GREEN AUDIT REPORT
FOR
JECRC ENGINEERING COLLEGE & RESEARCH CENTRE
JAIPUR

Carried On
11th Dec, 2021

Carried Out By

ELION TECHNOLOGIES & CONSULTING PVT LTD
307, 3rd Floor Local Shopping Centre, Lal Market,
H Block, Vikas Puri, New Delhi - 110018
Tel: +91-11-28531884, +91-11-28541888
Web: www.elion.co.in, Email: safety@elion.co.in

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CONTENT

1. INTRODUCTION

The National Society for Education Research and Development (NSERD) was registered in the year 1999 in Jaipur with the major objective of providing quality education and research environment in Rajasthan. It established its first college, Jaipur Engineering College & Research Centre (JECRC) in Jaipur, in the year 2000. Encouraged by its splendid achievements and overwhelming public patronage, it ventured into establishing second college, UDML College of Engineering (which is known as JECRC UDML College of Engineering) in the year 2007.

The JECRC Foundation having 22 years of existence, is amongst the most reputed educational groups in Higher and Technical Education in North India which has 2 large campuses with 10,000 students enrolled as on date in various courses alongside engineering courses, the major chunk of the admissions being routed through JEE examinations. The engineering colleges are approved by the AICTE, New Delhi and are affiliated to the Rajasthan Technical University, Kota.

JECRC has become the most sought-after institutions for admissions as evident by the REAP admission! Patterns. The JECRC Foundation has now become a brand name in professional education in Rajasthan.

JECRC was established in 2000. The institution started with three branches namely, Computer Science Engineering, Electrical Engineering and Electronics and Communication Engineering, with 180 students. The very next year one more branch introduced Information and Technology. After the introduction of the new branch total intake is increases by 240 students. In 2003, with the addition of Mechanical Engineering intake increased by 60. In 2009, college came up one more branch, Civil Engineering. With this new advancement, the student's sanctioned intake increased to 480. By 2013, second shift for Computer Science Engineering and Mechanical Engineering came into effect and at present the total sanctioned intake of 990 students in all.

The JECRC Foundation, is in its 19th year of existence, is amongst the most reputed educational groups in Higher and Technical Education in North India which has 2 large campuses with 10,000 students enrolled as on date in various courses along with engineering courses, the major chunk of the admissions being routed through JEE examinations. The JECRC Engineering College is approved by the AICTE, New Delhi and is affiliated to the Rajasthan

Technical University, Kota.

Elion Technologies and Consulting Pvt Ltd (Elion) team carried out remote audit of premises on 11th Dec, 2021. The audit was carried out using online meeting platform google hangout, prior to Audit questionnaire and checklists was shared with the client. During the audit Elion team carried out virtual visit of entire campus i.e. classrooms, library, washrooms, staff rooms, administration department, accounts department and hostels.

Campus Information

The college is offering courses in following fields:

- Applied Science
- Computer Science Engineering
- Mechanical Engineering
- Electronics and Communication Engineering
- Information Technology
- Civil Engineering
- Electrical Engineering

Details of the infrastructure of JRM college is as per below:

Building Name	Areas (Sq. Mtr.)	Number of Floors
Block A	4500	3
Block B	8372	5
Block C	10224	5
Block D	6698	6
Block E	1228	4
Workshop	242	1
BH 1	3000	3
BH 2	4400	4
GH	3600	4

During Audit, ELION team interacted with following stakeholders:

Name	Designation
Er. Yogendra Sharma	Asst. Proff.

Rajesh Sir	Electrician
Abhilasha Ma’am	Asst. Proff.
Mukesh Sir	Asst. Proff.
Ashish Boraida	Asst. Proff.
Sumit Saini	Asst. Proff.
Narendra Sipani	Asst. Proff.

2. ENVIRONMENTAL SETTING

The land use around the campus is mainly educational institute and residential area. There are educational institutes like RR college of nursing, Anand Agricultural University, Apex Institute of Engineering and Technology situated in vicinity of the college.

