

Water Audit Report

of



JBR
ARCHITECTURE COLLEGE
HYDERABAD

*Survey No. 156 to 162, Bhaskar Nagar, Moinabad Mandal, Hyderabad,
Telangana 500075*

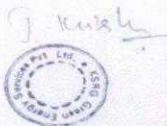
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December 2023



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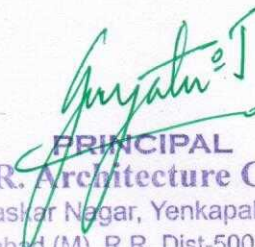
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Acknowledgement

KSRG Green Energy Services Pvt Ltd (called "KSRG" hereafter) places on record, its sincere gratitude to the Management of **M/sJBR Architecture College**, for assigning this important work of Water Audit of their College located at Survey No. 156 To 162, Bhaskar Nagar, Moinabad Mandal, Hyderabad, Telangana.

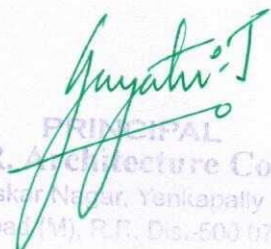
We also wish to thank the Principal & HODs, Lecturers , Executives & non- teaching staff of the institute for providing necessary guidance & support extended during audit study.

The Water Audit Report also presents present water usage practices, and measures and taken up by the institution and provides suggestions and recommendations to reduce water use in the college and sustainability.



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EXECUTIVE SUMMARY

The Water Audit has been conducted at **M/sJBR Architecture College** by KSRG GREEN ENERGY SERVICES PVT LTD., to study the water sources, water withdrawal, water distribution system, and water usage & consumption. The report also highlights wastewater treatment facilities installed and potential water saving opportunities in the college. Based on the study, measures are identified for improving water efficiency, which upon implementation will reduce water consumption.

The management has keen to take up furthermore measures for reducing water consumption and water audit has been awarded to KSRG Green Energy Services Pvt Ltd

A) Water Management Summary

i) Water usage

Table A: Water usage for the last year (April 2022 to March 2023)

Year	Ground Water Withdrawal kL /Yr.	R.O Water kL /Yr.	Total kL /Yr.
2022 - 23	3,100	450	3,550

ii) Water Usage areas & consumption

The major water consumption areas of the college are:

- Domestic Consumption
- Drinking water
- Gardening

B) Major Observations & Recommendations

- 1) The rain harvesting can be made by providing rainwater harvesting pits.
- 2) Aeration type fixtures for washbasin taps
- 3) Dual flush type for toilets in wash rooms.

Water saving measures have been identified in the water audit, the details of which are furnished in the Table B below:



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Table B: Summary of Water Savings, Investment Required and Payback Period

Sr. No.	Suggested Measure	Estimated Water Savings (KL/Yr.)	Monetary savings (Rs. lakh/ Yr.)	Investment required (Rs. lakh)	Payback period (Months)
1	Aeration type fixtures for taps.	250	--	0.25	--
2	Rain water harvesting	1000	--	1.00	--
	Total	1250		1.25	6

4)

5) As can be observed from the above Table B, the estimated water savings are 1,250 KL/Yr. The investment required is Rs. 1.25 lakhs.



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CHAPTER-1: INTRODUCTION TO WATER AUDIT

1.1 Introduction to Water Audit

Water audit determines the amount of water lost from a distribution system due to leakage and other reasons such as theft, unauthorized or illegal withdrawals from the systems and the cost of such losses to the utility. Comprehensive water audit gives a detailed profile of the distribution system and water users, thereby facilitating easier and effective management of the resources with improved reliability. It helps in correct diagnosis of the problems faced to suggest optimum solutions. It is also an effective tool for realistic understanding and assessment of the present performance level and efficiency of the service and the adaptability of the system for future expansion & rectification of faults during modernization.

Elements of water audit include a record of the amount of water produced (total water supply), water delivered to metered users, water delivered to unmetered users, water loss and suggested measures to address water loss (through leakages and other unaccounted for water losses).

According to the World Health Organization, less than 1% of the world's freshwater, or 0.007% of all the water on Earth, is readily available for human consumption. Fortunately, there is still enough for our needs, if we use it wisely and avoid contaminating a precious resource with harmful pollutants.

