GREEN AUDIT REPORT

OF

DAYANANDA SAGAR COLLEGE OF DENTAL SCIENCES

SHAVIGE MALLESHWARA HILLS,

KUMARASWAMY LAYOUT, BANGALORE – 560 111

2021 – 2022

FOR MORE INFORMATION

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GREEN AUDIT REPORT

ON

WATER AUDIT, ENERGY AUDIT,

WASTE MANAGEMENT AUDIT,

GREEN CAMPUS MANAGEMENT AUDIT

AND ENVIRONMENT AUDIT

OF

DAYANANDA SAGAR COLLEGE OF DENTAL SCIENCES

SHAVIGE MALLESHWARA HILLS,

KUMARASWAMY LAYOUT, BANGALORE – 560 111

2021 – 2022

ECO ENERGIME ENGINEERS LLP

ENHANCING RESOURCE EFFICIENCY

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PROJECT ADVISOR

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ACKNOWLEDGEMENTS

We are thankful to the management of **Dayananda Sagar College of Dental Sciences, Bengaluru,** for the support, guidance and, giving us the opportunity to be involved in this very interesting and challenging assignment.

We would be happy to provide any further clarifications, if required, to facilitate the implementation of the recommendations.

We received full co-operation and support from the concerned personnel/ staff members of the college. They took key interest and gave valuable inputs during the course of study. We would like to thank:

Chairman – Dayananda Sagar College of Dental Sciences, Bengaluru

Vice Chairman – Dayananda Sagar College of Dental Sciences, Bengaluru

Secretary – Dayananda Sagar College of Dental Sciences, Bengaluru

Joint Secretaries – Dayananda Sagar College of Dental Sciences, Bengaluru

Principal – Dayananda Sagar College of Dental Sciences, Bengaluru

And other Staff in personnel who have given full co-operation and support. They took a keen interest and gave valuable inputs during the course of study.

Certificate

This is to certify that M/s. Eco Energime Engineers LLP, Bengaluru has conducted **Quality Audit** of **"Dayananda Sagar College of Dental Sciences, Bangalore"** during the March 2022 to May 2022. The Audit includes water audit, energy audit, waste management audit, green campus management audit and aspects of environment audit.

The audit involves field visit, measurements and observations, verification of bills, log books, data base, maintenance registers and interview with staffs, and this gives an overview of the existing system.

In an opinion and to the best of our information and according to the information given to us, said Quality Audit gives a true and fair view in conformity with auditing principles.

For Eco Energime Engineers LLP

Authorized Signatory

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DISCLAIMER

The Audit Team has prepared this report for Dayananda Sagar College of Dental Sciences, Bangalore based on the input data submitted by the representatives of college complemented with the best judgment capacity of the expert team.

While all reasonable care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered.

It is further informed that the recommendations are arrived following best judgments and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report

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EEELLP ACKNOWLEDGEMENT

EEELLP team thanks the management of **Dayananda Sagar College of Dental Sciences, Bangalore** for assigning this interesting work to us. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to Principal & their team of colleagues for giving us necessary inputs to carry out this very vital exercise. We would like to thank all the head of the departments and staff members who were actively involved while collecting the data and conducting field measurements.

For Eco Energime Engineers LLP

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ABBREVIATION AND ACRONYMS

1.	A	:	Amperes
2.	AC	:	Air Conditioner
3.	APFC	:	Automatic Power Factor Controller
4.	BBMP	:	Bruhat Bengaluru Mahanagara Palike
5.	BESCOM	:	Bangalore Electricity Supply Company
6.	BWSSB	:	Bangalore Water Supply and Sewerage Board
7.	CC Camera	:	Closed Circuit Camera
8.	CFL	:	Compact Fluorescent Lamps
9.	DG	:	Diesel Generators
10.	DSI	:	Dayananda Sagar Institutions
11.	DSCDS	:	Dayananda Sagar College of Dental Sciences
12.	EE	:	Energy Efficient
13.	E-Waste	:	Electronic Waste
14.	etc.	:	Etcetera
15.	FTL	:	Fluorescent Tube Light
16.	GHG	:	Green House Gas
17.	Hz	:	Hertz
18.	HP	:	Horse Power
19.	HT	:	High Tension
20.	I	:	Current
21.	ICT	:	Information and Communications Technology
22.	IQAC	:	Internal Quality Assurance Cell
23.	ISO	:	International Organization for Standardization
24.	kgs	:	Kilograms
25.	kL	:	Kilo Liters
26.	kV	:	kilo volt
27.	kVA	:	kilo volt ampere
28.	kVAr	:	Reactive kilo volt ampere
29.	kW	:	Kilo Watt
30.	kWh	:	kilo Watt hour
31.	kWp	:	kilo Watt peak
32.	Lab	:	Laboratory
33.	LCD	:	Liquid Crystal Display
34.	LED	:	Light Emitting Diode
35.	LT	:	Low Tension
36.	mA	:	Milli Amperes
37.	MoU	:	Memorandum of Understanding
38.	NA	:	Not Applicable
39.	NAAC	:	National Assessment and Accreditation Council
40.	Nos.	:	Numbers

41.	NSS	:	National Service Scheme
42.	Prim/Sec	:	Primary/Secondary
43.	PF	:	Power factor
44.	PG	:	Post Graduate
45.	PV	:	Photo Voltaic
46.	Rs.	:	Rupees
47.	RO	:	Reverse Osmosis
48.	RR. No.	:	Revenue Register Number.
49.	RWH	:	Rain Water Harvesting
50.	S. No.	:	Serial Number
51.	Sq. Ft.	:	Square Feet
52.	Sq. m.	:	Square Meter
53.	SRTPV	:	Solar Roof Top Photo Voltaic
54.	STP	:	Sewage Treatment Plant
55.	TL	:	Tube Light
56.	TR	:	Ton of Refrigeration
57.	V	:	Volts
58.	W	:	Watts
59.	Wp	:	Watt peak
60.	#	:	Number

1. INTRODUCTION

Dayananda Sagar College of Dental Sciences has been part of the DSI Family since 1992 imparting high quality of Dental Education and possesses state-of-the-art teaching and research facilities, classrooms, tutorial facilities, Pre-Clinical and Clinical Skill Labs creating a perfect environment for knowledge and skills development. The College of Dental Sciences is equipped with World-Class infrastructure with the latest of equipment and technology to train students with the most recent and advanced Dental Care.

The college is centered on:

- supporting patient care
- pursuing innovation in oral health education
- preparing the educated dentists of tomorrow with clinical practice and training.

The campus is set on a 23-acre lush green campus in Bangalore, Dayananda Sagar College of Dental Sciences comprises state-of-the-art teaching and research facilities, classrooms, tutorial facilities, laboratories, creating the perfect learning environment.

We are proud of our close-knit campus community - a student intake of 60 each year. All students benefit from more one-on-one contact time with staff, and our curriculum has been designed to cover all specialties of dental science ranging from diagnosis, child dentistry to surgery, restorative, cosmetic and preventive dentistry.

From its extensive pre-clinical departments and laboratories to its wealth of library, classrooms, modern clinical and tutorial facilities, the college is an abundant resource to the communities it serves.

Departments : BDS - Program

- Basic Medical Sciences
- Conservative Dentistry and Endodontics
- Oral and Maxillofacial Surgery
- Oral Medicine and Radiology
- Oral Pathology and Microbiology
- Orthodontics and Dentofacial Orthopedics
- Pediatric and Preventive Dentistry
- Periodontics
- Prosthodontics Crown and Bridge
- Public Health Dentistry
- Research and Sustenance

Departments : MDS - Program

- Conservative Dentistry and Endodontics
- Oral and Maxillofacial Surgery
- Oral Medicine and Radiology
- Orthodontics and Dentofacial Orthopedics
- Periodontics
- Prosthodontics Crown and Bridge
- Public Health Dentistry

Vision mission and values of the DSCDS are given below.

VISION

Dayananda Sagar College of Dental Sciences aims to be amongst the world's foremost Dental academic institutions in the pursuit of educational, clinical, and research excellence. The institution also aims to provide ample scope for ideation, innovation, and community service to shape future leaders in dentistry by applying science, art and technology breakthroughs, thereby contributing to national/global welfare and development.

MISSION

- Our mission is to realize this vision by:
- Imparting integrated education and training to students on par with global standards in dentistry for the prevention and treatment of various oral diseases and conditions, hence contributing to the improvement and sustenance of better quality of life among all individuals of the society.
- Ensuring the development of comprehensive knowledge, skills and attitudes as required, to meet the above said objective.
- Inculcating necessary clinical, diagnostic, and treatment skills, to manage patients effectively and efficiently, and extend similar quality services to the community.
- Applying theoretical and analytical knowledge in various areas of dentistry to create novel clinical methods and engage in knowledge transfer for the benefit of society locally and for mankind globally.
- Delivering quality education in basic and applied dental research to promote innovation and ensure dissemination of new knowledge through presentations at conferences and publications in high-impact journals.
- Mobilizing faculty expertise to implement local, national, and international initiatives in the field of dentistry to achieve global oral health goals by the year 2030.

VALUES

Values that drive Dayananda Sagar College of Dental Sciences and support its vision include:

- Pursuit of Excellence - Strive continuously to improve ourselves and our systems with the aim of becoming the best in our field.
- Fairness - Ensuring objectivity and impartiality in all our processes to earn the trust and respect of society.
- Leadership - Lead responsibly and creatively while imparting education and delivering oral health care.
- Integrity and Transparency - Remain ethical, sincere, and transparent in our activities and treat all individuals with dignity and respect.
- Empathy and Compassion - Be respectful and develop a compassionate relationship between doctors, the auxiliary team, and patients.

QUALITY POLICY

We, at Dayananda Sagar College of Dental Sciences, are committed to imparting and inspiring lifelong learning by providing the highest quality dental education, research opportunities, and dental services to the satisfaction of all the stakeholders.

CORE VALUES

Discipline, Dedication, Deference

Internal Quality Assurance Cell (IQAC)

To create quality, to maintain quality, to enhance quality in all spheres – that is the task of the IQAC or the Internal Quality Assurance Cell of the college. The IQAC is the central quality- monitoring body of the institution. It functions under the Chairmanship of the Principal and comprises senior faculty members, representative from the local community and a student representative.

The IQAC functions with the belief that excellence and quality are not one-time goals but continuous processes. To this end, the IQAC meets on a regular basis. New programs, up gradation of infrastructure and increasing the effective functioning of all systems are some of the major concerns of the IQAC. The IQAC aims at providing an excellent academic enhance, center of health and environment safety. List of IQAC team members are given in figure 1-1.

Dayananda Sagar College of Dental Sciences
Shavige Malleshwara Hills, Kumaraswamy Layout,
Bengaluru - 560078

INTERNAL QUALITY ASSURANCE CELL (IQAC)
IQAC is reconstitute on 27-07-2022 W.E.F 01-08-2022

Sl. No.	Name	Designation	Position Held	Signature
1.	Dr. Hemanth M	Principal	Chairman	
2.	Dr. Nagesh L	Prof & HOD	IQAC Co-ordinator	
3.	Mr. Galiswamy	Secretary	Management Representative	
4.	Dr. Gargi S Murthy	Reader	Member Co-ordinator	
5.	Dr. Sunil S	Professor	Member Coordinator	
6.	Dr. Ramnarayan BK	Professor	Member Admin Representative	
7.	Mr. Venkataramaiah	Superintendent	Member Admin Representative	
8.	Mr. Chalapathy	Accounts	Member Finance Representative	
9.	Dr. Chaya M David	Prof & HOD	Member	
10.	Dr. Savita AM	Prof & HOD	Member	
11.	Dr. Shobha ES	Prof & HOD	Member	
12.	Dr. Avinash J	Prof & HOD	Member	
13.	Dr. Sarandha DL	Prof & HOD	Member	
14.	Dr. Krishnanand P S	Prof & HOD	Member	
15.	Dr. Vedavathi B	Prof & HOD	Member	
16.	Dr. Prashanth N T	Professor	Member secretary	
17.	Dr. Smitha Sharan	Reader	Member	
18.	Dr. Archana R Naik	Reader	Member	
19.	Dr. Pradeep Chandra	Sr. Lecturer	Member	
20.	Dr. Rayan Malick	Sr. Lecturer	Member	
21.	Dr. Shavari Shetty	Sr. Lecturer	Member	
22.	Dr. Jayanth M R	Sr. Lecturer	Member	
23.	Dr. Megha Kachari	Sr. Lecturer	Member	
24.	Dr. Nayana M	Sr. Lecturer	Member	
25.	Mr. Ravindra S	Local Resident	Local Society Member	
26.	Ms. Shiksha	DSCDS Student	Member Student Representative	
27.	Dr. Puneeth Chowdhary	BDS Alumni	Member Alumni Representative	
28.	Dr. Kumar NC	Pedodontist & Dental Clinic Proprietor	Member Employer	
29.	Mr. Unni Krishnan	Best Dental Supply	Member Industry Representative	
30.	Mr. Ravi Kumar B	Stake Holder	Member Parent Representative	

Figure 1-1: List of IQAC members

Campus Area and Built-up area

The area of the campus (built up and total) is given in table 1-1.

S. No.	Description	Units	Details
1	Campus total area	Acres	23
2	Built up area	Sq. ft.	104,071

Table 1-1: College Area

Overview of Green Audit:

Green Audit helps college / facility to:

- Understand the optimum usage of electricity, water and other natural resources
- Identify opportunities to conserve various natural resources
- Identify various environmental-friendly technological improvements
- Evaluate the techno-commercial aspects of identified conservative measures
- Create awareness among the students and staff
- Disseminate the commitment of management towards saving nature
- Develop a culture among students, staff and management to be socially responsible

2. PRE – AUDIT PHASE

A pre-audit meeting is a prerequisite for the Audit; it helps to meet and discuss about the schedule and documents required during the audit. The pre-audit meeting was conducted at DSCDS, Bengaluru in the end of March 2022. During the meeting, introduction of team members, scope and objectives of the audit were discussed.

Management Commitment

The Management of the college has shown significant commitment towards Green Auditing during the pre-audit meeting. They were ready to encourage all green activities. It is decided to promote all activities that are environment friendly such as awareness programmes on the environment, campus farming, planting more trees on the campus etc., after the Green Auditing.

College administration is vital to the process of realizing campus sustainability, and college policy is an essential instrument for any substantial change in the campus environment.

Scope and goals of Green Auditing

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Green Auditing is one among them for educational institutions.

Once a baseline is established, the data can serve as a point of departure for further action in campus greening. Existing data will allow the college to compare its programs and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects.

This data will also provide a basis for calculating the economic benefits of resource conservation projects by establishing the current rates of resource use and their associated costs. This audit initiative focused initially on educating colleges and universities through workshops, guidebooks, fact sheets and ensuring compliance through inspections and self-audits.

2.1. Audit Schedule

Green Audit schedule includes the pre-audit phase, on-site / audit phase and post audit phase. Table 2-1 details the complete Quality Audit schedule.

S. No	Description	Timeline
1.	Pre-audit Phase	21 March 22 to 25 March 22
2.	Onsite-audit Phase	11 April 22 to 16 April 22
3.	Post-audit Phase	02 May 22 to 07 May 22
4.	Presentation	18 May 22

Table 2-1: Audit Schedule

3. ON-SITE AUDIT PHASE

3.1. Scope / Target Areas of Green Auditing

3.1.1. Water Audit

Water Audit addresses water consumption, water sources, appliances and fixtures. Aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

3.1.2. Energy Audit

Energy Audit addresses energy consumption, energy sources, use of renewable energy, implementation of energy conservation measures, energy monitoring, lighting, appliances, and use of electric vehicles. Energy use is clearly an important aspect of campus sustainability.

3.1.3. Waste Management Audit

Waste management Audit addresses waste production and disposal, plastic waste, paper waste, food waste, and recycling. Municipal solid waste has a number of adverse environmental impacts, most of which are well known and not in need of elaboration.

3.1.4. Green Campus Management Audit

Green campus initiatives are becoming an integral part of modern day's university systems. Green campus Audit helps in maintaining the air and water clean. It regulates the climatic conditions and provides a healthy and comfortable environment for living.

3.1.5. Environment Audit

Environment Audit addresses the usage of fossil fuels (coal, diesel, petrol and gas). The mode of commute to and from college each day has an impact on the environment through the emission of greenhouse gases into the atmosphere by the burning of fossil fuels.

3.2. Audit Methodology and Approach

The methodology and approach adopted for the study involve various steps that include:

- Review of Document and records
- Review of Policies
- Review of MoU
- Review of various measures implemented
- Site Walkthrough
- Data Collection
- Interviews

3.2.1. Review of Document and Records

Electricity bills, Water bills, equipment register, list of appliances, office registers, internal Quality Audit document, purchase document, were reviewed and relevant data and inputs required for analysis have been collected.

3.2.2. Review of Policies

College has various policies that include safety policy, environment policy, and Anti-ragging policy.

A. Safety Policy:

An organization's safety policy is a recognized, written statement of its commitment to protect the health and safety of the students and employees, as well as the surrounding community.

All the students, teaching and non-teaching staff, maintenance and house-keeping staff have been given training to use fire extinguishers in emergency situations of fire and explosion.

Fire extinguishing cylinders have been installed in each floor and in laboratory areas and have been refilled and checked regularly.

Sample photo of the fire extinguisher is shown in figure 3-1.

Figure 3-1: Sample photo of fire extinguisher

Information about the fire-fighting drill procedure is posted at the corridors of the Dental hospital. Sample photo of the same is shown in the figure 3-2.

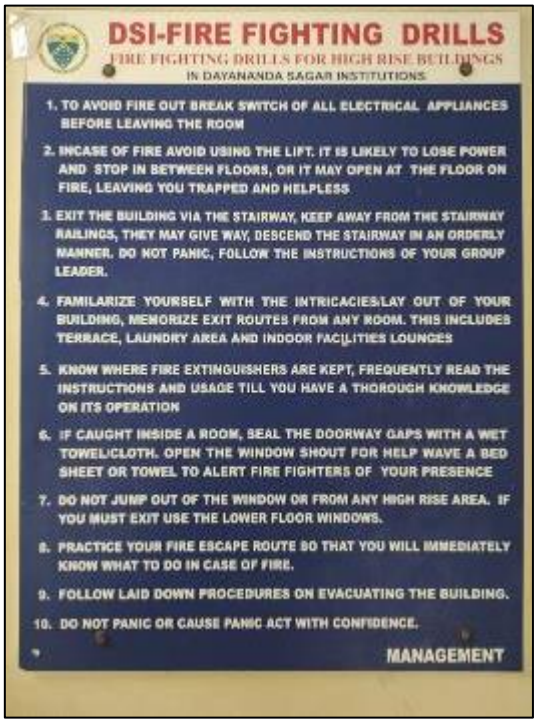


Figure 3-2: Sample photo Fire-fighting drill - procedure

3.2.3. Review of various measures implemented

During the Green Audit study, it was observed the college has taken various initiatives in conserving natural resources that include:

- Internal Audit team including Management, Staff and Students
- Rain water harvesting system has been implemented block-wise.
- Sensor based Wash Basin is installed at some places of DSCDS.
- Water flow meters are installed for water accounting
- Sewage treatment plant is available to treat the waste water of the entire campus and using the treated final water for gardening
- Installation of Solar Roof Top Photo Voltaic (SRTPV) system for power generation
- Solar water heaters and heat pump technology is used for Hot water requirements in the hostels
- Wheeling of Renewable Energy power supply from a third party agency to reduce the carbon footprints
- Installation of LED lights to reduce electricity consumption
- DSCDS infrastructure is well designed for good air circulation and maximum utilization of day light; to reduce the energy consumption
- Installation of LCD/LED monitors for all the desktops to conserve electricity
- Switching OFF lights and fans whenever not in use to save electricity
- Sensor based hand driers are used at the suitable locations near the hand wash areas
- Annual maintenance of UPS, Lifts and DG sets are carried out.
- Complaint registers and log books for DG fuel are maintained
- Installation of waste collection bins at each dental chair, all the class rooms, staff rooms and corridors.
- Regular cleaning practices are followed by maintenance team to maintain the campus clean and hygiene
- Food waste is collected separately in the canteen and given to piggeries.
- Bio medical waste are segregated at the source level using color coding bins and given Maridi Bio Industries Ltd.
- There are more than 750 trees and well-maintained landscaping. Campus is completely surrounded by trees and plantations.
- Environment day celebrations and sapling plantations were done every year.
- 'Quit Smoking' Poster is placed at the entrance of the Hospital to create awareness among all Staff, Students and patients.
- Encouragement is given to use Electric – Vehicles among all the staff and students.
- Training is conducted on regular basis regarding usage of fire extinguisher, conservation of resources such as electricity, water, food and green campus.

3.2.4. Site Walk through

Site walk through was conducted with staff members, students and audit team members. Staff and students have shown very keen interest in the data collection process and methods to be followed in field data collection. The staff and students have given inputs and suggestions for resource conservation as well.

College Infrastructure

DSCDS campus has two blocks. Each floor has its own state of the art of class rooms, staff rooms, laboratories libraries and many more.

The campus includes Dental college and various other courses including Engineering, MBA, Paramedical, etc., Few of the infrastructure facilities such as hostel, canteen, gym, play ground and parking are shared and utilized by students/ staffs of Dental college and various other courses including Engineering, MBA, Paramedical, etc.,

Details of infrastructure of DSCDS are shown in figure 3-2.

