

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

DETAILS OF THE CLIENT

K. RAMAKRISHNAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112.



(Audited and accounted from June 2024 to May 2025)

DATE OF AUDIT

18 JUNE 2025

AUDIT CONDUCTED AND SUBMITTED BY

RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING

(An ISO 9001:2015 Certified Company & Registered under MSME, GoI)

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1. ACKNOWLEDGEMENT

Energy Earns or Simply Burns: Choice is yours....



ACKNOWLEDGEMENT

RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING, Coimbatore – 641 062 is thankful to the Management, Principal, Faculty and Technical team members of **K. RAMAKRISHNAN COLLEGE OF ENGINEERING**, I NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112, India for providing an opportunity to conduct a detailed Energy, Environment and Green Audit process in the college premises.

It is our great pleasure which must be recorded here that the Management of **K. RAMAKRISHNAN COLLEGE OF ENGINEERING** extended all possible support and assistance resulting in thorough completion of the audit process. The audit team appreciates the cooperation and guidance extended during the course of site visit and measurements. We are also thankful to all those who gave us the necessary inputs and information to carry out this very vital exercise.

Finally, we offer our sincere thanks to all the members in the engineering division/ technical / non-technical divisions and office members who were directly and indirectly involved with us during collection of data and while conducting field measurements.

<u><i>Audit Team Member</i></u>	
Dr. S.R. SIVARASU, Ph.D.,	BEE Certified Energy Auditor (EA-27299) Lead Auditor-ISO-14001:2015 (EMS), IGBC AP, GRIHA CP, CII CP in SWM Carbon Footprint Auditor & Implementor Mobile: +91- 80567 19372, 99420 29372

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2. INTRODUCTION TO ENERGY-ENVIRONMENT-GREEN AUDIT



2.1: Preface about the Institution:

- ✓ **K. RAMAKRISHNAN COLLEGE OF ENGINEERING** established in the year 2008 is a leading Engineering college affiliated to Anna University, Chennai, providing valuable courses. It is located in the famous town of Shri Samayapuram Mariyamman temple, on the sprawling campus of 30 acres with a panoramic and pleasant view.
- ✓ It has been accredited by NAAC with 'A' grade. The college has got its autonomous status in 2020 conferred by UGC and it also has got NIRF ranking with the band 201-300 under Engineering Category during 2023-2024.
- ✓ Our college offers 8 Under Graduate programs such as B.E – Mechanical Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Electrical and Electronics Engineering, Computer Science and Engineering (Artificial Intelligence and Machine Learning), B.Tech - Artificial Intelligence and Data Science, Information Technology and Computer Science and Business Systems.
- ✓ The College also provides 5 Post Graduate Programs such as M.E – Computer Science and Engineering, Engineering Design, Communication Systems, Power systems Engineering and Master of Business and Administration.
- ✓ Four departments of our college CSE, EEE, ECE and MECH were accredited with NBA. Our college has Exclusive Entrepreneurship Development Cell (EDC) and IPR cell to promote entrepreneurship zeal among the students.
- ✓ In order to promote the job opportunity in foreign countries, foreign languages such as Japanese, German and French are taught consecutively.
 - Permanent Anna University affiliation for CSE, ECE, EEE, Mechanical, & MBA departments.
 - Recognized by UGC under section 2(f) and 12(B).
 - Received Autonomous Status for a period of ten years from 2020-21 to 2029-30 from UGC.
 - Certified by ISO 9001:2015
 - Accredited by NAAC with A grade.
 - NBA accreditation for four programs: Computer Science and Engineering (CSE), Electronics and Communication Engineering (ECE), Electrical and Electronics Engineering (EEE) and Mechanical Engineering (MECH).
 - Anna University approved Research Centers in the Departments of ECE, EEE and Mechanical.
 - ANNA UNIVERSITY RANK LIST: State First Position in Anna University Odd and Even Semester Examination Results - 2013.
 - Crowned with 213 Anna University Rank Holders.
 - Student Affairs Cell aims to assist our students in exploring opportunities for higher education abroad.
 - 50+ MoU's with different industries and institutions.
 - IPR: 499 Patents Filed, 133 Patents Granted, 299 Patents Published.
 - Placements from top companies like TCS, Cognizant, IBM, ZOHO Corporation, Hexaware, Accenture, TECH Mahendra, Musigma, LTIMIND Tree, Virtusa, Genpact, Avasoft , Ford Motors and KAAR Technologies and many more.

- Recognized as a Host Institute by the Ministry of Micro, Small and Medium Enterprise (MSME).
- The Ministry of Skill Development & Entrepreneurship (MSDE), Govt. of India, is implementing the flagship skill development scheme of Government of India - Pradhan Mantri Kaushal Vikas Yojana 4.0 (PMKVY 4.0). Accordingly, K. Ramakrishnan College of Engineering, has been allocated 30 targets for implementing training under PMKVY4.0
- Unnat Bharat Abhiyan (UBA), has been approved by the Ministry of Education (MoE) Government of India and adopted 5 villages in and around KRCE through this scheme to leverage the rural development

2.2: Vision:

- To achieve a prominent position among the top technical institutions

2.3: Mission:

- ☞ To bestow standard technical education par excellence through state-of-the-art infrastructure, competent faculty and high ethical standards.
- ☞ To nurture research and entrepreneurial skills among students in cutting edge technologies.
- ☞ To provide education for developing high-quality professionals to transform the society.

2.4: Major Activities in the Institution:



2.5: Scope of the Audit Process:

- **Energy Audit:** To conduct a detailed energy audit in the college campus with a main focus to identify judicious usage of electrical and thermal energy (where, when, why and how energy is being utilized)
- **Environmental Audit:** Identification of history of activities, present environmental practices followed, monitoring records and known sources of environmental issues inside the college
- **Green Audit:** Assessment on Campus greenery in terms of mature trees, flowering shrubs, bushes, medicinal plants, adoption of green energy generation and utilization, reduction of CO₂ due to green energy system and identification of possible implementation and enhancement of current greenery practices

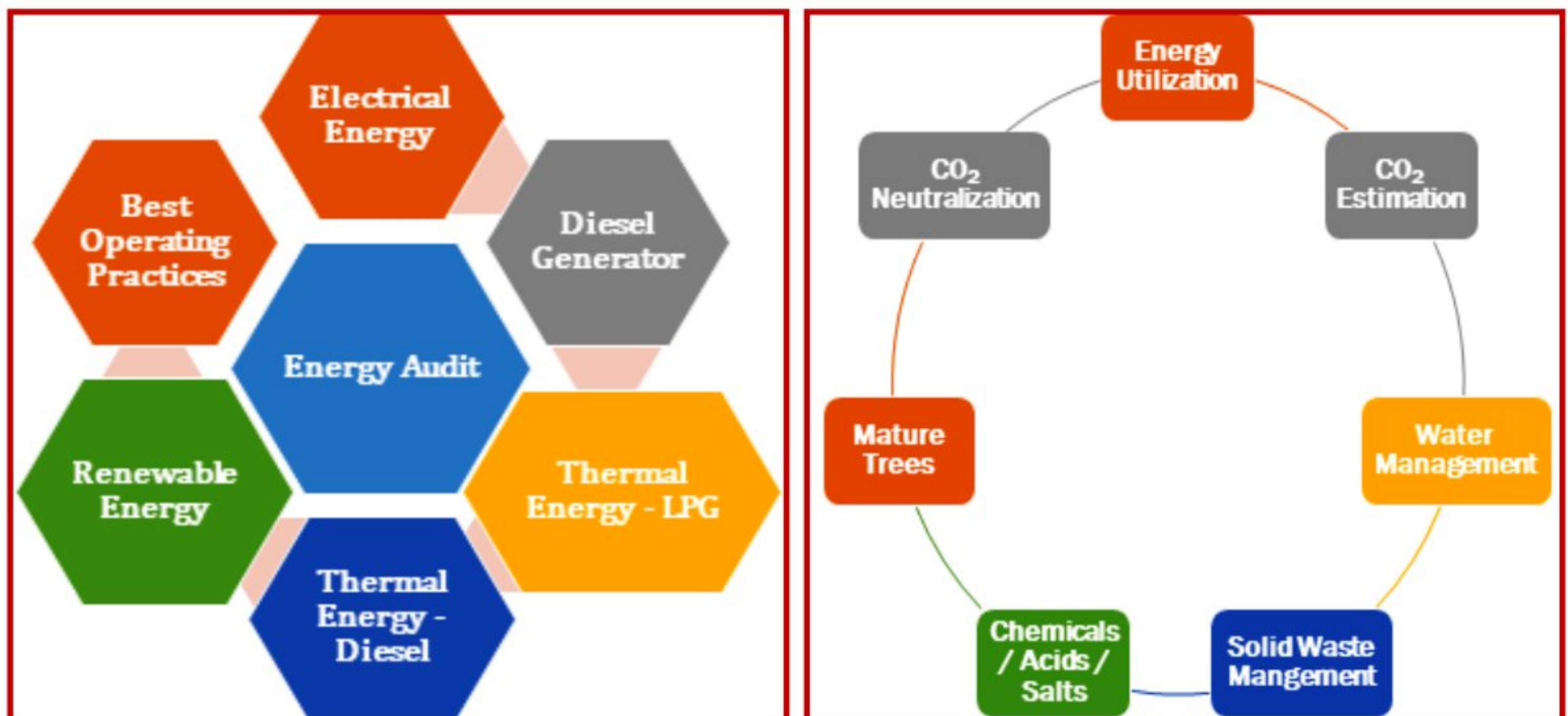
2.6: Outcomes of the Audit Process:

- Recommendations based on field measurement with achievable **Energy Conservation (ENCON)** proposals under **No cost/Low cost and Cost investment categories**
- **Minimization of present energy cost** by adjusting and optimizing energy usage and reduction of energy wastage without affecting the regular activities
- **Identification of possible cost and energy saving from energy conservation, waste reduction, reuse and recycling**
- Formation of methodology for long term road map for maintaining green environment within the campus and encourage the stakeholders for continuous improvements

2.7: Audit Approach:

The audit team completed the assessment of energy consumption in the factory premises and operating hours of each machine (system) using two approaches namely **i) Objective Approach** in which a detailed measurement was taken and **ii) Subjective Approach** in which field data is collected from the maintenance department.

2.8: Coverage in Energy- Environment & Green Audit Process:



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3. ESTIMATION OF CO₂ EMISSION AND NEUTRALIZATION (ELECTRICITY, DIESEL, LPG, WOOD, SOLAR THERMAL, BIO GAS & TREES)



3.1: Assessment of Annual Energy Usage:

Table-1 shows the types of energy carriers used for their regular operation in the college campus along with application area and their source.

Table-1: Energy Carriers and their sources used for College Operation

S. No.	Type of Energy Carrier	Application Area	Source of Procurement
1.	Electricity (HT Service - 01 No)	Powering to all electrical / electronic / HVAC equipment's	From TANGEDCO
2.	Solar PV System (150 kW)		Installed in Roof Top and Captive Power Generation
3.	Diesel	Transport vehicles and Diesel Generator (Captive Generation)	From authorised distributor
4.	Liquified Petroleum Gas (LPG), Bio Gas & Wood	Used only for cooking	
5.	Mature Trees, Bushes & shrubs	The college has nearly 1,769 mature trees of different varieties which are more than 10 years old .	

Table-2: Analysis of Annual Energy Consumption of all types of Fuels (2024-2025)

S. No.	Month	Electricity (kWh)	LPG (kg)	Bio gas (kg)	Solar (kWh)	Wood (Tons)	Diesel Consumed (L)		
							DG	Transport	Total
1.	Jun-24	58,199	829	818.4	7,280	1.09	345	2,787	3,133
2.	Jul-24	49,829	622	816.8	6,500	1.09	11	1,870	1,881
3.	Aug-24	66,902	829	817.9	6,920	1.09	466	3,521	3,987
4.	Sep-24	69,706	829	545.6	7,620	1.09	450	3,732	4,182
5.	Oct-24	69,636	1,037	528.1	6,740	1.09	13	3,462	3,476
6.	Nov-24	64,624	1,451	463.8	4,900	1.09	135	3,715	3,850
7.	Dec-24	56,050	1,451	474.7	6,040	1.09	307	2,624	2,931
8.	Jan-25	43,701	1,037	545.6	5,840	1.09	391	3,036	3,426
9.	Feb-25	52,942	1,244	545.6	7,820	1.09	39	2,504	2,543
10.	Mar-25	71,854	1,244	632.9	9,020	1.09	28	3,070	3,098
11.	Apr-25	69,367	1,037	601.3	7,680	1.09	240	2,941	3,181
12.	May-25	73,370	1,451	654.7	9,160	1.09	634	3,304	3,938
Total		7,46,180	13,062	7,445	85,520	13.0	3,059	36,567	39,626

• The cost of the electricity is Rs. 12.00/kWh.

3.2: Environmental System: CO₂ Balance Sheet (2024-25):

- CO₂ Balance sheet is the indicator on the carbon emission and their neutralization in a year
- As per the **Environmental Management System (EMS)**; only Scope-1 & Scope-2 based energy consumption is accounted.
- The following tables provide the balance sheet indicating various energy carriers associated with the regular activities and their CO₂ mapping.

Table-3: Environmental System: CO₂ Balance Sheet (2024-25)

S. No.	Annual Energy Consumption & CO ₂ Emission			Annual CO ₂ Neutralization		
	Description	Usage	Emission (Tons)	Description	Usage	Neutralized (Tons)
1.	Electricity	7,46,180 kWh	611.9	Electricity-DG	10,488 kWh	8.6
2.	Diesel	39,626 Litres	104.6	Solar PV Thermal	85,520 kWh	70.1
3.	LPG	13,062 kg	39.2	Solar Water heater	41,320 kWh	33.9
4.	Wood	13.0 Tons	23.6	Trees	1,769	38.6
				Bio Gas	7,445	20.0
Total Emission			779.2	Total-Neutralized		171.2
Balance CO₂ to be Neutralized = 608.0 Tons/Annum						

3.3: Calculation Table:

For Electricity = $\left[\text{kWh} \times \frac{0.82 \text{ kg of CO}_2 \text{ emission}}{\text{kWh}} \right]$
For LPG = $\left[\text{LPG Consumption (kg)} \times \frac{3.0 \text{ kg of CO}_2 \text{ emission}}{\text{kg of LPG Consumption}} \right]$
For Diesel = $\left[\text{Diesel Consumption (Litre)} \times \frac{2.64 \text{ kg of CO}_2 \text{ emission}}{\text{Litre of Fuel Consumption}} \right]$
For Wood = $[\text{Wood Consumption (kg)} \times 1.9 \text{ kg of CO}_2 \text{ Consumption}]$
A mature tree is able to absorb nearly CO ₂ at a rate of 21.8 kg/annum; $\frac{(21.8 \times 1,769)}{1,000} = 38.6 \frac{\text{Tons}}{\text{Annum}}$

3.4: References:

- ¹ <https://ecoscore.be/en/info/ecoscore/co2>
- ³ <http://www.tenmilliontrees.org/trees/#:~:text=A%20mature%20tree%20absorbs%20carbon,the%20average%20car's%20annual%20mileage>

3.5: Recommendations:

From the above discussion points; it is evident that activities taken forward to neutralize the CO₂ is predominant and to become a Net-Zero Carbon Emission buildings. The management has to plan several activities achieve the target.

- Increase the foot print of trees planted inside the college campus.
- Encourage the students to plant more trees and account them all.
- It is a right time to install considerable amount of roof top solar PV plant and generate the electricity. This must reduce the utility supply and hence reduce the direct CO₂ reduction.

