FEASIBILITY REPORT ON SEWAGE TREATMENT PLANT BASED ON SOIL BIO TECHNOLOGY AS GEO GREEN BIO FILTERS(A NOVEL GREEN TECHNOLOGY)

300kld

For

MEWAR UNIVERSITY AT GANGRAR

Green Tech Engineers

(Old name Teesta SAI Infrastructure Pvt. Ltd)

1148, RANI SATI NAGAR (SOUTH)

KING'S ROAD, JAIPUR-302019

Registrar
Mewar University
Gangrar, (Chittorgarh)

1.1 Introduction about the Project including project Cost

Water is most essential but scarce resource in our country. Presently the quality & the availability of the fresh water resources is the most pressing of the many environmental challenges on the national horizon. The stress on water resources is from multiple sources and the impacts can take diverse forms. Geometric increase in population coupled with rapid urbanization, industrialization and agricultural development has resulted in high impact on quality and quantity of water in our country.

Mewar University has proposed to construct a STP of 300 KLD at their campus and M/s Green Tech Engineers has been assigned the work for installation of STP of 300 KLD STP based on GEO GREEN BIOFILTERS.

1.1.1 Techno-Economical Feasibility Analysis

While comparing the cost of the technologies, cost of environment should also be taken into account because conventional technologies release gases harmful to the environment and the electricity consumed in these technologies increase the carbon foot print of the project, so to balance that they need to develop more greener area, whereas our technology being itself a green technology & releases oxygen during the process of treatment. So, no additional cost for development of green area is required.

The prices for Design, Engineering, Manufacturing, Inspection, Supply, of STP Treatment Plant are Rs.1800000.00 Plus GST extra.

1.2 Details of STP Technology

GEO GREEN BIO-FILTERS is an oxygenation engine that harnesses a special set of Bio-chemical reactions to deliver the oxygenation required for effluent

Registrar
Mewar University
Gangrar, (Chittorgarh)

treatment. In conventional technologies, aeration is achieved mechanically, which is very high energy consuming.

It outperforms conventional technologies like Activated Sludge Process (ASP), Sequential batch Reactor (SBR), Membrane Bio Reactor (MBR), and Moving Bed Bio-reactor (MBBR).

The Green technology for treatment of sewage being installed at the Mewar University campus has been developed at IIT Bombay by Dr. Praveen Nemade & Dr. Suhas.S Zambre & their team **for treating the sewage waste water & for restoring water quality making it suitable for irrigation, construction, floor washing as well as for flushing purpose.**

At very higher ambient temperatures (like in India) the solubility of oxygen in water is lowered, therefore energy requirements of mechanical aeration used by conventional technology increases. Moreover, air contains only 20% of oxygen, the rest being nitrogen that is passed into water wastefully, further adding the process inefficiency.

GEO GREEN BIO-FILTERS resolves this problem using a bio-chemical method of oxygenation, which not only uses the atmospheric oxygen, but also uses the nitrogen from atmosphere in a specially engineered natural ecology to achieve the desired level of purity.

Our technology removes nitrogen & phosphorous from sewage water which restricts the growth of the algae.In addition conventional technologies generate large amount of sludge for which additional disposal facilities have to be created. Geo green Bio-filters does not face any such problems.

The GBF is based on a bio-conversion process where fundamental actions of nature, namely, respiration, mineral weathering, and photosynthesis are brought about in a controlled media containing selected micro and macro-organisms. The GBF plant is built of natural minerals, constructed media, proprietary culture, additives, and plantation, with absolutely no moving parts. The plant is a replica of

Registrar
Mewar University
Gangrar, Chittorgarh

Jungle system where nature does all the purification process. It is one time investment as the plant over a period of time merges with local ecology and becomes part of it. Hence it has got endless life.

1.3 Advantages of Installation of Geo green bio filter STP

The Geo Green Bio filters has been offered because of its certain advantages as :

Low power consumption compared to other technologies due to natural aeration.

- Very Low maintenance with least manpower.
- Very long life as there are no moving parts & the media does not wear off.
- No secondary sludge left to be disposed off which is a problem in other technologies.
- Looks like garden nursery.
- Oil & grease removal in single pass no need for separate oil-grease trap.
- Green Technology releasing oxygen due to vegetation on Bio reactor bed.
- High dissolved oxygen in treated water.

Treated water can be used for Horticulture/ Agriculture application and for toilet flushing after tertiary treatment.

1.4 DESIGN OF SEWAGE TREATMENT PLANT:

STP is envisaged for this project to conserve usage of fresh water by recycling and utilizing for Landscaping and flushing Purpose.

Sewage generated = 300 m^3 / day

Based on the above discharge a state of the art sewage treatment plant capacity 300 KLD is proposed.

1.5 Quality of Raw Sewage & Treated Domestic Sewage

The general characteristic of sewage is considered as shown in the table below.

Registrar
Mewar University
Gangrar, (Chittorgarh)
2015

General characteristics:

Raw Sewage Generation & Characteristics for Designing of the plant	
Average Daily flow (cum day)	cum
PH	6.5 - 7.5
BOD (5 days at 20 degree C) (mg l)	250 -350
COD	500-700

The anticipated final water quality:

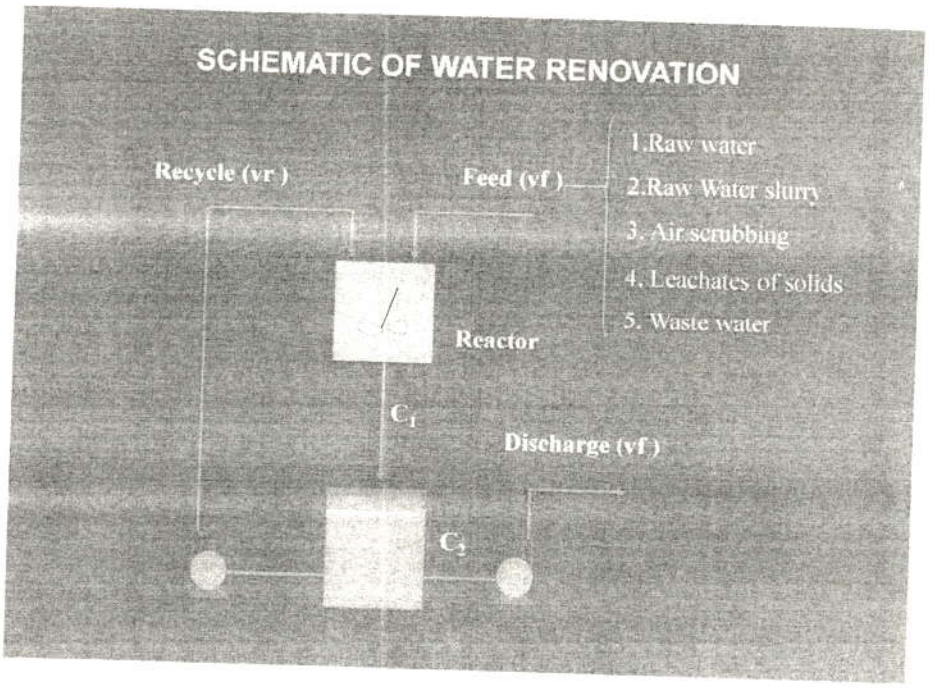
Treated water Characteristics	
BOD	<30 mg/l
COD	< 100 mg/l
Suspended Solids	< 20 mg/l
Oil and Grease	< 5 mg/l
PH	7– 7.5
DO	>4 (mg/l)
Amonical N	<2 (mg/l)

1.6 PROCESS DESCRIPTION:

The technology is based on a bio-conversion process where fundamental reactions of nature, namely respiration, photosynthesis & mineral weathering take place in a media housing micro & macro organisms which bring about the desired purification. GBF is an oxygen supplying biological engine and so the process can treat all types of water – domestic municipal & industrial ***with limitation on salinity which should be less than 2500 mg/L .*** when salinity level exceeds, reaction rates in the GBF system are lower. Hence the system design is adjusted suitably to achieve the desired purification. If salinity is very high an additional facility using RO technology can also be included.

