E.G.S. PILLAY ENGINEERING COLLEGE (AUTONOMOUS)
NAGAPATTINAM – 611 002. TAMILNADU, INDIA
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
(Accredited by NAAC with 'A' Grade and NBA)
Email: principal@egspec.org website: www.egspec.org

7.1.6.1. The institution's initiatives to preserve and improve the environment and harness energy are confirmed through the following:

TO WHOMSOEVER IT MAY CONCERN

This is certifying that the following initiatives are taken in our institution to preserve and improve the environment and harness energy are confirmed.

1. **Green audit**
2. **Energy audit**
3. **Environment audit**
4. **Clean and green campus recognitions/awards**
5. **Beyond the campus environmental promotional activities**

PRINCIPAL

REPORT OF ENVIRONMENT, GREEN AND ENERGY AUDIT

of

E.G.S. Pillay Engineering College

(Autonomous)

Nagapattinam

EXECUTED BY

DEPARTMENT OF MECHANICAL ENGINEERING
&
ELECTRICAL AND ELECTRONICS ENGINEERING

INDUSTRY- INSTITUTE PARTNERSHIP CELL

CENTRE OF EXCELLENCE IN ENERGY STUDIES

KONGU ENGINEERING COLLEGE

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TAMILNADU

Estd : 1984

Transform Yourself

January 2023

KONGU
Assuring the Best

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Acknowledgement

The Industry Institute Partnership Cell of Kongu Engineering College is thankful to the Management of E.G.S. Pillay Engineering College for providing an opportunity to conduct Environment, Green and Energy audit inside their college premises. We express our sincere gratitude to the Principal, Internal Quality Assurance Cell team, faculty members and technicians of E.G.S. Pillay Engineering College for the support and also for providing necessary information to the KEC team for successfully carrying out the measurements which have enabled the timely submission of this report.

We also thank the following audit team members of Kongu Engineering College for carrying out the audit. The audit was carried out by qualified and experienced Energy Professionals/Engineers, including BEE certified Energy Auditors/Managers.

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1. EXECUTIVE SUMMARY

E.G.S. Pillay Engineering College 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 qualified faculty members from Mechanical and Electrical Engineering Departments 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 analysed by the audit team members. The remaining data which involved measurements 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 institution.

2. OBJECTIVES OF THE AUDIT STUDY

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.

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- 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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E.G.S. Pillay Engineering College imparts futuristic technical education with a humane touch through dedicated faculty, so that the students become trendsetting engineers of the modern era and responsible citizens of the nation. The management of E.G.S. Pillay Engineering College is concerned about the needs of the nation as well as the world with the help of niche technologies. The Institution offers 8 Under Graduate and 7 Post Graduate programs. Holistic teaching, well equipped class rooms, User friendly laboratories with air conditioners, high profile placement records and well established Central library are the highlights of the institution.

Figure 1. Green campus

3.1 WATER MANAGEMENT

Two bore-wells inside the campus cater the total requirement of the college through water tanks of different capacities. The College has its own RO plant with a generation capacity of 40000 liters 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 since its inception. This recharging and harvesting has been very helpful to augment the ground water. The

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college buys water from the corporation for feeding the raw water to the RO system. Water metering is done for RO water.