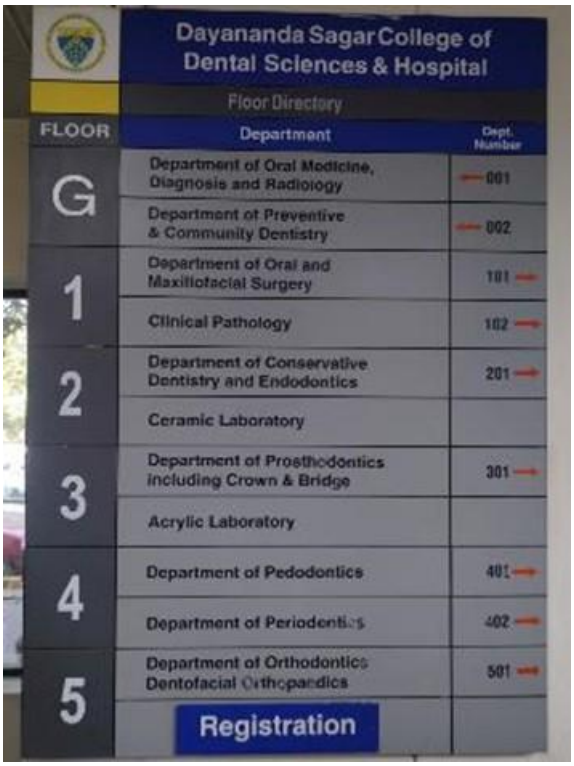


Figure 3-3: Infrastructure details

All the classrooms, staff rooms and corridors are well ventilated and the integration of day-light is well utilized. This has helped in optimum usage of electricity for lights and fans during day time.

3.2.5. Inventory Collection

To understand the types of appliances used, inventory collection was carried out by the audit team members. The various types of appliances used are lights, fans, geysers, RO water plants etc. The consolidated list of inventories is given in table 3-1.

S. No.	Description		Old Dental Block	New Dental Block	Total
1	Florescent Tube Light	36W	244	0	**244**
2	LED	18W TL	33	0	**33**
		2 x 10W	8	355	**363**
		6 W Downlight	0	33	**33**
		10 W Downlight	8	2	**10**
		12 W Downlight	3	172	**175**
		15 W Downlight	0	12	**12**
		9W Bulb	5	19	**24**
3	CFL	18 W	43	12	**55**
4	Fan	Ceiling Fan	91	166	**257**
		Wall mount Fan	5	0	**5**
		Pedestal Fan	6	6	**12**
5	Exhaust Fans	PVC blade	0	6	**6**
		Metal Blade	1	1	**2**

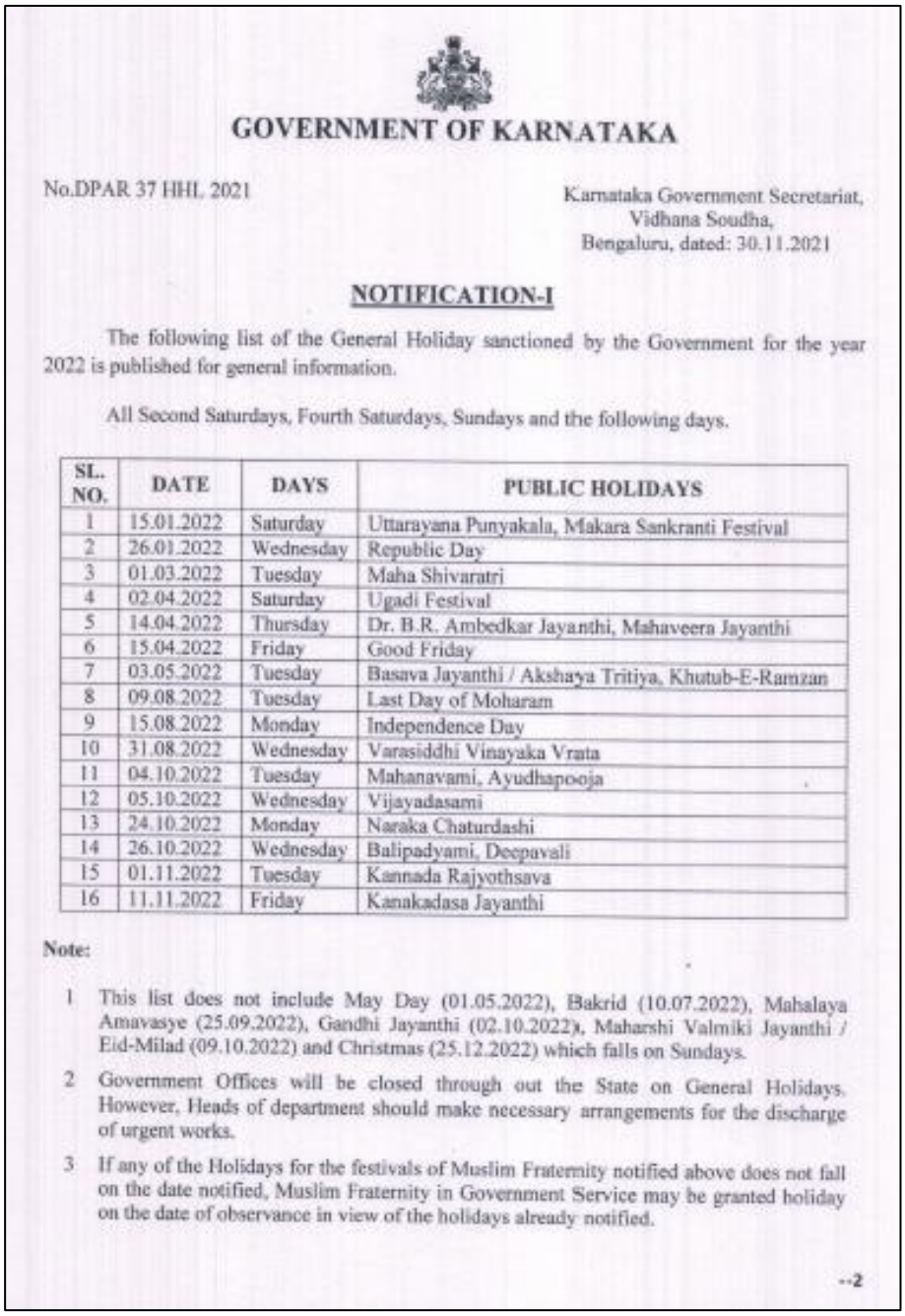
Table 3-1: Consolidated list of Inventories

3.2.6. Interviews

To collect the various data, information and operating patterns, interviews were conducted with college staff (Principal, teaching staff, non-teaching staff) and students. The consolidated information from the interviews is given in the following sub-sections.

3.2.6.1. List of Holidays:

The lists of holidays were collected during the study and the same is given in figure 3-3 and figure 3-4.



GOVERNMENT OF KARNATAKA

No.DPAR 37 HHL 2021

Karnataka Government Secretariat,
Vidhana Soudha,
Bengaluru, dated: 30.11.2021

NOTIFICATION-I

The following list of the General Holiday sanctioned by the Government for the year 2022 is published for general information.

All Second Saturdays, Fourth Saturdays, Sundays and the following days.

SL. NO.	DATE	DAYS	PUBLIC HOLIDAYS
1	15.01.2022	Saturday	Uttarayana Punyakala, Makara Sankranti Festival
2	26.01.2022	Wednesday	Republic Day
3	01.03.2022	Tuesday	Maha Shivaratri
4	02.04.2022	Saturday	Ugadi Festival
5	14.04.2022	Thursday	Dr. B.R. Ambedkar Jayanthi, Mahaveera Jayanthi
6	15.04.2022	Friday	Good Friday
7	03.05.2022	Tuesday	Basava Jayanthi / Akshaya Tritiya, Khutub-E-Ramzan
8	09.08.2022	Tuesday	Last Day of Moharam
9	15.08.2022	Monday	Independence Day
10	31.08.2022	Wednesday	Varasiddhi Vinayaka Vrata
11	04.10.2022	Tuesday	Mahanavami, Ayudhapooja
12	05.10.2022	Wednesday	Vijayadasami
13	24.10.2022	Monday	Naraka Chaturdashi
14	26.10.2022	Wednesday	Balipadyami, Deepavali
15	01.11.2022	Tuesday	Kannada Rajyothsava
16	11.11.2022	Friday	Kanakadasa Jayanthi

Note:

1 This list does not include May Day (01.05.2022), Bakrid (10.07.2022), Mahalaya Amavasye (25.09.2022), Gandhi Jayanthi (02.10.2022), Maharshi Valmiki Jayanthi / Eid-Milad (09.10.2022) and Christmas (25.12.2022) which falls on Sundays.

2 Government Offices will be closed through out the State on General Holidays. However, Heads of department should make necessary arrangements for the discharge of urgent works.

3 If any of the Holidays for the festivals of Muslim Fraternity notified above does not fall on the date notified, Muslim Fraternity in Government Service may be granted holiday on the date of observance in view of the holidays already notified.

--2

Figure 3-4: List of Holidays – 2022

3.2.6.2. Tentative Schedule of College:

The tentative schedule of the college is 08.00 AM to 4.00.PM. The house-keeping staff works from 08.00 AM to 05.30 PM. Essential areas like labs, library, security, gym, CCTV monitoring area work for extended hours i.e., for 12 to 14 hrs per day.

3.2.6.3. Staff and students of college:

The number of staff includes teaching, non-teaching, and house-keeping is given in the table 3-3. The number of students includes both boys and girls.

S. No.	Staff	Students
1	76	270

Table 3-2: Number of staff and students

4. WATER AUDIT

4.1. Facility description

The study involved carrying out various data collections, observations and analysis, to realistically assess water usage and potential for water conservation. The sources of water for facilitating the water supply to the college campus bore-wells, water bottles and tankers. Tanker water is purchased very rarely (only when there is scarcity of water from bore-well). The campus includes Dental college and various other courses including Engineering, MBA, Paramedical, etc., The raw water source, raw water treatment, water distribution system, waste water pipelines and sewage treatment plant is shared by Dental college and various other blocks including Engineering, MBA, Paramedical, etc.,.

The domestic (bore well) water is consumed in the following areas:

- Drinking (For RO Plant)
- Kitchen
- Cafeteria
- Practice floors of dental hospital
- Laboratory
- Cleaning
- Bathrooms
- Washing Utensils
- Washing Machines

Waste water sources are

- Labs (Drainage)
- Washrooms
- Canteen (Drainage)

4.1.1. Raw Water System

The raw water is consumed in the following areas:

- Washrooms
- Cleaning
- Laboratories

Nine number of bore well are installed at various locations of the campus. There are two number of underground water tanks (sumps) are made available and total 52 number of overhead water tanks are placed at different blocks. The water from borewell is pumped

to underground sump and then pumped to overhead tanks. This water distribution system is interconnected with each other.

All the water pump motors and the water levels of tanks are controlled by Automatic water level controllers installed at appropriate places. Total number of motors used for pumping with its rating is shown in the table 4-1.

S. No.	Quantity	Motor Rating in HP	Description
1	3	5	Near STP, Near Automobile block, Near NRI hostel
2	2	7.5	Near NEB, Old civil block
3	4	10	Staff parking – 2, MGVT Canteen, Students Parking

Table 4-1: Details of water pump motors

Water level controller installed at the main underground sump is as shown in the figure 4-1.

Figure 4-1: Raw water sump level controller

Water pump house in the campus contains all the water pump panels and water level controller displays of both underground and overhead tanks. A picture of the panel board has been taken and shown in the figure 4-2. Figure 4-3 depicts level controller switch and figure 4-4 shows one of the bore-well's pump panel with underground sump level controller.

The details of overhead tanks and underground tanks are:

- Total 52 numbers of overhead tanks have been installed in the terrace of different blocks of the campus and its break up with capacity is shown in table 4-2.
- Two numbers of underground tanks (sump) with storage capacity of 100 kL is available.

Table 4-2 details the number and the quantity of the tanks available in the campus and hence it is observed that different capacities of tanks with different quantity are available. Therefore, the table 4-3 tells the location of tanks at different blocks.

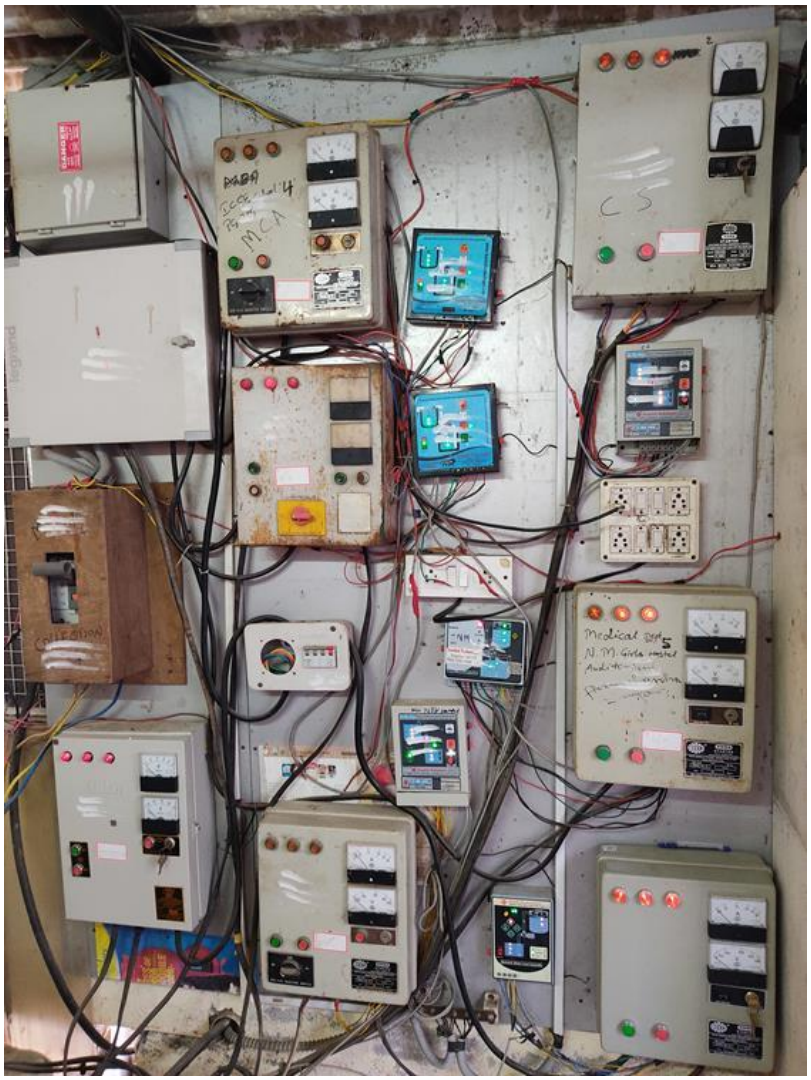


Figure 4-2: Pump house water controllers and meters

Figure 4-3: Level controller switch

Figure 4-4: Bore-well pump panel and level controller switch

S. No.	Capacity in Litres	Quantity
1	500	1
2	1000	2
3	2000	32
4	5000	17
5	100000	2

Table 4-2: Details of tank capacity

S. No.	Location	Description	Capacity	Quantity
1	Siva Temple	Over Head Tank	1000	1
2	New Dental Block	Over Head Tank	2000	1
		Over Head Tank	5000	1
3	Ganesha Temple	Over Head Tank	1000	1

S. No.	Location	Description	Capacity	Quantity
4	New Auditorium	Over Head Tank	5000	1
		Over Head Tank	2000	1
5	ICSE School	Over Head Tank	2000	2
6	MCA Department	Over Head Tank	5000	1
		Over Head Tank	2000	1
6	Residence	Over Head Tank	5000	5
		Underground Tank (sump)	100000	1
7	C.D. Sagar Block	Over Head Tank	2000	7
8	N E B	Over Head Tank	2000	6
		Main Underground Tank (Main Sump)	100000	1
9	S.P. Boys Hostel	Over Head Tank	5000	1
		Over Head Tank	2000	4
10	Computer Science	Over Head Tank	5000	5
11	Heritage Building	Over Head Tank	5000	3
		Over Head Tank	500	1
12	Medical Electronics	Over Head Tank	2000	2
13	Indian Student Mess	Over Head Tank	2000	1
14	New Architecture Building	Over Head Tank	2000	7
	Total Number of Tanks			54

Table 4-3: Details of tanks

Two number of Over -head Tanks are placed on the terrace of New dental block. One is of 2000 Litres and other is of 5000 Litres capacity.

4.1.2. Drinking Water System

Drinking water for staff is facilitated by water bottles storage units. Every day DSCDS purchase 13 water bottles each of 20 litres capacity to fulfill the drinking water facility to all teaching and non-teaching staff of the dental blocks.

Figure 4-5: Water cans - Drinking purpose

4.1.3. Rain Water Harvesting System

The college campus is on a hilly terrain and is very much suitable for rain water harvesting. The campus has small check bunds/trenches to arrest rainwater during rainy season as shown in the figure 4-6. The rainwater/runoff water is collected in harvesting pond constructed near parking area as shown in the figure 4-7.

Figure 4-6: Trenches and bunds in the campus

Figure 4-7: Rain water harvesting pond

Further, an open well which is situated within the campus is also used for rainwater harvesting and the same is shown in figure 4-8.

Figure 4-8: Open well

Percolation pits are installed near the students parking area in the campus and are shown in figure 4-9 and figure 4-10. The collected rain water is used for lawns and garden in the campus.

Figure 4-9: Rain water harvesting Percolation pit

Figure 4-10: Percolation pits for rain water harvesting

Run-away water around the dental blocks is collected in two number of 5000 Litres tanks. Picture of the tanks are shown in figure 4-11. This water is used for watering the plants and trees around the DSCDS.

Figure 4-11: RWH sump near dental blocks

Point recharge measures are taken to protect bore wells for sustainability of water management as shown in figure 4-12.

Figure 4-12: Point recharge for a Bore well

4.1.4. Hot water System

The hot water is mainly consumed in hostels for bathing purposes. The hot water requirement for bathing is met by solar water heater systems. Sample photo of Solar water heater is integrated with heat pump system is shown in figure 4-13.

Figure 4-13: Hot water system in hostel

Hot water for drinking purposes in the dental hospital premises is arranged by dispensers as shown in figure 4-14.

Figure 4-14: Drinking hot water system

4.1.5. Sewage Water System

Most of the institutional sewage generated to be treated and re-used for gardening purpose of the campus. All the sewage water generated from International hostel, Boys and girls' hostel and hostel's canteen is directed to Sewage water treatment plant (STP) for tertiary treatment (Extended Aeration-ASP). The recycled water will be used for gardening/horticulture purpose. This STP is of 180 KLD capacities. Sample photo of STP is as shown in the figure 4-15 and 4-16.

Figure 4-15: STP

Figure 4-16: STP Plant

The working of STP in a schematic representation is shown in the figure 4-17.

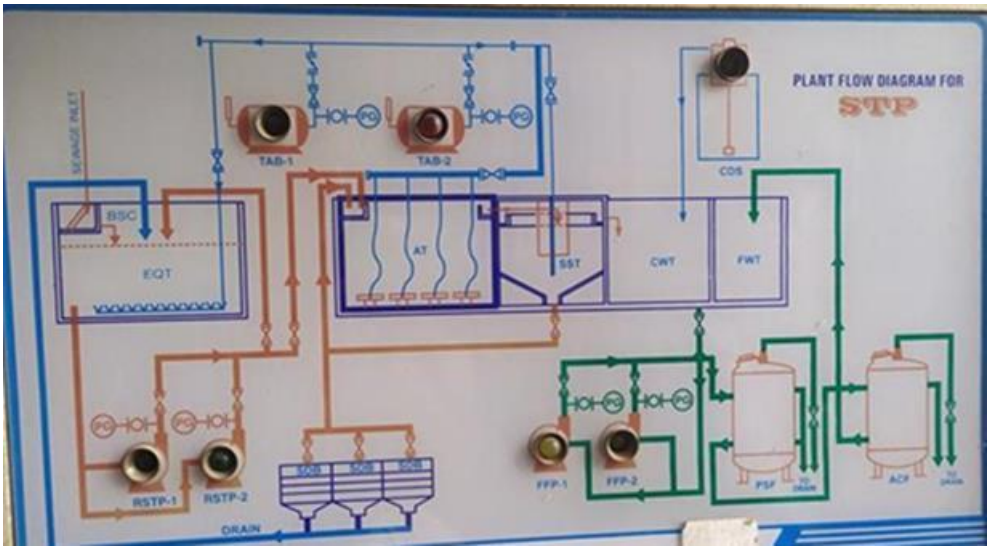


Figure 4-17: Schematic flow diagram of STP

The STP plant specifications can be seen from the table 4-4.

S. No.	Description	Details
1.	Number of STP plants installed	1
2.	Capacity of STP	180 KLD
3.	Technology of STP	SBR
4.	Year of Installation	20+ year old
5.	Schematic / Layout of STP	YES
6.	Water flow meters installed	YES
7.	Quantity of Sludge	800 kg/year
8.	Disposal of Sludge	Drying bed

Table 4-4: Details of STP

Electrical equipment's used in STP are bar screening, evaporation tank, SBR units, sludge draying beds, sand filter and carbon filter.

The processed water from the STP is well utilized for watering plants, trees and maintaining lawns of the entire campus, some of the pictures collected during audit are as shown in figure 4-18.

