2022-23

LILAVATI LALJI DAYAL NIGHT COLLEGE OF COMMERC

Prepared by:

Vrindavan Landscape & Ecological Solutions

ENERGY AUDIT

ENERGY AUDIT REPORT

2022-23

LILAVATI LALJI DAYAL NIGHT COLLEGE OF COMMERCE

375/377, S.V.P. ROAD, Mumbai – 400004

Prepared by

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1. INTRODUCTION

Energy audit helps to understand more about the ways energy is used in any plant/ Institute and helps in identifying areas where waste may occur and scope for improvement exists.

Energy audit is the most efficient way to identify the strength and weakness of energy management practices and to find a way to solve problem. Energy audit is one kind of professionalapproach towards a responsible way in utilizing economic, financial, and social and natural resources. Energy audits can "add value" to the management approaches being taken by the institute and is a way of identifying, evaluating the system.

The **"Energy Audit" carried out** at the site to find loopholes in the energy consumption pattern for **Lilavati Lalji Dayal Night college of commerce.** An audit report has been prepared as per the need and the requirement of the college.

Improving energy efficiency is the most cost-effective way to reduce energy-related emissions, improve economic competitiveness and increase energy security.

Energy audit:

An assessment of the energy needs and efficiency of a building or buildings used to find the inefficiencies, done through an inspection survey and an analysis of the energy use, to identify improvements that need to be made to increase energy efficiency. This is often the first step in identifying opportunities to reduce energy expenses and carbon footprint.

College Energy Management System (CEMS)

Making a framework of practical procedures and processes (monitoring, control) for buildings or organizations to achieve best practices relating to energy efficiency, use and consumption, through the setting and delivery of energy targets. The energy management process starts with an energy audit to find opportunities to improve efficiency, then putting It into action with a number of strategies and then tracking the progress of the made changes. The CEMS is usually aligned with ISO 50001, providing a means of validating a best practice approach and recognizing an organization's commitment to energy performance management and improvement.

2. OBJECTIVES

The Energy Audit was defined to meet the following objectives:

- Conduct a simple Walk-Through audit or observation of the energy consumption ofelectrical appliances within the college building.
- Review and analyze energy usage history to create a baseline for which savings can bemeasured in the audited building.
- Determine what can be done to reduce energy consumption throughout the college buildings and what options are available for system improvements.
- Identify and evaluate measures that could improve the environmental performance of thebuildings and provide recommendations.

3. INTERPRETATION OF COLLEGE ENERGY MANAGEMENT SYSTEM (CEMS)

1.Energy Conservation means steps taken to reduce and to use as much energy as necessary through changing energy consumption behavior, e.g. Switching off lights when not in use.

Energy Efficiency means using less energy to provide the same service/output, e.g. Replacing inefficient light bulbs with efficient ones.

Faulty means an equipment not working or made correctly; having defects.

Potential savings means the actual reduction in operating expenses from the improved energy efficiency generated by an energy conservation or efficiency activity.

Retrofitting means upgrading an existing system to improve energy efficiency.

Tariff means the amount of money charge by the supplier (utility) per kWh for the use of electrical energy.

Vampire Load means the way power is consumed by electronic and electrical appliances while they are switched off or in standby mode (consuming electricity at a cost but not doing any work).

