# ENERGY AUDIT REPORT
# FOR
# PTVA'S INSTITUTE OF MANAGEMENT


## Elion Technologies & Consulting Private Limited

307, 3rd Floor, DDA Lal Market, H-Block
Vikas Puri, New Delhi-110018
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PTVA's Institute of Management Mumbai 57.

Director
PTVA's Institute of Management
Chitrakar Ketkar Marg,
Behind M. L. Dahanukar College,
Vile Parle (E), Mumbai-400 057.

# Table of Contents



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# Acknowledgement

Elion Technologies and Consulting Pvt Ltd places on record it's thanks to PTVA's Institute of Management for entrusting the task of conducting energy audit study.

We acknowledge with gratitude the whole hearted support and cooperation extended by all team members while carrying out the study.

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# Site Information

| | |
|---|---|
| **Name of College** | PTVA's Institute of Management |
| **College Address** | Chitrakar Ketkar Marg, Behind M.L. Dahanukar college of commerce, Vile parle (E), Mumbai, Maharashtra, 400057 |
| **Execution Partner** | ELION Technologies & Consulting Pvt Ltd |
| **Communication Address** | 307, 3rd Floor<br>DDA Lal Market<br>H-Block Vikas Puri, New Delhi, 110018 |
| **Date of Audit** | 15th December 2023 |
| **Year of Audit** | 2022 – 2023 |
| **Site Team who participated in the Study** | Dr. Tejashree Deshmukh<br>Ms. Preeti Kaushik<br>Ms. Sunita Shringarpure<br>Mr. Mandar Salasakar |
| **Main Energy Consuming Machines/Equipments considered for Energy Audit** | • Lighting & Fans<br>• Air Conditioners<br>• Motors & Pumps<br>• Desktops & Printers |



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# Executive Summary

Established under the aegis of Parle Tilak Vidyalaya Association which is more than a 100 year old reputed educational Trust in Mumbai well known for imparting value based, high quality, yet affordable education, PTVA's Institute of Management (PTVAIM) was founded in 2009 with an objective of offering quality Management Education to students interested in pursuing Post-graduate Degree in Management. The Institute offers Two Year Full Time MBA Program namely, MMS (Master of Management Studies), Two Year Full Time MBA Program namely, MBA-IEV (MBA on Innovation, Entrepreneurship and Venture Development) & Three Year Part-time MBA Program, for Working Executives, namely, MMS – Financial Management. PTVAIM's Ph.D. Centre is affiliated to the University of Mumbai and offers the Ph.D. Program in Management. PTVAIM offers five specializations, i.e., Finance, Marketing, HR, Systems & Operations to its MMS students. Our Institute is approved by the AICTE, New Delhi and DTE, Maharashtra and is permanently affiliated to the University of Mumbai. It is NAAC accredited and ISO 9001:2015 certified and is governed by the Board of Governors & College Development Committee under the chairmanship of CA Anil Ganu, President of our Parent Trust, PTVA and comprise of illustrious members including Former Vice-Chancellor of University of Mumbai, Dr. (Smt.) Snehalata Deshmukh and industry legends like Mr. Praveen Kadle, CA Mukund Chitale, Mr. Mohan Tanksale, to name a few. University of Mumbai appointed PTVAIM as Lead College of Cluster IV (Post-graduate Management Institutes) for MU Exam Mission 2020 onwards which itself is the testimony of the excellent work done by PTVAIM.

### List of courses offered by the institute:

Following are the list of courses offered by the institute-

- Master of Management Studies (MMS)
- MBA in Innovation Entrepreneurship and Venture Development (MBA-IEV)
- Three year Part-time MMS (Financial Management) degree program.

Electricity is supplied by Adani Electricity Mumbai Limited.

The energy audit included detailed data collection, analysis of data and identification of specific energy saving proposals.

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# Chapter 01: Introduction

M/S PTVA's Institute of Management evinced interest in availing the services of Elion Technologies and Consulting Pvt Ltd for conducting energy audit of their premises.

Elion Technologies and Consulting Pvt Ltd team conducted the Detail Energy audit on 15th December 2023.

This report is on the energy audit carried out M/S PTVA's Institute of Management. The detailed energy audit comprised of the following activities:

- Data collection of power consuming equipment's.
- A brief session on energy management was conducted to seek more inputs from the personnel engaged in operation and maintenance of electro mechanical services.
- Analysis of collected data.
- Discussion with the officials on the identified proposals.
- Discussion and reporting of the findings of energy audit with the Engineers and management staff.

All the identified energy savings proposals have been discussed with the executives concerned before finalizing the projects.

The contents of the report are based solely on the data provided by PTVA's Institute of Management officials during the energy audit.

The management should implement the suggestions made in the report after verifying requisite safety aspects.

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### Methodology for Energy Audit:

The following is a list of general procedure and information undertaken during the energy audit:

- General information of the site.
- Baseline energy description.

- Past energy consumption bills which includes electricity bills.
- On site data collection
- Energy analysis of different sectors.
- Recommendation of energy conservation measures.

The primary goal of the energy audit was to identify sources and areas of potential energy savings and cost saving throughout the Plant by measures of optimization, replacement, retrofitting, and on the other hand, to also provide recommendations on operational and maintenance practices improvements.

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# Chapter 02: Energy Consumption Details

**The main areas of energy consumption as observed during the audit are as follows:**

- Air Conditioners
- Lighting & Fans
- Motors & Pumps
- Desktops & Printers

**The main sources of energy to meet the required consumptions are as follows:**

- Electricity supply from Power Distribution Company.
- Solar Power Plant.

**Consumption pattern for energy is given below:**

| CA No. 152630186 | | |
|---|---|---|
| **Months** | **Units Consumed** | **Net Amount Payable** |
| Dec-22 | 12634.00 | 133760.00 |
| Jan-23 | 9723.00 | 103330.00 |
| Feb-23 | 12629.00 | 133920.00 |
| Mar-23 | 15175.00 | 160330.00 |
| Apr-23 | 13527.00 | 147740.00 |
| May-23 | 12038.00 | 130180.00 |
| Jun-23 | 11877.00 | 128380.00 |
| Jul-23 | 8915.00 | 96360.00 |
| Aug-23 | 10810.00 | 117030.00 |
| Sep-23 | 10354.00 | 113110.00 |
| Oct-23 | 13648.00 | 147700.00 |

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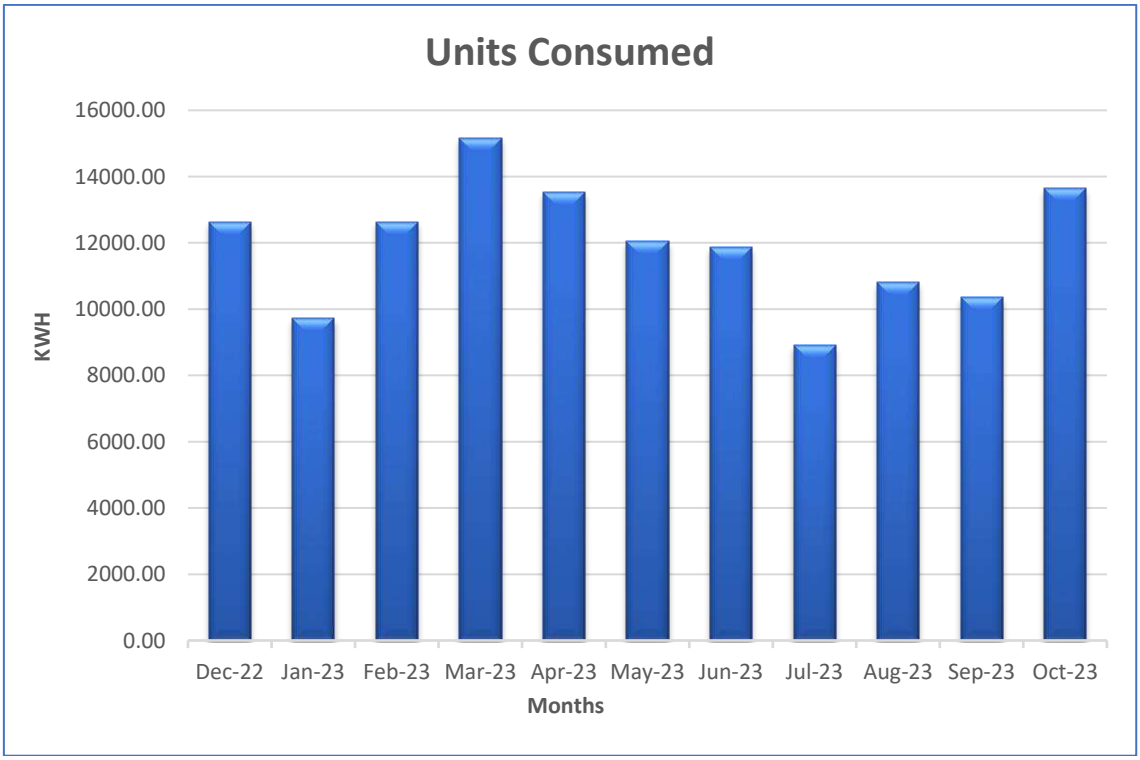


