PRE-FEASIBILITY REPORT

ANALYSIS AND EXECUTION PLAN

**CENTRALIZED BIO-MEDICAL WASTE TREATMENT FACILITY**

REPORT BY

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# **EXECUTIVE SUMARY:**

As per the study done by World Health Organization, Bio Medical Waste (BMW) is considered to be the most dangerous waste after nuclear waste. If not stored/handled properly, it can become a potent source of infection propagation and disease causing more harm to society, animals and environment than the benefits to the medical facilities. A Common Bio-medical Waste Treatment Facility (CBWTF) is a set up where bio-medical waste, generated from different healthcare units, is collected and then after imparting necessary treatment to these waste to nullify its adverse effects (that it may pose to the society and environment) is finally sent for disposal in a landfill or for recycling depending on its nature. An individual treatment facility by a healthcare unit requires comparatively high capital investment. In addition, it requires separate manpower and infrastructure for proper operation and maintenance of treatment systems. The concept of CBWTF not only addresses such problems but also prevents proliferation of treatment equipment in a city. In turn it also reduces the monitoring pressure on regulatory agencies. By running the treatment equipment at CBWTF to its full capacity, the cost of treatment of per kilogram gets significantly reduced. Its considerable advantages have made CBWTF popular and proven concept in many developed countries. In order to set up a CBWTF to its perfection, care shall be taken in choosing the right technology, proper site selection for development of CBWTF area, proper designing of Collection system, Deployment of trained personnel to achieve optimum results etc. In the current pandemic scenario, exponentially increasing number of corona virus victims are producing synonymous volumes of medical waste. Hence in order to effectively and safely process the waste is of utmost importance in the containment of the infection. Such a facility will also create employment which shall contribute to jump-starting the slowing economy of the nation. Since large volumes of waste is available, it would commercially be feasible for the same facility to be profitable while also conferring to a greater social cause.

# **INTRODUCTION:**

India is considered to be the 4th worst affected nation by the COVID-19 pandemic as of June 18th, 2020. With over 400,000 cases and 14,000 deaths, estimates studying the growth rate now project that the coronavirus cases shall peak in mid-November. Such an exponential rise in the number of patients has resulted in increased bed occupancy in healthcare facilities such as hospitals, clinics and public quarantine centres (90% of critical coronavirus care beds had been occupied as of 6th June, 2020). As a consequence of the same, the amount of medical waste generated by HCF has been rising in synchrony. It has been estimated that an average Indian hospital produces about 100-150 kg/day of medical waste post lockdown period [2]. Furthermore, hospitals are having to shell out large sums of money for disposing bio-waste amid the coronavirus pandemic. The cost of biomedical waste disposal, which was Rs 24 per kg before the lockdown, has doubled and risen to Rs 50 for Covid-19 bio-waste ever since the lockdown came into effect. Moreover, hospitals are now also paying a supplementary charge at an average of Rs. 500 per trip for the collection of Covid-19 bio-waste. The lockdown period saw this charge rise to Rs. 750 [3]. This is synonymous with the increased use of personal protective equipment (PPE) kits, masks, gloves, goggles, cotton swabs, dressing, bedding contaminated with blood and body fluids, blood bags needles and syringes [4].

Though several hospitals have an on-site medical waste treatment facility, a centralized facility of the same nature is advantageous owing to the following reasons:

* Through centralized system, the hospital would have to expend reduced effort to waste management and might devote more time on development of quality patient care.
* Installation of individual treatment facilities by small healthcare establishments requires comparatively high capital investment.
* It requires separate manpower along with infrastructure development and consequently management for the proper operations and maintenance of treatment systems.
* Setting up and running treatment technologies requires space, huge investment, high operation and maintenance charges, technically qualified staff, waste to the maximum capacity of the machine to bring down the per kg treatment cost, etc.
* In comparison, if the waste from a number of healthcare establishments is brought at a centralised facility, all the above problems get scaled down.
* The concept of CBWTF not only addresses these problems but also prevents scattering of treatment equipment in the city which might otherwise prove to be hazardous.
* Moreover, monitoring these facilities is much easier and one can ensure that the best and cleanest technologies with adequate pollution control devices are installed.
* Since there has been a rise in the number of public quarantine centres, the waste generated from such facilities can easily be processed by a CBWTF.

A centralized bio-medical waste treatment facility would not only aid greatly in the management of the large volume of medical waste generated during the current pandemic but also cater and contribute to jumpstarting the local economy.

# **BIO-MEDICAL WASTE MANAGEMENT RULES:**

As per the Gazette Notification dated 20th July, 1998 it is the duty of every occupier (a person having control over an institution or premises) of an institution generating bio-medical waste including a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment. Under these rules...

