

### **6.5.3 The Institution adopts several Quality Assurance initiatives**

# GREEN, ENERGY AND ENVIRONMENT AUDIT REPORT

of

## Priyadarshini Dental College and Hospital

Thiruvallur, Chennai

EXECUTED BY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

&

DEPARTMENT OF MECHANICAL ENGINEERING

INDUSTRY- INSTITUTE PARTNERSHIP CELL

CETRE OF EXCELLENCE IN ENERGY STUDIES

### KONGU ENGINEERING COLLEGE

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## Acknowledgement

The Industry Institute Partnership Cell (IIPC) of Kongu Engineering College (KEC) expresses the gratitude to the Management of **Priyadarshini Dental College and Hospital**, No.1, V.G.R Gardens, V.G.R Nagar, Pandur, Thiruvallur Taluk & District, Tamilnadu- 631203, for providing an opportunity to conduct Environment, Green and Energy audit inside their college premises. The KEC Energy Audit team wishes to thank **Priyadarshini Dental College and Hospital**, for giving them the opportunity to carry out the energy audit in their institution and for providing all support to the team during the audit. We extend our thanks to **Priyadarshini Dental College and Hospital**, Principal, HODs, IQAC team, NAAC coordinators, other Faculty members from various department and the Electrical Maintenance team for their support and for providing various information enabling the successful completion of the audit , which has facilitated the submission of this report.



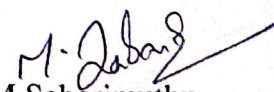
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<b>1.</b>	<b>EXECUTIVE SUMMARY</b>
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Priyadarshini Dental College and Hospital had agreed to provide access to Kongu Engineering College to undertake Environmental/Green and Energy Audit related measurements at their campus. This Audit has been conducted by a team of faculty members from Mechanical and Electrical Engineering Department of Kongu Engineering College. As there is no standard model for such an audit, the committee brainstormed and evolved a questionnaire. The data was collected, compiled and was finally analyzed by the audit team members. The remaining data which involved measurement using sophisticated instruments were done by the audit team members. By and large, the audit reveals a healthy environment in the campus. The committee has made short term and long-term suggestions to protect environment at higher levels and it is hoped that this will receive due attention of authorities and all stakeholders of the College.

<b>2.</b>	<b>OBJECTIVES OF THE AUDIT STUDY</b>
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The goals of the present environmental/green and energy audits typically include:

- To recognize, diagnose and resolve the environmental problems.
- To recognize the effects of an organization on the environment and vice versa.
- To identify and control the impact of activities of organizations on environment.
- To suggest the best protocols for sustainable development of organization and environment.
- To assess environmental performance and the effectiveness of the measures to achieve the defined objectives and targets.
- To identify the different pressures on organization to improve their environmental performance.
- To ensure that the natural resources are utilized properly as per national policy of environment.
- To establish the parameters for maintaining health and welfare of the community of the organization.

- To set the procedure for disposal of all types of harmful wastes.
- To reduce energy consumption.
- To give preference to the most energy efficient and environmentally sound appliances.
- To minimize the consumption of water and monitor its quality.
- To identify the risks of hazards and implement the policies for safety of stakeholders.
- To facilitate the stakeholders with different aspects of disaster management.
- To train all stakeholders of the organization and empower them to contribute and participate in the environmental protection.

To achieve the mentioned objectives, following stages are implemented. It includes three stages viz. pre-audit stage, audit stage and post-audit stage. Each of these stages comprises a number of clearly defined objectives, with each objective to be achieved through specific actions and these actions yielding results in the form of outputs at the end of each stage.

### 3.

### INTRODUCTION TO ENVIRONMENTAL/GREEN AUDIT

The various activities carried out in the academic institutions affects the environment in which it is situated. To address the issues, the institutions can successfully use auditing strategies to monitor their environmental-energy related activities. An "environmental audit" is a "systematic, documented, periodic and objective review to meet environmental requirements". Although environmental audits may be performed in many ways for different purposes, the reasons for performing an audit and the goals to be achieved will determine the type of environmental audit to be performed. Green audit is the tool of management system used methodologically for protection and conservation of the environment. It is also used for the sustenance of the environment. The audit suggests different standard parameters, methods and projects for environmental protection. The green audit is useful to detect and monitor sources of environment pollution and it emphasizes on management of all types of wastes, monitoring of energy consumption, monitoring of quality and quantity of water, monitoring of hazards, safety of stakeholders and even the management of disasters.



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Priyadarshini Dental College and Hospital (PDCH) was established in the year 2007 as a part of the Indira Educational and Charitable Trust under the dynamic leadership of Mr. V.G. Raajendran our Chairman, and Mrs. Indira Rajendran our Managing Director. The Institution is affiliated to Tamil Nadu Dr. M.G.R. MEDICAL UNIVERSITY, Chennai and is recognised by Dental Council of India, New Delhi.



**Figure 1(a) Green Cover**



**Figure 1(b). Green campus**

### 3.1 WATER MANAGEMENT

Three bore-wells inside the campus cater the total requirement of the college through water tanks of different capacities. The College has its own RO plants with a generation capacity of 10000 litres per day. The grey water coming out of RO plant is reused for gardening purposes. Recharging of ground water and rainwater harvesting are implemented by the college thereby conserving the water from its inception. This recharging and harvesting has been very helpful to augment the ground water. Sprinklers are used for the irrigation of garden plants. An open well caters the water demand of the institution and hospital. Water metering is available for RO water.



**Figure 2: Rain water harvesting system**



**Figure 3: Bore Well**



### 3.2 SOLID WASTE MANAGEMENT

The campus is cleaned on daily basis. Waste bins are placed in corridors, laboratories, clinics, office and staff rooms. The waste generated in the campus includes biomedical waste also. Segregation of waste is properly done and the biomedical wastes are handled by Tamil Nadu Waste Management Limited. Leaf litter is allowed to decompose systematically over a period of time and used as manure for the gardens in the institute.



**Figure 4. Waste Collection**



**Figure 5. Waste management**

### 3.3 LIQUID WASTE MANAGEMENT

Sewage, Laboratory, hostel and canteen effluent waste are the major liquid waste. Effective drainage system is found in all buildings for managing sewages. The laboratory waste water does not contain hazardous chemicals and periodical monitoring is done by the maintenance team. The college will be strict on the source reduction of chemical waste. A sewage treatment plant is functioning within the college premises.



**Figure 6. Sewage Treatment Plant**



**Figure 7 Chemical waste disposal**

### 3.4 ENERGY EFFICIENCY

The institute is replacing the 80% of fluorescent lamps with LED lamps gradually. Energy meter is closely monitored and necessary steps are being taken for energy savings. Slogans are placed in the common areas to save energy.



