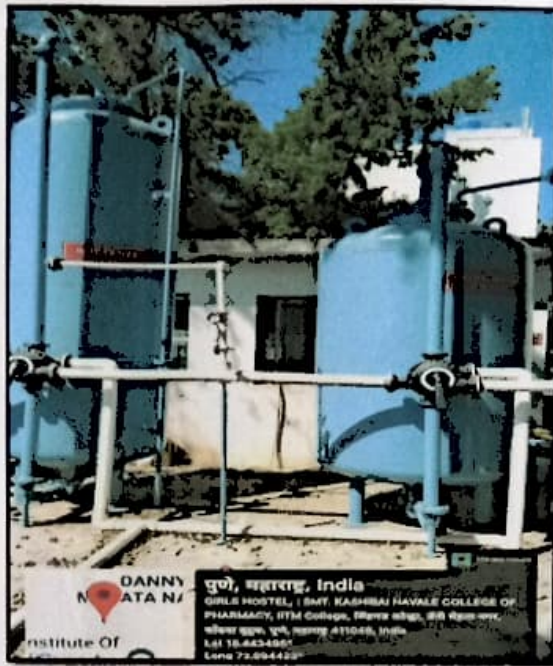
Photograph of Tumble Arrangement:



6.3 Liquid Waste Management:

The College has installed a 150 m³/Day Capacity Sewage Treatment Plant, to handle the human waste generated in the College.

Photograph of Sewage Treatment Plant:



6.4 E-Waste Management:

The E Waste generated is handed over to Authorized Agency for further disposal.

CHAPTER VII STUDY OF RAIN WATER MANAGEMENT

The Rain Water falling on the terrace is run down through the Pipes and is used to in recharge the bore well.

Photograph of Rain Water Harvesting Pipe from Terrace:



Photograph of Rain Water Recharge Location:



CHAPTER VIII STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

8.1 Tree Plantation:

The College has maintained plantation in the campus.

Photograph of Tree Plantation in the College campus:



8.2 Creation of Awareness on Resource Conservation:

The College has displayed Posters on Resource Conservation.

Photograph of Posters on Resource Conservation:



ANNEXURE: 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%