The process requires mesophylic temperatures(15-55 Deg C); therefore, wherever low/ very low ambient temperatures are encountered a greenhouse infrastructure appropriate for the loc houses the GBF plant. The process can work at high ambient temperatures, quite

Registrar
Mewar University
Gangrar, (Chittorgarh)



well. al conditions

Fig 2.1: ***Schematic of Water Renovation***

The facilities of a treatment process for water & waste water consists of a raw water tank, bioreactor containment , treated water tank and where appropriate a greenhouse and associated piping ,pumps & electricals. Schematic of the process is shown in Fig 2.1. Bioreactor containment houses: -

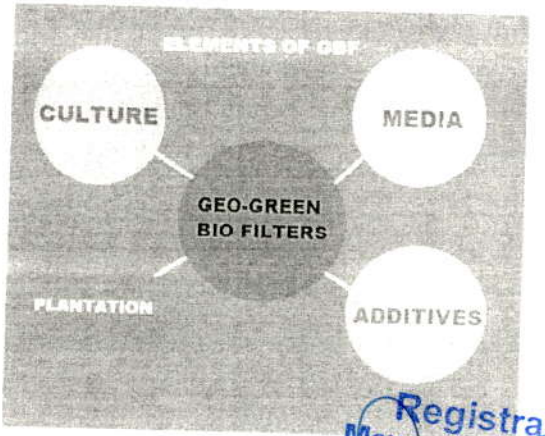
(a) Media,

(b) Culture,

(c) Additives

(d) Plantation required for the bioconversion

Water or waste water is pumped over the bioreactor; the suspended solids are removed by the top media which is scrapped and discarded into municipal solid waste. The water trickles into the bed and treated water collects in the filtrate tank. Recirculation pumps are provided to obtain desired hydraulic retention times; in general purification to desired quality is achieved in one pass and so these recirculation pumps are not used.



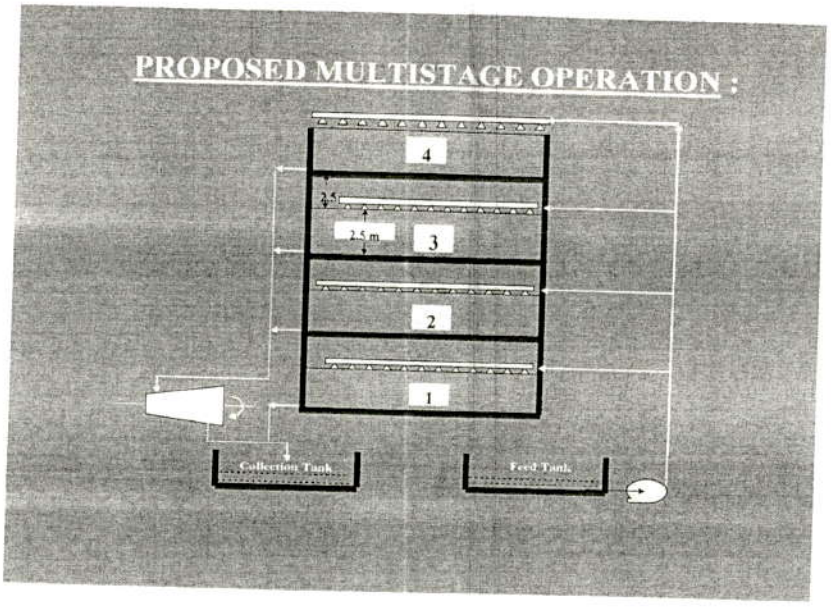


Fig 2.2: ***Proposed Multistage Operation***

The scheme for drinking quality raw water, swimming pool water , rain water & storm water & waste water treatment are identical to description above. GBF bioreactor is developed at each level and arrangements for pumping & piping to the different levels are provided.

In the case of air purification the air to be purified is scrubbed with GBF treated water. Then the waste water so generated from scrubber is processed through GBF system and treated water is recycled to scrubber.

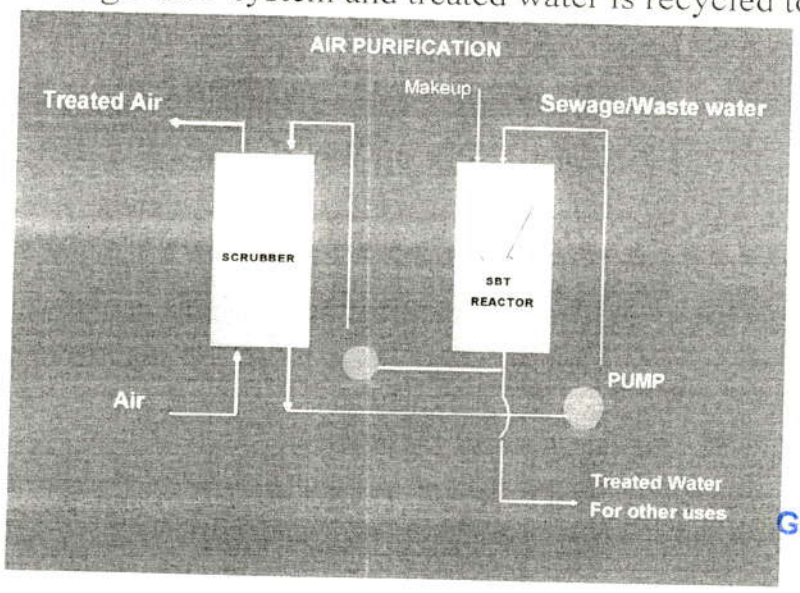


Fig 2.3: ***Schematic of Air Purification***

The treatment scheme proposed to treat the raw sewage generated from various areas is first collected in a raw sewage sump & then pumped for further treatment, into three distinct parts:

1. Pre-treatment, which comprises of screening
2. Biological treatment comprising of Bioreactor Bed
3. Tertiary treatment comprising of Filters to further polish the water (Optional).

There is Minimal Energy Consumption *(0.03 to 0.05 kWh/m^3) and* Very low Hydraulic Retention Time *(0.5–2.0 h)* & High hydraulic loading *(800 -1250 L/m^2 per day). This STP can Tolerates high fluctuation flows*
Detailed description of each step of treatment is given below:

1. Pre-Treatment Raw Sewage:
The raw sewage will be pumped to inlet flange of equalization tank
Screen Removal
The Raw Sewage follows though Bar Screens for removal of floating matter. Removal of such floating / coarse matter is essential because it can otherwise choke pipelines / pumps etc, and hinders the normal operation of the treatment plant. The mechanical screen is made of S.S. bars, placed at equal intervals. The inclination of bars is kept such that raking becomes easy. A manual standby screen is also provided.

2. Biological Treatment:
Water or waste water is pumped over the bioreactor; the suspended solids are removed by the top media which is scrapped and discarded into municipal solid waste. The water trickles into the bed and treated water collects in the filtrate tank. Recirculation pumps are provided to obtain desired hydraulic retention times; in general purification to desired quality is achieved in one pass and so these recirculation pumps are not used.

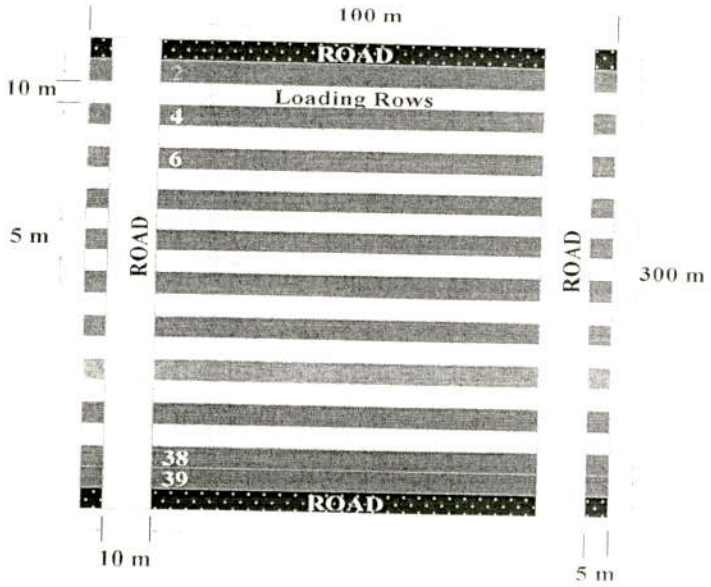
Parameters	Raw water	Treated water
pH	6.8-7.1	7.3
SS	78-293	9.0
DO(mg/l)	ND-2.8	6.2
COD(mg/l)	280-560	14.1
BOD(mg/l)	64-130	4.4
Turbidity (NTU)	46-148	0.4

Registrar
Mewar University
Gangrar, (Chittorgarh)
23/5/22

TDIS(mg/l)	1030-1786	644.1
Ammoniacal N (mg/l)	9.3-3.4	0.9
TKN (mg/l)	11.2-23.1	1.6
Orthophosphate (mg/l)	0.47-3.44	0.05
Oil and grease (mg/l)	14.8	1.4

3. Tertiary Treatment:

The treated sewage, is then passed thru 2 filters which further polishes the treated sewage. (Optional). Sewage is distributed on the top of filter bed with pump and pipes with controlled flow. Sewage slowly moves downwards over the surface of filter media, impurities are consumed by ecosystem and clean water flows



out.