**Figure 8: LED Bulb**



**Figure 9: Energy saving slogans in College campus**

### 3.5 GREEN COVER

The natural site is well preserved inside the college premises. The college is occupied with nearly 100 matured trees. Such a green cover helps in reducing the CO<sub>2</sub> levels in and around the vicinity of the campus.



**Figure 10: Green Cover**



**Figure 11: Green Cover**

Trees and plants placed near the buildings provide shade and fresh air supply to the occupants. This also helps in reducing the heat island effect. As the institution is located in a hilly area, rainfall and green vegetation are abundance and they remain as nature's gift. Excellent learning ambience exists in the campus.

### 3.6 TRANSPORTATION

Pedestrian network is provided inside the campus in places wherever required. Public transport facility is available for utilizing the services of hospital. The institute owns 6 buses, 2 vans and 1 electric vehicle. Most of the students are residing in the hostel which is located very close to the academic block. This helps in reducing the CO<sub>2</sub> emissions associated with the fuel usage due to individual vehicles. Also roofed parking facility is available in the campus for those coming in their own vehicles.



**Figure 12. Roofed Parking for Four Wheeler's**



**Figure 13. Electric Vehicle**

### 3.7 HEALTH AND WELL BEING

The basic amenities like ATM, cafeteria, gym and stores are available for the use of students and staffs. Also ramp and lift facility are available in building for physically challenged. Yoga centre and indoor games facility help the staff and students to remain fit. Universal design of the buildings aid in circulation of fresh air which is a significant requirement for medical premises.




**Figure14: Lift Facilities**



**Figure 15: Cafeteria**



**Figure 16: Ramp Facility**

  
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### 3.8 GREEN EDUCATION

Events related to green practices are organized frequently through students' associations. The concept of 'Pot gardening' is practised within the academic block itself and it motivates the students as well as the visitors to carry out such activity in their home.



**Figure 17: Green Education awareness Program**

#### 4. INDOOR AIRQUALITY

Indoor air quality (IAQ) refers to the quality of the air inside buildings as represented by concentrations of pollutants and thermal (temperature and relative humidity) conditions that affect the health and performance of occupants. It has become one of the most important issues of environment and health worldwide considering the principle of human rights to health that everyone has the right to breathe healthy indoor air. With the help of Indoor Air Quality meter (Extech EA80), CO<sub>2</sub> level, relative humidity and dry bulb temperatures can be measured. The measurements are carried out based on the protocol given by Central Pollution Control Board, Ministry of Environment and Forests, Govt. of India and the norms are discussed briefly in the subsequent sections. Indoor air quality test was carried out at different locations of the institution. Carbon dioxide levels are within the ASHRAE 55-1992 limit in the outdoor and indoor. The instrument used in the present audit was Extech Make EA80 Model of Indoor air quality meter. The range of the instrument is given below

CO<sub>2</sub> range : 0 to 6,000ppm  
Temperature range : -4 to 140°F (-20 to 60°C)  
Humidity range : 10 to 95%RH



Figure 18. Indoor air quality meter



## 4.1 AIR QUALITY MEASUREMENTS

**Table1: Air quality Measurements**

<b>Standard Level of CO<sub>2</sub></b>	<b>ASHRAE and OSHA standards: 1000 ppm</b>
<b>Standard Level of Relative Humidity</b>	<b>30 – 60 % (ASHRAE)</b>
<b>Standard Level of Temperature</b>	<b>26 - 30°C <math>\pm</math>3°C (ASHRAE)</b>

<b>Standard Level of CO<sub>2</sub></b>			<b>ASHRAE and OSHA standards: 1000 ppm</b>		
<b>Standard Level of Relative Humidity</b>			<b>30 – 60 % (ASHRAE)</b>		
<b>Standard Level of Temperature</b>			<b>26 - 30°C <math>\pm</math>3°C (ASHRAE)</b>		
<b>S.No.</b>	<b>Location</b>	<b>CO<sub>2</sub> Level (ppm)</b>	<b>Relative Humidity (%)</b>	<b>Temperature (°C)</b>	<b>Comments &amp; Recommendation</b>
1.	Veranda	530	61.7	30.9	Within the limits
2.	Orthodontics Lab	447	62.7	31.5	Within the limits
3.	Conservative dentist	336	63.1	30.9	Within the limits
4.	Oral & Maxillofacial department	416	65.5	31.0	Within the limits
5.	2 <sup>nd</sup> Floor- Paediatric & Preventive dentist	456	60.1	31.8	Within the limits
6.	2 <sup>nd</sup> Floor- Periodontology & Implantology	479	60.3	31.6	Within the limits
7.	3 <sup>rd</sup> Floor Histology Lab	436	61.3	32.4	Within the limits
8.	Biochemistry Lab	428	59.7	32.5	Within the limits
9.	Seminar Hall	363	59.6	31.5	Within the limits
10.	Ground floor- Principal office	387	60.4	30.9	Within the limits

## 4.2 COMFORT LEVEL

Discomfort can be caused to the occupants due to

- Inadequate ventilation
- High temperature and humidity levels
- High levels of CO<sub>2</sub>

Ventilation should be distributed effectively in spaces, and stagnant air zones should be avoided. ASHRAE recommends relative humidity levels between 30 and 60 percent for optimum comfort. Higher humidity may result in microbial growth. A consistently implemented good-housekeeping plan is essential to eliminate or reduce the microbial growth in the building.

Damp indoor environments have been associated with many serious health effects, including asthma, hypersensitivity, and sinusitis. Moisture incursion leading to dampness can result from water leaks and/or by condensation due to high humidity. Common sources of moisture in buildings include: plumbing; roof and window leaks; flooding; condensation on cold surfaces, e.g., pipe sweating; poorly-maintained drain pans; and wet foundations due to landscaping or gutters that direct water into or under the building. Water vapor from unvented or poorly-vented kitchens, showers or steam pipes can also create conditions that promote microbial growth. Well-designed, well-constructed and well-maintained building envelopes are critical to the prevention and control of excess moisture and microbial growth by avoiding thermal bridges and preventing intrusion by liquid or vapor-phase water. Management of moisture requires proper control of temperatures and ventilation to avoid high humidity, condensation on surfaces, and excess moisture in materials.

CO<sub>2</sub> is a colourless, odourless, and tasteless gas. It is a product of completed carbon combustion and the by-product of biological respiration. ASHRAE states that CO<sub>2</sub> concentrations in acceptable outdoor air typically range from 300-500 ppm. Adverse health effects from CO<sub>2</sub> may occur since it is an asphyxiate gas. The CO<sub>2</sub> levels can be used as a rough indicator of the effectiveness of ventilation, and excessive population density in a structure. CO<sub>2</sub> increases in buildings with higher occupant densities, and is diluted and removed from buildings based on outdoor air ventilation rates. Therefore, examining levels of CO<sub>2</sub> in indoor air can reveal information regarding occupant densities and outdoor air ventilation rates. High CO<sub>2</sub> levels may indicate a problem with overcrowding or inadequate outdoor air ventilation rates. CO<sub>2</sub>, a by-product of normal cell function, is removed from the body via the lungs in the exhaled air. Exposure to high levels of CO<sub>2</sub> can increase the amount of this gas in the blood, which is referred to as *hypercapnia* or *hypercarbia*. As the severity of hypercapnia increases, more symptoms ranging from headache to unconsciousness appear, and it can also lead to death.

