

Lessons in Bio-Medical Waste Management



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What is Bio-medical waste?

Bio-medical waste (Management & Handling) Rules 1998 define Bio-medical waste as any waste generated during diagnosis, treatment, or immunization of human beings or animals or in research or in the production or testing of biologicals, including categories mentioned in Schedule¹

Why Manage Bio-medical waste?

WHO estimated that in 2000, injections with contaminated syringes caused:

- 21 million Hepatitis B virus (HBV) infections (32% of all new infections)
- Two million Hepatitis C virus (HCV) infections (40% of all new infections)²
- At least 260 000 HIV infections (5% of all new infections)

In 2002, the findings from a WHO assessment conducted in 22 developing countries demonstrated that the proportion of health care facilities which do not use proper waste disposal methods range from 18% to 64%³

Reuse of disposables in India can be as high as 60%. In addition to blood-borne pathogens, medical waste can spread many respiratory, gastro-intestinal, ocular diseases etc. If not disposed properly, vaccine, chemical and radioactive waste from the hospitals has created problems in the past.

Patient safety is a serious global public health issue and in 2004, World Alliance for Patient Safety was formed to address it. In developing countries, the probability of patients being harmed in hospitals is higher than in developed nations. The risk of health care-associated infection (HAIs) in some developing countries is as much as 20 times higher than in developed countries (which is 1 in 10 patients).³

Medical waste management and safe disposal of syringes are among the first five ways to clean care which help reduce the burden of HAIs. Safe disposal of sharp objects has also been linked to increased occupational safety in hospitals.

18
to
64
percent

healthcare facilities lack proper waste disposal systems

Litter Layers: Different Categories of Waste

According to the Schedule I of the BMW Rules 1998, the waste categories are as under:

Cat. No.	Waste category & Type	Treatment & disposal options+
1.	Human anatomical waste	Incineration/ deep burial
2.	Animal waste	Incineration/deep burial
3.	Microbiology & Biotechnology	Inc./alternate
4.	Waste Sharp Objects	Alternate
5.	Discarded Medicines, Cytotoxic drugs	Inc./ landfill
6.	Soiled waste	Inc./alternate
7.	Solid Waste ^{mutilation must}	Alternate
8.	Liquid waste	Disinfection
9.	Incineration ash	Landfill
10.	Chemical waste	Drain/ secured landfill after treatment

These 10 categories are not produced within every single healthcare establishment. Even within a single set up, most of the generation points generate 3-4 kinds of waste and very few locations generate specialized waste streams.

Any hospital aiming to build a Bio-medical waste management system should start with a waste audit and analysis. This exercise will help the administrators understand the quality and quantity of waste produced at each generation point and the specific requirements of each of these.

¹ <http://www.who.int/mediacentre/factsheets/fs281/en>

² http://www.who.int/water_sanitation_health/publications/wsh0408.pdf

³ http://www.who.int/features/factfiles/patient_safety/patient_safety_facts/en/index2.html



The Waste Streamlines

A hospital wears multiple hats- it is a diagnosis and treatment centre, and at the same time, features administrative blocks, hospitality centers etc., thus planning waste management system has to take a holistic approach. Some of the important waste streams are:

NON-MEDICAL OR GENERAL WASTE

A hospital produces both medical and non-medical waste. The latter constitutes about 80% of the total waste produced at the hospital. Non-medical waste should be segregated at the point of generation and managed according to the Municipal Solid Waste Rules (2000). These Rules direct the segregation of waste into bio-degradable waste and recyclable waste. Bio-degradable waste generated mainly from the kitchen and canteen can be composted (vermin or pit composting). This not only generates compost for the hospital lawn but also helps minimize carbon footprint.

Segregation Plan for kitchen and canteen, where only non-medical waste is generated:

- White Bin- For recyclable waste
- Green Bin- For bio-degradable waste
- In wards where mostly recyclable general waste is generated, white bags can be considered for use

E-WASTE

This has to be managed according to the e-waste (Management & Handling) Rules 2012, which dictate that consumers or bulk consumers

(hospitals qualify) should ensure that e-waste generated by them is channelized to an authorized collection centre or registered dismantler or recycler or is returned to the pick-up or take-back services provided by the producer. Bulk Consumers are also supposed to maintain records for scrutiny by pollution control board or committee.