Fig 2.4 Processing of Solid waste

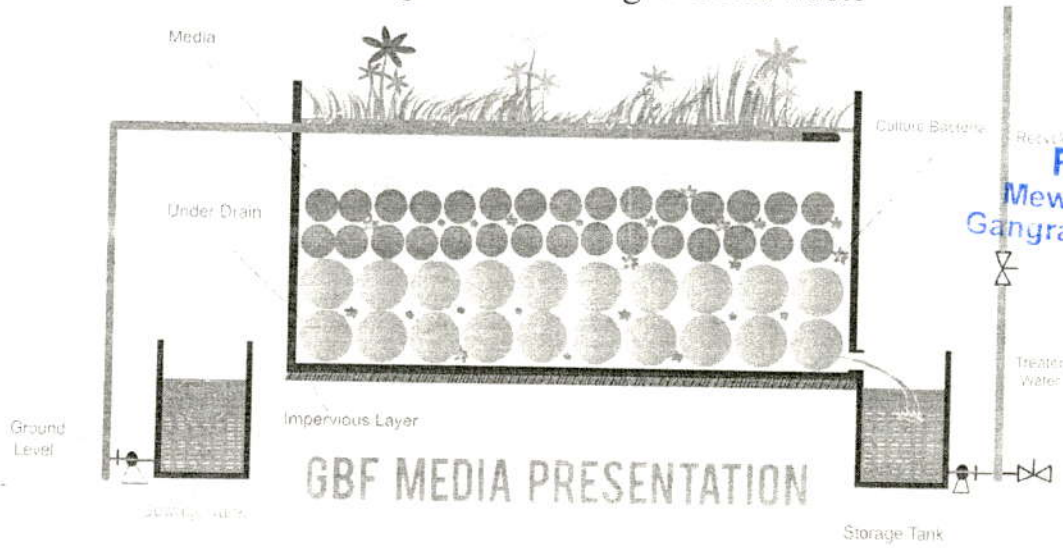


Fig 2.5: *Layout of GBF Media*

Sewage Decomposition Methods adopted:

Characteristic	AEROBIC	ANAEROBIC
Process	Sufficient oxygen present in the water, organic matter is broken down by microbes aerobically. The organic compounds are oxidized.	Insufficient amount of oxygen present in the water, organic matter is decomposed by microbes that don't require oxygen. The organic compounds are reduced.
Carbon→	Carbon-di-oxide (CO2)	Methane (CH4)
Nitrogen→	Nitrate (NO_3^-)	Ammonia (NH3)
Sulfur→	Sulfate (SO_4^{2-})	Hydrogen sulfide (H2S)

1.7 BUILDING & EQUIPMENT

GBF STP plant is essentially a civil structure. It comprises of tanks, bioreactor containment & a pump room and piping & pumping arrangements.

Water Treatment: -

Raw water tank, treated water tank & bioreactor containment, pump cum store room constitute the civil structure of the GBF plant .

The choice of media layout depends on process requirements. The civil structure of the GBF plant is typically of stone rubble or RCC and sometimes soil embankment. The piping system for the GBF plant is typically of UPVC. All valves compatible with high pressure corrosion free service is fine for GBF plant.

Registrar
Mewar University
Gangrar, Chittorgarh
23/5/22

Pumps are typically self priming & submersible type as per site conditions. All electricals cables switches alarms monitors & displays are as per design & safety requirements of the process on hand.

- **Multilevel waste water treatment:** - The civil structure tanks included are typically of steel or RCC. All pumps & piping as in water treatment. The multi level design of waste water treatment plants typically use steel structures protected electrochemically against corrosion. Multi-level designs find extensive applications in space limited sites.

- **Air Purification:** - The system consists of raw water & treated water tanks , air scrubber & bioreactor, circulation pumps & associated electricals. All equipment details are as described for water treatment.

- **Municipal solid Waste:** - The system consists of fenced wire net (if required) environment, water supply & distribution, power supply & distribution, storage sheds & tractor & earth moving equipment, mixing equipment, implements &trolleys , bioreactor, internal roads for vehicular movement of materials & wastes, office space & facilities.

1.8 DESIGN & CONSTRUCTION OF GBF PLANT

The specifications for tanks & bioreactor required to treat water & waste water, solid & hospital waste are obtained from process models & laboratory investigations. Table 4.1 & 4.2 summarizes the data required for design . The construction of the GBF plant is essentially civil works; design & construction follows standard civil engineering procedures.

Safety: - The GBF process involves no moving parts excepting feed & discharge pumps. So safety needs are minimal. However gloves & gum boots are required while handling solids and during movements in the plant area so that accidental fall into tanks are avoided. Accordingly all tanks are provided closures and ladders.

Personnel Training: - Personnel training required are routine pump operation & maintenance ii) routine O&M of plantations. These procedures are imparted during commissioning and trial run period by Green Tech.Engineers.

Registrar
Mewar University
Gangrar (Chittorgarh)

Reporting & Recording: -

1.9 OPERATION & MAINTENANCE OF GBF PLANT:

The water purification plant works on the principle of Geo green bio filters which *applies the biochemistry of nature in a concentrated manner. It aims at enriching soil & extracting excellent water for use in irrigation, fisheries, industries. The solid waste facility also uses the same principle to process waste for disposal or for conversion to fertilizer.*

Pumps & pipes: - All pumps should be run daily to ascertain maintenance requirements. All monitors & alarms should be checked daily. All pipe ports should be maintained daily to ensure that water flows out of all the ports. All valves & fittings should be checked and where faulty should be restored.

Bioreactor: - The top surface should be scrapped daily/weekly as necessary and the solids should be disposed. The top surface additives should be replenished periodically once say every 8 weeks.

Plantation: - The plantation on the bioreactor and surroundings should be regularly watered, pruned, replaced and provided with manure as required.

Tanks: - All tanks should be thoroughly scrapped to remove adhering dirt and washed.

1. The sewage coming out from the sewer line is collected in a bar Screen chamber and the suspended plastic bags, pouches, sanitary napkins ,hair, condoms are restricted to enter the raw water tank by installing a bar screen at the exist point of bar screen chambers.
2. The screened sewage is collected in the raw water tank and is lifted by sewage pumps for even distribution on top of the bioreactor bed through a

main pipe and then through the distribution perforated pipes at a rated calculation by valves.

3. The sewage water trickles down throughout the bed for treatment by the culture bacteria spread all along inside the bed.
4. The culture bacteria treats the sewage water and the treated water comes out from the discharge pipes installed at the bottom of the bioreactor tank.
5. The treated water is collected in the treated water tank. Treated water pumps are installed in the treated water tank & are connected to the piping network on top of the bioreactor bed to clean the pipes once the sewage pumps are put off.
6. The treated water pumps are turned on once a day to clean the pipes & to water the plants which are planted on top of the bioreactor bed.
7. Top layer of soil under the vegetative cover maintains microenvironment within which soil flora and fauna decompose the organic matter. Thus, top layer of soil will be utilized for the treatment of domestic sewage and variety of biodegradable wastewaters (root-zone treatment). The Plants are maintained & trimmed regularly by the Gardner.

1.10 Water quality management plan

- Gangrar is water scarce region therefore, there is an increased demand to recycle and reused the treated water.
- The unit has proposed to install 300KLD STP with the aforementioned GBF technology to achieve their goal of water quality for recycle and reuse of water.

- The treated water will be recycled and re-used by the unit for plantation and landscaping purpose.
- **Water Quality Monitoring:** Water quality monitoring will be carried to acquire the knowledge on water quality of the treated water.
- Treated Water Quality Assessment will be done as per RPCB guidelines from government approved laboratory.
- Pollution control at source will be done encouraged.
- Green technology will be adopted for sewage treatment. All organic wastes are best source of energy.

1.11 Details of Hazardous waste generation and treatment.

There is no generation of hazardous waste. Therefore, the same is not applicable.