The traditional means of dealing with IAQ is through ventilation with outdoor air, but this approach assumes that the outdoor air is cleaner than the indoor air. In many locations and for many contaminants, this is not the case, and insufficiently treated ventilation air can actually make IAQ worse. Poor outdoor air quality includes regionally elevated outdoor contaminant levels, as well as local sources such as motor vehicle exhaust from nearby roadways and contaminants generated by activities in adjacent buildings. Some green building programs recommend across-the-board increases in ventilation rates, but such recommendations may be counterproductive in areas with poor outdoor air quality unless accompanied by appropriate and effective increases in filtration and air cleaning.

### **4.3 INFERENCE**

- Carbon-di-oxide levels are within the ASHRAE 55-1992 limit in the outdoor and indoor. For indoor condition, CO<sub>2</sub> level should be less than 1000 ppm. CO<sub>2</sub> levels are well within the limits in all places.
- ASHRAE recommends relative humidity levels between 30 and 60 percent for optimum comfort. The humidity is within the limit in most of the places. The buildings are well planned and natural circulation of air is felt in all places.
- The average ambient temperature in the campus is found to be 32°C.
- Tree plantation is highly promoted and it is evidenced through the presence of trees in many areas where buildings have not been constructed.
- Awareness programmes on environmental consciousness are organized and it is evidenced through the student participation in the respective activities.

## 5. LIQUID AND GASEOUS FUEL CONSUMPTION

LPG cylinders are used in the college hostel. Diesel and Petrol are being used for vehicles and generator. The number of bikes and cars used per day are 150 and 10 respectively. There are 36 number of college buses. The LPG cylinder ( 19.2 kg ) is used at the rate of 1 per day.

**Table 2: Liquid and Fuel consumption**

S.No	Purpose	Fuel	Usage in Nos.	Usage period
1.	Hostel	LPG	496 kg	1 year
2.	College Vehicles	Petrol and diesel	9600 Litres of diesel	1 year
3.	Generator	Diesel	35 lit for 9 hrs	1 month

## 6. INTRODUCTION TO ENERGY AUDIT

An energy audit is an examination of the total energy used in a particular building or industry. The analysis is designed to provide a relatively quick and simple method of determining not only how much energy is being consumed but where and when. The energy audit will identify deficiencies in operating procedures and in physical facilities. Once these deficiencies have been identified, it will be apparent where to concentrate efforts in order to save energy. The energy audit is the beginning of and the basis for an effective energy-management programme. Human settlements encompass a variety of buildings. Regardless of the building involved, the audit procedure is basically the same. No two buildings are identical regarding energy usage. This is due to the possible variables affecting the buildings, e.g., occupancy rates, the building's size and orientation, its geographic location, the type of heating and cooling systems, the amount and types of equipment in use, the type of construction and the level of insulation and so on. Because each building is unique, it is difficult to generalize about energy-consumption patterns, and so it is necessary to conduct an energy audit for each building. This

energy audit is aimed at obtaining a detailed idea about the various end use energy consumption activities and identification, enumerating and evaluating the possible energy saving opportunities.

## 6.1 ELECTRICITY CONSUMPTION

This energy audit is aimed at obtaining a detailed idea about the various end use energy consumption activities and identification, enumerating and evaluating the possible energy saving opportunities. It is a customary practice to conduct Energy audit every year in the Institute in order to estimate the energy consumption pattern. The present level of energy consumption of the institution has been analyzed, averaged by collecting utility bills from June 2022 to May 2023. The same is detailed in this report.

**Table 3: Electric Energy Consumption details from June 2022 to May 2023**

S.NO.	MONTH/YEAR	UNITS
1	Jun-22	7162
2	Jul-22	7668
3	Aug-22	10352
4	Sep-22	10525
5	Oct-22	10698
6	Nov-22	11754
7	Dec-22	12962
8	Jan-23	12516
9	Feb-23	11804
10	Mar-23	14322
11	Apr-23	13638
12	May-23	12958

**7.****ACTUAL MEASUREMENTS IN ELECTRICAL SYSTEM**

The measurements were undertaken using *Fluke 438* Power Quality Analyzer at the college incoming transformer. The following relevant electrical parameters were recorded by the above instrument with the set recording sample time of **10** seconds. The measurements were carried out for a period of 30 minutes to take care of different loading situations.

(i) The parameters monitored are :

- a. 3 phase average *line or phase* voltages
- b. 3 phase average line currents
- c. 3 phase average fundamental *line or phase* voltages
- d. 3 phase average fundamental line currents
- e. Frequency
- f. Total 3- phase active power in kW- *in case of four wire output, the total three phase power alone is monitored*
- g. Total 3 phase reactive power in kVAR- *in case of four wire output, the total three phase power alone is monitored*
- h. Total 3 phase apparent power in kVA- *in case of four wire output, the total three phase power alone is monitored*
- i. Total average Power factor
- j. Percentage 3 phase voltage THD
- k. Percentage 3 phase current THD

