



**Water Audit Report of  
Gandhi Memorial National College  
Ambala Cantt. Haryana  
Year 2020-21**



**WATER AUDIT REPORT  
CONSULTATION REPORT**



**Gandhi Memorial National College  
Ambala Cantt. -133001**

PREPARED BY

**EMPIRICAL EXERGY PRIVATE LIMITED**

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(2020-21)



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## **ACKNOWLEDGEMENT**

**Empirical Exergy Private Limited (EEPL), Indore** takes this opportunity to appreciate & thank the management of **Gandhi Memorial National College Ambala Cantt. Haryana** for giving us an opportunity to conduct energy audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

**Rajesh Kumar Singadiya**

**(Director)**

M.Tech (Energy Management), PhD (Research Scholar)  
Accredited Energy Auditor [AEA-0284]  
Certified Energy Auditor [CEA-7271]  
(BEE, Ministry of Power, Govt. of India)  
Empanelled Energy Auditor with MPUVN, Bhopal M.P.  
Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi  
Certified Water Auditor (NPC, Govt of India)  
Chartered Engineer [M-1699118], The Institution of Engineers (India)  
Member of ISHRAE [58150]



## EXECUTIVE SUMMARY

The executive summary of the water audit report furnished in this section briefly gives the identified water conservation measures, that can be implemented in a phased manner to water conservation and increase the productivity of the college.

### **INITIATIVE TAKEN BY COLLEGE MANAGEMENT**

#### **+ COLLECTION OF RO REJECTED WATER**

College management has collected RO rejected water from all RO drinking points and it collected water utilized for toilet and washroom activity. **It appreciable.**

### **AREAS FOR IMPROVEMENT AND RECOMMENDATION**

#### **FRESH WATER MONITORING SYSTEM:**

- + Installation of “Cloud based (IoT based) ground water extraction monitoring system” for well to quantify fresh water consumption per day in the college.
- + Install water flow meters (Mechanical or Electronics) in distribution network, like college building, drinking, Gardening for quantity per day water consumption and waste water generation in the college campus.

#### **DIP WATER IRRIGATION SYSTEM FOR GARDENING.**

- + Use dip water irrigation system for gardening.
- + Treated waste water from above STP plant can be reuse for gardening purpose. **It will reduce the fresh water consumption of college.**

#### **WASTE WATER TREATMENT PLANT**

- + Waste water generated from various departments and canteen should be collect in separate waste water collection tank. It should be treated in proposed STP and ETP plants after that treated water reuse activity like gardening, toilet and wash room etc.
- + Waste water generated from college activities like washroom, canteen, shower water (bath) should be collected in a separate tank It should be treated in proposed STP and ETP plants after that treated water reuse activity like gardening, toilet and wash room etc.



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**OTHER SUGGESTIONS.**

Some of the very important suggestions are: -

- ✚ Prepare the water management policy, and work towards creating and implementing a strategy to reduce the water consumption.
- ✚ Establish institutional ecology policy and set an example of environmental responsibility and practices of resource conservation, recycling, waste management.
- ✚ Involve all stakeholders and encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in water conservation and sustainable development.
- ✚ Collaborate for interdisciplinary approaches to develop curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- ✚ Promote 3R education policy (reduces, reuse, and recycle) in campus.
- ✚ Arrange training programmes on water management system and nature conservation.
- ✚ Ensure participation of students and teachers in local water issues.