1.12 Total capital cost on pollution control system along with the operation and maintenance cost.(Excluding Civil Work)

Registrar
Mewar University
Gangrar, (Chittorgarh)

1.13

OPERATION & MAINTENANCE OF GBF SEWAGE TREATMENT PLANT:

1. *The water purification plant works on the principle of Geo green bio filters which applies the biochemistry of nature in a concentrated manner. It aims at enriching soil & extracting excellent water for use in irrigation, fisheries, industries. The solid waste facility also uses the same principle to process waste for disposal or for conversion to fertilizer.*

2. **Pumps & pipes:** - All pumps should be run daily to ascertain maintenance requirements. All monitors & alarms should be checked daily. All pipe pores should be maintained daily to ensure that water flows out of all the pores. All valves & fittings should be checked and where faulty should be restored.

3. **Bioreactor:** - The top surface should be scrapped periodically as necessary and the solids should be disposed.

4. **Plantation:** - The plantation on the bioreactor and surroundings should be regularly watered, pruned, replaced and provided with manure as required.

5. **Tanks:** - All tanks should be thoroughly scrapped to remove adhering dirt and washed.

CONCLUSION:

1. **GBF is a novel green technology for purification of water & for processing of organic solids.**

2. **GBF is a 100% fool proof system to treat the effluent coming out from the hospital labs, operation theaters along with the general sewage coming out from the toilets, bathrooms, hostel mess. Thus the requirement of ETP is ruled out.**

Registrar
Maharana Pratap University
Gangrar, (Chittorgarh)
25/5/20

OPERATING PROCEDURE:

1. The sewage coming out from the sewer line is collected in a bar Screen chamber and the suspended plastic bags, pouches, sanitary napkins ,hair, condoms are restricted to enter the raw water tank by installing a bar screen at the exit point of bar screen chambers.
2. The screened sewage is collected in the raw water tank and is lifted by sewage pumps for even distribution on top of the bioreactor bed through a main pipe and then through the distribution perforated pipes at a rated flow by control of valves.
3. The sewage water trickles down throughout the bed for treatment by the culture, bacteria spread all along inside the bed.
4. The culture, bacteria treats the sewage water and the treated water comes out from the discharge pipes installed at the bottom of the bioreactor tank.
5. The treated water is collected in the treated water tank.
6. The treated water pump is used to water the plants which are planted on top of the bioreactor bed.
7. The Plants are maintained & trimmed regularly by the gardener for excellent growth of the plants.

   The growth of the plants is an indicator of good functioning of the STP as oxygen is supplied through the plants to the bacteria present on the media inside the Bioreactor tank .

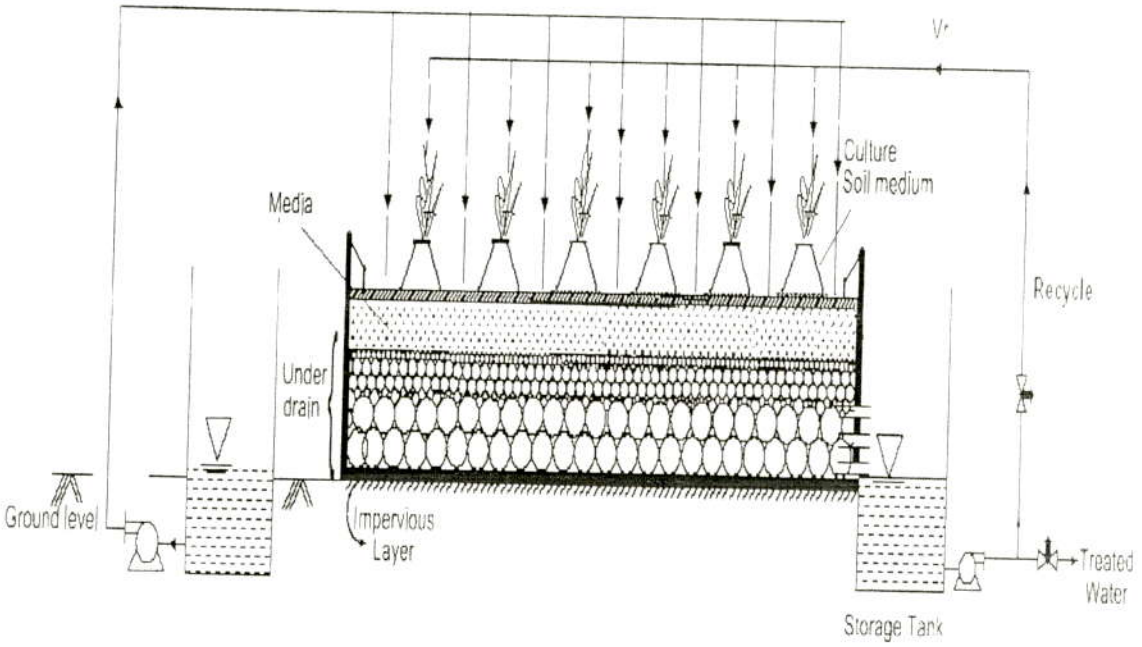
Registrar
Mewar University
Gangrar, Chittorgarh
25/5/22

1.14

Total Cost of Installtion: Rs. 1800000.00 Plus GST extra.

Time for implementation : Six Month after the completion of civil work.

Process flow Diagram of STP



Registrar
Mewar University
Gangrar, (Chittorgarh)
23/5/20.

Emm-Tech Engineers

MANUFACTURES OR EFFLUENT TREATMENT PLANTS,
SEWAGE TREATMENT PLANTS, SOUND CONTROL DEVICES
Plot No. 26/6, Industrial Area, Phase-II, Chandigarh - 160002
Works : Plot No. 1642, Deep Complex, Hallow Majra, Chandigarh

No. ---

Date 3/4/2009

रजिस्ट्रार,
मेवाड़ विश्वविद्यालय,
गंगरार, चित्तौड़गढ़।

विषय – सीवरेज ट्रीटमेन्ट प्लांट के बिल का भुगतान करने बाबत।

महोदय

उपरोक्त विषयान्तर्गत निवेदन है कि हमारी कम्पनी Emm-Tech Engineerings द्वारा आपके विश्वविद्यालय में स्थापित सीवरेज ट्रीटमेन्ट प्लांट का कार्य पूर्ण हो गया है एवं इसका राशि रू. 884000/- का बिल संख्या 301 दिनांक 03.04.2009 इस पत्र के साथ संलग्न कर प्रेषित किया जा रहा है।

कृप्या राशि रूपये आठ लाख चौरासी हजार मात्र का भुगतान करने की कृपा करावें।

सधन्यवाद।

प्रबन्धक,
Emm-Tech Engineerings
Chandigarh – 160002

Registrar
Mewar University
Gangrar, (Chittorgarh)

TIN 04960023875

RETAIL INVOICE

Emm-Tech Engineers

09888551966
09888027698
Fax 0172-2642107

MANUFACTURES OF EFFLUENT TREATMENT PLANTS,
SEWAGE TREATMENT PLANTS, SOUND CONTROL DEVICES
Plot No. 26/6, Industrial Area, Phase-II, Chandigarh-160 002
Works : Plot No. 1642, Deep Complex, Hallow Majra, Chandigarh

Invoice No. 301 Date 03/04/09

M/s Mewar University
Gangrar Distt. Chittorgarh (Rajasthan)

Purchase Order No. ____ Dated 25/03/09 CST/TIN No. ____

Delivery Through HR-46 F 5313. GR No 124516 Dt 03/4/09

S No	DESCRIPTION OF GOODS	QTY.	UNIT/ RATE	RATE OF TAX	AMOUNT Rs	P
	Parts of Sewage Treatment Plant (S.T.P.)					
C	with Sand filter, Carbon filter Blowers, Diffusers, pumps, Dairy pumps Pannel Board, pipe line & fittings.	One Lot	850000/-		850000-00	
	Note:- This Material use for Educational Project only					
	Pipe line & fittings received by Registrar 6/4/09					
	Central Sale Tax 4%					
			Total Sale price inclusive of VAT			
			CST Sale/Transfer against Inter-State Sale		34000-00	
Rupees	Eight Lac Eighty four Thousand only		Nil Amount		8,84000-00	

E. & O.E
1 Due date for Payment As per P.O. terms
2 Interest @ 24% P.A. will be charged on all over due payments
3 Goods once sold are not returnable
4 All disputes subject to Chandigarh Jurisdiction only

For Emm-Tech Engineers
Authorised Signatory

Registrar
Mewar University
Gangrar, (Chittorgarh)

MEWAR UNIVERSITY

Gangrar, Chittorgarh (Raj.)
OFFICE OF THE REGISTRAR

Ref. No.MU/RO/2021/ 490

06th March, 2021

OFFICE ORDER

Waste Management Committee

The main Objective of this committee are:

- To ensure proper and efficient disposal of chemical waste from the laboratories.
- To develop laboratories working Guidelines for Waste Chemical disposal.
- Generating awareness among the students & staff by conducting Waste Management programme.