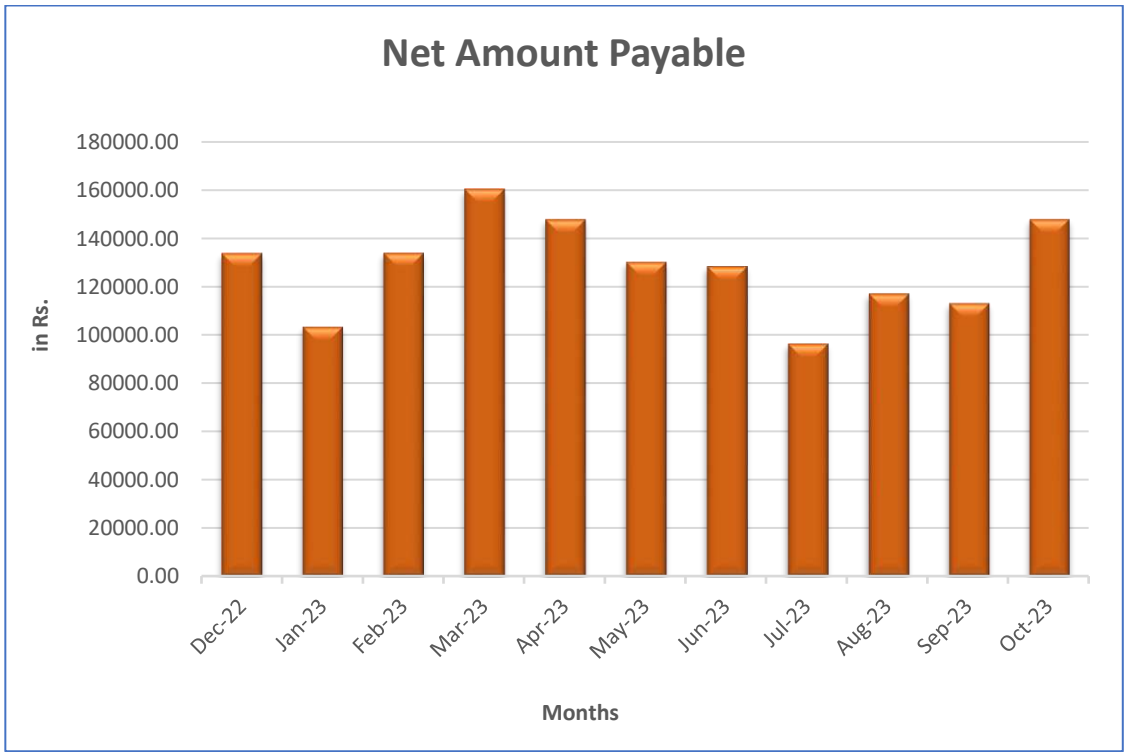


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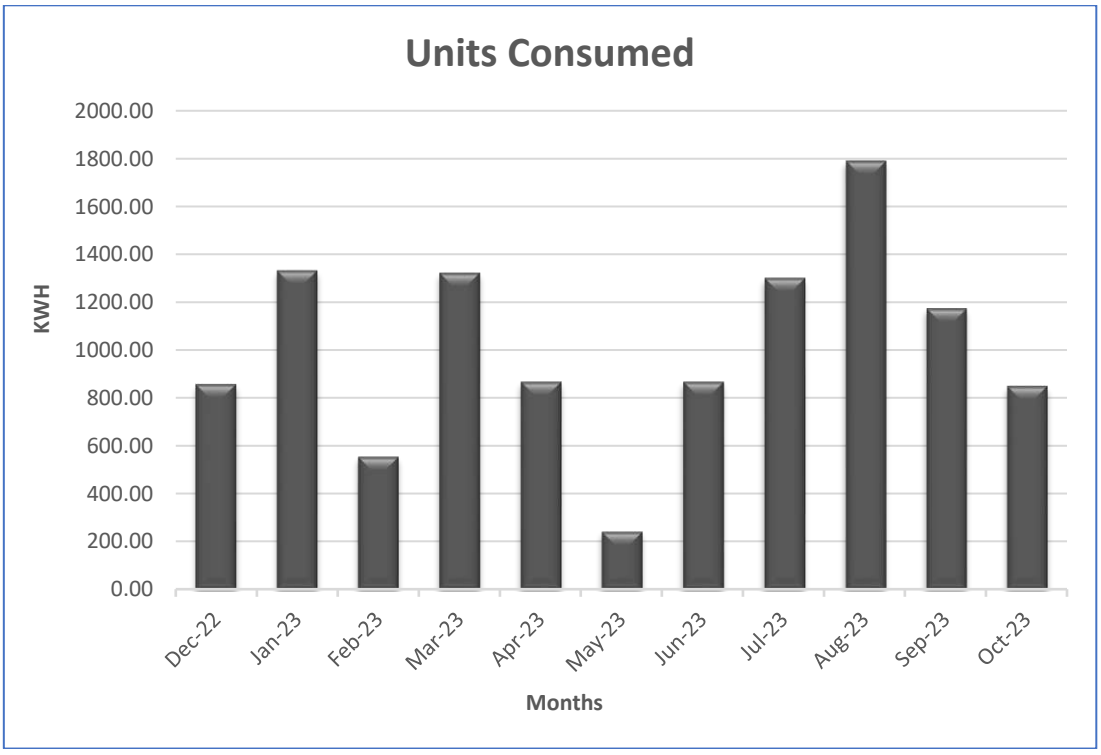
| CA No. 152630185 | | |
|---|---|---|
| Months | Units Consumed | Net Amount Payable |
| Dec-22 | 856.00 | 10250.00 |
| Jan-23 | 1331.00 | 15740.00 |
| Feb-23 | 553.00 | 6920.00 |
| Mar-23 | 1321.00 | 15520.00 |
| Apr-23 | 866.00 | 14250.00 |
| May-23 | 240.00 | 3330.00 |
| Jun-23 | 866.00 | 10640.00 |
| Jul-23 | 1300.00 | 15560.00 |
| Aug-23 | 1790.00 | 21110.00 |
| Sep-23 | 1173.00 | 14170.00 |
| Oct-23 | 848.00 | 10460.00 |

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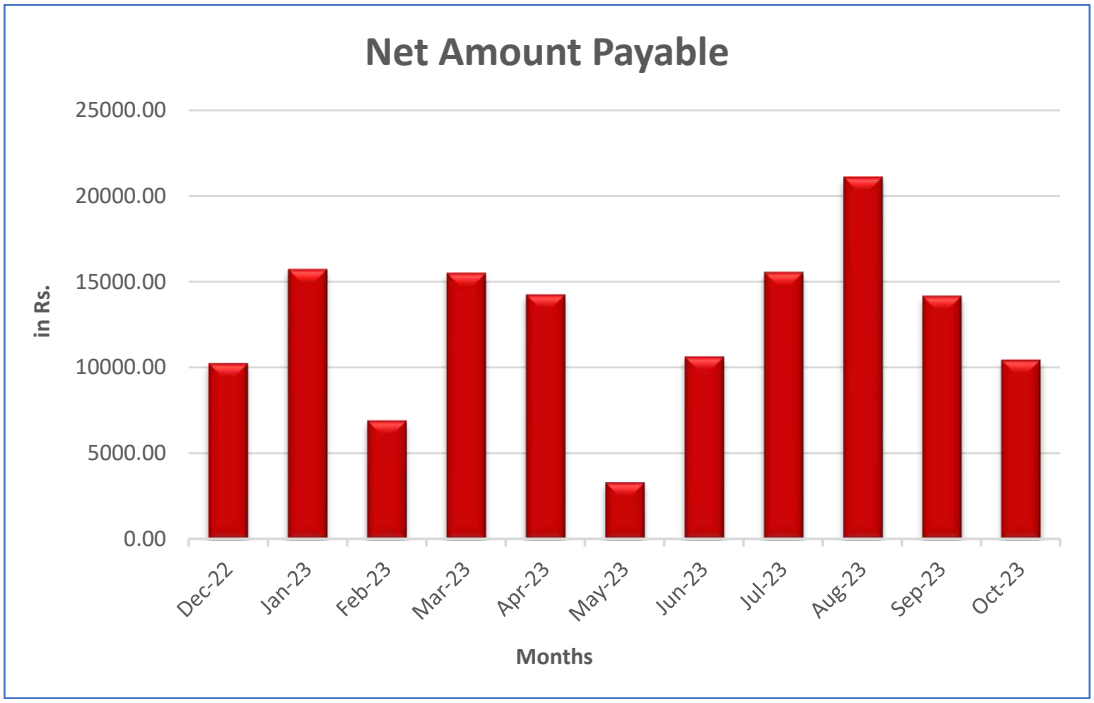


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# Chapter 03: Lighting System

Following is the summary of lights installed at various locations of the college campus:

| Type of lights | Location | Rating (W) | Quantity | Number of Hours being turned on |
|---|---|---|---|---|
| Tube light | Classroom | 22 | 402 | 5 |
| Tube light | Admin office area | 2 | 80 | 10 |
| LED | Passage | 9 | 219 | 10 |

**Observation:**

Most of the lights used in the campus are LEDs. Campus has replaced all the conventional lights with energy efficient LED lights which is a good practice.

**LED tube lights**

**LED panel lights**



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**Recommendation:**

- Sticker to SWITCH OFF LIGHT and SAVE ENERGY to be displayed.
- Regular cleaning of light fixtures to be done to get maximum lux level.



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# Chapter 04: Air Conditioning

Split, Ductable and Cassette Air Conditioners are used in facility for air conditioning. Following is the list of ACs present in the campus:

| Type of AC (Windows/Split/Package and Location) | Capacity in Ton | Quantity | Set Temperature | Running Hours | Whether AC performance is satisfactory (Yes/No) |
|---|---|---|---|---|---|
| Cassette - Classrooms | 1 | 33 | 23 | 10 | Yes |
| Hi Wall - Admin office area | 1.5 | 19 | 23 | 11 | Yes |
| Ductable - Auditorium and Conference room | 2 | 2 | 22 | 4 | Yes |

**Observation:**

- All air conditioners are found to be functioning properly and well maintained.

**Cassette ACs**

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Split ACs

**Recommendation:**

- All doors to be kept closed while using the air conditioners and regular annual service of AC's should be carried out.
- Set Temperature of Air Conditioner shall be maintained at 26°C.
- A reduction in 1°C set point temperature, the energy cost comes down by 5%. By carefully selecting the seasonal temperature in different areas as per requirement considerable saving on account of power consumption can be achieved.
- Whenever Air Conditioners are replaced in future, BEE 5 star rated air conditioners shall be considered which are energy efficient.

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# Conclusion

The energy audit performed at PVTA's Institute of Management showcased commendable efforts towards sustainability within the college. The replacement of conventional lights with energy-efficient LED alternatives marks a significant stride in reducing energy consumption. Additionally, the integration of a fully functional solar system underscores the commitment to renewable energy sources. Despite these advancements, there remains untapped potential for further enhancing energy efficiency. The audit report likely contains specific recommendations aimed at maximizing sustainability efforts. Implementing these suggestions could significantly bolster the college's energy-saving initiatives, continuing the positive trajectory towards a more environmentally conscious campus.

## End of Report

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DISCLAIMER

All information contained in this report is based on the data available and observations made during the audit. All recommendations made in this audit report should be duly evaluated by the management before implementation.

Elion Technologies and Consulting is not liable for any damages incurred by the organization through implementation of the energy saving proposals either to it or to any third party getting impacted by the implementation of this report.

No warranty, guarantee, or representation, either expressed or implied, is made as to the correctness or sufficiency of any representation contained herein. This report may not address every possible loss potential, violation of any laws, rules or regulations, or exception to good practices and procedures. The absence of comment, suggestion, or recommendation does not mean the property or operation(s) is in compliance with all applicable laws, rules, or regulations, is engaging in good practices and procedures, or is without loss potential. No responsibility is assumed for the discovery and/or elimination of hazards that could cause accidents or damage at any facility that is subject to this report.

