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MESSAGE

Access to affordable, quality and responsive healthcare services and facilities is the primary concern of all healthcare facilities and is one of the key strategic thrusts of the Aquino Administration Health Agenda: Achieving Universal Health Care for All Filipinos or Kalusugang Pangkalahatan, in order to ensure better health for our countrymen. The Department of Health launched numerous initiatives to implement this commitment, among which are our increased efforts towards patient safety, “Malinis at Mabangong Ospital”, Health Facility Enhancement Program and PhilHealth’s Benchbook on performance improvement of health services. Proper management of healthcare waste is a common thread in these efforts to attain high standards for provision of healthcare services.

The revision of the 2004 2nd Edition Manual on Healthcare Waste Management is intended to make our guidelines, practices and techniques compliant with policies and legislations enacted in the last seven years and be at par with international best practices. A national roadmap that defines our medium-term strategic directions and a training module to keep health workers informed are two other complementary efforts of the Department to enhance national capacities in managing healthcare waste.

Now, the challenge of each and every healthcare facility is to minimize, properly segregate, treat and dispose of the wastes it generates. As we worked together in completing this 3rd edition Manual on Healthcare Waste Management, let us continue our cooperation to prevent the spread of disease, occurrence of accidents and degradation of our environment.

ENRIQUE T. ONA, MD. FPCS, FACS
Secretary of Health
PREFACE

With the issuances of different laws and Administrative Orders and Implementing Rules and Regulations jointly by the Department of Health and the Department of Environment and Natural Resources, there is an urgent need to review and update the 2004 2nd Edition Healthcare Waste Management Manual of the DOH. Notwithstanding the major concerns on the proper handling of waste generated by Healthcare Facilities, the risks and threats caused by improper handling of wastes on human health and the environment has been a continuing problem.

These considerations led to the preparation of the 3rd Edition Manual on Healthcare Waste Management, which is more comprehensive and user-friendly. The Manual is composed of four (4) main parts, each one subdivided into various chapters. It includes a General Description of Healthcare Waste Management (HCWM), Components of HCWM, Administrative Requirements, and copies of related laws and issuances and sample of forms to be used in the implementation of a Healthcare Waste Management program in the Healthcare Facility.

While the 3rd edition Manual on HCWM has been designed to serve as guide for both hospital administrators and staff for application to the current situation, a review and updating may be essential after five (5) years or so. Any proposal for revision shall be forwarded to the National Center for Health Facility Development for consideration. Ensuing amendments to the Manual shall be subject to the formal approval of the Secretary of Health.
ACKNOWLEDGMENT

The Manual on Healthcare Waste Management, 3rd edition was made possible through the collaborative effort of government, the private sector and international development partners. We thank

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The head of the offices of the members of the Technical Working Group: Director Juan Miguel Cuna, Environmental Management Bureau, DENR; OIC-Assistant Secretary Enrique A. Tayag and Dr. Winston Go, Medical Center Chiefs, San Lazaro Hospital, Manila; Sis. Normita L. Guevara, D.C., Vice President for Health Services, San Juan De Dios Educational Foundation Inc. (Hospital), Pasay City; Dr. Ludgerio D. Torres and Dr. Manuel Chua Chiaco, Executive Directors, Philippine Heart Center, Quezon City; Dr. Edgardo V. Salud, Chief of Hospital, Quezon City General Hospital, Quezon City; Director Eduardo C. Janairo, MD and Director Lilitheth C. David, MD, National Center for Disease Prevention and Control - DOH; Director Juanito Taleon, MD, Center for Health Development - CALABARZON and Dr. Soe Nyunt-U, World Health Organization for allowing their staff to actively participate as members of the TWG that prepared this manual;

The TWG members, HCWM stakeholders and resource persons whose names appear in the succeeding pages for participating in the meetings and consultations and for sharing their experience and knowledge; and

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TECHNICAL WORKING GROUP

Ms. Eleonorita Reyes
Chair, Technical Working Group
San Lazaro Hospital, Manila

Engr. Aida Calma
Co-Chair
San Lazaro Hospital, Manila/ UNDP-GEF Project, Philippines

Members

Engr. Elmer Benedictos  Department of Health-National Center for Disease Prevention and Control
Ms. Gilda Cirila Ramos  San Juan De Dios Educational Foundation, Inc. (Hospital), Pasay City
Engr. Bonifacio Magtibay  World Health Organization-Philippines
Ms. Ester Borja  Philippine Heart Center, Quezon City
Engr. Jose Barzaga  Philippine Heart Center, Quezon City
Engr. Corazon Vidad  Department of Health-Center for Health Development CALABARZON
Dr. Jose Briones  Quezon City General Hospital, Quezon City
Mr. Salvador Passe, Jr.  Department of Environment and Natural Resources-Environment Management Bureau
Ms. Deborah Carmina Sarmiento  UNDP-GEF Project, Philippines
Ms. Erika Claudine Tabunar  UNDP-GEF Project, Philippines

Advisers

Director Ma. Rebecca Peñaflie  DOH-National Center for Health Facility Development
Director Maylene Beltran  DOH-Bureau of International Health Cooperation
Director Asuncion Anden, M.D.  DOH-National Center for Health Facility Development
Director Criselda Abesamis, M.D.  DOH-National Center for Health Facility Development/Office for Special Concerns

