

COMPREHENSIVE WASTE DISPOSAL POLICY DOCUMENTS

**Datta Meghe Institute of Medical Sciences
(Deemed to be University)**

Sawangi (Meghe), Wardha

INTRODUCTION

Datta Meghe Institute of Medical Sciences (Deemed to be University) was granted the status of Deemed to be University by University Grants Commission, on 24th May, 2005. Immediately after getting the Deemed to be University status, the DMIMS(DU) has opted for inspection by National Assessment & Accreditation Council, and accordingly Peer Team from NAAC inspected the DMIMS(DU) campus and its constituent units and accredited the DMIMS (Deemed to be University) with 'A' Grade, in March 2007. Thereafter, Datta Meghe Institute of Medical Sciences (Deemed to be University) was conferred 'A' Grade status by the Ministry of HRD, Government of India amongst the Deemed Universities in the Country, in the month of May 2013.

It has been reaccredited with the 'Grade A' by the National Assessment and Accreditation Council (NAAC) for a period of five years, in March 2013. Thereafter, in the 3rd cycle of re-accreditation by the NAAC, the University has been re-accredited with "A+" Grade making it a unique Health Sciences University in the County to have such a unique distinction, in the 3rd cycle of its re-accreditation, in the year 2017. Subsequently, it was placed in 'Category-I Deemed to be University' as per University Grants Commission (Categorisation of Universities only) for grant of graded autonomy, regulations 2018. It has also been included in the list of Deemed to be Universities under 12 B of UGC act, 1956. The University is also received the prestigious Dr. B.C. Roy Award for Institutional Research.

The constituent Units of Deemed University are located in a 125 acre campus in Sawangi (Meghe), Wardha about 80 kms from Nagpur, Maharashtra, India, which is the geographic centre of India. It is located away from the hustle and bustle of the city amidst serene surroundings in a self sustaining complex with an excellent academic ambience. It is very well connected by road, rail and air (via Nagpur) to all the major cities in the country and abroad.

We at the DMIMS have adopted the **Waste Disposal Policies notified by the Government of India** from time to time. This document is a compilation of these policies and guidelines prescribed by various statutory authorities.

HEALTH CARE WASTE& BIOMEDICAL WASTE

'Biomedical waste' (BMW) means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps.

A Common Bio-medical Waste Treatment and Disposal Facility (CBWTF) is a set up where biomedical waste generated from member health care facilities is imparted necessary treatment to reduce adverse effects that this waste may pose on human health and environment. The treated recyclable waste may finally be sent for disposal in a secured landfill or for recycling. According to the Bio-medical Waste Management Rules, 2016, "bio-medical waste treatment and disposal facility" means any facility wherein treatment, disposal of bio-medical waste or processes incidental to such treatment and disposal is carried out, and includes common bio-medical waste treatment facilities and "operator of a common bio-medical waste treatment facility" means a person who owns or controls a Common Bio-medical Waste Treatment and Disposal Facility (CBWTF) for the collection, reception, storage, transport, treatment, disposal or any other form of handling of bio-medical waste.

In the context of these guidelines, buffer zone represents a separation distance between the source of pollution in CBWTF and the receptor - following the principle that the degree of impact reduces with increased distance. The following parameters may be considered for ascertaining buffer distance on case-to-case basis:

- (i) potential for spread of infection from wastes stored in the premises.
- (ii) applicable standards for pollution control and the relative efficiency of the existing incinerators and emission control systems,
- (iii) potential of fugitive dust emission from incinerators,
- (iv) potential for discharge of wastewater
- (v) the potential for odour production,
- (vi) the potential for noise pollution,
- (vii) the risk posed to human health and safety due to exposure to emissions from incinerator,
- (viii) the risk of fire and
- (ix) Significance of the residual impacts such as bottom ash and fly ash.

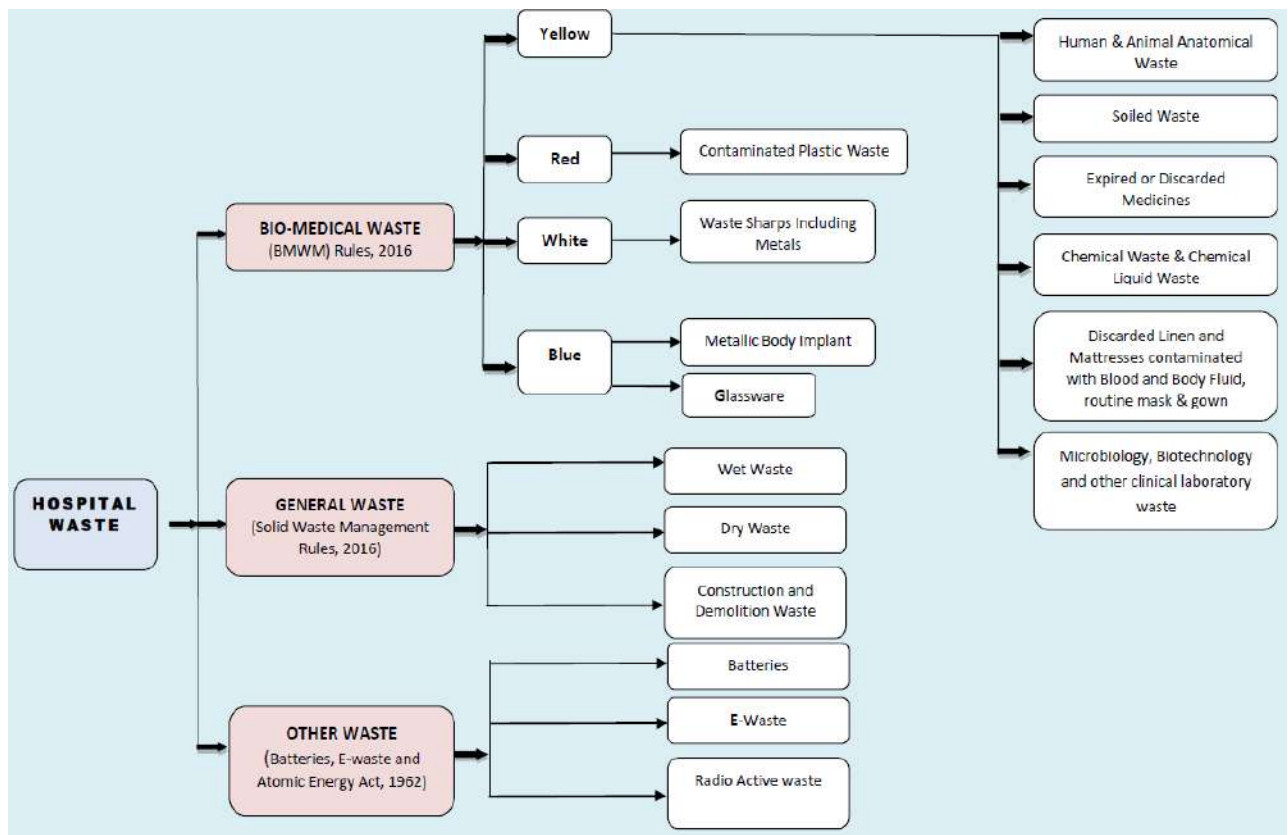
As far as possible, the CBWTF shall be located near to its area of operation in order to minimize the transportation distance in waste collection, thus enhancing its operational flexibility as well as for ensuring compliance to the time limit for treatment and disposal of bio-medical waste as stipulated under the BMW Rules (i.e., within 48 hours). Also, the location of the CBWTF should be in conformity to the CRZ Norms and other provisions notified under the Environment (Protection) Act, 1986. The location shall be decided in consultation with the State Pollution Control Board (SPCB)/ Pollution Control Committee (PCC).

Health care waste : Health Care Facilities (HCFs) are primarily responsible for management of the healthcare waste generated within the facilities, including activities undertaken by

them in the community. The health care facilities, while generating the waste are responsible for segregation, collection, in-house transportation, pre-treatment of waste and storage of waste, before such waste is collected by Common Bio-medical Waste Treatment Facility (CBWTF) Operator. Thus, for proper management of the waste in the healthcare facilities the technical requirements of waste handling are needed to be understood and practiced by each category of the staff in accordance with the BMW Rules. The health care wastes includes

- Biomedical waste
- General waste
- Other waste (e-waste, radio-active waste)

Categorization & Classification of Wastes in Health Care Facilities.