Figure 4-18: Greenery maintained by STP processed water

4.2. Best Practices Implemented for Water Conservation

4.2.1. Sensor based Wash Basin

To conserve water, in some area's sensor-based hand wash is installed in the DSCDS. Sample photo is shown in the figure 4-19.

Figure 4-19: Sensors based wash basin

4.2.2. Water Flow meters

A water meter is a device that is used to track water usage. It helps, not just in monitoring consumption but also to save money incurred on electricity used to pump the water and also energy consumption for functioning of sewage treatment plants.

In the campus there are Sixteen number of water flow meters. Eight number of flow meters for pumps at the borewells another eight number of flow meters at the pumps used to pump the water from the sump to over-head tanks. Sample photo of a water flow meter is shown in figure 4-20.

Figure 4-20: Sample photo of flow meter

Log books are maintained for all the flow meters. Some of the sample photos of log book are shown in figure 4-21 and figure 4-22

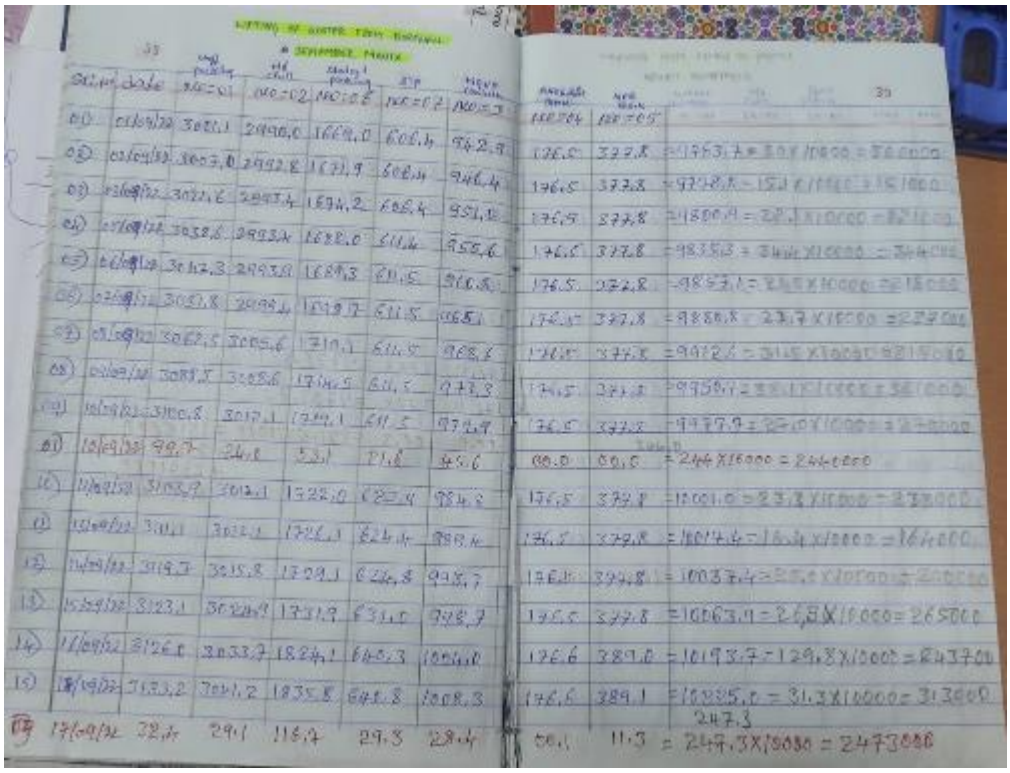


Figure 4-21: Sample photo of logbook of borewell water flow meter

Figure 4-22: Sample photo of logbook of sump to OHT water flow meter

4.2.3. Rain water harvesting

Rainwater harvesting is the simple process or technology used to conserve rainwater by collecting, conveying, purifying and storing of rainwater for later use.

The benefits of rainwater harvesting system are listed below.

- Helps in reducing the water bill.
- Decreases the demand for water.
- Reduces the need of bore well water
- Promotes both water and energy conservation
- Improves the quality and quantity of groundwater
- It is an excellent source of water for landscape irrigation

Run away water around the dental blocks are collected in two number of 5000 Litres tanks. Picture of the tanks are shown in figure 4-23.

Figure 4-23: RWH sump near dental blocks

4.2.4. Sewage Treatment Plant

The procedure for removing contaminants from the wastewater basically from the household sewage is called sewage treatment. It has to undergo the chemical, physical and biological procedure to remove these contaminants and give out an environmentally safe treated effluent. A semi-solid slurry called the sewage sludge is the by-product of the sewage treatment. This sludge is further processed before it is suitable for land application.

The institution has installed STP with capacity of 180 kLPD and the quantity of final treated water is 75% of the total capacity, which is 135 kLPD.

The details of water savings and cost savings due to installation of STP is given in table 4-5.

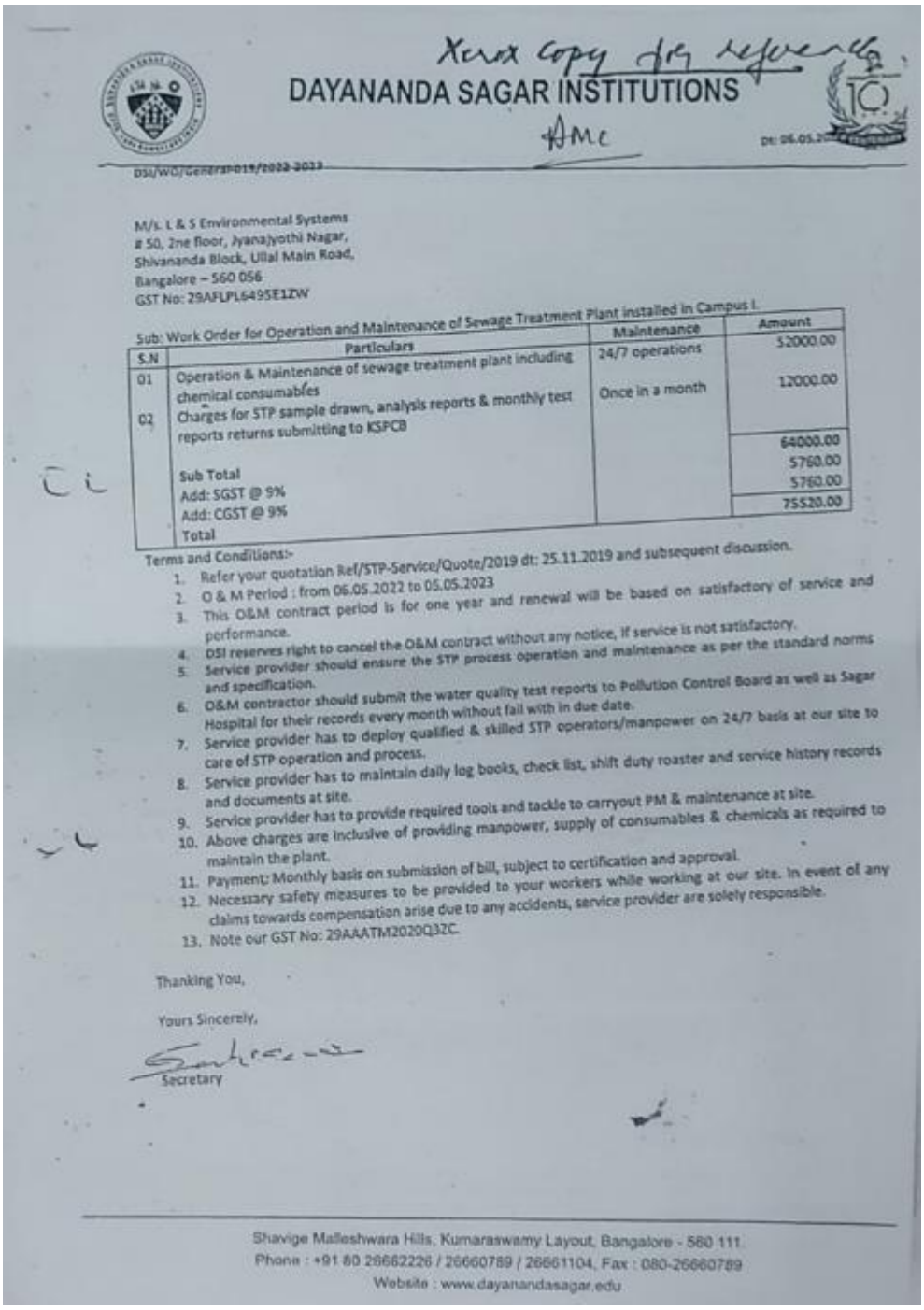
S. No.	Description	Unit	Details
1	STP capacity	kLPD	180.0
2	Quantity of final treated water from STP	kLPD	135.0
3	Quantity of water reused @ 50% utilization factor	kLPD	67.5
4	No. of working days per year	days	280.0
5	Annual Quantity of water reused (saved)	kLPD	18,900.0
6	Average water cost	Rs./Litre	0.086
7	Annual cost savings achieved	Rs. lakh/year	16.25

Table 4-5: Annual water and cost savings by installation of STP

STP treated water is used for gardening. Sample photo is shown in figure 4-24.

Figure 4-24: Greenery maintained by STP treated water

STP annual maintenance done by third party. Sample copy of AMC is given in figure 4-25.



Xerox copy for reference.

DAYANANDA SAGAR INSTITUTIONS

AMC

DSI/WO/General-019/2022-2023

Dt: 06.05.2022

M/s. L & S Environmental Systems
50, 2ne floor, Jyana Jyothi Nagar,
Shivananda Block, Ullal Main Road,
Bangalore – 560 056
GST No: 29AFLPL6495E1ZW

Sub: Work Order for Operation and Maintenance of Sewage Treatment Plant installed in Campus I.

S.N	Particulars	Maintenance	Amount
01	Operation & Maintenance of sewage treatment plant including chemical consumables	24/7 operations	52000.00
02	Charges for STP sample drawn, analysis reports & monthly test reports returns submitting to KSPCB	Once in a month	12000.00
	Sub Total		64000.00
	Add: SGST @ 9%		5760.00
	Add: CGST @ 9%		5760.00
	Total		75520.00

Terms and Conditions:-

1. Refer your quotation Ref/STP-Service/Quote/2019 dt: 25.11.2019 and subsequent discussion.
2. O & M Period : from 06.05.2022 to 05.05.2023
3. This O&M contract period is for one year and renewal will be based on satisfactory of service and performance.
4. DSI reserves right to cancel the O&M contract without any notice, if service is not satisfactory.
5. Service provider should ensure the STP process operation and maintenance as per the standard norms and specification.
6. O&M contractor should submit the water quality test reports to Pollution Control Board as well as Sagar Hospital for their records every month without fail with in due date.
7. Service provider has to deploy qualified & skilled STP operators/manpower on 24/7 basis at our site to care of STP operation and process.
8. Service provider has to maintain daily log books, check list, shift duty roaster and service history records and documents at site.
9. Service provider has to provide required tools and tackle to carryout PM & maintenance at site.
10. Above charges are inclusive of providing manpower, supply of consumables & chemicals as required to maintain the plant.
11. Payment: Monthly basis on submission of bill, subject to certification and approval.
12. Necessary safety measures to be provided to your workers while working at our site. In event of any claims towards compensation arise due to any accidents, service provider are solely responsible.
13. Note our GST No: 29AAATM2020Q3ZC.

Thanking You,

Yours Sincerely,

Secretary

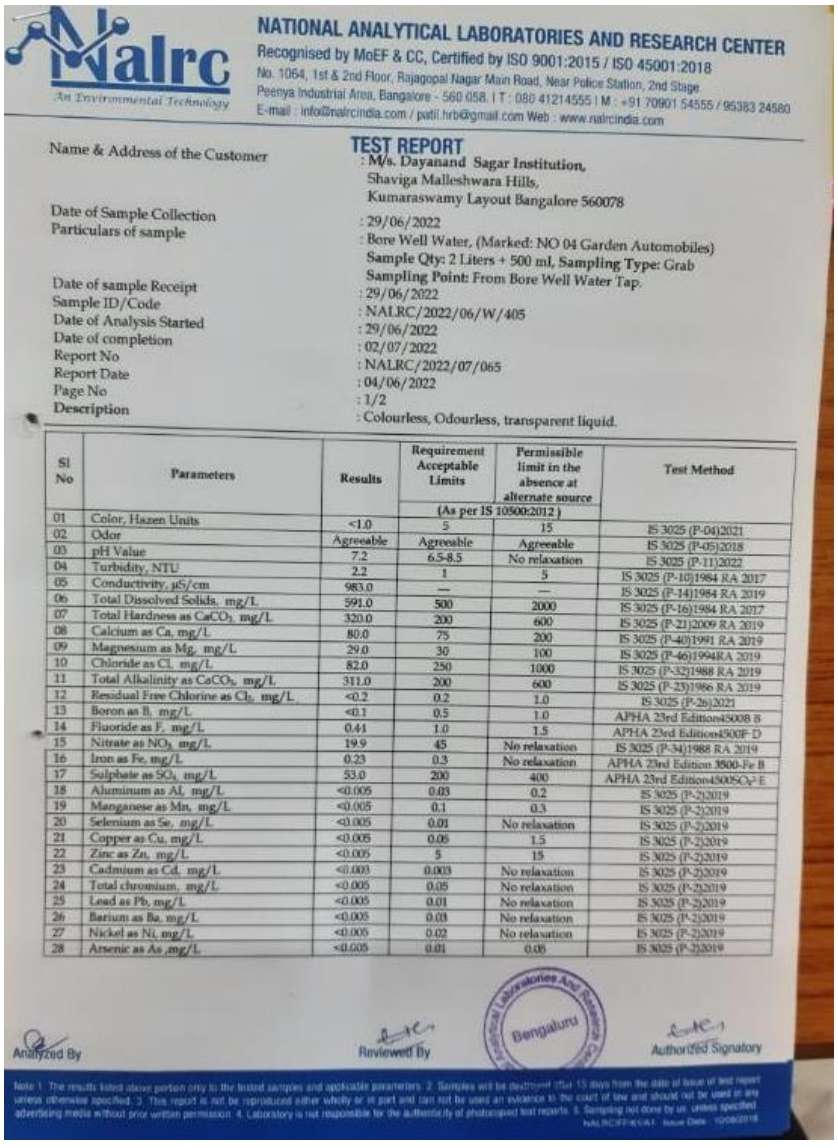
Shavige Malleshwara Hills, Kumaraswamy Layout, Bangalore - 560 111
Phone : +91 80 26662226 / 26660789 / 26661104, Fax : 080-26660789
Website : www.dayanandasagar.edu

Figure 4-25: Sample photo of STP – AMC copy

4.2.5. Regular testing of water quality

Testing water quality on a regular basis is an important part of maintaining a safe and reliable source. The test result allows to properly addressing the specific problems of a water supply. This will help ensure that the water source is being properly protected from potential contamination, and that appropriate treatment is selected and operating properly.

It is important to test the suitability of water quality for its intended use, whether it be livestock watering, chemical spraying, or drinking water. This will assist in making informed decisions about water and how to use it. Sample photos of water testing reports are shown in figure 4-26 to figure 4-28.



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No. 1064, 1st & 2nd Floor, Rajagopal Nagar Main Road, Near Police Station, 2nd Stage, Peenya Industrial Area, Bangalore - 560 058. | T : 080 41214555 | M : +91 70901 54555 / 95383 24580

E-mail : info@nalrcindia.com / patil.hrb@gmail.com Web : www.nalrcindia.com

TEST REPORT

Name & Address of the Customer : M/s. Dayanand Sagar Institution, Shaviga Malleshwara Hills, Kumaraswamy Layout Bangalore 560078

Date of Sample Collection : 29/06/2022

Particulars of sample : Bore Well Water, (Marked: NO 04 Garden Automobiles) **Sample Qty:** 2 Liters + 500 ml, **Sampling Type:** Grab **Sampling Point:** From Bore Well Water Tap.

Date of sample Receipt : 29/06/2022

Sample ID/Code : NALRC/2022/06/W/405

Date of Analysis Started : 29/06/2022

Date of completion : 02/07/2022

Report No : NALRC/2022/07/065

Report Date : 04/06/2022

Page No : 1/2

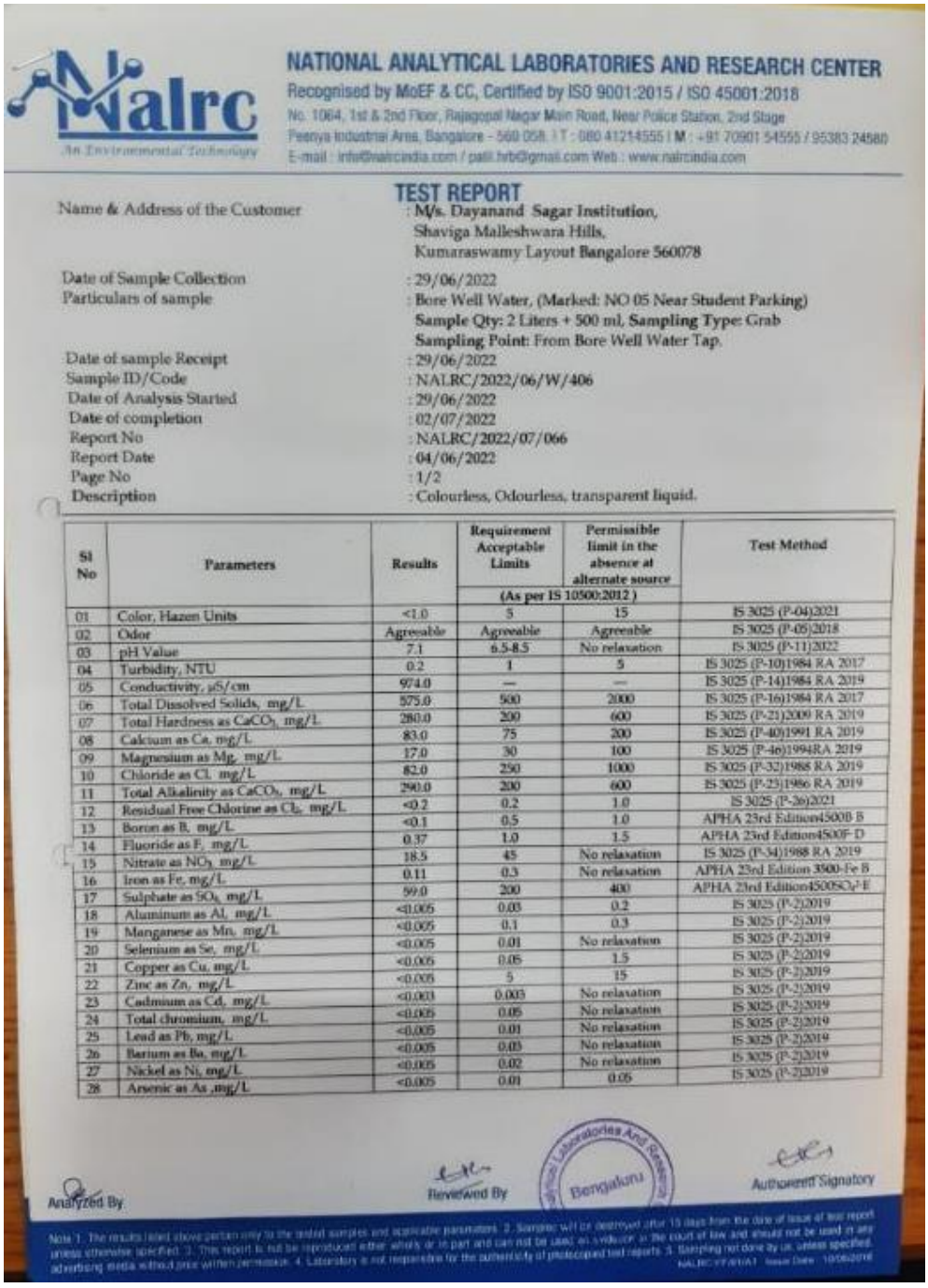
Description : Colourless, Odourless, transparent liquid.