4. COLLEGE GOOGLE LOCATION

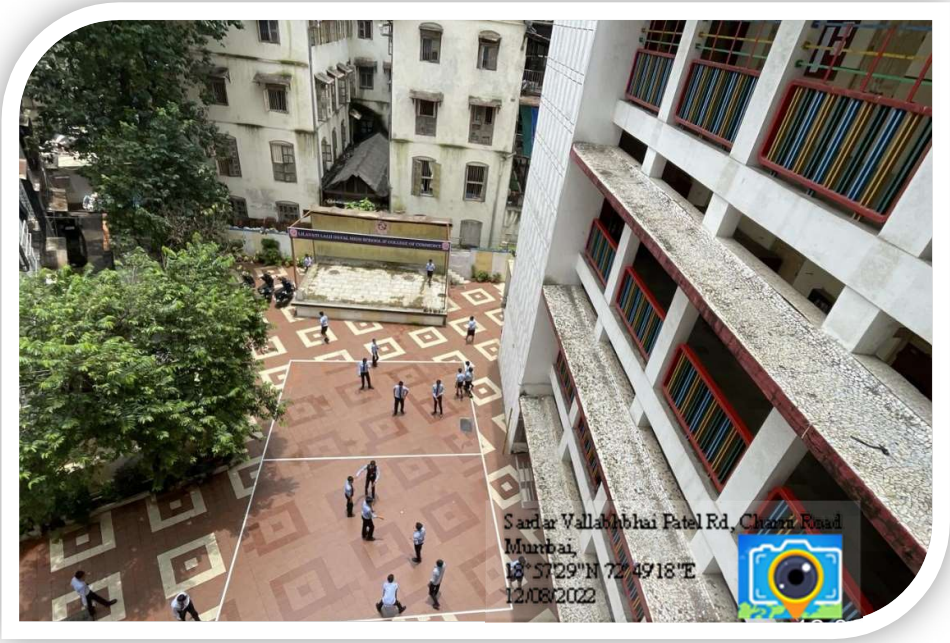
5. DESCRIPTION OF COLLAGE CAMPUS

College is located in South of Mumbai near Reliance Hospital. The campus is having a tree, few shrubs and herbs as well in proper pots with labels showing their names. The college building consists of five floors with two staircases for easy dispersal of children during any emergency. Each floor has washroom and washbasin with water filter (aqua guard) at each floor.

The architecture plan and structure of the building is looking ancient. The building has huge windows and corridors for excellent ventilation and natural light source.

College has manual bell. Bells offer several advantages, including loud and clear sound, reliability, and adjustability, reduce electricity bill. Fire extinguisher at each floor near the staircase area, generator, laboratory, library with CCTV cameras all around the campus showing great security management.

Best out of waste articles made by students well exhibits talent and awareness towards environment in the wooden showcases at every floor. Waste products like tube lights, wooden ply broken tables etc is well stored in one corner of the campus on the ground floor behind the building. Open well is also present behind college building which is used as another source of water.



College campus

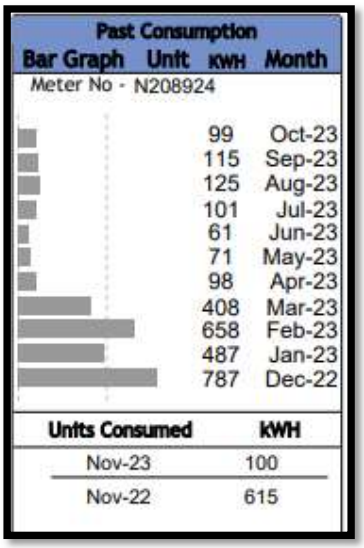
6. ENERGY AUDIT: METHODOLOGY

Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility. It quantifies energy usage according to its discrete functions. College campus energy audit is an effective tool in defining and pursuing comprehensive energy management programmed. As per the Energy Conservation Act, 2001, Energy Audit is defined as "the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption".

7. FINDINGS

7.1. Electricity:

L.L.D.N. college of commerce. Uses energy in the form of electricity purchased from BEST. Mumbai, the college has sanctioned load 1.400 KW. Total billing amount has been found to be about INR 20580/- for 12 months analysis period from Jun – 2022 to March – 2023. The overall average energy charges as Rs. 7.55 per unit in last 11 months.



Name :
L.LALJI DAYAL HIGH SCHOOL
Mobile No:98XXXXX813
Email ID:XXXXXX000@gmail.com

Billing Address :
375/377,PLOT-375/377,LALJI DAYAL HIGH SCHOOL,SARDAR VALLABHBHAI PATEL ROAD,KHETWADI,GIRGAON,MUMBAI-400004

Power Supply Address :
375/377,PLOT-375/377,LALJI DAYAL HIGH SCHOOL,SARDAR VALLABHBHAI PATEL ROAD,KHETWADI,GIRGAON,MUMBAI-400004

Bill For : Nov-2023 Date of Bill : 21/11/2023 Invoice No. : 311488249005

Book Folio No.	: 488249	Consumer No.	: 488-249-005*6
Cycle	: 12	C.A.No.	: 1143854
Type of Supply	: 3P	Bill Period	: 12/10/2023 - 13/11/2023
Service No	: 6348-X-X	Tariff	: LT IV B
Installation No.	: 0073407	Category	: PUBLIC SERVC
Sanctioned Load	: 1.400 KW	Ward	: C
Security Deposit	: 4004.00		

Last Payment Received	Last Payment Received Date
₹ 3350.00	06/11/2023

7.1 VAMPIRE LOADS FINDINGS:

- **Electronics appliances (computer, printer, etc.) are still ON even though they areturned off.**
- **Appliances on STANBY MODE are draining power even though they are not doing any use full task.**
- **Faulty light fittings which are left without bulb and faulty bulb which is intactare also vampire loads.**

7.2 LIGHTING:

- **Lighting is the most common load which is used in all the rooms and outdoors. Here are some of the aspects and faults that were discovered:**
- **It has been observed there are a lot of unnecessary lights in one single room**