## 7.1 Recorded Data

### a) Readings taken at Incomer

Phase Voltage (L1,L2,L3) Avg V	Line Current (L1,L2,L3) Avg A	Phase Voltage (L1,L2,L3) Fundamental Avg V	Line Current (L1,L2,L3) Fundamental Avg A	%-age Voltage Un balance	%-age Current Un balance	Frequency In Hz	Active Power Total Avg in kW	Reactive Power Total Avg in kVAR	Apparent Power Total Avg in kVA	DPF	TPF	THD V Avg % age	THD A Avg % age
240.09	79.87	240.03	79.47	0.98	7.57	50.13	57.06	1.53	57.81	1.00	0.99	2.20	5.46
239.95	82.47	239.87	82.13	1.02	6.98	50.12	58.95	1.50	59.58	1.00	0.99	2.18	5.25
240.04	82.30	239.97	81.87	0.98	5.37	50.12	58.83	1.71	59.34	1.00	0.99	2.18	5.40
240.01	82.10	239.97	81.67	0.93	4.78	50.12	58.68	1.77	59.16	1.00	0.99	2.21	5.38
240.28	82.80	240.23	82.47	0.92	4.64	50.11	59.28	1.89	59.79	1.00	0.99	2.25	5.32
240.08	86.30	240.00	85.87	0.89	4.29	50.11	61.56	4.32	62.19	1.00	0.99	2.25	5.08
240.14	94.13	240.07	93.73	0.88	3.44	50.11	67.29	0.21	67.83	1.00	0.99	2.34	5.50
240.42	97.70	240.37	97.20	0.89	3.19	50.11	69.75	-3.69	70.53	1.00	0.99	2.43	6.28
240.09	98.23	240.00	97.80	0.91	4.31	50.10	70.32	-1.23	70.86	1.00	0.99	2.38	5.61
240.05	97.93	240.00	97.53	0.88	4.14	50.09	70.11	-1.38	70.65	1.00	0.99	2.38	5.62
240.08	98.33	240.00	97.93	0.86	4.54	50.09	70.41	-1.35	70.98	1.00	0.99	2.37	5.63
239.98	98.53	239.90	98.13	0.86	4.79	50.11	70.53	-1.38	71.10	1.00	0.99	2.38	5.56
239.83	98.73	239.77	98.33	0.88	4.56	50.11	70.65	-1.32	71.19	1.00	0.99	2.41	5.60
239.56	98.93	239.50	98.60	0.90	4.62	50.12	70.71	-1.47	71.28	1.00	0.99	2.51	6.01
239.39	99.23	239.30	98.80	0.96	5.06	50.13	70.83	-1.50	71.43	1.00	0.99	2.63	6.44
239.26	99.67	239.17	99.20	0.96	5.09	50.13	71.10	-1.08	71.70	1.00	0.99	2.65	6.52
239.65	100.07	239.57	99.67	0.92	5.17	50.14	71.58	-0.24	72.12	1.00	0.99	2.57	6.13

239.77	99.93	239.70	99.53	0.90	5.72	50.13	71.49	-0.24	72.09	1.00	0.99	2.58	6.08
239.46	100.03	239.37	99.60	0.91	5.25	50.14	71.46	0.15	72.06	1.00	0.99	2.58	6.03
239.64	99.70	239.57	99.33	0.92	4.67	50.13	71.28	0.54	71.88	1.00	0.99	2.59	6.04
239.45	99.80	239.37	99.40	0.91	4.63	50.12	71.28	0.57	71.85	1.00	0.99	2.61	6.07
239.44	101.13	239.37	100.73	0.91	5.58	50.11	72.24	0.69	72.87	1.00	0.99	2.62	5.97
239.51	101.17	239.40	100.73	0.95	5.79	50.12	72.30	0.78	72.96	1.00	0.99	2.64	5.94
239.45	101.50	239.37	101.07	1.00	7.28	50.12	72.45	0.90	73.23	1.00	0.99	2.65	5.94
239.52	101.60	239.43	101.20	1.01	9.34	50.12	72.57	0.75	73.50	1.00	0.99	2.65	5.92
239.53	103.30	239.47	102.93	1.01	10.07	50.12	73.77	0.84	74.82	1.00	0.99	2.65	5.82
239.52	102.90	239.47	102.53	1.02	10.32	50.12	73.47	1.08	74.58	1.00	0.99	2.65	5.87
239.65	103.40	239.57	103.00	1.03	10.86	50.13	73.86	0.99	75.03	1.00	0.98	2.64	5.81
239.68	103.67	239.60	103.27	0.99	11.13	50.13	74.07	1.20	75.30	1.00	0.98	2.62	5.80
239.94	103.93	239.87	103.47	1.02	10.94	50.12	74.04	-2.85	75.51	1.00	0.98	2.69	6.64
240.32	106.70	240.23	106.20	1.04	12.09	50.13	75.81	-7.71	77.79	0.99	0.97	2.75	7.24
240.53	106.93	240.43	106.47	0.99	12.00	50.12	76.02	-7.65	77.94	1.00	0.98	2.68	6.87
240.27	115.13	240.17	114.73	0.98	11.99	50.13	81.84	-3.36	83.67	1.00	0.98	2.65	6.20
240.45	108.47	240.33	108.00	0.95	10.17	50.13	77.46	-4.98	78.87	1.00	0.98	2.65	6.48
240.56	107.43	240.50	107.07	0.96	9.22	50.12	76.80	-4.89	78.06	1.00	0.98	2.64	6.49
240.59	107.87	240.53	107.47	0.98	9.35	50.11	77.07	-4.98	78.39	1.00	0.98	2.60	6.40
240.60	110.80	240.50	110.40	0.93	7.23	50.12	79.35	-3.48	80.28	1.00	0.99	2.57	6.09
240.39	113.03	240.33	112.67	0.88	5.93	50.14	81.03	-3.09	81.72	1.00	0.99	2.54	5.89
240.44	113.53	240.37	113.13	0.87	6.17	50.15	81.42	-3.27	82.11	1.00	0.99	2.56	6.02
240.49	114.33	240.40	113.87	0.86	5.88	50.15	81.99	-3.06	82.65	1.00	0.99	2.58	6.00
240.59	115.37	240.53	115.00	0.86	5.32	50.15	82.83	-2.67	83.43	1.00	0.99	2.58	5.84

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240.43	116.27	240.37	115.93	0.88	5.28	50.15	83.43	-2.73	84.03	1.00	0.99	2.60	5.90
240.40	115.83	240.33	115.47	0.85	4.82	50.15	83.10	-2.73	83.70	1.00	0.99	2.63	6.02
240.48	115.00	240.37	114.60	0.84	5.08	50.15	82.50	-2.79	83.13	1.00	0.99	2.65	6.06
240.51	113.97	240.40	113.53	0.79	2.98	50.15	81.75	-2.94	82.32	1.00	0.99	2.66	6.17
240.49	114.93	240.40	114.60	0.78	2.60	50.15	82.47	-2.88	83.01	1.00	0.99	2.64	6.07
240.39	116.23	240.27	115.80	0.77	2.56	50.15	83.37	-2.64	83.91	1.00	0.99	2.65	6.06
240.29	116.27	240.20	115.80	0.82	2.50	50.16	83.34	-3.00	83.94	1.00	0.99	2.69	6.21
240.15	116.00	240.07	115.53	0.82	2.45	50.17	83.16	-3.06	83.73	1.00	0.99	2.70	6.24
240.17	117.73	240.07	117.33	0.78	2.83	50.17	84.39	-2.94	84.99	1.00	0.99	2.67	6.12
240.10	119.50	240.03	119.13	0.74	2.72	50.15	85.65	-2.49	86.28	1.00	0.99	2.58	5.73
240.17	120.17	240.10	119.80	0.73	2.83	50.15	86.16	-2.31	86.82	1.00	0.99	2.59	5.67
240.03	120.90	239.93	120.53	0.73	3.03	50.15	86.67	-1.98	87.33	1.00	0.99	2.60	5.66
239.81	120.33	239.70	119.93	0.75	3.26	50.13	86.16	-2.22	86.82	1.00	0.99	2.59	5.65
239.75	122.07	239.67	121.67	0.79	3.94	50.13	87.42	-2.55	88.08	1.00	0.99	2.59	5.57
239.71	124.40	239.63	124.07	0.76	5.61	50.13	89.10	-2.43	89.91	1.00	0.99	2.60	5.52
239.68	127.00	239.60	126.67	0.81	6.07	50.13	90.96	-2.55	91.80	1.00	0.99	2.60	5.33
239.72	127.23	239.63	126.87	0.85	5.89	50.13	91.14	-2.46	91.95	1.00	0.99	2.61	5.40
239.82	126.53	239.73	126.20	0.90	4.85	50.13	90.69	-2.43	91.35	1.00	0.99	2.60	5.41
239.73	126.30	239.67	125.93	0.86	5.32	50.12	90.48	-2.61	91.20	1.00	0.99	2.62	5.53
239.84	126.97	239.77	126.60	0.87	4.60	50.12	90.99	-2.58	91.65	1.00	0.99	2.63	5.57
239.89	129.20	239.80	128.87	0.90	3.71	50.13	92.64	-2.31	93.21	1.00	0.99	2.64	5.51
239.85	130.43	239.77	130.07	0.89	4.23	50.14	93.51	-2.31	94.11	1.00	0.99	2.63	5.52
239.93	130.27	239.87	129.93	0.89	3.93	50.14	93.45	-2.13	94.02	1.00	0.99	2.63	5.54
240.03	130.07	239.97	129.73	0.85	3.65	50.14	93.33	-2.10	93.90	1.00	0.99	2.62	5.62