# GREEN AUDIT REPORT
# FOR
# PTVA'S INSTITUTE OF MANAGEMENT


## Elion Technologies & Consulting Private Limited

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# Site Information

| | |
|---|---|
| **Name of College** | PTVA's Institute of Management |
| **College Address** | Chitrakar Ketkar Marg, Behind M.L. Dahanukar college of commerce, Vile parle (E), Mumbai, Maharashtra, 400057 |
| **Execution Partner** | ELION Technologies & Consulting Pvt Ltd |
| **Communication Address** | 307, 3rd Floor<br>DDA Lal Market<br>H-Block Vikas Puri, New Delhi, 110018 |
| **Date of Audit** | 15th December 2023 |
| **Year of Audit** | 2022 – 2023 |
| **Audit Participants** | Dr. Tejashree Deshmukh<br>Ms. Preeti Kaushik<br>Ms. Sunita Shringarpure<br>Mr. Mandar Salasakar |
| **Total College Area** | 2023.43 sq. m |
| **Total Green Area** | 80 sq. m |

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# Overview of Institute

Established under the aegis of Parle Tilak Vidyalaya Association which is more than a 100 year old reputed educational Trust in Mumbai well known for imparting value based, high quality, yet affordable education, PTVA's Institute of Management (PTVAIM) was founded in 2009 with an objective of offering quality Management Education to students interested in pursuing Post-graduate Degree in Management. The Institute offers Two Year Full Time MBA Program namely, MMS (Master of Management Studies), Two Year Full Time MBA Program namely, MBA-IEV (MBA on Innovation, Entrepreneurship and Venture Development) & Three Year Part-time MBA Program, for Working Executives, namely, MMS – Financial Management. PTVAIM's Ph.D. Centre is affiliated to the University of Mumbai and offers the Ph.D. Program in Management. PTVAIM offers five specializations, i.e., Finance, Marketing, HR, Systems & Operations to its MMS students. Our Institute is approved by the AICTE, New Delhi and DTE, Maharashtra and is permanently affiliated to the University of Mumbai. It is NAAC accredited and ISO 9001:2015 certified and is governed by the Board of Governors & College Development Committee under the chairmanship of CA Anil Ganu, President of our Parent Trust, PTVA and comprise of illustrious members including Former Vice-Chancellor of University of Mumbai, Dr. (Smt.) Snehalata Deshmukh and industry legends like Mr. Praveen Kadle, CA Mukund Chitale, Mr. Mohan Tanksale, to name a few. University of Mumbai appointed PTVAIM as Lead College of Cluster IV (Post-graduate Management Institutes) for MU Exam Mission 2020 onwards which itself is the testimony of the excellent work done by PTVAIM.

### List of courses offered by the institute:

Following are the list of courses offered by the institute-

- Master of Management Studies (MMS)
- MBA in Innovation Entrepreneurship and Venture Development (MBA-IEV)
- Three year Part-time MMS (Financial Management) degree program.

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# Introduction

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of institute. It aims to analyse environmental practices within and outside of the concerned place, which will have an impact on the eco-friendly atmosphere. Green audit is a valuable means for a college to determine how and where they are using the most energy or water or other resources; the college can then consider how to implement changes and make savings. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students' better understanding of Green impact on campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric CO2 from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through carbon footprint reduction measures.

### Advantages of Green Audit:

Green Audit is assigned to the Criteria 7 of NAAC, National Assessment and Accreditation Council 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. Some main advantages of green Audit are:

- It helps to shield the environment.
- Minimizing the waste and managing the cost.
- Authenticate conformity with the implemented laws.
- Minimizing the energy consumptions and focus on green and clean energy.
- Ambient Environmental Condition.
- Awareness and Training on Sustainability for Students.
- Awareness about environmental guidelines and duties.



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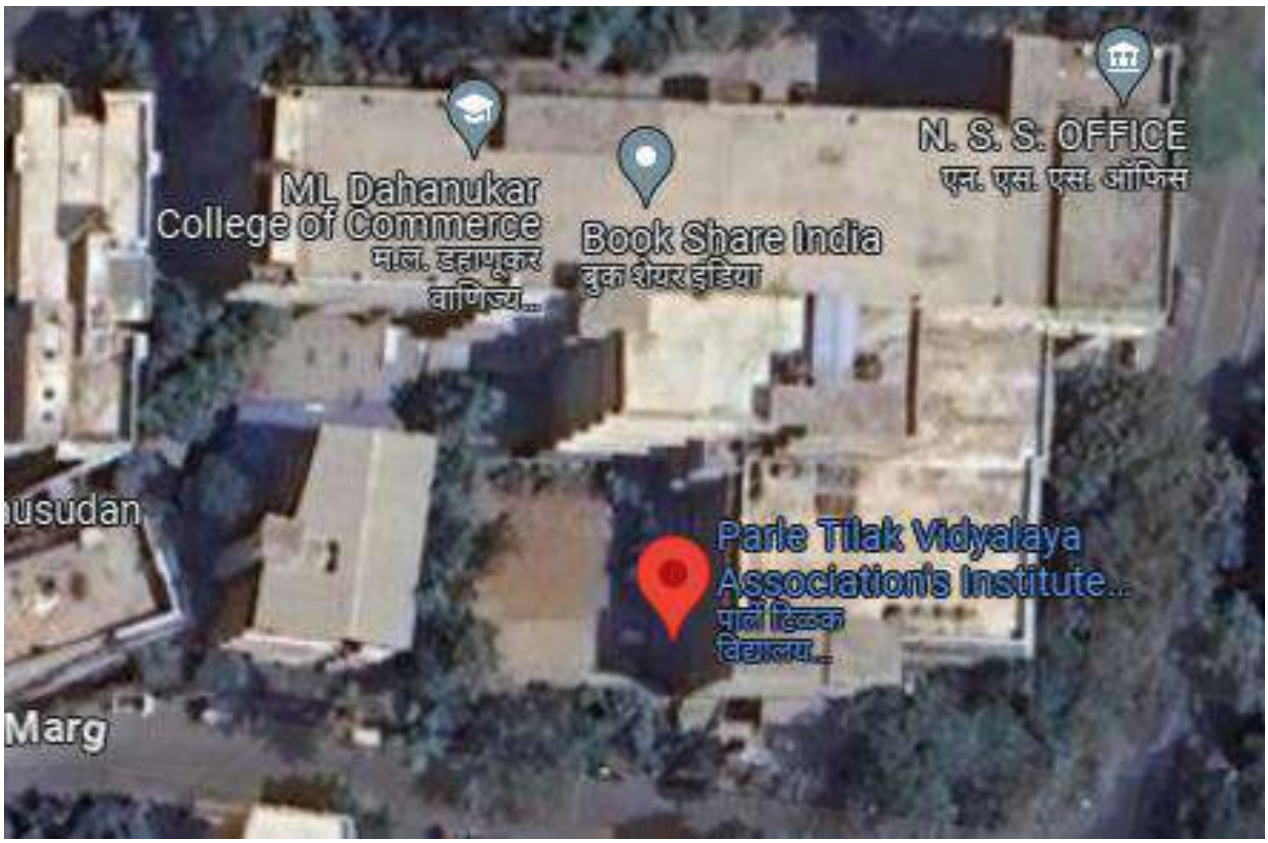
# Environment Setting

The land use around the campus is mix of commercial and residential use. Schools, Restaurants, Commercial complexes, restaurants etc are present around the campus.




PTVA's Institute of Management Campus

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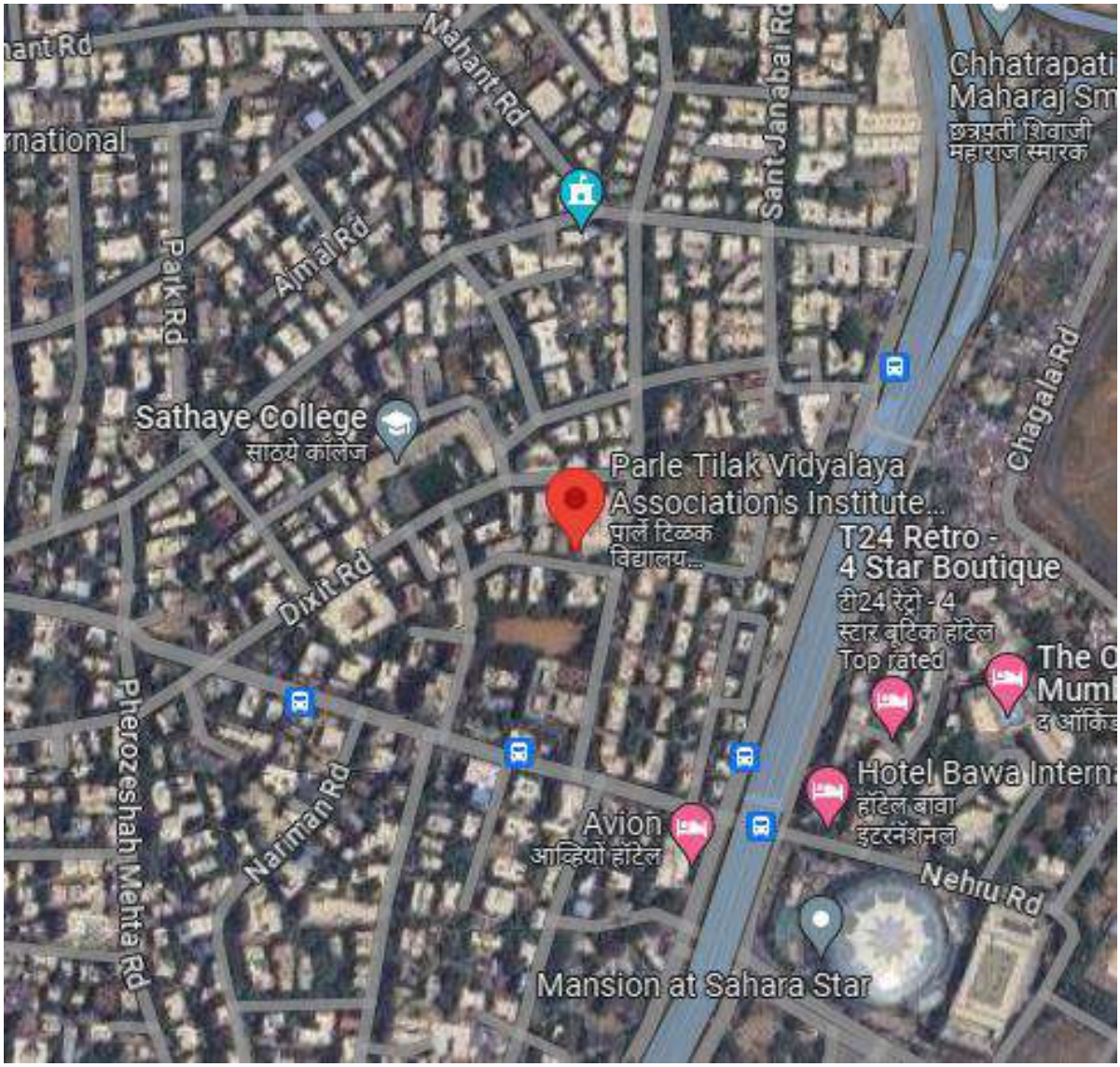


Location of PTVA's Institute of Management Campus

# Green Audit

For Green Audit following 13 major areas (including their subsections) were covered and compliance/ initiatives under these areas were verified/ validated.