Sl No	Parameters	Results	Requirement Acceptable Limits	Permissible limit in the absence at alternate source	Test Method
			(As per IS 10500:2012)		
01	Color, Hazen Units	<1.0	5	15	IS 3025 (P-04)2021
02	Odor	Agreeable	Agreeable	Agreeable	IS 3025 (P-05)2018
03	pH Value	7.2	6.5-8.5	No relaxation	IS 3025 (P-11)2022
04	Turbidity, NTU	2.2	1	5	IS 3025 (P-10)1984 RA 2017
05	Conductivity, µS/cm	983.0	—	—	IS 3025 (P-14)1984 RA 2019
06	Total Dissolved Solids, mg/L	591.0	500	2000	IS 3025 (P-16)1984 RA 2017
07	Total Hardness as $CaCO_3$ mg/L	320.0	200	600	IS 3025 (P-21)2009 RA 2019
08	Calcium as Ca, mg/L	80.0	75	200	IS 3025 (P-40)1991 RA 2019
09	Magnesium as Mg, mg/L	29.0	30	100	IS 3025 (P-46)1994RA 2019
10	Chloride as Cl, mg/L	82.0	250	1000	IS 3025 (P-32)1988 RA 2019
11	Total Alkalinity as $CaCO_3$, mg/L	311.0	200	600	IS 3025 (P-23)1986 RA 2019
12	Residual Free Chlorine as Cl_2, mg/L	<0.2	0.2	1.0	IS 3025 (P-26)2021
13	Boron as B, mg/L	<0.1	0.5	1.0	APHA 23rd Edition4500B B
14	Fluoride as F, mg/L	0.41	1.0	1.5	APHA 23rd Edition4500F D
15	Nitrate as NO_3, mg/L	19.9	45	No relaxation	IS 3025 (P-34)1988 RA 2019
16	Iron as Fe, mg/L	0.23	0.3	No relaxation	APHA 23rd Edition 3500-Fe B
17	Sulphate as SO_4, mg/L	53.0	200	400	APHA 23rd Edition4500SO_4^{2-}E
18	Aluminum as Al, mg/L	<0.005	0.03	0.2	IS 3025 (P-2)2019
19	Manganese as Mn, mg/L	<0.005	0.1	0.3	IS 3025 (P-2)2019
20	Selenium as Se, mg/L	<0.005	0.01	No relaxation	IS 3025 (P-2)2019
21	Copper as Cu, mg/L	<0.005	0.05	1.5	IS 3025 (P-2)2019
22	Zinc as Zn, mg/L	<0.005	5	15	IS 3025 (P-2)2019
23	Cadmium as Cd, mg/L	<0.003	0.003	No relaxation	IS 3025 (P-2)2019
24	Total chromium, mg/L	<0.005	0.05	No relaxation	IS 3025 (P-2)2019
25	Lead as Pb, mg/L	<0.005	0.01	No relaxation	IS 3025 (P-2)2019
26	Barium as Ba, mg/L	<0.005	0.03	No relaxation	IS 3025 (P-2)2019
27	Nickel as Ni, mg/L	<0.005	0.02	No relaxation	IS 3025 (P-2)2019
28	Arsenic as As ,mg/L	<0.005	0.01	0.05	IS 3025 (P-2)2019

Analyzed By | Reviewed By | Bengaluru | Authorized Signatory

Note 1. The results listed above pertain only to the tested samples and applicable parameters. 2. Samples will be destroyed after 15 days from the date of issue of test report unless otherwise specified. 3. This report is not be reproduced either wholly or in part and can not be used an evidence in the court of law and should not be used in any advertising media without prior written permission. 4. Laboratory is not responsible for the authenticity of photocopied test reports. 5. Sampling not done by us unless specified

Figure 4-26: Sample water test report of Borewell-1



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E-mail : info@nalrcindia.com / patil.hrb@gmail.com Web : www.nalrcindia.com

TEST REPORT

Name & Address of the Customer : M/s. Dayanand Sagar Institution,
Shaviga Malleshwara Hills,
Kumaraswamy Layout Bangalore 560078

Date of Sample Collection : 29/06/2022
Particulars of sample : Bore Well Water, (Marked: NO 05 Near Student Parking)
Sample Qty: 2 Liters + 500 ml, **Sampling Type:** Grab
Sampling Point: From Bore Well Water Tap.
Date of sample Receipt : 29/06/2022
Sample ID/Code : NALRC/2022/06/W/406
Date of Analysis Started : 29/06/2022
Date of completion : 02/07/2022
Report No : NALRC/2022/07/066
Report Date : 04/06/2022
Page No : 1/2
Description : Colourless, Odourless, transparent liquid.

Sl No	Parameters	Results	Requirement Acceptable Limits	Permissible limit in the absence at alternate source	Test Method
			(As per IS 10500:2012)		
01	Color, Hazen Units	<1.0	5	15	IS 3025 (P-04)2021
02	Odor	Agreeable	Agreeable	Agreeable	IS 3025 (P-05)2018
03	pH Value	7.1	6.5-8.5	No relaxation	IS 3025 (P-11)2022
04	Turbidity, NTU	0.2	1	5	IS 3025 (P-10)1984 RA 2017
05	Conductivity, µS/cm	974.0	—	—	IS 3025 (P-14)1984 RA 2019
06	Total Dissolved Solids, mg/L	575.0	500	2000	IS 3025 (P-16)1984 RA 2017
07	Total Hardness as $CaCO_3$, mg/L	280.0	200	600	IS 3025 (P-21)2009 RA 2019
08	Calcium as Ca, mg/L	83.0	75	200	IS 3025 (P-40)1991 RA 2019
09	Magnesium as Mg, mg/L	17.0	30	100	IS 3025 (P-46)1994RA 2019
10	Chloride as Cl, mg/L	82.0	250	1000	IS 3025 (P-32)1988 RA 2019
11	Total Alkalinity as $CaCO_3$, mg/L	290.0	200	600	IS 3025 (P-23)1986 RA 2019
12	Residual Free Chlorine as Cl_2, mg/L	<0.2	0.2	1.0	IS 3025 (P-26)2021
13	Boron as B, mg/L	<0.1	0.5	1.0	APHA 23rd Edition4500B-B
14	Fluoride as F, mg/L	0.37	1.0	1.5	APHA 23rd Edition4500F-D
15	Nitrate as NO_3, mg/L	18.5	45	No relaxation	IS 3025 (P-34)1988 RA 2019
16	Iron as Fe, mg/L	0.11	0.3	No relaxation	APHA 23rd Edition 3500-Fe B
17	Sulphate as SO_4, mg/L	59.0	200	400	APHA 23rd Edition4500SO_4^{2-}E
18	Aluminum as Al, mg/L	<0.005	0.03	0.2	IS 3025 (P-2)2019
19	Manganese as Mn, mg/L	<0.005	0.1	0.3	IS 3025 (P-2)2019
20	Selenium as Se, mg/L	<0.005	0.01	No relaxation	IS 3025 (P-2)2019
21	Copper as Cu, mg/L	<0.005	0.05	1.5	IS 3025 (P-2)2019
22	Zinc as Zn, mg/L	<0.005	5	15	IS 3025 (P-2)2019
23	Cadmium as Cd, mg/L	<0.003	0.003	No relaxation	IS 3025 (P-2)2019
24	Total chromium, mg/L	<0.005	0.05	No relaxation	IS 3025 (P-2)2019
25	Lead as Pb, mg/L	<0.005	0.01	No relaxation	IS 3025 (P-2)2019
26	Barium as Ba, mg/L	<0.005	0.03	No relaxation	IS 3025 (P-2)2019
27	Nickel as Ni, mg/L	<0.005	0.02	No relaxation	IS 3025 (P-2)2019
28	Arsenic as As ,mg/L	<0.005	0.01	0.05	IS 3025 (P-2)2019

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Reviewed By

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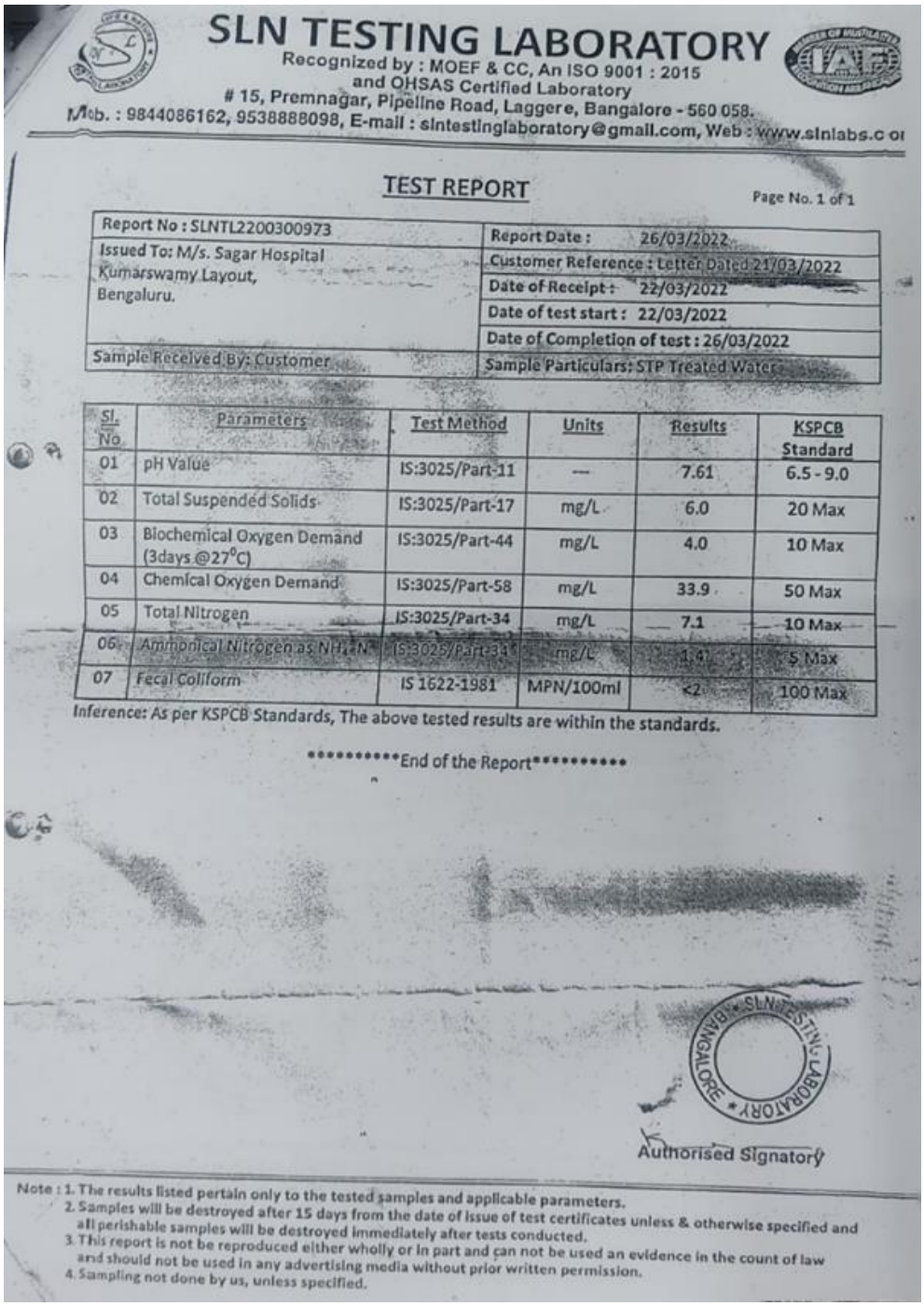
Figure 4-27: Sample water test report of Borewell-2



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Mob. : 9844086162, 9538888098, E-mail : slntestinglaboratory@gmail.com, Web : www.slnlabs.c o

TEST REPORT

Page No. 1 of 1

Report No : SLNTL2200300973	Report Date : 26/03/2022
Issued To: M/s. Sagar Hospital Kumarswamy Layout, Bengaluru.	Customer Reference : Letter Dated 21/03/2022
	Date of Receipt : 22/03/2022
	Date of test start : 22/03/2022
	Date of Completion of test : 26/03/2022
Sample Received By: Customer	Sample Particulars: STP Treated Water

Sl. No	Parameters	Test Method	Units	Results	KSPCB Standard
01	pH Value	IS:3025/Part-11	---	7.61	6.5 - 9.0
02	Total Suspended Solids	IS:3025/Part-17	mg/L	6.0	20 Max
03	Biochemical Oxygen Demand (3days @27°C)	IS:3025/Part-44	mg/L	4.0	10 Max
04	Chemical Oxygen Demand	IS:3025/Part-58	mg/L	33.9	50 Max
05	Total Nitrogen	IS:3025/Part-34	mg/L	7.1	10 Max
06	Ammonical Nitrogen as NH_4N	IS:3025/Part-34	mg/L	1.4	5 Max
07	Fecal Coliform	IS 1622-1981	MPN/100ml	<2	100 Max

Inference: As per KSPCB Standards, The above tested results are within the standards.

**********End of the Report**********

SLN TESTING LABORATORY BANGALORE

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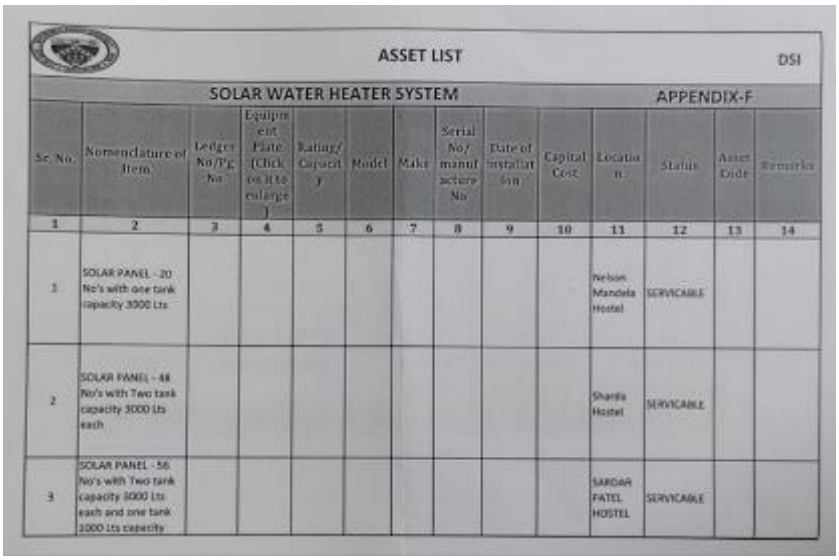
Note : 1. The results listed pertain only to the tested samples and applicable parameters.
2. Samples will be destroyed after 15 days from the date of issue of test certificates unless & otherwise specified and all perishable samples will be destroyed immediately after tests conducted.
3. This report is not be reproduced either wholly or in part and can not be used an evidence in the count of law and should not be used in any advertising media without prior written permission.
4. Sampling not done by us, unless specified.

Figure 4-28: Sample copy of STP treated water test report

4.2.6. Solar Water Heaters (SWH) in Hostels:

Three number of Solar Water Heaters (SWH) are installed with each 3000 Litres capacity at three hostels, namely: NM Hostel, Sharda Hostel and SP Hostel. Details of the SWH are given in figure 4-29.



ASSET LIST — DSI

SOLAR WATER HEATER SYSTEM — APPENDIX-F

Sr. No.	Nomenclature of Item	Ledger No/Pg No	Equipment Plate (Click on it to enlarge)	Rating/ Capacity	Model	Make	Serial No/ manufacturers No	Date of installation	Capital Cost	Location	Status	Asset Code	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	SOLAR PANEL - 20 No's with one tank capacity 3000 Lts									Nelson Mandela Hostel	SERVICABLE		
2	SOLAR PANEL - 48 No's with Two tank capacity 3000 Lts each									Sharda Hostel	SERVICABLE		
3	SOLAR PANEL - 56 No's with Two tank capacity 3000 Lts each and one tank 1000 Lts capacity									SARDAR PATEL HOSTEL	SERVICABLE		

Figure 4-29: Solar water heaters - details

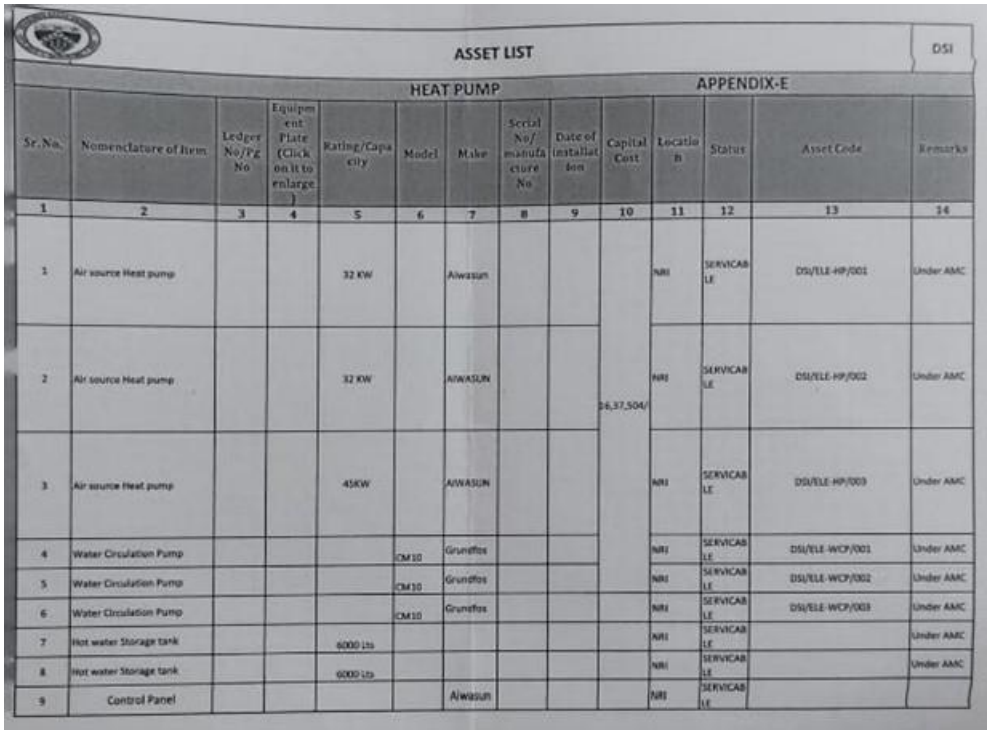
Savings achieved due to Solar water heating system are tabulated in table 4-6.

S. No.	Description	Unit	Values
1	Solar water heater installed	L	9000
2	Total amount of heat produced	kCal/hr	270000
3	Electricity equivalent	kWh	313.95
4	No. of working days per year	days	280
5	Annual electricity savings	kWh	87906
6	Average electricity cost	Rs./kWh	9
7	Annual cost savings achieved per year	Rs. lakh/year	7.91
8	CO2 mitigations per year	Tons/year	74.72

Table 4-6: Savings achieved due to Solar water heaters

4.2.7. Heat pump systems

There are three heat pump systems installed at the NRI hostel terrace. Details of the Heat pump is shown in figure 4-30.



ASSET LIST

DSI

HEAT PUMP

APPENDIX-E

Sr. No.	Nomenclature of Item	Ledger No/Pg No	Equipment Plate (Click on it to enlarge)	Rating/Capacity	Model	Make	Serial No/ manufacture No	Date of installation	Capital Cost	Location	Status	Asset Code	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Air source Heat pump			32 KW		Aiwasun				NRI	SERVICABLE	DSI/ELE-HP/001	Under AMC
2	Air source Heat pump			32 KW		AIWASUN			26,37,504/	NRI	SERVICABLE	DSI/ELE-HP/002	Under AMC
3	Air source Heat pump			45KW		AIWASUN				NRI	SERVICABLE	DSI/ELE-HP/003	Under AMC
4	Water Circulation Pump				CM10	Grundfos				NRI	SERVICABLE	DSI/ELE-WCP/001	Under AMC
5	Water Circulation Pump				CM10	Grundfos				NRI	SERVICABLE	DSI/ELE-WCP/002	Under AMC
6	Water Circulation Pump				CM10	Grundfos				NRI	SERVICABLE	DSI/ELE-WCP/003	Under AMC
7	Hot water Storage tank			6000 Lts						NRI	SERVICABLE		Under AMC
8	Hot water Storage tank			6000 Lts						NRI	SERVICABLE		Under AMC
9	Control Panel					Aiwasun				NRI	SERVICABLE		

Figure 4-30: Heat pump details

Savings achieved due to adoption of heat pump system is detailed in the table 4-7.

S. No.	Description	Unit	Details
1	Heat Pump Capacity	kW	77
2	Input Power required for heat pump	kW	19
3	Difference in electrical power	kW	58
4	Energy savings per heat pump per day (Considering 4 hours of working)	kWh	19
5	Total number of heat pumps installed	no.	3
6	Total energy savings from 3 numbers of heat pumps	kWh	58
7	No. of working days per year	days	280
8	Annual electricity savings	kWh	16170
9	Average electricity cost	Rs./kWh	8
10	Annual cost savings achieved per year	Rs. lakh/year	1
11	CO2 mitigations per year	Tons/year	14

Table 4-7: Savings achieved due to Heat pumps

4.2.8. Poster to Save Water

Sign boards have been placed in the wash rooms and canteen to create awareness for water conservation, sample photos are shown in figure 4-31.

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Figure 4-31: Sample photo - 1 'Save Water'

4.2.9. Maintenance Team

The college has a separate maintenance team. The maintenance team performs regular monitoring of the water distribution system which involves general monitoring of the system, identifying and arresting of leakages, keep track of water requirement and ensuring availability of required water quantity, maintain and provide for the safe condition and operation of entire water distribution systems.

Proper operation and maintenance of sewage treatment plant ensures it will perform as designed to treat and safely dispose of sewage from the establishment and maximizes the efficiency of waste water treatment system.

During the audit, walk through survey was carried out to observe the maintenance of the water distribution system, log registers, preventive maintenance etc., The entire water distribution system is maintained clean and tidy. The water storing sumps, pumping sections, distribution lines, toilets, wash rooms and other water consumption points is found to be well maintained

4.2.10. Other measures implemented for water conservation

- Regular checking and maintenance of pipelines are done to control water wastage and complaint register is maintained to attend the complaints

- Leakage old taps are replaced by new aerator taps

4.3. Recommendations

4.3.1. Aerators for taps

The aerator is a small attachment that either fits onto the end of the tap or can be inserted inside of the existing spout. These water saving devices will control the amount of water that flows through the tap without affecting the water pressure as they mix the water with air which will save water and money.

The aerators will separate a single flow of water into many tiny streams which introduces the air in to the water flow. Also, as there is less space for the water to flow through, the water flow is reduced, resulting in water savings. As the water pressure is maintained, most people don't notice a difference in the amount of water coming out of an aerated faucet yet benefit from the water efficiency.