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239.87	128.97	239.77	128.60	0.87	2.99	50.14	92.43	-1.98	92.94	1.00	0.99	2.65	5.74
239.75	126.97	239.67	126.60	0.88	1.81	50.14	90.99	-1.92	91.41	1.00	1.00	2.65	5.97
239.54	127.67	239.47	127.27	0.89	2.07	50.14	91.38	-1.86	91.83	1.00	1.00	2.65	5.93
239.28	130.00	239.20	129.60	0.90	3.18	50.14	92.97	-2.10	93.51	1.00	0.99	2.62	5.79
238.97	133.80	238.90	133.47	0.96	4.04	50.13	95.52	-2.04	96.15	1.00	0.99	2.63	5.87
238.95	133.03	238.87	132.67	0.95	4.85	50.13	94.95	-2.13	95.70	1.00	0.99	2.64	5.95
239.12	131.03	239.00	130.67	0.80	3.86	50.12	93.63	-2.28	94.26	1.00	0.99	2.63	5.70
239.52	129.23	239.47	128.80	0.66	3.31	50.13	92.43	-3.45	93.06	1.00	0.99	2.60	5.73
239.73	126.53	239.67	126.13	0.59	2.74	50.13	90.48	-5.19	91.17	1.00	0.99	2.60	5.99
239.90	126.70	239.83	126.33	0.62	2.70	50.13	90.69	-5.13	91.38	1.00	0.99	2.61	6.04
240.06	127.33	239.97	126.93	0.62	2.63	50.13	91.17	-5.10	91.86	1.00	0.99	2.63	6.08
240.08	129.67	240.00	129.27	0.61	2.08	50.14	92.85	-5.07	93.51	1.00	0.99	2.63	5.98
240.23	129.07	240.13	128.67	0.57	1.11	50.13	92.49	-5.10	93.09	1.00	0.99	2.63	6.06
240.11	128.83	240.03	128.47	0.58	1.47	50.12	92.28	-5.01	92.91	1.00	0.99	2.63	6.11
240.06	130.00	239.97	129.60	0.60	1.24	50.12	93.09	-5.10	93.69	1.00	0.99	2.66	6.16
239.99	129.40	239.90	129.00	0.63	1.16	50.12	92.61	-5.25	93.21	1.00	0.99	2.64	6.02
240.05	129.27	239.97	128.87	0.65	1.28	50.12	92.58	-5.25	93.15	1.00	0.99	2.62	5.96
239.94	131.53	239.87	131.13	0.67	2.71	50.11	94.14	-5.37	94.83	1.00	0.99	2.64	5.95
239.48	132.93	239.40	132.60	0.79	2.54	50.12	94.98	-5.46	95.67	1.00	0.99	2.65	6.02
239.87	132.63	239.80	132.20	0.79	2.83	50.12	94.89	-5.34	95.61	1.00	0.99	2.68	6.09
240.00	133.40	239.90	133.07	0.80	2.72	50.14	95.52	-5.49	96.18	1.00	0.99	2.66	5.83
239.99	131.77	239.90	131.47	0.79	2.93	50.15	94.38	-5.58	95.07	1.00	0.99	2.64	5.90
239.84	130.93	239.73	130.53	0.80	3.42	50.15	93.69	-5.49	94.44	1.00	0.99	2.65	6.07
239.73	132.27	239.63	131.87	0.79	3.53	50.14	94.56	-5.28	95.34	1.00	0.99	2.71	6.20

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239.61	133.33	239.50	132.93	0.76	4.23	50.14	95.34	-5.34	96.18	1.00	0.99	2.71	6.12
239.33	132.83	239.23	132.47	0.80	4.47	50.14	94.89	-5.46	95.73	1.00	0.99	2.69	6.01
239.70	132.73	239.60	132.33	0.81	4.67	50.13	94.98	-5.19	95.85	1.00	0.99	2.74	6.15
239.69	133.03	239.60	132.67	0.82	4.70	50.14	95.19	-5.13	96.03	1.00	0.99	2.73	6.11
239.71	133.73	239.63	133.40	0.85	4.69	50.15	95.67	-5.10	96.54	1.00	0.99	2.74	6.07
239.73	134.20	239.63	133.73	0.85	4.16	50.16	95.97	-4.98	96.81	1.00	0.99	2.77	6.14
240.21	134.63	240.13	134.20	0.82	2.37	50.15	96.51	-4.89	97.17	1.00	0.99	2.70	5.95
240.32	136.93	240.27	136.53	0.76	2.64	50.15	98.25	-4.74	98.91	1.00	0.99	2.66	5.79
240.34	137.37	240.27	137.07	0.73	3.04	50.16	98.58	-4.92	99.27	1.00	0.99	2.65	5.76
240.31	137.90	240.20	137.53	0.71	4.52	50.17	98.94	-4.98	99.78	1.00	0.99	2.64	5.73
240.23	138.73	240.13	138.40	0.69	4.62	50.17	99.54	-5.01	100.41	1.00	0.99	2.64	5.78
240.17	139.23	240.07	138.87	0.66	4.47	50.16	99.84	-4.95	100.71	1.00	0.99	2.65	5.78
240.23	137.40	240.17	137.07	0.64	5.36	50.16	98.55	-4.95	99.51	1.00	0.99	2.65	5.83
240.32	135.20	240.23	134.80	0.63	5.04	50.17	96.96	-4.89	97.92	1.00	0.99	2.68	5.95
240.40	134.87	240.33	134.53	0.64	4.68	50.18	96.78	-4.89	97.68	1.00	0.99	2.67	5.87
240.27	135.70	240.20	135.33	0.65	4.59	50.18	97.32	-4.80	98.22	1.00	0.99	2.66	5.92
240.07	139.47	239.97	139.13	0.67	4.52	50.17	100.02	-3.09	100.83	1.00	0.99	2.63	5.61
239.68	140.47	239.60	140.20	0.73	2.56	50.17	100.65	-1.65	101.16	1.00	0.99	2.60	5.39
239.87	138.87	239.80	138.53	0.76	1.42	50.16	99.63	-1.74	100.02	1.00	1.00	2.60	5.38
239.46	139.60	239.37	139.27	0.81	1.57	50.16	99.99	-1.71	100.38	1.00	1.00	2.59	5.32
239.36	139.53	239.30	139.20	0.79	1.68	50.15	99.90	-1.74	100.29	1.00	1.00	2.61	5.31
239.44	140.10	239.37	139.80	0.77	1.76	50.15	100.32	-1.74	100.71	1.00	1.00	2.60	5.28
239.31	142.73	239.23	142.40	0.78	2.59	50.16	102.15	-1.74	102.57	1.00	1.00	2.61	5.20
239.50	142.83	239.47	142.53	0.77	2.54	50.16	102.33	-1.74	102.75	1.00	1.00	2.59	5.18