Members of Waste Management Committee are:

S.no	Name	Designation	Designation in committee
1.	Dr. Hariom Sharma	Asso. Prof. (Pharmacy)	Chairman
2.	Dr. Mohammad Ashid	Assistant Prof.(Chemistry)	Member
3.	Dr. Faiq Ahmed	Medical Officer	Member
4.	Mr. Ankit Navalakha	IT Head	Member
5.	Dr.Gaurav Kumar Sharma	Assistant Prof. (Pharmacy)	Convener

Registrar
Mewar University
Gangrar, (Chittorgarh)

To: All the members of the above Committee

Copy to:

1. Ps to Hon'ble Chancellor for kind information
2. PS to Hon'ble President for kind information
3. Pro-President/OSD
4. Dean (Academics/Admission) /Director/Hod's
5. Accounts/Library/Warden/Store/Maintenance/ITt).

(EPWMC)

Environment Protection & Waste Management Committee

Mewar University

LABORATORY WASTE MANAGEMENT GUIDELINES

Registrar
Mewar University
Gangrar, (Chittorgarh)

Contents

1. Overview

EPWMC is responsible for the development and implementation of proper management practices for all aspects of the handling, storage, and disposal of chemical wastes that are generated at the Mewar University. Our goal is to manage wastes in a safe and environmentally sound manner that complies with all applicable federal, state and local regulations.

2. When is Hazardous/Chemical Waste Regulated?

Hazardous/Chemical waste is regulated from the moment it is generated inside the lab until it reaches its final destination for disposal or treatment at an offsite facility.

3. What is Hazardous/Chemical Waste?

A Hazardous/Chemical waste is a solid, liquid, or gaseous material that displays either a "Hazardous/Chemical Characteristic" or is specifically "listed" by name as a Hazardous/Chemical waste.

Characteristic wastes are not listed specifically by their chemical name but they are regulated as Hazardous/Chemical wastes because they exhibit one or more Hazardous/Chemical characteristics. These four characteristics are **Ignitability**, **Corrosivity**, **Reactivity**, and **Toxicity**.

The **Ignitability** characteristic applies to wastes that are:

- Liquids with a flash point less than 140° F
- Solids capable of spontaneous combustion under normal temperature and pressure
- Oxidizing materials
- Ignitable compressed gases
- Examples include ethanol, sodium nitrate, hydrogen gas, xylene and acetone

The **Corrosivity** characteristic applies to wastes that are:

- Aqueous solutions with a pH less than or equal to 2 or greater than or equal to 12.5
- This does not apply to solid or non-aqueous materials
- Examples include hydrochloric acid, nitric acid, and sodium hydroxide

The **Reactivity** characteristic applies to the following:

- Materials that react violently or generate toxic fumes when mixed with water
- Cyanide or sulfide bearing wastes which evolve toxic fumes when mixed with acids or bases
- Materials that are normally unstable or explosive
- Examples include sodium metal, reactive sulfides, potassium cyanide and picric acid

The **Toxicity** Characteristic applies to wastes that have the potential to contaminate groundwater if improperly disposed of. These materials are regulated as Hazardous/Chemical waste due to their potential to leach out specific toxic substances in a landfill.

4. Essential rules for managing Hazardous/Chemical chemical materials

1. When possible, seek ways that will minimize the quantity of waste generated inside the laboratory.
2. Only use appropriate containers for the storage of waste materials (Plastic is preferred).
3. Store chemical waste in a designated Area.
4. Properly label all waste containers.
5. Keep waste containers **closed.**
6. **Contact** EPWMC for pick-up.

4.1 Waste minimization

The University is required by Federal and State regulations to develop and implement a Waste Minimization Strategy. Ways to help achieve the goal of reducing the volume of chemical waste generated on campus include but are not limited to:

1. Practice the concept of *Source Reduction* by simply ordering the smallest quantity of chemical materials required for your research.
2. Keep an inventory of chemicals in your lab.
3. Share surplus chemical with other labs.
4. Purchase mercury-free instruments.
5. Substitute Hazardous/Chemical chemicals with non-Hazardous/Chemical chemicals whenever possible.
6. Reduce the scale of laboratory experiments to reduce the volume of waste being produced whenever possible.

4.2 Storing waste in the lab

Each location on campus where Hazardous/Chemical waste is generated and stored is a specific collection area. There are specific requirements for managing chemical wastes within these areas. A maximum of 55-gallons of Hazardous/Chemical waste may be stored within any specific collection area. In the case of acutely toxic chemical waste (P-list), a maximum of one quart of liquid or one kilogram of solid may be accumulated at a time. Some common P-list chemicals are sodium azide, osmium tetraoxide, sodium cyanide. Once either limit is reached, EPWMC must remove the material from your laboratory within 3 calendar days.

The location of the specific collection area must be at or near the point where the waste is generated. Waste must not be generated in one room and taken to another room for storage.

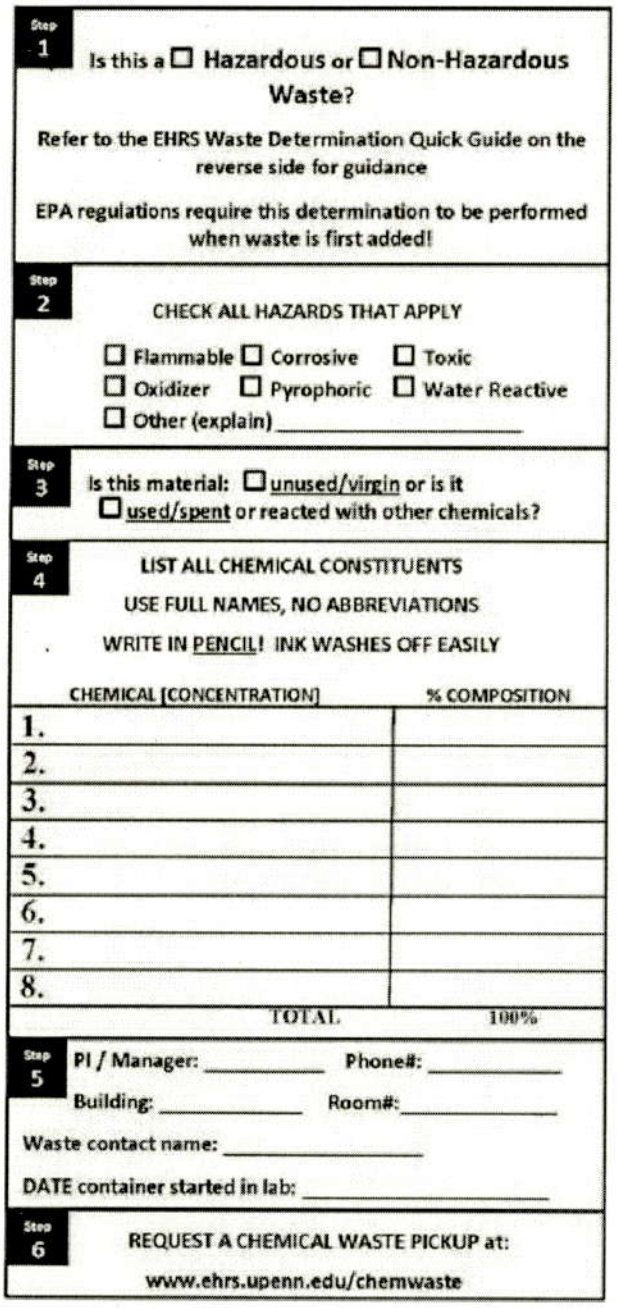
4.3 Container management in specific collection area

Waste containers stored in a specific collection area must be:

- In good condition
- Compatible with the waste being stored
- Kept closed at all times except when filling
- Labeled with a specified colour waste label
- Stored inside secondary containment bins (provided by EPWMC for no charge)
- Waste must always remain in the lab
- Never store waste in PUBLIC AREAS (such as hallways)

4.3.1 Properly labeling waste containers

- All waste containers must have a specific color waste label affixed when waste is first placed into the container
- All sections of the label must be completed when waste is first added to a container. Percentages and additional constituents can be added later
- Don't use chemical symbols, abbreviations, or codes for waste identification
- Use Pencil to complete the label since inks are easily washed off by solvent waste streams



Step 1

Is this a ☐ Hazardous or ☐ Non-Hazardous Waste?