BIOMEDICAL WASTE: Bio-medical waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps. Bio-Medical waste includes all the waste generated from the Health Care Facility which can have any adverse effect to the health of a person or to the environment in general if not disposed properly. All such waste which can adversely harm the environment or health of a person is considered as infectious and needs to be treated.

The quantity of such waste is around 10% to 15% of total waste generated from the Health Care Facility. This waste consists of the materials which have been in contact with the patient's blood, secretions, infected parts, biological liquids such as chemicals, medical supplies, medicines, lab discharge, sharps metallic and glassware, plastics etc.

Bio Medical Waste can be broadly classified into four categories based on the segregation pathway and colour code. They are

Yellow category

Red category

White category



Blue category

Table 1: Categories of Biomedical Waste

CATEGORY	TYPE OF WASTE
YELLOW	Human Anatomical Waste Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time).
	Animal Anatomical Waste Experimental animal carcasses, body parts, organs, tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.
	Soiled Waste Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components.
	Discarded or Expired Medicine Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.
	Chemical Waste Chemicals used in production of biological and used or discarded disinfectants
	Chemical Liquid Waste Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, Silver X - ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids , liquid from laboratories and floor washings, cleaning, house - keeping and disinfecting activities etc
	Discarded linen, mattresses, beddings contaminated with blood or body fluid, routine mask & gown.

	<p>Microbiology, Biotechnology and other clinical laboratory waste (Pre-treated)</p> <p>Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of microorganisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.</p>
RED	<p>Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes without needles, fixed needle syringes with their needles cut, vacutainers and gloves</p>
WHITE	<p>Waste Sharps including metals</p> <p>Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps</p>
BLUE	<p>Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.</p>

Table 2: Storage of Biomedical Waste

S. No.	Category	Type of waste	Colour & Type of Container
1.	Yellow Category	<ul style="list-style-type: none"> - Human Anatomical Waste - Animal Anatomical Waste - Soiled Waste - Discarded or Expired Medicine - Microbiology, Biotechnology and other clinical laboratory waste - Chemical Waste (yellow-e) - Chemical Liquid Waste 	<p>Yellow coloured non-chlorinated Plastic Bags</p>  <p>Note: (i) Chemical waste (yellow-e) comprising of un-used, residual or date expired liquid chemicals including spent hypo of X-Ray, should be stored in yellow container</p>
2.	Red Category	Contaminated Waste (Recyclable)	<p>Red Coloured Non Chlorinated Plastic Bags (having thickness equal to more than 50 μ) and Containers</p> 

3.	White Category	Waste Sharps including metals	White Coloured translucent, puncture proof, leak proof, Temper Proof containers 
4.	Blue Category	<ul style="list-style-type: none"> • Glassware • Metallic Implants Body	Puncture proof, leak proof boxes or containers with blue coloured marking  <p>Cardboard Box with Blue marking</p> 

Treatment Option for Bio-medical Waste

As per BMW Rules, the treatment and disposal of BMW generated from the HCF must be carried out in accordance with Schedule I, and in compliance with the standards provided in Schedule II of BMW Rules.

It is also emphasized in the rules that no healthcare facility shall establish on-site treatment and disposal facility for BMW, if a service of CBWTF is available within 75 kilometre of travelling distance of the facility. All the public healthcare facilities within reach of 75 kilometres of CBWTF needs to dispose of the BMW through such CBWTF only and are not allowed to establish its own treatment and disposal facility. For the public health care facilities especially in rural areas where there is no CBWTF within range of 75 kilometres, the disposal of BMW can still be made through a CBWTF who is willing to provide treatment services and authorized by the concerned SPCB/PCC to operate in an area beyond 75 Km radial distance. In case of no reach to any CBWTF, the BMW generated from HCFs should be disposed in captive treatment and disposal facility or by deep burial pit as authorised by the respective SPCB/and as specified in these guidelines

The collection, treatment, processing and disposal options for both the categories of healthcare facilities; having linkage with CBWTF or not having linkage with CBWTF, are detailed here as per Schedule I of BMW Rules.

YELLOW CATEGORY

(a)-Human Anatomical Waste

Segregation

Human tissues, organs, body parts and fetus below the viability period. This includes, placenta and extracted tooth.

Type of bag and container

Collect the waste in yellow colored non chlorinated plastic bag and store in yellow coloured container

Treatment and Disposal:

For HCF having linkage with CBWTF

No treatment of waste is required to be carried out at the health care facility except pre-treatment (sterilization) of Yellow (h) category waste by autoclaving/ microwaving/ hydroclaving or sterilize as per methods prescribed in WHO Blue book 2014. Yellow category waste along with pre-treated waste should be stored in central storage point and must be handed over to CBWTF. It is mandatory for each health care facility that dead fetus waste should be handed over to CBWTF in yellow bag with a copy of the official Medical Termination of Pregnancy (MTP) certificate from the Obstetrician or the Medical Superintendent/ SMO/ CMO of the HCF.

For HCF without linkage to CBWTF

This waste should be disposed through Plasma Pyrolysis unit or twin chambered compact incinerator with 2 seconds retention time in secondary combustion chamber and adequate air pollution control devices to comply with revised emission norms prescribed under BMW Management Rules.

Disposal of the waste in the deep burial pit should not be practiced unless the hospitals is located in rural or remote isolated place. Use of deep burial pit should be as authorised by the respective SPCB/PCC.

Copy of official MTP certificate from the MO I/C for fetus below the vitality period must be kept with the HCF.

(b)- Animal Anatomical Waste

Segregation

This waste include experimental animal carcasses, body parts, organs, tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.

Type of bag and container

Collect the waste in yellow coloured non chlorinated plastic bag and store in yellow coloured container.

Treatment and Disposal:

For HCF having linkage with CBWTF

No treatment of waste is required to be carried out at veterinary hospital except pre-treatment (sterilization) of Yellow (h) category waste (if applicable) by autoclaving/ microwaving/ hydroclaving or sterilize as per methods prescribed in WHO Blue book 2014. Yellow category waste along with pre-treated waste should be stored in central storage point and must be handed over to CBWTF.

For HCF having own treatment and Disposal facility

Animal anatomical waste should be disposed through Plasma Pyrolysis unit or twin chambered compact incinerator with 2 seconds retention time in secondary combustion chamber and adequate air pollution control devices to comply with revised emission norms prescribed under BMW Management Rules, 2016.

Animal anatomical waste can also be disposed in captive deep burial pits only in case of those veterinary hospitals located in rural or remote isolated place. Use of deep burial pit should be as authorised by SPCB/PCC.

(c) - Soiled Waste

Segregation:

Items contaminated with blood/body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components. This includes used infectious material such as caps, shoe-cover, blotting paper/gauze, wooden swab stick, paraffin blocks, indicators tapes and disposable (single use non-linen based) masks and gowns.

Type of bag and container: Collect the waste in yellow coloured non chlorinated plastic bag and store in yellow coloured container

Treatment and Disposal:

For HCF having linkage with CBWTF

No treatment of waste is required to be carried out at the health care facility. Waste must be handed over to CBWTF

For HCF having own treatment and Disposal facility

Soiled waste should be disposed through Plasma Pyrolysis unit or in twin chambered compact incinerator with 2 seconds retention time in secondary combustion chamber and adequate air pollution control devices to comply with revised emission norms prescribed under BMW Management Rules, 2016. In absence of above, soiled waste can also be treated by autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding for ultimate disposal through waste to energy plants.

Soiled waste can also be disposed in captive deep burial pits only in case of the hospitals located in rural or remote isolated place. Use of deep burial pit should be as authorised by SPCB/PCC.

(d) - Expired and Discarded Medicine

Segregation: Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.. This includes cytotoxic drugs dispensed in dextrose / saline bottles and disposables used in delivery of cytotoxic drugs.

Type of bag and container: Collect all the expired and discarded medicines except for cytotoxic drugs waste in a separate yellow colored non chlorinated plastic bag (different form being used for human anatomical waste) and store in yellow colored container.

All the cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc must be collected in separate yellow colored non chlorinated plastic bag labeled as cytotoxic hazard.