* Bio-medical waste shall not be mixed with other wastes.
* Bio-medical waste shall be segregated into container / bags at the point of generation as per their respective categories.
* Bio-medical waste shall not be stored for more than 48 hrs.
* Every occupier is required to set up requisite bio-medical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste or ensure requisite treatment of waste at a common waste treatment facility.
* Every occupier shall make an application to the prescribed authority for grant of Authorization.
* Every occupier shall maintain records related to generation, collection, reception, storage, transportation, treatment and disposal of bio-medical waste.

Categories of bio-medical waste and modes of treatment according to the BIO-MEMDICAL WASTE MANAGEMENT RULES 2016.

|  |  |  |  |
| --- | --- | --- | --- |
| **NO.** | **CATEGORY** | **WASTE CATEGORY** | **METHOD OF DISPOSAL** |
| 1 | No. 1 | **Human anatomical waste**  (human tissues, organs, body parts) | Incineration |
| 2 | No. 2 | **Animal waste**  (animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge from hospitals animal houses) | Incineration |
| 3 | No. 3 | **Microbiology & biotechnology waste**  (wastes from laboratory cultures, stocks or specimens of micro- organism live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals toxins, dishes and levices used for transfer of cultures) | Autoclaving/ shredding |
| 4 | No. 4 | **Waste sharps**  (needles, syringes, scalpels, blades, glass, etc. That may cause puncture and cuts. This included both used and unused sharps) | Autoclaving/ shredding |
| 5 | No. 5 | **Discarded medical and Cytotoxic drugs**  (wastes comprising or outdated, contaminated and discarded medicines) | Incineration |
| 6 | No. 6 | **Soiled waste**  (items contaminated with blood, and body, fluids including cotton, dressings, soiled plaster casts, lines beddings, other material contaminated with blood) | Incineration |
| 7 | No. 7 | **Solid waste**  (wastes generated from disposable items other than the waste sharps such as tubings, catheters, in travenous sets etc.) | Autoclaving/ shredding |
| 8 | No. 9 | **Incineration ash**  (ash from incineration of bio-medical waste) | Disposal in secured landfill |

# **PROPOSAL:**

Considering the above information, establishing a CBWTF in the current pandemic is feasible as:

1. The amount of medical waste generated by HCF currently would allow such a facility to operate at full capacity hence making the process much more efficient.
2. The facility shall allow for effortless waste management operations hence allowing hospitals and quarantine centres to divert their focus on dealing effectively with the adversity of the current situation.
3. Centralized facility would greatly reduce the cost incurred by HCF in dealing with waste hence it would promote safe handling of waste as opposed to illegal dumping.
4. Such a facility shall reduce the tension on the supply chain of medical waste and hence avoid the storage of the hazardous waste in HFC.
5. Since monitoring a singular facility is easier, minimal environmental by incomplete incineration shall be avoided.

The activities of the proposed facility shall be as follows:

* Collection: Door to door collection facility for health care units.
* Transportation: Waste is transported as per the guidelines of CPCB, from generation unit to treatment facility. All the transportation is according to the Motor Vehicle act which prescribe the standards for transport of Hazardous waste.
* Treatment: 3 types of treatment that shall be provided in the CBWTF are as follows:
* Incineration.
* Autoclaving.
* Shredder.
* Final Disposal:
  + Incineration unit: Treatment of the following:
    - Human anatomical waste (human tissue, organs, body parts).
* Animal anatomical waste (animal tissue, organs, body parts, bleeding parts, experimental used in research).
* Discarded medicines and toxic drugs (waste comprises of outdated, contaminated and discarded medicines).
* Other waste (item contaminated with blood and body fluids including cotton, dressing, soiled plaster casts, bedding other material contaminated with blood).
* Infected Plastic.
* Autoclave unit: Treatment of Microbiological waste.
* Shredder Unit: Treat waste generated by autoclave unit.
* Landfill: incinerated ash is sent to Municipal Landfill site.