a) Good Daylight Design and Ventilation
b) Water Efficiency
c) Wastewater Management
d) Indoor Air Quality
e) Energy Efficiency
f) On-site Energy Generation
g) Temperature and Acoustic Control
h) Paper Waste Management
i) E-Waste Management
j) Canteen and Solid Waste Management
k) Universal Access and Efficient Operation and Maintenance of Building
l) Green Belt
m) Green Programs (Green initiatives)

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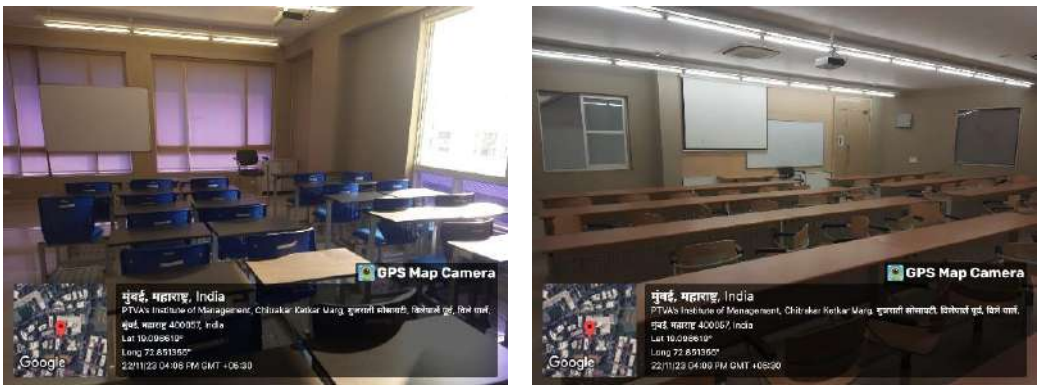
### 3.1 Good Daylight Design and Ventilation

a) Corridors are wide with good ceiling height. All the corridors receive good daylight.
b) Classrooms and Library have large windows. Adequate daylight is received through the windows during daytime.
c) Classroom walls, corridors and other areas are white-washed, this enhances the daylight received.
d) Curtains are provided on some of the windows to avoid glare.
e) Stair cases receive daylight through windows provided at various levels.




Good Daylight in Classrooms


Daylight in stairs and corridors

### 3.2 Water Efficiency:

a) Government water supply is the source of water supply in the campus.
b) Water from government supply is then stored in two tanks of capacity 20KL and 5KL.
c) Water coolers are provided for drinking water at every floor.
d) Normally mops are used for floor cleaning and hose is used for cleaning once a week.
e) Water conservation faucets are used in the washrooms.
f) Dual flushing system is not provided in the washrooms.
g) Signages are provided in washrooms emphasizing water conservation.
h) Water from air conditioning unit and reject water from water purifiers is not used anywhere. It is recommended to store and use the rejected water for gardening and watering plants.
i) Rain water harvesting system is available and rainwater is stored in a tank and reused further as and when required.


Water tank available

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Water coolers

Rainwater Harvesting Pits


Signages for water conservation

### 3.3 Wastewater Management:

j) Water treatment plant or water recycling plant is not available in the campus.

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### 3.4 Indoor Air Quality;

Indoor Air Quality (IAQ) refers to the air quality within and around buildings and structures, as it relates to the health and comfort of building occupants. Some common indoor pollutant are listed as below:

- Molds and other allergens – This may arise from water seeping into the building envelope or skin, plumbing leaks, condensation due to improper ventilation, or from ground moisture penetrating a building part.
- Carbon monoxide – Sources of carbon monoxide are incomplete combustion of fossil fuels.
- Volatile organic compounds (VOCs) – VOCs are emitted by paints and lacquers, paint strippers, pesticides, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions etc.
- Carbon dioxide – Due to human respiration
- Particulate matter – Due to construction and maintenance activities

Major observations under indoor air quality are as below:

a) Casette, Ductable and Split Air Conditioners are used in the classrooms, labs, seminar hall etc.
b) Indoor plants are not seen in the College. Indoor plants can be plotted not only for the aesthetic appearance but also for health benefits. Refer Annexure 1 for details.
c) Indoor air quality tests are not carried. It is recommended to get air quality tested once a year.
d) Small gardens and green area have been planted around the campus.

Air Conditioners used in the campus



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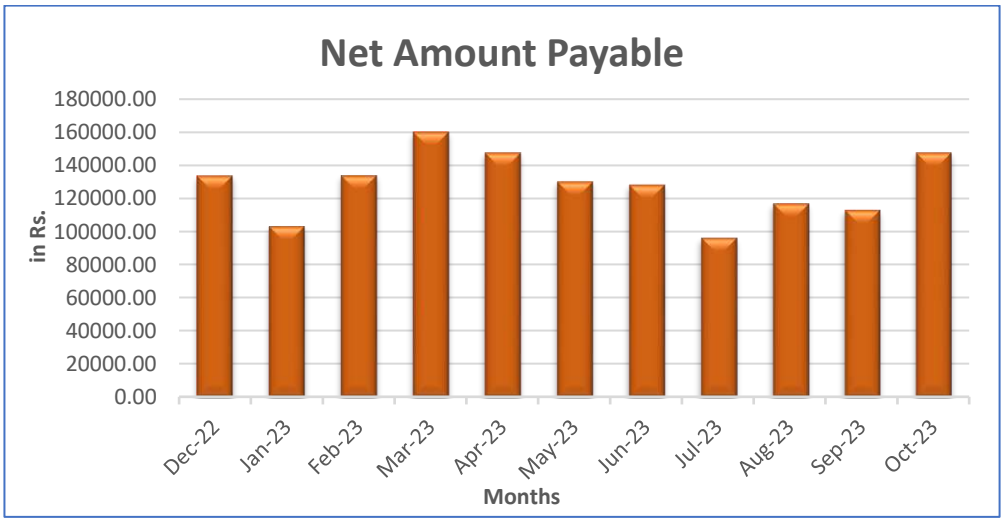
### 3.5 Energy Efficiency:

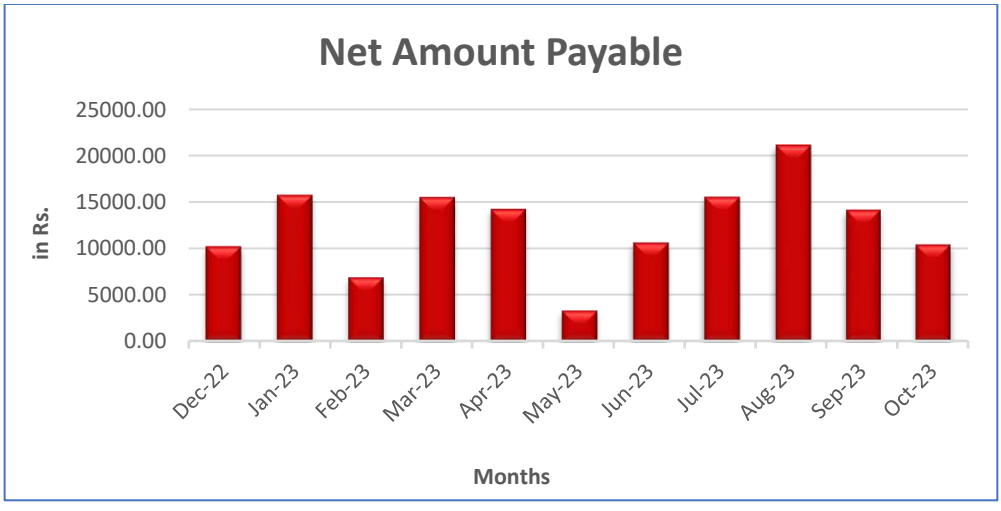
**Electricity:**

Power is supplied by Adani Electricity Mumbai Limited. The major electricity consuming equipment installed in the campus are Air Conditioners, Water Coolers, Lighting, Desktop, Printers etc.

Following is details of energy consumption:




**Meter No. 152630186**




**Meter No. 152630186**

It was observed that:



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a) LED lights are installed in the entire campus.
b) Campus has air conditioners which are in good working condition.
c) Solar power system is also installed in the campus.

Solar Power Plant

### 3.6 On Site Energy Generation (usage of LPG/ Natural Gas):

a) LPG or PNG is not used for cooking purpose.
b) Back Up diesel generator is not available in the campus.

### 3.7 Temperature and Acoustic Control

a) White washed rooms & corridors and white/off-white flooring improve the lighting conditions.
b) The campus has done tree plantation all around the boundary walls and parking area.
c) There is no noise pollution inside and around the campus.


Tree plantation



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### 3.8 Paper Waste Management:

Being academic institution, waste paper is the main solid waste generated in the premises. The College has taken steps to minimize and avoid paper usage.
It was observed that:

a) Prints and photocopies are taken on both sides of the pages to avoid excess paper usage. Rather than photocopy, digitalization (scanning) is practiced.
b) Internal notices and communications are through E-mail/Whatsapp.
c) Faculty and administration staff uses old papers and envelops for internal usages as rough work, file markers, page separators etc.
d) Old papers and answer sheets are kept in a separate storage room and disposed off as and when required.


Storage Area

### 3.9 E-Waste Management:

a) MOU with an external agency named Ecofriendly Co. is signed for disposal of E-waste.

### 3.10 Solid Waste Management:

It was observed that:

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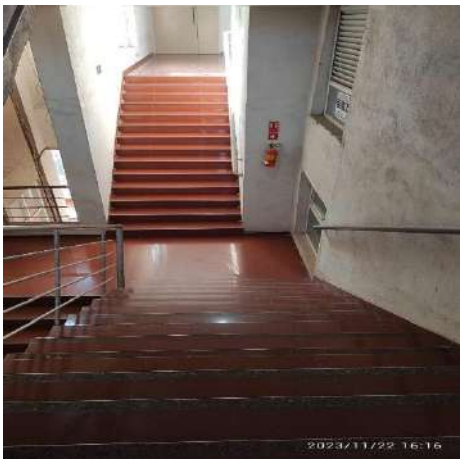
a) Wet waste and dry waste segregation is practiced in the premises. Separate bins are provided for wet biodegradable and dry recyclable waste.
b) Non Hazardous Waste – Daily garbage, canteen waste, carton papers, plastic and civil construction waste generated from premise on regular basis. The regular collection is done by Municipal Corporation for further dispose of at dumping site. There is designated garbage yard inside premise for the same.
c) Biodegradable waste is mainly generated in canteen.


Garbage storage area

### 3.11 Universal Access and Efficient Operation and Maintenance of Building:

It was observed that:

a) College is easily accessible. Staircase and ramps are provided for staff and students.
b) Since the access and staircases are wide and uncluttered, it is possible to have a safe evacuation during emergency.
c) Fire extinguishers and Smoke detectors are provided for emergency. They are inspected and serviced by fire protection Service Company annually.
d) Directional exit signages and floor markings are present on every floor of the campus.
e) Regular Fire Safety Trainings is given to staff and students on annual basis.