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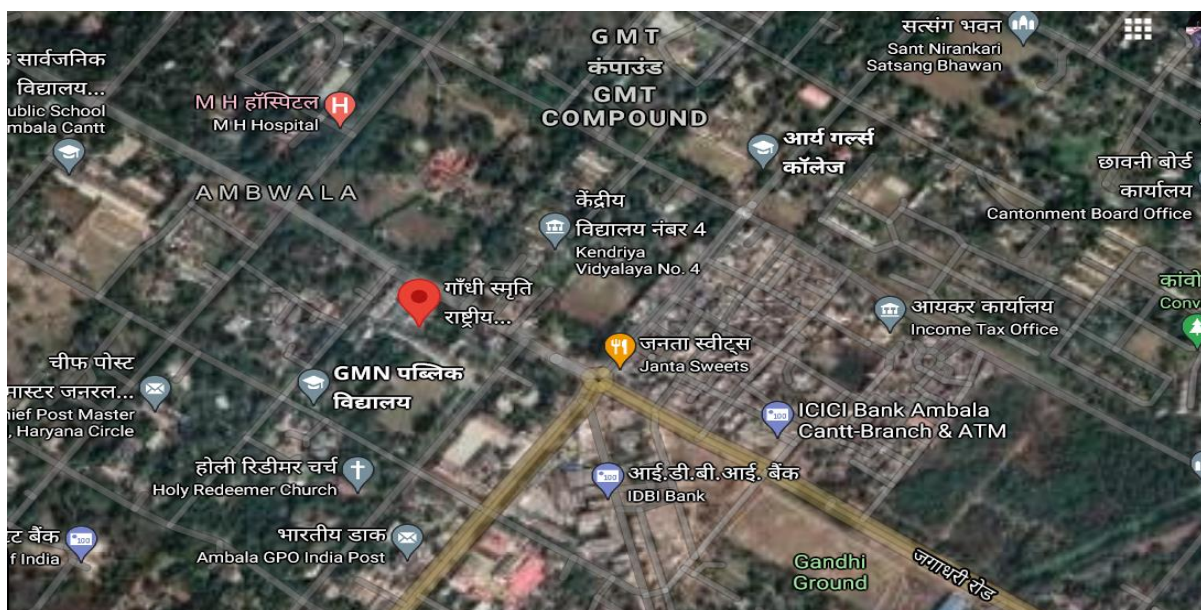


**CHAPTER-1  
INTRODUCTION**

**1.1 About College**

Through seven eventful decades of its history, Gandhi Memorial National College, Ambala Cantt has celebrated the quest for expanding landscapes of learning and critical thinking. Today, this college is recognised as a premier institution of higher learning that nurtures intellectual and academic striving, vibrant curricular activities, outreach initiatives and civic engagement. The college offers a unique combination of resources where community of inspired faculty and talented students learn and grow together to share the dynamic energy field. It is a place not only of teaching but collaborated scholarship reinforcing a very special interaction between students and faculty.

After partition, a great visionary and philanthropist Sh. Jaswant Rai with other eminent associates planted the seeds of D.A.V. College, Rawalpindi at Ambala which flourished into G.M.N. College in 1948. Having had a modest beginning in a building with thatched roofs, today the college has a whole range of infrastructural facilities such as high-tech seminar rooms, Smart Class Rooms, Arts, Science and Commerce block, well-equipped laboratories, departmental rooms equipped with computers and internet facilities, gymnasium, fully automated library, E-library, sprawling sports fields.



**Figure: 1.1 - Image of Gandhi Memorial National College from Google map**



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The college has become a byword for academic and extra-curricular achievements. The dynamic, enlightened and supportive Managing Committee comprising of members from industry, medicine, academic and administration is constantly engaged in taking the college to newer heights of excellence. Its alumni occupy distinguished positions in almost all spheres of society – Government, Banking, Finance, Academics, Sports, Armed Forces, Business and Media. The college believes in the motto “Be the First and be with the First”.

### **Institutional Strength**

- ✚ Highly qualified and experienced teaching staff
- ✚ Blend of traditional and modern pedagogical methods
- ✚ Pioneers in offering post-graduation in English and Political Science
- ✚ Pioneer in installing solar grid in educational institution
- ✚ Facilitation of research activities
- ✚ Automated library and administrative block
- ✚ Well-equipped laboratories
- ✚ Well-maintained infrastructure
- ✚ Vast and well-managed sports ground and gymnasium
- ✚ Clean and green campus
- ✚ Eco-friendly premises
- ✚ Achievements in sports and cultural activities
- ✚ Co-educational institution
- ✚ Locational advantage



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**Vision:**

- ✚ To impart qualitative value-based education and to reinvent itself constantly in the context of ever-changing scenario so as to create a happier and growth-oriented society.

**Mission:**

- ✚ To pursue and disseminate knowledge with commitment to all the sections of society.
- ✚ To create and provide opportunity for the overall development of students that can transform the society too.
- ✚ To evolve skilled human resource of higher calibre.
- ✚ To revive high ideal of student-teacher relationship so as to inspire the youth to have yearning for acquiring knowledge and professional skills.
- ✚ To imbibe the ideals of Gandhian Philosophy amongst the youth in order to instill in their minds high moral values, instinct for social justice, awareness and equality.
- ✚ To uplift the mind, body and soul of the new generation of the society.