E-WASTE INCLUDES⁴

- IT and telecommunication equipment: Personal computers, Laptop Notebook, notepad etc. Printer including cartridge, Copying equipments, Electrical & electronic typewriters, Pocket and desk calculators, User terminal & systems, Telex, telephones (cellular, cordless, pay) and other equipment that transmits sound, images or other information via-telecommunication.
- Consumer electrical & electronics: Television sets (including LCD & LED), refrigerators, washing machines, air-conditioners.

BIO-MEDICAL WASTE

Around 15-20% of the waste generated at the hospital is Bio-medical in nature. Within this stream, different categories of Health care units have different waste composition. Generally, 45% of BMW is found recyclable whereas 55% is found non-recyclable. However, in case of bedded HCU's, the proportion of soiled waste is more and the proportion of recyclable waste is only 40% of the total BMW generated (out of which around 30% is composed of IV fluid bottles)

MERCURY WASTE

States like Delhi, Punjab and Manipur have issued State directives to phase out the use of mercury-based medical equipment in the healthcare sector. Healthcare facilities in these states have either phased out the use of mercury-based equipment or are in the process of doing it.

In, 2010, Directorate General of Health Services (DGHS, MOH) released Guidelines asking healthcare facilities to phase out the use of mercury-based instruments and dispose related waste in an environmentally sound manner. The Central Pollution Control Board issued "The Mercury Storage Guidelines" in 2011 and these guidelines direct proper management of mercury waste generated in the healthcare sector (mercury waste arising from spillage / breakage/ phase out of mercury instruments and the dental amalgam waste). Thus, hospitals should develop a strategy to phase out the use of mercury-based instruments and then dispose it safely.

Respective State Pollution-Control Board can be contacted for the details of authorized collectors. The recently proposed amendments to the BMW Rules also include a section on proper management of mercury spillage in hospitals.

80
percent

of Total Waste
Produced at
Hospital is
Non-Medical
Waste

⁴ List of CPCB Approved recyclers (<http://www.cpcb.nic.in/divisionsofheadoffice/hwmd/e-Waste.pdf>)

⁵ http://www.cpcb.nic.in/Guidelines_for_ESM_%20MercuryW_fromHCFs.pdf



Waste management's principles remain the same nationally but the generation points, quantity of waste/ patient/ day would vary significantly depending upon the type of healthcare.

SUB-CENTRE (SC)

These are non-bedded Healthcare Units (HCUs) which mainly generate immunization waste. Proportion by weight of Category (Cat.) 4 and 7 (i.e. the plastic syringes and needles) is almost 90 – 95% whereas Category 6 (mainly cotton swab) is 5 – 10% by weight ⁶. Immunization sessions happen once/ twice a week, with the aim to cover each village under the SC. When going for immunization/ outreach sessions to various villages the ANMs should carry white, red and blue bags and a needle destroyer-cum-hub cutter with them. The entire waste-stream should then be segregated at source and brought back to the PHC.

In case of Sub Centers and Outreach Sessions, collection of waste was a common problem. At some places waste was burnt on site or left in pits in the villages. But recently some PHCs have worked out interesting ways to streamline the system.

Case study 1- (PHC, Mohana, Haryana)

A MPH (Multi-Purpose Health Worker in the hospital vehicle) takes the vaccine bag, needle cutter, bags and all other supplies to each sub-centre in the morning and in the afternoon, on his way back, collects the waste and other supplies from the ANMs. The PHC is connected to the centralized treatment facility and thus the problem of waste disposal is solved.

SPECIFIC CASES

Some Sub-centers have been equipped to handle deliveries; in this case the Sub-centre should have the provision of all the bins as shown in Table.

