

**7.1.6 Quality audits on environment and energy regularly undertaken by the Institution and any awards received for such green campus initiatives:**

- 1. Green audit**
- 2. Energy audit**
- 3. Environment audit**
- 4. Clean and green campus recognitions**
- 5. Beyond the campus environmental promotion activities**
  - A. Any 4 or all of the above**
  - B. Any 3 of the above**
  - C. Any 2 of the above**
  - D. Any 1 of the above**
  - E. None of the above**

<b>Sr. No.</b>	<b>Description</b>	<b>Page No.</b>
1	Green Audit Report	2
2	Energy Audit Report	21
3	Environment Audit Report	56
4	Sample report of Beyond the campus environmental promotion activities	84

**Green Audit Report**  
**of**  
**THADOMAL SHAHANI ENGINEERING COLLEGE,**  
**BANDRA (WEST), MUMBAI**



**Prepared**  
**By**  
**Endutech Consultancy Services Pvt Ltd**  
**Navi Mumbai**

**2023-2024**





**ACCREDITED**  
ISO 9001: 2015  
QMS Certification CAB # 118005

# ENDUTECH CONSULTANCY SERVICES PVT LTD

Ref No. ECS-GAR-3-2023

Date- 15/11/2023

## GREEN AUDIT CERTIFICATE (AY: 2023-24)

This is to certify that Green Audit has been carried out in the campus and buildings of Thadomal Shahani Engineering College, Bandra West, Mumbai- 400050, Maharashtra, in the month of November 2023.

The scope, coverage, findings and suggestions are submitted in the report ECS-GAR-3-321151 dated November 15, 2023.

For,

**ENDUTECH Consultancy Services**

**Dr. D. Santosh (Govt. Reg. No. CEA-12141)**  
Director

## Contents

Sr No	Description	Page No
I	Green Audit	4
II	Trees & plantation	7
III	Green Infrastructure	12
IV	Safety	17
V	Green culture	23

# Chapter-I

## Green Audit

### 1.1 Background of the study:

According to National Assessment and Accreditation Council (NAAC), the Green Audit is defined as the process of assessing the environmental impact of an organization, process, project, product, etc.

Green audit was originated with the beginning of 1960's with the purpose of examining the work conducted within the establishments whose activities can cause risk to the health of inhabitants and the environment.

It exposes the authenticity of the proclamations made by multinational industries and governments with the concern of health issues as the consequences of environmental pollution. Each organization should carry out the Green Audit of ongoing processes for various reasons such as; to make sure whether they are performing in accordance with relevant rules and regulations, to improve the procedures and ability of materials, to analyze the potential duties and to determine a way which can lower the cost and add to the revenue. Through Green Audit, the organization gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit.

Green Audit is assigned to the Criteria **VII of NAAC**, which is a self-governing organization of India that declares the institutions as Grade A, Grade B or Grade C according to the scores assigned at the time of accreditation.

The aim of organizing Green Audit is to upgrade the environment condition in and around the institutes, colleges, industries and other organizations. It is carried out with the aid of performing tasks like waste management, energy saving and others to turn into a better environmentally friendly institute.

This green audit report presents the analysis of the data collected, observations made at the facility and is governed by the objectives, scope of work, methodology etc. discussed in the ensuing paragraphs.

### **Objectives:**

The basic objectives of the Energy Audit Study are to,

- assess the environmental impact of an organization (educational institute)
- assess the environmental impact of an educational system/process
- assess the environmental impact of projects requiring machine, material etc.
- assess the environmental impact of education system products.
- make sure that rules and regulations are taken care of
- avoid the interruptions in environment that are more difficult to handle and their correction requires high cost.
- suggest the best protocols for adding to sustainable development
- to secure the environment and cut down the threats posed to human health.

### **Methodology:**

Following methodology is adopted to conduct the green audit at TSEC.

1. Prior to start of the Audit session, list of data required along with the execution plan is submitted to the TSEC.
2. The team of Project Engineers for this task is deputed.
3. The visit was undertaken in the First week of November 2023.
4. The field training was given to the engineers about data collection.
5. The data about trees types, tree height, number of trees is recorded with photographs.

6. The data about infrastructure like draining system, seepage in the building and parking area is collected.
7. The data of elevators, staircases, fire fighting system is noted down.
8. The data about green culture of TSEC is noted down.

**Team:**

The team members of the audit study.

1. Dr S D Dalvi, Certified Energy Auditor (CEA-12141)
2. Mr. Sairaj Hande, Project Manager

**Acknowledgment:**

Endutech consultancy services wish to record their gratitude to the management of TSEC for awarding this assignment.

We extend our thanks to the Principal, **Dr. G T Thampi** for initiating the work.

We are also thankful to **Prof. Monika G Tolani**, Assistant Professor, Training & Placement Officer, TSEC, and the maintenance team including Mr. Gomes, Mr. Mali and Mr. Sunil for extending all possible help and co-operation from their side.



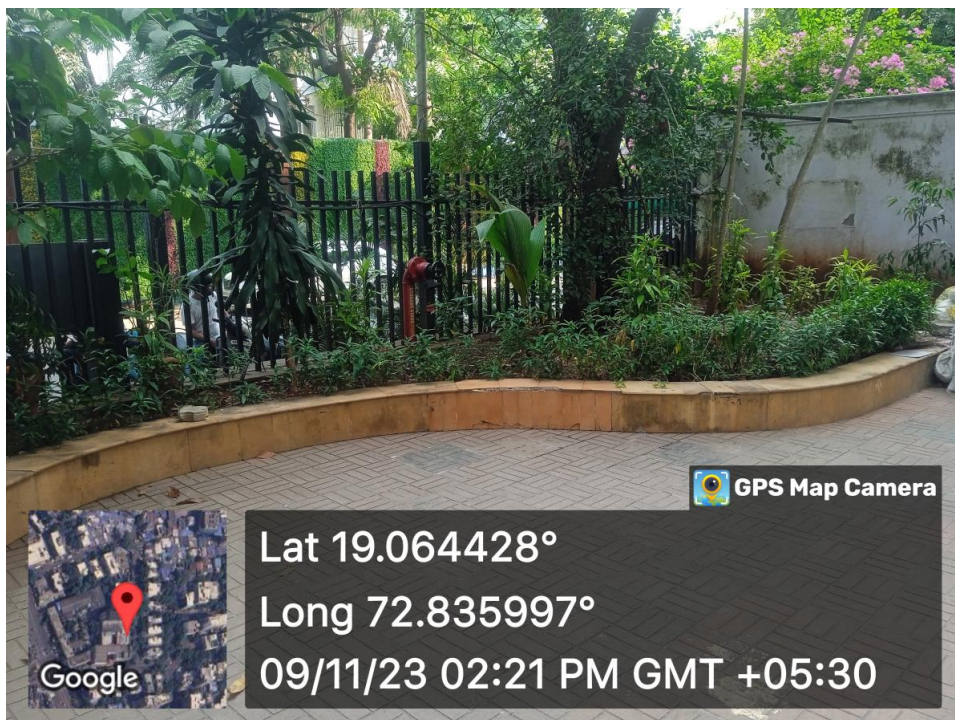
## Chapter-II

# Trees & Plantation

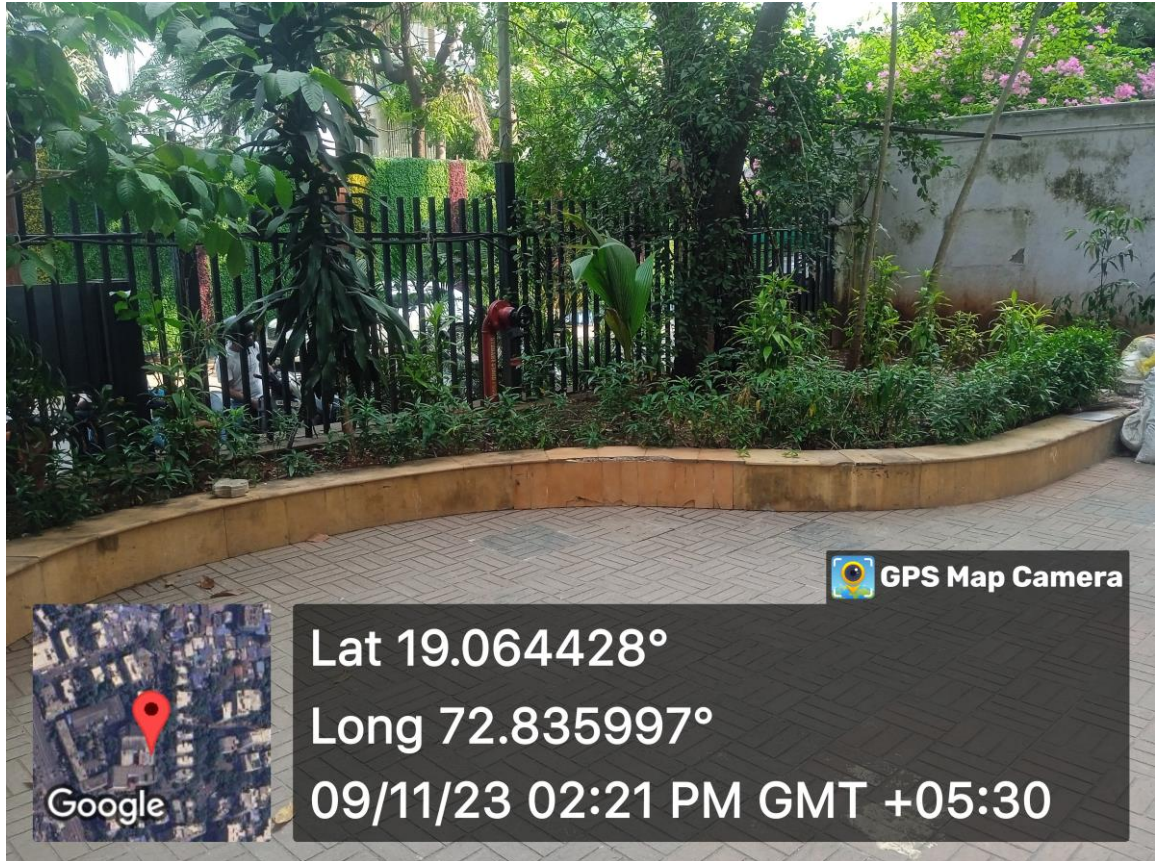
### 2.1 Brief Description:

Many trees are planted in the campus of TSEC. Trees and plants covers all directions of the college. Potted trees, landed trees are seen in the campus. The trees and plants are taken care by maintenance team of the institute including Mr. Mali and Mr. Sunil.

Figure below shows the flora and fauna of TSEC.



**Trees/Plants towards East Side of New Building**



**Trees/Plants towards East Side of New Building**





**Trees/Plants towards South Side of Old Building**



### Trees/Plants towards South Side of Old Building

#### 2.2 Trees and Plants Details:

The trees details and botanical identifications are given in the table below.

Plant/Tree Botanical Name	Location	Direction	Height (Ft)	No.
Dyopsis lutescens	New building	North	5	12
Dyopsis lutescens	New building	East	6	4
Pandanus tectorius	New building	North	6	1
Syngonium podophyllum	New building	East	4	1
Euphorbia tithymaloides	New building	North	6	1
Manilkara zapota	New building	East	6	1
Cordyline fruticosa	New building	East	6	1
Saraca Asoca	New building	East	25	1
Saraca Asoca	Old building	South	15-30	5

Lemon	New building	East	5	1
Vanilla planifolia	New building	East	6	1
Firmiana simplex	New building	East	6	1
Dracaena sanderiana	New building	East	6	2
Papaya	Old building	South	7	1
Solanum diphyllum	Old building	South	5	1
Ficus macrocarpa	Old building	South	5	1
Dracaena fragrans	Old building	South	5	1
Monoon longifolium	Old building	South	4	1
Rhapis excelsa	Old building	South	4	1
Mangifera indica	Old building	South	15	1
Tabernaemontana divaricate	Old building	South	4	1
Bougainvillea glabra	Old building	South	5	1
Hibiscus rosa-sinensis	Old building	South	5	1
Heptapleurum arboricola	Old building	South	5	1
Dieffenbachia	Old building	South	5	1
Codiaeum variegatum	Old building	South	4	1
Elaeis guineensis	Old building	South	7	1
Elaeis guineensis	Old building	South	10	1
Elaeis guineensis	Old building	South	35	1
Terminalia catappa	Old building	East	15	2
Peepal (Ficus Religiosa)	Old building	East	25	1

## 2.2 Observation/Suggestions:

The trees in the new building campus were trimmed as instructed and done by Municipal Corporation of Greater Mumbai. The broken pots of the potted plants, towards North side of new building, may be replaced.