For HCF having linkage with CBWTF

No treatment of waste is required to be carried out at the health care facility. As per BMW Rules, 2016 all the expired and discarded medicines including cytotoxic drugs expired `cytotoxic drugs are either returned back to the manufacturer or are handed over to the CBWTF to be disposed of through incineration at temperature > 1200oC.

For healthcare facilities where there no established system for returning the drugs to the manufacturer it is recommended that the expired and discarded medicines are handed over only to CBWTF for disposing of through incineration.

For HCF having own treatment and Disposal facility

Expired and discarded medicines are required to be sent back to manufacturer or can be disposed though nearest common biomedical Waste or Hazardous waste incinerators with prior intimation to SPCBs./PCCs.

This waste can also be disposed through twin chambered captive incinerator with 2 seconds retention time in secondary combustion chamber, which can withstand a temperature of 1200oC and having adequate air pollution control devices to comply with emission norms.

(e) - Chemical Waste

Segregation:

This waste comprises of chemicals used in production of biological, discarded containers of chemicals and disinfectants etc. This includes solid or liquid residual chemicals used in HCFs.

Type of bag and container: Collect solid chemical waste in yellow coloured containers or non-chlorinated yellow plastic bag. Collect un-used, residual or date expired liquid chemicals in yellow container.

Treatment and Disposal:

For HCF having linkage with CBWTF

No treatment is required to be carried out at the facility. The chemical waste (liquid or solid chemicals) should be collected into different yellow coloured plastic containers, whereas empty chemical containers with residual chemicals should be collected in yellow bags and handover to CBWTF operator for final disposal by incineration. It is required to specify the name of chemical on the yellow containers so that it would help CBWTF operator to decide whether to incinerate or transfer to Hazardous Waste TSDF for final disposal.

For HCF having own treatment and Disposal facility

This waste should be incinerated in captive incinerator or it can be sent to nearby Hazardous Waste TSDF for final disposal

(f) - Chemical Waste

Segregation:

Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, silver X Ray film developing liquid, discarded formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities, etc. Leftover, unused, residual or date expired liquid chemicals shall not be discharged as chemical liquid waste.

Type of bag and container: Not applicable since this liquid waste containing waste chemicals is collected and pre-treated prior to disposal through Effluent Treatment Plant. However, recyclable liquid chemicals such as spent X-ray hypo should be collected in yellow containers and sold or given to only authorised recyclers for resource recovery.

Treatment and Disposal:

As per the BMW Rules 2016, the chemical liquid waste of the hospital must be collected through a separate collection system for pre-treatment. Hospitals with large standalone labs shall install separate drainage system leading to pre-treatment unit prior to mixing the same with rest of the wastewater from hospital for further treatment. For middle and small healthcare facilities having no system of separate drainage/collection system, the liquid waste is required to be collected on-site in containers for pre-treatment before mixing the same with other wastewater. Silver X ray film developing fluid should be given or sold to the authorized recyclers for resource recovery, else it should be handed over to CBWTF as yellow(e) chemical waste.

Depending on type of chemical effluent generated, pre-treatment should comprise of neutralization/precipitation, followed by disinfection prior to mixing with rest of the wastewater from hospital. Prior to mixing with rest of the hospital effluent, disinfection should be done preferably by passing the effluent through UV sterilizer rather than using disinfecting chemicals since use of chemicals may affect performance of biological treatment in down-stream.

(g) - Discarded Linen, Mattresses, beddings contaminated with Blood, body fluids, routine mask and gown.

Segregation

This includes discarded linen from bedsheets, beddings, re-usable routine masks and gowns.

Type of bag and container:

Collect the waste in yellow coloured non-chlorinated plastic bag and store in yellow coloured container

Treatment and Disposal:

For HCF having linkage with CBWTF

Disinfect the waste linen with non-chlorinated chemical disinfection and hand over to the CBWTF operator for final disposal by incineration. The waste mattresses should be cut into pieces and disinfected and can be sent to the CBWTF operator for final disposal by incineration. Alternatively, waste mattresses can be cut into pieces and disinfected with non-chlorinated chemicals for disposal as general waste (dry-waste) for energy recovery in cities having waste to energy plants or RDF (Refuse Derived Fuel) plants.

The waste mattresses shall not be sold or auctioned. Used bed sheets that are not soiled and re-usable can be sold or auctioned only after washing and disinfection. Disposable (single use non-linen based) masks and gowns, after use shall be treated as yellow-c (soiled waste).

For HCF having own treatment and Disposal facility

The waste mattresses after cutting into pieces and disinfected with non-chlorinated chemicals and can be incinerated in captive incinerator or can be disposed as General waste in dry bins in cities having RDF or waste to Energy Plants.

(h) Microbiology, Biotechnology and Other Clinical Laboratory Waste:

Segregation:

Microbiology, Biotechnology and other clinical laboratory waste, waste blood bags (containing date expired or contaminated blood), Laboratory cultures, stocks or specimen of micro-organisms, live or attenuated vaccines, human cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures. This includes plastic culture plates and other highly infectious wastes.

Type of bag and container: Collect the waste in yellow coloured non chlorinated plastic bag and store in yellow coloured container

Treatment and Disposal:

For HCF having linkage with CBWTF

Pre-treatment by disinfection before handing over the waste to CBWTF operator. Pre-treatment can be done by autoclave / microwave / Hydroclave. Pre-treatment can also be done by using non-chlorinated chemical disinfectants like aldehydes, lime based powders or solutions, ozone gas, ammonium salts and phenolic compounds.

The pre-treated waste bags should be handed over to CBWTF operator on daily basis.

For HCF having own treatment and Disposal facility

Pre-treated waste should be disposed off by a HCF by installing twin chambered compact incinerator with 2 seconds retention time in secondary combustion chamber and adequate air pollution control devices to comply with revised emission norms prescribed under BMW Management Rules, 2016.

Pre-treated waste can be disposed in captive deep burial pits in case of the hospitals located in remote in rural or isolated places. Use of deep burial pit should be as authorised by SPCB/PCC.

RED CATEGORY

Segregation:

Red category waste is contaminated recyclable waste containing primarily plastics generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes with their needles cut), vacutainers and gloves. This includes waste pipette tips, plastic pipette, eppendorf, rubber teats, drains,

oxygen mask, thick plastic splash proof gowns, rubber apron, ICT test cards, ELISA plate and vials not containing blood samples.

Type of bag and container: Collect the waste in red coloured non chlorinated plastic bag and store in red coloured container

Treatment and Disposal:

For HCF having linkage with CBWTF

Contaminated recyclable waste containing mainly plastics and rubber shall be put in red coloured non chlorinated plastic bags and containers. Syringes after removing/cutting the needles should also be put in this category. Vacutainers/vials with blood samples should be pre-treated as given at section 3.1.1.h and disposed as yellow-h category waste.

No onsite treatment of Red category waste is required. All such waste is needed to be sent to CBWTF for final treatment and disposal

For HCF having own treatment and Disposal facility

All the recyclable waste generated from the HCF must be sterilised using autoclaving/microwaving / hydro-calving followed by shredding or mutilation or combination of sterilisation and shredding. Recyclable waste must never be disposed of along with general waste in dry stream and same is required to be disposed of only through registered or authorised recyclers or to waste to energy plants or plastics to diesel or fuel oil or for road making, whichever is possible.

WHITE CATEGORY

Segregation

This waste comprises of needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes waste sharps such as lumbar puncture needle, trocar cannula, IABP cannula, arthroscopy blade, insulin pen needle, lancet needle, removac needle, eye needle, Cardioplegia needle and surgical stab knife

Type of bag and container:

Collect the waste in white translucent, puncture proof, leak proof, tamper proof container.

Treatment and Disposal:

For HCF having linkage with CBWTF

After collection in puncture proof, leak proof, tamper proof container, handover the waste to CBWTF without any alteration or onsite treatment.

BLUE CATEGORY

(a) Glassware

Segregation:

Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes. This includes glass slides and glass pipettes.

Type of bag and container:

Puncture proof, leak proof boxes or containers with blue coloured marking

Treatment and Disposal:

For HCFs having linkage with CBWTF

Dispose of the empty glass bottles by handing over to CBWTF without any onsite treatment. The residual chemicals in glass bottle should be collected as chemical waste in yellow coloured container / bags and over to CBWTF as yellow(e) waste.