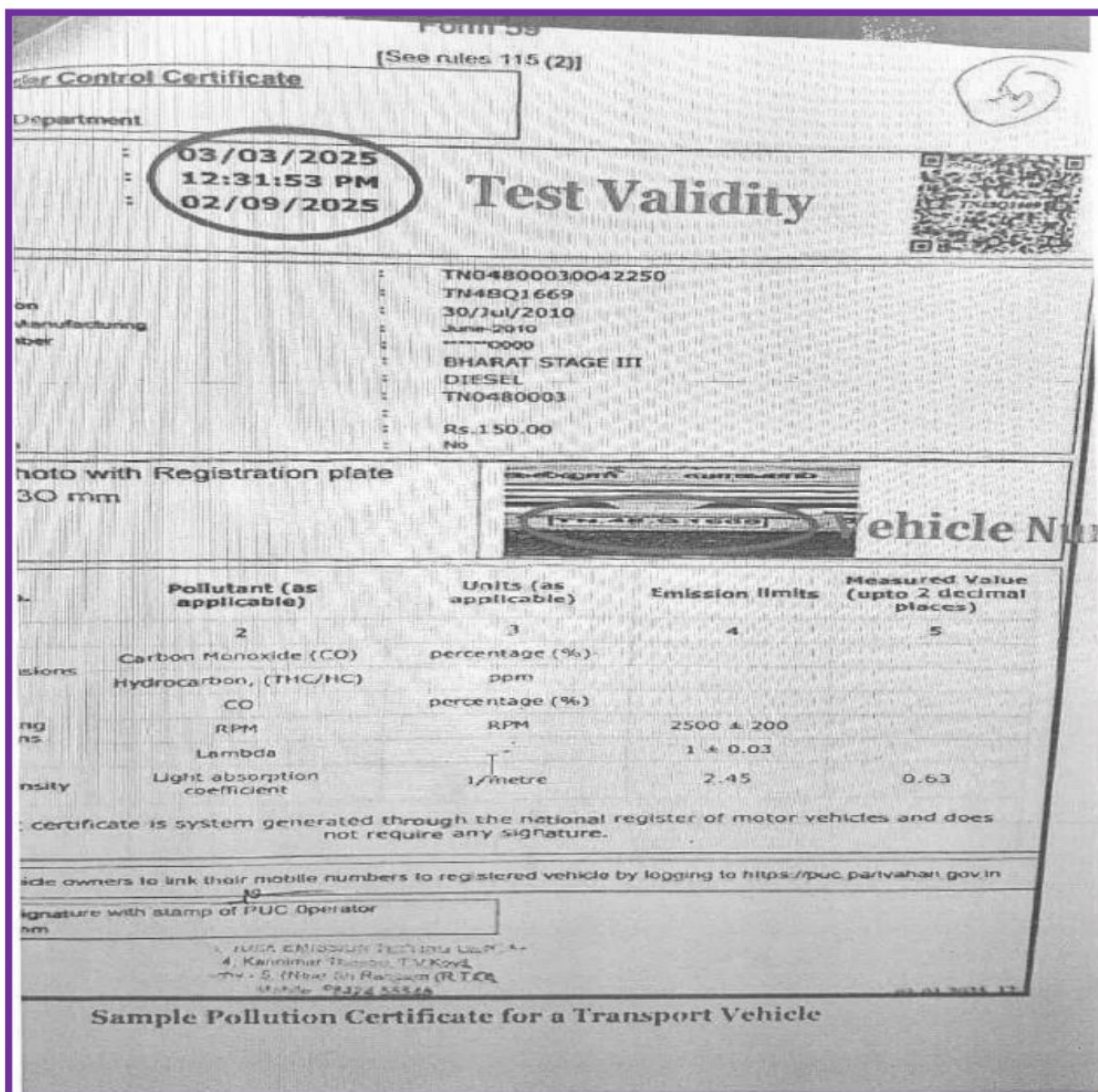
- As per the Solar Policy-2019 from Government of Tamil Nadu; for any educational institutions have to implement substantiate a minimum of 6 % of its energy generation from renewable energy source.
- Convert existing convention street lightings into solar based battery-operated lightings.
- Identify higher fuel consuming vehicle and either rework or replace it.
- Conduct training programmes for the transport staffs at regular interval and encourage them to maintain the vehicles at good condition throughout the year.

3.6: List of Transport Vehicles:

Pollution level of all vehicles are regularly monitored and are maintained within the prescribed limit since the college is committed to provide green environment for better atmosphere. The list of transporting vehicles along with their type of engine are represented in Table-4.

Table-4: List of Transporting Vehicles available in the College

S. No.	Type of Vehicle	Fuel used	No. of vehicles	Pollution certified (Y/N)
1.	Bus	Diesel	27	Yes
Total No. of Vehicles			27	Yes





Fire Extinguishers



First Aid Box in Bus

3.7: Roof Top Solar Photovoltaic System:

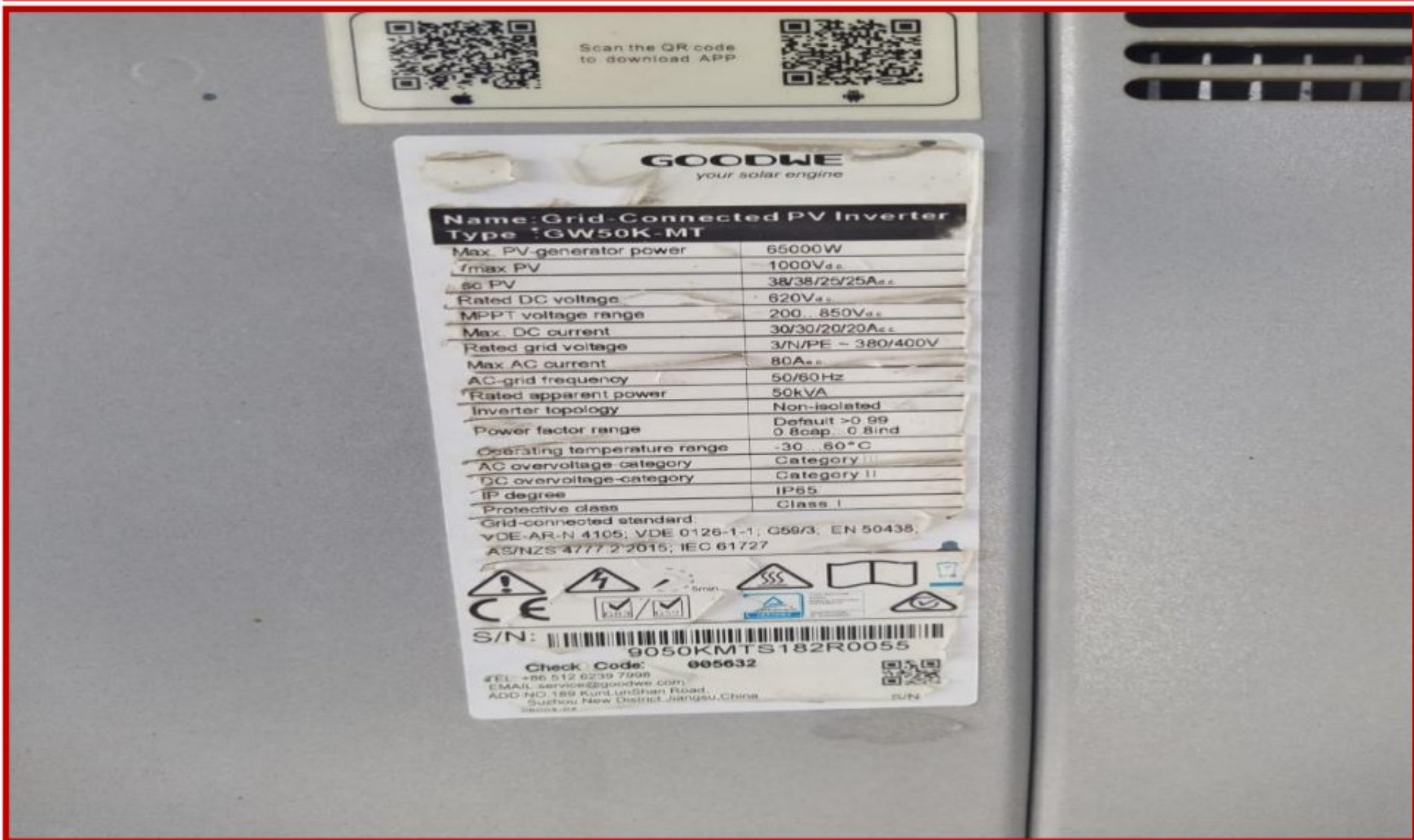
- The college has installed solar PV plants with a capacity of **150 kW**, generate and utilized by the campus load.
- All the conductive parts are properly earthed at respective buildings and ensures safety.
- Table-4 shows the Specifications of Roof Top Solar PV Plant.