JECRC Campus

Location of JECRC College

3. GREEN AUDIT

For Green Audit following 13 major areas (including their subsections) were covered and compliance/ initiatives under these areas were verified/ validated.

a) Good Daylight Design and Ventilation
b) Water Efficiency
c) Wastewater Management
d) Indoor Air Quality
e) Energy Efficiency
f) On-site Energy Generation
g) Temperature and Acoustic Control
h) Paper Waste Management
i) E-Waste Management
j) Canteen and Solid Waste Management
k) Universal Access and Efficient Operation and Maintenance of Building
l) Green Belt
m) Green Programs (Green initiatives)

3.1 Good Daylight Design and Ventilation

a) Corridors are wide with good ceiling height. All the corridors receive good daylight.
b) Curtains are provided on some of the windows to avoid glare.
c) Laboratories are provided with exhaust fans to disperse heat, fumes and odours.
d) Stair cases receive daylight through windows provided at various levels.
e) Classrooms, Labs and Library have large windows. Windows are kept open to adequate daylight.

Good daylight and Ventilation in classrooms Main staircase which receives daylight

Daylight in Labs

3.2 Water Efficiency:

a) Submersible pump is used for water supply in the campus
b) For drinking water supply water cooler are installed at various location in the campus.
c) Currently water meter is not installed to monitor the quantity of water extracted.
d) It is recommended water meter to be installed and daily/monthly water consumption to be recorded.
e) Rain water harvesting system is installed in all the blocks.
f) Water conservation faucets in washrooms were not seen. Installation of such faucets can save water and will help in minimizing the water footprint of the institute.
g) Normally mops are used for floor cleaning and hose is used for cleaning once a week
h) Dual flushing system is not provided in the washrooms.
i) Signage are not provided in washrooms emphasizing water conservation.
j) Water from air conditioning unit and reject water from water purifiers is used for watering plants within premises.

k) Water coolers & purifiers are installed at drinking water supply points.

3.3 Wastewater Management:

a) Sanitary wastewater generated from washrooms is discharged into septic tank
b) Wastewater/ sewage recycle is not practiced in the College as grey water/ sewage treatment/recycle facility is not provided.
c) Sewage Treatment plant should be provided and all water to be recycle

3.4 Indoor Air Quality:

Indoor Air Quality (IAQ) refers to the air quality within and around buildings and structures, as it relates to the health and comfort of building occupants. Some common indoor pollutant are listed as below:

- Molds and other allergens – This may arise from water seeping into the building envelope or skin, plumbing leaks, condensation due to improper ventilation, or from ground moisture penetrating a building part.
- Volatile organic compounds (VOCs) – VOCs are emitted by paints and lacquers, paint strippers, pesticides, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions etc.
- Carbon monoxide – Sources of carbon monoxide are incomplete combustion of fossil fuels.
- Carbon dioxide – Due to human respiration
- Particulate matter – Due to construction and maintenance activities

Major observations under indoor air quality are as below:

a) In classrooms the mode of ventilation is natural (through windows) and is enhanced by fans. Air conditioners are used in some of rooms/ labs e.g. computer labs, computer server room.
b) Green belts have been set up in campus area.
c) Heating Ventilation and Air Conditioning (HVAC) system does not exist. Split and Windows Air conditioner are used.
d) Indoor plants are seen in the College. Indoor plants can be plotted not only for the aesthetic appearance but also for health benefits. Refer **Annexure 1** for details.
e) Exhaust fans are provided only in labs and washroom
f) IAQ awareness signage was missing in College. Information on sources,

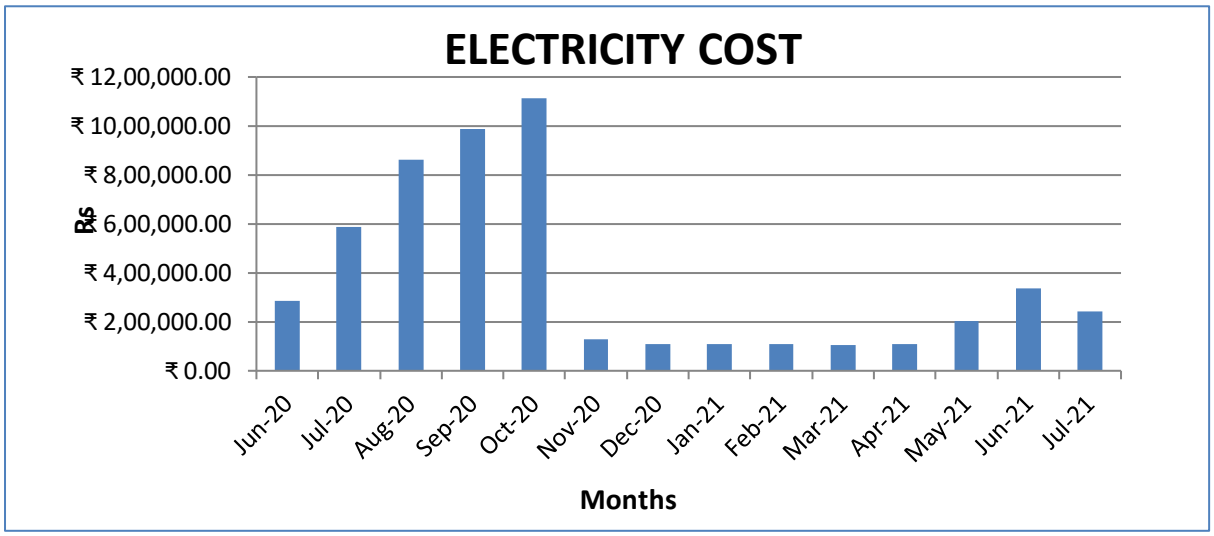
impacts and mitigation of indoor air pollution to be displayed within College for increasing awareness about indoor air pollution.