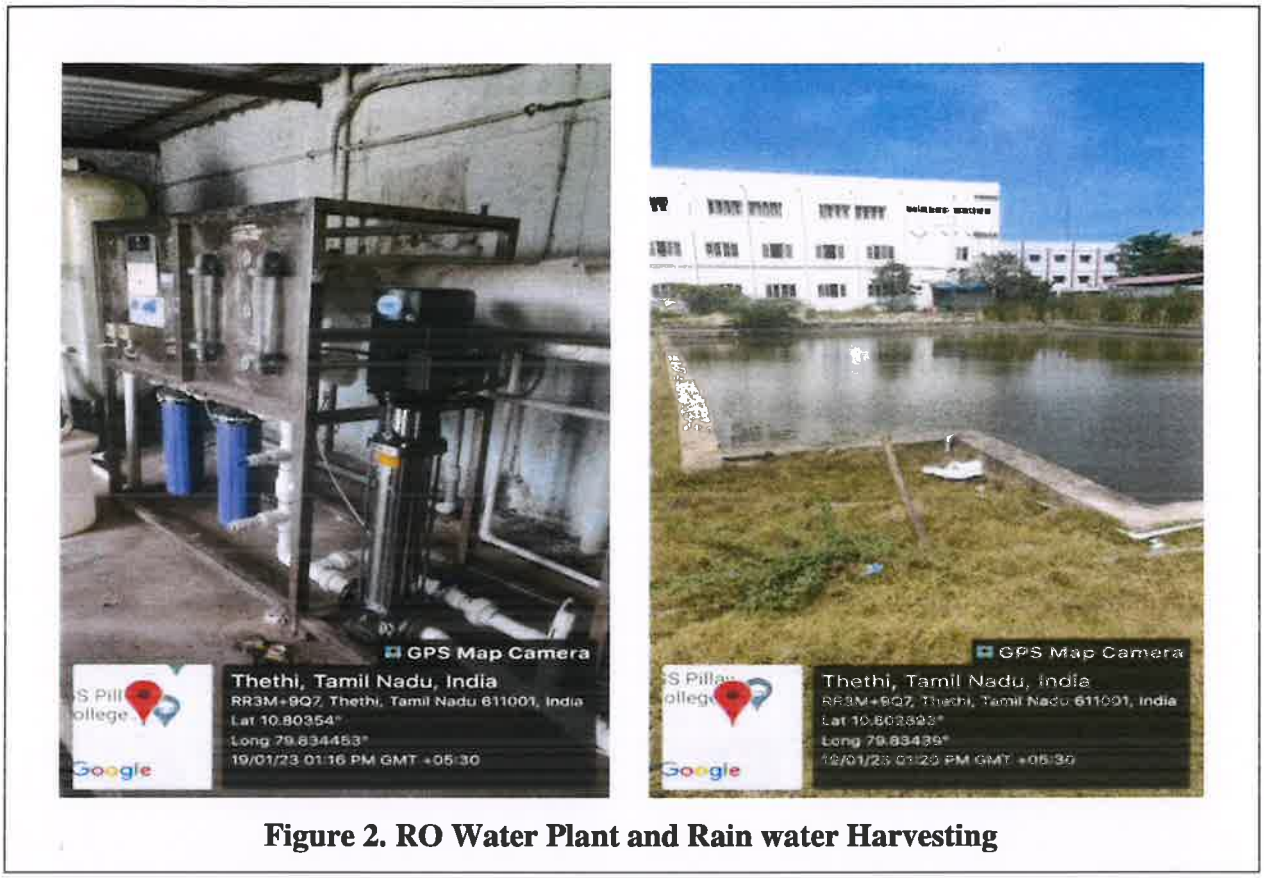

Figure 2. RO Water Plant and Rain water Harvesting

3.2 SOLID WASTE MANAGEMENT

The campus is cleaned on daily basis. Waste bins are placed in corridors, office and staff rooms. The waste generated in the campus includes wrappers, glass, metals, paper, etc. Old newspapers, used papers and journal files, workshop scrap etc. are given for recycling to external agencies. Glass, metals and other non-biodegradable wastes are given to external agencies where they are segregated and disposed/ recycled according to the nature of the waste. Non-biodegradable and plastic wastes are disposed by municipal collection centre. Leaf litter is allowed to decompose systematically over a period of time and used as manure for the gardens in the institute. In the hostel approximately 3-5 kg of food waste is generated per day which is given outside for domestic cattle feed.

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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. Laboratories are purchasing chemicals for particular purposes and share surplus chemicals with other laboratories inside the campus. A sewage treatment plant is functioning within the college premises.

3.4 E WASTE MANAGEMENT

Electronic goods are put to optimum use; the minor repairs are set right by the Laboratory assistants and teaching staff; and the major repairs are handled by the Technical Assistant and are reused. UPS Batteries are recharged / repaired / exchanged by the suppliers. The waste compact discs and other disposable non-hazardous items are used by students for decoration during college fests as a creative means of showcasing the waste management practice that has been induced in the minds of the students.

3.5 GREEN COVER

The college is occupied with nearly 300 matured trees. Such a green cover helps in reducing the CO_2 levels in and around the vicinity of the campus.

Figure 3. Green Cover

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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. Approximately 200 m^2 of area is occupied by green cover.

3.6 TRANSPORTATION

73 buses are operated by the institution for commuting students and staff. Nearly 80 % of the students are using college buses and this helps in reducing the CO_2 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.

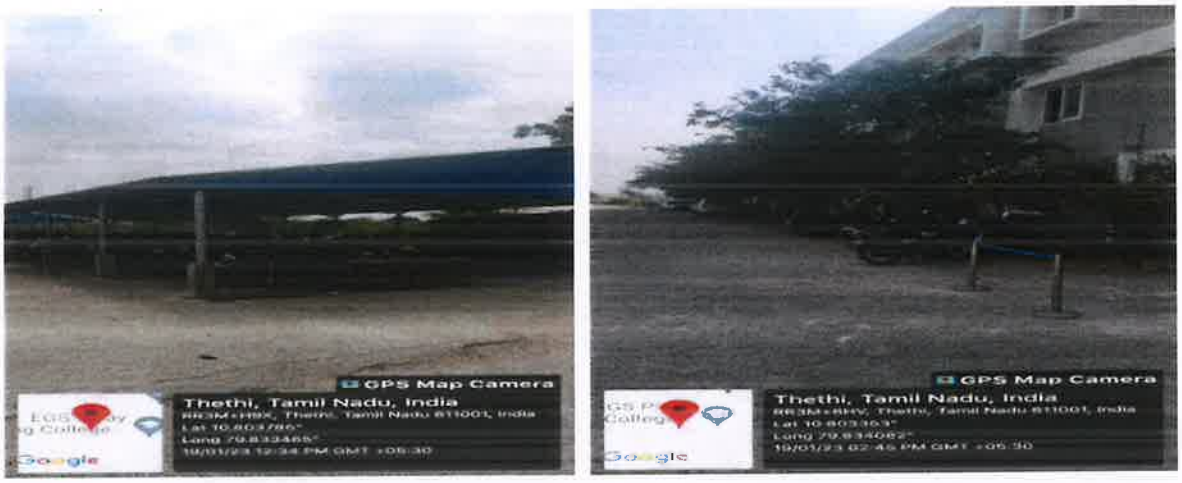

Figure 3. Roofed and Shaded Parking for two and four wheelers

The institute encourages students to use bicycle within the campus.

3.7 BASIC AMENITIES

The basic amenities are present inside the campus itself. ATM, cafeteria, gym, and photocopying facility are available for the use of students and staffs. Also ramp and lift facility are available in building for physically challenged students.