For HCFs having own treatment and Disposal facility

The waste glass bottles / broken glass has to be sterilized or disinfected (either by autoclaving or microwaving or hydroclaving or by Sodium Hypochlorite Solution) followed by soaking & washing with detergent prior to sending it for recycling. Broken glass should also be disinfected and if the same cannot be given/or sold for recycling it can be disposed in sharps pit. The residual chemical in glass bottle should be collected as chemical waste in yellow coloured container / bags as yellow(e) waste and send the same to either a CBWTF or common hazardous waste Treatment and Disposal Facility.

Glass vials with positive controls should be pre-treated and disposed as yellow(h) waste.

(b) Metallic Body Implants

Segregation

Implants used for orthopaedic surgeries. This include metal sternal wire, Gigli saw wire and Orthopaedic Splint.

Type of bag and container:

Puncture proof, leak proof boxes or containers with blue coloured marking.

Treatment and Disposal:

Dispose of the waste by handing over to CBWTF. In case of no access to CBWTF, metallic body implants should be disinfected (either by autoclaving or microwaving or hydroclaving or by Sodium Hypochlorite Solution) and later washed with detergent prior to sending/sold to metal recyclers.

GENERAL WASTES

General waste consists of all the waste other than bio-medical waste and which has not been in contact with any hazardous or infectious, chemical or biological secretions and does not include any waste sharps. This waste consists of mainly:

- (i) News paper, paper and card boxes (dry waste)
- (ii) Plastic water bottles (dry waste)
- (iii) Aluminium cans of soft drinks (dry waste)
- (iv) Packaging materials (dry waste)
- (v) Food Containers after emptying residual food (dry waste)
- (vi) Organic / Bio-degradable waste - mostly food waste (wet waste)
- (vii) Construction and Demolition wastes

As per Bio Medical Waste Management Rules 2016, the general waste generated from the healthcare facility must be disposed of in accordance with the provisions of Solid Waste Management Rules, 2016.

SOLID WASTE

Health care facilities must ensure that the general solid waste generated from the facility is segregated and collected in separate bins filled with non-chlorinated bags and shall not be mixed up with the BMW generated in the facility. Requirements of HCFs in management of solid waste are given below;

- Collect segregate waste in two separate streams namely bio-degradable waste and dry-waste. Green bins shall be provided for bio-degradable wastes and blue bin for dry wastes. Colour coded bins may be either painted or labelled with particular colour.
- Plastic sheets provided inside the bins shall be of minimum 50mm thick as required under plastic waste management Rules, 2016. In case of bio-degradable waste collection bins, it is recommended to use compostable plastic bags of any thickness.
- Waste collected in bins shall be handed over to authorised waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;
- HCFs having more than 5,000 sqm area should setup on-site compost plants as far as possible.
- Used sanitary waste like diapers, sanitary pads etc. generated from hospitals should preferably be wrapped in the pouches provided by the manufacturers or brand owners of

these products or in a suitable wrapping material and disposed along with soiled waste (yellow c) category waste for incineration.

- To store horticulture waste and garden waste generated from his premises separately in their own premises and dispose of as per the directions of the local body (local authorities) from time to time.
- General waste shall not be throw or burnt on streets, open public spaces outside the premises or in the drain or water bodies.
- HCFs shall pay user fee for solid waste management, as may be specified in the byelaws of the local body.
- HCFs shall handover segregated waste to authorized waste collector or agency as specified by the local body.
- General waste should not be stored in central waste storage area meant for Bio Medical Waste generated for the facility, but is stored separately, till it is handed over to authorised waste picker of local bodies or corporations or Gram Panchayats
- Any BMW generated should not be mixed with the general waste. To ensure the same, health care facilities have to train all the staff of HCF to segregate general wastes and they shall also caution or advise the visitors in HCFs to follow the same.

LIQUID WASTE

Waste Water generated in hospitals is more complex than normal sewage. As such hospital waste water treatment is also more complex. Large hospitals have laundry, operation theatres and laboratories; which discharge substantial quantity of toxic waste water. Any liquid adversely affecting quality during provision of healthcare services which might contain some solids disposed by staffs and patients or during other healthcare related process such as cooking, cleaning or laundry.

Black water (Sewage)

Heavily polluted wastewater containing high concentration of faecal matter and urine, food residues, toxic chemicals.

Grey water (Sullage)

Low polluted wastewater with residues from washing, bathing, laboratory process, laundry, or technical processes such as cooling water or rinsing of X-ray films

Storm water

Technically not wastewater, but consist of rainfall collected on hospital roofs, grounds and paved surfaces. It may seep into ground water or be used for irrigation of hospital grounds or toilet flushing.

Hospital sewage or wastewater treatment plant process:

Compact or packaged sewage treatment plant for hospitals is done in series of steps. Conventional treatment processes involved to remove impurities from the influent are listed below.

1. Preliminary Stage or Pretreatment: As a first stage, preliminary treatment process is essential in most of the sewage treatment plant (STP). It removes items such as sticks, rags and other large debris and heavy inorganic solids contained in the hotel influent through bar screens. Removal of these materials protects plant's equipments from damage. The inorganic settled is called as grit which is removed using grit chamber.

2. Primary Treatment Stage: This is the second step in sewage treatment system. Physical separation of solids and greases from wastewater is done in this stage. Now, water flows into primary filter or clarifiers for few hours to allow solid particles to settle down and lighter particles will float to the top will be skimmed off from the tank. The settled solid is called as primary sludge or primary effluent contains about 60-70% of solids. Partly treated wastewater is now subjected to next treatment level.

3. Secondary Treatment Stage: It is a biological treatment process removes dissolved inorganic materials present in soluble and colloidal form from the wastewater. Here, bacteria are used convert the colloidal and dissolved organic matter. Now the partially treated wastewater from primary tank flows into the aeration tank and air is supplied through air blower to provide oxygen for microbes. When wastewater flows into secondary clarifier, where solids settle down which is called as secondary sludge and part of it is recycled for activated sludge process and remaining is mixed with primary sludge which will be send to sludge digestion tank and then disposes off. This stage removes about 90% of inorganic solids.

4. Tertiary or Advanced Treatment Stage: This is the last stage in most of the STP's. This stage removes the suspended solids and organic matter which was not removed in secondary treatment. The pathogenic microorganisms which were not removed during biological treatment process will get removed by the process called disinfection. Several disinfection agents can be used depending on wastewater condition (pH, clarity etc). It is achieved by means of physical or chemical disinfectants like chlorine, UV light, ozone etc. Now, disinfected wastewater is suitable for disposal or reuse.

OTHER WASTES

Other wastes consist of used electronic wastes, used batteries, and radio-active wastes which are not covered under biomedical wastes but have to be disposed as and when such wastes are generated as per the provisions laid down under E-Waste (Management) Rules, 2016, Batteries (Management & Handling) Rules, 2001, and Rules/guidelines under Atomic Energy Act, 1962 respectively.

Management of Used Batteries

As per the provisions under Batteries (Management & Handling) Rules, 2001, used lead acid batteries generated from health care facilities (HCFs) should be sold/auctioned/sent only to the authorised dealers, designated collection centres or authorised recyclers or any authorised agency. In no case the used batteries be handed over to an unauthorised person. Hospital having purchased more than 100 batteries should maintain records of number of batteries purchased, and number of used batteries sent to registered recyclers/authorised dealers/designated collection centres/any other agency as per Form-VIII of Batteries Rules, 2001 and the returns shall be filed half yearly i.e. by 30th June and 31st December of every year to the concerned State Pollution Control board.

Management of Radioactive Wastes

The Atomic Energy Regulatory Board (AERB) has been mandated by the Central Government, as the Competent Authority as per Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987 notified under the Atomic Energy Act 1962. It exercises regulatory control over nuclear installations and the use of radioactive substances and radiation generating plants outside such installations.

AERB also empowered to perform the functions as stipulated under sections 10(1) (powers of entry) and 11(1) (powers to take samples) of Environmental (Protection) Act, 1986 and Rule 12 (agency to which information on excess discharge of pollutants to be given) of the Environmental (Protection) Amendment Rules, 1987 with respect to radioactive substances.

As per provisions of Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987, no person shall dispose of radioactive waste (a) unless he has obtained an authorization from the competent authority under these rules; (b) in any manner other than in accordance with the terms and conditions specified in the authorization issued under these rules; (c) in any location different from those specified in the authorization; and (d) in quantities exceeding those specified in the authorization.