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### 1.2 About College Campus:

The college is spread over 405979.2(sq. Ft) beautiful land with plenty of open space and sports area interspersed within academic buildings. The details of various department and building are given below:

Table 1.1 Name of the various Building and area in Gandhi Memorial National College

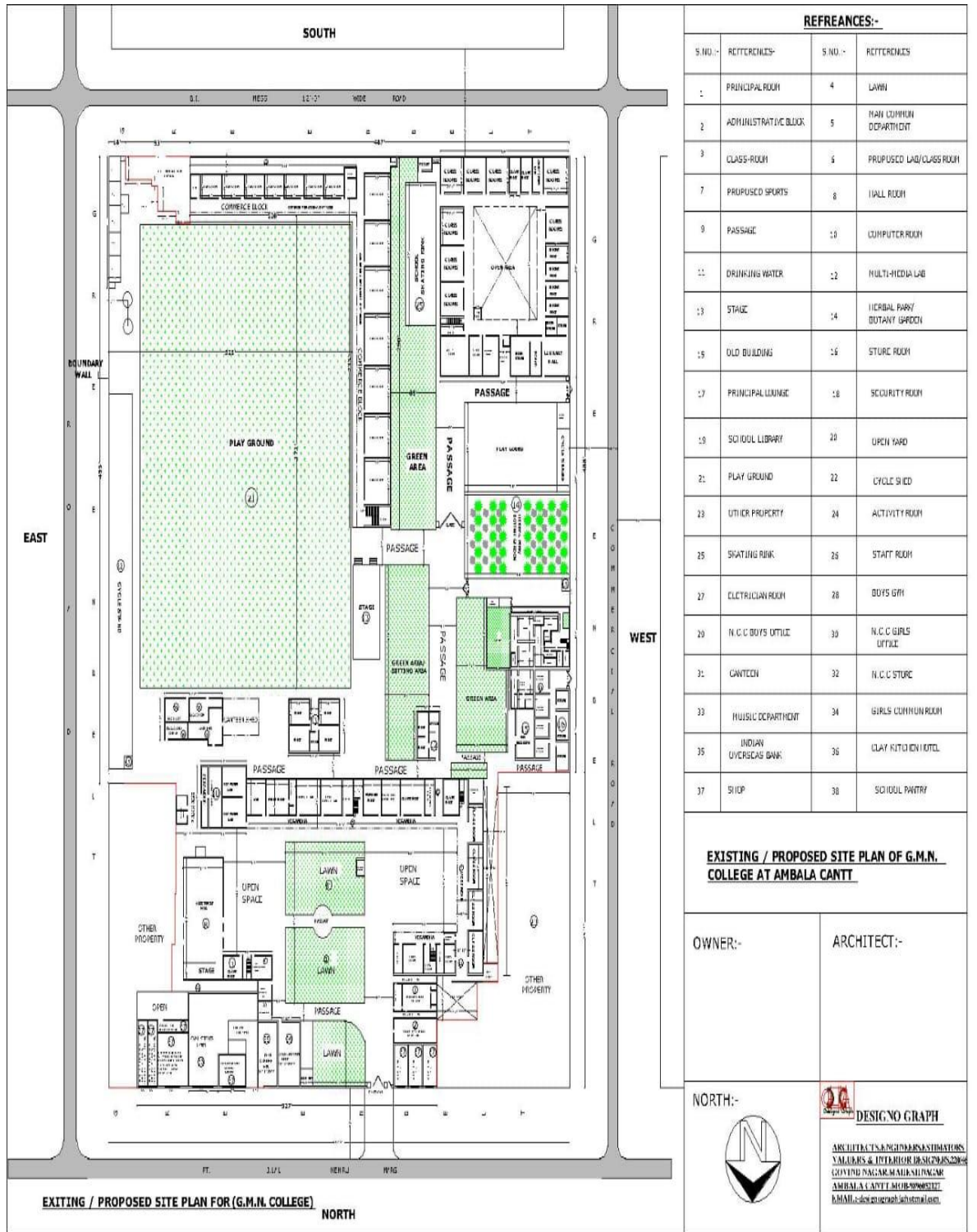
Sr.no	Department Name	Length	Width	Area (sq. ft)
1	Commerce Block	40	204	8160
2	Commerce Block	26	219	5694
3	Stage	45	29.5	1327.5
7	PG block	35.4	53	1876.2
8	Canteen Shed	86.4	33	2851.2
9	Canteen Phy. Edu & Other	74	33	2442
10	Principal Residence	72	54	3888
11	Music room	32	49	1568
12	Sanskrit Department	21	25	525
13	Cycle Stand Shed	300	35	10500
14	Servant and water pump room	110	20	2200
15	Servant House	59	16	944
16	Stores	120	25	3000
17	Auditorium Hall	48	75	3600
18	Room No -26	36	24	864
19	Mass communication to maths Eng.	28	68	1904
20	Girls Common room	28	35	980
21	Main power Supply room	17	13	221
22	Comp. lab to Phys. Lab	358.8	42.8	15356.64
23	Room no - 6 to 9	123	19.4	2386.2
24	Room no - 1 to 5	82	36.9	3025.8
25	Principal Office	59	30.3	1787.7
26	Clerical room	56	34	1904
27	Shops Area			4138
	<b>Total Build Up Area</b>			<b>81143.24</b>
	<b>Total Open Area</b>			<b>324836</b>
	<b>Total Area</b>			<b>405979.2</b>