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Figure 4. Basic Amenities

3.8 GREEN EDUCATION

Events related to green practices are organized frequently through students' associations. Few more activities related to energy conservation and water management can be conducted through various clubs and student association of the institution

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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_2 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_2 range : 0 to 6,000ppm
- Temperature range : -4 to 140°F (-20 to 60°C)
- Humidity range : 10 to 95%RH

Figure 6. Indoor air quality meter

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4.1 AIR QUALITY MEASUREMENTS

Standard Level of CO_2	**ASHRAE and OSHA standards: 1000 ppm**
Standard Level of Relative Humidity	**30 – 60 % (ASHRAE)**
Standard Level of Temperature	**26 - 30°C ±3°C (ASHRAE)**

Standard Level of CO_2			**ASHRAE and OSHA standards: 1000 ppm**		
Standard Level of Relative Humidity			**30 – 60 % (ASHRAE)**		
Standard Level of Temperature			**26 - 30°C ±3°C (ASHRAE)**		
S.No.	**Location**	**CO_2 Level (ppm)**	**Relative Humidity (%)**	**Temperature (°C)**	**Comments & Recommendation**
SJ-Block					
1.	1st Floor veranda	350	28.5	54.5	Within the limits
2.	SJB-202 Classroom	378	28.5	54.4	Within the limits
3.	SJB 209 Staff Room	365	28.8	55	Within the limits
4.	Placement & Training Cell	405	28.9	55.1	Within the limits
5.	2nd Floor Veranda	340	28.4	55.1	Within the limits
6.	S&H Staff room	312	28.2	55.7	Within the limits
7.	Ground Floor-Auditorium	340	28.4	55.9	Within the limits
8.	Indoor Sports Court	350	31.1	52	Within the limits
9.	Chemistry lab	315	31.5	51.2	Within the limits
EE Block					
10.	Veranda- Ground floor	328	28.9	57.2	Within the limits
11.	Biochemistry Lab	335	28.2	62.3	Within the limits
GG Block					
12.	Veranda – Ground floor	338	29.1	58.2	Within the limits
13.	Library	328	28.3	59.3	Within the limits
14.	GGB 203- Classroom	330	29.1	58.2	Within the limits

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15.	GGB 212	335	29.3	54.7	Within the limits
16.	GGB 302 Staffroom	335	29.2	55.2	Within the limits
17.	GGB 303- Class room	332	29.2	54.3	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_2

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_2 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_2 concentrations in acceptable outdoor air typically range from 300-500 ppm. Adverse health effects from CO_2 may occur since it is an asphyxiate gas. The CO_2 levels can be used as a rough indicator of the

effectiveness of ventilation, and excessive population density in a structure. CO_2 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_2 in indoor air can reveal information regarding occupant densities and outdoor air ventilation rates. High CO_2 levels may indicate a problem with overcrowding or inadequate outdoor air ventilation rates.CO_2, 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_2 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.

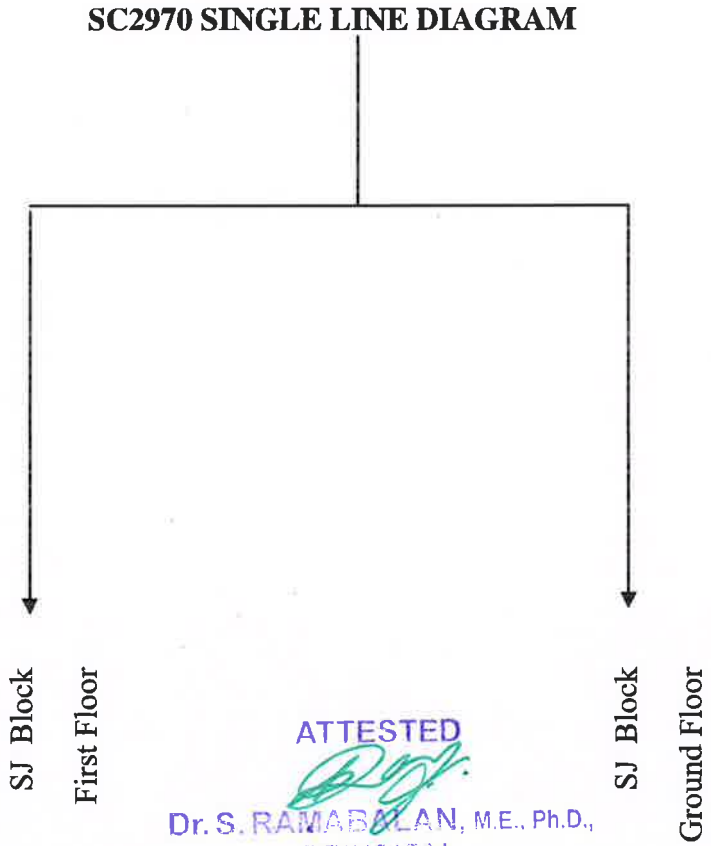
4.3 INFERENCE

- Carbon-di-oxide levels are within the ASHRAE 55-1992 limit in the outdoor and indoor. For indoor condition, CO_2 level should be less than 1000 ppm. CO_2 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.	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, 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. Most buildings were probably designed, built and equipped when cheap energy was readily available. Little attention was paid to energy efficiency. Consequently, there is a great potential for improving operating costs of existing buildings.