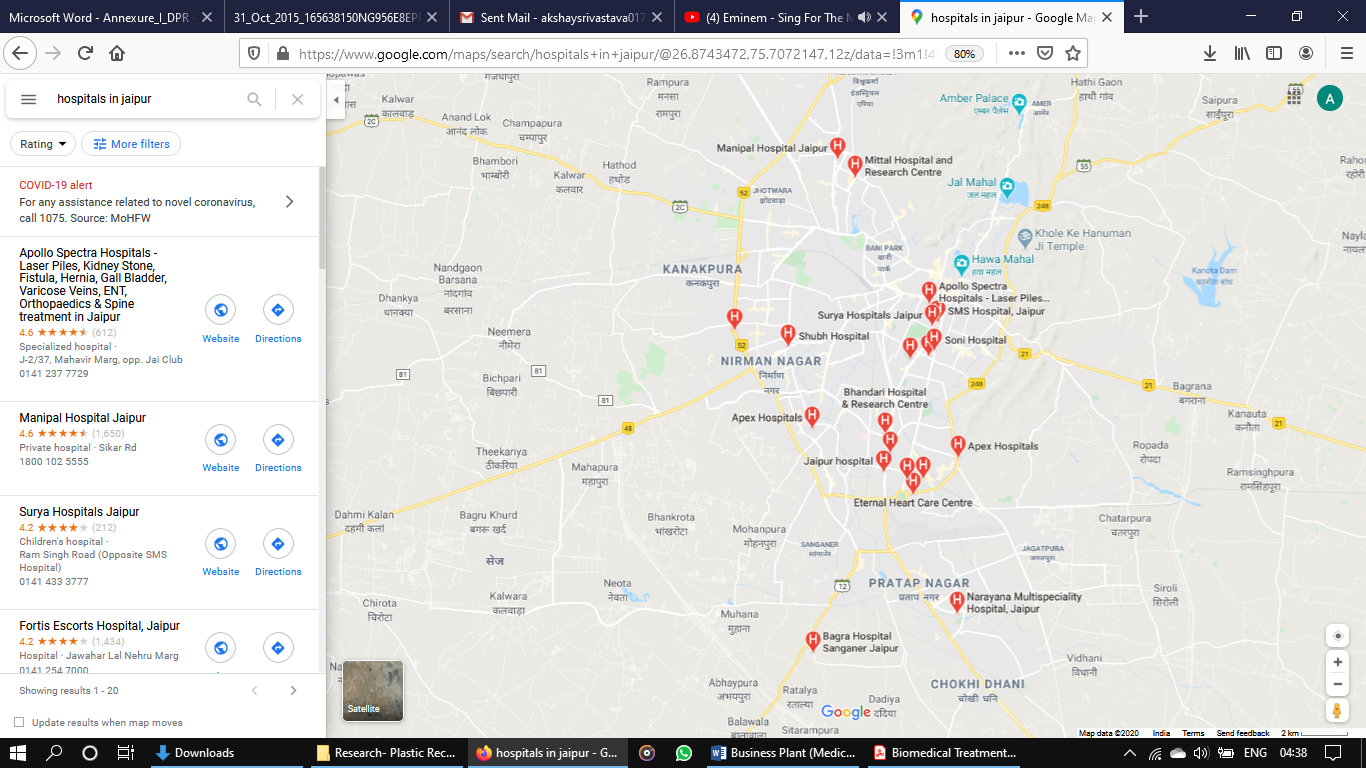
|  |  |  |
| --- | --- | --- |
| S.No. | DESCRIPTION | DETAILS |
|  | PROPOSED PROJECT | Centralized Bio-medical Waste Treatment Facility |
|  | PROJECT CATEGORY | Category B S.No. 7(a)(d)as per EIA Notification 2006 |
|  | PROJECT PROPONENT | Dr. Abhishek Sharma & Akshay Srivastava |
|  | PROJECT LOCATION | Kanakpura industrial area, Kanakpura, Jaipur |
|  | PLOT AREA | ~1 Acre |
|  | GREEN AREA |  |
|  | CAPACITY | 200 kg/hr |
|  | WATER REQUIREMENT | 5000L/hr |
|  | POWER CONSUMPTION | 50KVA (10KW solar power) |
|  | POWER BACKUP | D.G. set 10KW |

# **LOCATION OF ESTABLISHMENT:**

The location of the establishment is selected to be Kanahpura, Jaipur. The location is selected on the basis of preliminary assessments such as the following:

* The location is central to a large number HCF in Jaipur.
* The location is close to a national highway (NH52) for waste transportation.
* According to Bio-medical waste management rules 2016, facilities shall restrict utilizing self-operated on-site establishment if a centralized facility is present within a 75km radius of the said facility.

The following map lists out the hospitals near Kanakpura, Jaipur:



The number of beds available in the above listed hospitals have been tabulated as follows:

|  |  |  |
| --- | --- | --- |
| S.No. | Hospital Name | Number of beds |
|  | Apollo Spectra Hospital | 50 |
|  | Manipal Hospital Jaipur | 650 |
|  | Surya Hospital Jaipur | 130 |
|  | Apex Hospital Jaipur | 150 |
|  | Fortis Escort Hospital Jaipur | 105 |
|  | Jaipur Hospital | 70 |
|  | Shalby Multi-Specialty Hospital | 225 |
|  | Narayana Multispecialty Hospital | 290 |
|  | Bagra Hospital Sanganer Jaipur | 150 |
|  | SMS Hospital, Jaipur | 2250 |
|  | Eternal Heart Care Centre Jaipur | 150 |
|  | Shubh Hospital Jaipur | 25 |
|  | Bhandari Hospital and research centre | 150 |
|  | Khandaka Hospital Jaipur | 70 |
|  | Soni Hospital | 250 |
|  | Dhanwantri Hospital and research centre | 100 |
|  | Santokba Durlabhji Memorial Hospital | 500 |
|  | TOTAL | 5315 |