Tap aerators are of most use to those with older taps which run on average around 15 Litres of water per minute. Adding an aerator to an older tap can reduce this to as little as 6 Litres of water per minute.

The biggest water saving benefit is achieved in the hand wash / kitchen sinks where you are often turning the taps on and off to wash your hands and for other uses.
The aerator tap is shown in figure 4-32.

Figure 4-32: Sample photo - Aerators for taps

Tap aerators can save as much as up to half your water usage through this way. When you are using aerated water, you are unlikely to notice the difference except for saving water resulting in lower bills.

4.3.2. Dual Piping System

Dual piping system can be implemented to reduce the usage raw water. Dual piping is a system of plumbing installations used to supply both raw water and STP treated water. Under this system, two completely separate water piping systems are used to deliver water to the user. The STP treated final water can be used for flushing in the toilets. The conventional system and dual piping systems are shown in figure 4-33 and 4-34.

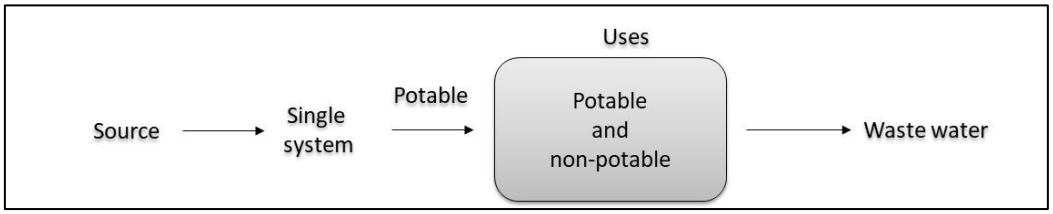

Figure 4-33: Single piping systems

The single conventional system is linear and draws from a source to provide potable water, which is used for all uses and becomes wastewater, which is disposed to the environment.

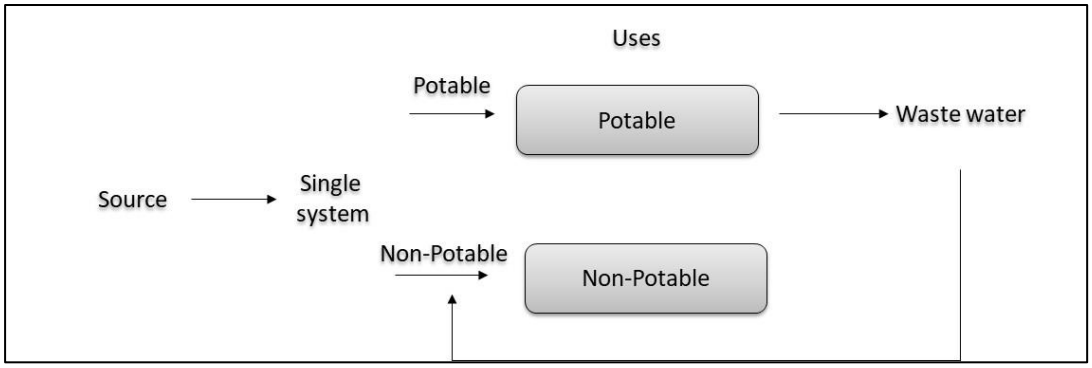

Figure 4-34: Dual piping systems

The dual system offers additional possibilities. It offers the possibility to cut the volume of wastewater that must be discharged to the environment, reduce the volume of water needed from the source. It is possible that the potable water infrastructure could then be downsized, depending on the situation.

4.3.3. Other recommendations

- Water conservation awareness campaigns
- Rain water harvesting for the terrace can be made to utilize rain water at large requirement.

5. ENERGY AUDIT

5.1. Facility Description

DSI campus receives power supply from the state electricity board (BESCOM – Bangalore Electricity Supply Company Limited) as HT 11 kV. DSI has availed power supply, with connection – RR. No 5313062791 (S5HT36).

Incoming power supply from BESCOM is received at the transformer yard inside the college premises. The 11 kV rated HT power supply is stepped down to LT 415 V, by one number of 1600 kVA rated transformer. Transformer unit installed inside college premises is as shown in the figure 5-1. The campus has one source of power supply, which caters power supply to Dental college and various other blocks including Engineering, MBA, Paramedical, etc.,

Figure 5-1: Transformer unit Installed in the campus

The name plate details of transformer are given in table 5-1.

S. No.	Description	Units	Details
1	Company	-	Subhasri Enterprises, Bangalore
2	Capacity	kVA	1600
3	Volts at No Load	HV	11000
4		LV	433
5	Amperes	HV	84
6		LV	2133
7	Phase	HV	Three-Delta
8		LV	Three-Star

S. No.	Description	Units	Details
9	Reference Specification	-	IS 2026
10	Insulation Level	-	LI 75 AC 28/3
11	Mfg. Year	-	2008
12	Serial No	-	810360
13	Frequency	Hz	50
14	Impedance Volts	-	6.50%
15	Vector Group	-	Dyn 11
16	Type of Cooling	-	ONAN
17	Core & Windings	kg	1900
18	Oil	kg	1000
19	Oil	Litres	1125
20	Total Mass	kg	5000
21	Transport Mass	kg	4000

Table 5-1: Name plate details of transformer

11 kV HT supply received at RMU. Then it is given to 1600 kVA transformer. Transformer step-downs 11kV voltage to 415 V. The LT supply from the transformer is taken to the main distribution panel. Electrical panel room is as shown in the figure 5-2. From the main distribution panel supply goes to Feeder pillar 1, NRI block, hospital and capacitor bank section and heritage block.

Feeder pillar 1 acts as loop to serve other feeder pillars. Table 3-12 details the complete description of fifteen feeder pillars distributing power supply to the entire campus.

Figure 5-2: Electrical Panel Room

S. No	Panel Name	Incoming Supply from	Connected Blocks
1	Main Panel Board	1600 kVA, 11kV/415V Outdoor Transformer	Spare
			NRI Block
			Hospital
			350 kVAr ACP Panel
			Spare
		1600 kVA, 11kV/415V Outdoor Transformer / 500kVA DG Set	Heritage Block
			Feeder Pillar 1
2	Feeder Pillar 1	Main Panel Board	Feeder Pillar 2
			Feeder Pillar 3
3	Feeder Pilar 2	Feeder Pillar 1	Architect Building
			PGDM
			ICSC School
			New Building Block (No. 13)
			MCA & Electronics Block
4	Feeder Pillar 3	Feeder Pillar 1	Indian Ladies Hostel
			Computer Science Lab
5	Feeder Pillar 4	Feeder Pillar 2	CD Sagar Fountain
			CD Sagar 1st, 2nd Floor Lab & 4th Floor AC
6	Feeder Pillar 5		Chemistry Chemical Old Pharmacy
			Spare 1
			Spare 2
			Spare 3
			Spare 4
7	Feeder Pillar 6	Feeder Pillar 5	IM
			Street Light Control
			Spare -1
			Spare -2
8	Feeder Pillar 7	Feeder Pillar 8	Automobile
			NEB
			Mechanical Panel Room
			Mechanical
9	Feeder Pillar 8	Feeder Pillar 2 / 250kVA DG	Spare 1
			Spare 2
			Spare 3
			Spare 4

S. No	Panel Name	Incoming Supply from	Connected Blocks
10	Feeder Pillar 9		Main Library(New Block)
			Old Library
			Spare
			Parking Fountain
			Kuppa
11	Feeder Pillar 10	Feeder Pillar 1	AMF Panel
			NRI Hostel Main Panel Board
			NRI Kitchen
12	Feeder Pillar 11		Nursing & P.U College
			STP
13	Feeder Pillar 12	Feeder Pillar 15	Nelson Mandela Ladies Hostel
			Medical Electronics Block
			High Mask Light
			Spare
14	Feeder Pillar 13	Feeder Pillar 14	SP Boys Hostel & Old Civil
			High Mask Light (Staff Parking)
			Main Sump Motor
			Spare
15	Feeder Pillar 14		Spare
			Old Civil Block 6th & 7th Floor AC
			New Dental Block
16	Feeder Pillar 15	Feeder Pillar 12	Heritage Block Canteen & Mess
			Old Dental Block
			Vijaya Bank
			Staff Parking (High Mask Light)
17	250 kVA AMF Panel	Feeder Pillar 10 / 250kVA DG Set	NRI Hostel & CD Sagar
18	250 kVAr ACCP Panel	Main Panel Board	50 kVAr CB-1
			50 kVAr CB-2
			50 kVAr CB-3
			50 kVAr CB-4
			50 kVAr CB-5
			50 kVAr CB-6
			25 kVAr CB
			10 kVAr CB-1
			10 kVAr CB-2
			5 kVAr CB

Table 5-2: Details of Connected loads to different feeder pillars

From the Feeder pillar 14 power supply is given to New dental block and feeder pillar 15 is suppling power to Old dental block.

A total of 250 kVAr rated capacitor banks have been installed for power factor improvement. Figure 5-3 depicts the capacitor bank panel installed in the LT panel room.

Figure 5-3: Capacitor Bank Panel

There are 2 x 250 kVA and 1 x 400 kVA Diesel Generators (DGs) sets used for the backup power supply for the entire campus during power failure from BESCOM. 400 kVA and 250 kVA DG sets installed near the parking area of the college premises are shown in the figure 5-4. The name plate specifications of the three DG sets are given in the table 5-3.

Figure 5-4: 400kVA and 250 kVA Diesel Generator (DG) set

S. No.	Description	Unit	Details of DG Set		
			400kVA; Parking	250 kVA ; Main Sump	250 kVA; Parking
1	Make	-	KIRLOSKAR	KIRLOSKAR	STAMFORD

2	Rated Demand	kVA	400	250	250
3	Rated Power	kW	320	200	200
4	Rated Voltage	Volts	415	415	415
5	Rated Current	Amps	556.5	347.8	348
6	Frequency	Hz	50	50	50
7	Ambient Temperature	Degree Centigrade	40	40	40
8	Phase	-	Three	Three	Three
9	M/C No.	-	IS3 S210E105470	G S3 L1 07 F 19095	6031901

Table 5-3: DG set specifications

Mobile generator with a capacity of 62.5 kVA available in the campus is as shown in figure 5-5. Name plate details of the same are as depicted in the table 5-4.

Figure 5-5: Mobile Diesel Generator (DG) set

S. No.	Unit	Details
1	Model	KG 82.5WS2
2	Rating	62.5 kVA
3	Mfg. Date	25.02.2010
4	Sl. No.	10021142
5	Noise Limit	75 dB at 1 Meter
6	Certificate No.	2009/2503
7	Mfg. Name	Jackson Generators Pvt. Ltd. Puduchery

Table 5-4: Mobile DG set specifications

UPS

The UPS power supply is given to the critical loads. Two number of 3kVA UPS supply is given to radiology lab. One number of 6 kVA UPS power supply is given to ceramic lab and Seminar-hall. Details of the UPS are given in the table 5-5.

S. No	Make of UPS	Capacity, kVA	Battery Details	Location
1	APC	3	8 x 42 Ah Exide	Ground floor
2	Power In	6	16 x 42 Ah Exide	New Dental
2	Delta	3	6 x 42 Ah	Ground floor – New Dental

Table 5-5: List of UPS and its rated capacity

Note: ***As part of regular practice the inverters and batteries are always kept in a separate room and electrical panel rooms are separate.***

5.2. SRTPV (Solar Roof Top Photo Voltaic) system

During the audit Solar rooftop PV systems were installed at terrace of various blocks in campus. The power generated from the solar PV system is shared for Dental college and various other courses including Engineering, MBA, Paramedical, etc., Solar PV system installed in the campus for the power generation accounts to 388 kWp. Geo-tag photo of a solar PV panel installed in the campus is shown in figure 5-6. PV modules are made of multi crystalline. Details of solar panels at different locations and its capacity are given in table 5-8.

Figure 5-6: Solar rooftop PV system

S. No.	Location	Module Wattage in Wp	Peak Capacity in kWp	No. of Panels
1	Nursing	320	59	185
2	Architecture Department	370	40	108
3	EC Block	300	96	300
4	CSE Block	320	55	171
5	Medical Electronics Block	325	69	211
6	Polytechnic Block	320	64	200
	Total		**382**	**1175**

Table 5-6: Details of Solar rooftop PV system

5.3. Best Practices Implemented for Energy Conservation

During the study, observations were carried out on the usage of the inventories in the college building premises. In the intension of saving the electricity, various measures have been adopted in the college. Computers and AC units are used only during the working hours, after completion of class hours – fans, lights, computers and AC units are found to be turned OFF. This practice is followed across the college premises (class rooms, labs, staff rooms, office rooms, library and auditoriums).

5.3.1. Day-light Integration

During the audit phase classrooms, Staff-rooms, computer lab, seminar hall, UPS & batteries room and library areas were surveyed for illumination levels and fresh air-circulation. It was observed most of the rooms are well ventilated and day-light integrated; sample photos are shown in figure 5-9 and figure 5-12.

Figure 5-8: Day light integrated floors

Figure 5-9: Day-light integrated Corridor and Seminar hall

Figure 5-10: Day-light integrated Library and learning area

Figure 5-11: Day-light integrated Laboratories

5.3.2. Installation of LED lights

Many of the FTL in all the blocks of the campus are replaced with LED lights. LED tube lights are used in the class rooms, staff-rooms, corridors, hostel, dining area and in the library area. Sample photo of LED lamp used in the some of the locations of the college area are shown in figure 5-13 to figure to figure 5-14.

Figure 5-12: LED lights in the practice floors

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Figure 5-13: LED lights in Classrooms, Labs, and Corridors

The cost savings by installation of LED lights are given in table 5-9 to table 5-11.

S. No.	Description	Unit	Details
1	Rated Wattage of LED lamps installed	W	18
2	Quantity of LED lamps installed	Nos	33
3	Rated wattage of lamps used earlier	W	36
4	Savings per lamp by installation of LED lamps	W	18
5	Total savings	kW	0.594
6	Working hours per day	hours	9
7	No. of working days per year	days	280
8	Annual electricity savings	kWh	1496.8
9	Average electricity cost	Rs./kWh	8
10	Annual cost savings achieved per year	Rs. lakh/year	0.12
11	CO2 mitigations per year	Tons/year	1.27

Table 5-7: Annual cost savings by installation of 18 W LED tube-lights

S. No.	Description	Unit	Details
1	Rated Wattage of LED lamps installed	W	10
2	Quantity of LED lamps installed	Nos	363
3	Rated wattage of lamps used earlier	W	36
4	Savings per lamp by installation of LED lamps	W	26
5	Total savings	kW	9.438
6	Working hours per day	hours	9
7	No. of working days per year	days	280
8	Annual electricity savings	kWh	23783.76
9	Average electricity cost	Rs./kWh	8
10	Annual cost savings achieved per year	Rs. lakh/year	1.90
11	CO2 mitigations per year	Tons/year	20.22

Table 5-8: Annual cost savings by installation of 10 W LED lights

S. No.	Description	Unit	Details
1	Rated Wattage of LED lamps installed	W	12
2	Quantity of LED lamps installed	Nos	175
3	Rated wattage of lamps used earlier	W	36
4	Savings per lamp by installation of LED lamps	W	24
5	Total savings	kW	4.2
6	Working hours per day	hours	9
7	No. of working days per year	days	280
8	Annual electricity savings	kWh	10584
9	Average electricity cost	Rs./kWh	8
10	Annual cost savings achieved per year	Rs. lakh/year	0.85
11	CO2 mitigations per year	Tons/year	9.00

Table 5-9: Annual cost savings by installation of 12 W LED lights

5.3.3. Installation of SRTPV system

Solar PV system installed in the campus for the power generation accounts to 382 kWp. Sample photo of a solar PV panel installed in the campus is shown in figure 5-15. PV modules are made of multi crystalline.

Figure 5-14: Sample photo – SRTPV system

The SRTPV system has net metering (Bi-directional meter) system. Power Purchase Agreement (PPA) made between the management trust and with BESCOM with net metering arrangements has been reviewed.

Energy generation and cost savings of the SRTPV system of the campus is estimated and the same is given in the table 5-12.

S. No.	Description	Unit	Values
1	Rated Capacity of SRTPV system	kWp	382
2	Average units generated per day	kWh/day/kWp	3
3	No. of working days per annum	days	280
4	No. of years in operation	years	4
5	Annual energy generation from SRTPV	kWh/ annum	320880
6	Average energy cost	Rs./kWh	8
7	Annual cost savings due to installation of SRTPV	Rs. Lakh / annum	25.67
8	Total cost savings due to installation of SRTPV for 4 years	Rs. Lakh / annum	102.68
9	CO2 mitigations per year	Tons/year	272.7

Table 5-10: Cost savings from SRTPV system

5.3.4. Procurement of LED/LCD monitors

LED/LCD monitors are used for all the desktop computers in staff rooms and in digital library. Sample photo is as shown in the figure 5-16.

Figure 5-15: Use of LED monitors in the digital library

5.3.5. Use of Sensor based Hand Driers and Hand Wash

Sensor based devise are most effective equipment in conserving energy. Sensor based hand driers are placed in the college at many of the hand wash areas. Sample photo of the sensor based hand drier and wash basin are shown in figure 5-17 and figure 5-18.

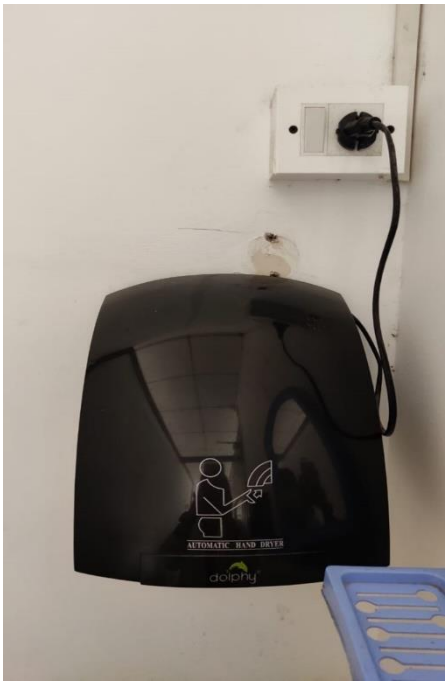
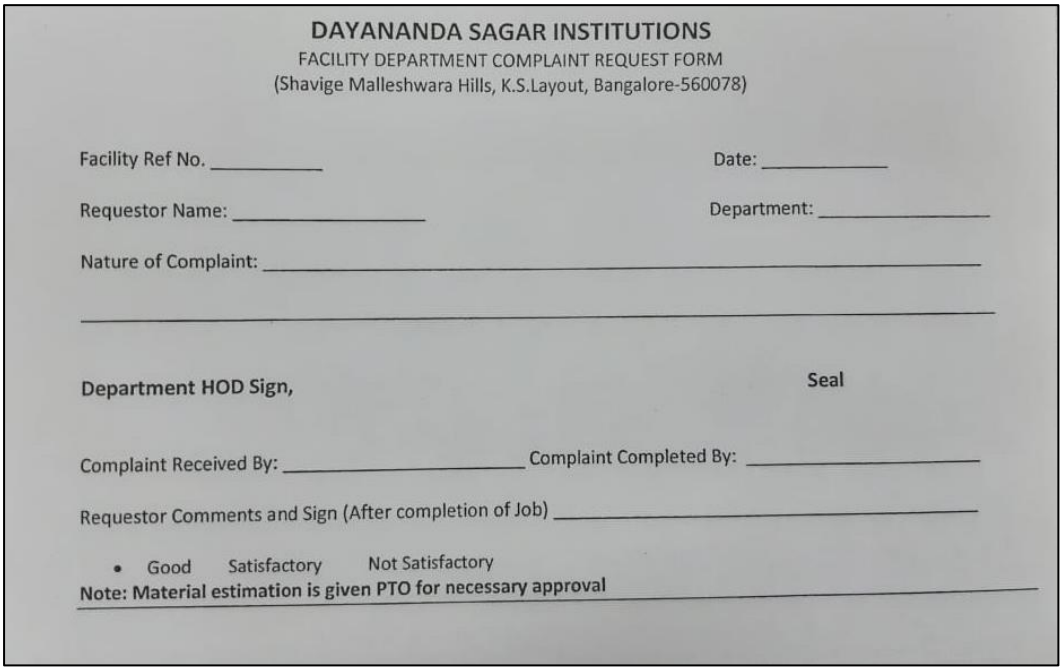


Figure 5-16: Sample photo of Sensor based Hand driers

Figure 5-17: Sensors based wash basin

5.3.6. Maintenance Complaint & log Register

There is a systematic process is in place for complaints and maintenance monitoring. Once the complaint is attended and fixed, manual sign of completion is obtained from the person raised the complaint and then the complaint gets closed in the register. The picture of the complaint form is shown in figure 5-18.