The trees may be provided with QR codes showing technical/botanical information.



## Chapter-III

# Infrastructure

### 3.1 Introduction:

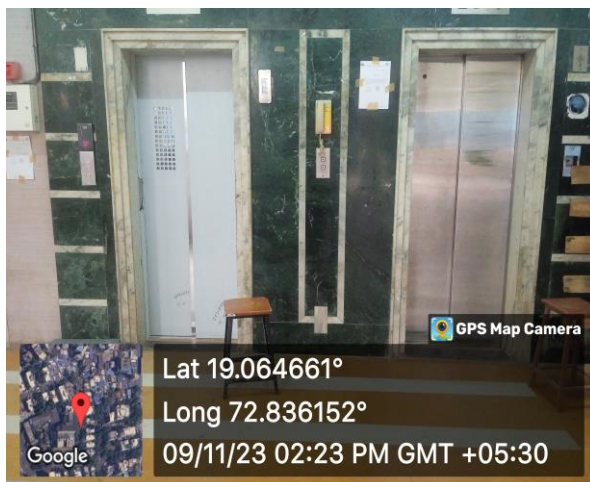
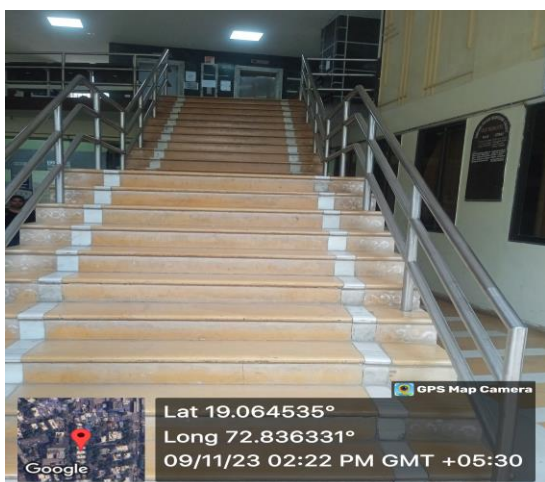
Thadomal Shahani Engineering College (TSEC) is a private engineering college in Mumbai, India. Founded in 1983, it is the first and the oldest private engineering institute affiliated with the University of Mumbai.

TSEC was founded by the Hyderabad (Sind) National Collegiate Board (HSNC Board) in the year 1983. It is named after one of Mumbai's most respected philanthropists, Dada Kishinchand T. Shahani's father, Thadomal Shahani.

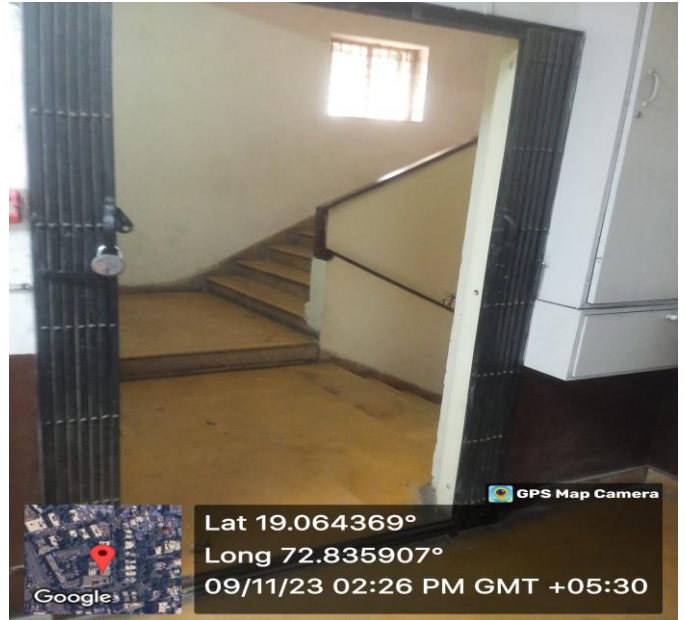
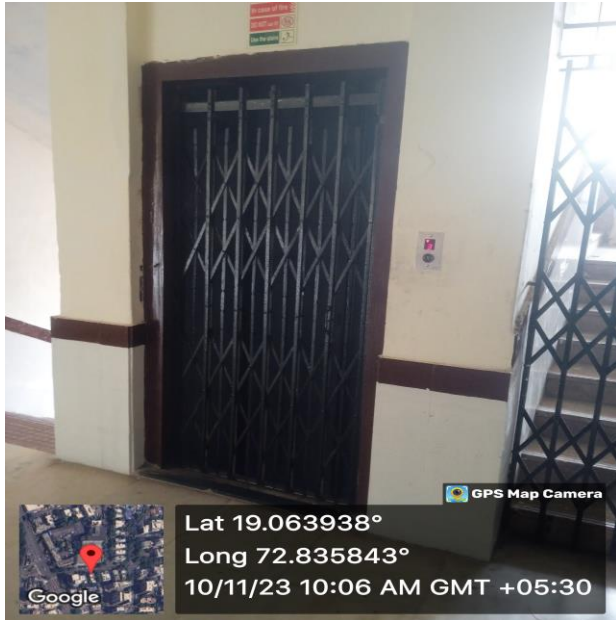
### 3.2 Movements and Parking Facility:

TSEC campus is provided with multiple staircases as well as elevators with necessary entrances to ensure quick and effective movement in normal as well as emergency conditions.

The old doors of the lifts are being replaced by new doors.

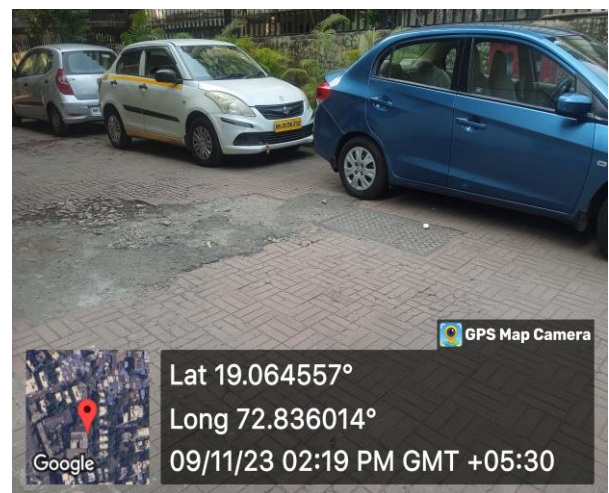


**New building Ease of Movements**



### Old building Ease of Movements

The movement of vehicle inside the campus is restricted and separate parking areas are provided in the campus.



### Parking Facility in Old & New building

The students and many of the faculty members avail public transport system which is very convenient due to proximity to Bandra and Khar road railway stations and bus services.

Floor plans are disseminated at all locations in the new building and old building.



**THADOMAL SHAHANI ENGINEERING COLLEGE TSEC**  
FIRST FLOOR PLAN

101-102 STAIRS LIFT LIFT STAIRS  
103  
104 STAIRS 105B 105A 105C  
GENTS WASH ROOM

**ADMINISTRATION**

- 101-102 OFFICE BLOCK
- ADMINISTRATIVE /ACCOUNTS
- 103 Ph.D RESEARCH LABORATORY
- 104A INTELLIGENT ROBOTIC PROCESS AUTOMATION LABORATORY
- 104B HEAD OF DEPARTMENT (AI-DS)
- 105A BOARD ROOM
- 105B PRINCIPAL OFFICE
- 105C PANTRY

GPS M

Google

Lat 19.064375°  
Long 72.835762°  
09/11/23 02:27 PM GMT +05:30

**THADOMAL SHAHANI ENGINEERING COLLEGE TSEC**  
SECOND FLOOR PLAN

207 205 204  
LADIES WASH ROOM 208 206 203  
STAIRS LIFT LIFT STAIRS 202  
201

**DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE**

- 201 LECTURE HALL (AI-DS)
- 202 WEB PROGRAMMING / COMPUTER NETWORK LABORATORY
- 203 COMPUTER GRAPHICS / DATABASE TECHNOLOGIES LABORATORY
- 204 HEAD OF DEPARTMENT (COMPUTER)
- 205 FACULTY ROOM
- 206 FACULTY ROOM
- 207 FACULTY ROOM
- 208 JAVA / PYTHON PROGRAMMING / DATA STRUCTURE LABORATORY

GPS Map Camera

Google

Lat 19.064404°  
Long 72.835733°  
09/11/23 02:37 PM GMT +05:30

**New building Floor Plans**

**COMPUTER ENGINEERING DEPARTMENT TSEC**

Faculty Name	Designation	Room Number
Dr. Tanuja K. Sarode	Professor & HOD	204
Dr. Jayant Gadge	Professor & Vice Principal	205
Dr. Archana Patankar	Professor & Dean Research	206
Mr. Vaibhav Ambhure	Assistant Professor	207
Ms. Darakhshan Khan	Assistant Professor	207
Ms. Nabanita Mandal	Assistant Professor	207
Ms. Juhi Janjua	Assistant Professor	207
Ms. Rupali Sarode	Assistant Professor	301
Ms. Manisha Dumbre	Assistant Professor	301
Ms. Urvi Kore	Assistant Professor	301
Ms. Parul Jain	Assistant Professor	301
Mr. Adil Shaikh	Assistant Professor	301
Dr. Seema Kolkur	Associate Professor	303
Dr. Ujwala Bharambe	Assistant Professor	303
Ms. Sonali Jadhav	Assistant Professor	304
Dr. Shilpa Verma	Associate Professor	306
Ms. Tasneem Mirza	Associate Professor	306
Ms. Sakshi Surve	Assistant Professor	306
Ms. Anagha Durugkar	Assistant Professor	306
Dr. Arti Deshpande	Associate Professor & Dean Students Affair	405
Ms. Vijaya Padmadas	Assistant Professor	405
Ms. Sonal Shroff	Assistant Professor	506
Ms. Vaishali Suryawanshi	Assistant Professor	506
Ms. Shilpa Ingoley	Assistant Professor	506
Dr. Anil Chhangani	Associate Professor	507
Mr. Aejazul Khan	Assistant Professor	507
Mr. Rithesh Kini	Assistant Professor	703
Mr. Khalid Ansari	Assistant Professor	703
Dr. Gauri Shukla	Associate Professor	703

GPS Map Camera

Google

Lat 19.064341°  
Long 72.836055°  
09/11/23 04:19 PM GMT +05:30

**Faculty Seating Arrangements Display in New building**



### Old building Floor Plans

#### 3.3 Draining system:

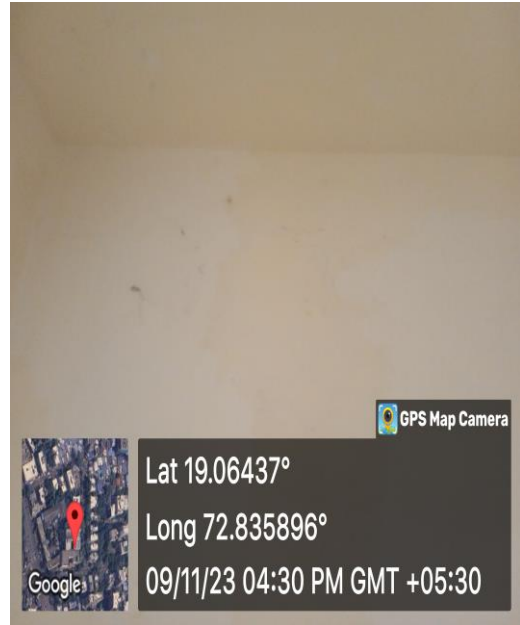
The drains from the washrooms are connected to the municipal drainage, which is a common practice in the colleges in the MCGM region.

#### 3.4 Seepage in the building:

The organization is inspected for seepages.

No seepages are observed in any of the places of the new building.

But at few places in the old building the seepages are observed.



### Crack and Seepage (Old Building)



## Chapter-IV

# Safety

### 4.1 Introduction:

Healthy and safety environments are inevitable to conduct all Educational, Research, Service and campus activities in any institutions.