The water audit is a well-established procedure that identifies productive uses and needless waste of water. A water audit is an on-site survey and assessment of water-using hardware, fixtures, equipment, landscaping, and management practices to determine the efficiency of water use and to develop recommendations for improving water-use efficiency. In simple words, a water audit is a systematic review of a site that identifies the quantities and characteristics of all the water uses. The site may vary from Industrial Establishment, public water utility, facility (institutional or commercial properties like Hotels, office, schools etc.) or a household. The overall objective of conducting a water audit is to identify opportunities to make system or building water use more efficient.



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Water audit determines the amount of water lost from a distribution system due to leakages, evaporation, overall wastage etc. and the cost of such losses to the utility. Comprehensive water audit gives a detailed profile of the distribution system and water users, thereby facilitating easier and effective management of the resources with improved monitoring. Thus, even though the nature and scale of water use varies and differs according to the sites and systems, the underline principle is common, that is, water use audit determines where the water ends up and in what amount. The audit exercise provides decision making tools to the concerned people in the utility, institutions, or households by identifying inefficient uses, problem areas wherein water conservation and remedial measures can be undertaken.

1.2 Benefits of Water Audit

Water audit improves the knowledge and documentation of the distribution system, problem and risk areas and a better understanding of what is happening to the water after it leaves the source point. Leak detection programs help in minimizing leakages and tackling hotel problems before they become major ones. These audit lead to:

- (a) Reduced Water Losses,
- (b) Improved Financial Performance,
- (c) Improved Reliability of Supply System,
- (d) Enhanced Knowledge of the Distribution System,
- (e) Efficient Use of Existing Supplies,
- (f) Better Safeguard to Public Health and Property,
- (g) Reduced Disruption, Thereby Improving Level of Service to Customers.

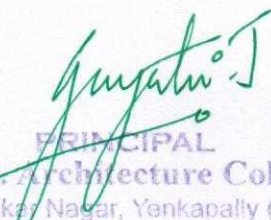
1.3 Scope of Work of Water Audit

The scope of work for the water audit study is as follows:

- Water system analysis
- Measurements of flow and pressure for water sources and end use applications
- Quantification of efficiency, losses, and leaks
- Quantification of various water quality and quantity
- Quantification of variability in flows and quality parameters
- Strategies for water treatment and reuse or direct use

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Water Audit Report of M/s JBR Architecture College

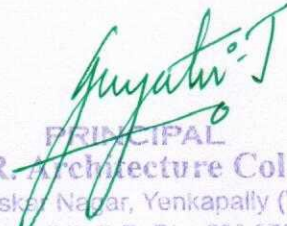
The water audit report contains the following:

- Water sources, consumption, and wastewater generation
- Specific water uses for various applications/end uses
- Identify the loss of water, if any during transit and water distribution network and provide suggestion to eliminate these water losses
- To study the performance of existing water circulating pumps/motors and recommend energy and water fixtures.
- Identify the opportunities to reduce the water consumption by various activities and to establish specific water consumption in the premises.
- Identification of various water saving opportunities.
- Strategy to be followed for implementation of water saving measures, quantity saving, monetary benefit, investment required and payback period.
- Assessment of adequacy and efficacy of existing treatment system and recommend feasible technological option for treatment of water and waste water.
- Identify the loss of water if any during transit and to provide suggestions to eliminate the losses.
- To analyse areas of water conservation, wastewater generation and recycle
- Preparation of detailed water balance schematic diagram

KSRG Green Energy Services Pvt Ltd has been entrusted by JBR Architecture College to conduct water audit for their college. This report aims at representing the water audit details and the outcome along with recommendations for JBR Architecture College



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1.4 Methodology of the Water Audit Study

Step 1: Reconnaissance or Walk through survey

- Understanding of existing water sourcing, storage, and distribution facility.
- Assessing the water demand and water consumption areas.