Table-5: Specifications of Roof Top Solar PV Plant

Total Capacity (kWp)					150 kW				
Panel Make/Model					TATA Power Solar / TP315LBZ				
P _{max}	315	V _{max}	37.00	I _{max}	8.53	V _{oc}	44.90	I _{sc}	8.97
Location of SPV Plant					CE Block Top & Girls Hostel Top				
Availability of Tracking					No				
No. of Panels per Inverter & No. of Panels					125 & 345				
No. of Inverters & Power Rating					3 Nos of 50 kW each				
Make and Model.					GOODWE				
Output Voltage and Frequency					380 - 400/230 V, 3P-4W, 50 Hz				
Synchronizing Point					MV Panel				
Number of DC & Inverter Earthing					4 Each				
Panel Mounting Direction & Angle					15° North-South; Fixed Orientation				
Frequency of Panel Cleaning					15 Days Once				
Average Units Generated per Day					675 kWh/day				



Energy saving from solar PV system (from the installation) is **85,520 kWh** which reduces **70.1 Tons of CO₂ Emission.**



Components of Roof Top Solar PV Plants

3.8: Hot Water Generation using Solar Thermal System:

- In order to promote more green generation; the management has installed Solar Thermal system in the staff quarter's roof top and generates hot waters for bathing application
- It is a good practice to use renewable energy-based system for hot water generation by avoiding conventional heating methods (electricity or wood based)
- The specifications of the existing solar thermal hot water system are shown in Table-6.

Table-6: Specifications of the Solar Thermal Hot Water System

Description	1,000 Litre x 4 Nos	1,000 Litre x 4 Nos
Make and Model	Racold	Racold
Location	New Boys hostel	Old Boys hostel
Panel Orientation	North - South face	North - South face

Source of Water	Bore well	Bore well
Application	Bathing only	Bathing only
Total Capacity	4,000	4,000

Energy Calculation:

S. No	Description	Parameters
1.	Assuming 80 % of the total capacity is being utilized	$= (0.8 * 8,000)$ $= 6,400 \text{ Litres/Day}$
2.	Energy required to heat the water from ambient (25°C) to maximum of 60°C (Normal bathing temperature)	$= m \times C_p \times \Delta t$ $= 6,400 \times 1 \times (60-25)$ $= 1,59,940 \text{ kcal/Day}$
3.	Considering 10 % cumulative losses in the electric heating element + electrical network; then energy input to the heater is given by,	$= \frac{1,59,940}{0.9}$ $= 1,77,711 \text{ kcal/day}$
4.	Electrical energy required to heat up the same quantity of water for the same condition is given by;	$= \frac{1,77,711}{860}$ $= 206.6 \text{ kWh/Day}$
5.	Approximately 200 days in a year then cumulative electrical energy (200*206.6)	$= 41,320 \text{ kWh/Day}$

3.9: Handling of Chemicals/ Salts/ Acids used in the Laboratories:

The science departments & Department of S & H use chemicals for experimental applications and are having strict safety rules as follows;

- Well trained faculty and lab assistants who have knowledge about the hazardous nature of each and every chemical are only allowed to handle the chemicals safely
- Strictly follow the manufacturer's instruction on the container in order to prevent accidents
- Volatile or highly odorous chemicals, fuming acids are stored in a ventilated area
- Chemicals are stored in eye level and never on the top shelf of storage unit
- All stored chemicals; especially flammable liquids are kept away from heat and direct sunlight. Reactive chemicals are not stored closely
- Hazardous and corrosive chemicals are kept on sand platform to avoid corrosion
- First aid box and fire extinguishers are readily available in the laboratory

3.10: Storage of Chemicals/ Salts/ Acids:

Less concentrated chemicals, salts and acids are stored in proper racks, cupboards and high concentrated acids are stored in separate area filled with sand.

- Most of the chemicals, salts and acids used in the science departments are inorganic in nature and no harmful effects are created during the experiment process
- However, after completion of each experiment, the wastes are washed in the water sink and are rooted to common choke pit.

- Only trained teaching and non-teaching staffs are handling the chemicals and also, they are well trained to handle any abnormal laboratories with chemicals are well ventilated with proper emergency exits. Adequate and correct sequence of fire extinguishers are placed near all the laboratories



3.11: Use of Chemical for Vessels & Floor Cleaning:

In order to maintain hygiene in the College campus; the administration regularly clean the floors and restrooms. In addition to this, the hostel management has to monitor i) the cleaning of vessels, kitchen floor, dining hall, store room and gas station. Table-7 shows the cleaning agents used in the campus.

Table-7: Cleaning Agents used for Floor and Vessel Cleaning

S. No.	Cleaning Agent	Application
1.	Sabena	Vessel Cleaning
2.	Soap oil	Floor Cleaner



Cleaning & Refreshing Agents used for Vessel & Floor Cleaning

3.12: Recommendations: Eco Friendly – Green Cleaning Agents:

- It is recommended to use natural ingredients like orange peel extract & vinegar. It leaves a mild and pleasant fragrance after use. The formula is free from all harmful chemicals & toxins. It is pH-neutral, gentle on the skin as well as on the surface where it is used
- Also, these products are **IGBC GreenPro** certified. GreenPro is a mark of guarantee that the product is environment friendly throughout its life cycle



Green Pro Certified Eco-Friendly Cleaning Agents (ZERODER)

3.13: Source of Water, Storage and Distribution:

Table 8 shows the source of water, location of storage along with their application.

Table-8: Source of Water, Location of Storage and Application

Type of Water	Source	Application
Fresh Water	Product RO Plant	Drinking application
Bore Well	1. Engineering Play Ground 2. Near Main Gate (Engg. Borewell) 3. Near Main Gate (Boys Hostel Borewell) 4. Main Gate 5. Near Boys Hostel 6. Mess Borewell 7. Girls Hostel Borewell (Boy + Girls Hostel) 8. Girls Hostel Borewell	Utensil Cleaning, Bathing, Cloth Washing & RO Plant
Open Well	Open well	Gardening
Rain Water Harvesting System (RWHS)	Two individual pond is used to store rain water	➤ Used to increase the ground water ➤ To store building run-off only

3.14: Details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours:

The following table provides the details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours available inside the college for regular application.