Unnecessary lights

- **Too many lights are assigned to 1 switch.**

7.3 FAULTY LIGHTS:

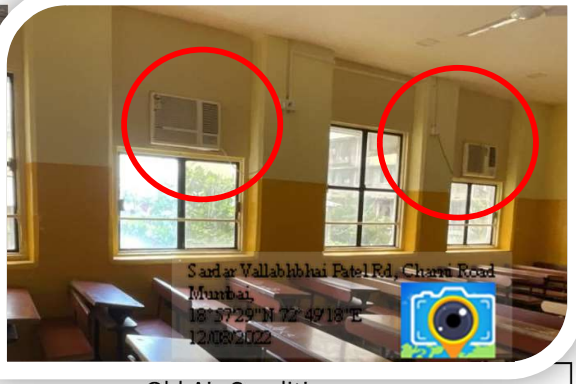
- **Ballast of faulty light will draw power when the lights are ON even though it is not working.**

Faulty lights

7.4 AIR CONDITIONERS:

- **Brand & model not consistent throughout the building which is expensive for maintenance.**
- **Most of the unit is old.**
- **Officers leaving the door open when entering and exiting the room where the air conditioneris located.**
- **Air conditioning contributes to about 62% of the overall power consumption of the buildings.**

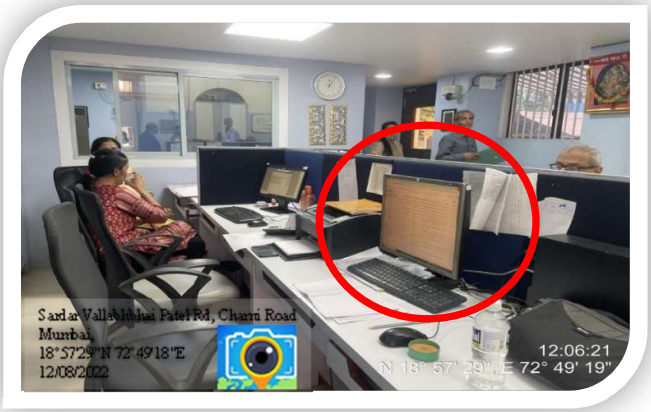
New branded five-star Air Conditioner

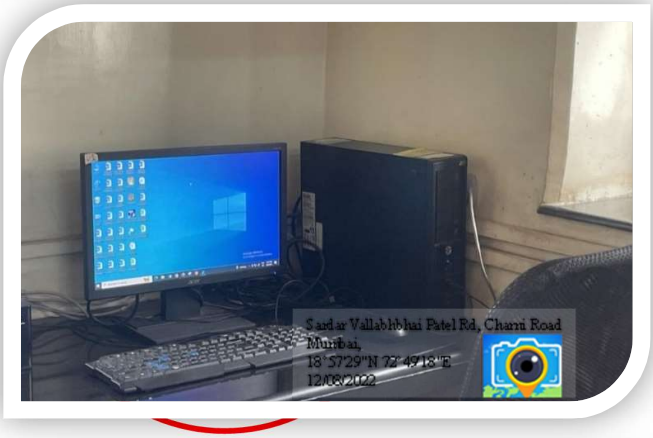


Old Air Conditioner

7.5 OFFICE EQUIPMENT:

- **Most of the office equipment are usually left without turning them off after working hours and are using electricity as Vampire loads.**
- **- Electronics appliances (computer, printer, etc.) are still ON when connected to power point even though they are turned off.**





8.SUMMARY OF RECOMMENDATIONS

Below are some recommendations based on general observations carried out throughout the college building.
The recommendations are categorized with **A** being the most urgent where immediate actions are needed to be executed (first or second week of receiving this report). **B** can be 1 to 2 monthsafter receiving this report, while **C** will depend on the availability of funds.

Recommendations		
Category A	**Category B**	**Category C**
Apply energy conservation measures. Isolate or unplug vampire loads from power when not in use (i.e. re-chargeable equipment, computer and any other electronic devices with standby modes).	Establish Energy Efficiency and Conservation steering committee to take lead with EE&C initiatives and management within the college buildings.	Where applicable, replace all Double Frame light fittings (double tube) with single frame (single tube) throughout the building. Also remove unnecessary lights or reduce the number of lights per location.
Remove faulty light holders and bulbs or remove live wire from socket inside the light holder.	Renovate or improve the lighting control, i.e. add more switches to existing rooms/spaces where only one switch controls more than 10 lights, especially the lights in the conference/meeting room.	Replace all lights with energy efficient light bulbs, i.e. LED bulbs and tube.
Remove any faulty appliances located in the building.	Use fans in places where possible (especially in unsealed room, indoor corridor, conference room, etc.).	The conservation and efficiency mechanisms are tools for reducing the energy consumption.
so late or unplug faulty air conditioners if found within the building (working but no cold air coming out) and, OR service the air conditioner units quarterly.	Remove air conditioner if the room is very poorly sealed (i.e. if the room has no seals on the door and frequently open at times).	Replace old existing out-door air conditioner units with efficient ones (if funding is available).