Health Care Facilities generating radionuclides waste from treatment of Cancer patients and end-of-life equipment containing radio radionuclides shall obtain authorization from AERB

for its disposal. As per the policy of AERB, radionuclides wastes are required to be re-exported back to the manufacturer. It was recommended that such generators shall ensure arrangement with manufacturer at the time of purchase of such equipment. Waste disposal facilities of AERB are regulated by Waste Disposal Agency (Division) of AERB.

Management of E-Wastes

As per provisions under E-Waste (Management) Rules, 2016, as amended every generators of end of life electrical and electronic equipment (EEE) listed under Schedule-I are required to ensure that such E-Waste is sent to an authorized E-Waste dismantling or recycling facility or an authorised collection centre of the Producer of EEE or through designated take back service providers of Producers or registered Producer Responsibility Organization (PRO) of a Producer. E-waste can be auctioned only to authorised E-Waste Recyclers/ Dismantlers/ PRO of a Producer. Records of E-Waste transfer/sale should be maintained records in Form -2 for verification of the SPCBs/PCCs and Annual returns as per Form-3 of E-Waste (Management) Rules, 2016, as amended should be submitted to SPCBs/PCCs by June 30th of every year. E-Waste generated from hospital equipment not listed in Schedule-I should also be sold/ transferred to only the authorized E-Waste Recyclers/Dismantlers.

GUIDELINES FOR SAFETY & HEALTH ON CONSTRUCTION SITES

This guideline has been prepared with a view to providing essential information to job contractors/employers to ensure health and safety on construction sites.

MANAGING SAFETY AND HEALTH ON CONSTRUCTION SITES

Safety policy

Every employer of 50 or employees shall make a written statement of his policy with respect to the safety and health of his employees and make arrangements to give effect to the policy.

Risk assessment

The employer should make a suitable and sufficient assessment of: -

- (a) Any risk to the safety and health to which any employee is exposed whilst he is at work.
- (b) Any risk to the safety and health of any person not in his employment arising out of or in connection with the conduct by him of his undertaking.

ORGANISING THE SITE

Planning the work

Make a good planning by gathering as much information about the project and the project site before works begin to ensure safety during construction phase. Information that could be sought should be: -

- (a) Underground services.
- (b) Presence of live bare electrical conductors, underground/overhead insulated cables.

Advice from the authority concerned should be sought prior to start of work.

- (c) Ground conditions.
- (d) Contract documents.
- (e) Nearby schools, footpaths and roads.
- (f) Other activities going on the site.

Organising the work

Responsibilities regarding safety and health between different stakeholders should be clearly allocated: -

- (a) Between client/main contractor/subcontractor.
- (b) By appointment of competent supervisors/safety and health officers.
- (c) By proper coordination on site between parties.

Common facilities to be provided

Ensure provision of basic facilities to ensure safety, health and welfare of employees.

Site access

Adequate, safe and separate pedestrian and vehicular traffic routes should be provided on and around the site.

Site boundaries

Fence the construction site to prevent the entry of unauthorised persons on construction sites, which are located in built-up areas and alongside vehicular and pedestrian traffic routes.

Public safety

Ensure public safety through appropriate fencing of site or by other means.

Lighting

Ensure adequate lighting of all worksite through natural and/or artificial lighting.

Site tidiness

- (a) The site should be kept tidy.
- (b) Walkways and stairs should be kept free of slipping and tripping hazards.
- (c) Ensure there are no protruding nails on loose or fixed materials.

Storage areas

- (a) Set up storage areas for plants, materials, flammable substances (e.g. flammable liquids and gases) and hazardous substances (e.g. chemicals).
- (b) Store flammable materials away from other materials and protected from accidental ignition.
- (c) Prevent obstruction of access routes/emergency escapes by proper storage of materials.
- (d) Materials to be properly stacked to prevent falls.

Fire Safety

Ensure fire safety on the construction site by: -

- (a) Providing adequate means for fighting fire.
- (b) Training of personnel in the use of these fire-fighting equipments.

EXCAVATIONS

- (a) Locate and identify all utility services, such as electrical, water and sewer in the area before beginning to excavate.
- (b) Don't use pointed tools to probe for underground electrical cables.
- (c) Remove or secure trees, utility poles, rocks or similar objects near the edge of an excavation to prevent workers from being injured.
- (d) Support the sides of excavations by sheet piling, shoring and bracing to guard against danger to workers from fall or dislodgement of earth, rock or other material.

- (e) Inspect excavation slopes and/or supporting systems daily for erosion or deterioration.
 - (f) Keep excavated materials back at least 600 mm (2 ft.) from the edge of any trench excavation and 1.2 m (4 ft.) from any other excavation.
 - (g) Erect substantial guardrails or barriers around excavations to prevent workers or other persons from falling into them.
 - (h) Provide a ladder when workers are required to enter excavations over 1.5 m (5 ft) in depth.
 - (i) Do not place or move load, plant or equipment near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.
 - (j) Provide anchored stop blocks and barriers to prevent vehicles being driven into the excavation.
 - (k) Do not allow heavy vehicles near the excavation unless the support work has been specially designed to permit it.
- If an excavation is likely to affect the security of a structure on which persons are working, precautions should be taken to protect the structure from collapse by providing shoring.

WORKING AT HEIGHT

General provisions

- (a) Ensure that working platform is secure and check that it: -
 - (i) will support the weight of workers using it and any materials and equipment they are likely to use or store on it.
 - (ii) is stable and will not overturn.
 - (iii) is footed on stable ground or on a stable support or structure.
- (b) Provide guard rails, barriers, etc. at open edges, including edges of floors, floor openings, edges of roofs and edges of working platforms.

Guard rails

Guard rails should: -

- (a) be made from any material, provided they are strong and rigid enough to prevent people from falling and be able to withstand other loads likely to be placed on them.
- (b) Be fixed to a structure, or part of a structure capable of supporting them.
- (c) Include: -
 - (i) a main guard rail at least 900 mm above any edge from which people are liable to fall.
 - (ii) a toe board at least 150 mm high.
 - (iii) a sufficient number of intermediate guard rails or suitable alternatives.
- (d) Risks of falls through openings or fragile material (e.g. rooflights), to be reduced by providing appropriate and adequate guard rails or barriers to cover the opening or material.

Safe working platforms

All working platforms should be: -

- (a) Fully boarded and securely fixed to prevent displacement.
- (b) Strong enough to support the load usually placed on it (workers and materials).

(c) Provided with toe-boards so as to prevent materials and tools from falling over the edges.

General access scaffolds

All scaffolds should be: -

- (a) Properly designed, constructed, erected and maintained so as to prevent collapse or accidental displacement.
- (b) Based on a firm and level foundation.
- (c) Erected on a firm ground capable of supporting the weight of the scaffold and any load likely to be placed on it.
- (d) Braced and tied into a permanent structure or otherwise stabilized.
- (e) Provided with platforms that are fully boarded and wide enough for the work and for access.
- (f) Provided with scaffold boards that are properly supported and rest on at least three supports.
- (g) Have a safe ladder or other access onto the work platforms.

Safe use of access ladders

- (a) Any ladder should be properly fixed to prevent slipping.
- (b) A good handhold should be provided to the ladder.
- (c) The ladder should be leaned at the proper angle to minimize the risk of slipping outwards, that is, about 1 m out at the base for every 4 m in height.
- (d) The top of the ladder should rest against a solid surface and not on fragile or other insecure materials such as cement or plastic guttering.
- (e) Both feet of the ladder should rest on a firm footing and cannot slip.
- (f) If the ladder is more than 3 m long, or used as a way to and from a workplace, it should be secured from falling by fixing it at the top or sometimes at base.
- (g) If the ladder cannot be fixed a second person should secure the ladder at the base while it is being used.
- (h) The ladder should extend a sufficient height (about 1 m) above any landing place where workers will get on and off it unless some other adequate handhold is available.

Stepladders

- (a) Stepladders should be fully opened and both spreader bars should be locked.
- (b) Stepladders should not be used on top of scaffolds, platforms, or other surfaces above the ground.
- (c) Unattended tools, such as hammers, should not be left on top of stepladder.
- (d) Stepladder should be dismantled before being moved.
- (e) Top most rung of a stepladder should not be used.