Step 2: Secondary Data Collection through the Discussion with Hotel executives, past records, Available technical literature/specifications

- Analyze historic water use and wastewater generation
- Field measurements for estimating current water use
- Metered & unmetered supplies.
- Wastewater Treatment

Step 3: Conduction of Water Audit & Measurements

- Conduction of field measurements to Quantify water/wastewater streams
- Measurement of suction & discharge pressure at various pumps
- Establishing Water Consumption Pattern
- Evolving value added “cost of water” at various locations
- Determine key opportunities for water consumption reduction, reuse & recycle with paybacks

Step 4: Preparation of Water Audit Report with Sustainable Water Management Plan

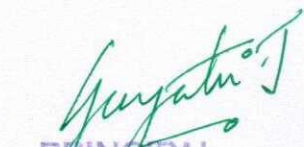
- Documentation of collected & analyzed Water Balancing and Measurement details
- Projects and procedures to maximize water savings and minimize/eliminate water losses
- Water Metering and Accounting System
- Opportunities for Water Conservation based on Reduce/ Recycle/ Reuse/ Regeneration/ Recharge options with Cost Benefit Analysis
- Preparation & submission of the report.

1.5 Instruments Used for Water Audit

- Ultrasonic water flow meter
- TDS and Ph meter



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CHAPTER-2: DESCRIPTION OF JBR ARCHITECTURE COLLEGE

2.1 About the JBR Architecture College

An admiration in the field of Engineering education, Joginpally B.R. Engineering College, a part of the visionary Sri J. Bhaskar Rao's accomplishment, observed its inception in the year 2002 with the lofty aim of providing quality professional education and meeting the rising expectations of the student community in Andhra Pradesh. J.B.R Educational Society has been working relentlessly towards the objective of achieving excellence in the fields of Engineering, Medicine, Management, Hospitality, and Information Technology.

The campus was established in a sprawling woody campus of about 106 acres of land, on the main road at Yenkapally, Moinabad Mandal, R.R.District. The efficacy of the group can be witnessed from the establishment of three Engineering Colleges; J.B. Institute of Engineering & Technology; Joginpally. B.R. Engineering College; and Bhaskar Engineering College, besides the manifestation of Bhaskar Medical College and Bhaskar General Hospital.

The J.B.R. Architecture College has been established by Joginpally B.R. Educational Society (JBRES), Hyderabad by a group of enthusiastic architects under the patronage of Late Shri J. Bhaskar Rao garu - a devoted educationalist and philanthropist, with a view to impart quality education in the field of architecture.

The college is offering B Tech and M Tech in Architecture

- B.Tech - 400 Students
- M Tech - 40 Students

The management of the institute, as a part of its sustainability goal, is keen to optimize water footprint and costs by identifying and implementing profitable water conservation projects.

CHAPTER-3: OBSERVATIONS AND RECOMMENDATIONS

3.1 Water Sources and Withdrawal

The major sources of water for the college is ground water. The college premises has two bore wells and both are in operation.

Ground water withdrawal is carried out through bore wells (2 nos.) by submersible pumps. The select details of borewells in operation are furnished below in Table 3.1:

Table 3.1: Details of Bore wells in Operation

Reference	Pump Type	Remarks
Borewell No.1	Submersible	Supplied to raw water common tank
Borewell No.2	Submersible	Supplied to raw water common tank

The drinking water required for the college is packaged RO water and is collected within the campus from other college.

Based on estimation, the water withdrawal from borewells for the last year is given below in Table 3.2:

Table 3.2: Sources of water intake for last year (April 2022 to March 2023)

Year	Ground Water Withdrawal kL/Yr.	RO kL/Yr.	Total kL/Yr.
2022 - 23	3,100	450	3,550

3.2 Water Usage & Consumption

The water is used in the institute for different applications as below:

- Domestic consumption
- Drinking
- Gardening



On an average the total use of water in the college is 10,000 to 11,000 Lit/day, which include for drinking water and balance for sanitation requirement & domestic requirement, and for gardening purposes.

The major water source is borewell water only

3.3 Rainfall in the Area

Total rainfall received in the campus site based on IMD datasets shows that average rainfall is 694mm.

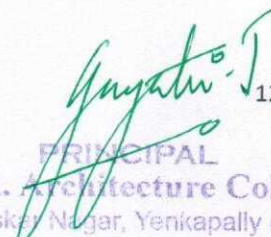
3.4 Water Supply & Distribution

A water network diagram provides a schematic (simplified) representation of facility's water distribution system from the water or point of entry (to the facility) to points of water consumption.

- For the institute, the main water sources are borewell water is supplied to raw water tank for further uses.
- The borewells are operated as per the requirement.
- No rain water harvesting in the college.
- The major water consumption in facility is common area toilets, sanitation and gardening.