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## Gandhi Memorial National College layout of various buildings






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### 1.3 Green Monitoring Committee

**GANDHI MEMORIAL NATIONAL COLLEGE**  
AMBALA CANTT - 133001  
Phones: 0171-2640321, 2633151 (O), 2601281 (R)  
Fax: 0171-2633151

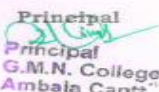
Ref. No. GMNC/1107/159 Dated: 28/06/2021

**Energy, Water, Green & Environment Audit Committee**

Energy, Water, Green & Environment Audit Committee will consist of the following faculty members.

S.No.	Name	Designation	Department
1.	Dr. Anju Jain	Associate Professor	English
2.	Mrs. Kamlesh Kumari	Assistant Professor	English
3.	Dr. Kuldeep Yadav	Assistant Professor	Botany
4.	Dr. Neha Aggarwal	Assistant Professor	Chemistry
5.	Mr. Ravinder Singh	Office Supdt.	Admin. Office

Time duration of this committee is 2 years up to June 2023, after which the committee will be reconstituted.

  
Principal  
G.M.N. College  
Ambala Cantt

e-mail: [gmncolleges@gmail.com](mailto:gmncolleges@gmail.com), Website: [gmncollegeambala.ac.in](http://gmncollegeambala.ac.in)

### 1.4 Water Audit Team

The study team constituted of the following senior technical executives from **Empirical Exergy Private Limited**,

- ✚ **Rajesh Kumar Singadiya**, [Director & Accredited Energy Auditor ,AEA-0284]
- ✚ **Mr. Rakesh Pathak**, [Director & Reviewer]
- ✚ **Mrs. Laxmi Raikwar Singadiya**, [Energy Engineer]
- ✚ **Mr. Sachin Kumawat** [ Project Engineer]
- ✚ **Mr. Ajay Nahra**, [Site Engineer]



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### **1.5 About Water Auditing**

Water audits can be a highly valuable tool for institute in a wide range of ways to improve their energy, environment and economic performance. while reducing wastages and operating costs. Water audits provide a basis for calculating the economic benefits of water conservation projects by establishing the current rates of water use and their associated cost.

### **1.6 Objectives of Water audit**

The general objective of water audit is to prepare a baseline report on water conservation measures to mitigate consumption, improve quality and sustainable practices.

#### **The specific objectives are:**

-  To monitor the water consumption and water conservation practices.
-  To assess the quantity of water, usage, quantity of waste water generation and their reduction within the college.

### **1.7 Target Areas of Water audit**

This indicator addresses water sources, water consumption, irrigation, storm water, 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.