90
to
95
percent

of HCUs waste is immunization waste

PRIMARY HEALTH CENTRE (PHC)

PHCs are mostly 6-bed facilities (some centers may even operate with a higher number of beds) and they may also have a laboratory.

Sharps Pit (would cater to Cat. 4) and deep burial pits (Cat.1, 2, 3, 6,) are interim options which can be explored in case the CTFs are not available in the region. But to use these options the region should not have high water table/ prone to flooding. The cost of establishing these pits is minimal (Annexure 2) and the standards can be found in the BMW Rules 1998.

COMMUNITY HEALTH CENTRE (CHC)

Typically CHCs are hospitals with 30 beds, but many of them over the years have become Sub-district hospitals. Thus the placement of bins can change depending on the infrastructure available within a particular set up. The bin-placement is almost similar to the PHC; the only exception being the addition of general bins in the 2 additional wards.

URBAN HOSPITALS

Urban hospitals include various levels of District Hospitals, teaching / referral hospitals in the Public sector and nursing homes/ hospitals of varying bed-strengths in the Private sector. Rural hospitals are mostly government-run and are major health providers in these areas. They face the problems of tie-ups with Centralized treatment facilities. Initiatives at state-level can be taken to streamline the collection of waste from the PHC by the CTF.

The Urban hospitals of comparable sizes must adopt similar templates of bin placement as discussed above. Other than the PHC model, each ward can be considered as one generation point in urban hospitals.

Large urban hospitals may/ may not be interested in tying up with a CTF. If a hospital wants to be self-sufficient in its waste-treatment capabilities, it should sign up with the CTF only for its yellow-bag waste (since Guidelines on incinerators by the Central Pollution Control Board do not encourage onsite incineration).

HCE can then install an (autoclave/ microwave (with shredder))/ hydroclave to treat its plastic waste and then dispose it through an authorized plastic recycler.

Six generation points of Primary Health Center



Generation points, other than wards, depending on specialties health care facilities offers



⁶ http://www.wbpcb.gov.in/html/downloads/report_BioMedicalWaste.pdf

TABLE: Equipment Placement Scheme for Different Healthcare Units								
	Injection room	Dressing room	Laboratory	Immunization/ ANC room	Delivery room	Operation Theater	Kitchen / Canteen	Wards
SC	Y							
	B							
	W							
	NC							
PHC	Y	Y	Y	Y	Y	Y	G	W
	B	B	B	B	B	B		
	W	W	W	W	W	W		
	NC	NC	NC	NC	NC	NC		
	NB	NB	NB	NB	NB	NB		
CHC	Y	Y	Y	Y	Y	Y	G	W W (assuming 2 wards)
	B	B	B	B	B	B		
	W	W	W	W	W	W		
	NC	NC	NC	NC	NC	NC		
	NB	NB	NB	NB	NB	NB		
Urban hospital (more generation points depending on the set-up)	Y	Y	Y	Y	Y	Y	G	W (Each Ward should be complemented with a nursing station (with scheme – Y,B,W,NC,NB
	B	B	B	B	B	B		
	W	W	W	W	W	W		
	NC	NC	NC	NC	NC	NC		
	NB	NB	NB	NB	NB	NB		

COLOR CODER		
Type of bin	Code	Category of Waste
Yellow Bins	Y	Body Parts, anatomical tissues, blood soaked bandages
White Bin	W	Recyclable General Waste
Blue Bin	B	Solid waste (Plastic disposables used in patient care)
Needle Box	NB	Needle Box (for storage of all sharps, scalpels, blades, mutilated needles)
Green Bin	G	Another sharps container can be provided for broken glass, which also qualifies as sharps
Needle Cutter	NC	
Needle Cutter	NC	





Choose your region – urban/rural, and the calculator automatically estimates the cost of implementation, based on Toxics Link’s research.