# **TREATMENT FACILITY AND INFRASTRUCTURE**

The CBMWTF shall have enough space within it to install required treatment equipment, incoming and outgoing waste storage area, vehicle-parking and washing area, effluent treatment plant (ETP), staff room, Security Cabin, Sharp Pits, Chimney foundation, Boundary wall etc. The required area for CBMWTF would depend upon the projected amount of bio-medical waste to be handled by it. A CBMWTF shall have the following infrastructure:

* TREATMENT EQUIPMENT ROOM: A separate housing may be provided for treatment equipment at the CBMWTF such as incinerator room, autoclave room, microwave room etc, as applicable. Each room shall have well-designed roof and walls. Such room shall be well ventilated and easy to wash. The floor and interior finishing of the room shall be such that chances of sticking/ harbouring of microorganisms are minimized. This can be attained by providing smooth & fine floor and wall surfaces (to a height of 2 meter from floor) preferably of tiles. The number of joints in such surfaces shall be minimal. The equipment room shall also have a separate cabin, to supervise the operation of the equipment and to record the waste handling and equipment operational data. Attached to each equipment room, there shall be two waste storage rooms, one for storage of untreated wastes and another for treated wastes. The storage room shall have provisions similar to that of equipment room being well-ventilated with easy to wash floors & walls, smooth and fine surfaces etc.
* MAIN WASTE STORAGE ROOM: This shall be provided near the entry point of the CBMWTF to unload and store all bio-medical wastes that have been transported to the facility by vehicle. The size of the room shall be adequate to store all wastes transported to the CBMWTF. The front portion of the room shall be utilized for unloading the wastes from the vehicle and back or side portion shall be utilized for shifting the wastes to the respective treatment equipment. In the front of the room where vehicle is parked for unloading, the floor shall be made impermeable so that any liquid spilled during unloading does not percolate into the ground. The liquid generated during handling of wastes and washing, shall be diverted to the inlet of ETP. In the main storage room, wastes shall be stacked with clear distinction as per the color coding of the containers. From here, the coloured containers may be sent to the respective treatment equipment. The main storage room too shall have provisions similar to that of equipment room such as roofing, well ventilated, easy to wash floors & walls, smooth and fine surfaces etc.
* TREATED WASTE STORAGE ROOM: This is the room where wastes treated in different treatment units shall be stored. The wastes shall be stored in separate group as per the disposal options. Other provisions in the room shall be similar to the main storage room.
* ADMINISTRATIVE ROOM: This room shall be utilized for general administration, record keeping, and billing etc.
* SITE SECURITY: High walls, fencing and guarded gates shall be provided at the facility to prevent unauthorized access to the site by humans and livestock.
* PARKING: Provision shall be made within the confines of the site for parking of required number of vehicles, loading and unloading of the vehicles meant for transporting waste to and from the facility, etc.
* SIGN BOARD: An identification board of durable material and finish shall be displayed at the entrance to the facility. This shall clearly display the name of the facility, the name, address and telephone number of the operator and the prescribed authority, the hours of operation and the telephone numbers of the personnel to be contacted in the event of an emergency.
* GREEN BELT: The open area within the CBMWTF shall be developed into greenbelt.
* WASHING ROOM: A washing room shall be provided for eye washing/hand washing/bathing etc.

Besides above, following important provisions should be made in a CBMWTF:

* + A telephone shall be provided and maintained at the facility.
  + A first aid box shall be provided and maintained at the CBMWTF. Proper lighting shall be provided at the facility.
  + Proper care shall be taken to keep the facility and surroundings free from odours.
  + Proper firefighting facilities and emergency alarm shall be installed. Measures shall be implemented to control pests and insects at the site. Measures shall be implemented to control the escape of litter from the site.
  + Necessary provision shall be made to prevent and control noise generated, if any, due to the activities at the site. Necessary protective gear for the waste handlers shall be provided.

Records of waste movements:

* + Daily records shall be maintained for the waste accepted and treated waste removed from the site. This record shall include the following details:
  + Waste accepted: - waste collection date, name of the healthcare unit, waste category as per the rules, quantity of waste, vehicle number and receiving date (at site).
  + Treated waste removed: - date, treated waste type, quantity, vehicle number and location of disposal.