Ramps and stairs provided



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Directional exit signages


Fire extinguishers & Alarm Panel

### 3.12 Green belt/ Landscaping:

a) Large trees and plants are planted in the premises. Plantation also helps maintaining lower temperatures of the area.

### 3.13 Green Initiatives:

College is regularly celebrating important days such as Environment Day, Yoga Day, Earth Day etc as well as other cultural programs.

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Yoga Day


Tree Plantation

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# Recommendations/Suggestions

## For Improving Energy Consumption:

a) Every classroom and lab with central switch board can have a diagram linking location of a tube light, fan etc. with corresponding switch. This will ensure that correct fitting is switched on/ off and can save time & unnecessary operation.
b) Installation of automatic lights with sensors can be considered.
c) Standard Operation Procedures (SOPs) should be prepared and followed for green purchasing. Equipment with star rating, using eco-friendly materials; with safe disposal policy to be preferred. Policy of returning equipment at the end of life span to the supplier to be preferred.
d) For purchasing new electronic appliances, star rating provided by Bureau of Energy Efficiency (BEE) should be considered. The equipment which has maximum star ratings could be purchased, which will consume less energy, ensure environmental sustainability and also operate at low cost.
e) Usage of light reflectors is recommended as the reflectors can spread light to relatively large areas.
f) If possible, computers should be switched off from main power connections.
g) Notices/signages can be put up/displayed near switches and on notice boards, informing students and staff to switch off all electricals when not in use.
h) Control sensors can help to reduce consumption by automatically dimming lights when people are not around, and keeping blinds open to use natural light & reduce energy consumption.
i) Raise awareness:
    - Encourage students to help in monitoring energy consumption & implement corrective actions
    - Integrate energy education into classroom learning.

## Water Conservation:

a) Provide information on water usage and savings to students/ staff through notices, screen savers in computer labs.
b) Dry sweep or use a sponge broom when possible, instead of using a hose to clean floors, sidewalks, or other hard surfaces.
c) Minimize/ reduce water usage by installing water saving faucets such as pressmatic taps, tap aerators, jet sprays etc.
d) Installation of waterless urinals can be considered to reduce water consumption.
e) Water balance diagram can be prepared to quantify the water consumption by installing water meters at key points. Based on data gathered, appropriate measures can be taken to reduce the water consumption.



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## Paper and other Solid Waste Reduction:

a) Inventories of all solid waste generated in the premises must be maintained.
b) Enhance recycling. This can be done by creating a group where students can recycle books, personal clothes and other material to needy students. This can be an initiative under green program.
c) Standard Operating Procedures (SOP) for Solid and E-waste management and for recycling of waste should be prepared & practiced. The SOP's may include collection, segregation and reuse of different types of wastes, if any (e.g. biodegradable waste for composting). This will help in safe disposal of waste to recycle agencies.
d) Training as well as awareness programs should be organized on segregation of biodegradable waste and recycling of waste. Efforts should be taken to inform students about recycling options and signs should be posted on appropriate bins indicating what could be dumped in each bin.
e) The college can introduce online app, which can be useful for conducting internal exams, assignment/ reports submission. This system can also be used for displaying important notices, timetables.
f) Paper usage shall be monitored to understand the impact of digitization in the facility.

## Others:

a) Environmental advisory committee could be formed. The discussions/ information sharing among different departments can generate lot of ideas and awareness on green issues.
b) Maintain minutes of meetings of environmental committees; evaluate the effectiveness of various environmental programs conducted by the institutes. Set annual targets for Green Initiatives & monitor them closely. Create 'Green Champions'.
c) Since each student uses computer lab, the screen savers can be set up for creating environmental awareness. (Ergonomics, water conservation etc.). Short 30 second pop up can be displayed on computer screens when they are on standby mode. Or wallpapers informing students about environment conservation can be created.
d) Consider detailed energy audit (energy consumption, thermal emission, visual comfort) and water audit.
e) Adopt environmentally responsible purchasing policy, and work towards creating and implementing a strategy to reduce environmental impact of its purchasing decision.



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# Annexure 1 – Indoor Gardening Details

Indoor plants are commonly used for their aesthetics benefits but they also have vital role reducing airborne pollution. The right choice of plants can be an excellent way of improving indoor air quality and general health. Local landscape contractor can be contacted for supply and rotation of these plants.

| Plants | VOC it removes | Indoor source of VOC's | Plant care |
|---|---|---|---|
|  Aloe Vera | Formaldehyde, Trichloroethylene and Benzene | Chemical based cleaners and paints | Easy to grow with enough sunlight |
|  Bamboo Plant | Formaldehyde, Trichloroethylene and Benzene | Paints, Plastics, Wood products etc. | Thrives under low light conditions as well as easy to maintain |
|  Chinese Evergreen | Benzene | Paints | Low maintenance plant that prefers low light conditions. |

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| | | | |
|---|---|---|---|
|  English Ivy | Formaldehyde, Benzene, Air borne fecal matter particles | Wood, Paper products, Air borne fecal – matter particles from pests | Easy to maintain |
|  Janet Craig | Formaldehyde, Benzene and Trichloroethylene | Paints, Plastics, Wood products etc. | Medium to low light tolerant plant. Requires little water for growth. |
|  Golden Pothos or Devils Ivy | Formaldehyde, Cleanses air | Exhaust fumes, carpeting materials, panelling and furniture products made with particle board | Extremely easy to maintain under low to bright light conditions. Fast growing and grows well under Fluorescent light. |
|  Mass Cane | Formaldehyde, benzene and trichloroethylene | Paints, Plastics, Wood products etc. | Medium to low light tolerant plant. Requires little water for growth. |

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| | | | |
|---|---|---|---|
|  Snake plant | Formaldehyde and trichloroethylene | cooking fuels, wood products, facial tissues, personal care products and waxed papers | Drought resistant and Tolerates a variety Of light conditions. Hard to damage or kill. |
|  Peace Lily | Formaldehyde, benzene and trichloroethylene | Paints, Plastics, Wood products etc. | Relatively easy to maintain. Survives in low light conditions. |
|  Red-edged Dracaena | Formaldehyde and trichloroethylene | cooking fuels, wood products, facial tissues, personal care products and waxed papers | Drought resistant and Tolerates a variety of light conditions. Hard to damage or kill. |
|  Spider Plant | Formaldehyde, benzene, carbon monoxide and xylene | cooking fuels, wood products, Printing | Easy to maintain under medium to bright light condition. |

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| | | | |
|---|---|---|---|
|  Parlor Palm | Purifies indoor air | - | Easy to maintain |

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# ENVIRONMENT AUDIT REPORT
# FOR
# PTVA'S INSTITUTE OF MANAGEMENT


## Elion Technologies & Consulting Private Limited

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# Acknowledgement

Elion Technologies and Consulting Pvt Ltd thanks the management of PTVA's Institute of Management for assigning this important work of Environmental Audit. We appreciate the co-operation to our team for completion of study.

For giving us necessary inputs to carry out this very vital exercise of Environment Audit. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.


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# Site Information

| | |
|---|---|
| **Name of College** | PTVA's Institute of Management |
| **College Address** | Chitrakar Ketkar Marg, Behind M.L. Dahanukar college of commerce, Vile parle (E), Mumbai, Maharashtra, 400057 |
| **Execution Partner** | ELION Technologies & Consulting Pvt Ltd |
| **Communication Address** | 307, 3rd Floor<br>DDA Lal Market<br>H-Block Vikas Puri, New Delhi, 110018 |
| **Date of Audit** | 15th December 2023 |
| **Year of Audit** | 2022 – 2023 |
| **Audit Participants** | Dr. Tejashree Deshmukh<br>Ms. Preeti Kaushik<br>Ms. Sunita Shringarpure<br>Mr. Mandar Salasakar |
| **Total College Area** | 2023.43 sq. m |
| **Total Green Area** | 80 sq. m |

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# Concept

The term 'Environmental audit' means differently to different people. Terms like 'assessment', 'survey' and 'review' are also used to describe similar activities. Furthermore, some organizations believe that an 'environmental audit' addresses only environmental matters, whereas others use the term to mean an audit of health, safety and environment-related matters. Although there is no universal definition of Environmental Audit, many leading companies/ institutions follow the basic philosophy and approach summarized by the broad definition adopted by the International Chambers of Commerce (ICC) in its publication of Environmental Auditing (1989).

The ICC defines Environmental Auditing as:
"A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of safeguarding the environment and natural resources in its operations/projects."

The European Commission, in its proposed regulation on environmental auditing, has also adopted the ICC definition of Environmental Audit.

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# Introduction

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues.

Environmental Management Systems (EMS) is very popular in the industrial sector, but the general belief is that EMS is something pertaining to industries only. Other parts of the world have started adopting compatible environmental management systems either voluntarily or for promoting standards by external certification. International environmental standards do not suit the existing Indian educational system.

A very simple indigenized system has been devised to monitor the environmental performance of educational institutions. It comes with a series of questions to be answered on a regular basis. Environmental conditions may be monitored from angles that are relevant to Indian requirements, without stress on legal issues or compliance. This innovative scheme is user- friendly and totally voluntary. The environmental monitoring system helps the institution to set environmental examples for the community and to educate young learners. It can be adapted to urban and / or rural situations.

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# Overview of Campus

Established under the aegis of Parle Tilak Vidyalaya Association which is more than a 100 year old reputed educational Trust in Mumbai well known for imparting value based, high quality, yet affordable education, PTVA's Institute of Management (PTVAIM) was founded in 2009 with an objective of offering quality Management Education to students interested in pursuing Post-graduate Degree in Management. The Institute offers Two Year Full Time MBA Program namely, MMS (Master of Management Studies), Two Year Full Time MBA Program namely, MBA-IEV (MBA on Innovation, Entrepreneurship and Venture Development) & Three Year Part-time MBA Program, for Working Executives, namely, MMS – Financial Management. PTVAIM's Ph.D. Centre is affiliated to the University of Mumbai and offers the Ph.D. Program in Management. PTVAIM offers five specializations, i.e., Finance, Marketing, HR, Systems & Operations to its MMS students. Our Institute is approved by the AICTE, New Delhi and DTE, Maharashtra and is permanently affiliated to the University of Mumbai. It is NAAC accredited and ISO 9001:2015 certified and is governed by the Board of Governors & College Development Committee under the chairmanship of CA Anil Ganu, President of our Parent Trust, PTVA and comprise of illustrious members including Former Vice-Chancellor of University of Mumbai, Dr. (Smt.) Snehalata Deshmukh and industry legends like Mr. Praveen Kadle, CA Mukund Chitale, Mr. Mohan Tanksale, to name a few. University of Mumbai appointed PTVAIM as Lead College of Cluster IV (Post-graduate Management Institutes) for MU Exam Mission 2020 onwards which itself is the testimony of the excellent work done by PTVAIM.