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Care of ladders

- (a) Ladders should be inspected regularly by a competent person and damaged ladders

should be removed from service.

(b) Ladders should be properly stored on racks under cover and above ground.

(c) Ladders should not be hung from its rungs.

Roof works

(a) All roof-work operations should be pre-planned and properly supervised.

(b) Roof work should only be undertaken by workers who are physically and psychologically fit

and have the necessary knowledge and experience for such work.

(c) Work on roofs should not be carried on in weather conditions that threaten the safety of workers.

Flat roofs

(a) All the edges and openings on a roof from or through which there is a risk of fall should be

protected with suitable guardrails and toe boards.

(b) All covers for openings in roofs should be of substantial construction and be secured in position.

Sloping roofs

(a) When work is being carried out on sloping roofs, sufficient and suitable crawling boards or

roof ladders should be provided and firmly secured in position as soon as practicable.

(b) During extensive work on sloping roofs, edge protection in the form of barriers or guardrails high enough and strong enough should be provided to stop worker from falling off the roof.

Fragile Roofs

Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with sufficient suitable

roof ladders or crawling boards strong enough, when spanning across the supports for the roof

covering, to support those workers.

MOVING, LIFTING AND HANDLING LOADS

Manual handling

(a) Work site and storage of materials should be planned so that manual handling is reduced to a minimum.

(b) Manual handling should be done by the kinetic lifting technique and the person involved should be properly trained.

Hoists

- (a) Select a hoist, which is suitable for the site and capable of lifting the loads required.
- (b) To prevent people being struck by the platform or other moving parts: -
 - (i) Enclose the hoistway at places where people might be struck, e.g., working platforms or window/door openings.
 - (ii) Provide gates at all landings and at ground level
- (c) Prevent falling down the hoistway by making sure: -
 - (i) the hoistway is fenced where people could fall down it.
 - (ii) the gates at landings are kept closed except during loading and unloading.
 - (iii) the edge of the hoist platform is close to the edge of the landing so that there is no gap to fall through.
- (d) Prevent being hit by falling materials by: -
 - (i) stopping loads falling from the platform, e.g., make sure wheelbarrows are not overfilled.
 - (ii) not carrying loose loads. Put loose loads in proper container or use a hoist with an enclosed platform.
 - (iii) not overloading the platform.
 - (iv) enclosing the hoistway.
 - (v) hoist should be used to carry materials only.

Lifts

Lifts for the carriage of persons need to be especially constructed and installed for the purpose, with such features as mechanical and electrical interlocking devices on the cage and landing gates.

Mobile cranes

- (a) The crane should be able to lift the load on a site.
- (b) It should be of such a size so that it can be used safely on a site.
- (c) Crane's inspection certificates should be up-to-date.
- (d) The crane should be fitted with an automatic Safe Load Indicator, which should be in good working order.
- (e) The employer should ensure that the driver is trained and experienced in the operation of the type of crane being used.
- (f) The crane should be sited in a safe place, so that:
 - The driver has a clear view of the site.
 - It is well away from excavations and overhead powerlines.
 - It is on level ground which can take its full weight and together with its maximum load.

SITE VEHICLES AND MOBILE PLANT

- (a) Provide safe site entry and exit points with adequate turning room and good visibility for vehicle drivers.

- (b) Keep pedestrians separate from vehicles, e.g., by providing separate site entry and exit points.
- (c) Consider a one-way system and avoid needs for vehicles to reverse wherever possible.
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- (d) Consider fitting reversing alarms to vehicles.
- (e) Make use of signalers to control high-risk situations, e.g., where visibility is restricted.
- (f) Prepare the running surface of temporary roads. Where the site is muddy, use hardcore or other fill to overcome the problem of skidding and repair potholes
- (g) Protect any temporary structures, such as scaffolds or falseworks, which might be damaged and made unsafe if struck by a vehicle.
- (h) Protect any excavations and alongside any areas of water if vehicles must pass close by.
- (i) Take precautions, such as stop blocks, where vehicles tip materials into excavations.
- (j) Make sure that vehicles are not overloaded as they may become unstable, difficult to steer or have their braking efficiency impaired.
- (k) Make sure loads are securely attached to vehicles and that loose materials cannot fall from lorries or site dumpers and strike workers.
- (l) Take special precautions with blind corners.

CHEMICALS

- (a) Follow the instructions provided on the labels when working with glues, paints, and solvents.
- (b) Work with glue, paint, or solvents in well-ventilated areas so as to prevent build-up of hazardous environment to chemical vapours.
- (c) Use appropriate personal protective equipment and clothing to employees working with chemicals based on labels and Material Safety Data Sheet (MSDS).

PROTECTIVE EQUIPMENT

Employers on construction sites need specific Personal Protective Equipment (PPE) to ensure their safety and health. e.g.: -

Safety helmet

- (a) Employees should be provided with safety helmets to protect the head from injury due to falling or flying objects or due to striking against objects or structures.
- (b) Employers should ensure that the safety helmets are worn.
- (c) When working at height, a strap should additionally be used to prevent the safety helmets from falling.

Footwear

- (a) Protective footwear should be provided to workers who are exposed to the risk of injury of materials being dropped on their feet or nail or other sharp objects penetrating their sole.
- (b) Where it is likely that employees will be working in water or wet concrete, appropriate

boots should be provided.

Goggles and safety spectacles

The employer should provide goggles or other suitable protective device when likely to be exposed to eye or face injury from airborne dust or flying particles, dangerous substances,
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harmful heat, light or other radiation, and in particular during welding, flame cutting, rock drilling,
concrete mixing or other hazardous work;

Gloves and protective clothing

Protective gloves and suitable protective clothing to protect hands or the whole body as required when exposed to heat radiation or while handling hot, hazardous or other substances which might cause injury to the skin should be provided by the employer.

Other protective equipments

Where necessary, workers should be provided with and required to wear the following personal

protective equipment: -

- (a) Ear protection when exposed to noise.
- (b) Dust masks when exposed to excessive dust.
- (c) Waterproof clothing and head coverings when working in adverse weather conditions.
- (d) Safety harnesses with independently secured lifelines where protection against falls cannot be provided by other appropriate means.
- (e) Life vests and life preservers where there is a danger of falling into water.
- (f) Distinguishing clothing or reflective devices or otherwise conspicuously visible material when there is regular exposure to danger from moving vehicles.

Note: All protective equipments should be properly maintained and stored after use.

EMERGENCY PROCEDURES

Transport

- (a) Where an employee has suffered injury or illness at work necessitating his removal to his home or to a hospital or other similar institution, the employer shall promptly and at his own expense provide an appropriate means of conveyance for the employee.
- (b) The appointed person or first-aider shall accompany the injured or ill employee to a hospital or other similar institution whenever the circumstances so justify.

FIRE SAFETY

On the basis of undertaking given by the Fire Consultant / Architect, the Chief Fire Officer shall renew the fire clearance in respect of the following buildings on annual basis:-

- 1) Public entertainment and assembly
- 2) Hospitals
- 3) Hotels
- 4) Under ground shopping complex

Fire Escapes or External Stairs:

- a) Fire escape shall not be taken into account while calculating the number of staircases for a building.
- b) All fire escapes shall be directly connected to the ground.
- c) Entrance to the fire escape shall be separate and remote from internal staircase.
- d) The route to fire escape shall be free of obstructions at all times except the doorway leading to the fire escape which shall have the required fire resistance.
- e) Fire escape shall be constructed of non-combustible materials.
- f) Fire escape stairs shall have straight flight not less than 125 cm wide with 25 cm treads and risers not more than 19 cm.
- g) Handrails shall be at a height not less than 100 cm.

h) Fire escape staircase in the mercantile, business, assembly, hotel buildings above 24 m. height shall be a fire tower and in such a case width of the same shall not be less than the width of the main staircase. No combustible material shall be allowed in the fire tower.

Spiral Stairs

- a) The use of spiral staircase shall be limited to low occupant load and to a building height 9 m.
- b) A spiral stair shall not be less than 150 cm in diameter and shall be designed to give the adequate headroom.