9. ENERGY SAVING ACTION PLAN BY COLLEGE:

9.1.1 REDUCING VAMPIRE LOADS:

- **Turned OFF lights when not in used.**
- **Reduced the number of lights per switch, to better manage lighting.**
- **Reduced the number of lights per room.**

9.1.2 LIGHTING:

- **Disconnected the live wire connected to the faulty light bulb (s) to avoid leakage of energy.**

9.1.3 SOURCE OF NATURAL LIGHT:

College building architecture

plan made in such way that the more day light (natural light) simply comes in

Replacing with led lights

corridor and class rooms.

Natural light is one of the key ways of saving energy. Daylighting minimizes the amount of artificial light and reduces electricity and HVAC (heating, ventilation, and air conditioning) costs. Electrical lighting produces a lot of heat, whereas natural lighting generates hardly any heat if it is properly controlled. Making use of natural light can save up to 75 percent of the energy used for lighting buildings and reduce cooling costs

A. Source of natural light

Source of natural light

9.1.4 VENTILATION:

The old building of college has been designed to minimize the environmental impact. the large size window and big corridors give fresh air and cross ventilation.

Since natural ventilation mainly affects air conditioning energy consumption in terms of energy saving, the design building reduces cooling energy consumption by 8.54 kWh/m2 and heating energy consumption by 0.1 kWh/m2 compared to the baseline building.

Big and specious corridor's

9.1.5 AIR CONDITIONERS:

- Using same brand throughout (cheap for maintenance cost)
- The air conditioners serviced quarterly.
- Using sealed glass windows and sealed glass doors.
- Always door closed when entering/exiting an air-conditioned room (putting a notice on the front and back of the door as a reminder).
- Keeping and maintaining the temperature at **23** ℃ during summer and occasionally used in winder.
- Switch OFF when not in used.
- Using electric fan whenever possible.
- Using outside breeze, when possible, should the air conditioner be turned off completely to minimize the cost of electricity.
- Installation of correct sizing of air conditioner in the rooms.

- All installed air conditioners servicing twice or three times a year.

9.1.6 PETROL GENERATOR:

There is 1 DG set in power house unexpected power outages: Generator sets offer consistent power, emergency preparedness, support for off-grid living, environmental considerations, reduced energy costs, and minimized downtime, making them indispensable for energy reliability in secluded locations. Detailed of the DG Sets are given below

1. Company Name: Perfect
2. Model No : 3200RC2
3. Voltage : 230 v
4. Frequency :50 Hz
5. Fuel Type : Petrol

9.1.7 Bell:

College has manual bell. Bells offer several advantages, including loud and clear sound, reliability, and adjustability, reduce electricity bill. However, electric bell has some disadvantages, including the need for a power supply, the risk of shock, cost, and maintenance requirements.

9.1.8 OFFICE EQUIPMENT:

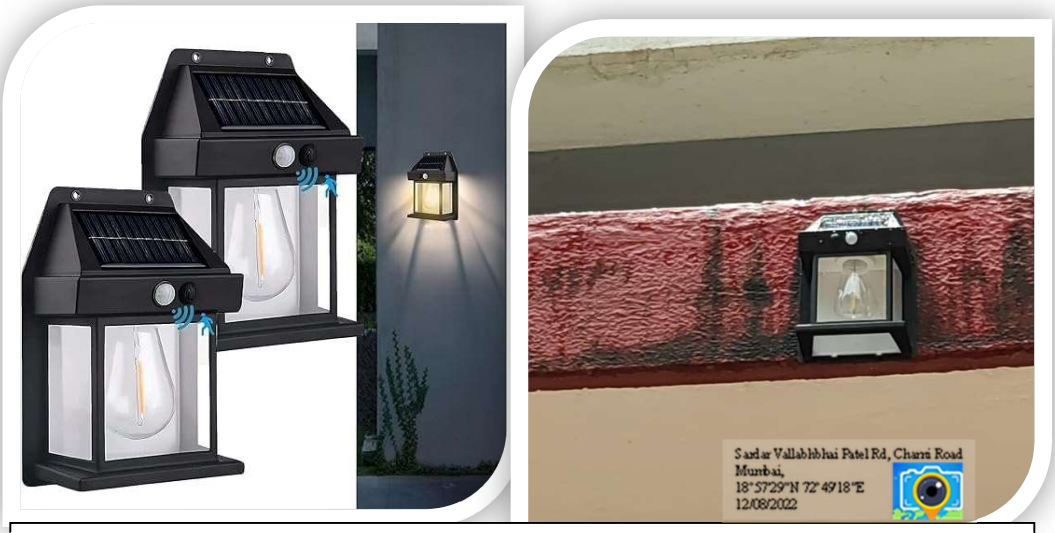
(Computers, printers and network accessories)

- **all office equipment such as printers, computers i.e. PC, monitor, etc. turned off on the power point.**
- **Avoiding putting equipment on 'STANDBY MODE'**

9.1.9 SOLAR LIGHTS:

- Solar lights are a clean and green energy source that do not produce any harmful emissions or pollutants. This makes them an environmentally friendly option that can help reduce carbon emissions and improve air quality.