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## **1.8 Methodology followed for conducting water audit**

### **Step 1: Walk through survey**

- ✚ Understanding of existing water sourcing, storage and distribution facility.
- ✚ Assessing the water demand and water consumption areas/processes.
- ✚ Preparation of detailed water circuit diagram.

### **Step 2: Secondary Data Collection**

- ✚ Analyse historic water use and wastewater generation
- ✚ Field measurements for estimating current water use
- ✚ Metered & unmetered supplies.
- ✚ Understanding of “base” flow and usage trend at site
- ✚ Past water bills
- ✚ Wastewater treatment scheme & costs etc.

### **Step 3: Site Water Audit Planning (based on site operations and practices)**

- ✚ Preparation of water flow diagram to quantify water use at various locations
- ✚ Wastewater flow measurement and sampling plan

### **Step 4: Conduction of Detailed Water Audit & Measurements**

- ✚ Conduction of field measurements to quantify water/wastewater streams
- ✚ Power measurement of pumps/motors
- ✚ Preparation of water balance diagram
- ✚ Establishing water consumption pattern
- ✚ Detection of potential leaks & water losses in the system
- ✚ Assessment of productive and unproductive usage of water
- ✚ Determine key opportunities for water consumption reduction, reuse & recycle.

### **Step 5: Preparation of Water Audit Report**

- ✚ Documentation of collected & analysed water balancing and measurement details
- ✚ Projects and procedures to maximize water savings and minimize water losses.
- ✚ Opportunities for water conservation based on reduce/ recycle/ reuse and recharge options



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**CHAPTER- 2**

**WATER CONSUMPTION AND WASTE WATER SOURCES**

**2.1 Details of Source of Fresh Water and Use Areas:**

The main source of freshwater is Borewell and Cantonment Board Connection for the college. The freshwater is mainly used for drinking, housekeeping, gardening, domestic activity and new construction project. Details of the well and pumps are given in table 2.1

Table:2.1 Details of Fresh water sources and Supply pumps

Sr.no	Water Source	Location	Quantity
1	Borewell -01	Near Ground area	1
2	Borewell -02	Near Botanical Garden	1
3	Borewell -03	Near Canteen area	1
4	Cantt. Board Connection	Near Principal Residence	3
5	Cantt. Board Connection	Near School Side	2

**2.2 Water Accounting & Metering system:**

It was observed that there is requirement of water flow meters on water sources to quantify water consumption in the college.



Figure: - 2.1 fresh water supply from open well for college campus



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**2.3 Water Storage Capacity in College Campus: -**

Table 2.2 Water Storage Capacity in college campus

1	Near Auditorium Hall	1000	1	Overhead tank
2	Physics Department	12000	1	Overhead tank
3	Principal Office	500	1	Overhead tank
4	Principal Residence	3000	1	Overhead tank
5	Principal Residence	500	2	Overhead tank
6	College Guest room	1000	1	Overhead tank
7	Non-teaching staff Residence	500	1	Overhead tank
8	Near room no-06 Boy's toilet	1000	1	Overhead tank
9	vatica near PG Block	33000	1	Ground water tank
10	Boys Toilet (Near Ground)	500	3	Overhead tank
11	Library Building	500	1	Overhead tank
12	Commerce Block (Girls Wash Room)	500	2	Overhead tank
13	Commerce Block (Boys Washroom)	1000	1	Overhead tank
14	Commerce Block (Staff Washroom)	500	2	Overhead tank
	Total water storage Capacity	55500	19	

**Photographs of water storage tanks.**



Fig :- 2.2 Water Storage Tank and capacity of College Campus



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**2.4 Fresh Water distribution layout of Dental College:**

Audit team study the water sources and prepared water distribution flow system in College campus.