In any organization, human resource is the most important one, especially in the educational institute. Safety practices are aimed at preventing accidents which cause injury to the persons and damage to the properties.

Accidents invariably cause some kind of damage – injury to the personnel and/or damage to property. However, accidents are preventable, if proper care is taken in the safety guidelines for any kind of activity. Unsafe conditions and unsafe acts during a particular work cause accident. These can be avoided by ensuring:

- Safe working conditions in workshop/machine shop
- Proper maintenance of tools and equipment
- Availability of first-aid
- Training of safety to the students and faculty members

### 4.2 Fire-fighting system:

TSEC is very innovative and alert towards safety and security of the infrastructure and human being. The novel and innovative Fire extinguisher balls have been located at each floor, which operates easily and quickly attacks on the fire. There are sufficient fire extinguishers/fire sand buckets/fire hydrants/fire alarms in the both new and old building; which are checked / refilled as per the stipulated frequency.

The details of the fire extinguishers are given in the table.

Location (New Building)	Fire Extinguisher (ABC Class)	Sand Bucket	Fire Hydrant and Hose	Fire Extinguisher Ball	Fire Alarm
Gr floor	2	2	Yes	Yes	Yes
1 <sup>st</sup> floor	2	2	Yes	Yes	Yes
2 <sup>nd</sup> floor	2	2	Yes	Yes	Yes
3 <sup>rd</sup> floor	2	2	Yes	Yes	Yes
4 <sup>th</sup> floor	2	2	Yes	Yes	Yes
5 <sup>th</sup> floor	2	2	Yes	Yes	Yes
6 <sup>th</sup> floor	2	2	Yes	Yes	Yes
7 <sup>th</sup> floor	2	2	Yes	Yes	Yes
8 <sup>th</sup> floor	2	2	Yes	Yes	Yes
9 <sup>th</sup> floor	2	2	Yes	Yes	Yes
10 <sup>th</sup> floor	2	2	Yes	Yes	Yes
11 <sup>th</sup> floor	2	2	Yes	Yes	Yes

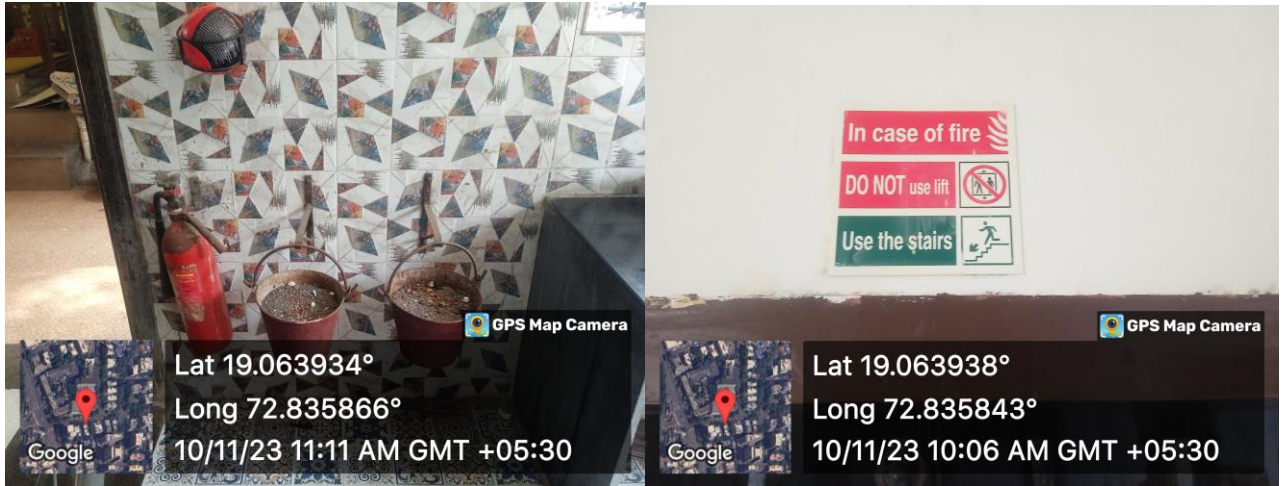
Location (Old Building)	Fire Extinguisher (ABC Class)	Sand Bucket	Fire Hydrant and Hose	Fire Extinguisher Ball	Fire Alarm
Gr floor	2	2	Yes	Yes	Yes
1 <sup>st</sup> floor	2	2	Yes	Yes	Yes
2 <sup>nd</sup> floor	2	2	Yes	Yes	Yes
3 <sup>rd</sup> floor	2	2	Yes	Yes	Yes
4 <sup>th</sup> floor	2	2	Yes	Yes	Yes
5 <sup>th</sup> floor	2	2	Yes	Yes	Yes
6 <sup>th</sup> floor	2	2	Yes	Yes	Yes



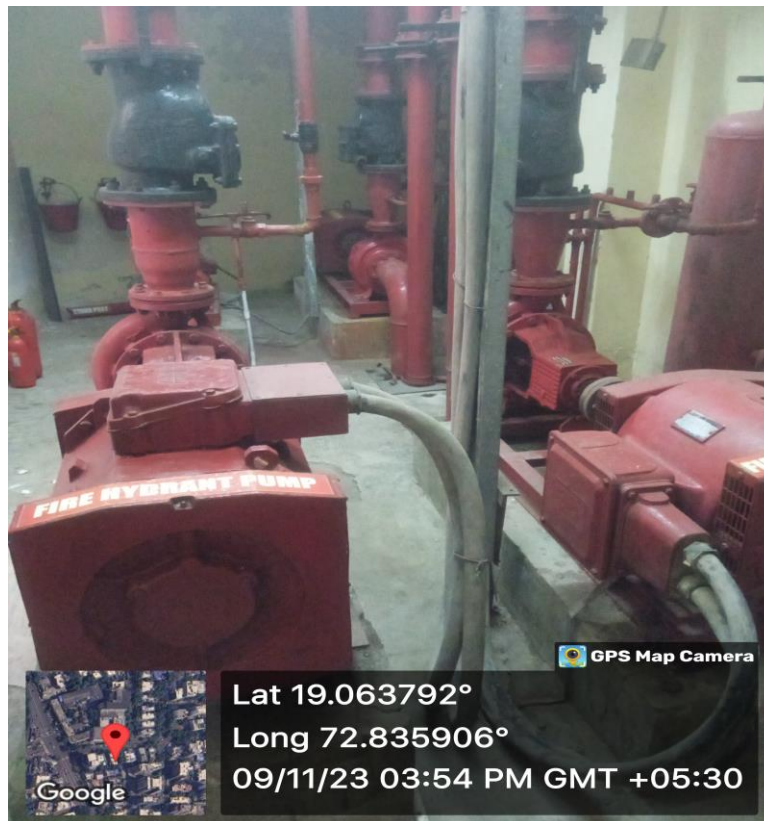
**Firefighting Equipment in the New building**



**Fire Extinguisher Balls**



### Firefighting Equipment and Safety Notices (OB Ground Floor)



### Fire Hydrant and Pumps (NB Ground Floor)

Both old and new building of TSEC is installed with fire water pumping system. The drinking water and fire water tanks are partitioned at both the locations.

#### 4.3 Fire system monitoring Center:





**Fire Systems Monitoring Center (NB Ground Floor)**

**4.4 First Aid Provision:**

In the TSEC, the medical kits are kept at department levels to ensure the injured person will get the first aid immediately. The availability should be disseminated through notices, displays at all locations for quick access.

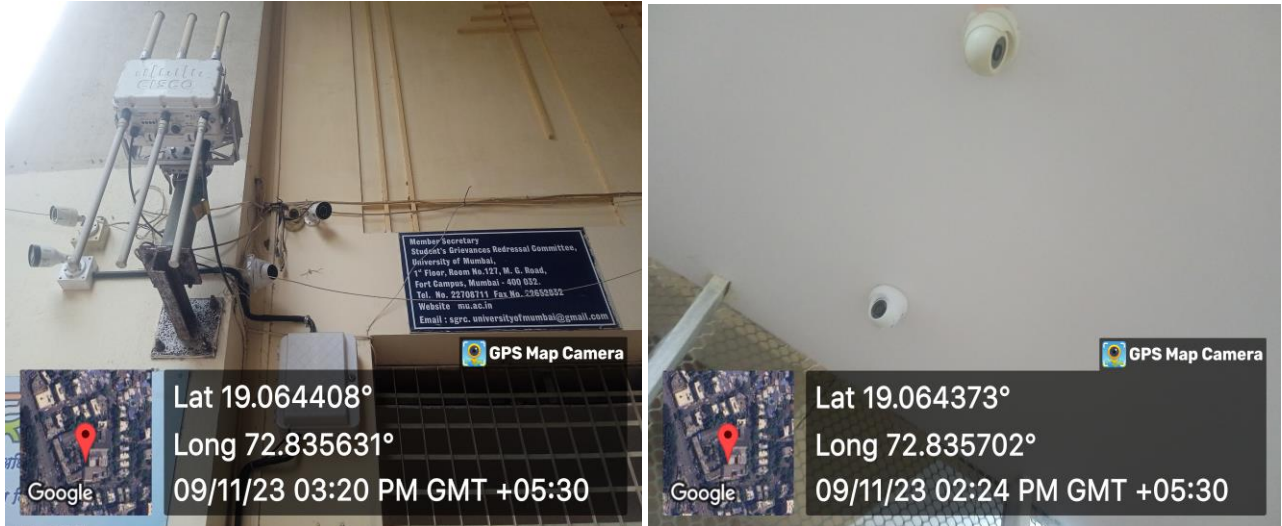


**Fire Systems Monitoring Center (NB Ground Floor)**



#### 4.5 CCTV Provision:

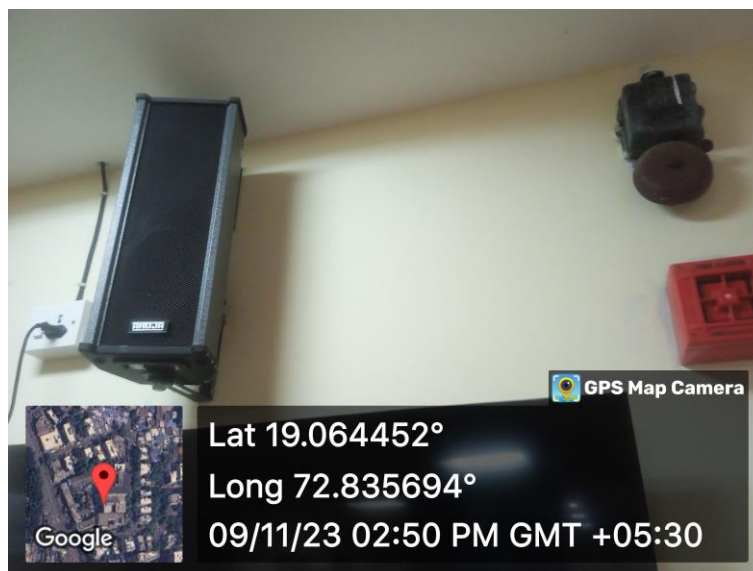
TSEC is equipped with cctv at all locations, for safety and security of the infrastructure and human being.



**CCTV Provision at TSEC**

#### 4.6 Alarming and PA System:

Alarming and PA system is installed at each floor near to the lift and staircase area, which communicates the announcements to the faculty members, staff and students.



**Alarming and PA System**

# Chapter-V

## Green Culture

### 5.1 Description:

Green culture is a collective belief toward an ecological, environment-friendly working procedures followed by institutions. TSEC has an NSS wing to inculcate a sense of social sensibilities among students. NSS unit organizes the green activities like Cleaning of Village Areas, Cleaning of Common Water Bodies at Adopted villages, Juhu Beach Cleaning after Ganapati festival etc.

Under the Green Army project of Govt of India, TSEC students and teachers regularly participate in plantation in nearby area.

TSEC has procured the star rated, energy efficient devices like

1. Air-conditioners
2. LED/LCD displays
3. Projectors

The following steps may be initiated to further enhance efficiency of the systems.

1. An efficient power management system may be incorporated to
  - a. Switch off the display if not in use.
  - b. Put the computer in Sleep mode / switching off the machines, if not used for prolonged period.
2. Optimize brightness of the screen.
3. Discourage use of screen savers, which has similar power consumption.