DAYANANDA SAGAR INSTITUTIONS

FACILITY DEPARTMENT COMPLAINT REQUEST FORM

(Shavige Malleshwara Hills, K.S.Layout, Bangalore-560078)

Facility Ref No. _____ Date: _____

Requestor Name: _____ Department: _____

Nature of Complaint: _____

_____

Department HOD Sign, **Seal**

Complaint Received By: _____ Complaint Completed By: _____

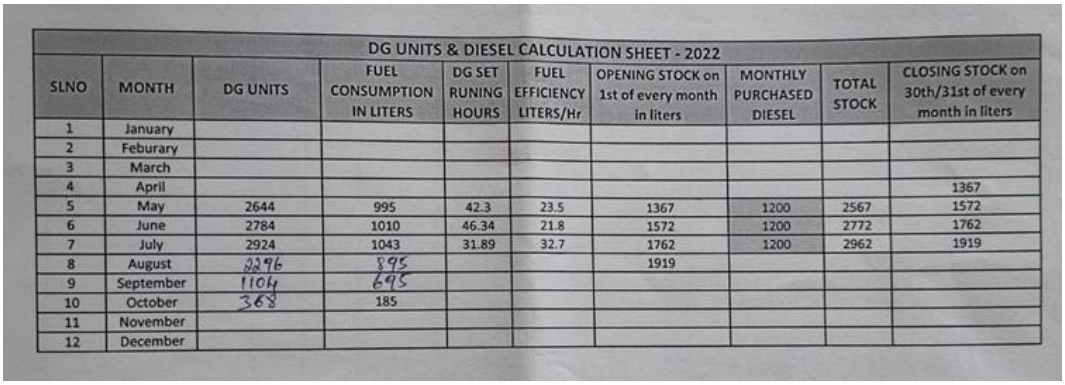
Requestor Comments and Sign (After completion of Job) _____

- Good Satisfactory Not Satisfactory

Note: Material estimation is given PTO for necessary approval

Figure 5-18: Sample photo of Complaint register form

DG log book is maintained regularly and a sample copy of log register is shown in figure 5-28.



DG UNITS & DIESEL CALCULATION SHEET - 2022

SLNO	MONTH	DG UNITS	FUEL CONSUMPTION IN LITERS	DG SET RUNING HOURS	FUEL EFFICIENCY LITERS/Hr	OPENING STOCK on 1st of every month in liters	MONTHLY PURCHASED DIESEL	TOTAL STOCK	CLOSING STOCK on 30th/31st of every month in liters
1	January								
2	Feburary								
3	March								
4	April								1367
5	May	2644	995	42.3	23.5	1367	1200	2567	1572
6	June	2784	1010	46.34	21.8	1572	1200	2772	1762
7	July	2924	1043	31.89	32.7	1762	1200	2962	1919
8	August	3296	895			1919			
9	September	1104	695						
10	October	368	185						
11	November								
12	December								

Figure 5-19: Sample photo of Complaint register form

5.4. Recommendations

5.4.1. Replacement of conventional FTL with EE LED tube lights

Background

From the inventory data; collected during study it is observed conventional FTL lighting fixtures are used in the campus. The total number of 1x36W FTL fixtures is 244. The power consumed by FTL in comparison with LED fixtures is 50% higher. Replacing the existing FTL with LED will result in energy savings.

Recommendation

It is recommended to replace the existing 1x36W FTL lamps with 1x18W LED tube lights.

Energy Savings

The energy savings and investment cost for replacement of FTL with LED fixtures and its payback period are given in table 5-13.

S. No.	Description	Unit	Details
1	Total no. of FTL rated 36W	No.s	244
2	Power consumption by 1x36W FTL	kW	8.784
3	% of savings if all FTL replaced by LED fixtures	%	50
4	% of savings in kW if replaced by LED fixtures (Considering all fixtures)	kW	4.392
5	%of Lights found to be ON during working hours	%	75
6	Energy savings for fixtures in ON condition (4 x 5%)	kW	3.29
7	Total working hours per day	hours	9.0
8	Annual savings (6 x **7** x **280 days**)	kWh/Annum	8300.9
9	Average energy cost per kWh	Rs./kWh	8.00
10	Annual cost savings	Rs. lakh	0.7
11	Cost of LED per fixture	Rs.	500.0
12	Total Investment cost for 244 LED fixtures	Rs. lakh	1.2
13	Simple payback period (12 / 10)	Years	1.84

Table 5-11: Savings and payback period calculations on replacement FTL to LED

5.4.2. Replacement of 18W CFL with 10W LED lights

Background

From the inventory data; collected during study it is observed CFL lighting fixtures are used in the campus. The total number of 18W CFL fixtures is 55. The power consumed by FTL in comparison with LED fixtures is 50% higher. Replacing the existing FTL with LED will result in energy savings.

Recommendation

It is recommended to replace the existing 1x18W FTL lamps with 10W LED lights.

Energy Savings

The energy savings and investment cost for replacement of FTL with LED fixtures and its payback period are given in table 5-14.

S. No.	Description	Unit	Details
1	Total no. of CFL rated 18W	No.	55
2	Power consumption by 18W CFL	kW	0.99
3	% of savings if all FTL replaced by LED fixtures	%	55
4	% of savings in kW if replaced by LED fixtures (Considering all fixtures)	kW	0.5445
5	%of Lights found to be ON during working hours	%	75
6	Energy savings for fixtures in ON condition (4 x 5%)	kW	0.41
7	Total working hours per day	hours	9.0
8	Annual savings (6 x **7** x **280 days**)	kWh/Annum	1029.1
9	Average energy cost per kWh	Rs./kWh	8.00
10	Annual cost savings	Rs. lakh	0.1
11	Cost of LED per fixture	Rs.	300.0
12	Total Investment cost for 55 LED fixtures	Rs. lakh	0.2
13	Simple payback period (12 / 10)	Years	2.00

Table 5-12: Savings and payback period calculations on replacement CFL to LED

5.4.3. Usage of Sign boards

There were no Sign boards stating ”Please turn off all electrical switches when not in use’ posted in class rooms, staff-rooms, labs, libraries hostels and corridors.

5.4.4. Other energy conservation opportunities

- Sensor based lighting system can be implemented at the suitable areas.
- Conduct training and awareness programs on energy conservation

6. WASTE MANAGEMENT AUDIT

6.1. Facility Description

The study involved carrying out various analyses to realistically assess waste generation. There are different types of waste generated in the college and is tabulated in table 6-1.

S. No.	Description	Yes / No	Details
1	E-Waste	Yes	External Agency
2	Hazardous / Chemical Waste	No	NA
3	Solid Waste	Yes	BBMP
4	Dry Leaves	Yes	Compost pit
5	Food Waste	Yes	Piggeries
6	Waste Water	Yes	STP
7	Glass Waste	No	BBMP
8	Sanitary Napkins	Yes	BBMP
9	Unused Materials	No	BBMP
10	Plastic Waste	Yes	BBMP

Table 6-1: Types of Waste Generated in the DSCDS

From the table above it is clearly understood that the garbage segregation is done and the garbage is given to external agencies / municipal agencies from time to time in order to maintain the college premises clean & hygiene.

The Institution implements solid waste management by enforcing the waste segregation rules. Solid waste includes both biodegradable and non-biodegradable components. The non-biodegradable solid waste generated in the campus include, paper, plastics, metal cans etc. Biodegradable waste includes food waste, vegetable peels, leaves etc. Liquid waste is sent to STP to treat and reusing it for gardening.

E-waste or Electronic waste, refers to all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intent of re-use. In academic institutions major e-waste are accounted as old computers and its accessories. Such E-waste are segregated from the dry waste and given to e-waste disposing vendors.

6.1.1. Dry Waste Management

Separate bins are used across the campus for Dry and Wet waste collection. Each room (Staff, class rooms, office, restrooms, and library) is provided with the dustbin to segregate waste.

The housekeeping staffs cleans and collect the wastes generated inside the campus and dumps them into the larger waste bins in segregated manner at disposal point. From, there the wastes are taken by the BBMP vehicles. Sample photo of waste collection bin placed at corridor is shown in figure 6-1.

Figure 6-1: Sample photo of Dustbin at corridor

The garbage segregation is done at the college premises and the garbage is given to external agencies / municipal agencies from time to time in order to maintain the college premises clean & hygiene. Figure 6-2 shows the waste collection areas and Figure 6-3 shows a sample dry and wet waste collection points available in the college campus.

Figure 6-2: Dry and wet waste collection area

Figure 6-3: waste collection bins in the campus area

Dry waste is collected in dry waste collection area located near staff parking. Dry waste segregation is not done properly. Hence it is recommended to practice dry waste segregation.

6.1.2. Wet Waste Management

To manage the wet waste produced in the college, management has taken initiative to separate the wet waste from dry waste. Wet waste is produced from kitchen of cafeteria in the campus is segregated separately and given to the local piggeries and remaining waste has been dumped to dry-leaves compost pit to form manure. The remains of the tiffin boxes brought by the students, teachers, & staff of the college, are collected separately and dumped in dry-leaves compost pit.

Food waste in the canteen is collected in plastic drums. This waste has been given to piggeries on daily basis. Before lockdown 50-70 kg/day of food waste and during lockdown 20-30 kg/day of food waste was produced.

6.1.3. Bio-medical waste Management

In the dental hospital practice floors, each department's treatment section for each of the dental engine setup; there is a separate dustbin placed. It is hygiene practice to maintain cleanliness and health of the patient and doctor.

Figure 6-4: Sample photo of Dustbins

Segregation of bio-waste at source level is best way of Waste management by using color code bins. Sample photos of using color code bins are shown in the figure 6-4 and figure 6-5.

Figure 6-5: Sample photo of Color-coded Waste collection bins

Bio-waste has been disposed to Maridi Bio Industries Pvt. Ltd. Sample copy of the MoU between DSCDS and Maridi Bio Industries Pvt. Ltd is as shown in figure 6-8 and figure 6-9.

INDIA NON JUDICIAL

Government of Karnataka

e-Stamp

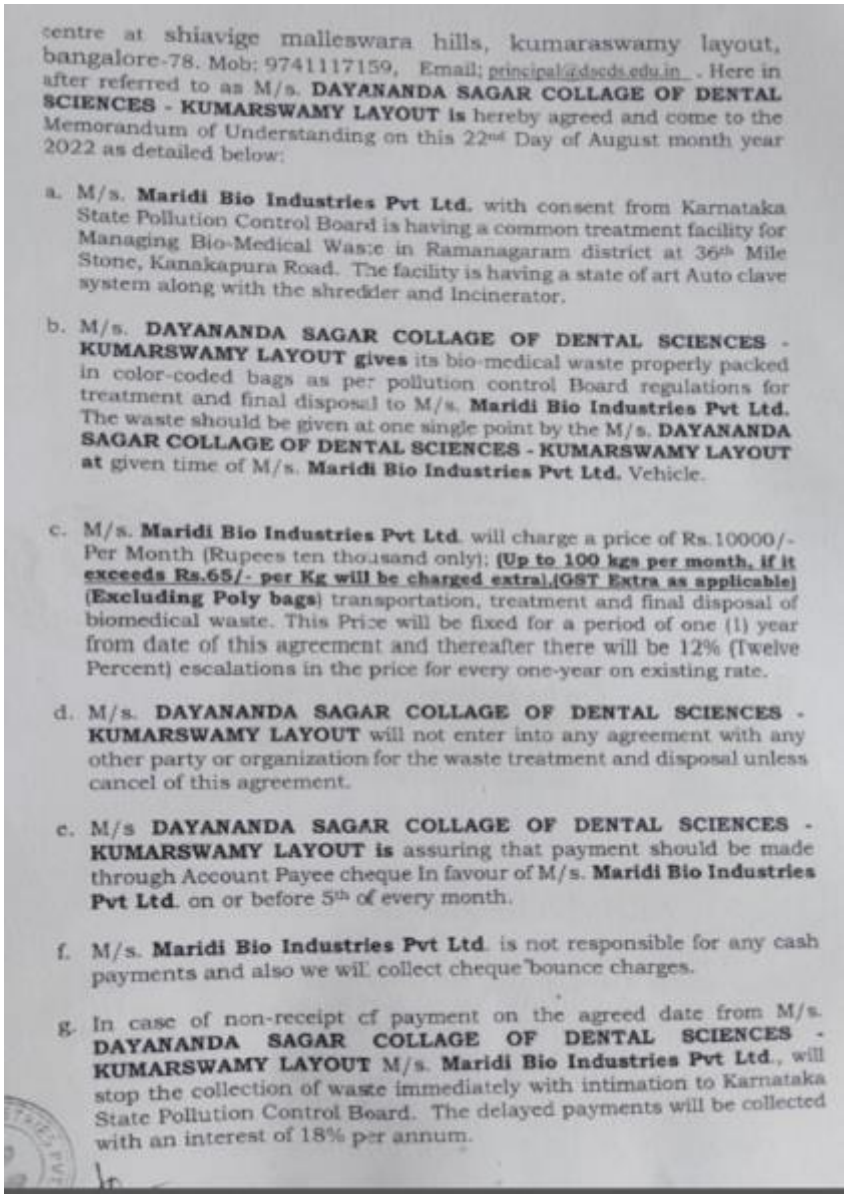
Certificate No.	:	IN-KA24491243514028U
Certificate Issued Date	:	09-Sep-2022 12:43 PM
Account Reference	:	NONACC (BK)/ kakscub08/ BANGALORE4/ KA-BV
Unique Doc. Reference	:	SUBIN-KAKAKSCUB0862173567929776U
Purchased by	:	MARIDI BIO INDUSTRIES PVT LTD
Description of Document	:	Article 12 Bond
Description	:	AGREEMENT
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	MARIDI BIO INDUSTRIES PVT LTD
Second Party	:	DAYANANDA SAGAR COLLAGE OF DENTAL SCIENCES
Stamp Duty Paid By	:	MARIDI BIO INDUSTRIES PVT LTD
Stamp Duty Amount(Rs.)	:	20 (Twenty only)

MEMORANDUM OF UNDERSTANDING

Reg.No: 330

M/s. **Maridi Bio Industries Pvt Ltd.,** having its registered office at No .8, SUNAGA ARCADE, 4th Floor, 1st Main, 8th Cross, S.R.nagar, Bangalore-560027, Phone No 080-41512958/22103270, Email id: maridibmw@maridibio.com and having Its Plant at Sy.No.1/37 & 1/38, 35th Milestone, Gabbadi Kaval, Kanakapura Road, Ramanagar District, here in after referred to as, M/s. **Maridi Bio Industries Pvt Ltd.** represented by its Authorized Signatory and M/s. **DAYANANDA SAGAR COLLAGE OF DENTAL SCIENCES - KUMARSWAMY LAYOUT having** its

Figure 6-6: Image 1 of 2 – MoU for bio-waste management



centre at shiavige malleswara hills, kumaraswamy layout, bangalore-78. Mob: 9741117159, Email: principal@dscds.edu.in . Here in after referred to as M/s. **DAYANANDA SAGAR COLLAGE OF DENTAL SCIENCES - KUMARSWAMY LAYOUT is** hereby agreed and come to the Memorandum of Understanding on this 22nd Day of August month year 2022 as detailed below:

a. M/s. **Maridi Bio Industries Pvt Ltd.** with consent from Karnataka State Pollution Control Board is having a common treatment facility for Managing Bio-Medical Waste in Ramanagaram district at 36th Mile Stone, Kanakapura Road. The facility is having a state of art Auto clave system along with the shredder and Incinerator.

b. M/s. **DAYANANDA SAGAR COLLAGE OF DENTAL SCIENCES - KUMARSWAMY LAYOUT gives** its bio-medical waste properly packed in color-coded bags as per pollution control Board regulations for treatment and final disposal to M/s. **Maridi Bio Industries Pvt Ltd.** The waste should be given at one single point by the M/s. **DAYANANDA SAGAR COLLAGE OF DENTAL SCIENCES - KUMARSWAMY LAYOUT at** given time of M/s. **Maridi Bio Industries Pvt Ltd.** Vehicle.

c. M/s. **Maridi Bio Industries Pvt Ltd**. will charge a price of Rs.10000/- Per Month (Rupees ten thousand only); **(Up to 100 kgs per month, if it exceeds Rs.65/- per Kg will be charged extra).(GST Extra as applicable) (Excluding Poly bags)** transportation, treatment and final disposal of biomedical waste. This Price will be fixed for a period of one (1) year from date of this agreement and thereafter there will be 12% (Twelve Percent) escalations in the price for every one-year on existing rate.

d. M/s. **DAYANANDA SAGAR COLLAGE OF DENTAL SCIENCES - KUMARSWAMY LAYOUT** will not enter into any agreement with any other party or organization for the waste treatment and disposal unless cancel of this agreement.

e. M/s **DAYANANDA SAGAR COLLAGE OF DENTAL SCIENCES - KUMARSWAMY LAYOUT is** assuring that payment should be made through Account Payee cheque In favour of M/s. **Maridi Bio Industries Pvt Ltd**. on or before 5th of every month.

f. M/s. **Maridi Bio Industries Pvt Ltd**. is not responsible for any cash payments and also we will collect cheque bounce charges.

g. In case of non-receipt of payment on the agreed date from M/s. **DAYANANDA SAGAR COLLAGE OF DENTAL SCIENCES - KUMARSWAMY LAYOUT** M/s. **Maridi Bio Industries Pvt Ltd.**, will stop the collection of waste immediately with intimation to Karnataka State Pollution Control Board. The delayed payments will be collected with an interest of 18% per annum.

Figure 6-7: Image 2 of 2 – MoU for bio-waste management

6.1.4. E- Waste Management

E-waste like desktop computers, key boards, mouse CPU, batteries are segregated as e-waste. Batteries are exchanged on buy back policy. Other e-waste is given to vendor when the quantity is more.

6.2. Best Practices Implemented for Waste management

6.2.1. Color Code Bins

The garbage segregation is done and the garbage is given to external agencies / municipal agencies from time to time in order to maintain the college premises clean & hygiene. Figure 6-7 shows the sample photo of waste segregation bins at the treatment wards.

Figure 6-8: Sample photo of Color-coded Waste collection bins

6.2.2. Waste Segregation

Dry waste and waste are separated at the source level in the college. Sample photos of dry waste segregation is shown in the figure 6-8.

Figure 6-9: Waste segregation

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6.2.3. Dry leaves compost pit

Composting dry leaves make a dark, rich, earthy, organic matter that can be used as soil. It adds nutrients to the garden soil and the larger particle size helps enhance the tilth and then loosen compacted earth. The composting process retains moisture and repels weeds when used as a top dressing or mulch.

6.2.4. Sewage Treatment Plant for waste water recycling

The procedure for removing contaminants from the wastewater basically from the household sewage is called sewage treatment. It has to undergo the chemical, physical and biological procedure to remove these contaminants and give out an environmentally safe treated effluent. A semi-solid slurry called the sewage sludge is the by-product of the sewage treatment. This sludge is further processed before it is suitable for land application.

The institution has installed STP with capacity of 180 kLPD and the quantity of final treated water is 75% of the total capacity, which is 135 kLPD.

The details of water savings and cost savings due to installation of STP is given in table 4-1.

S. No.	Description	Unit	Details
1	STP capacity	kLPD	180.0
2	Quantity of final treated water from STP	kLPD	135.0
3	Quantity of water reused @ 50% utilization factor	kLPD	67.5
4	No. of working days per year	days	280.0
5	Annual Quantity of water reused (saved)	kLPD	18900
6	Average water cost	Rs./Litre	0.086
7	Annual cost savings achieved	Rs. lakh/year	16.25

Table 6-2: Annual Savings - STP – Waste water recycling

6.2.5. Maintenance Team

The college management has formed separate operations & maintenance team, house-keeping team and security personnel's for maintaining the cleanliness of various areas inside the campus.

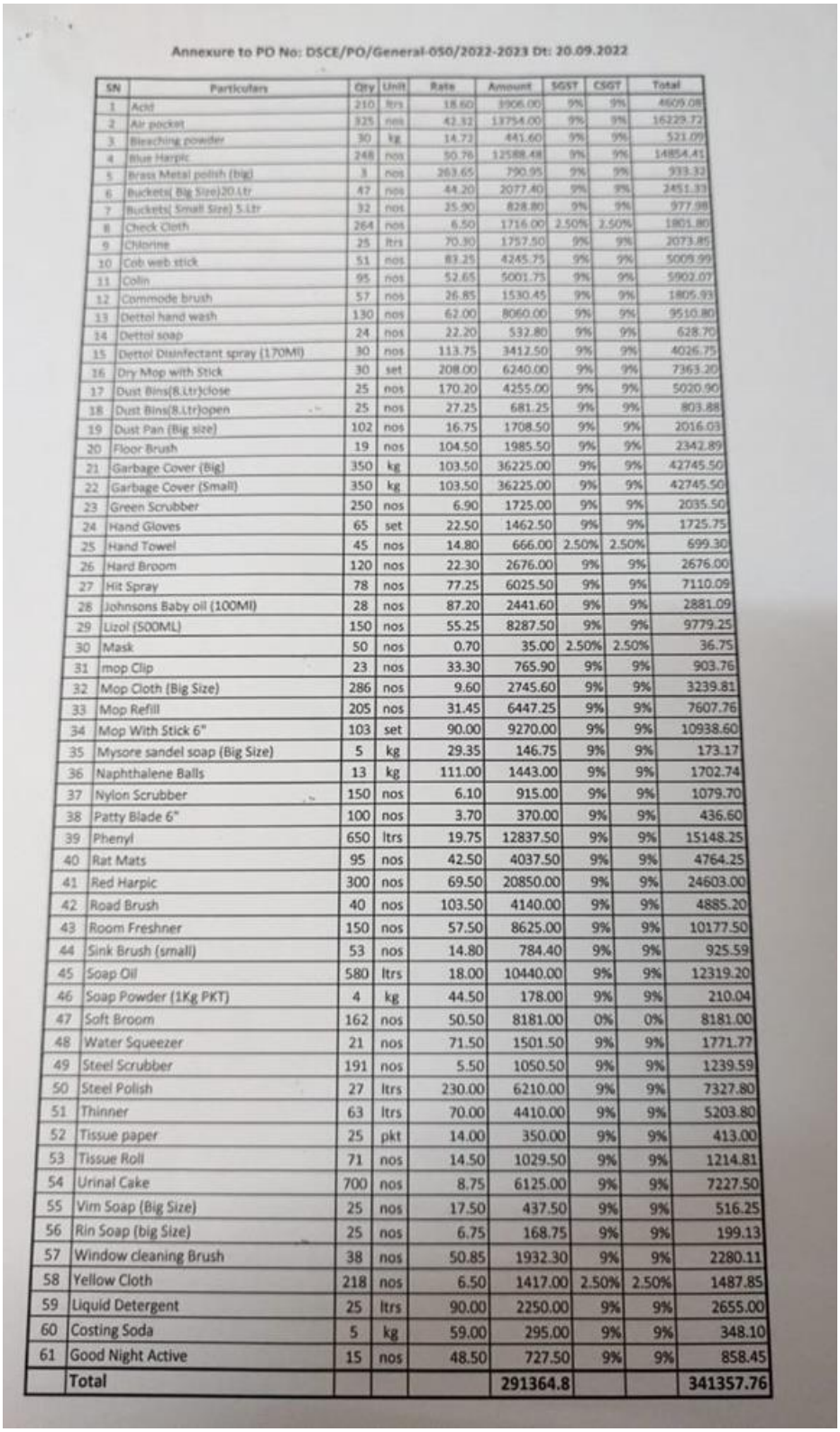
During the audit, walk through survey was carried out to observe the maintenance of the electrical panels, water distribution system, housekeeping and log book/ records for maintenance and housekeeping.