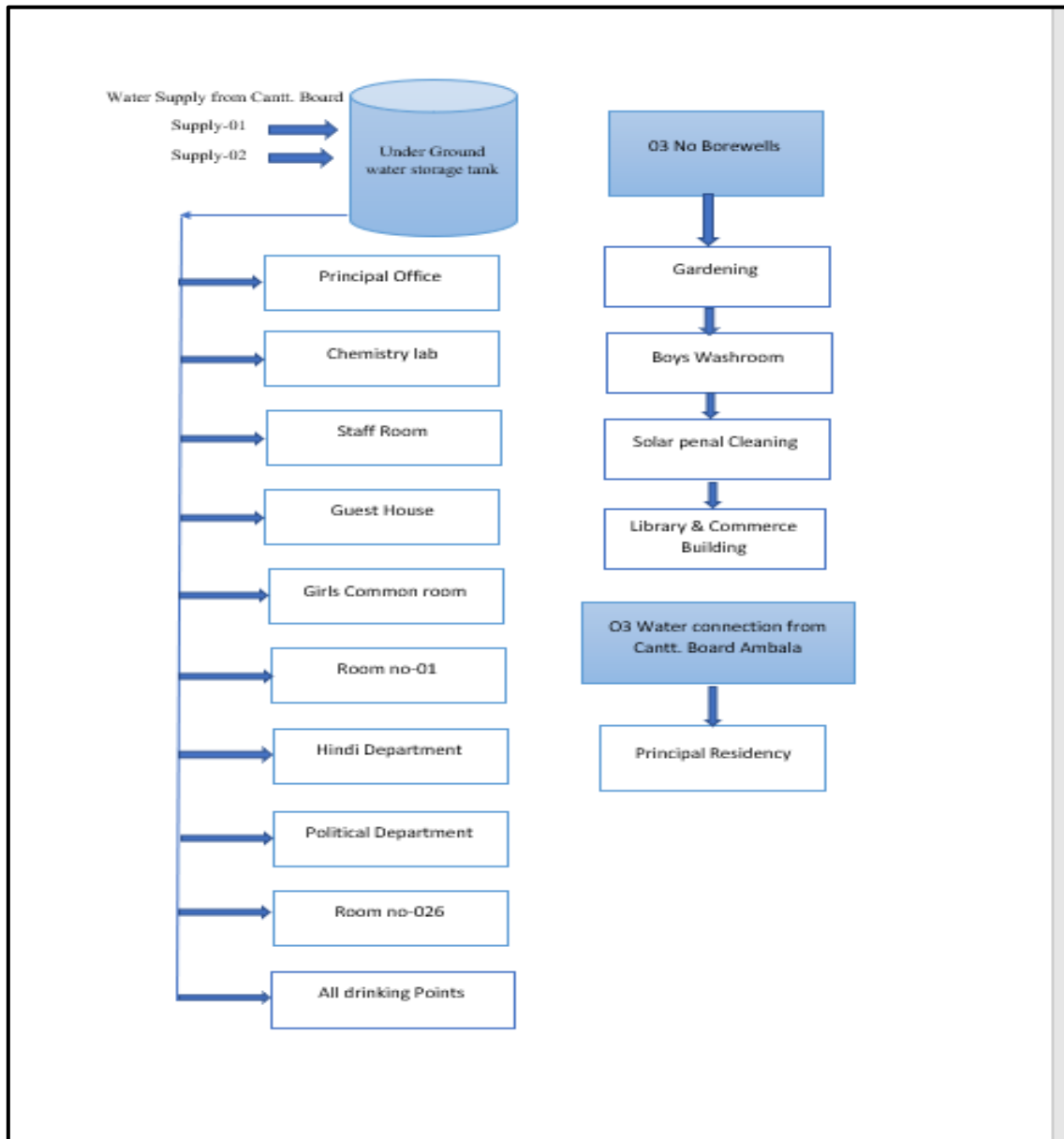


Figure:- 2.3 Fresh water distribution in College campus

**Observation & recommendation:**

There is requirement of water flow meters in distribution line to quantify water consumption in departments. It is also observed that water overflow from overhead water tanks. It can avoid by installation of water level sensor.





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**2.5 Water use areas and taps in College Campus: -**

Water is preliminary used for drinking, washing, Toilet, gardening and Domestic activity. Audit team visited various departments and buildings to determine appliances. The details of washroom, toilet and taps are given in table 2.3