3.5 Energy Efficiency:

Electricity:

Power is supplied by local electricity department. The major electricity consuming equipment installed in the campus are Windows and Split AC, Submersible Motor, Motors, Air Cooler, RO Plant, Desktop, Printer, Fan, Tube light, LED Bulb, Halogen Bulb, Mercury Bulb, Mosquito Replete, Fire Alarm System.

Following is details of energy consumption



It was observed that:

a) LED tube lights & fans are installed in classrooms and labs. CFL and conventional tube lights are also used. College is in the process of replacing periodically the dysfunctional conventional tube lights with LED lights.
b) Signage are not present near every electrical switch board encouraging users to switch off light and fans to save electricity.
c) JECRC has air conditioner which are in good working condition.
d) It was observed that reflectors are not provided for tube lights which can reduce electricity consumption.
e) The college is exporting power using solar power plant and is net positive.

3.6 On Site Energy Generation (usage of LPG/ Natural Gas):

a) Canteen facility is present in JECRC
b) Back Up diesel generators are available.
c) Natural gas pipeline and LPG is provided in the canteen for cooking.
d) Solar Power plant of capacity 400kW is provided in the college.

3.7 Temperature and Acoustic Control

a) White washed rooms & corridors and white/ off-white flooring improve the lighting conditions.
b) The entire campus has green area

Green Campus

Green Campus

c) JECRC has done tree plantation all around the building which helps in reducing temperature

Tree Plantation all around campus

3.8 Paper Waste Management:

Being academic institution, waste paper is the main solid waste generated in the premises. The College has taken steps to minimize and avoid paper usage. It was observed that:

a) Prints and photocopies are taken on both sides of the pages to avoid excess paper usage. Rather than photocopy, digitalization (scanning) is practiced.
b) Faculty and administration staff uses old papers and envelops for internal usages as rough work, file markers, page separators etc.
c) Paper notices are displayed on the notice boards. Most of the storage is in library and staff room. After couple of years, old submissions and answer papers will be archived and stored in record room.
d) Internal notices and communications are through E-mail/SMS.
e) Old papers are given to vendor in exchange of new papers, in the ratio.

3.9 E-Waste Management:

a) JECRC is digitalized to a large extent. This includes classrooms, library, internal mails etc.
b) E-waste is collected and stored in respective department. Once in a year this e-waste is collected from respective department and given to vendor

3.10 Solid Waste Management:

It was observed that:

a) Wet waste and dry waste segregation is practiced in the premises. Separate bins are provided for wet biodegradable and dry recyclable waste.
b) Biodegradable waste is mainly generated in canteen
c) The Biodegradable waste is kept in forest area and over period of time it is converted into manure.
d) Scrapped benches are repaired and reused.

3.11 Universal Access and Efficient Operation and Maintenance of Building:

It was observed that:

a) College is easily accessible. Staircase is provided for staff and students.
b) Fire extinguishers and fire hydrants are provided in few areas for emergency. They are inspected and serviced by fire protection service company annually.
c) There is no signage for emergency fire exit. This is of crucial importance during emergency.
d) Since the access and staircases are wide and uncluttered, it is possible to have a safe evacuation during emergency.

3.12 Green belt/ Landscaping:

a) Large trees are planted in the premises. Plantation also helps maintaining lower temperatures of the area. .
b) Potted plants are kept at the back side which are brought indoors on certain occasions.
c) Indoor plants are kept along the corridors and entrance of the building.

3.13 Green Initiatives:

College is regularly celebrating Milap, Environment Day, and Earth Day.