		Mandated No. of Units	Operation Theatre	Laboratory	Casualty	Labour Room	Ward	OPD	Injection Room	Dressing room
Sharps Box		1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bios	Yellow	1	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres
	Blue	1	15 Litres	250 Litres	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres
	White	1	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres	15 Litres
Needle Management		1	Hub Cutter	15 Litres 300 Litres 600 Litres	Hub Cutter	Hub Cutter	Hub Cutter	Hub Cutter	Hub Cutter	Hub Cutter
Total One-time Cost			₹ 4,400.00		₹ 4,400.00	₹ 4,400.00	₹ 4,400.00	₹ 4,400.00	₹ 4,400.00	₹ 4,400.00
Bags	Blue	3	25 x 20 cms	25 x 20 cms	25 x 20 cms	25 x 20 cms	25 x 20 cms	25 x 20 cms	25 x 20 cms	25 x 20 cms
	Yellow	3	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms
	Black	3	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms	16 x 14 cms
Total Recurring Costs			₹ 3,869.00	₹ 3,869.00	₹ 3,869.00	₹ 3,869.00	₹ 3,869.00	₹ 3,869.00	₹ 3,869.00	₹ 3,869.00

You can customise the varieties of consumables to implement in the programme at your hospital, and see the costs reflect immediately.

Bio-Medical Waste (BMW) Management Implementing Cost Calculator

This calculator helps hospitals estimate roughly the budgetary allocations that they need to consider while making their annual plans for BMW management. Depending on the waste generation points in the hospital and the bed strength, you can calculate the approximate cost of consumables and one-time investment in the hospital.

NOTE:

THIS IS ONLY THE REPRESENTATION OF THE EXCEL SHEET. VISIT www.toxicslink.org/bmwbudgetcalculator TO SEE THE ACTUAL BMW CALCULATOR



Bio-medical waste management had been declared the best managed waste rule in India by the Comptroller and Auditor General of India in 2008. This waste stream has the potential to be managed 100% because it is sector-specific and is managed by the intelligentsia of the society. The State Governments and hospitals can help improve compliance at their end by using the following methods:

I) Steps to be taken at the State Level

TRAINING NEEDS

- District Hospitals should be made responsible for catering to the training-based needs of the area under their jurisdiction
- All the Continued Medical Education (CME)/Continued Nursing Education (CNE) can include important aspects of BMW so that it would not be an additional burden and at the same time, it would ensure recurrence of training in medical waste management

100
percent

of BMW can be managed because it is sector-specific & is managed by intelligentsia

- Training of waste handlers and cleaners in the hospital should be focused on safe collection and transportation practices. Street plays, role plays and discussions work best during such training regimens
- The effects on an individual's health due to mismanagement of waste need to be highlighted and the use of PPE emphasized conversely
- Certificate training on induction is an effective technique. Newly inducted staff is supposed to undertake training on BMW within a month of joining to be entitled to their first salary. (The candidates are evaluated through a test after the training and only after securing the required percentage, they are issued the certificate)
- States can include BMW in their list of celebrations (like the BMW week). Techniques like poster competitions, paper presentations/role plays and skits help as effective indirect training tools

INCENTIVIZE

The BMW Rules 1998 have been made under the EPA (1986). Hospital can be penalized under various provisions for non-compliance. These transgressions may result in severe punishments in form of water or electrical supply to the hospital being cut, or even closure of the hospital itself. However, the imposition of a monetary fine is more common (A fine of Rs.1 lakh and Rs 5,000 for every subsequent day of non-compliance). But rather than a disincentive model, an incentivization model from the government can play a crucial and important role. Also, because of increasing privatization of healthcare sector, notions of competition and image-building can be used to incentivize compliance.

- Rolling trophy – An annual inspection report of the Prescribed Authority can be based on evaluation points and can culminate in a final report card for each hospital. Based on a comparison of these report cards, an award can then be constituted for the most effective institution within the sector. The State advisory committee can be involved in the task.
- In case a private hospital in a particular region is a model of quality, the government can help build the capacity of this hospital and enable it to act as the Regional training centre for the state.

BUDGETARY NEEDS

The state has to allocate budgets for Bio-medical waste management.