Sr.no	Location of taps	Fresh Water taps	RO Water Tap
1	Clerk Office	7	0
2	Girls Common Room	4	2
3	Room no- 026	3	0
4	Water supply IOB	3	0
5	Near Auditorium Hall	0	6
6	NCC office	1	0
7	Hindi Department	2	0
8	Computer Department	1	0
9	Chemistry department Staff room	1	0
10	Chemistry lab -I	13	0
11	Chemistry lab -II	13	1
12	Phycology Department	1	0
13	Physics Department & washroom	7	0
14	Botany Lan	2	0
15	Zoology lab	2	0
16	Electronics Department	1	0
17	Principal Residency	16	0
18	College Guest room	7	0
19	Music room	1	0
20	Non-teaching staff Residency	5	0
21	Room no-11 (back side)	1	0
22	Room no -13 (Back Side)	1	0
23	Sanskrit Lab	1	0
24	Near Room No-06 (Boys Toilet)	14	0
25	Naac Room	1	0
26	Doctor room	1	0
27	Room no -1	1	0
28	Principal Office	3	1
30	Teaching Staff Room	0	6
31	Near Canteen	0	2
33	College Canteen	2	0
34	Physical Department	1	0
35	Boys Toilet Near Ground	10	0
36	Commerce block Room no-35	0	4
37	Staff Wash room	7	0
38	Library Department	1	0
39	Commerce Block	28	0
	<b>Total No of water Taps</b>	<b>162</b>	<b>22</b>



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Fig: 2.4 Efficient water fixtures for water saving in campus

## 2.6 Water test parameter in GMN College

Table 2.4 Water test parameter in college water

Sr. No	Parameter	Test sample -01	Test sample -02	Unit
1	Source of sample	Deep Borewell water supply	M/s Water Supply at GMN College	NA
2	Sample Quantity	2 Litter	2 Litter	NA
3	Analysis date	14.07.2021	14.07.2021	NA
4	Total Dissolved	488	682	mg/l
5	Total hardness	133.65	331.65	mg/l
6	Calcium (As Ca)	25.79	75.39	mg/l
7	Magnesium (as Mg)	16.83	34.88	mg/l
8	Total Alkalinity	354.05	538.35	mg/l
9	Chloride (as Cs)	32.72	30.2	mg/l
10	Fluoride (As F)	0.4	0.5	mg/l
11	PH	7.43	7.69	PH
12	Nitrate (as N03)	0.1	0.3	mg/l
13	Taste	Agreeable	Agreeable	0
14	Colour	0	0	HU
15	Turbidity	0	0	NTU
16	Sulphate (As SO4)	56	39	MG/1

**Observation:** - Total 02 No of water sample are tested. All parameter in Permissible range and water quality are good. Both reports are attached in Annexure -01.



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**2.7 Fresh Water uses for Gardening:**

The one of major contribution from fresh water consumption is watering for plants and garden in college campus. There is good potential for water saving by adopt “Automatic Watering 360 adjustable misting nozzle irrigation Dripper’s system” for plants. adjustable drip irrigation tools to provide different amounts of water depending on the water requirements of different plants. The drip speed can be set as for indoor and outdoor plants.



Fig: 2.5 Technology for Drip Water Irrigation for plant



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**2.8 Waste Water Generation sources: -**

At present waste water generated from various departments canteen, Mess, and like washrooms, handwash and washing and RO rejected etc is discharge into drain line.it should be collect is separate tank and treat in proposed STP and ETP plants. After that treated water reuse activity like gardening, toilet and wash room etc.

Some photographs of waste water generation sources are given in Figure. 2,4



Figure: -2.6 Waste Water Generation sources



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## 2.9 Rain water Harvesting systems

The rainwater harvesting is a technique to capture the rainwater when it precipitates, store that water for direct use or charge the groundwater and use it later.

There are typically four components in a rainwater harvesting system:

- ✚ Roof Catchment.
- ✚ Collection.
- ✚ Transport.
- ✚ Infiltration or storage tank and use.

If rainwater is not harvested and channelized its runoffs quickly and flow out through storm-water drains. For storm-water management the recharge pits, percolation pits and porous trenches are constructed to allow storm water to infiltrate inside the soil.

## 3.0 Rainwater Harvesting System of the College

The college has total build-up area is about 7538 m<sup>2</sup>. The average annual rainfall 1197.8 mm and runoff coefficient 0.88 are considered for commercial building. Accordingly, above figures and consideration, estimated rainwater harvesting potential for the college is about 7940.00 m<sup>3</sup>/year The following Mathematical Equation is used for the calculation.