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239.19	146.70	239.10	146.40	0.79	2.53	50.15	104.94	0.60	105.36	1.00	1.00	2.59	5.01
238.99	148.03	238.90	147.67	0.79	2.77	50.14	105.90	0.84	106.26	1.00	1.00	2.62	4.96
238.98	147.17	238.90	146.87	0.76	2.49	50.13	105.27	0.87	105.66	1.00	1.00	2.60	4.98
239.08	146.57	239.00	146.20	0.75	2.45	50.14	104.88	0.90	105.24	1.00	1.00	2.58	4.87
239.15	146.63	239.03	146.27	0.76	2.53	50.14	104.94	0.90	105.27	1.00	1.00	2.58	4.88
239.24	147.13	239.17	146.80	0.73	2.64	50.15	105.33	0.75	105.69	1.00	1.00	2.57	4.87
239.19	146.77	239.10	146.47	0.74	2.23	50.15	105.09	0.75	105.42	1.00	1.00	2.58	4.88
239.11	147.97	239.07	147.60	0.77	1.16	50.14	105.90	0.81	106.17	1.00	1.00	2.58	4.86
238.94	147.43	238.83	147.13	0.79	0.69	50.13	105.45	0.69	105.72	1.00	1.00	2.58	4.86
238.90	145.37	238.80	145.07	0.80	0.85	50.12	103.98	0.45	104.25	1.00	1.00	2.57	4.94
238.74	145.30	238.67	145.07	0.78	0.77	50.12	103.83	0.33	104.10	1.00	1.00	2.56	4.96
238.76	145.17	238.70	144.80	0.78	0.90	50.11	103.74	0.33	104.01	1.00	1.00	2.59	5.05
238.72	147.07	238.67	146.73	0.74	1.31	50.11	105.09	0.45	105.42	1.00	1.00	2.59	5.00
238.53	147.23	238.47	147.00	0.74	1.75	50.12	105.12	0.30	105.45	1.00	1.00	2.59	5.03
238.63	148.40	238.53	148.07	0.79	1.36	50.11	105.99	0.24	106.32	1.00	1.00	2.58	4.96
238.54	150.03	238.43	149.67	0.80	1.29	50.11	107.13	0.15	107.43	1.00	1.00	2.58	4.92
238.67	147.50	238.60	147.20	0.82	1.64	50.10	105.36	0.06	105.66	1.00	1.00	2.59	4.98
238.43	148.37	238.33	148.07	0.82	1.53	50.10	105.93	-0.03	106.23	1.00	1.00	2.59	4.93
238.24	148.87	238.17	148.60	0.85	1.09	50.09	106.17	0.18	106.44	1.00	1.00	2.58	4.88
238.18	149.23	238.13	148.87	0.90	1.21	50.09	106.41	0.18	106.68	1.00	1.00	2.58	4.86
238.24	148.63	238.13	148.33	0.94	1.00	50.09	106.02	-0.03	106.29	1.00	1.00	2.60	4.89
238.21	147.57	238.10	147.20	0.94	1.23	50.09	105.24	-0.03	105.51	1.00	1.00	2.60	4.93
238.12	150.43	238.03	150.07	0.97	1.79	50.09	107.22	-0.09	107.52	1.00	1.00	2.60	4.79
238.19	152.10	238.07	151.80	0.93	2.08	50.09	108.45	-0.03	108.75	1.00	1.00	2.59	4.76

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238.42	151.53	238.37	151.20	0.78	1.46	50.09	108.18	-0.12	108.45	1.00	1.00	2.61	4.80
238.48	151.33	238.40	151.00	0.70	1.25	50.10	108.03	0.03	108.30	1.00	1.00	2.61	4.82
238.45	149.57	238.37	149.27	0.68	0.75	50.09	106.77	0.33	107.04	1.00	1.00	2.60	4.86
238.52	148.93	238.43	148.67	0.70	0.87	50.09	106.35	0.36	106.62	1.00	1.00	2.59	4.86
238.62	149.67	238.53	149.40	0.74	0.91	50.09	106.89	0.45	107.19	1.00	1.00	2.59	4.90
238.71	147.03	238.63	146.67	0.89	2.59	50.09	105.00	0.27	105.27	1.00	1.00	2.60	4.94
238.81	146.17	238.70	145.87	0.87	3.19	50.09	104.49	0.21	104.76	1.00	1.00	2.61	4.98
238.90	147.00	238.83	146.67	0.84	3.45	50.10	105.12	0.36	105.39	1.00	1.00	2.63	4.96
238.98	144.97	238.90	144.67	0.81	2.83	50.10	103.71	0.27	103.95	1.00	1.00	2.65	5.04
238.78	145.03	238.70	144.73	0.81	2.45	50.10	103.68	0.03	103.92	1.00	1.00	2.65	5.03
238.86	141.93	238.77	141.60	0.80	3.65	50.09	101.46	0.09	101.79	1.00	1.00	2.64	5.14
239.17	142.23	239.10	141.87	0.78	4.28	50.09	101.79	0.06	102.18	1.00	1.00	2.67	5.15
239.09	140.53	239.00	140.27	0.82	3.83	50.10	100.59	-0.09	100.98	1.00	1.00	2.68	5.17
239.07	141.83	239.00	141.53	0.86	3.36	50.09	101.46	0.09	101.79	1.00	1.00	2.65	5.15
239.07	142.00	239.00	141.73	0.83	2.92	50.08	101.61	0.15	101.91	1.00	1.00	2.64	5.14
239.03	140.60	238.93	140.27	0.88	3.28	50.08	100.59	0.39	100.86	1.00	1.00	2.63	5.17
239.05	141.97	238.97	141.60	0.91	2.89	50.08	101.58	0.36	101.85	1.00	1.00	2.64	5.16
239.00	140.87	238.90	140.47	1.00	2.88	50.08	100.74	0.45	101.01	1.00	1.00	2.64	5.20
238.68	141.83	238.60	141.53	1.07	2.77	50.08	101.31	0.42	101.58	1.00	1.00	2.63	5.13
238.71	140.97	238.63	140.67	1.11	2.59	50.08	100.74	0.45	100.98	1.00	1.00	2.63	5.18
238.56	141.17	238.47	140.80	1.12	2.59	50.08	100.77	0.42	101.01	1.00	1.00	2.64	5.15
238.50	141.20	238.40	140.93	1.06	2.63	50.08	100.80	0.42	101.07	1.00	1.00	2.64	5.16
238.58	141.17	238.50	140.80	0.89	2.94	50.08	100.80	0.36	101.07	1.00	1.00	2.63	5.15
238.60	141.13	238.53	140.80	0.90	3.12	50.08	100.77	0.45	101.04	1.00	1.00	2.63	5.16