5.1 TYPICAL SINGLE LINE DIAGRAM



SC2628 SINGLE LINE DIAGRAM

SC494 SINGLE LINE DIAGRAM

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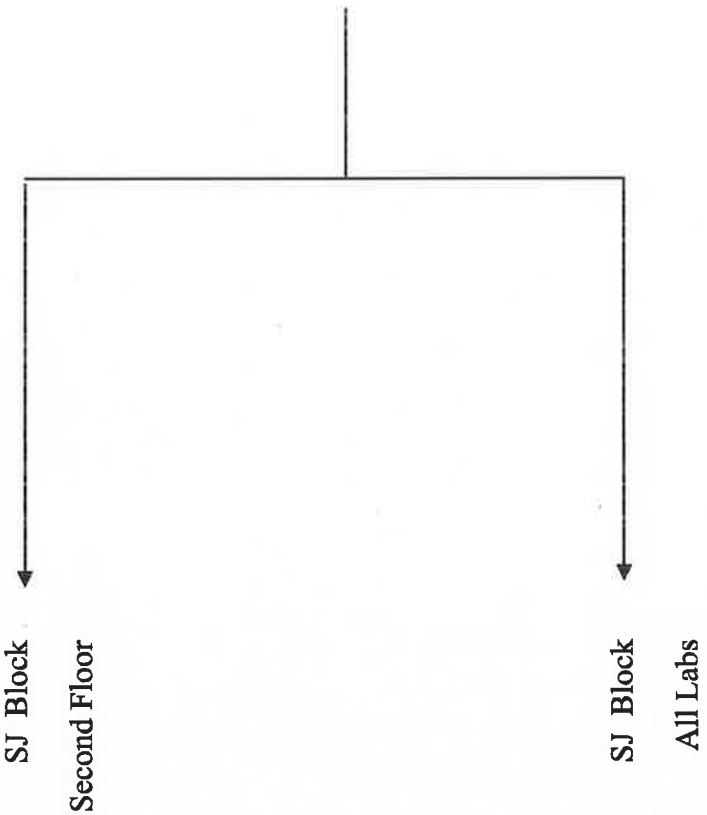
SC911 SINGLE LINE DIAGRAM

SC2641 SINGLE LINE DIAGRAM



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5.2 DETAILS OF EQUIPMENT AVAILABLE

EB Service Number 06-501-001-3016

In Door And Out Door Auditorium

S No	Equipment	Specification	Power Rating	Total Qty
1.	Fan	Ceiling Fan	65W	49
		Wall and Pedestal	125	17
2.	Light	Street Light	30W	4
			24W	110
			15W	32
			9W	22
3.	Ups	2kw		1
4.	AC	1 Ton	850W	3
5.	Amplifier And Speaker set		2000W	1

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EB service Number 06-501-001-2641

S.J Block 2nd Floor, Sail mechanical Lab, Sarver Lab Physics Lab and Chemistry Lab, Bike Stand

S No	Equipment	Specification	Power Rating	Total Qty
1.	Fan		65 85 125	149 42 1
2.	Light	Street Light Street Light Tube Light Blub Blub Blub	30 24 18 15 9 5	4 14 179 51 28 38
3.	Computer		200W	10
4.	Printers			3
5.	Projector			23
6.	A/c	1 Ton 2 Ton	850W 1850W	6 14
7.	Water Cooler	20 liter	2000W	2
8.	Ups	10 KVA 6 KVA		1 1
9.	All Pump motor	12 ½ HP 3 HP 1 HP		1 3 1
10.	TV		200W	12
11.	Net Service Cable Rock And Camera		50W	3
12.	FM Radio Station		3000W	1
13.	Amplifier And Speaker set		200W	1
14.	Lift		8000W	1

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EB service Number 06-501-001-574

E.E.E Block, FM & and SM Lab, EEE Machines Lab HMT Lab Carpenter Lab, Welding Lab, Transport Workshop And All Workshop Lab.

S No	Equipment	Specification	Power Rating	Total Qty
1.	Fan	Ceiling Fan Pedestal Fan Wall Fan	65W 125W 85	194 10 34
2.	Light	Tube Light Tube Light Blub& Street Light	40 18 30 23	55 38 20 9
3.	A/C	2 Ton	1850W	1
4.	Computer		200W	38
5.	Printers			1
6.	Projector			1
7.	Transport Workshop m/c	3 HP	2250	1
8.	Ups	10 KVA		1
9.	Net service Cable Rock And Camera		50W	1
10.	Fridge	180 Liter		1

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EB service Number 06-501-001-3207

S No	Equipment	Specification	Power Rating	Total Qty
1.	Fan	Ceiling Fan Exhaust Fan	65 250	84 1
2.	Light	Tube Light Tube Light Blub	40 18 5	48 36 22
3.	Pump Motor	3 HP		1
4.	Water Heater		2000W	3
5.	Projector			2
6.	Mixer grinder		2000W	2
7.	Grinder Machine And etc	3 HP	2250	3
8.	Fridge And Freezer	Freezer Fridge Fridge	300 Liter 250 Liter 220 Liter	1 1 1
9.	Amplifier And Speaker set		100W	1

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EB service Number 06-501-001-573

Gents Hostel & Hostel B Block, Quarters, Hostel Mess

S No	Equipment	Specification	Power Ratin	Total Qty
1.	Fan		65 85	122 5
2.	Light	Tube Light Tube Light Blub	40 18 9	60 124 55
3.	Computer		250W	2
4.	Printers		2000W	2
5.	A/C	2 Ton	1850W	3
6.	Water Cooler	10 Liter	1000W	1
7.	Ups		1400W	2 1
8.	TV		200W	4
9.	Net service Cable Rock And Camera		50W	2
10.	Mixer grinder		2000W	4
11.	Grinder Machine And etc	8.5 HP	6375	
12.	Fridge	220 Liter		1
13.	Amplifier And Speaker set		50W	1