The entire campus is maintained clean and tidy. The electrical panels, panel rooms in each block, sub-station, DG set area, water distribution system, STP area, terrace water tanks, solar water heaters, SRTPV systems, class rooms, office rooms, hostels, kitchen and dining area, canteen, auditorium, library, playground, corridors, walk ways, and toilets & wash rooms, is found to be well maintained and cleaned on regular intervals.

The college campus has a dedicated team for maintenance of the campus. The breakup of the maintenance team members is given in table 6-3. Sample bill copy of list of items purchased for housekeeping and maintenance is given in figure 4.21.

Table 6-3: Details of maintenance staffs

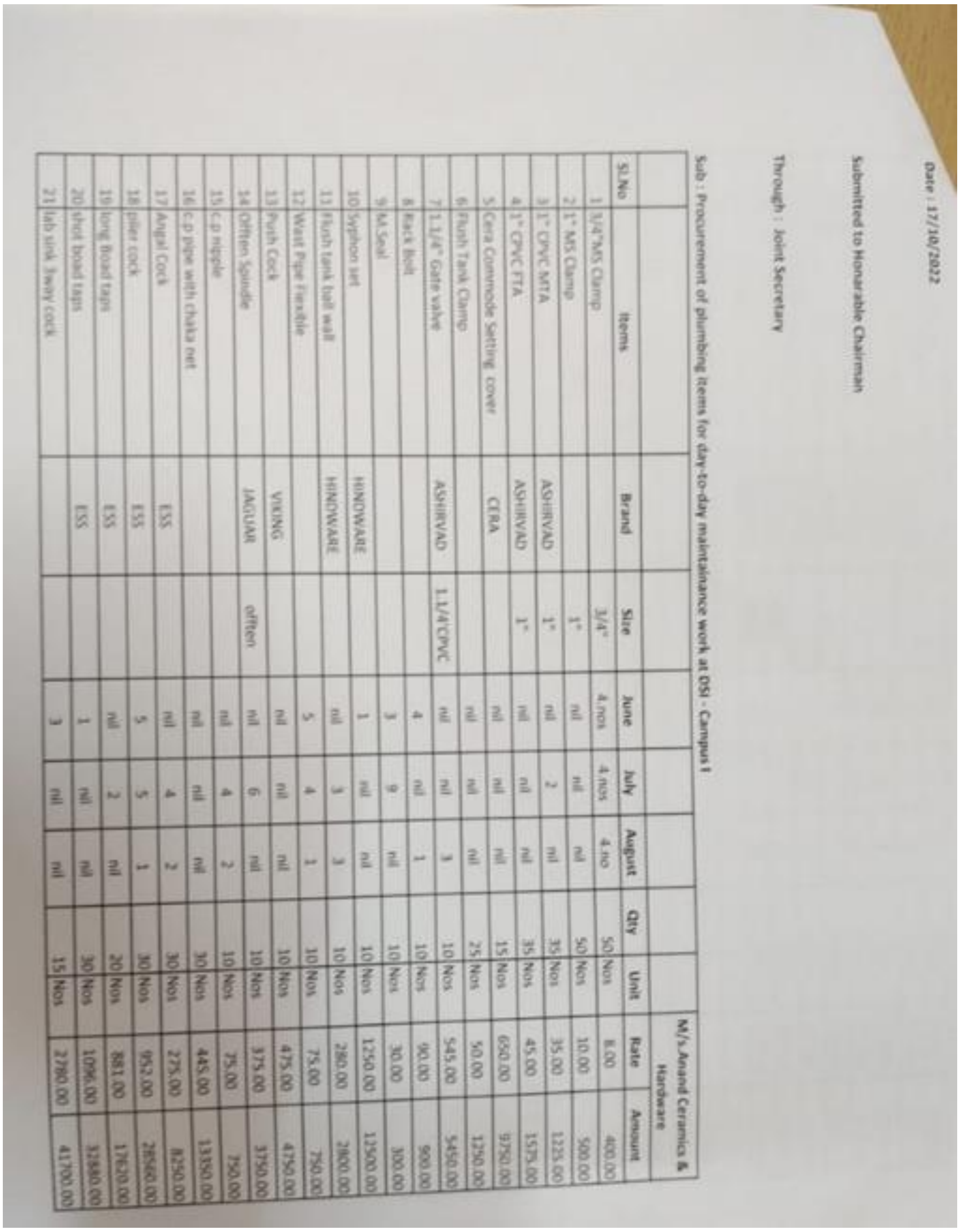
S. No.	Department	No. of Staffs
1	Electrical	05
2	Carpentry	02
3	House Keeping	118
4	Plumbing	03



Annexure to PO No: DSCE/PO/General-050/2022-2023 Dt: 20.09.2022

SN	Particulars	Qty	Unit	Rate	Amount	SGST	CSGT	Total
1	Acid	210	ltrs	18.60	3906.00	9%	9%	4609.08
2	Air pocket	325	nos	42.32	13754.00	9%	9%	16229.72
3	Bleaching powder	30	kg	14.72	441.60	9%	9%	521.09
4	Blue Harpic	248	nos	50.76	12588.48	9%	9%	14854.41
5	Brass Metal polish (big)	3	nos	263.65	790.95	9%	9%	933.33
6	Buckets(Big Size)20 Ltr	47	nos	44.20	2077.40	9%	9%	2451.33
7	Buckets(Small Size) 5 Ltr	32	nos	25.90	828.80	9%	9%	977.98
8	Check Cloth	264	nos	6.50	1716.00	2.50%	2.50%	1801.80
9	Chlorine	25	ltrs	70.30	1757.50	9%	9%	2073.85
10	Cob web stick	51	nos	83.25	4245.75	9%	9%	5009.99
11	Colin	95	nos	52.65	5001.75	9%	9%	5902.07
12	Commode brush	57	nos	26.85	1530.45	9%	9%	1805.93
13	Dettol hand wash	130	nos	62.00	8060.00	9%	9%	9510.80
14	Dettol soap	24	nos	22.20	532.80	9%	9%	628.70
15	Dettol Disinfectant spray (170Ml)	30	nos	113.75	3412.50	9%	9%	4026.75
16	Dry Mop with Stick	30	set	208.00	6240.00	9%	9%	7363.20
17	Dust Bins(8.Ltr)close	25	nos	170.20	4255.00	9%	9%	5020.90
18	Dust Bins(8.Ltr)open	25	nos	27.25	681.25	9%	9%	803.88
19	Dust Pan (Big size)	102	nos	16.75	1708.50	9%	9%	2016.03
20	Floor Brush	19	nos	104.50	1985.50	9%	9%	2342.89
21	Garbage Cover (Big)	350	kg	103.50	36225.00	9%	9%	42745.50
22	Garbage Cover (Small)	350	kg	103.50	36225.00	9%	9%	42745.50
23	Green Scrubber	250	nos	6.90	1725.00	9%	9%	2035.50
24	Hand Gloves	65	set	22.50	1462.50	9%	9%	1725.75
25	Hand Towel	45	nos	14.80	666.00	2.50%	2.50%	699.30
26	Hard Broom	120	nos	22.30	2676.00	9%	9%	2676.00
27	Hit Spray	78	nos	77.25	6025.50	9%	9%	7110.09
28	Johnsons Baby oil (100Ml)	28	nos	87.20	2441.60	9%	9%	2881.09
29	Lizol (500ML)	150	nos	55.25	8287.50	9%	9%	9779.25
30	Mask	50	nos	0.70	35.00	2.50%	2.50%	36.75
31	mop Clip	23	nos	33.30	765.90	9%	9%	903.76
32	Mop Cloth (Big Size)	286	nos	9.60	2745.60	9%	9%	3239.81
33	Mop Refill	205	nos	31.45	6447.25	9%	9%	7607.76
34	Mop With Stick 6"	103	set	90.00	9270.00	9%	9%	10938.60
35	Mysore sandel soap (Big Size)	5	kg	29.35	146.75	9%	9%	173.17
36	Naphthalene Balls	13	kg	111.00	1443.00	9%	9%	1702.74
37	Nylon Scrubber	150	nos	6.10	915.00	9%	9%	1079.70
38	Patty Blade 6"	100	nos	3.70	370.00	9%	9%	436.60
39	Phenyl	650	ltrs	19.75	12837.50	9%	9%	15148.25
40	Rat Mats	95	nos	42.50	4037.50	9%	9%	4764.25
41	Red Harpic	300	nos	69.50	20850.00	9%	9%	24603.00
42	Road Brush	40	nos	103.50	4140.00	9%	9%	4885.20
43	Room Freshner	150	nos	57.50	8625.00	9%	9%	10177.50
44	Sink Brush (small)	53	nos	14.80	784.40	9%	9%	925.59
45	Soap Oil	580	ltrs	18.00	10440.00	9%	9%	12319.20
46	Soap Powder (1Kg PKT)	4	kg	44.50	178.00	9%	9%	210.04
47	Soft Broom	162	nos	50.50	8181.00	0%	0%	8181.00
48	Water Squeezer	21	nos	71.50	1501.50	9%	9%	1771.77
49	Steel Scrubber	191	nos	5.50	1050.50	9%	9%	1239.59
50	Steel Polish	27	ltrs	230.00	6210.00	9%	9%	7327.80
51	Thinner	63	ltrs	70.00	4410.00	9%	9%	5203.80
52	Tissue paper	25	pkt	14.00	350.00	9%	9%	413.00
53	Tissue Roll	71	nos	14.50	1029.50	9%	9%	1214.81
54	Urinal Cake	700	nos	8.75	6125.00	9%	9%	7227.50
55	Vim Soap (Big Size)	25	nos	17.50	437.50	9%	9%	516.25
56	Rin Soap (big Size)	25	nos	6.75	168.75	9%	9%	199.13
57	Window cleaning Brush	38	nos	50.85	1932.30	9%	9%	2280.11
58	Yellow Cloth	218	nos	6.50	1417.00	2.50%	2.50%	1487.85
59	Liquid Detergent	25	ltrs	90.00	2250.00	9%	9%	2655.00
60	Costing Soda	5	kg	59.00	295.00	9%	9%	348.10
61	Good Night Active	15	nos	48.50	727.50	9%	9%	858.45
	Total				**291364.8**			**341357.76**

Figure 6-10: Sample procurement bills for housekeeping items



Date : 17/10/2022

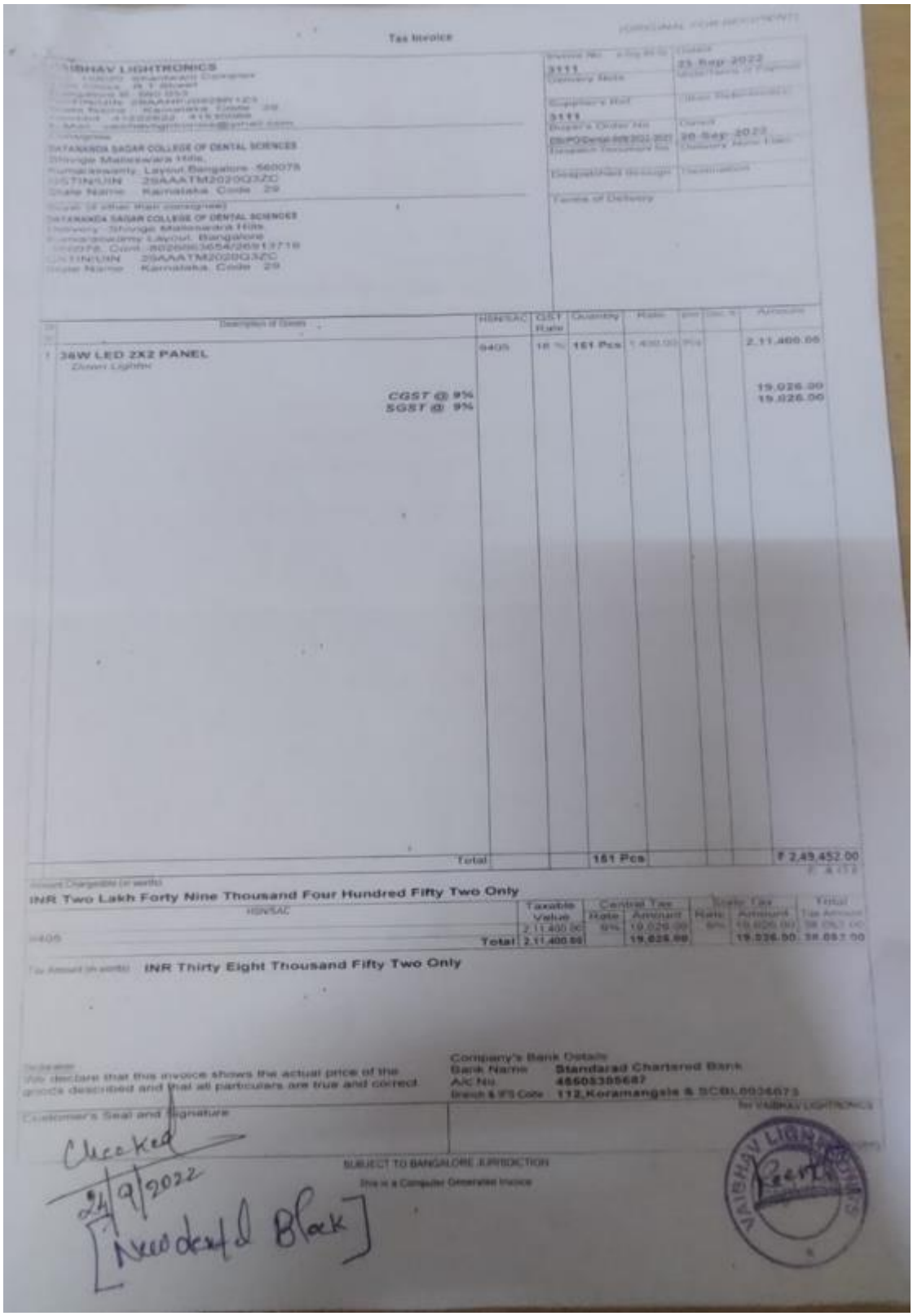
Submitted to Honarable Chairman

Through : Joint Secretary

Sub : Procurement of plumbing items for day-to-day maintainance work at DSI - Campus I

Sl.No	Items	Brand	Size	June	July	August	Qty	Unit	M/s.Anand Ceramics & Hardware Rate	Amount
1	3/4"MS Clamp		3/4"	4.nos	4.nos	4.no	50	Nos	8.00	400.00
2	1" MS Clamp		1"	nil	nil	nil	50	Nos	10.00	500.00
3	1" CPVC MTA	ASHIRVAD	1"	nil	2	nil	35	Nos	35.00	1225.00
4	1" CPVC FTA	ASHIRVAD	1"	nil	nil	nil	35	Nos	45.00	1575.00
5	Cera Commode Setting cover	CERA		nil	nil	nil	15	Nos	650.00	9750.00
6	Flush Tank Clamp			nil	nil	nil	25	Nos	50.00	1250.00
7	1.1/4" Gate valve	ASHIRVAD	1.1/4'CPVC	nil	nil	3	10	Nos	545.00	5450.00
8	Rack Bolt			4	nil	1	10	Nos	90.00	900.00
9	M.Seal			3	9	nil	10	Nos	30.00	300.00
10	Syphon set	HINDWARE		1	nil	nil	10	Nos	1250.00	12500.00
11	Flush tank ball wall	HINDWARE		nil	3	3	10	Nos	280.00	2800.00
12	Wast Pipe Flexible			5	4	1	10	Nos	75.00	750.00
13	Push Cock	VIKING		nil	nil	nil	10	Nos	475.00	4750.00
14	Offten Spindle	JAGUAR	offten	nil	6	nil	10	Nos	375.00	3750.00
15	c.p nipple			nil	4	2	10	Nos	75.00	750.00
16	c.p pipe with chaka net			nil	nil	nil	30	Nos	445.00	13350.00
17	Angal Cock	ESS		nil	4	2	30	Nos	275.00	8250.00
18	plier cock	ESS		5	5	1	30	Nos	952.00	28560.00
19	long Boad taps	ESS		nil	2	nil	20	Nos	881.00	17620.00
20	shot boad taps	ESS		1	nil	nil	30	Nos	1096.00	32880.00
21	lab sink 3way cock			3	nil	nil	15	Nos	2780.00	41700.00

Figure 6-11: Sample procurement bills for Plumbing items



Tax Invoice

VAIBHAV LIGHTRONICS

DATAMANDA SAGAR COLLEGE OF DENTAL SCIENCES
Shivige Maleswara Hills,
Kumaraswamy Layout Bangalore- 560078
GSTIN/UIN 29AAATM2020Q3ZC
State Name Karnataka, Code 29

Delivery Note: 3111
Dated: 23 Sep 2022
Supplier's Ref: 3111
Buyer's Order No.: 20 Sep 2022
Dispatch Document No.
Delivery Note Date
Dispatched through
Destination
Terms of Delivery

Description of Goods	HSN/SAC	GST Rate	Quantity	Rate	per	Disc. %	Amount
36W LED 2X2 PANEL Down Lights	9405	18 %	151 Pcs		Pcs		2,11,400.00
CGST @ 9%							19,026.00
SGST @ 9%							19,026.00
Total			151 Pcs				₹ 2,49,452.00

Amount Chargeable (in words)
INR Two Lakh Forty Nine Thousand Four Hundred Fifty Two Only

HSN/SAC	Taxable Value	Central Tax Rate	Central Tax Amount	State Tax Rate	State Tax Amount	Total Tax Amount
9405	2,11,400.00	9%	19,026.00	9%	19,026.00	38,052.00
Total	2,11,400.00		19,026.00		19,026.00	38,052.00

Tax Amount (in words) INR Thirty Eight Thousand Fifty Two Only

We declare that this invoice shows the actual price of the goods described and that all particulars are true and correct

Company's Bank Details
Bank Name: Standarad Chartered Bank
A/C No: 45505305687
Branch & IFS Code: 112,Koramangala & SCBL0036073

for VAIBHAV LIGHTRONICS

Customer's Seal and Signature

Checked
24/9/2022
[Needed Black]

SUBJECT TO BANGALORE JURISDICTION
This is a Computer Generated Invoice

Figure 6-12: Sample procurement bills of LED

6.3. Recommendations

The following are the recommendations for the better waste management.

- Conducting a greater number of waste management (collection) drives.
- Organizing Zero Waste Campus Campaigns every year
- Installation of dry leaf composter for the manure generation through dry leaves of garden.
- Replacement of plastic can be made with steel cutlery in the canteen
- Awareness programs and trainings
- Conducting Seminars and Workshops

7. GREEN CAMPUS MANAGEMENT AUDIT

7.1. Facility Description

Institution maintains a clean and green environment within the campus. This Institution ensures the green environment by establishing a separate maintenance department. The maintenance team takes care of the up-keeping of the environment and ensures to keep the surroundings clean. It maintains the lawn and plantations by employing gardeners and the cleanliness has been maintained by employing sufficient number of sweepers.

The maintenance staff members do periodic checks and maintain records for the same. Many initiatives are taken by the management to inculcate the eco-friendly culture among the student community. The lush green campus provides the facilities such as rain water harvesting, well grown trees and water reuse treatment plant.

7.1.1. Plantations and Lawn

The campus is gifted with adequate greenery like banana plantation, Green house, nursery plants and tree plantations. The greenery in the campus also aids in soil quality protection, watershed, landslide stabilization erosion control, and windbreaks. Such plantations are established to foster native species and promote forest regeneration on degraded lands as a tool of environmental restoration. The college is surrounded by ample greenery along with artificial landscaping in the heart of the campus. Vegetation is maintained and nurtured around main areas of the campus. The campus is enveloped by the canopy of huge trees.