- BMW should be defined as a budget head
- Color coded bins, poly bags, trolleys, weighing machines; disinfectants should be listed in the procurement document
- In case of a rural set up, the funds meant for medical-waste management and other necessary procurements can be allotted under state-level NRHM

AUTHORIZATION STATUS

All healthcare facilities need to manage their bio-medical waste and seek authorization from the State Pollution Control Board (SPCB) as per the

BMW Rules 1998. Facilities treating less than 1000 patients / month are not supposed to seek authorization but still come under the purview of the Rules. Authorization status in some states was improved by:

- Making authorization (to generate and handle BMW) from SPCB a mandatory pre-requisite to get registered as a HCE with the Department of Health
- Deploying one or two officer/s from the Department of Health in the Department of Environment to track down non-compliant HCEs
- Making the authorization process entirely online
- Working with the CTF to gather data on operational HCEs devoid of proper authorization.

CENTRALIZED TREATMENT FACILITY (INSTALLATION OF PLANT AND ONGOING MONITORING)

The urban local bodies have been entrusted with the responsibility of providing land for these facilities. As a result, they are working on the PPP model.

Monitoring the CBWTF would be the key to ensure that these facilities operate as per the directions laid down by the Centralized Treatment Facility guidelines 2004.

The following methods can be employed to make monitoring more effective:

- Bar-coding and weighing the bags at source HCE and then checking the entry of these bags, including the total weight into the CTF (this would ensure that there is no pilferage on the way)
- GPS installation on all the vehicles used by the CBWTF for transportation of the waste. (would help checking any pilferage during the transportation)
- CCTV monitoring of the CTF operations and close monitoring by the empowered body
- Online monitoring of the emission data/ cycle details of all the technologies used in the CTF
- Routine inspections and visits by the hospitals

II) Steps to be taken at the Hospital Level

- **Waste management Policy**– Hospital should have a well written policy, since institutionalization of effective waste management systems in healthcare facilities is a key prerequisite for improving efficiency and effectiveness of healthcare services.
- **Waste management guidelines** – Each facility should prepare a guideline detailing the waste management system that has been adopted (the types of waste generated, segregation, color codes etc), how it will be collected (frequency) and the various personnel designated with various tasks, along with the disposal methods for each waste type. The guidelines should be developed after waste audit is done.
- **Waste Management Committee**– According to the rules, if a facility has more than 30 beds, it would have to set up a waste management cell/unit. This is constituted of personnel who will supervise waste management. The cell should meet at least once in six months and the minutes of these meetings should be submitted along with the annual reports.
- **Waste Audit**– A waste survey helps in deciding the right kind of material and strategy required for managing waste, including the number and size of the bins, bags, hub cutters; collection time, interval and route; storage site (interim and final). It also helps in streamlining the waste management process and subsequent Policy documentation.
- **Training and awareness** – Training of hospital staff is key to establishing a good waste management system. It not only apprises them of the existing problems and the need for managing waste but also orients them towards a practical, functional system. Proper IEC materials or banners should be placed at appropriate places for both the health workers, patients and visitors to understand and dispose the waste in a proper manner.
- **Creation of a model ward**– Rather than instituting a system in the entire hospital at one go, one particular ward should be chosen and established as a model ward. Things that need to be streamlined in this ward are–

A) Segregation– Segregation of waste into 4 different categories (maximum 4 bins would help cater to all the total waste generated in a typical hospital)

Segregation Strategy at a typical generation point
Schedule II of the Rules specify the Color Coding and the type of Container for Disposal of Bio-Medical Waste

6

steps taken at Hospital level, helps in Bio-Medical Waste Management





Color Coding	Waste Category	Treatment Option
Yellow	Human anatomical, animal waste, discarded medicine and cytotoxic waste# Microbiology & Biotechnology, Soiled Waste(Category 1,2, 3, 5,6)	Incineration/ Deep Burial*
Blue	Waste generated from disposable items such as tubings, hand gloves, saline bottles with IV tubes, catheters, glass IV sets(Cat. 7)	Autoclaving/Microwaving/ Chemical treatment and destruction/shredding
Blue/White translucent (Puncture Proof Sharps container)	Waste Sharps (cat. 4)Needles, glass syringes/ syringes with fixed needle, scalpels, blades, glass, etc. that may cause puncture, cuts	Autoclaving/Microwaving/ Chemical treatment and destruction/shredding