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238.76	140.10	238.70	139.80	0.90	2.50	50.09	100.11	0.36	100.35	1.00	1.00	2.67	5.26
238.79	140.30	238.70	139.93	0.90	1.74	50.10	100.26	0.45	100.50	1.00	1.00	2.65	5.30
238.74	143.57	238.67	143.13	0.92	2.87	50.10	102.51	1.11	102.81	1.00	1.00	2.63	5.15
234.16	142.50	233.90	142.07	2.56	5.17	50.10	99.78	1.20	100.14	1.00	1.00	2.68	5.10
0.10	0.13	0.00	0.00	143.47	147.61	50.00	0.00	0.00	0.00	0.00	0.00	302.02	76.73
0.09	0.10	0.00	0.00	151.58	128.69	50.00	0.00	0.00	0.00	0.00	0.00	327.67	75.67
70.75	35.97	67.90	34.07	130.29	138.38	49.81	6.99	2.01	7.44	0.95	0.94	6.10	8.01
239.51	99.47	238.33	98.47	0.43	9.27	50.12	69.81	13.02	71.94	0.98	0.97	3.70	8.03
239.91	91.60	239.73	91.00	0.31	8.19	50.00	64.41	11.79	66.45	0.98	0.97	3.44	9.38
239.93	90.47	239.80	89.80	0.32	8.13	50.00	63.48	12.03	65.64	0.98	0.97	3.24	9.80
239.82	90.60	239.67	90.00	0.28	7.66	49.99	63.63	11.82	65.73	0.98	0.97	3.17	9.89
239.84	88.97	239.70	88.33	0.24	6.59	49.99	62.55	11.40	64.41	0.98	0.97	3.25	9.97
198.55	73.00	198.10	72.33	34.56	91.25	50.00	42.42	7.59	43.74	0.98	0.97	3.41	10.13
218.73	84.13	218.63	83.67	36.92	28.94	50.09	53.49	9.15	55.02	0.99	0.97	2.58	5.54
241.70	88.93	241.63	88.53	1.05	4.48	50.12	63.36	9.66	64.89	0.99	0.98	2.49	5.89
241.49	87.70	241.40	87.27	1.08	3.81	50.11	62.49	9.33	63.87	0.99	0.98	2.53	6.07
241.22	88.50	241.17	88.13	1.02	4.21	50.12	62.97	9.48	64.44	0.99	0.98	2.56	6.58
241.20	87.80	241.13	87.33	0.98	3.77	50.11	62.46	9.39	63.90	0.99	0.98	2.52	6.46
241.25	87.87	241.17	87.40	0.95	4.05	50.10	62.52	9.33	63.96	0.99	0.98	2.49	6.28
241.51	88.27	241.43	87.80	0.88	4.48	50.10	62.91	9.27	64.35	0.99	0.98	2.46	6.08
241.67	87.37	241.63	87.00	0.78	4.51	50.11	62.28	9.36	63.72	0.99	0.98	2.46	6.11
241.62	86.40	241.53	85.93	0.75	4.37	50.12	61.80	2.43	62.97	1.00	0.98	2.58	7.25
241.74	86.33	241.63	85.67	0.68	4.22	50.12	61.86	-2.31	62.91	1.00	0.98	2.63	7.89

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## 8. Energy saving Opportunities

### 8.1 Lighting:

#### SAMPLE CALCULATION FOR ENERGY SAVING

DESCRIPTION	FTL FITTINGS	LED FITTINGS
	40W	18W
<b>No. OF FITTINGS</b>	100	<b>100</b>
WATTS	40	<b>18</b>
TOTAL WATTS	4000	1800
CONSUMPTION UNITS PER DAY	40.000	<b>18.000</b>
RUNNING COST PER DAY	272.00	<b>122.40</b>
SAVINGS LED INSTEAD OF FTL IN WATTS	2200	
UNITS SAVINGS PER DAY	22.000	
<b>UNITS SAVINGS PER MONTH</b>	<b>550.000</b>	
RUNNING HOURS PER DAY	10	
PRESENT KSEB UNITS COST Rs.	6.80	
COST SAVINGS PER DAY Rs.	149.60	
<b>COST SAVINGS PER MONTH Rs.</b>	<b>3740.00</b>	
<b>LED LIGHT FITTING TOTAL EXPENSES Rs. (100*Rs.650)</b>	<b>65000.00</b>	
COST RETURN PERIOD IN DAYS	434	
COST RETURN PERIOD IN MONTHS	14.48	
<b>COST RETURN PERIOD IN YEARS</b>	<b>1.19</b>	



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## 8.2 Fan:

### SAMPLE CALCULATION FOR ENERGY SAVING

DESCRIPTION	NORMAL FAN	BLDC FAN
	80W	30W
<b>No. OF FITTINGS</b>	100	<b>100</b>
TOTAL WATTS	8000	<b>3000</b>
CONSUMPTION UNITS PER DAY	80.000	<b>30.000</b>
RUNNING COST PER DAY	544.00	<b>204.00</b>
SAVINGS BLDC INSTEAD OF NORMAL FAN IN WATTS	5000	
UNITS SAVINGS PER DAY	50.000	
<b>UNITS SAVINGS PER MONTH</b>	<b>1250.000</b>	
RUNNING HOURS PER DAY	10	
PRESENT KSEB UNITS COST Rs.	6.80	
COST SAVINGS PER DAY Rs.	340.00	
<b>COST SAVINGS PER MONTH Rs.</b>	<b>8500.00</b>	
<b>BLDC FAN TOTAL EXPENSES Rs. (100*Rs.3250)</b>	<b>325000.00</b>	
COST RETURN PERIOD IN DAYS	956	
COST RETURN PERIOD IN MONTHS	31.86	
<b>COST RETURN PERIOD IN YEARS</b>	<b>2.62</b>	