### Digital communication:

The internal communication is through electronic medium. Digital library, Digital diary of TSEC are the few examples of digital communication at TSEC.

**Paperless Submission:**

The institute has adopted the method of paperless submission as pilot project, for subject journals for students, which leads to saving in trees, natural resources.

**Energy Audit Report**  
**of**  
**THADOMAL SHAHANI ENGINEERING COLLEGE,**  
**BANDRA (WEST) MUMBAI**



**Prepared  
By**

**Endutech Consultancy Services Pvt Ltd  
Navi Mumbai**

**2023-2024**





**ACCREDITED**  
ISO 9001: 2015  
QMS Certification CAB # 118005

# ENDUTECH CONSULTANCY SERVICES PVT LTD

Ref No. ECS-EAR-3-2023

Date - 15/11/2023

## ENERGY AUDIT CERTIFICATE (AY: 2023-24)

This is to certify that Energy Audit has been carried out in the campus and buildings of Thadomal Shahani Engineering College, Bandra West, Mumbai- 400050, Maharashtra, in the month of November 2023.

The scope, coverage, findings and suggestions are submitted in the report ECS-EAR-3-321151 dated November 15, 2023.

For,

ENDUTECH Consultancy Services

**Dr. D. Santosh (Govt. Reg. No. CEA-12141)**  
Director

# Contents

Sr No	Description	Page No
	Summary of Recommendations	04
I	Introduction	05
II	Consumption Pattern	08
III	Computer Displays	12
IV	Air Conditioners	17
V	Illumination	22
VI	Ceiling Fans	28
VII	Miscellaneous	32
VIII	Renewable Energy	33

## Summary of Recommendations

1. Solar Roof top system is highly recommended at new and old buildings of TSEC to lower the electricity consumption.
2. Penalty and charges of Rs. 21,000/\_ per month are observed in the electricity bill towards non-unity power factor, TOD charges and Excess Demand.
3. 60% and 38% Tube lights in new building and old building, respectively, have been replaced by LED lights.
4. Solar street lights are provided in the campus.
5. Sensor based water conservation is achieved in the old building canteen premises.
6. Water coolers life need to be assessed and replacement decision may be taken accordingly.
7. Fire Extinguisher Ball is provided at each floor for quick and easy action against fire.
8. Old/Ordinary ceiling fans may be replaced by energy efficient Fans but investment is significantly higher compared to savings.
9. Solid waste/dry waste/garden waste may be managed to generate the compost in the TSEC campus itself.

# Chapter-I

## Introduction

### 1.1 Background of the study:

The Energy Audit was carried out in AY 2021-22 and 2022-23 for Thadomal Shahani Engineering College (TSEC). In above reference, Thadomal Shahani Engineering College (TSEC), Bandra (West), Mumbai, Maharashtra, assigned Endutech Consultancy Services, Navi Mumbai to carry out Energy Audit.

The fundamental purpose of the energy audit is not only to identify the potential saving areas but also to establish energy monitoring and control system to reap the gains on sustainable basis.

This energy audit report presents the analysis of the data collected, observations made at the facility and is governed by the objectives, scope of work, methodology etc. discussed in the ensuing paragraphs.

The energy audit report also recalls and reviews the recommendations/suggestions given in previous studies.

### Objective:

The basic objectives of the Energy Audit Study are to,

- Identify key result areas for energy saving along with their Cost Benefit Analysis.
- Suggest energy monitoring and control mechanism to realize the savings on the sustainable basis.
- Review and analyze the recommendations given in the energy audit report of AY 2022-23.



## Methodology:

Prior to start of the Audit session, submitted a list of data required along with the execution plan.

The visit was undertaken along with the project engineers, in the First week of November 2023. The field training was given to the engineers about data collection. The team was trained about operation and handling of the instruments used in the energy auditing.

The prime objectives of these visits were:

- To hold discussions with Principal, to understand Energy consumption pattern, to get acquainted with the efforts already put in for energy conservation
- To collect historic data regarding energy consumption and maintenance practices.
- To undertake requisite field trials and to make observation.

## Team:

The team members of the audit study.

1. Dr S D Dalvi, Certified Energy Auditor (CEA-12141)
2. Mr. Sairaj Hande, Project Manager

## Instruments

The following instruments were utilized for measurement during the energy audit study.

1. Power meter
2. Hygro-temperature meter
3. Anemometers

4. AC power meter
5. Lux meter

**Acknowledgment:**

Endutech consultancy services wish to record their gratitude to the management of TSEC for awarding this assignment.

We extend our thanks to the Principal, **Dr. G T Thampi** for initiating the work.

We are also thankful to **Prof. Monika G Tolani**, Assistant Professor, Training & Placement Officer, TSEC, and the maintenance team including Mr. Gomes, Mr. Samay and Mr. Sunil for extending all possible help and co-operation from their side.

## Chapter-II

# Consumption Pattern

### 2.1 Brief Description & Consumption data:

#### Present Scenario:

- Electricity consumption for August/September 2023 is around 40,500 kWh out of which 28000 units is for new building and 12500 units is for old building.
- The total payment made towards electricity consumption for August/September 2023 is Rs. 5,59,025 out of which Rs. 3,87,160 is for new building and Rs. 1,71,865 is for old building.
- The calculated cost of power is Rs 10.47/- per kWh in AY 23-24.

As can be seen the major consumption is of

- Air conditioners
- Ceiling fans
- Computers
- Projectors
- Illumination
- Elevators

The other unaccounted consumptions are of pumping system, printers, scanners, ups etc.

### 2.2 Electricity Bills:

The electricity is supplied through LT connection; TSEC has installed Seven LT I (B) electricity meters. TSEC has installed five LT II (C) electricity meters. This tariff category is applicable for electricity used at Low/Medium voltage in non-residential, non-industrial and/or commercial premises for commercial consumption meant for operating various appliances used for purposes such as lighting, heating, cooling, cooking, washing/cleaning, entertainment/ leisure and water pumping in.

The statistics of electricity consumption for month of August/September 2023 is tabulated.

The analysis of LT II (C) electricity meters is shown in table.

Location		NB 5/6 <sup>th</sup> Floor	NB 9/10 <sup>th</sup> Floor	NB Accounts	NB Lift Room	OB pump, lift room
Meter No		L1003438	L1003439	L1003440	L1004492	L1004495
Account No		150157256	150154523	150157252	151251739	102698704
Tariff		LT II (C)	LT II (C)	LT II (C)	LT II (C)	LT II (C)
MF		20	40	80	40	20
Consumption	KWH	3258	2161	13346	972	12051
Month and Year		Aug-23	Aug -23	Aug -23	Aug -23	Aug -23
TOD (9-12) charges	Rs	647	376	2456	79.50	2339
TOD (18-22) charges	Rs	18	62	248	34	489
TOD (22-06) charges	Rs	21Cr	50.25Cr	46.50Cr	6Cr	408.75Cr
CD Penalty	Rs	2385	0	0	0	2385
PF Penalty	Rs	9238.47	710.05Cr	731.76Cr	258.77Cr	667.04Cr
DPD	Rs	89.16Cr	57.31Cr	261.99Cr	26.97Cr	197.15Cr
PPD	Rs	356.65Cr	229.22Cr	1047.94Cr	107.89	788.58Cr
Power factor		0.40	0.99	0.96	0.98	0.96
Bill Amount	Rs	56980	34330	180640	12400	167540

The analysis of LT I (B) electricity meters are shown in table.

Location		OB	NB Basement	NB pump room	NB 1/2nd Floor
Meter No		7780668	7735461	7735462	7602803
Account No		102174897	150157262	150157261	102196435
Tariff		LT I (B)	LT I (B)	LT I (B)	LT I (B)
Consumption	KWH	441	109	104	1588
Month and Year		Sept -23	Sept -23	Sept -23	Sept -23
Bill Amount	Rs	4325	960	1270	19310
DPC		0	0.11	0.14	2.78



DPD		0	1.88Cr	2.46Cr	45.66Cr
PLED		0	0	0	0
PPD		0	0	0	0

Location		NB 7/8th Floor	NB 3/4th Floor	NB Basement
Meter No		7882202	7541328	7881869
Account No		150157255	102196445	150157258
Tariff		LT I (B)	LT I (B)	LT I (B)
Consumption	kWh	2635	1703	2143
Month and Year		Sept -23	Sept -23	Aug -23
Bill Amount	Rs	33470	20680	27120
DPC		3.52	2.11	3
DPD		57.25Cr	44.80Cr	56.12Cr
PLED		0	0	0
PPD		0	0	0

### 2.3 Energy Saving Analysis:

The observations are as below.

1. Power factor penalty of Rs. 9238.47/\_ is observed for new building meters of 5<sup>th</sup> and 6<sup>th</sup> floor, which can be saved and converted into incentives by maintaining power factor near to unity.

The improvement in power factor also reduces maximum demand and proportionally saves on demand charges. The power factor has been maintained at unity.

2. Delayed payment charges per month may be saved.

3. TOD charges of Rs. 6748.5/\_ are observed.

4. The prompt payment discount and digital payment discount may be availed.

5. The penalty on exceeding the contract demand of Rs. 4770/\_ is observed.

### 2.4 Important Information from Electricity Distributor:

The electricity distributor of TSEC is Adani Electricity Mumbai Limited.

Whenever the average Power Factor is more than 0.95 (lag or lead) and upto 1, an incentive shall be given at the rate of the following percentages of the amount of the monthly electricity bill. The details are shown in the table

Endutech Consultancy Services, Navi Mumbai

Sl.	Range of Power Factor	Power Factor Level	Incentive
1	0.951 to 0.954	0.95	0.0%
2	0.955 to 0.964	0.96	0.5%
3	0.965 to 0.974	0.97	1.0%
4	0.975 to 0.984	0.98	1.5%
5	0.985 to 0.994	0.99	2.5%
6	0.995 to 1.000	1.00	3.5%

Whenever the average PF is less than 0.9 (lag or lead), penal charges shall be levied at the rate of the following percentages of the amount of the monthly electricity bill. The details are shown in the table.

Sl.	Range of Power Factor	Power Factor Level	Penalty
1	0.895 to 0.900	0.90	0.0%
2	0.885 to 0.894	0.89	1.0%
3	0.875 to 0.884	0.88	1.5%
4	0.865 to 0.874	0.87	2.0%
5	0.855 to 0.864	0.86	2.5%
6	0.845 to 0.854	0.85	3.0%
7	0.835 to 0.844	0.84	3.5%
8	0.825 to 0.834	0.83	4.0%
9	0.815 to 0.824	0.82	4.5%
10	0.805 to 0.814	0.81	5.0%
...	...	...	...

## Chapter-III

### Computer Displays

#### 3.1 Brief Description:

In new building there are 1113 LED computers and TV displays and in old building 152 LED computers and TV displays, counted as observed. There were printers and scanners in both the buidings.