- College Utilizing solar LED lighting systems for a street, parking and pathways. This will reduce cost and the impact on the environment.
- Details of solar light:
- A solar panel is built in to quickly absorb sunlight for charging, and the battery is a large capacity of 1800mAh. Place the solar light in direct sunlight to fully charge the batteries. Charging 6-8 hours can be 8-12 hours of lighting, fully sufficient for daily use.



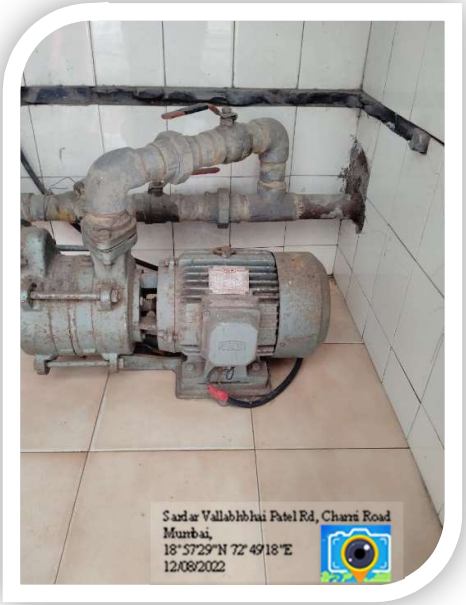
Neo Elect Solar Motion Sensor LED Lamp

9.1.10 WATER CONSERVATION:

- Conserving water saves energy. Energy is needed to filter, heat and pump water to your home, so reducing your water use also reduces your carbon footprint. College requires huge amounts of water to maintain clean campus, student washroom, on-campus dining, facilities, and more.

Source of water:

- **Municipal**: Mumbai Municipal Corporation supplies water to the college on free of cost. The same water store in overhead tanks, college use efficient pump for lifting water to over head tanks.
- **Drinking water**: The college has RO plant on each floor.

	
Water Management System on campus	**Efficient pump**

9.1.11 OPEN WELL:

The oldest and most common kind of well is a water well, to access groundwater in underground aquifers. The well water is drawn up by a pump, or using containers, such as buckets or large water bags that are raised mechanically or by hand

- College has a big well with good source of water. The well water is pumped into storage tanks located at different places in the campus.
- There are few numbers of overhead storage tanks. The water is distributed through well laid pipe network.
- Total water capacity = depth * (Radius)^2* 3.14
  - = 25*25**3.14
  - = 1962 cubic feet
  - = 55557 liters

Open Well

10. HISTORICAL DATA ANALYSIS

A. Energy Balance

Table shows the electricity consumption of college building for1-year period. Raw data was not provided accordingly, hence an average estimated power consumption was calculated

Table Electricity bill (JANUARY 2022 – DECEMBER 2023)

Month	Power Consumption(kWh)/Month	Total Electricity Cost (Rs)
January	101	757.5
February	61	457.5
March	71	532.5
April	98	735
May	408	3060
June	658	4935
Jully	487	3652.5
August	787	5902.5
September	56	420
October	99	742.5
November	115	862.5
December	125	937.5
Total	**3597 kWh**	**391140 /Rs**

From Table 2, the average cost of the monthly consumption is calculated to be: **32500 Rs**

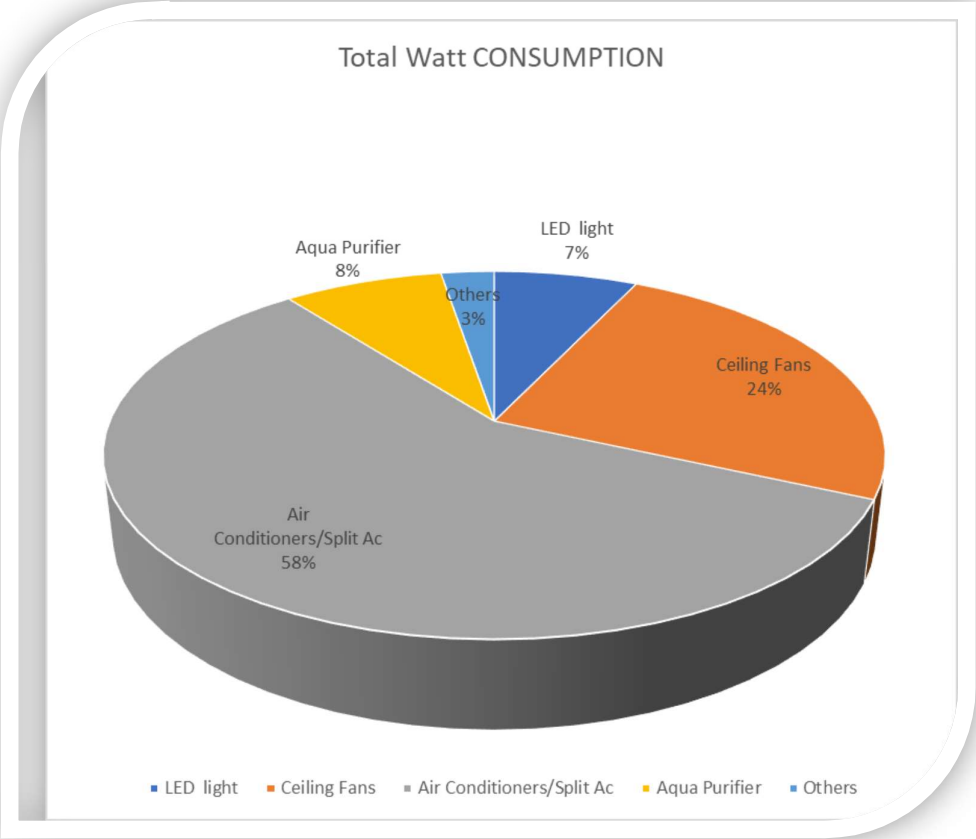
Thus, the cost of the yearly consumption is **391140 Rs**