Deep Burial*- This is an option for towns with population less than 5 lakhs
 #- Incineration/secured landfill

B) Disinfection and mutilation- Many hospitals linked to CTFs have discontinued the practice of giving primary disinfection and mutilation to the plastic used in patient care (to eliminate the possibility of any reuse). But one must remember that simple techniques like, cutting the tip of the syringes, cutting of the IV tubes and puncturing a hole in IV bottles/ urine and blood bags etc. at the point of generation helps to minimize any problems in the entire chain with respect to reuse potential.

Transportation of waste: Housekeeping staff should be trained to collect and transport waste in a manner that ensures that there is minimal risk of exposure to them and to others. They should be warned against mixing, spilling or mishandling the waste. They should also be informed about the contingency measures in case of accidents/spills and the method of reporting these.

Points that make this process of transportation safer and better include:

- Minimal people should be responsible for the collection of bio-medical waste. They should be well trained and well protected. Labels should be put on each bag before collection.
- Different waste streams should be collected at different times to reduce the chances of mixing.
- The time of collection for each type of waste would also depend on the time of its maximum generation

STORAGE

The main storage site of the hospital should be accessible to vehicles so that the collection vans can reach it. This reduces the number of personnel handling the waste directly. The storage site should have a

smooth surface so that it can be washed easily in case of spills and should have proper signages. The site should have separate lockable rooms for different waste streams (to avoid chances of any mixing during storage). The hospital should ensure that there are written instructions to handle spills, and that the personnel at the storage site are trained. Some hospitals also provide air conditioned rooms for yellow bag waste to help control putrefaction problems in summers.

ACCIDENT REPORTING

Several accidents can happen in a hospital which can be life threatening and fatal. In case of medical waste, these can include a needle stick injury, mercury spill, waste spill, body fluid spill/ splash. Each and every hospital should ensure that all their staff is vaccinated against the HBV. Some other steps that should be taken into consideration are:

- Accident reporting formats should be duly filled in case of accidents. The hospital staff should be trained in doing this.
- A high level monitoring committee/ infection control person should analyze the need for a Post exposure Prophylaxis (PEP regime) in case of a needle stick injury (24 hrs available)
- Mercury equipments should be phased out from t hospital. However, in case of a mercury spill, the staff should be able to contain the spill with the help of a spill management protocol and kit.
- Body Fluid spills should be covered with an absorbent cloth (which is then discarded into the yellow bin). The dry floor must then be disinfected with either phenol/ 10% bleaching solution.

Monitoring, evaluation and incentivization- Bio-medical waste management has been identified as a programme involved integrally in the reduction of Hospital Acquired Infections (by the World Health Assembly). This importance can be reflected by identifying BMW as a significant area identified for the monitoring and evaluation process of the hospital. Some hospitals have instituted rolling trophies for best waste management by a ward and this has helped infuse a sense of leadership and priority towards the subject within the senior nursing staff. In some government set-ups, Bio-medical waste management cells have been empowered to question any malpractice in a department and then issue corrective memos.

Ongoing Training- Ongoing and refresher training in BMW can be part of any CMEs/ CNEs of the hospital or integrated into any other annual programme of the hospital.

24
hour

availability of monitoring committee/ infection control person should be ensured

Annexure 1

WHAT ARE THE VARIOUS REGULATORY REQUIREMENTS?

All the environmental regulations in the country are constituted under the Environment Protection Act (EPA (1986)). A healthcare institution would have to follow acts and laws under this including the Water and Air Act, Municipal Solid Waste (Management & Handling) Rules, Bio-medical (Management & Handling) Rules, Hazardous waste (Management & Handling) Rules etc. and also the Atomic Energy Act (if it is handling radioactive substances) etc⁷.