Staircase Enclosures

- a) The external enclosing walls of the staircase shall be of the brick or the R.C.C. construction having fire resistance of not less than two hours. All enclosed staircases shall have access through self-closing door of one-hour fire resistance. These shall be single swing doors opening in the direction of the escape. The door shall be fitted with the check action door closers.
- b) The staircase enclosures on the external wall of the building shall be ventilated to the atmosphere at each landing.
- c) Permanent vent at the top equal to the 5% of the cross sectional area of the enclosure and openable sashes at each floor level with area equal to 1 to 15% of the cross sectional area of

the enclosure on external shall be provided. The roof of the shaft shall be at least 1 m. above the surrounding roof. There shall be no glazing or the glass bricks in any internal closing wall of staircase. If the staircase is in the core of the building and cannot be ventilated at each landing, a positive of 5-mm. w.g. by an electrically operated blower/blowers shall be maintained.

d) The mechanism for pressurizing the staircase shaft shall be so installed that the same shall operate automatically on fire alarm system/sprinkler system and be provided with manual operation facilities.

Ramps

a) Ramps of slope of not more than 1 in 10 may be substituted for and shall comply with all the applicable requirements of all required stairways as to enclosure capacity and limiting dimensions. Larger slopes shall be provided for special uses but in no case greater than 1 in 8. For all slopes exceeding 1 in 10 and where the use is such as to involve danger of slipping, the ramp shall be surfaced with approved non-slipping material.

b) The minimum width of the ramps in the Hospitals shall be 2.4 m. and in the basement using car parking shall be 6.0 m.

c) Handrails shall be provided on both sides of the ramp.

d) Ramp shall lead directly to outside open space at ground level or courtyards of safe place.

e) For building above 24.0 m. in height, access to ramps from any floor of the building shall be through smoke fire check door.

f) In case of nursing homes, hospitals etc. area exceeding 300 sq m. at each floor one of the exit facility shall be a ramp of not less than 2.4 m. in width.

PROVISION OF LIFTS

a) Provision of the lifts shall be made for all multi-storeyed building having a height of 15.0 m. and above.

b) All the floors shall be accessible for 24 hrs. by the lift. The lift provided in the buildings shall not be considered as a means of escape in case of emergency.

c) Grounding switch at ground floor level to enable the fire service to ground the lift car in case of emergency shall also be provided.

d) The lift machine room shall be separate and no other machinery be installed in it.

Lift Enclosure/lift

General requirements shall be as follows

a) Walls of lift enclosures shall have a fire rating of two hours. Lift shafts shall have a vent at the top of area not less than 0.2 sq m.

b) Lift motor room shall be located preferably on top of the shaft and separated from the shaft by the floor of the room.

c) Landing door in lift enclosures shall have a fire resistance of not less than one hour.

d) The number of lifts in one lift bank shall not exceed four. A wall of two hours fire rating shall separate individual shafts in a bank.

e) Lift car door shall have a fire resistance rating of 1 hour.

- f) For buildings 15.0 m. and above in height, collapsible gates shall not be permitted for lifts and solid doors with fire resistance of at least one hour shall be provided.
- g) If the lift shaft and lobby is in the core of the building a positive pressure between 25 and 30 pa shall be maintained in the lobby and a possible pressure of 50 pa shall be maintained in the lift shaft. The mechanism for the pressurization shall act automatically with the fire alarm/sprinkler system and it shall be possible to operate this mechanically also.
- h) Exit from the lift lobby, if located in the core of the building, shall be through a self-closing fire smoke check door of one-hour fire resistance.
- i) Lift shall not normally communicate with the basement. If however, lifts are in communication, the lift lobby of the basement shall be pressurized as in (g) with self closing door as in (h).
- j) Grounding switch (es), at ground floor level shall be provided to enable the fire service to ground the lifts.
- k) Telephone/talk back communication facilities may be provided in lift cars for communication system and lifts shall be connected to the fire control room of the building.
- l) Suitable arrangements such as providing slope in the floor of the lift lobby shall be made to prevent water used during fire fighting, etc at any landing from entering the lift shafts.
- m) A sign shall be posted and maintained on every floor at or near the lift indicating that in case of fire, occupants shall use the stairs unless instructed otherwise. The sign shall also contain a plan for each floor showing the location of the stairways. Floor marking shall be done at each floor on the wall in front of the lift-landing door.
- n) Alternate power supply shall be provided in all the lifts.

Fire Lift

Following details shall apply for a fire lift in addition to above requirements

- a) To enable fire service personnel to reach the upper floors with the minimum delay, one or more of the lifts shall be so designed so as to be available for the exclusive use of the fireman in an emergency and be directly accessible to every dwelling/lettable floor space on each floor.
- b) The lift shall have a floor area of not less than 1.4 sq.mt. It shall have a loading capacity of not less than 545 kg. (8 persons lift) with automatic closing doors.
- c) The electric supply shall be on a separate service from electric supply mains in a building and the cables run in a route safe from fire, that is within a lift shaft. Lights and fans in the elevator having wooden paneling or sheet steel construction shall be operated on 24-volt supply.
- d) In case of failure of normal electric supply, it shall automatically switchover to the alternate supply. For apartment houses, this changeover of supply could be done through manually operated changeover switch. Alternatively, the lift should be so wired that in case of power failure, it comes down at the ground level and comes to stand still with door open.
- e) The operation of a fire lift shall be by a single toggle of two-button switch situated in a glass-fronted box adjacent to the lift at the entrance level. When the switch is on landing; call points will become inoperative and the lift will be on car control only or on a priority control device. When the switch is off, the lift will return to normal working. This lift can be used by the occupants in normal times.

- f) The words 'FIRE LIFT' shall be conspicuously displayed in fluorescent paint on the lift landing doors at each floor level.
- g) The speed of the fire lift shall be such that it can reach to the top floor from ground level within one minute.

BASEMENT

Requirements

- i) The access to the basement shall be either from the main or alternate staircase providing access and exit from higher floors. Where the staircase is continue the same shall be enclosed type serving as a fire separation from the basement floor and higher floors. Open ramps shall be permitted if they are constructed within the building line subject to the provision of the (iv).
- ii) In case of basement for office, sufficient number of exit ways and access ways shall be provided with a travel distance not more than 15.0 m. The travel distance in case of dead-end shall be 7.5 m.
- iii) The basement shall be partitioned and in no case compartment shall be more than 500 sq m. and less than 50 sq m. area except parking. Each compartment shall have ventilation standards as laid down in Bye-Laws separately and independently. The partition shall be made in consultation with Chief Fire Officer.
- iv) The first basement (immediately below ground level) can be used for services/parking/other permissible services. Lower basement, if provided, shall exclusively be used for car parking only.
- v) Each basement shall be separately ventilated. Vents with cross-sectional area (aggregate) not less than 2.5 percent of the floor area spread evenly round the perimeter of the basement shall be provided in the form of grills or breakable starboard lights or pavement lights or by way of shafts. Alternatively a system of air inlets shall be provided at basement floor level and smoke outlets at basement ceiling level. Inlets and extracts may be terminated at ground level with starboard or pavement lights as before. But ducts to convey fresh air to the basement floor level have to be laid. Starboard and pavement lights should be in positions easily accessible to the firemen and clearly marked "SMOKE OUTLET" or AIR INLET" with an indication of area served at or near the opening.
- vi) The staircase of basement shall be of enclosed type having fire resistance of not less than two hours and shall be situated at the periphery of the basement to be entered at ground level only from the open air and in such positions that smoke from any fire in the basement shall not obstruct any exit serving the ground and upper stories of the building and shall communicate with basement through a lobby provided with fire resisting self closing door of one hour rating. In case of basement being used as car parking only, the travel distance shall be 45 m.
- vii) In multi-storeyed basements, intake duct may serve all basements levels, but each basement and basement compartment shall have separate smoke outlet duct or ducts. Mechanical extractors for smoke venting system from lower basement levels shall also be provided. The system shall be of such design as to operate on actuation of smoke, heat

sensitive detectors/sprinklers, if installed, and shall have a considerably superior performance compared to the standard units. It shall also have an arrangement to start it manually.

viii) Mechanical extractors shall have an internal locking arrangement so that extractors shall continue to operate and supply fans shall stop automatically with the actuation of fire detectors. Mechanical extractors shall be designed to permit 30 air changes per hour in case of fire or distress call. However, for normal operation, only 30 air changes or any other convenient factor can be maintained.

ix) Mechanical extractors shall have an alternate source of power supply.

x) Ventilating ducts shall be integrated with the structure and made out of brick masonry or RCC as far as possible and when this duct crosses the transformer area of electrical switchboard, fire dampers shall be provided.

xi) Kitchens working on gas fuel shall not be permitted in basement/sub-basement.

xii) If cutouts are provided from basement to the upper floors or to the atmosphere, all side cutout openings in the basements shall be protected by sprinkler heads at closed spacing so as to form a water curtain in the event of a fire.

xiii) Dewatering pump shall be provided in all basements.