This section includes the plants and greenery of the campus. There are more than 2000 plant species identified inside the campus. Garden area inside the college is available.

1. Total number of plant species identified - 2000
2. Total number of plants in the campus - 1500
3. Total number of Trees in the campus - 750
4. Total Garden area in the college campus accounts to – 18 Acres
5. Total number of medicinal plants /trees in the campus – 20 Species
6. Total number of vegetables and fruits plantation in the campus – 20 Species

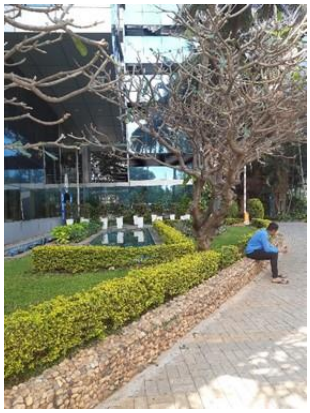
Sample list of plants in the campus with the scientific names and quantity is as given below in the table 7-1.

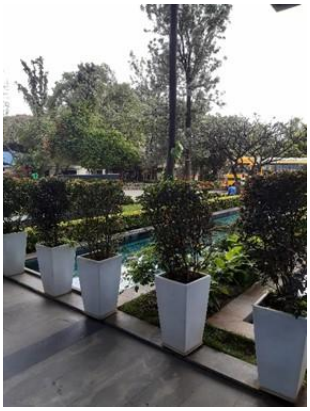
S. No.	Common Name	Scientific Name	No. of Trees/plants	Uses
1	Gulmohar	Delonix regia	4	Ornamental
2	plumeria	plumeria rubra	6	Ornamental
3	Amaltus	Cassia fistula	2	Ornamental
4	Bottle Brush	Callistemon citrinus	2	Ornamental
5	Jack Fruit tree	Artocarpus heterophyllus	2	Fruit & Wood
6	Rosy trumpet	Tabebuia rosea	2	Ornamental
7	Sacred Fig	Ficus religiosa	2	Ornamental
8	Mango	Mangifera indica	4	Fruit
9	Silver Oak	Grevillea robusta	4	Wood
10	Pougamia	Millettia	10	Leaves & Wood
11	Coconut tree	Cocos nucifera	10	Nuts
12	Ashoka tree	Saraca asoca	20	Ornamental
13	yellow trumpet	Tecoma stans	2	Ornamental
14	Tamarind tree	Tamarindus indica	4	Pods & wood
15	Iron wood Tree	Olneya tesota	1	Ornamental
16	Eucalyptus tree	Eucalyptus globulus	2	Wood
17	Fig	Ficus carica	1	Fruit & Wood
18	Bauhinia	Bauhinia blakeana	4	Wood
19	Ficus	Ficus benjamina	2	Wood
20	Bilva	Aegle marmelos	2	Wood

Table 7-1: Sample list of plants / trees with their scientific names

Some of the photos of trees in the campus are as shown in the figure 3-55.

The images of various plantations taken during the audit are shown in the following figure





(a) **(b)** **(c)**

Figure 7-1: (a)(b)(c)-Plantation in the entrance area

(a)

(b)

(c)

(d)

Figure 7-2: (a)(b)(c)(d)- Plantations all on the way to campus

(a) **(b)** **(c)**

Figure 7-3: (a)(b)(c)- Some of the trees and plants near canteen

(a) **(b)** **(c)**

Figure 7-4: (a)(b)(c)- Some of the trees in the campus with the name-plates

(a)

(b)

(c)

Figure 7-5: (a)-Plantations near college mess

(b)-Plantations inside the college

(c)-Trees and plantation near the parking area

(a)

(b)

Figure 7-6: (a) Indoor plants in Bio-chemistry lab (b) Indoor plants near lift

(a)

(b)

Figure 7-7: (a) Indoor plants in the corridors (b) Indoor plants outside the classrooms

7.2. Best Practices Implemented for Green Campus Management

The maintenance staff members do periodic checks and maintain records for the same. Many initiatives are taken by the management to inculcate the eco-friendly culture among the student community. The green campus provides the facilities such as rain water harvesting, well grown plantations and lawn all around the campus.

- Green landscaping with trees, plants like vegetable, fruits and medicinal plants; lawns
- Paperless office: All communication regarding academics and administration are sent as e-mails and messages to faculty members and students that contributes paperless communication

Figure 7-8: Sapling Plantation on Ramakrishna Paramahamsa Jayanthi

7.3. Recommendations

- Encouraging students to recommend creative ideas for making campus more greenery.
- Conducting competition among departments to promote student's ideas in sustainability initiatives

8. ENVIRONMENT AUDIT (CARBON FOOTPRINT ANALYSIS)

8.1. Facility Description

The carbon footprint is "the total amount of greenhouse gas (GHG) emissions caused by an organization, event or product". Global warming and climate change are the foremost environmental challenges facing the world today. It is our responsibility to minimize the consumption of energy and hence reduce the emissions of greenhouse gases.

To analysis the carbon footprint, transportation details of students and staff are collected as below:

1. Whether college provides transport facility for staff and students (Yes/No)? No,
2. Number (or Percentage) of Staff using public transport: 03%
3. Number (or Percentage) of Staff using Bike: 57%
4. Number (or Percentage) of Staff using Car: 31%
5. Number (or Percentage) of Staff using Electric Bike: 08%
6. Number (or Percentage) of Staff using Bicycle: 01
7. Number (or Percentage) of students using public transport: 46%
8. Number (or Percentage) of students commute by walking: 36%
9. Number (or Percentage) of students using Bike: 16%
10. Number (or Percentage) of students using Electric Bike: 01%
11. Number (or Percentage) of students using Bicycle: 01%

8.2. Best Practices Implemented for Environment Conservation

8.2.1. Use of Air purifiers in the treatment floors

The buildings are always engaged with the continuous passage of a larger number of occupants and with goods, several other items. All these materials may release volatile organic compounds (VOC's), obnoxious gases & particles into the premises. Eventually, the indoor air inside the commercial buildings will lose its quality. Moreover, the most common challenge in the buildings is the lower concentration on ventilation facilities, indoor air recirculation systems. As a result, occupants in the buildings are more susceptible to poor health. Pollutants occupied in the indoor environment can increase the risk of illness. Poor indoor air quality in the commercial spaces is due to the presence of:

- Molds, spores, pollens
- Carbon monoxide, radon, volatile organic compounds (VOCs)
- Bacteria, viruses, and byproducts
- Vehicle engine exhaust, exhaust from industrial plants
- Asbestos, clays, elemental particles, and man-made fibers

Control of indoor air quality involves integrating three main strategies. First, manage the sources of pollutants either by removing them from the building or isolating them from people through physical barriers, air pressure relationships or by controlling the timing of their use. Second, dilute pollutants and remove them from the building through ventilation. Third, use filtration solutions/ products to clean the air of pollutants.

Air purifiers inside the hospital wards keeps the air clean fresh. Sample photo of Oral medicine Air purifier in the DSCDS premises is shown in figure 8-1.

Figure 8-1: Sample photo of Oral medicine air-purifiers

8.2.2. Encouraging for usage of electric vehicles

The institution management is recommending and encouraging the staff and students to use the public transport and electric vehicles, to reduce the carbon foot prints.

Some of the staff & students coming to college are Electric bikes. During audit pictures of electric bikes are taken and the same is given in figure 8-1.

Figure 8-2: Sample photos of electric vehicles

8.2.3. Awareness program – No Tobacco Day

Dayananda Sagar College of Dental Sciences in association with Karnataka Cancer Society observed the **World No Tobacco Day on the 31st of May 2022.** In this connection, a mega awareness rally was organized from Banashankari bus stand to our college campus between 9 AM to 10.30 AM. About 400 students and staff were participated in the rally to convey the consequences of tobacco usage were performed for the benefit of public.

Figure 8-3: Sample photos of 'No Tobacco Day'

8.2.5. Quit smoking Awareness poster – Hospital

A big poster on 'Quit smoking' is placed at the entrance of the hospital. Sample picture of the same has been shown in figure 8-4

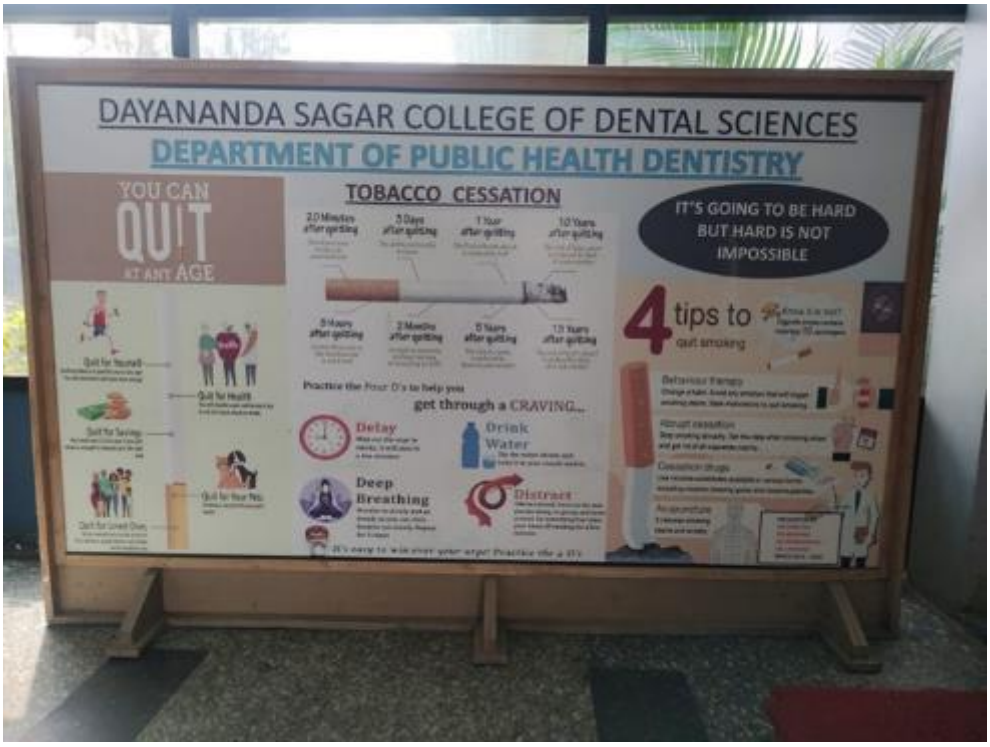


Figure 8-4: Sample photos of Poster – Quit Smoking

8.2.6. Awareness program – World Environment day

On the occasion of World Environment Day, Dayananda Sagar College of Dental Sciences NSS unit organized a cyclathon from the college campus to Vidhana Soudha with a pit stop at Lalbagh west . NSS volunteers enthusiastically cycled a distance of 24kms from college to Vidhana Soudha and back. Posters and banners about Environment awareness were displayed at Lalbagh and Vidhana Soudha. Sample photo of the event is shown in figure 8-4.

Figure 8-5: Sample photo of Word environment day

8.3. Recommendations

During the study, there was continuous interaction between the audit team, college engineers and staff members to ensure that the suggestions made are realistic, practical and implementable.

- Recommend more staffs to use car-pooling system
- Recommend students and staff to use more public transport system
- Recommend students and staff to use more bicycle
- Recommend staff and students to use more electric vehicles

9. ANNEXURES

9.1. Data Collection Questionnaire

A questionnaire is a checklist used as the primary tool for the collection of data / information in a systematic manner that enables to perform the audit.

9.1.1. General information of the college:

General information of the college needs to be collected to get an overview of the campus for the walk-through purpose. It includes a set of questionnaires as given below.

1. Internal Environment Quality Audit Team : 2020 – 2021

Table 9-1 depicts the format for the collection of Internal Environment Quality Audit team.

Table 9-1: Internal Environment Quality Audit team

S. No.	Name	Designation	Role
1			
2			
3			

2. General Information of the college

General information of the college includes an address of college and head office, contact person details, year of establishment etc., as given in table 9-2.

Table 9-2: General information of the college

S. No.	Description	Details
1.	Name of the College and address:	
1.a	Head office address :	
2.	Telephone/Fax No	
3.	Co-ordinating officer:	Name:
		Mob:
		Email:
4.	Year of Establishment:	

S. No.	Description	Details
5.	Hostel (Available/Not Available)	
6.	No. of Working days/year	
7.	Brief description of Campus	

3. Tentative Schedule of a working day:

a. No. of working days per year:

b. List of holidays:

4. Total area of the campus

5. Number of staff and students

Teaching, non-teaching, supporting staff with a male and female breakup is obtained from table 9-3

Table 9-3: Details of the Staff

S. No.	Staff	Students
1		

9.1.2. Water Audit details:

1. General information

General information required for water management analysis is collected from table 9-4.

Table 9-4: Water management details

S. No.	Description	Details
1	Source of water	
2	Types of water	
3	No of Wells	
4	No of motors used	

S. No.	Description	Details
5	No of bore wells	
6	Rating of the motors in HP	
7	Depth of each bore-well	
8	Water level of bore well	
9	Number of water tanks (overhead & underground tanks)	
10	Capacity of overhead tank	
11	Capacity of underground tank	
12	Quantity of water pumped every day	
13	Any water wastage of water /why?	
14	Water usage for gardening	
15	Waste water sources	
16	Use of waste water	
17	Faith of waste water from labs	
18	Whether waste water from labs mixed with ground water?	
19	Any treatment method available for lab water?	
20	Whether any green chemistry method practiced in labs?	
21	Total number of water coolers	
22	Whether Rain water harvesting system available?	
23	Whether Sewage Treatment Plant (STP) is available?	
24	List of equipment installed in STP (If S.No.23 is Yes)	
25	Whether Solar Hot Water System is available in the campus	
26	Number of units and amount of water harvested	
27	Any leaky taps in the campus	
28	Amount of water lost per day	
29	Any water management plan used?	
30	Any water-saving techniques followed?	
31	Are there any signs reminding peoples to turn off the water?	
32	No. of water flow meters available	
33	Method of water consumption monitoring	
34	Breakup of daily water consumption	

S. No.	Description	Details
35	Attach Month wise water bill for last 2 years	
36	Please attach recent water quality test reports for Bore well water, Drinking Water and STP processed water.	
37	What are the sources of hot water	
38	What are the usage areas of hot water	

2. STP information

STP details are collected from table 9-5

Table 9-5: Details of STP

S. No.	Description	Details
1.	Number of STP plants installed	
2.	Capacity of STP	
3.	Technology of STP	
4.	Year of Installation	
5.	Schematic / Layout of STP	
6.	Water flow meters installed	
7.	Quantity of Sludge	
8.	Disposal of Sludge	

3. RO Plant information

RO Plant details are obtained from table 9-6.

Table 9-6: Details of RO Plant

S. No.	Location	Quantity	Capacity
1.			
2.			
3.			

9.1.3. Energy consumption details:

1. Energy consumption details:

The energy consumption details required for the audit is collected, the brief format of the same is given in table 9-7.

Table 9-7: Details of Energy consumption

S. No.	Type	Units		Value	Cost in Rs.
1	Electricity	kWh	2020		
			2021		
2	LPG	Cylinders			
3	Diesel	Litres (Month wise consumption for the last two years)			
4	Others resources (Please specify)				
5	Total connected load	kW			
6	Contract demand	kVA			
7	Maximum demand recorded	kVA			
8	Average power factor				
9	Energy charges	Rs./kWh			
10	Demand charges	Rs./kVA			
	*** Attach Electricity Bill Copy of last 2 years**				

2. Solar Energy details:

The solar energy details required are collected from table 9-8.

Table 9-8: Details of Solar Energy

S. No.	Building No./ Name	Solar water Heater			Solar PV System		
		Capacity	Working / Not working	Year of Installation	Capacity	Working / Not working	Year of Installation

3. Solar Street lights details:

a. Quantity -
b. Capacity -
c. Year of Installation –

4. Electrical Equipment details:

Electrical Equipment like transformers DGs UPS Capacitor Bank, AC, Computers, water coolers, fans, exhaust fans are obtained from the table 9-9.

Table 9-9: Details of Electrical Equipment

S. No.	Description	Details	
1.	Number of Transformers Installed	Nos.	
2.	Number of Electrical Panels / Electrical Panel Rooms	Nos.	
3.	Whether Diesel Generator Set Backup Power is Available	Yes / No	
4..	How many number of DG Sets available in the campus (If S.No.3 is Yes)	Nos.	
5.	Whether UPS is available for labs, computers and/or any equipment	Yes / No	
6.	Number of UPS installed with location and capacity (If S.No.5 is Yes)	Nos.	
7.	Whether Capacitor Banks is installed in the electrical panel rooms	Yes / No	
8..	Whether Air Conditioning Units have been installed in the campus	Yes / No	
9.	Type of AC units (split, cassette or packaged) available, capacity and installed location (If S.No.8 is Yes)	Nos.	
10.	Total number of computers available in the campus	Nos.	
11.	Type of computer monitors available (CRT, LCD, LED)	Nos.	
12.	Whether water coolers are installed in the academic blocks	Yes/No	
13.	Type of lamps (Fluorescent Tube Light, CFL, LED, Incandescent, Sodium / Mercury lamps, etc.,) installed in the campus	Nos.	
14.	Type of fans (ceiling, wall mount, standing, exhaust, etc.,) installed in the campus	Nos.	
15.	Whether exhaust fans are installed in hostel / kitchen.(If Yes, share the quantity and installed location)	Yes /No	
16.	Any other electrical equipment's in college buildings.		

5. List of energy saving initiatives implemented
6. List of energy saving initiatives in plan for future

9.1.4. Waste management details:

Waste management includes the activities and actions required to manage waste from its inception to its final disposal. The various data/ information required for the assessment of waste management is as collected from the following set of questionnaires.

1. Basic information

Basic information for waste management is collected from table 9-10.

Table 9-10: Basic details of waste management

S. No.	Description	Yes/ No
1	Whether wet and dry garbage segregation is done inside the campus?	
2	Whether garbage is given to external agencies / municipal agencies?	

2. Types of Waste generated

Types of waste generated in the college are obtained from table 9-11.

Table 9-11: Types of waste generated

S. No.	Description	Yes / No	Remarks
1	E-Waste (Computers, electrical and electronic parts)		
2	Hazardous / Chemical Waste		
3	Solid Waste (Damaged furniture, paper waste, paper plates)		
4	Dry Leaves		
5	Food Waste		
6	Waste Water (Washing, urinals, bathrooms)		
7	Glass Waste (Broken glass wares from the labs)		
8	Unused Materials		

9	Plastic Waste (Pen, Refill, Plastic water bottles and other plastic containers, wrappers etc.)		

9.1.5. Green campus management details:

1. Total number of plants and trees

The total number of plantations, garden area, and many more are collected as per the set of questionnaires given in table 9-12

Table 9-12: List of plantation details

S. No	Description	Details
1	Total number of plant species identified	
2	Total number of plants on the campus	
3	Total number of Trees on the campus	
4	Garden area inside the college –	
5	Total number of medicinal plants /trees on the campus	
6	Total number of vegetables and fruits plantation in the campus	
7	Whether display boards are given to plants and trees for identification	
8	Does Institute celebrate World environment day?	
9	Does Institute celebrate World water day?	
10	Does Institute celebrate World ozone day?	
11	Does Institute celebrate World Earth day?	
12	Total number of aquatic water plants	

2. List of plants/ trees

List of plants/ trees with their scientific names obtained from table 9-13.

Table 9-13: List of plants/trees in campus

S. No.	Common/Local Name	Scientific name	No. of Trees/Plants

9.1.6. Carbon footprint management details:

The carbon emission from various activities such as transport, diesel generator usage, LPG consumption, and electricity consumption were collected, as per table 9-14.

Table 9-14: Details of Carbon footprint management

S. No	Description	Details
1	Whether college provides transport facility for staff and students (Yes/No)	
2	Number (or Percentage) of staff using transport services provided by college	
3	Number (or Percentage) of students using transport services provided by college	
4	Number (or Percentage) of Staff using public transport	
5	Number (or Percentage) of Staff using Bike	
6	Number (or Percentage) of Staff using Car	
7	Number (or Percentage) of students using Public transport	
8	Number (or Percentage) of students using Car	
9	Number (or Percentage) of students using Bike	
10	Number (or Percentage) of students using Bicycles	
11	Average consumption of diesel per month	
12	Average electricity consumption per month	
13	Average LPG consumption per month	

9.1.7. Photos required for Audit:

1. General Photos

In various sections, different types of photos are required to validate the existence of things, and hence they are collected from table 9-15.

Table 9-15: List of photos

S. No	Description		Details
1	Photos of student's NSS activities		
2	Photos of Safety policy		
3	Photos of the training program on the use of fire extinguishers		
4	Photos of environmental policies adopted by college		
5	Photos of MoUs for Waste management		
6	Photos of any other policies adopted by college		
7	Photos of water test report	Drinking Water	
		STP processed water	
		Bore-well water	
		Other water Sources (Like Tanker water and any other)	
8	Photos of use of Energy efficient devices like fan, bulbs etc.		
9	Photos of LCD/LED monitors used in Labs		
10	Photos of dry and wet waste collection bins		
11	Photos of celebrating World Environment Day		
12	Photos of celebrating World Water Day		
13	Photos of celebrating World Earth Day		
14	Photos of celebrating World Ozone Day		