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Main Block

EB Service Number 06-501-001-494

S No	Equipment	Specification	Power Rating	Total Qty
1.	Fan		65 85	145 5
2.	Light	Street Light Tube Light Tube Light Blub Blub	30 40 18 23 9	7 101 124 1 5
3.	Computer		200W	40
4.	Printer		1800W	3
5.	A/C	2 Ton 1 Ton	1850 170	7 3
6.	Ups		6 KVA 10 KVA	1 1
7.	All Pump Motor	1 HP	750W	1
8.	Net Server Cable Rock And Camera		30W	2
9.	Projector			4

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EB Service Number 06-501-001-911

P.G Block

S No	Equipment	Specification	Power Rating	Total Qty
1.	Fan	Ceiling Fan Pedestal Fan Wall Fan	65W 125 85W	128 2 27
2.	Light	Street Light Tube Light Tube Light Blub Blub	30W 40 18 15 9	5 78 83 91 2
3.	Xerox machine	Big Size	2500W	4
4.	Computer		200W	137
5.	A/C	270 170 1 ½		6 6 5
6.	Printers			8
7.	Ups		6 KVA 10 KVA 20 KVA	3 2 1
8.	Net Service Cable Rock And Camera		50W	5
9.	Projector			5

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EB Service Number 06-501-001-2970

S.J Block Ground Floor And First Floor

S No	Equipment	Specification	Power Rating	Total Qty
1.	Fan	Ceiling Fan Wall Fan	65W 85	215 10
2.	Light	Tube Light Tube Light Blub Blub Blub Street Light Blub	40W 18W 20W 15W 9W 30W 1W	73 48 3 66 77 7 20
3.	Ups	20 KVA 10KVA 6KVA		1 2 1
4.	Computer		200W	96
5.	Printers			13
6.	Xerox machine		2000W	2
7.	Projector		2000W	25
8.	A/C	2 Ton 1 Ton	1850W 1350W	4 3
9.	Amplifier And Speaker set		250W	3
10.	Net Service Cable Rock And Camera		50W	4
11.	Water Cooler	20 Liter		3
12.	Bell		50W	1

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EB Service Number 06-501-001-2628

G.G.Block & Ladies Hostel

S No	Equipment	Specification	Power Rating	Total Qty
1.	Fan	Ceiling Fan Wall Fan	65W 85	229 10
2.	Light	Tube Light Tube Light Tube Light Street Light Tube Light	40W 18W 15W 30W 12W 9W	119 95 158 16 5 27
3.	Ups	2 KVA 6KVA 1400W		2 6 3
4.	Computer		200W	363
5.	Printers			13
6.	Projector		1800W	20
7.	A/C	2 Ton 1 Ton 1 ½ Ton		14 3 2
8.	Net Service Cable Rock And Camera		30W 150W	6 1
9.	Water Cooler	10 Liter 10 Liter		2 1
10.	All pump motor		750W 2230W	5 4
11.	TV		200W	1

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6. 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.

S.No	Purpose	Fuel	Usage in Nos.	Capacity/Specification	Usage period
1.	Hostel	LPG	365	19.2 kg	1 year
2.	College Vehicles	Petrol and diesel		10200 lit during 2020-2021 and 118800 lit during previous years	1 year
3.	Generator	Diesel	35 lit for 9 hrs	30K – 4KFWN105, Kirloskar	1 month

7. ACTUAL MEASUREMENTS IN ELECTRICAL SYSTEM

The electrical energy consumption was verified using electricity bills. The measurements were undertaken using *CA 8332* Power Quality Analyzer at the Incomer PCC- LT side. The following relevant electrical parameters were recorded by the above instrument with the set recording sample time of 20 seconds. In addition additional measurements were undertaken at the downstream feeders.

At each downstream feeders, the measurements were carried out for a period of 5-10 minutes to take care of different loading situations.

The following parameters were recorded.

(a) average of 3 phase voltages

(b) average of 3 phase RMS currents and the average fundamental currents

(c) frequency

(d) various powers: active, reactive and apparent

(e) power factor

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The summary details of the above measurements are provided in appendix. The college has sanctioned demand of 112 kW with nine numbers of services. The college having the diesel operated gen-set for providing power supply in case of power failure.

Electric Energy Consumption Survey

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 the E.G.S Pillay Engineering College for the tenure of audit from June 2021 to May 2022. The same is detailed in this report.

The cost of electricity for the various month is shown in the table.

EB Service Number : 06-501-001-3016

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21	--	--	--
2	Jul-21			
3	Aug-21			
4	Sep-21	620	0.92	7608
5	Oct-21			
6	Nov-21	730	0.92	9005
7	Dec-21			
8	Jan-22	1250	0.93	13464
9	Feb-22			
10	Mar-22	800	0.92	9639
11	Apr-22			
12	May-22	1240	0.91	13302

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EB Service Number 06- 501-001-3692

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21	--		
2	Jul-21		0.91	1518
3	Aug-21	--		
4	Sep-21		0.92	1380
5	Oct-21	--		
6	Nov-21		0.92	1380
7	Dec-21	--		
8	Jan-22		0.92	1449
9	Feb-22	--		
10	Mar-22		0.91	1380
11	Apr-22	--		
12	May-22		0.91	1380

EB Service Number:06-501-001-2970

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21			
2	Jul-21	1016	0.93	8685
3	Aug-21			
4	Sep-21	5680	0.96	53568
5	Oct-21			
6	Nov-21	7878	0.95	72216
7	Dec-21			
8	Jan-22	7230	0.96	66768
9	Feb-22			
10	Mar-22	5230	0.93	48897
11	Apr-22			
12	May-22	5950	0.95	64568

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EB Service Number :06-501-001-2641