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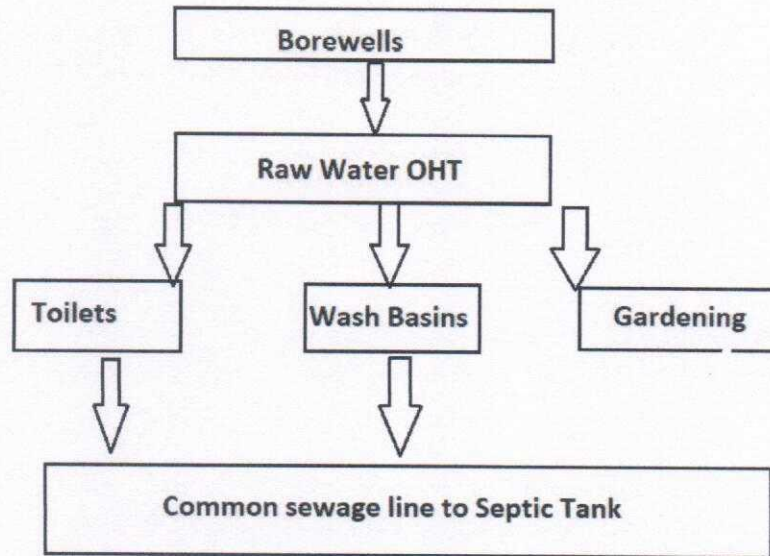


Figure 3.1: Water Distribution System -JBR Architecture College

There are no major leaks and no loss encountered in the water distribution system, storage, and consumption area.

3.5 Water Metering & Monitoring System

No water flow meters were installed for either borewells or end use applications.

3.6 Water Quality

The water quality in the college is tested as required with external agencies and daily checked with internal instruments available and is recorded in the log books. The details of water quality of various locations is furnished below:

Table 1.3: Sample analysis of water quality parameters

Source	Alkalinity, ph	TDS, mg/L	Conductivity, Us/cm
Raw water tank	7.4	165	235
R.O	7.7	45	65



3.7 Water Costing

As the major source of water is borewell water, the power cost is direct expenditure and hence, the water cost is minimal per KL and is negligible.

3.8 Water Treatment Practices

Presently, no STP or RO plant is available in the institute. The campus has common STP plant and is suggested to lay pipe lines to supply sewage to the common STP. Presently, the RO water required for drinking is procured in cans from Campus College.

3.9 Water Management & Conservation

Domestic waste water generated from the premises (Toilets, offices, Wash areas, buildings, Canteen etc.,) is being treated in the Common STP and the treated water is used for gardening /green belt development. The STP is common for the entire campus and the sewage is collected and treated.

It is suggested to use the STP treated water for gardening purpose and green belt.

In campus small scale/medium scale reuse and recycle of water system is necessary.

- (1) Rain water Harvesting
- (2) Ensure that all cleaning products used by college staff have a minimal detrimental impact on the environment, i.e., they are biodegradable and non-toxic,
- (3) Garden /plantation watering by drip system to minimize water use as a good practice followed by management towards water conservation in the campus.

(i) Rainwater harvesting management

The concept of rain water harvesting is an ancient one and has become popular in recent times because of the vagaries of the monsoon, depleting water resources, its user friendliness. It has become an important and eco-friendly tool to protect ground water, useful and cost-effective method to boost water resources in any area. Rainwater harvesting is the technique of collection and storage of rainwater at surface or in sub-surface aquifers before it is lost as surface run-off.

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1) About 10 m³ pit been planned for percolation of rain water from surface run -off and storm water, which recharges the ground water and conserves fresh water. It is observed that, only rain surface run off was only considered for rain water harvesting for recharging purpose in the college campus.

As the college has good roof top areas, however it is observed that no drain pipelines are provided for roof top rainwater and the same can be channeled through water channels or trenches to the percolation pit for effective ground water recharge and harvesting the rain water.

It is suggested to increase the efficiency of the artificial recharge by constructing more recharge pits (2 or 3 nos.), where the surface rain off water flows and these can be used for recharging the bore wells or ground water.

The amount of rain water that can be directed from roof top about 1000 KL /year based on average rainfall of mm in Moinabad area in which campus located.