SERVICE DUCTS/REFUGE CHUTE

a) Service duct shall be enclosed by walls and door, if any, of 2 hours fire rating. If ducts are larger than 10 sq m. the floor should seal them, but provide suitable opening for the pipes to pass through, with the gaps sealed.

b) A vent opening at the top of the service shaft shall be provided between one-fourth and on half of the area of the shaft. Refuge chutes shall have an outlet at least of wall of non-combustible material with fire resistance of not less than two hours. They shall not be located within the staircase enclosure or service shafts or air-conditioning shafts. Inspection panel and door shall be tight fitting with 1 hour fire resistance; the chutes should be as far away as possible from exits.

c) Refuge chutes shall not be provided in staircase walls and A/C shafts etc.

ELECTRICAL SERVICES

Electrical Services shall conform to the following:

a) The electric distribution cables/wiring shall be laid in a separate duct shall be sealed at every floor with non-combustible material having the same fire resistance as that of the duct. Low and medium voltage wiring running in shaft and in false ceiling shall run in separate conduits.

b) Water mains, telephone wires, inter-com lines, gas pipes or any other service lines shall not be laid in ducts for electric cables.

c) Separate conduits for water pumps, lifts, staircases and corridor lighting and blowers for pressuring system shall be directly from the main switch panel and these circuits shall be laid in separate conduit pipes, so that fire in one circuit will not affect the others. Master switches controlling essential service circuits shall be clearly labeled.

d) The inspection panel doors and any other opening in the shaft shall be provided with airtight fire doors having fire resistance of not less than 1 hour.

- e) Medium and low voltage wiring running in shafts, and within false ceiling shall run in metal conduits. Any 230 voltage wiring for lighting or other services, above false ceiling should have 660V grade insulation. The false ceiling including all fixtures used for its suspension shall be of non-combustible material.
- f) An independent and well-ventilated service room shall be provided on the ground floor with direct access from outside or from the corridor for the purpose of termination of electrical supply from the licenses service and alternative supply cables. The doors provided for the service room shall have fire resistance of not less than 1 hour
- g) MCB and ELCB shall be provided for electrical circuit.

First Aid /Fixed Fire Fighting /Fire Detection Systems and other Facilities

- 1 Where more than one riser is required because of large floor area, the quantity of water and pump capacity recommended in these Annexures should be finalized in consultation with Chief Fire Officer.
- 2 The above quantities of water shall be exclusively for fire fighting and shall not be utilized for domestic or other use.
- 3 A facility to boost up water pressure in the riser directly from the mobile pump shall be provided in the wet riser, down comer system with suitable fire service inlets (collecting head) with 2 to 4 numbers of 63 mm inlets for 100-200 mm dia main, with check valve and a gate valve.
4. Internal diameter of rubber hose for reel shall be minimum 20 mm. A shut off branch with nozzle of 5 mm. size shall be provided.
- 5 Fire pumps shall have positive suction. The pump house shall be adequately ventilated by using normal/mechanical means. A clear space of 1.0 m. shall be kept in between the pumps and enclosure for easy movement /maintenance. Proper testing facilities and control panel etc. shall be provided.

STATIC WATER STORAGE TANK

- a) A satisfactory supply of water exclusively for the purpose of fire fighting shall always be available in the form of underground static storage tank with capacity specified in Annexure-A with arrangements of replenishment by town's main or alternative source of supply @ 1000 liters per minute. The static storage water supply required for the above mentioned purpose should entirely be accessible to the fire tenders of the local fire service. Provision of suitable number of manholes shall be made available for inspection repairs and insertion of suction hose etc. The covering slab shall be able to withstand the vehicular load of 45 tonnes in case of high rise and 22 tonnes in case of low rise buildings. A draw off connection shall be provided. The slab need not strengthened if the static tank is not located in mandatory set-back area.

- b) To prevent stagnation of water in the static water tank the suction tank of the domestic water supply shall be fed only through an over flow arrangement to maintain the level therein at the minimum specified capacity.
- c) The static water storage tank shall be provided with a fire brigade collecting branching with 4 Nos. 63mm dia instantaneous male inlets arranged in a valve box with a suitable fixed pipe not less than 15 cm dia to discharge water into the tank. This arrangement is not required where down comer is provided.

AUTOMATIC SPRINKLERS

Automatic sprinkler system shall be installed in the following buildings

- a) All buildings of 24 m. and above in height, except group housing and 45 m. and above in case of apartment /group housing society building.
- b) Hotels below 15 m. in height and above 1000 sq m. built up area at each floor and or if basement is existing.
- c) All hotels, mercantile, and institutional buildings of 15 m. and above.
- d) Mercantile building having basement more than one floor but below 15 m. (floor area not exceeding 750 sq m.)
- e) Underground Shopping Complex.
- f) Underground car / scooter parking /enclosed car parking.
- g) Basement area 200 sq m. and above.
- h) Any special hazards where the Chief Fire Officer considers it necessary.
- i) For buildings up to 24 m. in height where automatic sprinkler system is not mandatory as per these Bye-Laws, if provided with sprinkler installation following relaxation may be considered.
- i) Automatic heat/smoke detection system and M.C.P. need not be insisted upon.
- ii) The number of Fire Extinguisher required shall be reduced by half.

FIXED CARBON DI-OXIDE / FOAM / DCO WATER SPRAY EXTINGUISHING SYSTEM

Fixed extinguishing installations shall be provided as per the relevant specifications in the premises where use of above extinguishing media is considered necessary by the Chief Fire Officer.

FIRE ALARM SYSTEM

All buildings of 15 m. and above in height shall be equipped with fire alarm system, and also residential buildings (Dwelling House, Boarding House and Hostels) above 24 m. height.

- a) All residential buildings like dwelling houses (including flats) boarding houses and hostels shall be equipped with manually operated electrical fire alarm system with one or more call boxes located at each floor. The location of the call boxes shall be decided after taking into consideration their floor without having to travel more than 22.5 m.
- b) The call boxes shall be of the break glass type without any moving parts, where the call is transmitted automatically to the control room without any other action on the part of the person operating the call boxes.

- c) All call boxes shall be wired in a closed circuit to a control panel in a control room, located as per Bye-Laws so that the floor number from where the call box is actuated is clearly indicated on the control panel. The circuit shall also include one or more batteries with a capacity of 48 hours normal working at full load. The battery shall be arranged to be a continuously trickle charged from the electric mains.
- d) The call boxes shall be arranged to sound one or more sounders so as to ensure that all occupants of the floor shall be warned whenever any call box is actuated.
- e) The call boxes shall be so installed that they do not obstruct the exit ways and yet their location can easily be noticed from either direction. The base of the call box shall be at a height of 1.5 m. from the floor level.
- f) All buildings other than as indicated above shall, in addition to the manually operated electrical fire alarm system, be equipped with an automatic fire alarm system.
- g) Automatic detection system shall be installed in accordance with the relevant standard specifications. In buildings where automatic sprinkler system is provided, the automatic detection system may not be insisted upon unless decided otherwise by the Chief Fire Officer.

CONTROL ROOM

There shall be a control room on the entrance floor of the building with communication system (suitable public address system) to all floors and facilities for receiving the message from different floors. Details of all floor plans along with the details of fire fighting equipment and installation shall be maintained in the Control Room. The Control Room shall also have facility to detect the fire on any floor through indicator boards connecting fire detection and alarm system on all floors. The staff in charge of the Control Room shall be responsible for the maintenance of the various services and fire fighting equipment and installation. The Control Room shall be manned round the clock by trained fire fighting staff.

FIRE DRILLS AND FIRE ORDERS

The guidelines for fire drill and evacuation etc. for high-rise building may be seen in Appendix (B) of National Building Code part IV. All such building shall prepare the fire orders duly approved by the Chief Fire Officer.



Registrar
DMIMS(DU)