Table-9: Details of the Water Utilities, Storage and Motor Capacity

S. No.	Location	Depth	Motor Capacity	Storage - I	Motor Capacity	Usage
BOREWELL WATER						
1.	Near Main Gate (Boys Hostel Bore well) + Near Boys Hostel + Mess Bore well + Girls Hostel Bore well (Boys & Girls)	210 ft + 110 ft + 270 ft + 90 ft	5 HP / 3.7 kW + 1 HP / 0.75 kW + 3 HP / 2.2 kW + 5 HP / 3.7 kW	Boys Hostel Sump (RCC Tank) 40,000 Litre	7.5 HP / 5.5 kW	New Boys Hostel (RCC Tank) 45,000 Litre Old Boys Hostel (Sintex Tank) 9 x 5,000 Litre
2.	Engineering Play Ground + Near Main Gate (Engg. College)	240 ft + 270 ft	5 HP / 3.7 kW + 5 HP / 3.7 kW	Main Block Sump (RCC Tank) 25,000 Litre	7.5 HP / 5.5 kW	KRCE Block (Sintex Tank) 4 x 5,000 Litre
3.	Girls Hostel Bore well (Boys & Girls) + Girls Hostel Bore well	90 ft + 230 ft	5 HP / 3.7 kW + 5 HP / 3.7 kW	Girls Hostel Sump (RCC Tank) 40,000 Litre	7.5 HP / 5.5 kW	New Girls Hostel (Sintex Tank) 8 x 5,000 Litre Old Girls Hostel (RCC Tank) 40,000 Litre
DRINKING WATER (R.O PLANT)						
S. No.	Source of Water	R.O Plant Location		Storage	Waste Water Usage	
5.	Old Boys Hostel Sintex Tank	Boys Hostel Ground Floor		2,000 Litre (Sintex Tank)	Return Back to Boys Hostel Sump	
6.	Old Boys Hostel Sintex Tank	Hostel Mess		500 Litre (Sintex Tank)	Vessel Washing	
7.	New Girls Hostel Sintex Tank	Girls Hostel Ground Floor		5,000 Litre (Sintex Tank)	Cloth Washing	
8.	College of Engineering Sintex Tank	College of Engineering Block Top		5,000 Litre (Sintex Tank)	Staffs Hand Wash	

Note:

- ☞ For Raw water Over Head (OH) tanks are made using cement construction and also Sintex Tanks.
- ☞ For R.O water stored only Sintex Tanks.
- ☞ The maintenance team ensure to clean the tank for six months once.
- ☞ Bleaching power is mostly used to clean the inside tank.

3.15: Treated Water for Drinking Application:

- The college management is keen on providing uninterrupted, safe and healthy drinking water to all; throughout the year.
- Water Taps are provided at appropriate places offering the treated water for the students.
- The overhead tanks storing the well water are cleaned at regular intervals and the water management team has been maintaining a cleaning schedule Utensil Cleaning, Bathing & Cloth Washing.



PVC and Metal Based Taping System for Water Distribution Line

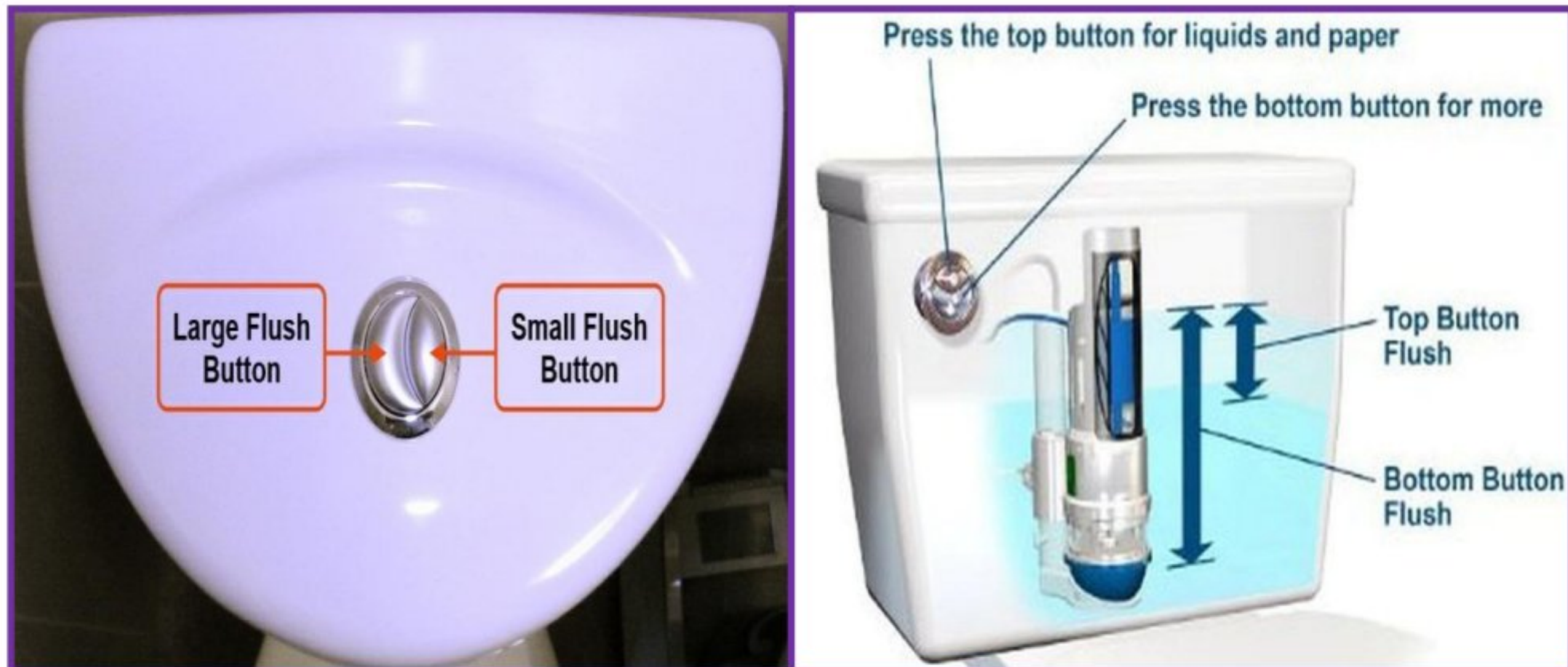
3.16: Water Savings in Foreign Toilets:

- The list of availability of Indian & Foreign style toilets are presented in the below Table-10.

Table-10: List of Indian & Foreign Style Toilets

S. No.	Location	Description (Quantity)	
		Indian	Foreign
1.	Ground Floor	5	3
2.	I st Floor	25	4
3.	II nd Floor	24	6
4.	III rd Floor	23	5
5.	IV th Floor	6	1
6.	V th Floor	12	2
Total		95	21

- In general, the flush tank capacity may be 8 to 10 Litres (depends on make and model). Water savings also leads to power saving it saves the operating duration of the water pumps directly.



3.17: Rain Water Harvesting (RWH) – from Building Roof Area & Run-off Area:

- The audit team appreciates the effects taken by the management of **K. RAMAKRISHNAN COLLEGE OF ENGINEERING (Autonomous)** for harvesting the rain water in separate pond available back side of the college.
- The roof area is so arranged to collect the rainwater and then passed through proper piping system, and then bring back to the open pond which are located inside the college next to the Vehicle Parking.
- The building run off and Common area and road run-off are properly collected and routed to nearby water body.



3.18: General Recommendations for Rain Water Harvesting:

- RWH has been fitted with their specifications indicating their i) year of installation, ii) approximate average rainfall and duration in the RWH location and iii) filter cleaning schedule (if any).
- Conduct a GIS based study on the improvement of ground water table especially before the rainy session and after rainy session. Compare the data and ensure that the water table improves due to percolation of rain water.
- Similar study must be conducted (in future) before installing an RWH and after RWH.
- Increase the no. of RWH pits and may be developed to place at least 2 per building.



Sample Name Board in front a Rain Water Harvesting System

3.19: General Recommendations:

- It is advisable to replace all the old taps without aerator into aerator-based taps in a phased manner.
- Aerators helps to reduce and regulate water flow and also offer the following benefits;
 - ✓ Lower Water Bills & Improved Water Pressure
 - ✓ Increased Filtration & Minimized Splashing
- All the pump motor must be fitted and controlled by floating sensor and hence the motors are automatically ON and OFF. It avoids the overflow; saves water and electrical energy.
- All the buildings are fitted with water flow meters & hence the water utilization must be properly accounted. Similar to the water flow meter; energy consumption of all pumping motors is recorded using panel board meters.
- Fault and leakage in the water distribution line will be promptly informed by the respective in-charges to the maintenance team and immediately arrested.