#### General Suggestions:

1. An efficient power management system may be incorporated to
  - a. Switch off the display if not in use.
  - b. Put the computer in Sleep mode / switching off the machines, if not used for prolonged period.
2. Optimize brightness of the screen.
3. Discourage use of screen savers, which has similar power consumption

#### 4.2.1 Computer Displays in New Building

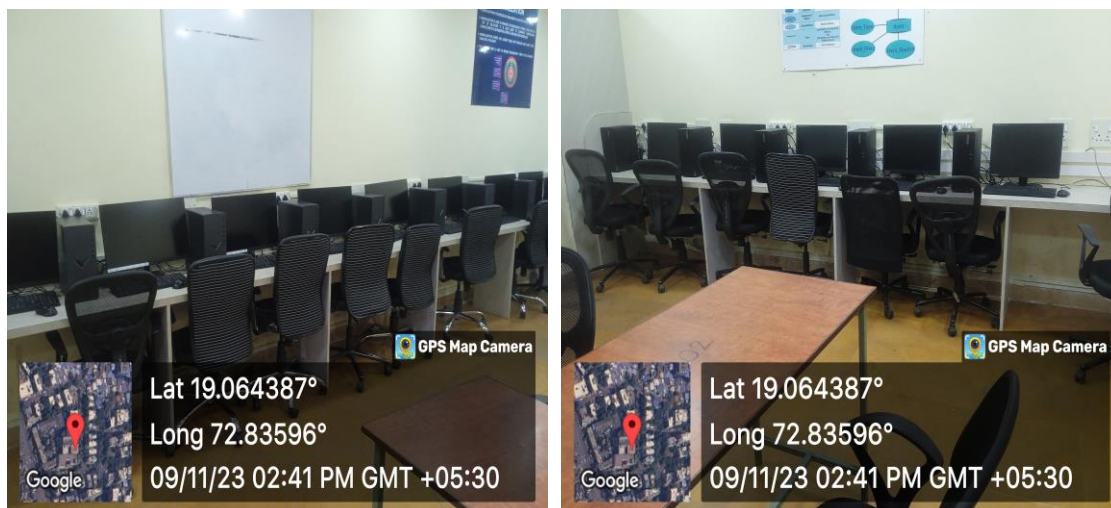
S N	Location	DISPLAY
1	Training Room	2
2	GYM	0
3	Reading Room (GF)	1 TV
4	Ground Floor	0
5	1st Floor Lobby	1 TV
6	OF 105	4
7	OF 104	23
8	OF 103	12
9	101 + 102	13
10	2nd Floor Lobby	0
11	CL 207 + 208	52
12	LH 206	0

13	LH 205	1
14	LH 204	1
15	CL 203	23
16	CL 202	34
17	LH 201	1
18	3rd Floor Lobby	1 TV
19	LH 307	0
20	CL 306	44
21	LH 305	0
22	CL 303 + 304	44
23	CL 302	43
24	CL 301	40
25	4th Floor Lobby	0
26	CL 405	36
27	CL 404	0
28	CL 403	33
29	CL 401 + 402	130
30	5th Floor Lobby	0
31	LH 508	1
32	507	2
33	506	3
34	LH 505	1
35	LH 504	1
36	LH 503	32
37	6th Floor Lobby	1 TV
38	LH 609	26
39	LH 605	24
40	LH 604	1
41	LH 603	2
42	LH 602	24
43	LH 601	1
44	7th Floor Lobby	0
45	COM 706	7
46	COM 705	7
47	COM 704	16
48	COM 703	23
49	LH 702	1
50	LH 701	11
51	8th Floor Lobby	1
52	LH 806 (IT)	1
53	LH 805 (IT)	22
54	LH 804 (IT)	28
55	LH 803 (IT)	7
56	LH 802 (IT)	1
57	LH 801 (I)	1



58	9th FLOOR LOBBY	0
59	LH 907 (IT)	1
60	CL 906 (IT)	40
61	LH 905	5
62	LH 904	3
63	LH 903	2
64	LH 902 (IT)	41
65	LH 901 (IT)	1
66	10th FLOOR LOBBY	22
67	CL 1006	50
68	CL 1005 (IT)	27
69	CL 1004 (IT)	47
70	LH 1003 (IT)	41
71	LH 1002 (IT)	45
72	LH 1001 (IT)	0
73	11th Floor Lobby	0
74	Seminar hall 1105 (IT)	0
75	LH 1104 (IT)	1
76	LH 1103 (IT)	1
77	LH 1102 (IT)	1
78	LH 1101 (IT)	1

Figure below shows the LED displays of computers provided in the laboratories of new and old buildings at TSEC.



**LED Computer Displays at TSEC**

#### 4.2.2 Computer Displays in Old Building

S N	Location	DISPLAY
1	1St Floor Lobby	0
2	Book Stall	0
3	OF 109	1
4	LI 108	1
5	LI 107	1
6	LI 106	41
7	LI 105	0
8	LI 104	0
9	LI 103	0
10	OF 102	2
11	2nd Floor Lobby	0
12	PRINCIPAL RESIDANCE	1 (2 TV)
13	OF 209	0
14	LH 208	0
15	LH 207	1
16	LH 206	0
17	LH 205	0
18	LH 204	1
19	LH 203 (A&B)	0
20	LH 202	3
21	3rd Floor Lobby	0
22	OF 309	1
23	NSS 308	1
24	CL 308	1
25	CL 307	25
26	CL 306	23
27	LH 305	1
28	LH 304	0
29	LH 303	2
30	LH 302	1
31	LH 301	2
32	4th Floor Lobby	0
33	OF 409	0
34	408 (work)	0
35	Library	7
36	OF 402	1
37	OF 401	3
38	5th Floor Lobby	0
39	LH 508	1
40	LH 507	0
41	LH 506	1
42	LH 505	1
43	LH 504	1

44	LH 503	0
45	OFFICE 502	3
46	501	4
47	6th Floor Lobby	0
48	LH 609	0
49	LH 607	0
50	LH 606	0
51	LH 605	19
52	LH 604	0
53	LH 603	0
54	LH 602	0
55	LH 601	1
56	1St Floor Lobby	0

## Chapter-IV

# Air Conditioning System

### 4.1 Brief Description:

Air conditioning system is basically provided to maintain comfortable ambience inside the premises by maintaining the temperature (and relative humidity, at times) at appropriate levels. The performance of human being is optimal at the temperature of  $24 \pm 2$  °C and at relative humidity (RH) of  $60 \pm 5\%$ .

The warmer and humid air from the premises is drawn and fed to the Air Conditioning System by a circulating fan. This air is chilled in an evaporator by vaporizing the refrigerant and is distributed throughout the conditioned area. The refrigerant is pressurized by a compressor and subsequently is cooled and condensed by an air-cooled condenser. The compressor and condenser are placed in an outdoor unit, located on the external side of the premise. While the circulating fan and evaporator is placed in an indoor unit located inside the premises.

### 4.2 Air conditioner (A/c) Survey:

The survey of air conditioners was carried out for inspection of type of A/c, STAR rating, outdoor unit, indoor unit and tubes insulation condition.

The details are as below.

#### 4.2.1 New Building

S N	Location	SPLIT	WINDOW	* Rating	TR
1	Training Room	1	0	-	2
2	GYM	0	0	0	0
3	Reading Room (GF)	0	0	0	0
4	Ground Floor	0	0	0	0
5	1st Floor Lobby	0	0	0	0

6	OF 105	3	0	3	2
7	OF 104	3	0	3	2
8	OF 103	1	0	3	2
9	101 + 102	3	0	3	2
10	2nd Floor Lobby	0	0	2	0
11	CL 207 + 208	4	0	2	2
12	LH 206	2	0	2	1.5
13	LH 205	1	0	3	2
14	LH 204	1	0	3	1.5
15	CL 203	2	0	3	2
16	CL 202	2	0	3	2
17	LH 201	2	0	3	2
18	3rd Floor Lobby	0	0	0	0
19	LH 307	0	0	0	0
20	CL 306	4	0	3	1.5
21	LH 305	2	0	3	1.5
22	CL 303 + 304	3	0	3	1.5
23	CL 302	2	0	3	2
24	CL 301	2	0	3	1.5
25	4th Floor Lobby	0	0		
26	CL 405	2	2	3	1.5
27	CL 404	2	0	3	2
28	CL 403	2	0	3	2
29	CL 401 + 402	6	2	3	1.5
30	5th Floor Lobby	0	0	3	2
31	LH 509	2	0	3	2
32	507	1	0	3	1.5
33	506	1	0	3	1.5
34	LH 505	2	0	3	2
35	LH 504	2	0	3	2
36	LH 503	2	0	3	2
37	6th Floor Lobby	0	0	0	2
38	LH 609	1	2	3	1.5
39	LH 605	2	0	3	2
40	LH 604	2	0	3	2
41	LH 603	1	0	3	2
42	LH 602	2	0	3	2
43	LH 601	2	0	3	2
44	7th Floor Lobby	0	0	3	2
45	COM 706	3	0	3	2
46	COM 705	2	0	3	1.5
47	COM 704	1	0	3	2
48	COM 703	2	0	3	2
49	LH 702	1	0	3	2
50	LH 701	3	0	3	2



51	8th Floor Lobby	0	0	3	2
52	LH 806 (IT)	2	0	3	0
53	LH 805 (IT)	2	0	3	2
54	LH 804 (IT)	2	0	3	2
55	LH 803 (IT)	2	0	3	2
56	LH 802 (IT)	2	0	3	2
57	LH 801 (I)	2	0	3	2
58	9th FLOOR LOBBY	0	0	0	0
59	LH 907 (IT)	2	0	3	2
60	CL 906 (IT)	3	0	3	2
61	LH 905	1	0	3	1.5
62	LH 904	1	0	3	1.5
63	LH 903	1	0	3	2
64	LH 902 (IT)	3	0	3	2
65	LH 901 (IT)	2	0	3	2
66	10th FLOOR LOBBY	0	0	0	0
67	CL 1006	4	0	3	1.5
68	CL 1005 (IT)	3	0	3	2
69	CL 1004 (IT)	3	0	3	2
70	LH 1003 (IT)	3	0	3	2
71	LH 1002 (IT)	2	0	3	2
72	LH 1001 (IT)	2	0	3	2
73	11th Floor Lobby	0	0	0	0
74	Seminar hall 1105 (IT)	6	0	3	2
75	LH 1104 (IT)	2	0	3	2
76	LH 1103 (IT)	2	0	3	2
77	LH 1102 (IT)	2	0	3	2
78	LH 1101 (IT)	2	0	3	2

#### 4.2.2 Old Building

S N	Location	SPLIT	WNDOW	* Rating	TR
1	Training Room	1	0	-	2
2	GYM	0	0	0	0
3	Reading Room (GF)	0	0	0	0
4	Ground Floor	0	0	0	0
5	1st Floor Lobby	0	0	0	0
6	OF 105	3	0	3	2
7	OF 104	3	0	3	2
8	OF 103	1	0	3	2
9	101 + 102	3	0	3	2
10	2nd Floor Lobby	0	0	2	0
11	CL 207 + 208	4	0	2	2
12	LH 206	2	0	2	1.5
13	LH 205	1	0	3	2

14	LH 204	1	0	3	1.5
15	CL 203	2	0	3	2
16	CL 202	2	0	3	2
17	LH 201	2	0	3	2
18	3rd Floor Lobby	0	0	0	0
19	LH 307	0	0	0	0
20	CL 306	4	0	3	1.5
21	LH 305	2	0	3	1.5
22	CL 303 + 304	3	0	3	1.5
23	CL 302	2	0	3	2
24	CL 301	2	0	3	1.5
25	1St Floor Lobby	0	0	0	0
26	4th Floor Lobby	0	0		
27	Book Stall	0	0	0	0
28	CL 405	2	2	3	1.5
29	OF 109	0	0	0	0
30	CL 404	2	0	3	2
31	LI 108	2	0	3	1.5
32	CL 403	2	0	3	2
33	LI 107	0	1	3	1.5
34	CL 401 + 402	6	2	3	1.5
35	LI 106	1	0	3	2
36	5th Floor Lobby	0	0	3	2
37	LI 105	0	0	0	0
38	LH 509	2	0	3	2
39	LI 104	0	0	0	0
40	507	1	0	3	1.5
41	LI 103	0	0	0	0
42	506	1	0	3	1.5
43	OF 102	1	0	3	2
44	LH 505	2	0	3	2
45	2nd Floor Lobby	0	0	0	0
46	LH 504	2	0	3	2
47	PRINCIPAL RESIDANCE	4	0	3	2
48	LH 503	2	0	3	2
49	OF 209	1	0	3	1.5
50	6th Floor Lobby	0	0	0	2
51	LH 208	1	0	3	2
52	LH 609	1	2	3	1.5
53	LH 207	1	1	3	1.5
54	LH 605	2	0	3	2
55	LH 206	0	2	3	1.5

#### 4.2.3 Observation:

- Total 205 and 138 split air-conditioners are fitted in the new and old building respectively.
- Total 16 and 06 window air-conditioners are fitted in the new and old building respectively.
- Window A/c's to be replaced by split A/c's.
- TURN OFF the a/c posters are required in the classrooms and laboratories.
- Doors must be closed when a/c is ON.

# Chapter-V

## Illumination

### 5.1 Brief Description:

Energy efficient tube-lights are fitted in new building as well as in the old building. The detail list of light fitting is as under.