11. INVENTORY DETAILS OF LIGHT UNITS

Sr. No	Gadgets	Total No	Watt
1	LED Tube light	135	20
2	Ceiling Fans	125	75Avg
3	Air Conditioners/Split Ac	22	1000Avg
4	Desktops	36	NA
5	Laptops	04	NA
6	Printers	06	NA
7	CCTV Cameras	49	NA
8	Aqua Purifier	04	750 Avg
9	Xerox Machine	01	NA

Details of AC			
	Type	Capacity	No
1	Split Ac	1Ton	03
2	Window Ac	1Ton	19

POWER CONSUMPTION DETAILS BREAKDOWN

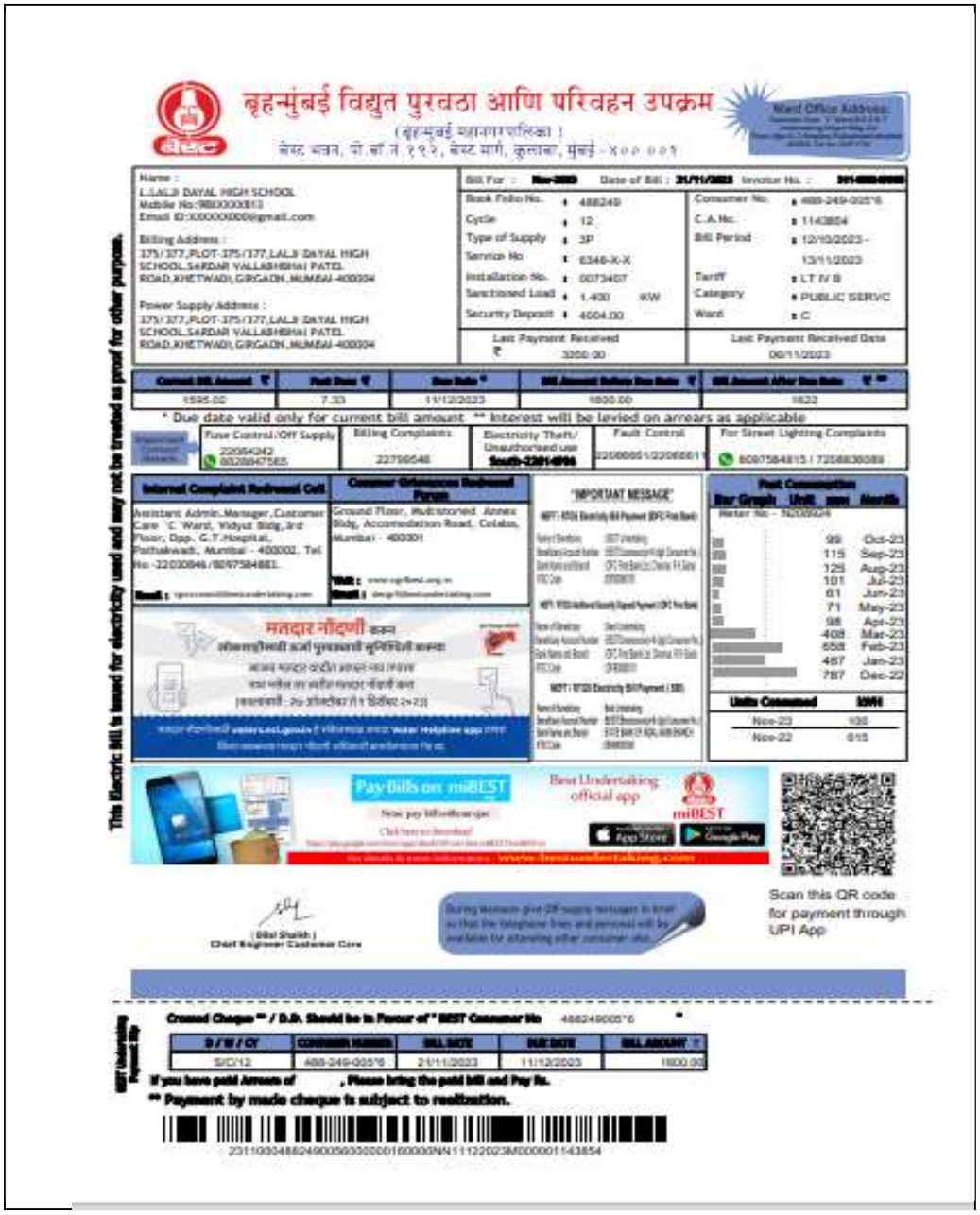


Analysis of the chart

- Air conditioning is responsible for high significant proportion of the total energy consumption followed by Fans.
- There is variation among the appliance due to their arrangement within the building, the hours in which they operate and the rate at which they consume electricity.

12.POWER CONSUMPTION DATA

Power consumption data for the campus building (2022/2023)

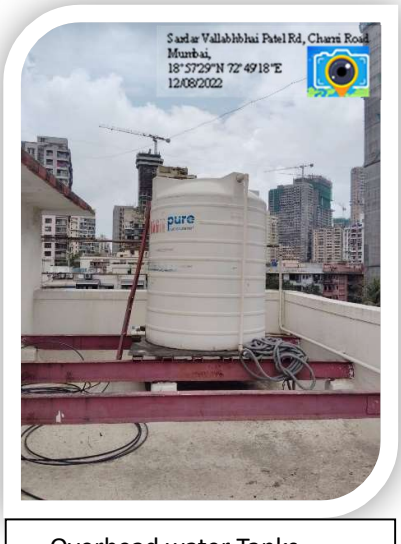


13.WATER MANAGEMENT:

- To minimize cost of electricity on water system college implemented following action
- Selecting the most efficient pump.
- Right-size the pump
- Maintain pumping systems effectively
- Use higher efficiency/proper pump seals
- Eliminate unnecessary uses