# **COLLECTION & TRANSPORTATION**

The collection and transportation of bio-medical waste shall be carried out in a manner so as to avoid any possible hazard to human health and environment. Collection and transportation are the two operations where the chances of segregated bio-medical waste coming in contact with the public, rag pickers, animals/birds, etc are high. Therefore, all care shall be taken to ensure that the segregated bio-medical waste, handed over by the healthcare units, reach CBMWTF without any damage, spillage or unauthorized access by public, animals etc.

A responsible person from the CBMWTF operator shall always accompany the vehicle to supervise the collection and transportation of bio-medical waste. An organogram of CBMWTF is attached herewith.

COLLECTION OF BIO-MEDICAL WASTE

Generator of the bio-medical waste is responsible for providing segregated waste to the CBMWTF operator. The wastes shall be segregated as per the provisions of the Bio-Medical Waste (Management & Handling) Rules, 1988 & amendment in 2003. The CBMWTF operator shall not accept the non-segregated waste and such incident shall be reported to the prescribed authority.

Temporary storage at healthcare unit shall be designated the coloured bags handed over by the healthcare units shall be collected in similar coloured containers with cover. Each bag shall be labeled as per the Schedule III & IV of the Bio- Medical Waste (Management & Handling) Rules, so that at any time, the healthcare units can be traced back that are not segregating the bio-medical wastes as per the rules. The coloured containers should be strong enough to withstand any possible damage that may occur during loading, transportation or unloading of such containers. These containers shall also be labeled as per the schedule iii of the rules. Sharps shall be collected in puncture resistant container.

The person responsible for collection of bio-medical wastes shall also carry a register with him to maintain the records such as name of the healthcare unit, the type and quantity of waste received, signature of the authorised person from the healthcare unit side, day and time of collection etc.

TRANSPORTATION OF THE COLLECTED BIO-MEDICAL WASTE TO THE CBMWTF:

The bio-medical waste collected in coloured containers shall be transported to the CBMWTF in a fully covered vehicle. Such vehicle shall be dedicated for transportation of bio-medical waste only. Depending upon the volume of the wastes to be transported, the vehicle may be a three-wheeler, light motor vehicle or heavy duty vehicle. In either case, the vehicle must possess the following:

* + 1. Separate cabins shall be provided for driver/staff and the bio-medical waste containers.
    2. The base of the waste cabin shall be leak proof to avoid pilferage of liquid during transportation.
    3. The waste cabin may be designed for storing waste containers in tiers.
    4. The waste cabin shall be so designed that it is easy to wash and disinfect.
    5. The inner surface of the waste cabin shall be made of smooth surface to minimize water retention.
    6. The waste cabin shall have provisions for sufficient openings in the rear and/or sides so that waste containers can be easily loaded and unloaded.
    7. The vehicle shall be labelled with the bio-medical waste symbol (as per the schedule iii of the rules) and should display the name, address and telephone number of the CBMWTF.

Depending upon the area to be covered under the CBMWTF, the route of transportation shall be worked out. The transportation routes of the vehicle shall be designed for optimum travel distance and to cover maximum number of healthcare units. As far as possible, the transportation shall be carried out during non-peak traffic hours. If the area to be covered is very large, a satellite station may be established to store the bio-medical waste collected from the adjoining areas. The wastes so stored at satellite station may then be transported to the CBMWTF in a big vehicle. It shall be ensured that the total time taken from generation of bio-medical waste to its treatment, which also includes collection and transportation and treatment time, shall not exceed 48 hours.

# **MODE OF TREATMENT**

Treatment can be broadly divided into Burn and Non-Burn types. Though emphasis should be more on non-burn technologies but anatomical waste, (both human as well as animal), items soiled with blood, body fluids etc should be incinerated. Some of treatment technologies are as below:

**INCINERATOR:**

An Incinerator is used for treatment of yellow category waste. Yellow Waste is generated from Human & Animal tissues, Body parts, carcasses, organs, Bleeding parts, Fluid, Blood, Laboratory cultures. Stock of specimens of micro-organism live or attenuated vaccines, human and animal cell culture used in research and industrial laboratories, items contaminated with blood and body fluids including cotton, dressing soiled plaster cast, lines, bleeding, other material contaminated with blood, Expired and discarded medicines, chemical waste etc. The Waste to be incinerated will be collected separately in yellow coloured liner bags.

Incineration is to burn the waste to ashes through a combustion process. Complete combustion is achieved when all hydrocarbons have been destroyed and are converted to H2O & CO2. Incinerator consists of a primary chamber and secondary chamber. In the primary chamber combustion takes place in stoichiometric condition. In the secondary chamber residence time of more than 2 Seconds is provided for the complete combustion of Volatiles organic compounds present in Flue Gas. The incineration chamber is lined suitably to maintain low skin temperature. The heat release from the burners vaporizes the organics and moisture present in the waste.