#### 5.1.1 New Building Illumination

S N	Location	LED	LED	LED	T5	LED	TUBELIGHT
		36W	22W	15W	22W	15W	36W
1	Workshop	0	0	0	0	15	22
2	Visiting Room	0	10	0	0	0	0
3	Training Room	2	0	0	0	5	0
4	Gymnasium	0	0	0	0	0	6
5	Reading Room (GF)	24	0	0	0	0	0
6	Ground Floor	0	0	0	0	0	12
7	1st Floor Lobby	6	4	0	0	0	0
8	OF 105	8	0	4	4	2	4
9	OF 104	0	29	0	0	0	0
10	OF 103	0	9	0	0	0	0
11	101 + 102	0	27	0	0	0	0
12	2nd Floor Lobby	8	0	0	0	0	0
13	CL 207 + 208	0	25	0	0	0	0
14	LH 206	0	0	0	0	0	6
15	LH 205	0	0	0	0	0	2
16	LH 204	0	0	0	0	0	7
17	CL 203	0	21	0	0	0	0
18	CL 202	0	16	0	0	0	0
19	LH 201	0	20	0	0	0	0
20	3rd Floor Lobby	0	8	0	0	0	0
21	LH 307	0	0	0	0	0	4
22	CL 306	0	0	0	0	0	9
23	LH 305	0	15	0	0	0	0
24	CL 303 + 304	0	0	0	14	0	0
25	CL 302	0	0	0	0	0	6
26	CL 301	0	0	0	9	0	0
27	4th Floor Lobby	0	0	0	0	0	3
28	CL 405	0	0	0	0	0	9
29	CL 404	0	15	0	0	0	0

30	CL 403	0	0	0	9	0	0
31	CL 401 + 402	0	64	0	0	0	0
32	5th Floor Lobby	0	0	0	0	0	3
33	LH 508	0	0	32	0	0	0
34	LH 505	0	16	0	0	0	0
35	LH 504	0	15	0	0	0	0
36	LH 503	0	8	10	0	0	0
37	6th Floor Lobby	0	0	0	0	0	3
38	LH 609	0	0	0	0	0	10
39	LH 605	0	0	0	0	0	9
40	LH 604	0	15	0	0	0	0
41	LH 603	0	6	0	0	0	0
42	LH 602	0	16	0	0	0	0
43	LH 601	0	0	0	0	0	8
44	7th Floor Lobby	0	2	0	0	0	0
45	COM 706	0	10	0	0	0	0
46	COM 705	0	8	0	0	0	0
47	COM 704	0	8	0	0	0	0
48	COM 703	0	10	0	0	0	0
49	LH 702	0	15	0	0	0	0
50	LH 701	0	12	0	0	0	0
51	8th Floor Lobby	0	2	0	0	0	0
52	LH 806 (IT)	0	16	0	0	0	0
53	LH 805 (IT)	0	14	0	0	0	0
54	LH 804 (IT)	0	16	0	0	0	0
55	LH 803 (IT)	0	18	0	0	0	0
56	LH 802 (IT)	0	15	0	0	0	0
57	LH 801 (I)	0	16	0	0	0	0
58	9th FLOOR LOBBY	0	3	0	0	0	0
59	LH 907 (IT)	0	16	0	0	0	0
60	CL 906 (IT)	0	11	0	0	0	0
61	LH 905	0	5	0	0	0	0
62	LH 904	0	4	0	0	0	1
63	LH 903	0	6	0	0	0	1
64	LH 902 (IT)	0	9	0	0	0	0
65	LH 901 (IT)	0	16	0	0	0	0
66	10th FLOOR LOBBY	0	5	0	0	0	1
67	CL 1006	0	10	0	0	0	0
68	CL 1005 (IT)	0	9	0	0	0	0
69	CL 1004 (IT)	0	13	0	0	0	5
70	LH 1003 (IT)	0	9	0	0	0	0
71	LH 1002 (IT)	0	9	0	0	0	0
72	LH 1001 (IT)	0	16	0	0	0	0
73	11th Floor Lobby	0	3	0	0	0	6
74	Seminar hall 1105 (IT)	0	27	0	0	0	0



75	LH 1104 (IT)	0	0	16	0	0	0
76	LH 1103 (IT)	0	0	12	0	0	0
77	LH 1102 (IT)	0	0	12	0	0	0
78	LH 1101 (IT)	0	0	14	0	0	0

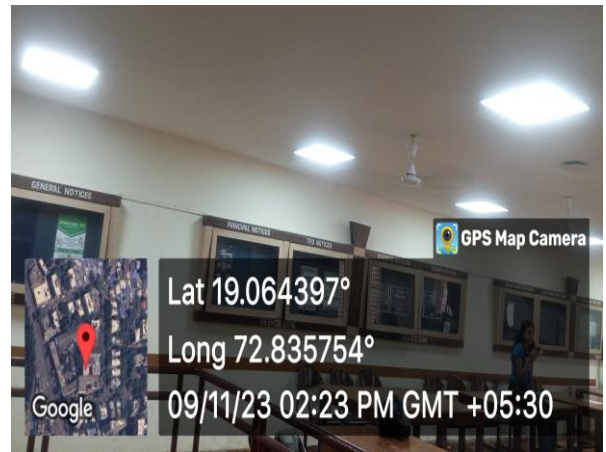
### 5.1.2 Old Building Illumination

S N	Location	LED	LED	LED	T5	LED	TUBELIGHT
		36W	22W	15W	22W	15W	36W
1	HoD (Chemical) 1	0	0	0	2	0	2
2	HoD (Chemical) 2	0	0	0	4	0	0
3	Ground Floor	0	0	21	3	0	1
4	1St Floor Lobby	0	0	0	4	0	6
5	Book Stall	0	0	1	0	0	0
6	OF 109	0	0	0	6	0	1
7	LI 108	0	0	0	3	0	3
8	LI 107	0	0	0	4	0	2
9	LI 106	0	0	0	7	0	0
10	LI 105	0	0	0	1	0	5
11	LI 104	0	0	0	0	0	4
12	LI 103 (60,70 level)	0	0	0	2	0	4
13	OF 102 (150,160 level)	0	0	0	3	0	0
14	101	0	0	0	1	0	5
15	2nd Floor Lobby	0	0	0	5	0	0
16	Principal Residence	0	12	0	0	0	1
17	OF 209	0	0	0	0	0	1
18	LH 208	0	25	0	0	0	0
19	LH 207	0	3	0	6	0	1
20	LH 206	0	0	0	6	0	0
21	LH 205	0	0	0	0	0	7
22	LH 204	0	0	0	0	0	6
23	LH 203 (A&B)	0	0	0	0	0	6
24	LH 202	0	0	6	2	0	1
25	201	0	0	0	2	0	2
26	3rd Floor Lobby	0	0	0	5	0	0
27	OF 309	0	0	0	0	0	1
28	NSS 308	16	0	0	0	0	5
29	CL 308	18	0	0	0	0	0
30	CL 307	0	0	0	3	0	4
31	CL 306	0	0	0	7	0	1
32	LH 305	0	0	0	5	0	5
33	LH 304	0	0	0	4	0	5
34	LH 303	0	0	0	0	0	4
35	LH 302	0	0	0	0	0	2

36	LH 301	0	0	0	0	0	3
37	4th Floor Lobby	0	0	0	5	0	0
38	OF 409	0	0	0	0	0	1
39	408 (work)	0	12	0	0	0	0
40	Library	0	0	36	0	0	8
41	OF 402	0	0	0	0	0	3
42	OF 401	0	0	0	0	0	3
43	5th Floor Lobby	0	0	0	5	0	0
44	LH 508	0	0	0	0	0	1
45	LH 507	0	0	0	3	0	3
46	LH 506	0	0	0	6	0	1
47	LH 505	0	0	0	7	0	0
48	LH 504	0	0	0	12	0	0
49	LH 503	0	0	0	0	0	5
50	OFFICE 502	0	0	0	0	0	2
51	501	0	0	0	1	0	1
52	6th Floor Lobby	0	0	0	5	0	0
53	LH 609	0	0	0	0	0	1
54	LH 607	0	0	0	2	0	5
55	LH 606	0	0	0	2	0	5
56	LH 605	0	0	0	0	0	9
57	LH 604	0	0	0	2	0	19
58	LH 603	0	0	0	2	0	5
59	LH 602	0	0	0	4	0	2
60	LH 601	0	0	0	2	0	2

## 5.2 Energy Conservation Analysis between TL and LED Lamps:

A 15 W LED lamp can provide similar illumination level to that of 36 W TFL. It is thus possible to save about 15 W of power by replacing a 36 W TFL (with conventional ballast). Thus, energy saving of over 40% can be realized by replacing TFL with LED lamp.



### LED Lights Fitting at TSEC

The statistics of LED and Tube lights fitting in the current and previous academic years is as below.

Premises	Type	LED	LED	LED	T5	LED	TUBELIGHTS
	Power (W)	36	22	15	22	15	36
Old Building	2022-23	0	24	22	87	0	227
	2023-24	34	52	64	143	0	164
New Building	2022-23	46	429	68	4	2	342
	2023-24	48	641	100	36	22	137

In the present scenario, TSEC is saving 1700.328 Rs/month in new building illumination modification but at the same time TSEC is losing 2101.96 Rs/month. Thus, to achieve break-even point a greater number of 36W tube lights are required to be replaced by 15W LED in old building.

### 5.3 Observations:

1. TSEC has taken initiative to replace Tube lights by LED lights in order to conserve the energy. It also has positive psychological effect on the approach of students and teachers towards teaching-learning process.

2. Low illumination levels are observed in the rooms (No. 603 OB) where films are applied on the window glasses and insufficient number of lights.
3. Passages and staircase tube lights to be replaced by LED lights.

# Chapter-VI

## Ceiling Fans

### 6.1 Brief Description:

Total 174 ceiling fans are counted in the available locations of old building and total 327 ceiling fans are counted in the available locations of new building. The average rating is around 60W for old fans in the old building. For comparison purpose 45W rating is considered for both old and new buildings.

### 6.2 Ceiling Fan Survey:

The survey of ceiling fan in the new building as given in the table below.

Sr No	Location or Room No	Operation		Ceiling Fan Details		Energy Eff Fan	Saving		
		hr/d	d/m	Fitted	Rating	Rating	W	kWh/Month	Rs. /Month
				48'		<u>28W@speed 5</u>		Rs 10.47/kWh	
1	GYM	5	20	5	45	28	17	8.5	89
2	Reading Room	5	20	13	45	28	17	22.1	231.39
3	OF 105	5	20	4	45	28	17	6.8	71.2
4	OF 104	5	20	6	45	28	17	10.2	106.79
5	OF 103	5	20	4	45	28	17	6.8	71.2
6	101 + 102	5	20	14	45	28	17	23.8	249.19
7	CL 207 + 208	5	20	4	45	28	17	6.8	71.2
8	LH 206	5	20	4	45	28	17	6.8	71.2
9	LH 205	5	20	1	45	28	17	1.7	17.8
10	LH 204	5	20	2	45	28	17	3.4	35.6
11	LH 201	5	20	4	45	28	17	6.8	71.2
12	LH 307	5	20	3	45	28	17	5.1	53.4
13	CL 306	5	20	7	45	28	17	11.9	124.59
14	LH 305	5	20	4	45	28	17	6.8	71.2
15	CL 303 + 304	5	20	2	45	28	17	3.4	35.6
16	CL 302	5	20	2	45	28	17	3.4	35.6
17	CL 301	5	20	5	45	28	17	8.5	89
18	CL 405	5	20	1	45	28	17	1.7	17.8