Refer to the EHRS Waste Determination Quick Guide on the reverse side for guidance

EPA regulations require this determination to be performed when waste is first added!

Step 2

CHECK ALL HAZARDS THAT APPLY

☐ Flammable ☐ Corrosive ☐ Toxic
☐ Oxidizer ☐ Pyrophoric ☐ Water Reactive
☐ Other (explain) _____

Step 3

Is this material: ☐ unused/virgin or is it ☐ used/spent or reacted with other chemicals?

Step 4

LIST ALL CHEMICAL CONSTITUENTS

USE FULL NAMES, NO ABBREVIATIONS

WRITE IN PENCIL! INK WASHES OFF EASILY

CHEMICAL [CONCENTRATION]	% COMPOSITION
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
TOTAL	100%

Step 5

PI / Manager: _____ Phone#: _____

Building: _____ Room#: _____

Waste contact name: _____

DATE container started in lab: _____

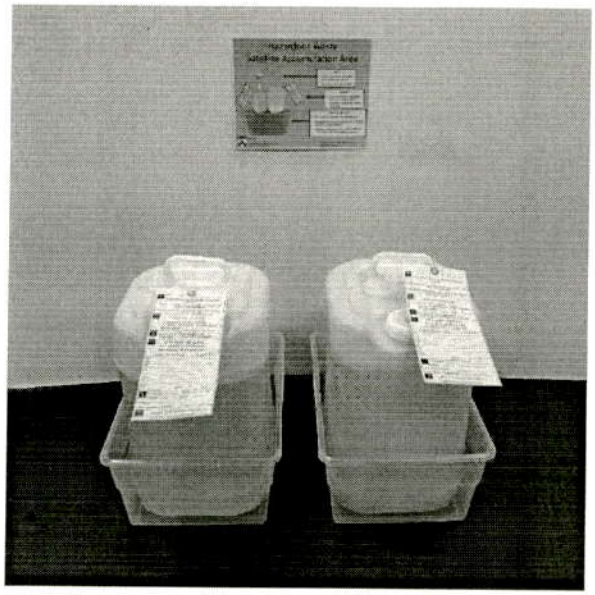
Step 6

REQUEST A CHEMICAL WASTE PICKUP at:

www.ehrs.upenn.edu/chemwaste

4.3.2 Why is labeling so important?

- EPWMC staff members need this information to decide how to safely manage the material
- Environmental laws require the generator to label chemical waste materials
- Chemical constituents must be known to allow us to dispose of chemicals with minimal cost and impact to the environment



Many chemicals are poured together into drums. Other chemicals are packaged together based on compatibility.

4.4 Drain disposal

Hazardous/Chemical chemicals **must never** be poured down the drain as a method of disposal. Contact the Members of EPWMC if you have specific questions about drain disposal.

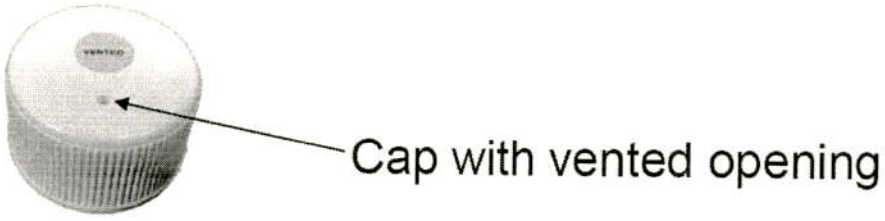
4.5 Best Practices for Laboratory Hazard Waste Management

Waste Containers

• Containers and lids must be in good condition and chemically compatible with the waste inside the container. Lab beakers, flasks, household containers (i.e. milk cartons) are not acceptable as waste containers. Metal containers are not acceptable unless they are the original container for the chemical waste being managed.

• Containers must have securely fitting lids, preferably the original lid for the container. Do not use corks, stoppers, a watch glass, or parafilm. Evaporation of waste is not a legal means of disposal! Do not leave the funnel in the container as this does NOT constitute a lid, even if covered with a watch glass!

• Waste containers must remain securely capped at all times, except: 1) When adding, removing, or consolidating waste materials; 2) When the waste is being temporarily collected in a working container, as described below; or 3) When venting of the container is necessary for either the proper operation of laboratory equipment (such as HPLC), or to prevent the dangerous buildup of extreme pressure that may result from a reaction between the wastes being added. In some cases, a vented container lid should be employed to prevent gas build-up.



• Containers must be the proper size. If you generate a large volume of liquid waste, consider a 5-gal pail for solvent accumulation.

• Filled containers of liquid must have at least a 10% headspace to accommodate expansion during storage and transport. **Do not completely fill the container**!

• Allow chemicals to react completely and/or cool to ambient temperature before accumulating as waste; once the reaction has completed and the reagents cooled, pour into a compatible container and secure the lid. In some cases, a vented container lid should be used.

• Hydrofluoric acid presents a special hazard and must be stored in Teflon containers or the original product container. Contact the Safety Office if you are using hydrofluoric acid.

Waste Separation

The fewer the number of chemicals associated with a waste, the more economical is the disposal method for that waste. Review the Safety Data Sheet for compatibility and disposal considerations and separate incompatible materials. Contact Safety & Risk Management for guidance when combining waste.

Acids and Bases	Separate acids and bases from one another in individual, compatible containers. Do not mix with solvent or oil wastes.
Biocides	Chemicals which are persistent in the environment or any concentrated solutions of biocides must not to be released to the sanitary sewer and are collected

	separately for hazardous waste disposal.
Ceramic Glaze	Many ceramic glazes contain metals that are considered hazardous waste. Glaze preparation and rinsing should be conducted in a sink equipped with a settling tank to prevent the solids from entering the drain. The settling tank must be emptied frequently and the collected material disposed of as hazardous waste.
Compressed Gas Cylinders	Disposal of non-returnable cylinders (i.e. lecture bottles) that are not empty can be very expensive, especially for reactive gases. Make every effort to purchase from suppliers who have a cylinder return program. Even if a cylinder seems empty, it cannot be discarded in the trash. Always treat pressurized cylinders as waste and contact the Safety Office for disposal.
Oil Waste	Used oil wastes from vacuum pumps, transformers, motors, etc., are collected for disposal and can be sent to a recycling service if the oil has not been mixed or contaminated with hazardous waste. Collect oil that has not been mixed or contaminated with hazardous waste in a container labeled as 'Used Oil'. Oils that are mixed with hazardous wastes must be collected and disposed of as hazardous waste.
Oily Rags	Oily rags must be placed in a red *oily rag* can with a self-closing lid. Oily rags should not be left lying around because they can ignite and cause fire to spread to other areas.
Oxidizers	Package oxidizers separately; store and accumulate away from organics including flammable materials. Oxidizers should never be stored or accumulated adjacent or proximate to any organic substances.
Paints	Oil-based paints are considered hazardous waste. DO NOT discard oil-based paint down the drain or place in the regular trash. Oil-based paints may be combined with solvents and linseed oil for hazard waste disposal. Latex or acrylic paints cannot be discarded down the drain. They may be dried completely and the solids placed in the regular trash. Do not place liquid latex paints in the regular trash.
Photographic Chemicals	Photographic chemicals generally fit into four categories: fixers, developers, rinses, and specialized chemicals. Standard developers and rinses can be rinsed down the drain during processing. Most fixers contain silver in quantities above the amount allowed for sewer disposal. Fixer wastes must be collected and either poured through a silver recovery unit or collected as hazardous waste. Specialized chemicals, such as special acids and bases, should be assumed to be hazardous waste and collected accordingly.
Sodium azide	Solutions containing sodium azide, commonly used as a preservative in many in-vitro diagnostic products and with automatic blood cell counters, cannot be discharged to the sanitary sewer. The accumulation of lead and/or copper azide in the drain pipes can produce a potentially explosive situation.
Solvents	Collect non-halogenated solvents separately from halogenated solvents whenever possible. Most solvents are flammable and should be separated from oxidizing and combustible materials. Non-halogenated flammable solvents are sent to an incinerator or recycler and must be free of heavy metals and reactive materials, e.g. sodium metal.

Unknowns	Unlabeled and unidentified chemicals present a challenging, dangerous, and very costly disposal problem. Exercise every precaution to avoid generating unknowns in the laboratory and ensure that all containers are properly labeled. If you discover unknown chemicals, please contact the Safety Office.