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21			
2	Jul-21	6420	0.93	61293
3	Aug-21			
4	Sep-21	4790	0.96	47639
5	Oct-21			
6	Nov-21	6017	0.95	58304
7	Dec-21			
8	Jan-22	6040	0.93	58564
9	Feb-22			
10	Mar-22	5290	0.92	48862
11	Apr-22			
12	May-22	7680	0.94	83606

EB Service Number:06-501-001-494

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21			
2	Jul-21	6990	0.93	43137
3	Aug-21			
4	Sep-21	5900	0.96	50147
5	Oct-21			
6	Nov-21	5870	0.95	49904
7	Dec-21			
8	Jan-22	3900	0.92	34331
9	Feb-22			
10	Mar-22	4480	0.97	38958
11	Apr-22			
12	May-22	4710	0.96	40781

EB Service Number:06-501-001-573

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21	--	--	--
2	Jul-21			
3	Aug-21			
4	Sep-21	917	0.96	8340

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5	Oct-21			
6	Nov-21	5320	0.95	46749
7	Dec-21			
8	Jan-22	7030	0.96	60197
9	Feb-22			
10	Mar-22	7140	0.98	61100
11	Apr-22			
12	May-22	8740	0.93	73700

EB Service Number:06-501-001-574

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21			
2	Jul-21	2420	0.95	8193
3	Aug-21			
4	Sep-21	1790	0.96	18944
5	Oct-21			
6	Nov-21	1650	0.95	17830
7	Dec-21			
8	Jan-22	1960	0.95	20174
9	Feb-22			
10	Mar-22	1250	0.96	14704
11	Apr-22			
12	May-22	1480	0.92	16515

EB Service Number:06-501-001-911

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21			
2	Jul-21	9060	0.95	29000
3	Aug-21			
4	Sep-21	6450	0.96	55084
5	Oct-21			
6	Nov-21	5770	0.95	49711
7	Dec-21			
8	Jan-22	5920	0.95	50868
9	Feb-22			
10	Mar-22	6640	0.96	56604
11	Apr-22			
12	May-22	6580	0.96	56144

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EB Service Number:06-501-001-2807

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21			
2	Jul-21	2860	0.95	19130
3	Aug-21			
4	Sep-21	790	0.93	7412
5	Oct-21			
6	Nov-21	1000	0.94	9160
7	Dec-21			
8	Jan-22	560	0.94	5597
9	Feb-22			
10	Mar-22	420	0.93	4257
11	Apr-22			
12	May-22	490	0.92	4856

EB Service Number:06-501-001-2628

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21	5621.1	0.94	53889
2	Jul-21	6526.8	0.94	61555
3	Aug-21	7098.3	0.94	66459
4	Sep-21	11611.2	0.94	104647
5	Oct-21	8742	0.93	80381
6	Nov-21	12279.7	0.97	110262
7	Dec-21	12279.7	0.92	110262
8	Jan-22	6998	0.93	65612
9	Feb-22	8439.6	0.97	77786
10	Mar-22	13158.4	0.92	117722
11	Apr-22	9546	0.94	96915
12	May-22	7874.8	0.95	78539

EB Service Number:06-501-001-3207

S No	Month	Used unit	Power Factor	Total Amount
1	Jun-21			
2	Jul-21	2229	0.95	22243

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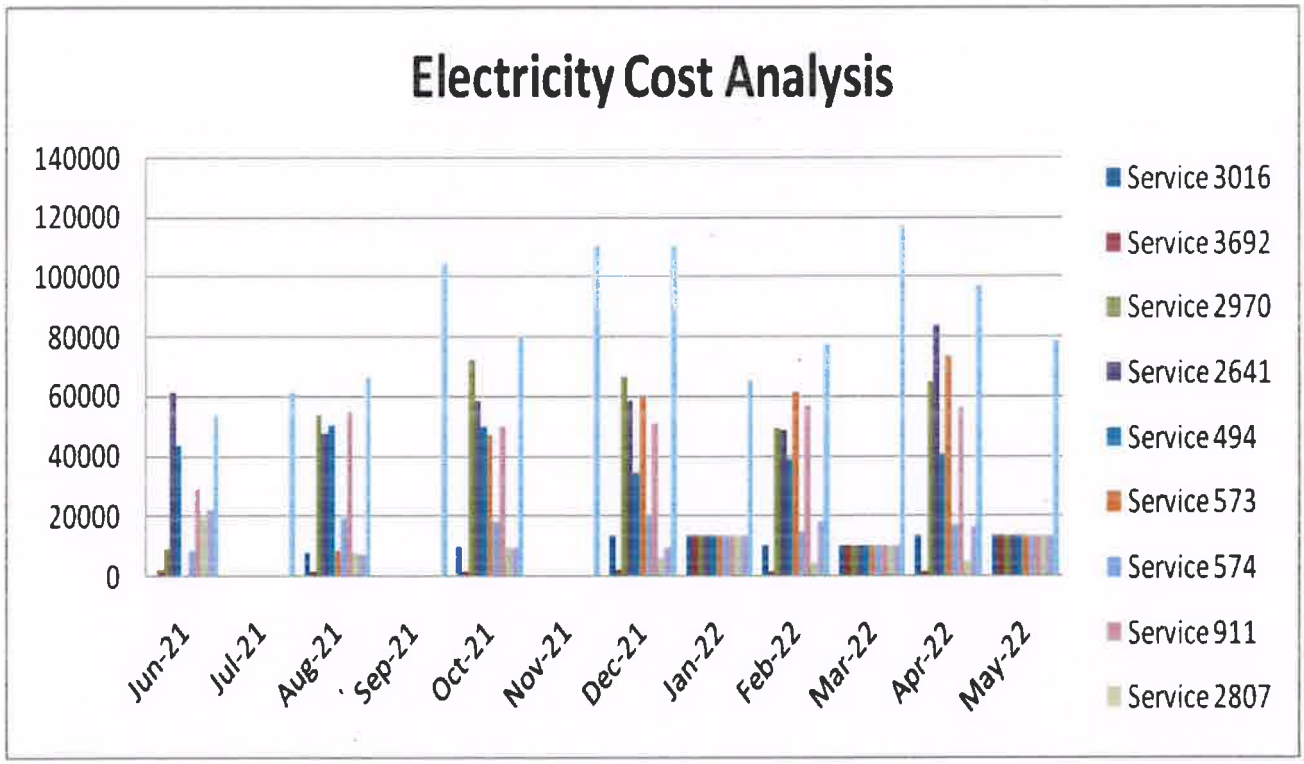
3	Aug-21			
4	Sep-21	450	0.93	7178
5	Oct-21			
6	Nov-21	660	0.94	8967
7	Dec-21			
8	Jan-22	710	0.95	9389
9	Feb-22			
10	Mar-22	1690	0.96	17687
11	Apr-22			
12	May-22	1480	0.97	15919