**List of courses offered by the institute:**

Following are the list of courses offered by the institute-

- Master of Management Studies (MMS)
- MBA in Innovation Entrepreneurship and Venture Development (MBA-IEV)
- Three year Part-time MMS (Financial Management) degree program.

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# Audit Objectives

The broad aims/ benefits of the eco-auditing system would be –

- Environmental education through systematic environmental management approach.
- Improving environmental standards.
- Benchmarking for environmental protection initiatives.
- Reduction in resource use.
- Financial savings through a reduction in resource use.
- Curriculum enrichment through practical experience.
- Development of ownership, personal and social responsibility for the college campus and its environment.
- Enhancement of university profile.
- Developing an environmental ethic and value systems in young people.

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# Executive Summary

An environmental audit is a snapshot in time, in which one assesses campus performance in complying with applicable environmental laws and regulations. Though a helpful benchmark, the audit almost immediately becomes outdated unless there is some mechanism in place to continue the effort of monitoring environmental compliance.

This is second environmental audit of campus for NACC affiliation; QS Program and doing their bid towards environmental protection and environmental awareness at local and global front. Audit criterion is environmental cognizance, waste minimization and management, biodiversity conservation, water conservation, energy conservation and environmental legislative compliance by the campus. A questionnaire is used during audit. This audit report contains observations and recommendations for improvement of environmental consciousness.

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# Environmental Audit

The areas of eco/environmental/green auditing to be followed/practiced by participating institutions:

I. Waste Minimization and Recycling
II. Greening
III. Energy Conservation
IV. Water Conservation
V. Clean Air
VI. Animal Welfare
VII. Environmental Legislative
VIII. General Practices

**Is any Environmental Audit conducted earlier?**
No, this the first time.

**What is the total permanent population of the Campus?**

| | Male | Female | Total |
|---|---|---|---|
| **Students** | 156 | 156 | 312 |
| **Teachers** | 8 | 11 | 19 |
| **Non-Teaching Staff** | 12 | 4 | 16 |
| **Sub Total** | 176 | 171 | 247 |
| **Approximate Number of Visitors (Per day)** | | | 25-30 |
| **What is the total number of working days of your campus in a year?** | | | 256 |

**Where is the campus located?**
The campus is Located at Vile Parle (E) Mumbai Suburban.

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Which of the following are available in your campus?

| | | |
|---|---|---|
| 1 | Garden area | Yes |
| 2 | Playground | Yes |
| 3 | Kitchen | No |
| 4 | Toilets | Yes |
| 5 | Garbage Or Waste Store Yard | No |
| 6 | Laboratory | No |
| 7 | Canteen | No |
| 8 | Hostel Facility (Numbers) | No |
| 9 | Guest House | No |

Which of the following are found near your campus?

| | | |
|---|---|---|
| 1 | Municipal dump yard | No |
| 2 | Garbage heap | No |
| 3 | Public convenience | Yes |
| 4 | Sewer line | Yes |
| 5 | Stagnant water | No |
| 6 | Open drainage | No |
| 7 | Industry – (Mention the type) | No |
| 8 | Bus / Railway station | Yes |
| 9 | Market / Shopping complex / Public halls | Yes |

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## I - WASTE MINIMIZATION AND RECYCLING

| | | |
|---|---|---|
| 1. | Does your campus generate any waste?<br>If so, what are they? | Yes.<br>Paper waste from campus and kitchen waste from canteen and pantry. |
| 2. | What is the approximate amount of waste generated per day? (in Kilograms/month) (approx.) | 2Kg/Day per day. |
| 3. | How is the waste generated in the campus managed? By<br>1 Composting<br>2 Recycling<br>3 Reusing<br>4 Others(specify) | 1 Paper is reused for draft approvals.<br>2 Wet waste disposal. |
| 4. | Do you use recycled paper in campus? | No |
| 5. | Do you use reused paper in campus? | Yes, for printing the drafts of letters the paper is reused. |
| 6. | How would you spread the message of recycling to others in the community? Have you taken any initiatives? If yes, please specify. | No |
| 7. | Can you achieve zero garbage in your campus? If yes, how? | No |

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## II – GREENING THE CAMPUS

| | | |
|---|---|---|
| 1. | Is there a garden in your campus? | Yes |
| 2. | Do students spend time in the garden? | Yes |
| 3. | Total number of Plants in Campus | 97 |
| 4. | Provide some names of trees and plants in the campus. | Ashoka, Mango, Gulmohar etc. |
| 5. | Is the university campus have any Horticulture Department? | No |
| | If yes, number of Staff working in Horticulture Department? | NA |
| 6. | Number of Tree Plantation Drives organized by institute per annum.(If Any) | 2 |
| 7. | Number of Trees Planted in Last year. | 3 trees and 50 plants |
| | Survival Rate | 90% |
| 8. | Plant Distribution Program for Students and Community | No |
| 9. | Plant Ownership Program | No |


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## III – ENERGY

| | | |
|---|---|---|
| 1. | List down ways that you use energy in your campus. (Electricity, LPG, firewood, others). Using this list, try to think of ways that you could use less energy every day. | 1. Electricity Supply from Distribution board<br>2. Solar Energy |
| 2. | Are there any energy saving methods, equipments, techniques employed in your campus? If yes, please specify. If no, suggest some | 1. Solar Power system.<br>2. Replacement of conventional lights with LED lights. |
| 3. | Give an estimate of number of lights installed in your campus along with numbers? | 701 lights |
| 4. | Are any alternative energy sources employed/ installed in your campus? (photovoltaic cells for solar energy, windmill, energy efficient stoves, etc.,) Specify. | Solar Energy |
| 5. | Do you run "switch off" drills at campus? | No |
| 6. | Are your computers and other equipment's put-on power-saving mode? | Yes |
| 7. | Does your machinery (TV, AC, Computer, weighing balance, printers, etc.) run on standby modes most of the time? If yes, how many hours? | No |

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## IV - WATER CONSERVATION

| | | |
|---|---|---|
| 1. | List all the uses of water in your campus? | 1. Drinking Purpose.<br>2. Sanitary Purpose.<br>3. Gardening. |
| 2. | How does your campus store water? (mention tanks with capacity)<br>Are there any water saving techniques followed in your campus? | 20KL tank |
| 3. | If there is water wastage, specify why and how can the wastage be prevented/ stopped? | No wastage as such. |
| 4. | Locate the point of entry of water and point of exit of waste water in your campus.<br>Entry-<br>Exit- | Entry - M. L. Dahanukar College canteen area<br>Exit - Sewage waste line |
| 5. | Write down few ways that could reduce the amount of water used in your campus? | 1. Detect and repair leakages at Institute taps so that wastage of water will get reduced.<br>2. Avoid flushing the toilet unnecessarily.<br>3. Dispose of tissues, and other similar waste in the dustbins rather than the toilet. |
| 6. | Record water use from the campus water meter for six months (record at the same time of each day). At the end of the period, compile a table to show how many litres of water have been used. | 31849 Ltr<br>Director<br>PTVA's Institute of Management<br>Chitrakar Ketkar Marg,<br>Behind M. L. Dahanukar College,<br>Vile Parle (E), Mumbai-400 057. |
| 7. | Does your campus harvest rain water? (Please explain the method and uses) | Yes, The institute has constructed a 15000 litre concreate water tank, which is |

| | | |
|---|---|---|
| | | connected to all the washroom flush tanks in the main building. During monsoon, rainwater is collected in this tank and is used for sanitation purposes. |
| 8. | Is there any water recycling System. | No water recycling system. |

## V - CLEAN AIR

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | Are the Rooms in Campus are Well Ventilated? | Yes | | | | |
| 2. | Number of windows per room (aggregate value to be provided) | 4 – 5 windows per room. | | | | |
| 3. | What is the ownership of the vehicles used by your institute? (Please Tick ✓ only one) | | Yes | | | |
| | | | Operator-owned vehicles | | | |
| | | | Institute-owned vehicles | | | |
| | | | A combination of campus-owned and operator-owned vehicles | | | |
| 4. | Provide details of institute-owned motorized vehicles? | Buses | Cars | Vans | Other | Total |
| | No. of vehicles | - | - | - | - | - |
| | No. of vehicles more than five years old | - | - | - | - | - |
| | No. of Air conditioned vehicles | - | - | - | - | - |
| | PUC done | - | - | - | - | - |
| 5. | Specify the type of fuel used by your institute's vehicles: | Buses | Cars | Vans | Other | |
| | Diesel | - | - | - | - | |
| | Petrol | - | - | - | - | |
| | CNG | - | - | - | - | |
| | LPG | - | - | - | - | |
| | Electric | - | - | - | - | |
| 6. | Air Quality Monitoring Program (If Any) | No | | | | |

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| | | |
|---|---|---|
| 7. | Students suffer from respiratory ailments? (If Any) | No |
| 8. | Details of Diesel/Gas Generator. (Rating & Make) | No |

## VI – ANIMAL WELFARE

| | | |
|---|---|---|
| 1. | List the animals (wild and domestic) found on the campus (dogs, cats, squirrels, birds, insects, etc.) (if any) | Birds, Squirrels, Insects etc. |
| 2. | How many dogs in your area have undergone Animal Birth Control - Anti Rabies (ABC - AR)? | NA |
| 3. | Does your campus have a Biodiversity Programme or a KARUNA CLUB? | NA |

## VII - ENVIRONMENTAL LEGISLATIVE COMPLIANCE

| | | |
|---|---|---|
| 1. | Are you aware of any environmental Laws pertaining to different aspects of environmental management? | Yes |
| 2. | Does your campus have any rules to protect the environment? List possible rules you could include. | Yes |
| 3. | Does Environmental Ambient Air Quality Monitoring conducted by the Campus? | No |
| 4. | Does Environmental Water and Wastewater Quality monitoring conducted by the Campus? | Yes |

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| | | |
|---|---|---|
| 5. | Does stack monitoring of DG sets conducted by the Campus? | No |
| 6. | Is any warning notice, letter issued by state government bodies? | No |
| 7. | Does any Hazardous waste generated by the Campus? If yes explain its category and disposal method. | No |
| 8. | Dose any Bio medical waste generated by the Campus? If yes explain its category and disposal method. | No |

## VIII - GENERAL

| | | |
|---|---|---|
| 1. | Are you aware of any environmental Laws pertaining to different aspects of environmental management? | Yes |
| 2. | Does your campus have any rules to protect the environment? List possible rules you could include. | Yes<br>Formation of Green Club<br>Posters throughout the campus to protect environment. |
| 3. | What is the housekeeping schedule of garden and common areas in your campus? | 1 09:30 AM to 10:00 AM Elaborate Cleaning.<br>2 1:00 PM to 01:20 PM Brief Cleaning.<br>3 04:30 PM to 04:50 PM Brief Cleaning. |
| 4. | Are students and faculties aware of environmental cleanliness ways? If Yes Explain | Yes.<br>Students & faculties bring their own reusable bottles.<br>Students & faculties make sure waste goes to right place.<br>Students and faculties refuse one-time-use plastic items. |
| 5. | Does Important Days Like World Environment Day, Earth Day, and Ozone Day etc. celebrated in your Campus? | Yes |

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| | | |
|---|---|---|
| 6. | Does Campus participated in National and Local Environmental Protection Movement? | Yes |
| 7. | Does Campus has any Recognition/certification for environment friendliness? | Yes, E-waste. |
| 8. | Does Campus using renewable energy? | Yes, Solar Energy. |
| 9. | Does Institution conducts a green/environmental audit of its campus? | No, this is the first time. |
| 10. | Has the institution been audited/ accredited by any other agency such as NABL, NABET, TQPM, NAAC etc.? | NAAC (B++) |


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# Recommendations

- Environment Policy to be adopted by the Campus.
- Waste handling policy shall be prepared and followed.
- Equipments when not in use shall be switched off and should not run in standby modes or ideal.
- Use of recycled paper shall be encouraged in the campus.
- Use of push type taps and dual flushing toilet system for water conservation.