(ii) Water conservation Opportunities in Wash rooms

(a) Faucets

Water efficient faucets and fixtures are available in the market now days to reduce water consumptions in wash basins by reducing flow without compromising comfort level of user. Faucets flows can easily be reduced without affecting the comfort of the water user by using appropriate flow regulator technology for these fixtures. This will result in impressive savings of around 40-50 percent of faucets water use. Flow regulators, especially the aerators are inexpensive and are easy to install and maintain. Therefore, they are often considered as the low hanging fruits of water saving programs



Figure 3.2: Water efficient faucets

There are about 30 no's of taps in the plant for domestic use, however the use of latest and water efficient faucets can be installed, and the investment required is marginal.

(b) Urinals

The urinals are of conventional type and recently urinals are being modified for low volume type fixtures for less water usage

Urinals screen mats are available in the market to cut the water use in urinals. These urinal screen mats not only create fragrance in the urinals but also help to remove napkin waste, cigarette buds etc. The audit team has conducted the survey to urinals used in the college and about 30 urinals are available. About 200 liters of water is flushed per day and normal raw water is used.

(c) Toilets

A dual-flush toilet is a variation of the flush toilet that uses two buttons or handles to flush different levels of water. A significant way to save water in buildings is to replace single-flush toilets with dual flush toilets. The standard dual-flush toilets use six Liters of water on full and three Liters on a half-flush.

Replacing old toilets will result to a reduction of toilet water consumption. More cost-effective results can be achieved by replacing only the toilet trim system.

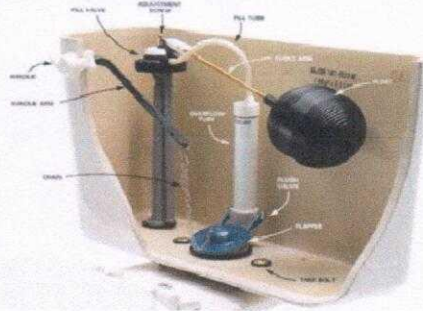


Figure3.3: Dual Flush Toilet System

The audit team has conducted the survey to toilets available in the plant. There are total 30 toilets and all toilets are of the old type of flushing by pressing push button having water consumption of 6 Liter/Flush. It is recommended to install dual flush system in the toilets.



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(iii) Awareness on water conservation

College has about 300 nos. (Including students, teaching & non-teaching & other workmen) and major water usage is for domestic consumption by them.

It is suggested that the student's staff at all levels should be made aware and trained on 'Water Saving & Conservation' and 'Good Housekeeping Practices'.

Therefore, it is recommended to periodically organize Awareness Programs for students/Staff including workers on Water Conservation.

It is also suggested that prominent water saving labels/posters should be placed/located in the college at noticeable locations like water filters/ wash rooms/ canteen /hand washing taps etc.

This will create awareness & sense of responsibility among Students/staff/employees/visitors.

3.10 Water Metering and Sub-metering

The metering and sub-metering of the college use is essential to understand the water consumption pattern inside the campus. The accurate measurements enable management to understand maximum and minimum consumption area in the Hotel and improve water efficiency. Monitoring the water use allows management to know where and when water is being used and where the best opportunities for water savings exist. The meters to be installed for the following lines{

- Bore wells (2nos)
- Raw Water Tank
- Gardening and domestic use
- STP water
- STP treated water use

3.11 Training and awareness of the employees and students

It is suggested that the employees at all levels should be made aware and trained on 'Water Saving & Conservation' and Good Housekeeping Practices. Therefore, it is recommended to periodically organize Awareness Programs for office employees and students on Water Conservation.



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It is also suggested that prominent water saving labels/posters should be placed/located in the campus at noticeable locations like process area; near hand washing taps; washrooms, etc. This will create awareness & sense of responsibility among staff/students/visitors.

3.12 Periodically conduct 'Water & Wastewater Audit'

The college should periodically conduct 'Water Audits' to assess the efficiency of water usage in processes; reduce water losses in the system and optimize costs & energy consumption.

A detailed 'Water & Wastewater Audit' should be done at least once in 2 years or as per requirement.

The team can create its own internal Audit team for conducting regular comprehensive 'Water & Wastewater Audit' after providing requisite training to the concerned officials.