Electricity cost analysis for the academic year 2021-2022 is depicted in the figure for various services.



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7.1 Recorded Data

a) Readings taken at SJ Block

Av . Of Three phase Voltages in V	Av. of three line currents in A	Frequency Avg	Active Power Total Avg in kW	Reactive Power Total Avg in kVAR	Apparent Power Total Avg in kVA	Power Factor Total Avg
227.00	7.40	49.9	2.00	1.03	5.10	0.28
226.40	6.43	49.9	0.40	1.02	4.41	0.04
226.30	6.40	49.9	0.78	1.00	4.40	0.10
226.27	6.37	49.9	0.56	0.97	4.37	0.07
226.40	6.27	49.9	0.08	0.97	4.31	0.01
227.50	8.57	49.9	4.05	0.90	5.91	0.54
227.40	8.33	49.9	3.83	1.07	5.76	0.53
228.90	13.80	49.9	8.78	0.17	9.57	0.87
228.07	10.93	49.9	6.47	0.54	7.53	0.78
226.27	6.53	49.8	0.35	0.99	4.46	0.07
225.57	6.70	49.8	1.94	1.00	4.55	0.30
225.30	6.47	49.8	2.05	0.94	4.41	0.33
225.93	6.30	49.8	0.83	1.00	4.32	0.11
226.07	6.23	49.8	0.25	1.01	4.27	0.02
226.67	6.70	49.8	1.70	1.05	4.62	0.27

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b) Readings taken at GG Block

Av . Of Three phase Voltages in V	Av. of three line currents in A	Frequency Avg	Active Power Total Avg in kW	Reactive Power Total Avg in kVAR	Apparent Power Total Avg in kVA	Power Factor Total Avg
228.17	7.77	49.7	4.58	0.76	5.33	0.86
227.97	7.30	49.7	4.34	1.24	5.01	0.86
227.97	7.30	49.7	4.34	1.23	5.02	0.86
228.20	8.00	49.7	4.74	0.43	5.50	0.86
228.17	7.67	49.7	4.55	0.84	5.29	0.86
227.83	7.00	49.7	4.13	1.59	4.80	0.86
228.27	8.00	49.7	4.75	0.51	5.51	0.86
229.37	10.17	49.7	5.61	0.24	7.04	0.78
228.70	8.43	49.7	4.71	0.57	5.82	0.81
228.83	8.63	49.7	4.83	0.52	5.96	0.81
229.50	10.00	49.7	5.52	0.32	6.91	0.79
230.77	12.73	49.7	6.73	0.32	8.82	0.74
229.70	10.63	49.7	5.79	0.15	7.36	0.77
231.00	13.80	49.7	7.27	0.50	9.60	0.73
234.87	22.67	49.7	11.30	2.49	15.99	0.68

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c) Readings taken at PG Block

Av . Of Three phase Voltages in V	Av. of three line currents in A	Frequency Avg	Active Power Total Avg in kW	Reactive Power Total Avg in kVAR	Apparent Power Total Avg in kVA	Power Factor Total Avg
226.90	25.40	49.7	16.20	1.44	17.13	0.95
227.10	23.00	49.7	14.80	1.04	15.55	0.95
228.43	21.00	49.7	13.68	0.75	14.32	0.96
228.27	19.57	49.7	12.78	0.58	13.37	0.96
229.07	18.73	49.7	12.29	0.46	12.84	0.96
230.53	17.80	49.7	11.77	2.56	12.30	0.96
232.43	17.43	49.7	11.63	3.50	12.14	0.96
232.67	17.67	49.7	11.82	2.98	12.36	0.96
232.87	17.23	49.7	11.52	3.54	12.06	0.96
232.97	17.37	49.7	11.59	3.58	12.14	0.96
232.97	18.10	49.7	12.07	3.36	12.65	0.96
233.20	17.63	49.7	11.77	3.67	12.34	0.96
232.80	20.37	49.7	13.68	3.55	14.15	0.97
232.63	21.07	49.7	14.23	2.94	14.66	0.97
232.53	21.23	49.7	14.33	1.90	14.76	0.97

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d) Readings taken at Mechanical Block