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# Photographic Evidences

Plantation and Greenery

Potted Plants

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Solar Power System

Water Tank

Rainwater Harvesting Tank

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# Conclusion

This audit involved extensive consultation with all the campus team, interactions with key personnel on wide range of issues related to Environmental aspects. Overall, a large are of campus is for landscaping. The audit has identified several observations for making the campus premise more environmentally friendly. The recommendations are also mentioned with observations for university campus team to initiate actions.

The audit team opines that the overall site is maintained well from environmental perspective. There are no major observations but recommendation is made in this report which would further strengthen the goal to achieve 100% environment friendly campus.


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# References


- The Environment [Protection] Act – 1986 (Amended 1991) & Rules-1986 (Amended 2010)
- The Petroleum Act: 1934 – The Petroleum Rules: 2002
- The Central Motor Vehicle Act: 1988 (Amended 2011) and The Central Motor Vehicle
- Rules:1989 (Amended in 2005)
- Energy Conservation Act 2010.
- The Water [Prevention & Control of Pollution] Act – 1974 (Amended 1988) & the Water (Prevention & Control of Pollution) Rules – 1975
- The Water [Prevention & Control of Pollution] Cess Act-1977 (Amended 2003) and Rules- 1978
- The Air [Prevention & Control of Pollution] Act – 1981 (Amended 1987) The Air (Prevention & Control of Pollution) Rules – 1982
- The Gas Cylinders Rules – 2016 (Replaces the Gas Cylinder Rules – 1981
- E-waste management rules 2016
- Electrical Act 2003 (Amended 2001) / Rules 1956 (Amended 2006)
- The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules, 2008 (Amended 2016)
- The Noise Pollution Regulation & Control rules, 2000 (Amended 2010)
- The Batteries (Management and Handling) rules, 2001 (Amended 2010)
- Relevant Indian Standard Code practices


## End of Report

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# REPORT OF ENERGY AUDIT

## CONDUCTED AT

## PARLE TILAK VIDYALAYA ASSOCIATION'S INSTUTUTE OF MANAGEMENT

## VILE PARLE EAST, MUMBAI

## JAN 2023

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Mumbai
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Date : 27-jan-2023

Kind Attn : Dr. Tejashree Deshmukh, Dean Academics & Professor

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Sub : Submission of Report of Energy Audit

Dear Dr Deshmukh

We thank you for the opportunity to carry out an energy audit at the PTVA- Institute of Management facility and are pleased to submit report of findings and recommendations.

The report comprises of three sections

Section-1 : Introduction to energy audit

Section-2 : Description of energy processes

Section-3 : Energy performance and energy saving opportunities

We would like to thank Mr Abhishek, Mr Kumavat and the Ops team for the assistance during the audit

Thanking you

Yours truly

For PSI ENERGY INFRA CONSULTING (OPC) PVT LTD

Aniruddha Deshpande, director
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### 1,1 Introduction to Energy Audit

Energy audit is the study of quantification of energy consumption of a facility, comparison of energy consumption against productivity, identifying wastage and formulation of energy saving opportunities.

An energy audit is the first step towards reducing energy, and as a result, environmental footprint, of every residential, commercial, educational or industrial facility.

### 1,2 Energy conservation act, 2001

MINISTRY OF LAW, JUSTICE AND COMPANY AFFAIRS (Legislative Department) New Delhi, the 1st October, 2001/ Asvina 9, 1923 (Saka) The following Act of Parliament received the assent of the President on the 29th September, 2001, and is hereby published for general information:--

Energy Conservation Act accommodates productive utilization of energy and its preservation for matters associated therewith or incidental thereto. It was instituted by the Parliament in the Fifty-second Year of the Republic of India, was enacted on 29th September 2001 and came into practice from 1st march, 2002. This act resulted in the formation of the Bureau of energy efficiency which came into effect from 2002.

### 1,3 Bureau of Energy Efficiency, Government of India

The Government of India set up Bureau of Energy Efficiency (BEE). on 1st March 2002 under the provisions of the Energy Conservation Act, 2001. The mission of the Bureau of Energy Efficiency is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act, 2001 with the primary objective of reducing energy intensity of the Indian economy.

### 1,4 Objectives of the Act

1. To serve the efficient and effective use of energy and its conservation.
2. Give an approach system and direction to national energy conservation activities.
3. Organize policies and programmes on the effective utilization of energy with shareholders.
4. Build up framework and strategies to verify measures and monitor energy efficiency improvements in the private and public sector at an individual and national level.
5. Leverage the support of multilateral, bilateral and private sectors to make into effect the Energy Conservation Act.
6. Show Energy efficiency delivery system through a public-private partnership.
7. Advance energy efficiency in the nation.



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8. To plan, manage and actualize energy conservation programs as visualized in the Energy Conservation Act.

**1,5 Salient features of the Act**

The Act empowers the Central Government and, in certain cases, State Governments to:

1. Determine energy utilization standards for notified hardware and apparatuses;
2. Directly required showcase of a label on notified hardware and machines;
3. Forbid production, dealing, buying and importing of notified hardware and apparatuses not complying with energy utilization norms;
4. Notify energy-intensive industries, different establishment and commercial structures as assigned consumers;
5. Set up and recommend energy utilization standards and measures for designated consumers;
6. Endorse energy preservation building standards for proficient utilization of energy and its conservation in new commercial buildings having an associated load of 500 kW or a contract demand of 600 kVA or more;
7. Directly assign purchasers to –

- Selected ensured energy administrator responsible for activities for effective utilization of energy and its conservation;
- Get an energy audit conducted to authorize energy evaluator in the predefined way and time frame;
- Furnish data as to energy consumption and steps taken on the suggestion of the authorized energy inspector to the planned organization;
- Comply with energy utilization standards and guidelines;
- Prepare and actualize plans for effective utilization of energy and its preservation if the recommended energy utilization standards and measures are not satisfied.

8. Get an energy audit of the building conducted by a licensed energy auditor in this predetermined way and time periods;

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**1,6 State Governments may**

1. Alter the energy conservation building codes arranged by the Central Government to suit territorial and neighbourhood climatic conditions;
2. Direct every proprietor or occupier of a new commercial building or building complex, to comply with the provisions of energy conservation building codes;
3. Direct, whenever necessary, about efficient utilization of energy and its conservation, any assigned purchaser to get energy audit conducted by a licensed energy auditor in such way and at such time spans as might be determined.

**1,7 Energy conservation act and the way forward**

The reservoir of solutions to limitations of the Energy conservation act of 2001 is given in Energy Conservation (Amendment) Bill, 2010. The Bill was presented in the Lok Sabha on March 8, 2010 and amends are based on practical difficulties and encourage implementations.

1. The Energy Conservation Act enables the administration to indicate standards and principles of energy efficiency to be followed by various industries in their utilization of power. Standards and measures of energy efficiency and conservation are likewise to be set for apparatuses and hardware and the development of a building. The Act enables state governments to authorize its different provisions.
2. The Act likewise sets up the Bureau of Energy Efficiency under the central government to determine qualification and certification procedures for energy inspectors and directors who will audit the utilization of energy by enterprises.
3. The Bill grows the extent of energy conservation standards for building and fixes the applicability of energy efficiency standards for apparatuses and gear. It gives a framework within which investment funds on energy use can be exchanged between those ventures who are energy effective and those whose utilization of energy is more than the maximum set by the legislature. The Bill builds punishments for offences and accommodates requests to be heard by the Electricity Appellate Tribunal set up under the Electricity Act, 2003.
4. Under the Act, the administration could specify energy conservation building codes for business structures with an associated load of in excess of 500 kW or agreement request of 600 kVA. The Bill widens the scope of business structures to which such building codes apply to those with an associated load of more than 100 kW or contracted demand of more than 120 kVA.
5. Under the Bill, the central government can give energy saving certificates to those businesses whose energy utilization is not exactly the most extreme permitted. Such authentications can be offered to different shoppers whose utilization is more than the greatest admissible.

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6. The Act enables the legislature to indicate energy utilization standards for gear or machines. The legislature can likewise preclude the assembling, deal, buy or import of informed gear except if they fit in with such standards. Be that as it may, this denial must be given two years after the standards have been determined. The Bill decreases this time period to a half year, extendable by a further half-year.
7. The Bill increases the punishment indicated for offences submitted under the Act. Every offence will result in punishment of Rs 10 lakh (Rs 10,000 prior), with an extra punishment of Rs 10,000 for every day that the offence remains (Rs 1000 prior). The extra punishment, for those enterprises who consume energy in an overabundance of standards, will be the estimation of the excess energy consumed.
8. The Act accommodated the setting up of an Appellate Tribunal for Energy Conservation, which would hear claims against requests of the central or state government. The Bill gets rid of this arrangement and accommodates appeals against such orders to be heard by the appellate tribunal built up under the Electricity Act, 2003.
9. The Bill increases the term of office of the Director-General of the Bureau of Energy Efficiency from three to five years. It accommodates the Bureau, as opposed to the Central Government, to appoint its officials and staff.

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This section describes the energy processes of the facility.