19	CL 404	5	20	4	45	28	17	6.8	71.2
20	CL 403	5	20	4	45	28	17	6.8	71.2
21	CL 401 + 402	5	20	0	45	28	17	0	0
22	LH 509	5	20	4	45	28	17	6.8	71.2
23	LH 505	5	20	4	45	28	17	6.8	71.2
24	LH 504	5	20	4	45	28	17	6.8	71.2
25	LH 503	5	20	5	45	28	17	8.5	89
26	LH 609	5	20	7	45	28	17	11.9	124.59
27	LH 605	5	20	7	45	28	17	11.9	124.59
28	LH 604	5	20	7	45	28	17	11.9	124.59
29	LH 603	5	20	5	45	28	17	8.5	89
30	LH 602	5	20	8	45	28	17	13.6	142.39
31	LH 601	5	20	8	45	28	17	13.6	142.39
32	COM 706	5	20	7	45	28	17	11.9	124.59
33	COM 705	5	20	5	45	28	17	8.5	89
34	COM 704	5	20	6	45	28	17	10.2	106.79
35	COM 703	5	20	9	45	28	17	15.3	160.19
36	LH 702	5	20	4	45	28	17	6.8	71.2
37	LH 701	5	20	9	45	28	17	15.3	160.19
38	LH 806 (IT)	5	20	4	45	28	17	6.8	71.2
39	LH 805 (IT)	5	20	6	45	28	17	10.2	106.79
40	LH 804 (IT)	5	20	14	45	28	17	23.8	249.19
41	LH 803 (IT)	5	20	14	45	28	17	23.8	249.19
42	LH 802 (IT)	5	20	4	45	28	17	6.8	71.2
43	LH 801 (I)	5	20	4	45	28	17	6.8	71.2
44	LH 907 (IT)	5	20	4	45	28	17	6.8	71.2
45	CL 906 (IT)	5	20	4	45	28	17	6.8	71.2
46	LH 905	5	20	2	45	28	17	3.4	35.6
47	LH 904	5	20	2	45	28	17	3.4	35.6
48	LH 903	5	20	1	45	28	17	1.7	17.8
49	LH 902 (IT)	5	20	4	45	28	17	6.8	71.2
50	LH 901 (IT)	5	20	3	45	28	17	5.1	53.4
51	CL 1006	5	20	3	45	28	17	5.1	53.4
52	CL 1005 (IT)	5	20	2	45	28	17	3.4	35.6
53	CL 1004 (IT)	5	20	4	45	28	17	6.8	71.2
54	LH 1003 (IT)	5	20	5	45	28	17	8.5	89
55	LH 1002 (IT)	5	20	5	45	28	17	8.5	89
56	LH 1001 (IT)	5	20	4	45	28	17	6.8	71.2
57	11th Floor Lobby	5	20	1	45	28	17	1.7	17.8
58	Seminar hall 1105 (IT)	5	20	15	45	28	17	25.5	266.99
59	LH 1104 (IT)	5	20	9	45	28	17	15.3	160.19
60	LH 1103 (IT)	5	20	6	45	28	17	10.2	106.79
61	LH 1102 (IT)	5	20	6	45	28	17	10.2	106.79
62	LH 1101 (IT)	5	20	9	45	28	17	15.3	160.19

The survey of ceiling fan in the old building as given in the table below.

Sr No	Location or Room No	Operation		Ceiling Fan Details		Energy Eff Fan		Saving		
		hr/d	d/m	Fitted	Rating	Rating	W	kWh/Month	Rs. /Month	
				48'		<u>28W@speed 5</u>		Rs 10.47/kWh		
1	Ground Floor	5	20	5	45	28	17	8.5	89	
2	Book Stall	5	20	1	45	28	17	1.7	17.8	
3	OF 109	5	20	4	45	28	17	6.8	71.2	
4	LI 108	5	20	3	45	28	17	5.1	53.4	
5	LI 107	5	20	6	45	28	17	10.2	106.79	
6	LI 106	5	20	6	45	28	17	10.2	106.79	
7	LI 105	5	20	4	45	28	17	6.8	71.2	
8	LI 104	5	20	4	45	28	17	6.8	71.2	
9	LI 103	5	20	4	45	28	17	6.8	71.2	
10	OF 102	5	20	2	45	28	17	3.4	35.6	
11	PRINCIPLE RESIDANCY	5	20	3	45	28	17	5.1	53.4	
12	OF 209	5	20	1	45	28	17	1.7	17.8	
13	LH 208	5	20	3	45	28	17	5.1	53.4	
14	LH 207	5	20	4	45	28	17	6.8	71.2	
15	LH 206	5	20	4	45	28	17	6.8	71.2	
16	LH 205	5	20	3	45	28	17	5.1	53.4	
17	LH 204	5	20	4	45	28	17	6.8	71.2	
18	LH 203 (A&B)	5	20	4	45	28	17	6.8	71.2	
19	LH 202	5	20	1	45	28	17	1.7	17.8	
20	OF 309	5	20	1	45	28	17	1.7	17.8	
21	NSS 308	5	20	4	45	28	17	6.8	71.2	
22	CL 308	5	20	1	45	28	17	1.7	17.8	
23	CL 307	5	20	3	45	28	17	5.1	53.4	
24	CL 306	5	20	5	45	28	17	8.5	89	
25	LH 305	5	20	4	45	28	17	6.8	71.2	
26	LH 304	5	20	5	45	28	17	8.5	89	
27	LH 303	5	20	4	45	28	17	6.8	71.2	
28	LH 302	5	20	1	45	28	17	1.7	17.8	
29	LH 301	5	20	2	45	28	17	3.4	35.6	
30	OF 409	5	20	1	45	28	17	1.7	17.8	
31	Library	5	20	24	45	28	17	40.8	427.18	
32	OF 402	5	20	1	45	28	17	1.7	17.8	
33	OF 401	5	20	3	45	28	17	5.1	53.4	
34	LH 508	5	20	1	45	28	17	1.7	17.8	
35	LH 507	5	20	4	45	28	17	6.8	71.2	
36	LH 506	5	20	4	45	28	17	6.8	71.2	
37	LH 505	5	20	5	45	28	17	8.5	89	

38	LH 503	5	20	5	45	28	17	8.5	89
39	OFFICE 502	5	20	1	45	28	17	1.7	17.8
40	LH 609	5	20	1	45	28	17	1.7	17.8
41	LH 607	5	20	4	45	28	17	6.8	71.2
42	LH 606	5	20	4	45	28	17	6.8	71.2
43	LH 605	5	20	6	45	28	17	10.2	106.79
44	LH 604	5	20	4	45	28	17	6.8	71.2
45	LH 603	5	20	4	45	28	17	6.8	71.2
46	LH 602	5	20	5	45	28	17	8.5	89
47	LH 601	5	20	1	45	28	17	1.7	17.8

### 6.3 Economics of Ceiling Fans:

Replacing old fans with new energy efficient fans can be considered. These fans save energy while delivering similar air flows.

The cost of replacement of 501 ceiling fans (excluding non-working, wall and exhaust fans) shall be around Rs 17,53,500/- giving a payback period of around 16.38 years. It is calculated by considering 45W consumption on average operation basis.

The expected saving potential is around Rs 8917/- per month.

Thus, the investment is high and the payback period is not much attractive.

## Chapter-VII

# Miscellaneous Consumers

### 7.1 Brief Description:

The other consumers include elevators, street lighting, passage lighting, water pumps, fire pumps, machine tools in the work shop, xerox machines, printers and computers.

The consumption of above equipment was not possible due to unavoidable circumstances.

# Chapter-VIII

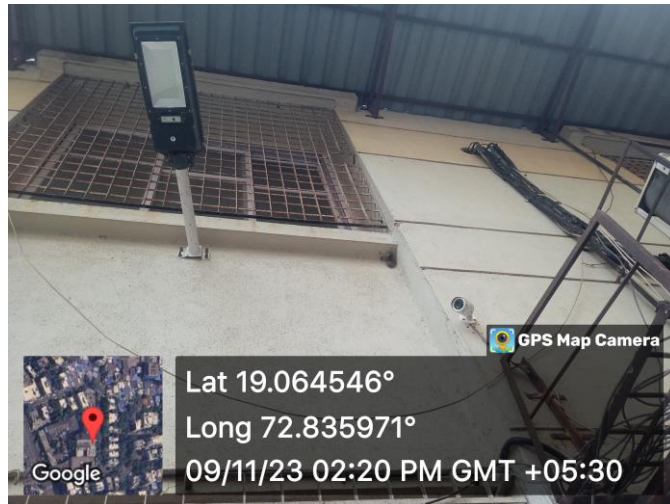
## Renewable Energy

### 8.1 Brief Description:

The institute should prefer the installation of solar system for both the old and new buildings.

It is possible to cut down the cost of electricity to great extent.

Also, solar water pumping must be considered which will save significant electricity as presently consumed by conventionally operated centrifugal pumps.



**Solar Street Lights Fitting at TSEC**

Figure above shows the solar street lights fitted at TSEC new building campus.



**Environment Audit Report**  
**of**  
**THADOMAL SHAHANI ENGINEERING COLLEGE,**  
**BANDRA (WEST) MUMBAI**



**Prepared  
By**

**Endutech Consultancy Services Pvt Ltd  
Navi Mumbai**

**2023-2024**



**ACCREDITED**  
ISO 9001: 2015  
QMS Certification CAB # 118005

# ENDUTECH CONSULTANCY SERVICES PVT LTD

Ref No. ECS-EAR-3-2023

Date- 15/11/2023

## ENVIRONMENT AUDIT CERTIFICATE (AY: 2023-24)

This is to certify that Environment Audit has been carried out in the campus and buildings of Thadomal Shahani Engineering College, Bandra West, Mumbai- 400050, Maharashtra, in the month of November 2023.

The scope, coverage, findings and suggestions are submitted in the report ECS-EVAR-3-321151 dated November 15, 2023.

For,

**ENDUTECH Consultancy Services**

A handwritten signature in black ink, appearing to read 'D. Santosh'.

**Dr. D. Santosh (Govt. Reg. No. CEA-12141)**  
Director

## Contents

Sr No	Description	Page No
I	Environment Audit	04
II	Water Management	07
III	Solid Waste Management	11
IV	Liquid Waste Management	14
V	E-waste Management	16
VI	Air Quality Analysis	18

# Chapter-I

## Environment Audit

### 1.1 Introduction:

An environmental audit evaluates and quantifies the environmental performance.

Environmental Auditing is an independent assessment performed by different organizations to ensure that they are complying with the Environmental Policies.

It examines the amount of risk or injury or actual harm caused by operational procedures and determines the types of Pollution produced by assessing the range of locations, procedures and activities.

### Objectives:

The basic objectives of the Environment Audit Study are to,

- Evaluate waste management practices of an organization.
- Determine pollution level in the organization.
- Assess energy conservation practices
- Assess water conservation practices

## Methodology:

The environment audit methodology is given below.

1. Reviewing the Institutes Environmental Protection Policy along with the applicable regulations

2. Structuring a plan for the audit for the applicable activities

3. Gathering of information and all relevant data

4. Evaluating the overall performance of the institution

5. Identifying the zones that require being focused on improvement

6. Submitting the Report of the Audit conducted to the management.

## Team:

The team members of the audit study.

1. Dr S D Dalvi, Certified Energy Auditor (CEA-12141)
2. Mr. Sairaj Hande, Project Manager

## Instruments

The following instruments were utilized for measurement during the energy audit study.

1. Power meter
2. Hygro-temperature meter
3. Lux meter
4. Air Quality meter

## Acknowledgment:

Endutech consultancy services wish to record their gratitude to the management of TSEC for awarding this assignment.

We extend our thanks to the Principal, **Dr. G T Thampi** for initiating the work.

We are also thankful to **Prof. Monika G Tolani**, Assistant Professor, Training & Placement Officer, TSEC, and the maintenance team including Mr. Gomes, Mr. Mali and Mr. Sunil for extending all possible help and co-operation from their side.



## Chapter-II

# Water Management

### 2.1 Introduction to water management:

Water conservation and management include the policies, framework, and strategies to manage water effectively and efficiently.

The different methods of water conservation are as follows.

1. Rainwater Harvesting- It is the process of collection and storage of rainwater, rather than allowing it to run off. Rainwater is collected from the roof and is redirected to a tank, reservoir, cistern, or natural tanks, etc.
2. Groundwater Harvesting- It is a method for saving water placed under the ground to control the groundwater flow in an aquifer and to raise the water table.
3. Water-wise Habits- There are various good habits to conserve water for a long time. Some of them are Fixing leaky taps, Keeping the tap closed while brushing, taking a shower of 5 mins instead of long baths are a few examples of saving water.
4. Sensor based water conservation- Using IoT (Internet of Things) is a flexible solution designed for the water utility industry, allowing for smarter decisions while optimizing the use of existing city resources and investments.

### 2.2 Water Consumption:

The water is supplied by BMC to TSEC and the frequency of billing is 90 days. The water meter of 50 mm size, number is 8911190 supplied by AMR Arad company. The monthly consumption of water is 300 KL on an average basis. The connection type is MN00 which means main connection.



**Drinking Water Pumping System**

The underground water tank capacity of old building is 50,000 liters and that of new building is 70,000 liters.

The basic uses of water at TSEC are as below.

1. Drinking
2. Gardening
3. Kitchen and Toilets
4. Others

There is water cooling and water purifier system provided at each floor of new and old building of TSEC as shown below.