The feeding of waste into the chamber is done through a Automatic charging door. Feeding starts only when chamber temperature is 850 0c. Modulating the fuel firing controls the temperature and combustion inside the chamber. The dilution air provides the minimum required oxygen potential for the heavy organic compounds.

The vapours of the organics and moisture are released at a temperature of 800 0c +/- 50 0 c from primary chamber. The chamber temperature ensures part oxidation of organics. The heating of the waste will be due to direct flame. The flue gases with organic vapours from primary chamber enters the secondary chamber where complete thermal oxidation is ensured at temperatures ranging from 1050 0 c +/- 50 0 c under excess air-conditions which ensure enough oxygen potential.

Incinerator shall be equipped with a Proper Air Pollution Control System of Device to control the emissions within the prescribed Limits.

INCINERATOR

Nos. : 1

Capacity : 200 Kg./ Hr.

Fuel : LDO / HSD (Duel Fired)

Type of Burner Operation : Automatic.

Operating Hours : Continuous. Residence Time of gases in

Secondary Chamber : 2 Sec.

Stack Height : 30 m.

Temperature : Primary Chamber – 850 0C

: Secondary Chamber – 1050 + 50 0C

Scrubbing media : SS Scrubber with 5% caustic solution

Interlock : Primary and Secondary Burner on/ off.

: Limit Switch on Charging Door.

: Venturi outlet temperature.

: ID Fan Failure.

Make : EEEPL

**HIGH PRESSURE HIGH VACCUM AUTOCLAVES**

An Autoclave is used for sterilisation of Red and White Category Waste. Red Category waste includes, Waste generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needle and fixed needle syringes) and gloves. White Category Waste includes sharps like, Needles, scalpel blades, scissors, etc.

In an autoclave the infectious waste is sterilized with steam. For effective and efficient sterilization, the degree of steam penetration will be of utmost importance. The autoclave is equipped either electric steam generator or Standalone Oil-fired Boiler which will supply steam required for sterilization.

The autoclave is equipped with a programmable Logic controller for automatic regulation of the sterilization temperature. Special isolation is provided against temperature and moisture. The system is programmed to carry out the sterilization program automatically to ensure the desired accuracy and repeatability.

Nos. : 1

Type : High Pressure High Vacuum.

Capacity : 200 kg/hr

Material of Construction : Stainless Steel Condensate Treatment : Secondary Sterilization Door Operation : Automatic

Control System : Micro Processor Controlled Process Management

: Automatic Door lock, Temperature/ Pressure alarms and relief devices

**SHREDDER:**

All waste coming out of Autoclave need to be shredded so that it no more remains in reusable shape.

In order to shred the Autoclaved materials for effective deshaping shredder is used. The shredder is equipped with hopper of adequate size to accept the material to be shredded. The hopper is also provided with a lid which can be locked during operation. The hopper is well designed to take care of volume and weight of the material. The hopper directs the materials to the cutting chamber.

The Cutting chamber is equipped with a set of fixed blades and a set of rotating blades mounted on Shaft, which rotate in specified direction to achieve necessary shredding action. Below the shredder there is an enclosure for bins to be kept for collecting shredded material. Once the hopper lid and enclosure door is closed, shredder operates as a closed system. This also avoids any dust generation or aerosoling.

The Treated and shredded Waste is then stored in Treated waste storage area. Every 15 Days this waste is then sent to authorized Recycling facility for recycling.

Nos. : 1

Capacity : 100 Kg./Hr.

Blades : Combined Hook / Shear Blades.

Safety Features : Auto Reverse System

: Interlocks to avoid aerosolizing.

: Low Noise, Non Ballistic.