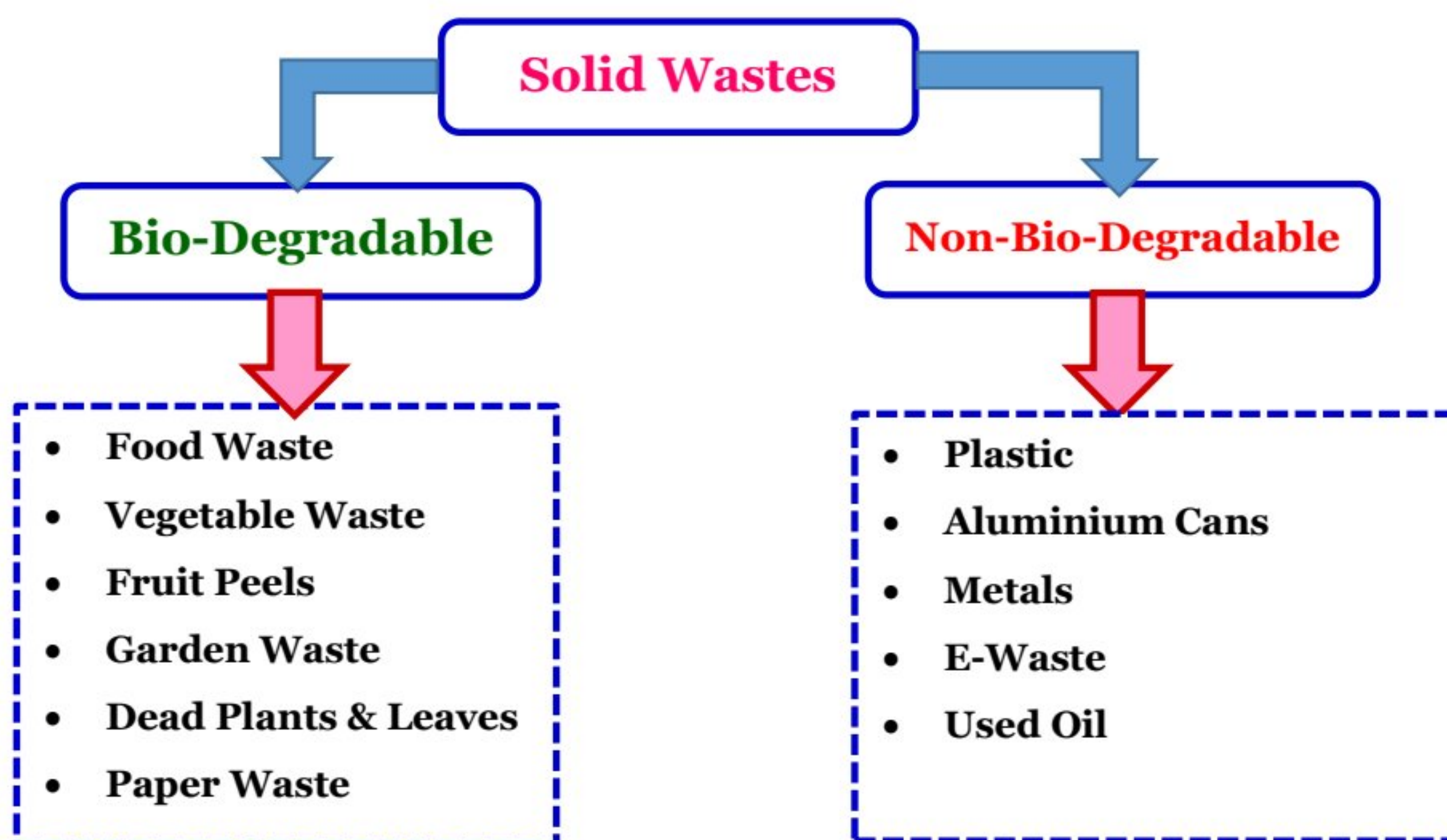
3.20: Installation on Fire extinguishers:

- The college has installed Fire extinguishers at all the vulnerable points.
- They are also refilled and in good condition (with adequate pressure indicated in the meter)



3.21: Solid Waste Management System:

Different types of wastes generated inside the college premises are represented in the block diagram given below.



3.22: Process of Waste Management:

The college management practised some methods to treat the waste generated and Table-11 shows the process of treating the solid waste generated inside the college campus.

Table-11: Process of Waste Management

S. No.	Waste Type	Waste Treatment
Bio-Degradable Waste Management		
1.	Food and Vegetable Waste	<ul style="list-style-type: none"> Used to Bio Gas Plant
2.	Garden Wastes and Plant Leaves	<ul style="list-style-type: none"> Daily collected and dumped in separate place
3.	Paper Waste	<ul style="list-style-type: none"> Collected and stored in a separate place
		<ul style="list-style-type: none"> Sold to third party for recycling
		<ul style="list-style-type: none"> Daily paper waste stored in a yard
Non-Bio-Degradable Waste Management		
4.	Plastics	<ul style="list-style-type: none"> Banned in the college campus (Welcome step). The chemical/salt storage containers are disposed to third party
5.	Construction Waste	<ul style="list-style-type: none"> Mostly used by their own construction and used for internal land filling
6.	Metals	<ul style="list-style-type: none"> Construction metals or metals from any other sources are stored & sale to third party for recycling
7.	Transport Oil + Tyres	<ul style="list-style-type: none"> Stored in separate place and soled to 3rd party
8.	DG Engine oil & Coolant	<ul style="list-style-type: none"> Stored in separate place and soled to 3rd party

9.	Vehicle & Computer Batteries	<ul style="list-style-type: none"> • Procuring new batteries with buyback offer • (Old battery replacement)
10.	Used edible oil	<ul style="list-style-type: none"> • Stored Separately and sold to third party.
11.	E-Waste Management	<ul style="list-style-type: none"> • Stord in separate place.

3.23: Standards Followed for Waste Handling & Management:

1. Solid Waste Management Rules – 2016
2. E-Waste Management Rules – 2016
3. Hazardous Waste Management Rules – 2016 (Management & Transboundary)
4. Battery Management Rules – 2001 (Management & Handling)

3.24: General Note:

- Prepare a flow chart for collection of E-waste from Generation to Disposal and paste it on appropriate places
- An electronic weighing scale (with suitable capacity) must be installed in the storage yard and should be properly calibrated
- One emergency lamp (with UPS supply) must be installed along with suitable fire extinguisher. Ensure proper ventilation in the yard
- Form rule for declaring the waste as E-Waste & Assign the signing authorities
- Identify a third-party vendor to procure the E-waste from the college
- Establish MoU with that party. Disseminate the following information at appropriate places i) E-Waste Policy, ii) Process Methodology, iii) Copy of MoU with third party vendor, iv) Contact persons mobile number and E-mail.
- Identify certain vehicle to carry the waste from generation to storage yard
- Provide training to the man power who are handling the waste
- Maintain separate Delivery Challan, Billing, weighing mechanism for handling the E-Waste
- Update the status of E-waste (through digital circular) to all the concerned management representatives, faculty members and staff at regular intervals (month wise is good)