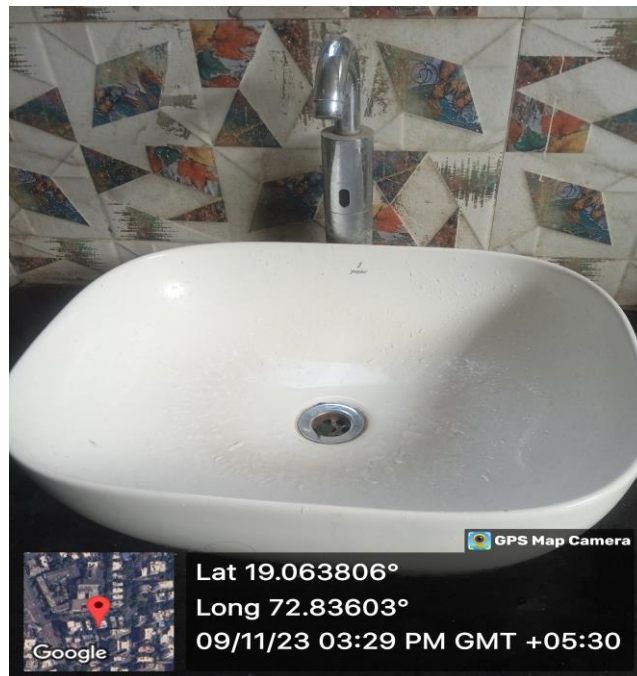
**Water Purifier System**



**Water Purifier and Cooler System**

### 2.3 Observations and Suggestions:

- Rainwater harvesting system is not present in the institute but the rainwater is at single point at ground level. It may be discharged into ground water tank and used for gardening, cleaning purpose.
- The distribution network and piping are satisfactory and adequate.



#### Sensor based water usage (Old Building)

- In the old building, the wash basin is provided with sensor in order to conserve the water.

## Chapter-III

# Solid Waste Management

### 3.1 Introduction:

Solid waste management mainly refers to the complete process of collecting, treating and disposing of solid wastes.

It addresses waste production and disposal of different wastes like paper, food, plastic, biodegradable, construction, glass, dust etc. and recycling.

Furthermore, solid waste often includes wasted material resources that could otherwise be channelled into better service through recycling, repair, and reuse.

Unscientific handling of solid waste can create threats to everyone. The survey focused on volume, type and current management practice of solid waste generated in the campus.

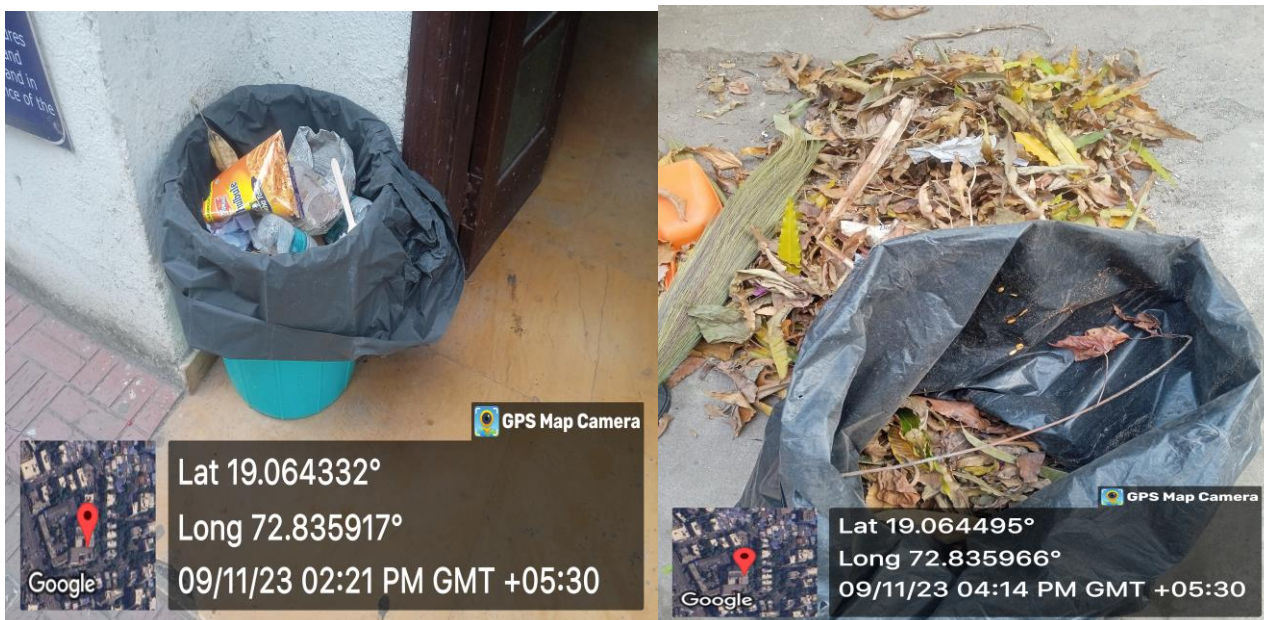
One of the ways solid management is through the 3 R's — Reduce, Reuse, Recycle.

- Reduce means to cut back on the amount of trash we generate.
- Reuse means to find new ways to use things that otherwise would have been thrown out.
- Recycle means to turn something old and useless (like plastic milk jugs) into something new and useful (like picnic benches, playground equipment and recycling bins).





**Bins for waste collection at TSEC**



**Dry waste collection at TSEC**

**3.2 Observations and Suggestions:**

- TSEC is handling the environmental issues very carefully and taking all possible steps towards sustainability.



- The waste is segregated in the separate green, red and blue dustbins after collecting in the dustbin bags.
- The canteen kitchen waste and dry waste is disposed by BMC. Canteen waste of around 4-5kg is generated per day and it is collected, treated by MCGM on daily basis.

Dry waste of 2-4 kg and 10-20 kg per day is generated in the old building and new building respectively.

## Chapter-IV

# Liquid Waste Management

### 4.1 Introduction:

Liquid waste is a major problem in the world, due to approximately 71% of the Earth's surface being covered in water.

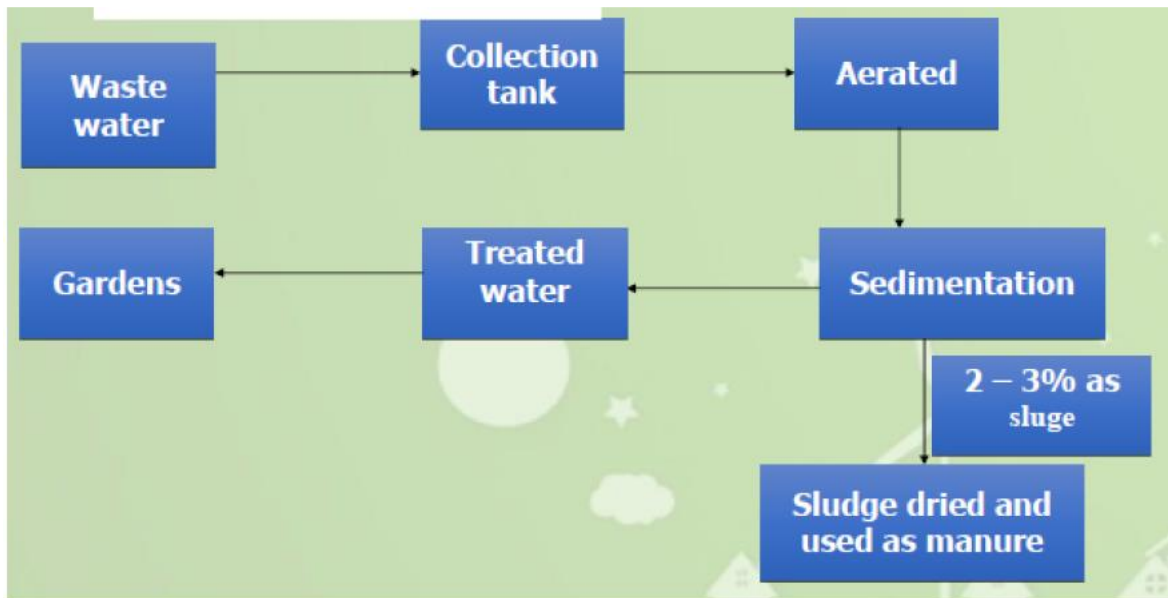
According to the Environmental Protection Agency (EPA), liquid waste is defined as any waste material that passes the definition of a "liquid." This means that the material must, "pass through a 0.45 micron filter at a pressure differential of 75 psi," according to the EPA's provided definition of a liquid (1). The main producers of liquid waste are animals and human beings as natural excretion of waste is flushed into sewage and waste lines.

Liquid waste is such an important category of waste management because it is so difficult to deal with. Unlike solid wastes, liquid wastes cannot be easily picked up and removed from an environment. Liquid wastes spread out, and easily pollute other sources of liquid if brought into contact. This type of waste can also soak into objects such as soil and groundwater. This pollution then carries over to pollute the plants we eat, the animals in the ecosystem, as well as the humans within the area of the pollution.

At the TSEC, no hazardous liquid waste is generated in the institute.

#### 4.2 Observations and Suggestions:

- 70% amount of water charges are deducted as sewerage charges by BMC as observed from the water bill.
- TSEC may have their own sewerage treatment plant as shown below for treatment of waste water.



## Chapter-V

### E - Waste Management

#### 5.1 Brief Description:

E-waste can be described as consumer and business electronic equipment that is near or at the end of its useful life.

This makes up about 5% of all municipal solid waste worldwide but is much more hazardous than other waste because electronic components contain cadmium, lead, mercury, and Polychlorinated biphenyls (PCBs) that can damage human health and the environment.

#### 5.2 Observations and Suggestions:

- E-waste generated in the TSEC campus is very less in quantity.
- TSEC Administration conducts the awareness programs regarding E-waste Management with the help of various departments.
- The E-waste and defective items from computer laboratories are being stored properly and collected in the E-waste bin kept at the ground floor in the new building.
- TSEC has decided to contact approved E-waste management and disposal facility in order to dispose E-waste in scientific manner.



#### **Bins for E-waste collection at TSEC**

Figure shows Bins kept at the ground floor of ground floor of new building, for E-waste collection at TSEC.

Few other recommendations are as below.

- Recycle or safely dispose of white goods, computers and electrical appliances.
- Use reusable resources and containers and avoid unnecessary packaging where possible.
- Always purchase recycled resources where these are both suitable and available.

## Chapter-VI

# Air Quality Analysis

### 6.1 Brief Description:

The air quality was checked by measuring the Carbon Dioxide and VOC contents at various locations in the college classrooms and the administrative areas.

### 6.2 Observations:

The Carbon dioxide and VOC levels are within the limits at all the places.

The average value of 491 ppm and 424 ppm is observed in the new building and new building.

The standard norm is to maintain the Carbon dioxide level below 1000 ppm and VOC level below 400 ppm.



**GREEN ENVIRONMENT INITIATIVES**

**TREE PLANTATION DRIVE:**

TSEC with the help of Municipal Corporation of Greater Mumbai (MCGM) organized a Tree Plantation Drive on July 22nd, 2019 at Pali Hill Railway Colony, Carter Road, Bandra West. This event was glorified by the presence of Cabinet Minister Mr. Ashish Shellar, Corporator Ms. Swapna Mhatre, Asst. Commissioner H West MCGM Mr. Sharad Ughade, Principal of Thadomal Shahani Engineering College Dr. G. T. Thampi. Students, from different branches participated in the plantation drive. Also, the TSEC Drama Team performed a street play creating awareness about the adverse effects of deforestation and the need to grow more trees.











**CAUVERY CALLING:**

Isha Foundation collaborated with NSS - TSEC on the 4th of September 2019 to conduct a River awareness programme "CAUVERY CALLING" on the streets of Bandra where the NSS Volunteers willingly participated even in heavy rains and made the locals aware about how the deforestation has led to making our rivers dead and that their little contribution might be of great help in saving Cauvery.







### RAILWAY WALL PAINTING

The walls and boards at Bandra station were given a facelift by the students of TSEC on the 26th of September. Students and teachers actively took part in creating awareness towards a clean and healthy environment through their paintings. The paintings were themed on topics of Swachh Bharat and Plastic ban.