: Auto Shut Off.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PROJECT COST:** **EXCLUSIVE OF LAND COST** | | | | | | | | | | | | | | | | | |
| **Project: Common Biomedical Waste Treatment Facility** | | | | | | | | | | | | | | | | | |
| **Document: Project Cost** | | | | | | | | | | | | | | | | | |
| **A** | | **EQUIPMENT COST** | | | | | | | | | | | | | | | |
| **Sr. No.** | | **Items** | | **Capacity** | | **Quantity** | | **Rate Per unit (Rs)** | | **Total Amount (Rs)** | | **GST @18% (Rs)** | | **Total With GST (Rs)** | | **Remarks** | |
| 1 | | Incinerator System (StationaryType) | | 200 Kgs/Hour | | 1 | | 7,500,000 | | 7,500,000 | | 1,350,000 | | 8,850,000 | |  | |
| 2 | | Autoclave | | 100 Kgs/Hour | | 2 | | 1,200,000 | | 2,400,000 | | 432,000 | | 2,832,000 | |  | |
| 3 | | Plastic Waste Shredder | | 100 Kgs/hour | | 2 | | 200,000 | | 400,000 | | 72,000 | | 472,000 | |  | |
| 4 | | Glass Shredder | | 100 Kgs/Hour | | 1 | | 550,000 | | 550,000 | | 99,000 | | 649,000 | |  | |
| 5 | | Mechanical Equipments for ETP | | 10 KLD | | Lot | | 1,050,000 | | 1,050,000 | | 189,000 | | 1,239,000 | |  | |
| 6 | | Air Compressor & Piping | | 5 cfm @ 6 Kg/Sq.cm | | 1 | | 150,000 | | 150,000 | | 27,000 | | 177,000 | |  | |
| 7 | | Vehicle Washing System | | Lumpsum | | 1 | | 100,000 | | 100,000 | | 18,000 | | 118,000 | |  | |
| 8 | | Fresh Water Supply Network | | 5 KL/Hour | | 1 | | 150,000 | | 150,000 | | 27,000 | | 177,000 | |  | |
|  | | **TOTAL EQUIPMENT COST** | | | | | |  | |  | |  | | **14,514,000** | |  | |
|  | | | | | | | | | | | | | | | | | |
| **B** | | **CONSTRUCTION COST** | | | | | | | | | | | | | | | |
| **Sr. No.** | | **Name Of Building / Structure** | | **Type of Construction** | | **Construction Size** | | **Area**  **M2** | | **Rate**  **Rs /M2** | | **Quantity** | | **Total Cost** | |  | |
| 1 | | Compound Wall | | RCC + Masonary + Plaster | |  | |  | |  | |  | | 500,000 | |  | |
| 2 | | Storm Water Drain | | PCC + RCC + Plaster | |  | |  | |  | |  | | 200,000 | |  | |
| 3 | | Internal Road | | WBM | |  | |  | |  | |  | | 250,000 | |  | |
| 4 | | Security Room | | RCC + Masonary + Asbestos Roof | |  | |  | |  | |  | | 100,000 | |  | |
| 5 | | Vehicle Washing Area | | RCC Floor + Asbestos Roof | |  | |  | |  | |  | | 75,000 | |  | |
| 6 | | Vehicle Parking Area | | Interlocking Blocks + Asbestos Roof | |  | |  | |  | |  | | 150,000 | |  | |
| 7 | | Waste Storage and Treatment Area | | RCC + Steel Structure + AC Sheet | | 30 M x 9 M x 7.5 M Height | |  | |  | |  | | 1,500,000 | |  | |
| 8 | | Distribution Panel Room | | RCC + Masonary + Plaster | |  | |  | |  | |  | | 300,000 | |  | |
| 9 | | Treated Waste Storage Area | | RCC + Steel Structure + AC Sheet | | 30 M x 9 M x 7.5 M Height | |  | |  | |  | | 250,000 | |  | |
| 10 | | DG Set Platform | | RCC + Rubble Soling | |  | |  | |  | |  | | 75,000 | |  | |
| 12 | | Wash Room for Plant worker | | RCC + Masonary+Plaster | |  | |  | |  | |  | | 90,000 | |  | |
| 13 | | Civil Work for ETP | | RCC + Plaster | |  | |  | |  | |  | | 450,000 | |  | |
| 15 | | Underground Water Storage Tank | | RCC + Plaster | | 5 M x 3 M x 2.5 M | |  | |  | |  | | 300,000 | |  | |
| 16 | | Sharp Pits | | RCC + Plaster | | 2.5 x 1.5 x 2.5 M | |  | |  | |  | | 75,000 | |  | |
| 17 | | Drainage Network | | PVC Pipe + Masonary Sump | |  | |  | |  | |  | | 75,000 | |  | |
|  | | **TOTAL CONSTRUCTION COST** | | | | | | | | | |  | | **4,390,000** | |  | |
|  | | | | | | | | | | | | | | | | | |
| **C** | | **ELECTRICAL COST** | | | | | | | | | | | | | | | |
| **Sr. No.** | | **Item** | | **Capacity** | | **Nos.** | | **Rate Per unit (Rs)** | | **Total Amount (Rs)** | | **GST @18% (Rs)** | | **Total, including GST (Rs)** | | **Basis** | |