4. RECOMMENDATIONS/ SUGGESTIONS

4.1 For Improving Energy Consumption:

a) Every classroom and lab with central switch board can have a diagram linking location of a tube light, fan etc. with corresponding switch. This will ensure that correct fitting is switched on/ off and can save time & unnecessary operation.
b) Installation of automatic lights with sensors can be considered.
c) Standard Operation Procedures (SOPs) should be prepared and followed for green purchasing. Equipment with star rating, using eco-friendly materials; with safe disposal policy to be preferred. Policy of returning equipment at the end of life span to the supplier to be preferred.
d) Conduct energy audit every two or three years and determine the lux levels within College. Energy audit can help in reduction in number of light fittings/ energy usage in the College.
e) For purchasing new electronic appliances, star rating provided by Bureau of Energy Efficiency (BEE) should be considered. The equipment which has maximum star ratings could be purchased, which will consume less energy, ensure environmental sustainability and also operate at low cost.
f) Usage of light reflectors is recommended as the reflectors can spread light to relatively large areas.
g) Notices/ signages can be put up/ displayed near switches and on notice boards, informing students and staff to switch off all electricals when not in use.
h) If possible, computers should be switched off from main power connections.
i) Control sensors can help to reduce consumption by automatically dimming lights when people are not around, and keeping blinds open to use natural light & reduce energy consumption.
j) Raise awareness:
   - Encourage students to help in monitoring energy consumption & implement corrective actions
   - Integrate energy education into classroom learning.

4.2 Water Conservation:

a) Provide information on water usage and savings to students/ staff through notices, screen savers in computer labs.
b) Dry sweep or use a sponge broom when possible, instead of using a hose to clean floors, sidewalks, or other hard surfaces.
c) Minimize/ reduce water usage by installing water saving faucets such as pressmatic taps, tap aerators, jet sprays etc.
d) Grey water/ sewage recycling system can be installed for flushing toilets. This will reduce the fresh water footprint.
e) Dual flushing system can be installed for toilet flushing which saves considerable amount of water.
f) Installation of waterless urinals can be considered to reduce water consumption.
g) Water balance diagram can be prepared to quantify the water consumption by installing water meters at key points. Based on data gathered, appropriate measures can be taken to reduce the water consumption.

4.3 Paper and other Solid Waste Reduction:

a) Inventories of all solid waste generated in the premises must be maintained.
b) Enhance recycling. This can be done by creating a group where students can recycle books, personal clothes and other material to needy students. This can be an initiative under green program.
c) Standard Operating Procedures (SOP) for Solid and E-waste management and for recycling of waste should be prepared & practiced. The SOP's may include collection, segregation and reuse of different types of wastes, if any (e.g. biodegradable waste for composting). This will help in safe disposal of waste to recycle agencies.
d) The college can introduce online app, which can be useful for conducting internal exams, assignment/ reports submission. This system can also be used for displaying important notices, timetables.
e) Paper usage shall be monitored to understand the impact of digitization in the facility.
f) Training as well as awareness programs should be organized on segregation of biodegradable waste and recycling of waste. Efforts should be taken to inform students about recycling options and signs should be posted on appropriate bins indicating what could be dumped in each bin.

4.4 Others:

a) Environmental advisory committee could be formed. The discussions/ information sharing among different departments can generate lot of ideas and awareness on green issues.
b) Since each student uses computer lab, the screen savers can be set up for creating environmental awareness. (Ergonomics, water conservation etc.). Short 30 second pop up can be displayed on computer screens when they are on standby mode. Or wallpapers informing students about environment conservation can be created.
c) Maintain minutes of meetings of environmental committees; evaluate the effectiveness of various environmental programs conducted by the institutes. Set annual targets for Green Initiatives & monitor them closely. Create 'Green Champions'.
d) Consider detailed energy audit (energy consumption, thermal emission, visual comfort) and water audit.
e) Adopt environmentally responsible purchasing policy, and work towards creating and implementing a strategy to reduce environmental impact of its purchasing decision.

ANNEXURE 1
INDOOR GARDENING DETAILS

Indoor plants are commonly used for their aesthetics benefits but they also have vital role reducing airborne pollution. The right choice of plants can be an excellent way of improving indoor air quality and general health. Local landscape contractor can be contacted for supply and rotation of these plants.