Underground water Tanks

Underground water Tanks

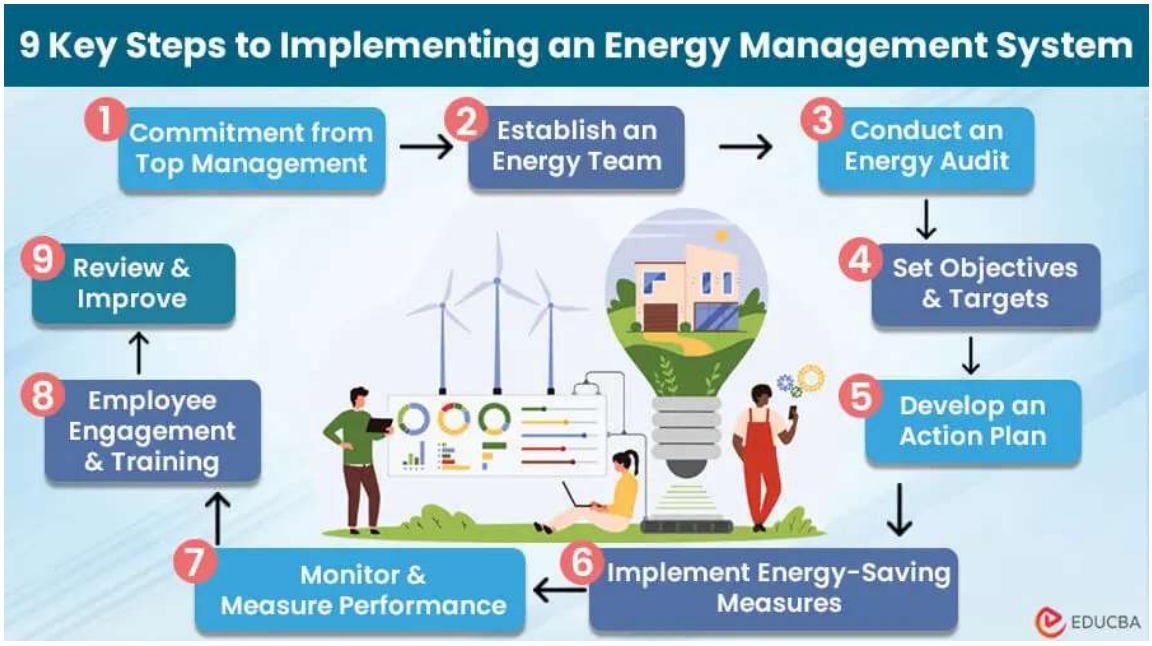


Overhead water Tanks

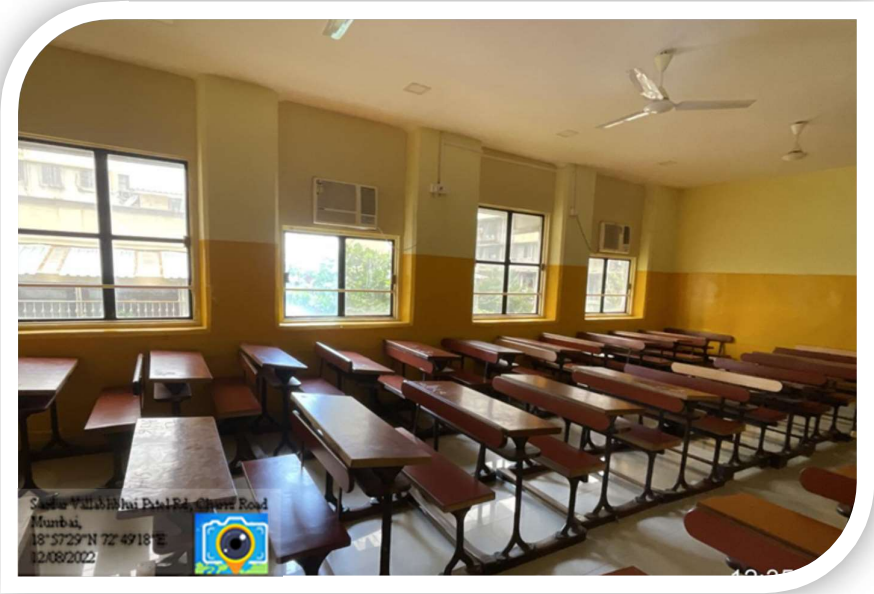
14.Energy Management Workshop and Training:

- Develop energy management policies for college. Establish a procurement policy thatis energy saving and eco-friendly.