Av . Of Three phase Voltages in V	Av. of three line currents in A	Frequency Avg	Active Power Total Avg in kW	Reactive Power Total Avg in kVAR	Apparent Power Total Avg in kVA	Power Factor Total Avg
230.10	4.57	50.2	1.74	2.54	3.18	0.61
230.17	4.57	50.2	1.73	2.53	3.16	0.61
230.10	4.57	50.2	1.73	2.52	3.16	0.61
230.07	4.57	50.2	1.73	2.52	3.15	0.61
229.97	4.53	50.2	1.73	2.51	3.15	0.61
229.97	4.57	50.2	1.73	2.51	3.15	0.61
229.93	4.57	50.2	1.73	2.52	3.15	0.61
230.03	4.57	50.2	1.73	2.53	3.16	0.61
229.97	4.57	50.2	1.73	2.52	3.15	0.61
230.17	4.57	50.2	1.73	2.52	3.15	0.61
230.00	4.57	50.1	1.73	2.52	3.15	0.61

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e) Readings taken at SJ Block (Second Floor & labs)

Av . Of Three phase Voltages in V	Av. of three line currents in A	Frequency Avg	Active Power Total Avg in kW	Reactive Power Total Avg in kVAR	Apparent Power Total Avg in kVA	Power Factor Total Avg
228.50	34.33	50.1	22.11	6.85	23.31	0.93
228.47	34.27	50.1	22.04	6.84	23.25	0.93
228.23	34.97	50.1	22.50	6.92	23.69	0.93
228.83	32.30	50.1	20.83	6.62	22.02	0.93
228.70	32.40	50.1	20.86	6.62	22.06	0.93
228.50	33.23	50.1	21.43	6.71	22.62	0.93
228.67	32.47	50.1	20.94	6.61	22.13	0.93
228.40	32.33	50.1	20.85	6.60	22.03	0.93
228.13	32.40	50.1	20.87	6.66	22.07	0.93
227.47	34.43	50.1	22.16	7.20	23.45	0.94
227.33	34.90	50.1	22.51	7.28	23.80	0.94
227.20	35.00	50.1	22.51	7.47	23.84	0.94
226.93	36.33	50.1	23.40	7.60	24.72	0.94
227.27	36.23	50.0	23.33	7.66	24.67	0.94
227.10	35.97	50.0	23.12	7.63	24.47	0.94

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7.2 Energy saving Opportunities

Lighting: SAMPLE CALCULATION FOR ENERGY SAVING

DESCRIPTION	FTL FITTINGS	LED FITTINGS
	36W	18W
No. OF FITTINGS	100	**100**
WATTS	36	**18**
TOTAL WATTS	3600	1800
CONSUMPTION UNITS PER DAY	54	**27**
RUNNING COST PER DAY	342.90	**171.45**
SAVINGS LED INSTEAD OF FTL IN WATTS	1800	
UNITS SAVINGS PER DAY	27.000	
UNITS SAVINGS PER MONTH	**810.000**	
RUNNING HOURS PER DAY	15	
PRESENT TNEB UNITS COST Rs.	6.35	
COST SAVINGS PER DAY Rs.	171.45	
COST SAVINGS PER MONTH Rs.	**5143.50**	
LED LIGHT FITTING TOTAL EXPENSES Rs. (100*Rs.650)	**65000.00**	
COST RETURN PERIOD IN DAYS	379	
COST RETURN PERIOD IN MONTHS	12.64	
COST RETURN PERIOD IN YEARS	**1.04**	

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Fan:SAMPLE CALCULATION FOR ENERGY SAVING

DESCRIPTION	NORMAL FAN	BLDC FAN
	72W	30W
No. OF FITTINGS	100	**100**
TOTAL WATTS	7200	**3000**
CONSUMPTION UNITS PER DAY	79.200	**33.000**
RUNNING COST PER DAY	502.92	**209.55**
SAVINGS BLDC INSTEAD OF NORMAL FAN IN WATTS	4200	
UNITS SAVINGS PER DAY	46.200	
UNITS SAVINGS PER MONTH	**1386.000**	
RUNNING HOURS PER DAY	11	
PRESENT TNEB UNITS COST Rs.	6.35	
COST SAVINGS PER DAY Rs.	293.37	
COST SAVINGS PER MONTH Rs.	**8801.10**	
BLDC FAN TOTAL EXPENSES Rs. (100*Rs.3250)	**325000.00**	
COST RETURN PERIOD IN DAYS	1108	
COST RETURN PERIOD IN MONTHS	36.93	
COST RETURN PERIOD IN YEARS	**3.04**	

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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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8. 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
- 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 has 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.

9. OBSERVATIONS AND RECOMMENDATIONS

Observations

(i) The maintenance of Power room is good.
(ii) The institute receives power from electricity board
(iii) The monthly average Power factor is maintained above 0.9
(iv) For Safety purpose, rubber mats as well as wooden board has been placed in front of panels in the power room

Recommendations

(i) Display messages regarding optimum use of electrical appliances in the laboratories and classrooms.

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(ii) All computers to have power saving settings to turn off monitors and hard discs, say after 10 minutes / 30 minutes.

(iii) 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

(iv) It is good practice of testing the Earth Electrode and maintaining the minimum Earth Electrode resistance at college campus area

(v) It is recommended to improve the maintenance of existing solar power plant.

(vi) The energy saving opportunities for various equipments and cost savings are discussed in subsequent chapters.

(vii) Students are encouraged to take projects related to energy efficiency and green energy.

(viii) Name board for Herbal trees/plants with QR code

(ix) Indoor plants like money plant may be kept inside the air-conditioned rooms. This will reduce carbon-di-oxide level inside the room.

(x) Occupation sensors may be used for effective operation of veranda lights.

(xi) Visiting birds, mammals/ animals details may be recorded and displayed.

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