Plants	VOC it removes	Indoor source of VOC's	Plant care
 **Aloe Vera**	Formaldehyde, Trichloroethylene and Benzene	Chemical based cleaners and paints	Easy to grow with enough sunlight
 **Bamboo Plant**	Formaldehyde, Trichloroethylene and Benzene	Paints, Plastics, Wood products etc.	Thrives under low light conditions as well as easy to maintain
 **Chinese Evergreen**	Benzene	Paints	Low maintenance plant that prefers low light conditions.
 **English Ivy**	Formaldehyde, Benzene, Air borne fecal matter particles	Wood, Paper products, Air borne fecal – matter particles from pests	Easy to maintain

 **Janet Craig**	Formaldehyde, Benzene and Trichloroethylene	Paints, Plastics, Wood products etc.	Medium to low light tolerant plant. Requires little water for growth.
 **Golden Pothos or Devils Ivy**	Formaldehyde, Cleanses air	Exhaust fumes, carpeting materials, panelling and furniture products made with particle board	Extremely easy to maintain under low to bright light conditions. Fast growing and grows well under Fluorescent light.
 **Mass Cane**	Formaldehyde, benzene and trichloroethylene	Paints, Plastics, Wood products etc.	Medium to low light tolerant plant. Requires little water for growth.
 **Snake plant**	Formaldehyde and trichloroethylene	cooking fuels, wood products, facial tissues, personal care products and waxed papers	Drought resistant and Tolerates a variety Of light conditions. Hard to damage or kill.

 **Peace Lily**	Formaldehyde, benzene and trichloroethylene	Paints, Plastics, Wood products etc.	Relatively easy to maintain. Survives in low light conditions.
 **Red-edged Dracaena**	Formaldehyde and trichloroethylene	cooking fuels, wood products, facial tissues, personal care products and waxed papers	Drought resistant and Tolerates a variety of light conditions. Hard to damage or kill.
 **Spider Plant**	Formaldehyde, benzene, carbon monoxide and xylene	cooking fuels, wood products, Printing	Easy to maintain under medium to bright light condition.
 **Parlor Palm**	Purifies indoor air	-	Easy to maintain

ANNEXURE 2
GREEN AUDIT CHECKLIST

Good Daylight Design

Sr. No.	Design Feature	
1	Broad door opening	✓
2	Clerestory/ High windows	✓
3	Openings at the eastern and southern side	✓
4	Rectangular building so that sunlight can reach all areas	✓
5	Sunshade	-
6	Double or triple glazing on windows	-
7	Enough illumination	✓
8	Light coloured fabric curtain or blind for window covering	✓
9	Operable/ openable windows	✓
10	Ultraviolet (UV) filtering windows	-
11	Use of exterior louvers to control glare	-
12	Use of glass as facilitator of natural light	✓
13	Use of insulated and tinted glass to filter heat gain	-

Ventilation

Sr. No.	Design Feature	
1	Downdraft cooling system (a downward flow of air)	-
2	Ceiling height	✓
3	Self-movement ventilators in the roof	-
4	Wide corridors	✓
5	Operable windows	✓
6	Use of exhaust fans	✓

Temperature and Acoustic Control

Sr. No.	Design Feature	
1	Double roof	-
2	Earth air tunnel (cools air in summer and heat it in winter)	-
3	Green roof	-
4	Mud roof	-
5	Openings at the eastern and southern side	?
6	Roof with reflective tile/aluminium/asbestos	-
7	Sand stone cladding outside the walls	?
8	Special walls for temperature control (Thick/Double/cavity/fire/composite /green)	-
9	Use of cool roofing material (mineral wool, rock wool, vermiculite, foams, expanded polystyrene, extruded polystyrene etc.)	-
10	Use of daylight design (Building is constructed in such a way that diffused sunlight allows light but not the heat)	?
11	Use of insulation material (e.g. autoclaved aerated blocks, hollow blocks, Thermocrete or higher R- value material)	-
12	Use of water bodies/fountain	-
13	Climbing creepers fitted to window in summer	-
14	Lime coating for cool roof	-
15	Retrofitting the existing roofs with cool roof technology	-
16	White wash on the roof	?
17	Use of landscaping as sound barrier	-

Water Efficiency & Wastewater Management

Sr. No.	Measures	
1	Aerators to water taps	-
2	Automatic toilet faucets	-
3	Drip irrigation (for plant watering system)	-
4	Dual flush toilet with cistern	-
5	Efficient plumbing system	✓
6	Sewage treatment plant for sewage recycle	-
7	Rainwater harvesting	✓
8	Regular maintenance for leakage free plumbing system	✓
9	Use of low flow/flow control water equipment or gadget	-
10	Water free urinals (No flush urinals/Zero flush urinals/Water less urinals/air based flushing system these save water used in toilet)	-