RWH Potential = Rainfall (m) x Area of catchment (m<sup>2</sup>) x Runoff coefficient



**Figure:-2.7 Rain water harvesting system in college campus**



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**Annexure -01 Water test reports .**

Govt. of Haryana  
Public Health Engineering Department, Water Testing Laboratory Ambala Cantt. 133001  
Email id: chemist.ambala@gmail.com

---

**Test Report**

Lab. ID. No : AMB/02237/1440      Memo No 262      Report Issue Date: 15/07/2021

Issued To : PRINCIPAL  
G.M.N. COLLEGE  
AMBALA CANTT- 133001

Sample Description & Type of analysis : Water (Chemical Analysis)

Customer Reference No. & Date : GMNC / 220 - 14.07.2021

Customer Name Who collected sample : SUNIL KUMAR

Sample collected on dated : 14.07.2021  
Sample received on dated : 14.07.2021

Source of Sample : MIS water Supply at GMN college  
Sample Quantity : 2 Lt.  
Date of Analysis started : 14.07.2021  
Dated of analysis completed : 14.07.2021

S. No.	Parameter	Method Used	Results	IS: 10500:2012 (Second Revision)		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Total Dissolved	APHA2540 C	682	500	2000	mg/l
2	Total Hardness	APHA2340 C	331.85	200	600	mg/l
3	Calcium (as Ca)	APHA3500-Ca	75.39	75	200	mg/l
4	Magnesium (as Mg)	APHA3500 Mg	34.88	30	100	mg/l
5	Total Alkalinity	APHA 2320 B	538.35	200	600	mg/l
6	Chloride (as Cl)	APHA 4500 Cl	30.20	250	1000	mg/l
7	Fluoride (as F)	APHA 4500- F	0.5	1.0	1.5	mg/l
8	pH	APHA4500-H*	7.69	6.5 to 8.5	No relaxation	pH
9	Nitrate (as NO3)	APHA4500-	0.3	45	45	Mg/l

i. The results given above are related to the sample as received and tested in PHED Lab, Ambala Cantt. Reliability of sample lies with the sender/collector.

ii. The test report can't be regenerated/re-produced in whole or in part without written permission of Laboratory.

iii. The test report can't be used for any publicity or any legal purpose.

iv. The test samples meant for chemical analysis will be disposed off after 15 days from the date of issue of test report.

Sample analyzed by: Vikram (Water Analyst)

(Arpna Choudhary)  
 Authorized Signatory/Chemist  
 PHED Water Testing Laboratory,  
 Ambala Cantt.



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Govt. of Haryana  
Public Health Engineering Department, Water Testing Laboratory Ambala Cantt. 133001  
Email id: chemist.ambala@gmail.com

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**Test Report**


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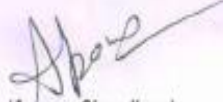
Lab. ID. No. : AMB/02237 /1440                      Memo No                      Report Issue Date:

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RESULTS						
S. No.	Parameter	Method Used	Results	IS: 10500:2012 (Second Revision)		Unit
				Desirable limit	Max. Permissible limit (in absence better alternate source)	
1	Taste	Qualitative	Agreeable	Agreeable	Agreeable	-----
2	Odour	---do---	Agreeable	Agreeable	Agreeable	-----
3	Colour	APHA2120 B	0	5 HU	15 HU	HU
4	Turbidity	APHA 2130 B	0	1 NTU	5 NTU	NTU
5	Iron as Fe	APHA 3500 Fe	0.04	1.0	No Relaxation	
6	Sulphate (as SO <sub>4</sub> )	APHA 4500 So <sub>4</sub>	39	200	400	Mg/l

I. The results given above are related to the sample as received and tested in PHED Lab, Ambala Cantt. Reliability of sample lies with the sender/collector.  
II. The test report can't be regenerated/re-produced in whole or in part without written permission of Laboratory.  
III. The test report can't be used for any publicity or any legal purpose.  
IV. The test samples meant for chemical analysis will be disposed off after 15 days from the date of issue of test report.

Sample analyzed by:  Vikram (Water Analyst)

  
(Arpana Choudhary)  
Authorized Signatory/Chemist  
PHED Water Testing Laboratory,  
Ambala Cantt.



**Water Audit Report of  
Gandhi Memorial National College  
Ambala Cantt. Haryana  
Year 2020-21**