2,1 The facility is an educational institution and energy is consumed in powering the infra of lights, aircon, computers, etc

2,2 Area of plot : 0.5 acres ( 21,780 sq feet ) approximately

No. of floors : ground, mezzanine, 1'st, to 4'th and terrace

**2,3 Process at each floor**

**Ground floor**

1. Reception
2. Security
3. Administration office
4. Placement office
5. Board room
6. Director's office
7. Cafeteria
8. Gymkhana
9. Seminar hall / auditorium
10. Green room
11. Sick room
12. Toilets

**Mezzanine**

1. Department office
2. HOD cabin
3. Open cubicles ( 13 no.s )

**First floor**

1. Computer center
2. Classrooms bearing no.s 101, 102 & 103
3. Library and spaces for librarian's desk, photocopier, tea/coffee dispenser, stacker
4. Toilets

**Second floor**

1. Classrooms bearing no. 201, 202, 204, 206 & 207
2. Room no. 203 includes maintenance section, stores & placement
3. Room no. 205 : examination control office
4. Boys' and Girls' common rooms
5. Toilets

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### Third floor

1. Classrooms 301 and 302
2. Part of open terrace housing installation of VRV aircon outdoor units and Solar PV installation
3. Toilets

### Fourth floor

1. Part of open terrace
2. Tutorial room ( 401 )
3. Classroom 402
4. Stationary room
5. Cafeteria with spaces for stationary stores, housekeeping & staff pantry

### 2,4 Energy sources – electrical from Adani Electricity Mumbai Ltd

Verification of tariff plan referred to Electricity bill for dec 2022

| A/C no | Meter no | Tariff plan | Contract demand | Area | Max demand recorded | Energy recorded |
|---|---|---|---|---|---|---|
| 152630185 | L988498 | LT IV (A) | 63 KVA | Auditorium | 40.56 KVA | 856 KWh |
| 152630186 | L988497 | LT IV (A) | 94 KVA | All facility except for Auditorium | 101.6 KVA | 12,633 KWh |

Extract of tariff plan

**LT IV: Public Services**

**LT IV (A): LT - Government Educational Institutions and Hospitals**

**Applicability:**

This Tariff category is applicable for electricity supply at Low/Medium Voltage for Educational Institutions, such as Schools and Colleges; Health Care facilities, such as Hospitals, Dispensaries, Clinics, Primary Health Care Centres, Diagnostic Centres and Pathology Laboratories; Libraries and public reading rooms - of the State or Central Government or Local Self-Government bodies such as Municipalities, Zilla Parishads, Panchayat Samitis, Gram Panchayats, etc.;

It shall also be applicable for electricity used for Sports Clubs and facilities / Health Clubs and facilities / Gymnasium / Swimming Pools / Hostels attached to such Educational Institutions / Hospitals, provided that they are situated in the same premises and are meant primarily for their students / faculty/ employees/ patients.

It shall also be applicable for Public Sanitary Conveniences.

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Extracted from Adani Electricity revised tariff plan

## 6.17 REVISED TARIFFS EFFECTIVE FROM 1 APRIL, 2022 (FY 2022-23)

| Sl. No | Consumer Category & Consumption Slab | Fixed/ Demand Charge per month | Energy Charge (Rs/kWh) | Wheeling Charges (Rs / kWh) |
|---|---|---|---|---|
| (B) | > 20 kW and ≤ 50 kW load | Rs. 355 per kVA | 6.00 | 1.47 |
| (C) | > 50 kW load | | 6.55 | 1.47 |
| 4 | LT III - LT Industry | | | |
| (A) | Upto 20 kW load | Rs. 425 | 5.55 | 1.47 |
| (B) | Above 20 kW | Rs. 355 per kVA | 5.95 | 1.47 |
| 5 | LT IV - Public Services | | | |
| (A) | Government Hospitals & Educational Institutions | Rs. 425 | 5.60 | 1.47 |

Applicable to PTVA-IM

### 2,5 Analysis of Energy bill – key parameters referred to bill for dec 2022

| Parameters | AC no. 152630185<br>Auditorium | AC no. 152630186<br>Rest of the facility |
|---|---|---|
| Contract demand | 63 KVA | 94 KVA |
| Max demand recorded | 40.65 KVA | 101.6 KVA*1 |
| Demand / fixed charges per KVA | 425 INR | 425 INR |
| Penalty for exceeding MD | 0 INR | 0 INR |
| Load factor | 0% | 0 % |
| Average PF | 0.754 lag | Not indicated |
| PF penalty | 611.44 INR *2 | 0 INR *3 |
| Energy consumption | 856 KWh | 12,633 KWh |
| Energy charges including ToD | 5,018.10 INR | 73,273.40 INR |
| Total bill for dec 2022 with other components | 10,250 INR | 1,33,760 INR |

Note :

*1 Contract demand exceeded, recommended to get the contract demand raised, liaise with Adani electricity

*2 Power factor to be improved close to unity to receive incentive and eliminate penalty

*3 PF not indicated, liaise with Adani Electricity

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### 2,6 Energy performance for last one year

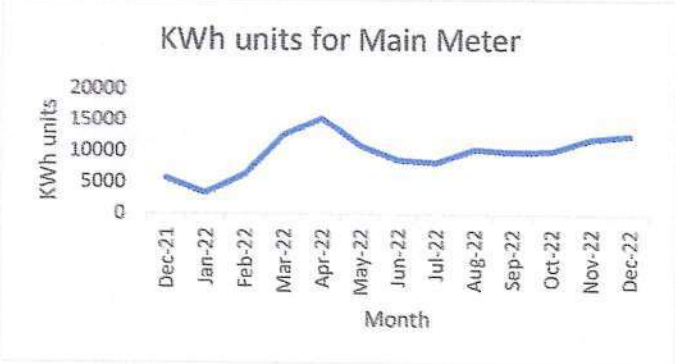
The normal operating hours of the facility are 0830 hours to 2130 hours, Mondays to Saturdays and 0830 hours to 1730 hours on Sundays.

Although all classrooms are not occupied all the days and time, the facility remains loaded in proportion to occupancy

Max occupancy is estimated as 120 students and 45 staff = 165 persons

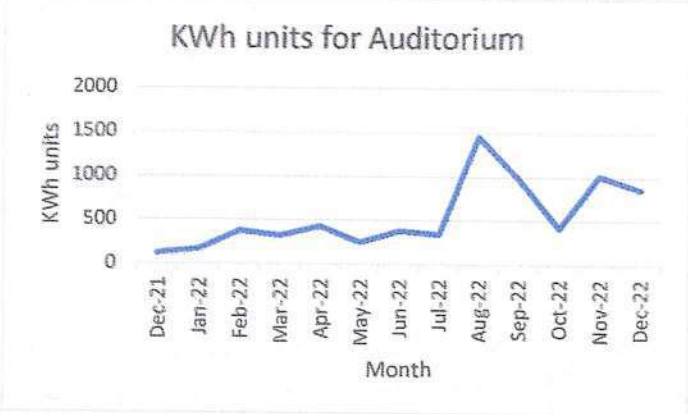
### 2,6,1 AC no. 152630186 ( entire facility except for auditorium )

**Historical data of energy consumption ( KWh )**




### 2,6,2 AC no. 152630185 ( only auditorium )

**Historical data of energy consumption ( KWh )**



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## 3,1 Energy Performance

### 3,1,1 Comfort Aircon-VRV

**Finding**

By design, the facility has chosen VRV aircon for comfort cooling.

With intelligent controller, the DBT at conditioned spaces is automatically maintained at 24 deg C +/- 1 deg C which is optimum.

The Installation of ODUs was found to be satisfactory with adequate space for heat dissipation.

IDUs were mainly ceiling mounted cassette units and a few hi wall units.

Energy performance of VRV aircon is superior in the sense that it reduces the max demand and continuously adjusts loading based on changes in heat load of the conditioned space.

As aircon is the major energy consumer, the VRV aircon is the best energy saving measure is already in place.

**Recommendation**

In order to upkeep the performance of aircon, it is recommended to

Clean air filters and cooling coils in IDUs once in a month

Clean condenser coils in ODUs once in a month

Set optimum temp set points at various cooling / comfort zones

**Expected energy saving : 2 to 3 %**

### 3,1,2 Comfort aircon – Dx for auditorium

**Finding**

The energy meter for auditorium is separate and the aircon used in Dx ( non VRV ) which is less efficient and can not control max demand.

However, since auditorium is not frequently used and remains in use for shorter duration, replacing the existing Dx aircon with VRV is not recommended due to poor cost to benefit ratio.

In order to upkeep the performance of aircon, it is recommended to

Clean air filters and cooling coils in IDUs

Clean condenser coils in ODUs

Set optimum temp set point at 24 deg C

Install energy saving controller

**Expected energy saving : 10 to 15%**



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### 3,1,4 Aircon for Mezzanine

Arrangement of Mezzanine is such that the aircon at various cubicles also cool the air column from ground floor. This amounts to some wastage of cooling and mixing with open air column needs to be minimized.

Expected saving : 5 to 10%

### 3,1,5 Power factor correction

Power factor could be improved by installation of power factor correction capacitors of small denominations such as 1, 2, 3, 5 KVAr to improve PF close to unity and avoid penal charges from electricity bill as well as receive incentive.

However, cost to benefit ratio will be poor.

### 3,1,6 Illumination

Most of the luminaries comprise of electromagnetic chokes ( FTL ) and smaller fitting of CFL.

It is recommended to replace the FTL with 22 watt LED tube lights and CFL with 8 or 12 Wall LED fittings whenever these fail.

Expected energy saving 20 to 30% in the lighting energy consumption.

### 3,1,7 Solar powered lighting

Solar powered peripheral lighting is provided with arrangement of solar PV and batteries

It was reported that the back up remained for 5 to 6 hours and was satisfactory.

### 3,1,8 Grid synch solar PV with net metering

It is recommended to consider grid synched solar PV which can considerably reduce the electricity bill thru net metering. Option of Capex based model will be beneficial with subsidy from Government.

Alternately, Opex based model will help reduce energy bill without requirement of major investment.

Customer has substantial size of open terrace and a feasibility survey may be conducted

### 3,1,9 Energy Management System ( EnMS )

The facility may benefit from monitoring key locations of energy consumption such as aircon and other area that have movement of occupants

Energy management system can help identify idle areas and compute area specific consumption which can further help in reducing energy usage.

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### 3,2 Summary of energy saving opportunities and simple payback calculations

| Sr | Description | Method | Investment | Saving | Simple payback |
|---|---|---|---|---|---|
| 1 | VRF aircon | Improved frequency of cleaning of ODUs and IDUs | INR 25,000 per year recurring | INR 50,000/- per year | 6 months |
| 2 | Conventional aircon for auditorium | Improved frequency of cleaning of ODUs and IDUs and use of electronic energy saver | INR 45,000/- one time | INR 25,000/- per year | 22 months |
| 3 | Power factor correction | Install APFC | INR 60,000/- one time | INR 12,000/- | 5 years |
| 4 | Indoor lighting | Replace with LED | INR 2,50,000/- one time | INR 75,000/- | 3 YEARS & 4 MONTHS |
| 5 | Solar PV | 20 KW peak Solar PV with net metering | INR 7,00,000/- | INR 1,65,000 | Over 4 years |

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Date : 21-dec-2021

Kind Attn : Dr Harish Kumar S. Purohit, Director

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Sub : Submission of Report of Energy Audit

Dear Sir

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Thanking you

Yours truly

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