Energy Efficiency and On-site Energy Generation Mechanism

Sr. No.	Measures	
1	Avoid excessive lighting	✓
2	Computerized monitoring of electrical system	-
3	Integrated energy saving design for natural cooling/heating	✓
4	On-site energy generation	-
5	Photocell occupancy sensor for automatic light control	-
6	Regular maintenance of electrical system	✓
7	Use of day lighting system	✓
8	Use of energy efficient equipment	✓
9	Use of energy saving bulbs (Compact florescent light/LED lights)	✓
10	Solar panel	✓

Sustainable Material for Building and Interior

Sr. No.	Strategy adopted	
1	Use of biodegradable material	
2	Use of locally sourced material	
3	Use of material with low embedded energy(i.e. stabilized earth blocks, straw bales, stones, sand stone chips, fly ash)	
4	Use of nontoxic recycled content material and furniture	
5	Use of post-consumer recycled material	
6	Use of salvaged (Discarded or refused) material	
7	Use of material which can recycled at end of useful life	
8	Use of material which is simple to install without dangerous adhesive	

Waste Management

Sr. No.	Measures	
1	Sale of books to its user for minimal charges	-
2	Sale of books to store or other library	-
3	Sale of weeded books to needy students	-
4	Send books and used papers to recycling organization	✓
5	Avoid use of paper by going digital (Paper)	✓
6	Lessen the margins while printing	-
7	Printing on both sides of paper	✓
8	Reuse of printed paper/ envelops	✓
9	Segregation of dry and wet waste	✓
10	Setting up recycling area/ composting area	✓
11	Creation of specified junctions for collection of E-waste(E-waste)	-
12	Donation of computers to NGO's to refurbish and give it to needy people	-
13	Hand over to organization or recycler who knows proper disposal system	✓
14	Implementation of any recycling project or program	-
15	Purchase of electronic products from company's which have after sales service for the disposal of product with buyback policy	✓
16	Installation of bins to collect garbage	✓
17	Outsourcing recycling of garbage to agency	-
18	Recreating in to new sustainable products	-
19	Use of coloured bins with code to collect garbage	✓

Environmental Audit

Sr. No.	Type of audit	
1	Energy audit (includes energy consumption, thermal comfort, visual comfort)	✓
2	Sound/ Noise audit (includes indoor noise level, outdoor noise level)	✓
3	Water and waste audit (includes water quality, solid waste generation, solid waste disposal process)	-

Universal Access and Efficient Operation and Maintenance of Building

Sr. No.	Design feature	
1	Easy access to the main entrance of the building	✓
2	Elevator	✓
3	Preferred car park spaces for specially abled	✓
4	Ramp/ stairs with handrails on at least one side	-
5	Restrooms (toilets) in common areas	✓
6	Uniformity in floor level	✓
7	Audio guidance for specially abled	-
8	Availability of wheel chair	-
9	Braille assistance for specially abled	-
10	Personalized services by staff for differently abled	✓
11	Visual warning signage in common and exterior areas	-
12	Follow standard procedures for commissioning of electrical/plumbing system	✓
13	Purchase of standardized and quality material for repair	✓
14	Regular maintenance of building	✓
15	Use of chemical free products for cleaning	-
16	User awareness program to minimize damage of property	✓

Green Program

Sr. No.	Green program	
1	Buying recycled material	√
2	Creation of “Green Team” in the institution/library	-
3	Green education i.e. to become leader in environmental awareness	-
4	College conduct graduate program by library science/Any other department	√
5	Outreach relationships with local groups interested in environmental concern and satisfy their information needs	√
6	Providing external membership to small and local libraries (MOU with other colleges, -internal collegiate library loan)	-
7	Recycling beyond books i.e. paper, aluminum, plastic, e-waste	-
8	Reduce, Reuse and recycle of the products (At the time of disposal of library material)	√
9	Regular purchase of books/ magazines related to sustainability	√
10	Selection of material content of which informs and assesses green practices (green computing, energy conservation, organic gardening etc.)	-
11	Contribute library information on sustainability resources to a campus publication, blog or website	-
12	Creation of topical online resource guide (on sustainability etc.)	√
13	Disseminating expert advice about sustainability to other colleges to make their own college greener	-
14	E Publishing reviews of new green resources in the newsletter or news	P
15	Digitization	√
16	E-archiving	P
17	E-resources : E books, Online Journals, membership of consortium	P
18	Subscription to databases	√

√- Provided P - Planned