- Conduct awareness and training programs for faculty, student and non-teaching staffs.Conduct seminars, workshops and exhibitions on energy management education.



15.PHOTO PLATES:(Energy Management System)

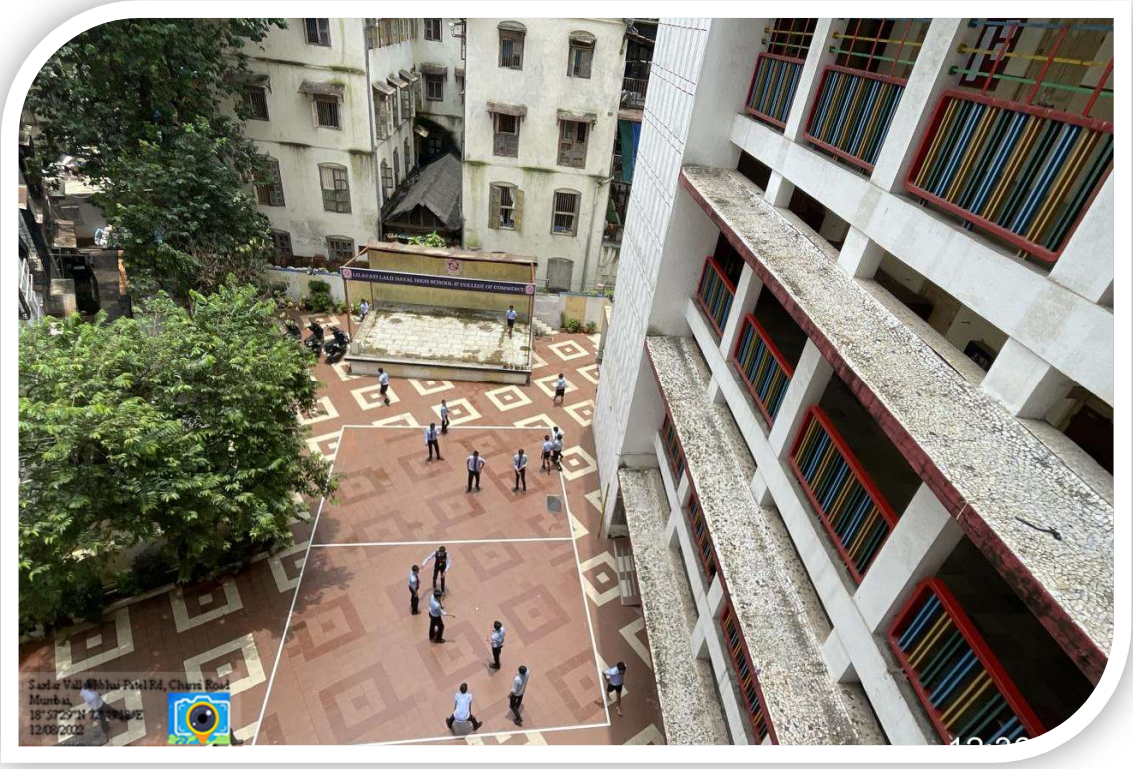


Use of natural source of light

Water Conservation Awareness

Fire extinguisher

Library



College Campus

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