BIO MEDICAL WASTE MANAGEMENT IN DELHI

Health Care Establishments (HCEs) produce a number of different types of waste. The Acts / Rules pertaining to pollution control & applicable to HCEs⁷ follow:

1. The Bio-Medical Waste (Management and Handling) Rules, 1998, as amended to date (for Bio-Medical Waste generated from the HCEs)
2. The Municipal Solid Waste (Management and Handling) Rules, 2000, as amended to date (for Municipal Solid Waste (General Waste) generated from the HCEs)
3. The Water (Prevention and Control of Pollution) Act, 1974, as amended to date and Rules made there under (for Waste Water / Liquid Waste generated from the HCEs, liquid waste also covered under the said BMW Rules)
4. The Air (Prevention and Control of Pollution) Act, 1981 as amended to date and Rules made there under (for Air Emissions from Boilers, DG Set(s), Incinerators etc. generated from the HCEs)
5. The Environment (Protection) Act, 1986, as amended to date and Rules made there under
6. The E-Waste (Management and Handling) Rules, 2011 (to be effective from 01.05.2012) for Electronic Wastes generated from the HCEs)
7. The Batteries (Management and Handling) Rules, 2001, as amended to date (for Lead Acid Batteries wastes generated from the HCEs)
8. The Water (Prevention and Control of Pollution) Cess Act, 1977, as amended to date and Rules made there under (for paying the water cess to DPCC for the quantity of water used by HCEs)
9. The Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, as amended to date. (for Hazardous Waste generated from the HCEs)
10. The Plastics Manufacture, Sale and Usage Rules, 1999, as amended to date (for regulating the use of plastic)
11. The Delhi Degradable Plastic Bag (Manufacture, Sale and Usage) and Garbage (Control) (Amendment) Act, 2008 (Delhi Act 9 of 2008)
12. The Noise Pollution (Regulation and Control) Rules, 2000, as amended to Date (to control noise pollution e.g. from DG Sets etc)
13. The Ozone Depleting Substances (Regulation and Control) Rules, 2000, as amended to date

Note: Radioactive Wastes are covered under the provisions of the Atomic Energy Act, 1962 and Rules made there under and the enforcement agency for the said Rules is Atomic Energy Regulatory Commission (AERC).

⁷ <http://dpcc.delhigovt.nic.in/bio-medical-waste.html>

Annexure 2

A Approximate cost of construction of Deep Burial Pit

S. No.	Material Required	Unit Cost	Total Cost
1.	Man hours/day laborer (2 workers for 2 days)	400/-	1600/-

B Approximate cost of construction of Sharps Pit

S. No.	Material Required	Cost involved: Rural	Cost involved: Urban
1.	Bricks	2000/-	2400/-
2.	Cement dust	1600/-	2000/-
3.	Man hours/day mason	2100/-	2500/-
4.	Cover with concrete slab / red stone	1500/-	2000/-
5.	Steel/ iron Pipe	300/-	400/-
	Total	7500/-	9300/-

As per general market survey in 2013, Delhi

C The Ministry of Health of Eritrea (MOH) and the World Health Organization Africa Regional Office (WHO AFRO), September 2003, shows that a pit of one cubic meter can contain approximately 1 million needles. (WHO PHC)

Annexure 3

A comparative study showing bio-medical waste generated per Bed per Day and per Patient per Day in government health care units (HCUs)⁸:

HCU Categories	Unit	Wt. in gms
Medical College & Hospital	Per Bed per Day	281
District Hospital	Per Bed per Day	263
Sub-Divisional Hospital	Per Bed per Day	245
State General Hospital	Per Bed per Day	246
Rural Hospital	Per Bed per Day	227
Block Primary Health Centre	Per Bed per Day	216
Primary Health Centre	Per Bed per Day	207
Sub-Centre & Out Reach Session	Per Patient per Day	31

⁸ http://www.wbpcb.gov.in/html/downloads/report_BioMedicalWaste.pdf