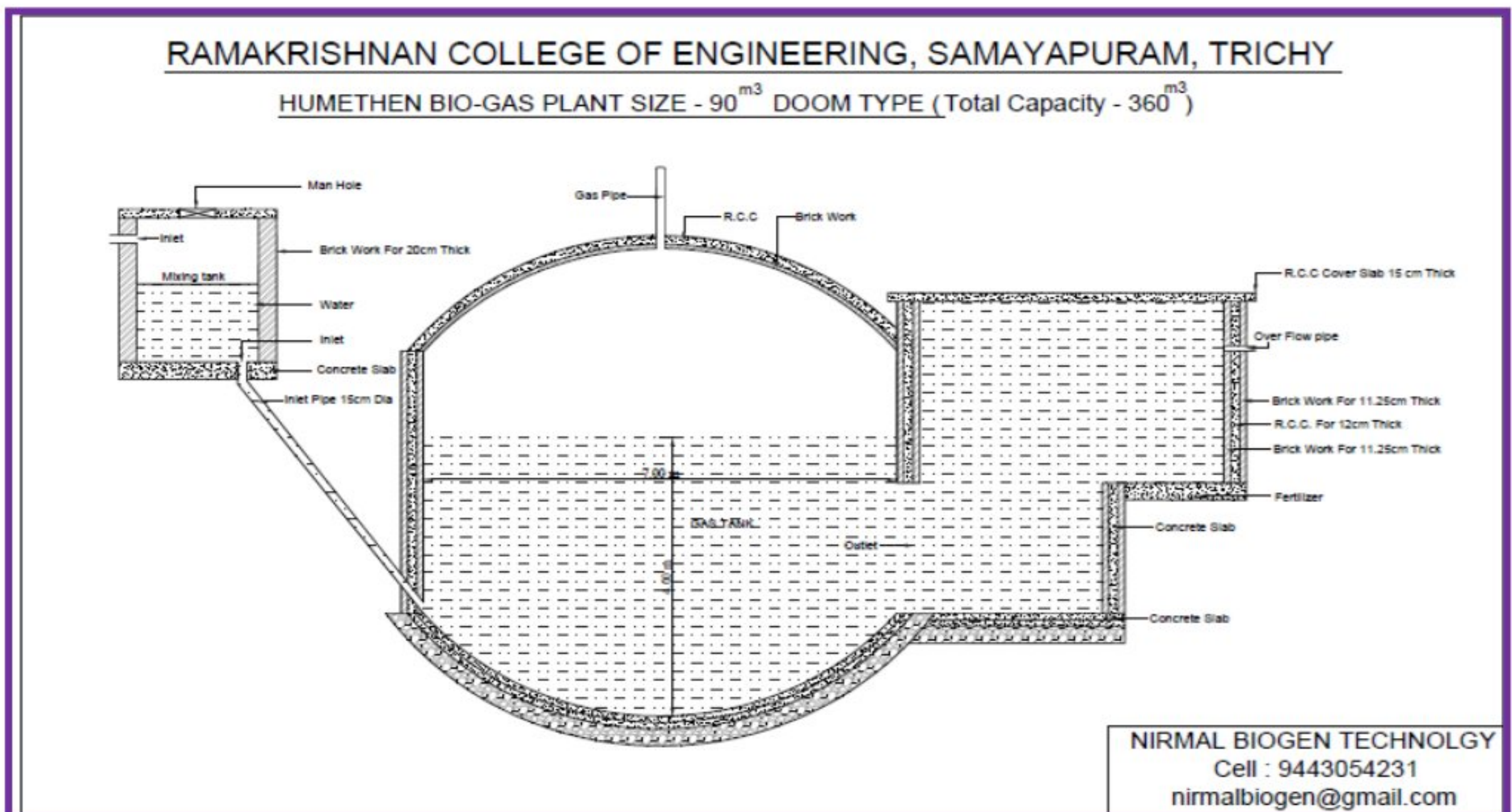


Solid Waste Management (Collection, Segregation, Storage & Safe Disposal)

3.25: E-Waste Management:

- ⊕ With the proliferation of electronics also comes the challenge of their proper disposal. The institute has very efficient mechanism to dispose E wastes generated from various sources.
- ⊕ The major e-waste such as written-off instruments/equipment, old version computers, printers, electronic gadgets/circuits, kits have been written off on regular basis and condemned devices and materials from computer lab are sold to the e-waste management companies/buyers in Coimbatore.
- ⊕ All the miscellaneous e-waste such as CDs, batteries, fluorescent bulbs, PCBs, and electronic items are collected and delivered for safe disposal. Minor repairs are addressed by the lab technician with the support of staff members whereas the major issues are repaired by professionally trained personnel.

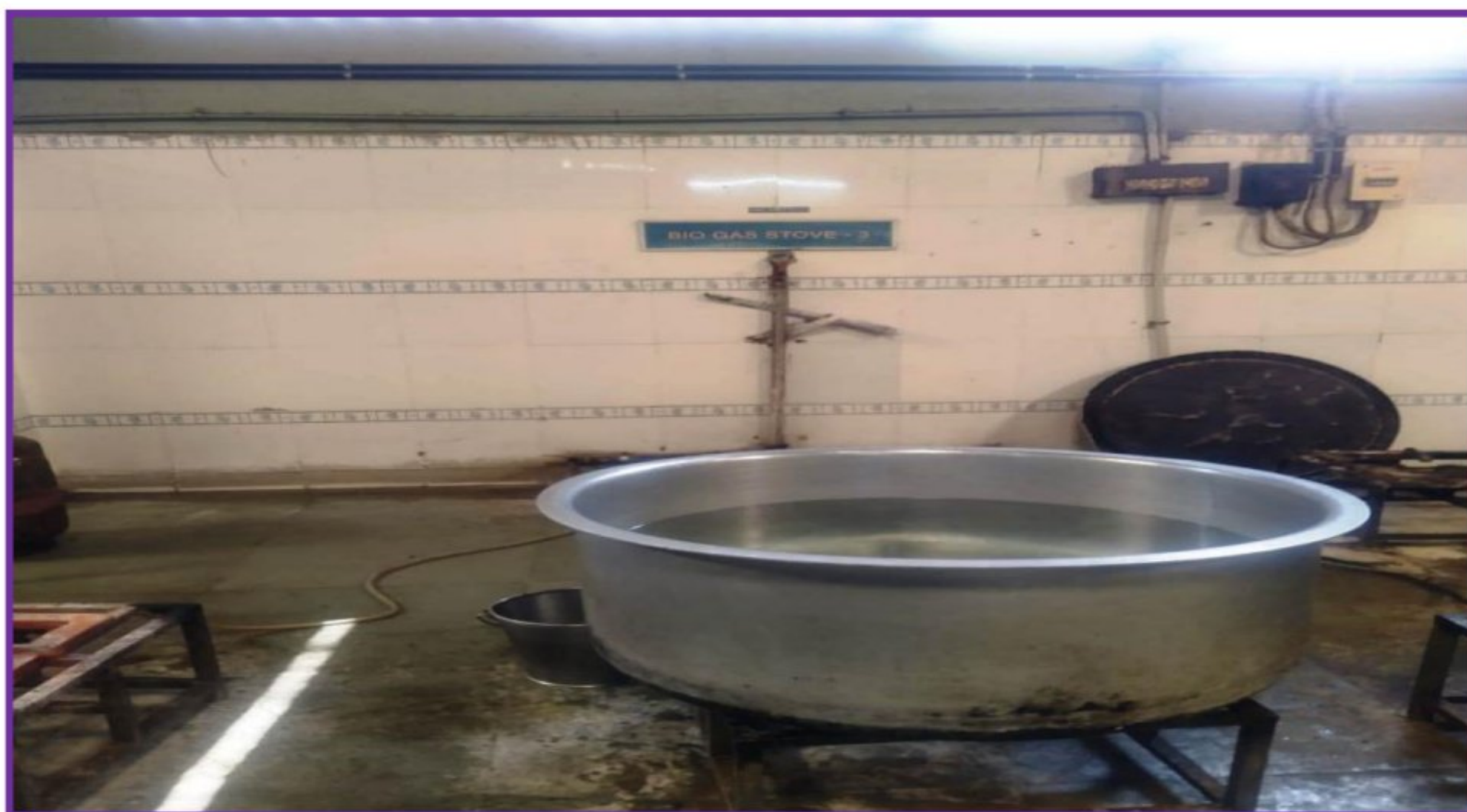
3.26: Bio-Gas Plant:



Specifications	
Plant Size	90 m ³
Cooking Gas	1. Two No's of Dosa maker 2. 8 Single Stove Connected (3 x 90 kg Produced / Day)



Dosa Maker connected to Biogas plant



Separate stove connected to Biogas plant

3.27: Campus Greenery:

The college is completely covered with mature trees grown for more than 20 years. The total number of mature trees available in the college campus is ***1,769 with many varieties of trees.***

Table-12: List of Mature Trees available in the College Campus

S. No.	Location	Name of the Tree	Quantity
1.0	Entire Campus Location	Variety of Mature Trees	1,769



Total No. of Mature Trees available in the college campus is 1,769 which contributes for reduction of 38.6 Tons of CO₂ emission/Annum



3.28: Recommendations for Miyawaki Forest:

Miyawaki is a technique (also called *Potted Seedling Method*) as that helps build dense, native, multi-layered forests. The approach is supposed to ensure that plant growth is 10 times faster and the resulting plantation is 30 times denser than usual. It involves planting dozens of native species in the same area, and becomes maintenance-free after the first three years. The overall density of the forest is beneficial in lowering temperature, making soil nutritious, supporting local wildlife and sequestration of carbon.



3.29: Bio-Diversity in the Campus:

- Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world.
- Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life.

3.30: Recommendations to maintain Bio-Diversity:

- **Bird Sighting and Survey:** Conduct a dedicated bird sighting and identify the list of birds both residing birds and migratory birds available in the college campus
- Prepare the list of birds with their local name, scientific name, their average life time, nesting facility created by the bird and photo of the bird. Show case the result to all the stake holder and inculcate a habit of friendly environment
- Discuss with the ornithologists and facilitate the environment with more birds coming to the campus and especially migratory birds.
- **Reptile & Amphibian survey:** Similar to bird survey; conduct a survey to list the amphibians available in the campus
- Amphibian and reptile surveys are often performed as part of the Green Audit process or terrestrial survey. These surveys are effective at detecting the presence of even the most elusive species.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

K. RAMAKRISHNAN COLLEGE OF ENGINEERING

NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112.

4. RECOMMENDATIONS



4.1: RECOMMENDATIONS:

- Prepare a schedule to clean the air filters of AC indoor units at regular intervals
- Measure the earth resistance at regular interval and maintain within the standard.
- Voltage drops at the load end can be improved by load end capacitors compensation
- Battery voltage of each UPS must be measured and monitored.
- Prepare and adhere a cleaning schedule for UPS
- Conduct awareness programmes on Energy Conservation to all the stake holders.
- Foot valve of all the submersible and open well pipes must be cleaned at regular intervals and this ensure i) free flow of water and ii) reduced power consumption.
- Connect load end compensation capacitors to reduce the cable distribution loss.
- Set the air conditioning area temperature within a range of 24-26 °C to have better human comfort and hence to save power.
- Provide electronic energy meters and run-hour meters for each pump.

Audit Conducted and Verified by,



Dr. S.R. SIVARASU

BEE Certified Energy Auditor (EA-27299)

Lead Auditor – ISO 14001: EMS; IGBC AP, GRIHA CP

CII Certified Professional in SWM

ISO-14064: Implementor & Auditor - Carbon Footprint Management

COMPLETION OF THE REPORT

This report is prepared as a part of the Energy, Environment and Green Audit process conducted **K. RAMAKRISHNAN COLLEGE OF ENGINEERING (AUTONOMOUS)**, NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112 by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING**, Coimbatore – 641 062.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

K. RAMAKRISHNAN COLLEGE OF ENGINEERING

NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112.

ANNEXURE:

AUTHORISED CERTIFICATES OF THE AUDITOR



CERTIFICATE

The Certification Body
of TÜV SÜD South Asia Private Limited

certifies that



**M/S RAMKALAM CENTRE FOR ENERGY
CONSULTANCY & TRAINING**
No.8, VPK Garden, Velanaipatti, Coimbatore – 641 062, India

has implemented Quality Management System
in accordance with **ISO 9001:2015**
for the scope of

**Providing Energy, Environment, Green audits to industry,
Academic institutions and organizations**

The certificate is valid from **2023-11-22** until **2026-11-21**

Subject to successful completion of annual periodic audits

The present status of this certificate can be obtained through TÜV SUD website by scanning below QR code and by entering the certificate number (without spaces) on web page. Further clarifications regarding the status & scope of this certificate may be obtained by consulting the certification body at info.in@tuvsud.com

Certificate Registration No. **99 100 23573**

Date of Initial certification: **2023-11-22**

Issue Date: **2023-11-22** Rev. 00

Rahul Kale
Head of Certification Body
of TÜV SÜD South Asia Private Limited,
Mumbai
Member of TÜV SÜD Group



Reg No.: EA-27299



Certificate No.: 9645/19

National Productivity Council
(National Certifying Agency)
PROVISIONAL CERTIFICATE

This is to certify that Mr./Mrs./Ms. **SIVARASU SULUR RATHINAVELU**
son / daughter of Mr. **P RATHINAVELU** has passed the National certification
Examination for Energy Auditors held in September 2018, 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 Accredited Energy Auditor and issuance of certificate of Accreditation by the Bureau of Energy
Efficiency under the said Act.

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

Digitally Signed by: K V R RAJU
Mon Apr 22 16:22:42 IST 2019
Controller of Examination, NPC AIP Chennai

Place : Chennai, India
Date : 22nd April, 2019

Controller of Examination



**ISO 14001:2015 Lead Auditor
(Environmental Management Systems)
Training course**

it is hereby certified that

Dr. S. R. Sivarasu

has successfully completed the above mentioned course and examination

08th - 12th December 2017

Coimbatore, India

Certificate No. 3521 2982 02

Delegate No. 71968

for TÜV NORD CERT GmbH

Essen, 2018-01-11

Course 18125 is certified by CQI/IRCA and meets the training requirements for those seeking certification under the
IRCA EMS auditor certification scheme.

TÜV NORD CERT GmbH

Langemarckstraße 20

45141 Essen

www.tuev-nord-cert.com





Confederation of Indian Industry

The Indian Green Building Council

hereby certifies that

Sivarasu S R

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

200239

20 June 2020



GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT

GRIHA CERTIFIED PROFESSIONAL CERTIFICATE

This is to certify that

Sivarasu sr

has qualified as a **GRIHA** Certified Professional For V. 2015

Date of issue: 18th September 2020

Note : This certification is valid only for GRIHA version 2015.

Chief Executive Officer
GRIHA Council



Confederation of Indian Industry


This is to certify that

SIVARASU S R

is a

CII Certified Professional in Sustainable Waste Management


K S Venkatagiri
Executive Director
CII - Godrej GBC


Pradeep Bhargava
Chairman
CII GreenCo Council



Issued by CII Sohrabji Godrej Green Business Centre

Issued on 9 June 2021

CIGBC-SWM-0621-298

HSSERisk Academy

CERTIFICATE OF APPRECIATION

THIS CERTIFICATE IS AWARDED TO

Sivarasu Rathinavelu

FOR SUCCESSFUL COMPLETION OF TRAINING COURSE ON

- ISO 14064-1:2018
- ISO 14064-2:2019
- ISO 14064-3:2019
- ISO 14066:2011
- ISO 14067:2018

AND CERTIFY HIM/ HER AS

**IMPLEMENTOR & AUDITOR
CARBON FOOTPRINT MANAGEMENT**

This certificate is awarded for successful completion of Global Virtual Training course conducted from August 27, 2021 to September 01, 2021. It serves as a proof of his/her knowledge, competence and ability to implement, verify and validate carbon footprint as per above mentioned standards and methods. This certificate was awarded on August 01, 2021.

01.09.21

DATE

Abhash

SIGNATURE

010920211006

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