4.6 Waste Disposal

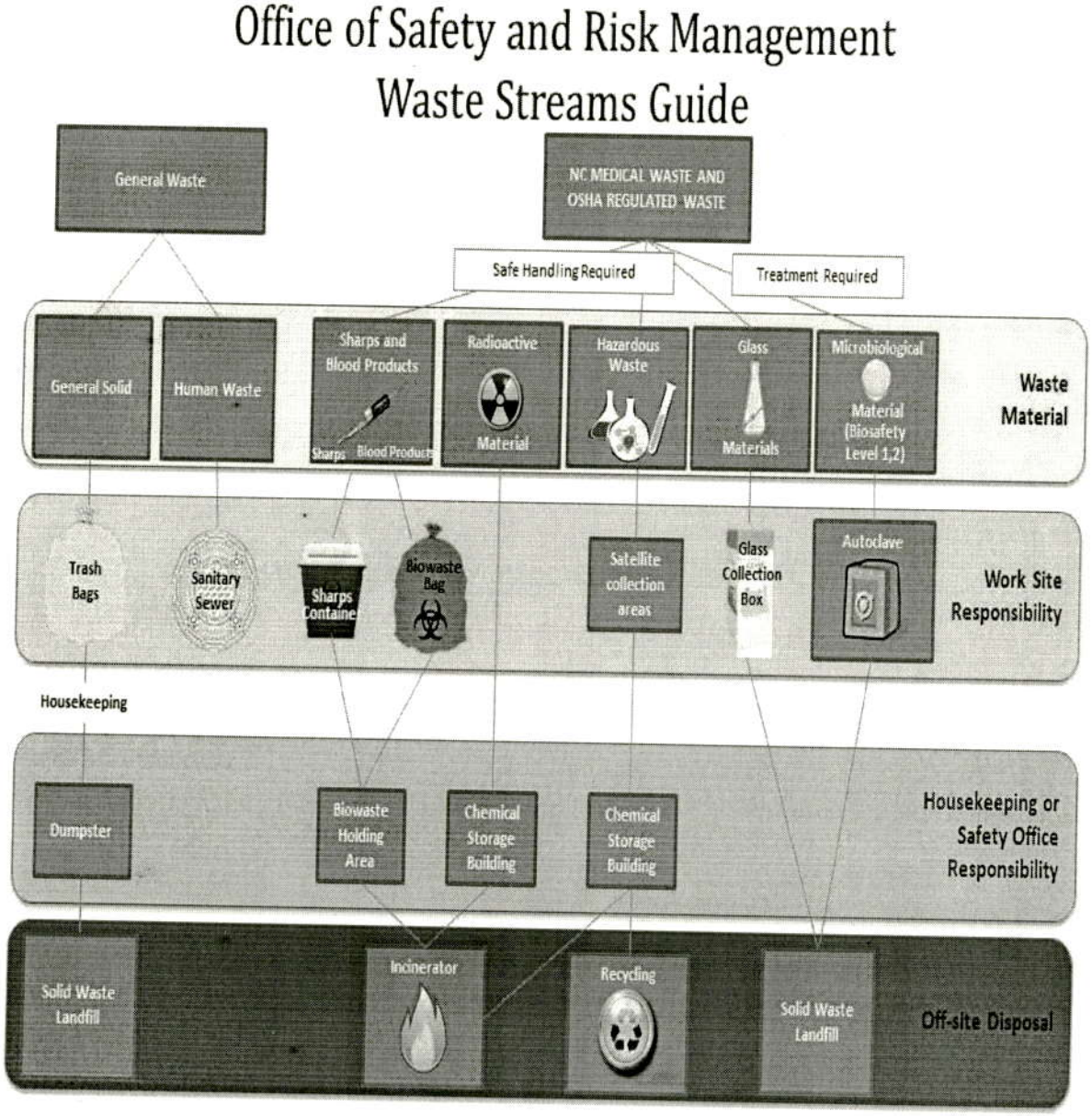
1. Material should be placed into compatible storage containers with secure screw-on tops and labeled with the "EPWMC Waste Label" (see appendix).
2. In general waste must be stored in the type of container in which the component materials were purchased (glass, plastic or metal). However, metal cans should not be used for acidic and corrosive solutions (alkali, acid, etc.). Also, as much as possible avoid glass containers for storage as they can shatter easily.
3. Small amount of waste can be collected in the labs. Once a month, lab incharges are required to collect all the waste and bring it to the waste collection shed (next the utility building). Only labelled and segregate waste will be collected so please make sure all the rules of segregation and labelling are followed. No mystery chemicals please.

Chemical Segregation

1. Acids + solvents mixture can spontaneously ignite. Never store/leave a solvent + acid mixture in the lab unattended. If you do happen to make such a solution, segregate it and take it outside of the building to the waster shed.
2. Acidic waste with fluoride ions must be collected separately in plastic containers, e.g. dilute hydrofluoric acid, ammonium fluoride and buffered-oxide etch.
3. Acidic wastes which contain toxic metal salts (Cr, Pb, etc.) cannot be buried in a chemical landfill, so must be collected separately.
4. Acid waste that does not contain metallic toxins or fluoride and have a pH>4 can be disposed into the drain with copious amounts of water
5. Acid waste that does not contain metallic toxins or fluoride and have a pH<4 must be separately collected in plastic containers. EPWMC does not allow individuals to neutralize acids.
6. Acids + oxidizers react and evolve gas. So unattended acids+oxidizer mixtures present an explosion hazard — in extreme cases plastic bottle can burst spraying acid everywhere. Fresh acids+oxidizer mixtures must be collected separately and kept inside the fume hood for 1 day. This allows time for the reaction to complete and gasses to escape. Nitric acid is both a strong acid and an oxidizer so solutions containing HNO3 it should be treated as an acid+oxidizer.
7. Solvents + oxidizer mixture can also spontaneously ignite. Never store/leave a solvents + oxidizer mixture in the lab unattended. If you do happen to make such a solution, segregate it and take it outside of the building to the waste shed.
8. Base + solvent mixtures also evolve gasses. So unattended base+oxidizer mixtures present an explosion hazard — in extreme cases plastic bottle can burst spraying base everywhere. Fresh base+oxidizer mixtures must be collected separately and kept inside the fume hood for 1 day. This allows time for the reaction to complete and gasses to escape.
9. Solvents must be separately collected in plastic or metal containers, e.g. benzene, ether, ethyl acetate, acetone, alcohols, hydrocarbons, etc.
10. Non-toxic basic waste with a pH<10 can be disposed into the drain with copious amounts of water
11. Basic waste with pH > 10, must be separately collected in plastic container. EPWMC does not allow individuals to neutralize bases. If they do not have any oxidizer, bases can be stored with solvents.

Waste Reduction

• **Solvent Recovery**: Setup solvent recovery systems (i.e. distillation) provided they meet specific safety and regulatory requirements to reduce the amount of solvent waste generated.
• **Neutralization**: Simple acids and bases can be rendered non-hazardous in the laboratory by elementary neutralization as the final step in a process. Toxic metals may also be precipitated from aqueous streams as the final step in a laboratory process. Changes to the waste stream outside of the generating process is considered treatment and requires a permit, so any changes to the waste stream should be the final step of a process in the generating laboratory.



Control Consultants & Engineers

en-vision™
Enviro Engineers Pvt. Ltd.

Correspondence Address : en-vision tech House, 4th Floor, Opp Primary School, New City Light Road, Bharthana, Surat, Gujarat, India - 395007 | email : info@en-vision.in | Visit us at : www.en-vision.in | Phone : 0261 2264003 - 2264004

TO WHOMSOVER THIS MAY CONCERN

This is to certify that **MEWAR UNIVERSITY HOSPITAL** located at **MEWAR UNIVERSITY CAMPUS, GANGRAR DIST: CHITTORGARH RAJASTHAN** have obtained the membership of Biomedical Waste Management at Centralized Biomedical Waste Disposal Facility at 5008, Village: Umarda, Tehsil-Girwa, Dist.: Udaipur.

They have agreed to dispatch the Biomedical Waste at our disposal facility as per the rules and regulation of Rajasthan Pollution Control Board and pay the charge for the same.