| 1 | | DG Set with Acoustic Enclosure | | 50 KVA | | 1 | | 600,000 | | 600,000 | | 108,000 | | 708,000 | |  | |
| 2 | | LT Cable upto Distribution Panel | | 100 Sq. MM | | 1 | | 100,000 | | 100,000 | | 18,000 | | 118,000 | |  | |
| 3 | | PCC & APFC Panel | |  | | 1 | | 350,000 | | 350,000 | | 63,000 | | 413,000 | |  | |
| 4 | | LT Cables PCC to MCCs | |  | | Lot | | 150,000 | | 150,000 | | 27,000 | | 177,000 | |  | |
| 5 | | Electrical Accessories | |  | | Lot | | 75,000 | | 75,000 | | 13,500 | | 88,500 | |  | |
| 6 | | Earthing Pits | |  | | 4 | | 3,000 | | 12,000 | | 2,160 | | 14,160 | |  | |
| 7 | | Area Lighting | |  | | 12 | | 9,000 | | 108,000 | | 19,440 | | 127,440 | |  | |
| 8 | | Plant Lighting | |  | | 6 | | 5,000 | | 30,000 | | 5,400 | | 35,400 | |  | |
| 9 | | Solar System ( Grid Tie) | | 10 KW | | 1 | | 500,000 | | 500,000 | | 90,000 | | 590,000 | |  | |
|  | | **TOTAL ELECTRICAL COST** | | | | | | | | | |  | | **2,271,500** | |  | |
|  | | | | | | | | | | | | | | | | | |
| **D** | | **INSTRUMENTATION COST** | | | | | | | | | | | | | | | |
| **Sr. No.** | | **Item** | | **Capacity** | | **Quantity** | | **Rate Per unit (Rs)** | | **Total Amount (Rs)** | | **GST @18% (Rs)** | | **Total, including GST (Rs)** | | **Basis** | |
| 1 | | Continuous Stack Monitoring System | | CO, CO2, O2, SPM | | 1 | | 850,000 | | 850,000 | | 153,000 | | 1,003,000 | |  | |
| 2 | | CCTV Camera & Monitoring Station | |  | | 9 | | 10,000 | | 90,000 | | 16,200 | | 106,200 | |  | |
| 3 | | Computer and Its Accessories | |  | | 3 | | 70,000 | | 210,000 | | 37,800 | | 247,800 | |  | |
| 4 | | Bar Coding System and software | |  | | 1 | | 250,000 | | 250,000 | | 45,000 | | 295,000 | |  | |
|  | | **TOTAL INSTRUMENTATION COST** | | | | | | | | | |  | | **1,652,000** | |  | |
|  | | | | | | | | | | | | | | | | | |
| **E** | | **VEHICLE** | |  | |  | |  | |  | |  | |  | |  | |
| **Sr. No.** | | **Item** | | **Capacity** | | **Quantity** | | **Rate Per unit**  **(Rs)** | | **Total Amount**  **(Rs)** | | **GST @18%**  **(Rs)** | | **Total, including**  **GST (Rs)** | |  | |
| 1 | | Collection Van | |  | | 6 | | 600,000 | | 3,600,000 | |  | | 3,600,000 | | | |
|  | | | | | | | | | | | | | | **3,600,000** | |  | |
|  | | | | | | | | | | | | | | | | | |
| **F** | | **FIRE & SAFETY COST** | | | | | | | | | | | | | | | |
| **Sr. No.** | | **Item** | | **Capacity** | | **Quantity** | | **Rate Per unit**  **(Rs)** | | **Total Amount**  **(Rs)** | | **GST @18%**  **(Rs)** | | **Total, including**  **GST (Rs)** | | **Basis** | |
| 1 | | Fire Extingushers | |  | | 6 | | 5,000 | | 30,000 | | 5,400 | | 35,400 | |  | |
| 2 | | Safety Showers | |  | | 3 | | 5,000 | | 15,000 | | 2,700 | | 17,700 | |  | |
|  | | **TOTAL FIRE & SAFETY COST** | | | | | | | | | |  | | **53,100** | |  | |
|  | | | | | | | | | | | | | | | | | |
| **G** | | **MISCELLANEOUS COST** | | | | | | | | | | | | | | | |
| **Sr. No.** | | **Item** | | **Capacity** | | **Quantity** | | **Rate Per unit**  **(Rs)** | | **Total Amount**  **(Rs)** | | **GST @18%**  **(Rs)** | | **Total, including**  **GST (Rs)** | | **Basis** | |
| 1 | | Statutory fees of Pollution Control Board | | Lumpsum | | 5 Years | |  | |  | |  | | 150,000 | |  | |
| 2 | | Engineering Consultancy Fees | | Lumpsum | | One Time | |  | |  | |  | | 600,000 | |  | |
| 3 | | Contingency and Cost Overrun | | Lumpsum | | One Time | |  | |  | |  | | 600,000 | |  | |
| 4 | | Deposit for Electrical Connection | | Lumpsum | | One Time | |  | |  | |  | | 300,000 | |  | |
| 5 | | Project Supervison Expenditure | | Lumpsum | | During Project Execution | |  | |  | |  | | 500,000 | |  | |
|  | | **TOTAL MISCELLANEOUS COST** | | | | | |  | |  | |  | | **2,150,000** | |  | |

|  |  |  |
| --- | --- | --- |
| **TOTAL PROJECT**  **COST** | **(A+B+C+D+E+F+G)** | **28,630,600** |