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### 8.3 Air Conditioner:

#### SAMPLE CALCULATION FOR ENERGY SAVING

Model	Star Rating	EER	Cooling Capacity	Power Consumption ( Watts/Hr)	No. of Watts saved / Hr to 0 Star Level	No. of Units saved / 8 Hr.	**Savings ( Rs / Yr) (300Days)
Split AC	5 Star	3.59	6212	1732	1268	10.1	19240
Split AC	3 Star	3.12	6044	1938	1062	8.5	16192
Split AC	2 Star	3	6610	2210	791	6.3	12001

(Actual may vary)

- Raising AC setting by 1° can save 6% power
- Typically the temperature is set at 20-21 degree Celsius, whereas, the comfort number is 24-28 degree Celsius.
- A change from 20 degree Celsius to 24 degree Celsius, has the potential to save about 24 per cent of power.

  
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**9.**

**BEST PRACTICES**

- The energy is also conserved by using natural light in the classrooms. Fixation of sensor lights in the campus is under processing.
- LED bulbs and CFLs are being used in all possible locations as an energy conservation measure.
- Green transport is often practiced as an active transport system which encourages students to walk or cycle in the campus. The College has made arrangements for the parking of the vehicles of the students and staff near the entrance. With this active transport practice, the use of private vehicles on campus is reduced and thus can be a strategy to reduce traffic congestion and pollution in campus.
- Training programmes conducted on Energy Conservation, Environment Impacts and Fuel Savings for i) Students, Staffs and Faculty Members (for the specified period) by any external agencies
- The college has been maintaining seventeen rain water recharging pits. Buildings in the college are linked to a rain water storage grid with varying capacities. These rainwater recharging systems help to recharge the ground water and thus the campus gets ample increase in the amount of ground water.
- The college herbal garden was setup in an area of 4000 square feet of land where medicinal and nourishment plants are cultivated. The college has four lawns and several hedges, as well as a variety of vegetation, which adds beauty and aesthetics to the campus. A gardener is assigned to guide irrigation, weeding, and manure application.
- Drip irrigation is used as an attempt to keep the hedges and landscaping in excellent condition. In order to maintain gardens and lawns 30 sprinklers have been installed. All of them have been in working conditions.

**10.**

**OBSERVATIONS, RECOMMENDATIONS AND  
GENERAL SUGGESTIONS**

Observations

- (i) The maintenance of Power room is good.
- (ii) The institute receives power from electricity board at 11kV. The average energy received from board is 11363.3 unit per month, maximum being 14322 units and minimum 7162 units.
- (iii) It is observed that the maximum load reached is 77kW.
- (iv) The monthly average Power factor is maintained at unity.
- (v) For Safety purpose, rubber mats as well as wooden board has been placed in front of panels in the power room

Recommendations

- (i) All class rooms and laboratory's to have display messages regarding optimum use of electrical appliances in the room like lights, fans, computers and projectors.
- (ii) All computers to have power saving settings to turn off monitors and hard discs, say after 10 minutes / 30 minutes.
- (iii) The comfort air conditioning temperature to be set between 24°C to 28°C.
- (iv) As the college is located at a place where solar intensity is sufficiently available, day lighting is sufficient for the class room environment which reduces the usage of lighting.
- (v) It is recommended to replace fluorescent light by LED whenever they get fused.
- (vi) The energy saving opportunities for various equipments and cost savings are discussed in above chapters.
- (vii) It is recommended to install 100kWp solar PV panel. However, initially 50 kWp may be installed to meet the demand.

**GENERAL SUGGESTIONS**

- 1. All class rooms and laboratory's to display messages regarding optimum use of electrical appliances like lights, fans, computers in the room
- 2. Vehicle pass may be issued as a sticker and that can be pasted in the vehicles belonging to Faculty, Staff and Students. This is to track the number of vehicles commuting inside the

campus and to prevent the entry of unauthorized vehicles. This will help to find the percentage of institute population using own vehicles.

3. Safety precautions/ Warning signs need to be displayed near to the chemical storage points such as Chemistry Laboratories.
4. All Faculty and non-teaching staff should be made aware of common safety procedures and location of centralized facility like RO Plant, Rain water harvesting tanks, etc.
5. Awareness programmes on energy and environment consciousness may be organized at regular intervals. Each department may plan atleast one such programme in a year and Clubs like NSS, Rotary, etc may be involved.
6. Responsibility chart (Name and In-charge) may be made available at RO, Gardening and Transport Offices/rooms as like in laboratories. This will be a first level of motivation and bring better attachment to towards institution.
7. Green, Environment and Energy Audits to be conducted every year, and progress can be analysed by creating action taken report on the recommendations.
8. Switching to digital forms, electronic means of communication helps in avoiding paper wastage.
9. Eliminate or reduce paper processes by scanning paperwork that you produce or receive from others.
10. Instead of using several paper documents or records, compile important information into a shared, accessible folder in a Google Drive and keep it updated.

Regn. No. EA-13164



Certificate No. 6461

**National Productivity Council**  
(National Certifying Agency)  
**PROVISIONAL CERTIFICATE**

This is to certify that Mr. / Ms. Logeswaran T  
son / daughter of Mr. Thangamuthu  
has passed the National Certification Examination for Energy Auditors held in October - 2011, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : 1<sup>st</sup> February, 2012

Controller of Examination

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Confederation of Indian Industry

## The Indian Green Building Council

hereby certifies that

**Logeswaran T**

has successfully demonstrated knowledge on the Green Building Design & Construction, Building Standards & Codes, IGBC Resources & Processes and Green Design Strategies & their Impacts, required to be awarded the title of

## IGBC Accredited Professional

**K S Venkatagiri**  
Executive Director  
CII-Godrej GBC

**V Suresh**  
Chairman  
Indian Green Building Council

**Gurmit Singh Arora**  
Vice-Chairman  
Indian Green Building Council

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18 December 2021



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Certificate 73531799 / 159674238

## LOGESWARAN T

has been awarded a Certificate of Achievement for

### ISO 14001:2015 - Environmental Management Systems Auditor/Lead Auditor Training Course

by passing the written examination and continuous assessment this learner  
has successfully passed all the course assessment requirements

Held at SGS India Private Limited  
Completed on 28 April 2022 - 2 May 2022  
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# **End of the Report**

## **Thank You**



**CHIEF CO-ORDINATOR**

INDUSTRY - INSTITUTE PARTNERSHIP CELL

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