Membership Category: **HOSPITAL**
Membership Code: **CH0137**
No. Of Beds: **100 (HUNDRED)**

Validity Date: Up to 31.03.2023

Issue Date: 25/04/2022

*For **EN-VISION ENVIRO ENGINEERS PVT. LTD.***

(DIRECTOR)

Registrar
Mewar University
Gangrar, (Chittorgarh)

Note: 1. Please send an application for fresh certificate 15 days before expiry date.

2. In case of non-payment of Bio-Medical Waste collection, treatment & disposal charges by the member, this certificate shall automatically be invalid even within the validity period.

MEWAR UNIVERSITY

Branch Office: 128/103, 1st Floor, Samrudhhi Complex, Opp. Krishi Mandi, Reti Stand, Udaipur, Rajasthan, Phone: (0294) 2481513 Cell: 9428-00-1868 email: bmw.udaipur@en-vision.in

Site: CBWTF, Plot No. 5008, Village: Umarda, Tehasil: Girwa, Dist: Udaipur, Rajasthan.

Dhruv Tech
Recycle Today For A better Tomorrow

EwasteBiz

MEMBERSHIP CERTIFICATE

DTPL/2023-24/BHIWADI-E-WASTE/C-010 **Date: - 30.05.2023**

TO HOME SO EVER IT MAY CONCERN

This is to certify that, M/s **MEWAR UNIVERSITY, CHITTORGARH, RAJASTHAN-312901** is allotted the following membership for disposal of E-Waste as per HW (MH & TM) Rules 2008 and in accordance with the authorization granted to us by Rajasthan State Pollution Control Board.

The validity of this certificate is for One year from the date of issue.

Membership No.

D	T	E	-	2	0	2	3	0	1	0

For, Dhruv Techengineers Pvt. Ltd.

Dhruv Techengineers Pvt. Ltd.

Authorized Signatory

MEWAR UNIVERSITY Gangrar Chittorgarh-312901 (Raj.)

3/6/23

DHRUV TECHENGINEERS PVT. LTD.

Authorised for : E- waste Electronics Equipment, Dismantling and Recycling, Computers, Printers, Air Conditioners, Refrigerators, Washing Machine and Cordless Telephone

G - 1209, Rampur Mundana, Industrial Area, Bhiwadi, Distt - Alwar - 301019 (Raj.) Phone No. : 9811036212
E-Mail : info@dhruvtech.net Website : www.ewastebiz.com

Control Consultants & Engineers

en-vision™
Enviro Engineers Pvt. Ltd.

Correspondence Address : en-vision tech House, 4th Floor, Opp Primary School, New City Light Road, Bharthana, Surat, Gujarat, India - 395007 | email : info@en-vision.in | Visit us at : www.en-vision.in | Phone : 0261 2264003 - 2264004

TO WHOMSOVER THIS MAY CONCERN

This is to certify that **MEWAR UNIVERSITY HOSPITAL** located at **MEWAR UNIVERSITY CAMPUS, GANGRAR DIST: CHITTORGARH RAJASTHAN** have obtained the membership of Biomedical Waste Management at Centralized Biomedical Waste Disposal Facility at 5008, Village: Umarda, Tehsil-Girwa, Dist.: Udaipur.

They have agreed to dispatch the Biomedical Waste at our disposal facility as per the rules and regulation of Rajasthan Pollution Control Board and pay the charge for the same.

Membership Category: **HOSPITAL**
Membership Code: **CH0137**
No. Of Beds: **100 (HUNDRED)**

Validity Date: Up to 31.03.2023

Issue Date: 25/04/2022

*For **EN-VISION ENVIRO ENGINEERS PVT. LTD.***

(DIRECTOR)

Registrar
Mewar University
Gangrar, (Chittorgarh)

Note: 1. Please send an application for fresh certificate 15 days before expiry date.

2. In case of non-payment of Bio-Medical Waste collection, treatment & disposal charges by the member, this certificate shall automatically be invalid even within the validity period.

MEWAR UNIVERSITY

Branch Office: 128/103, 1st Floor, Samrudhhi Complex, Opp. Krishi Mandi, Reti Stand, Udaipur, Rajasthan, Phone: (0294) 2481513 Cell: 9428-00-1868 email: bmw.udaipur@en-vision.in

Site: CBWTF, Plot No. 5008, Village: Umarda, Tehasil: Girwa, Dist: Udaipur, Rajasthan.

MEMORANDUM OF UNDERSTANDING

Between

Sarpanch, Gram Panchayat, Gangrar (District Chittorgarh) Rajasthan

1st party

Mewar University, Gangrar, Chittorgarh (Rajasthan)

2nd party

Gram Panchayat, Gangrar has been notified by the Government of Rajasthan as Gram panchayat and published in Rajasthan Gazette. The Gram Panchayat is the unit of local body with sole object to carry out the functions and duties assigned by the Government of Rajasthan in the Panchayat Department.

Mewar University, Gangrar (District Chittorgarh) Rajasthan is a body established by an Act No. 4 of 2009 passed by the Government of Rajasthan and recognized and approved by the University Grants Commission (UGC) u/s 2(f) and 12B with powers to confer degrees u/s 22(1) of the UGC Act, 1956. The University is NAAC accredited and a Member of the Association of Indian Universities (AIU)

Mewar University, Gangrar, the 2nd party runs many academic and professional courses as mandated by the Act passed by the Rajasthan Legislative Assembly and also provides the facility of Hostel to the students coming from various parts of the country and abroad. The Hostel mess produces lot of food waste. Apart from food waste there is lot of another waste material for disposal. The disposal of such unused and waste food and other material is very important and that is why this MoU between the 1st party and 2nd party.

Tenure of the agreement: This agreement shall be for 5 years starting from 1st July, 2020. Both the parties shall be at ease to revoke the agreement on account of violation of the conditions mentioned herein.

1. **Responsibility of the 2nd party :**
   - (i) The 2nd party shall ensure necessary approvals/clearances from Pollution Board
   - (ii) The 2nd party shall take all necessary steps to ensure that the waste is handled without adverse effect to the human health and environment
   - (iii) The 2nd party shall segregate the waste at the generation point in accordance with the directions of the pollution authorities
   - (iv) The 2nd party shall establish common secured waste collection point within the premises for collection
   - (v) The 2nd party shall maintain all the relevant documents
   - (vi) The 2nd party shall nominate the nodal officer to interact with the 1st party
   - (vii) The 2nd party shall collect the waste with their own means including transportation of the same

(रेखा शर्मा)
सरपंच
ग्राम पंचायत गंगरार

O.S.D.
Mewar University
Gangrar, Chittorgarh

2. **Services to be provided by the 1st party:**
   (i) The 1st party shall identify and notify the place for dumping and disposal of the waste material
   (ii) The 1st party shall charge money in case the waste is treated by them on the negotiated amount
   (iii) The 1st party will ensure that the waste treated is as per the standards prescribed by the pollution authorities and is not adverse to the environment
   (iv) The 1st party shall be responsible for the disposal of the treated waste in the secure landfill or any recycling plant
   (v) The 1st party will provide training to the officials of the 2nd party and will issue a certificate to this effect which the 2nd party will display in their office
3. **Mode of payment:**
   The payment shall be made by the 2nd party to the 1st party on negotiated rates.
   Places of collection:
   The waste shall be collected from the Mess, Canteen and the entire campus of the University
4. **Performance Guarantee:**
   (i) The 1st party shall meet the rules and regulations of the Pollution Board of Government of Rajasthan'
   (ii) The 2nd party shall have the right to visit the place notified by the 1st party for treatment of waste material
   (iii) The first party shall indemnify the 2nd party in case of any penalty imposed while irregularities in transportation of waste material
   (iv) The 2nd party shall have the right to change the common waste facility operator in case their services are not found satisfactory

   5 Other Terms and conditions:
   (i) Any of the terms and conditions can be altered, changed with the consent of both the parties
   (ii) Neither party shall assign or attempt to assign the party's right to any other party without the consent of other party
   (iii) Any dispute arising out of the matters mentioned above shall be decided as per mutual agreement
   (iv) Both the parties expressly agree and this agreement shall be valid for 5 years starting from 1st July, 2020, and the jurisdiction of the competent court shall be Chittorgarh only.

It has also been decided that no amount will be charged by the Gram panchayat for dumping of this waste food at the place notified to the Mewar University. In case of any dispute, the issue will be resolved by negotiation with in both the parties.

Signed by: 1st party---------- रेखा शर्मा सरपंच ग्राम पंचायत गंगरार प.स. गंगरार

Signature of 2nd party

Witness----------

Witness

O.S.D.
Mewar University
Gangrar. Chittorgarh