Administrative and Secretarial Support

Ms. Levi Lacuarin  UNDP-GEF Project, Philippines
Ms. Marcela Hilot  UNDP-GEF Project, Philippines
## CONTRIBUTORS AND RESOURCE PERSONS

### Department of Health

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Dr. Mario C. Villaverde</td>
<td>Undersecretary of Health</td>
</tr>
<tr>
<td>Dr. Gerardo V. Bayugo</td>
<td>OIC, Undersecretary of Health</td>
</tr>
<tr>
<td>Dr. David J. Lozada, Jr.</td>
<td>Undersecretary of Health</td>
</tr>
<tr>
<td>Dr. Teodoro J. Herbosa</td>
<td>Undersecretary of Health</td>
</tr>
<tr>
<td>Dr. Paulyn Jean B. Rosell-Ubial</td>
<td>Assistant Secretary of Health</td>
</tr>
<tr>
<td>Director Irma Asuncion, MD</td>
<td>National Center for Health Promotion/ Center for Health Development – Metro Manila</td>
</tr>
<tr>
<td>Ms. Brenda Panganiban</td>
<td>Bureau of International Health Cooperation</td>
</tr>
<tr>
<td>Engr. Aida Angeles</td>
<td>Bureau of Health Facilities and Services</td>
</tr>
<tr>
<td>Ms. Donatilla Esplanada</td>
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</tr>
<tr>
<td>Engr. Jose Zipagan</td>
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</tr>
<tr>
<td>Dr. Rhodora Cruz</td>
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</tr>
<tr>
<td>Ms. Gina Manlapig</td>
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</tr>
<tr>
<td>Mr. Elmer Valiente</td>
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<tr>
<td>Mr. Rogelio Millare</td>
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<tr>
<td>Mr. Edwin Bautista</td>
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<tr>
<td>Engr. Manuel Castro</td>
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</tr>
<tr>
<td>Director Benito Arca, MD</td>
<td>Center for Health Development – Central Luzon</td>
</tr>
<tr>
<td>Director Rio Magpantay, MD</td>
<td>Center for Health Development – Central Luzon</td>
</tr>
<tr>
<td>Mr. Vivencio Ediza, Jr.</td>
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<tr>
<td>Dr. Jocelyn Abellana</td>
<td>Center for Health Development – Central Visayas</td>
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<tr>
<td>Mr. Nelson Cara</td>
<td>Center for Health Development- CAR</td>
</tr>
<tr>
<td>Engr. Nilo Marayag</td>
<td>Center for Health Development – Metro Manila</td>
</tr>
<tr>
<td>Mr. Alejandre Mercado</td>
<td>Center for Health Development – MIMAROPA</td>
</tr>
<tr>
<td>Dr. Renato Dimayuga</td>
<td>Batangas Regional Hospital</td>
</tr>
<tr>
<td>Dr. Nenita Moraga-Po</td>
<td>Chief of Hospital, Celestino Gallares</td>
</tr>
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**Metro Manila**

**Batangas Regional Hospital**

**Chief of Hospital, Celestino Gallares**

**Memorial Regional Hospital**
Dr. Epifania S. Simbul  
Corazon Locsin Montelibano Memorial Regional Hospital/ National Children’s Hospital

Dr. Alberto C. de Leon  
Eastern Visayas Medical Center

Ms. Crisanta Cruz  
Florencio V. Bernabe Memorial Hospital

Dr. Maria Lourdes Otayza  
Mariano Marcos Memorial Hospital

Ms. Almeida Invencion  
Mariano Marcos Memorial Hospital

Mr. Philip Dasaua  
Paulino J. Garcia Memorial Research and Medical Center

Ms. Ma. Evelina Budlong  
Schistosomiasis Control and Research Hospital

Dr. Rolando Tacau  
Valenzuela City Emergency Hospital

Mr. Allan Gabito  
Valenzuela City Emergency Hospital

Dr. Gerardo Aquino, Jr.  
Vicente Sotto Memorial Medical Center

Mr. Joseph Al Abuen  
Vicente Sotto Memorial Medical Center

Mr. Philip Dasaua  
Paulino J. Garcia Memorial Research and Medical Center

United Nations Development Programme

Dr. Jorge Emmanuel  
UNDP-GEF Project, Global Project Team

Mr. Romulo Kintanar  
United Nations Development Program, Philippines

Mr. Hitoshi Katayama  
UNDP-GEF Project, Philippines

Department of Environment and Natural Resources

Engr. Geri Geronimo Sañez  
Environmental Management Bureau

Mr. Solon Rativo  
Environmental Management Bureau

Mr. Gilbert Gonzales  
Environmental Management Bureau

Mr. Eligio Ildifino  
Environmental Management Bureau

Ms. Grace Madelar  
Environmental Management Bureau

Mr. Dennis John Cabanolan  
Environmental Management Bureau

Ms. Annabeth Roble  
Environmental Management Bureau

Central Visayas

Other Organizations

Cagayan De Oro Medical Center, Cagayan de Oro City
Cebu Doctor’s University Hospital, Cebu City
Cebu North General Hospital, Cebu City
Chevalier Enviro Services, Inc., Paranaque City
City Health Office – Mandaluyong
City Health Office – Navotas
City Health Office – Olongapo
City Health Office – Puerto Princesa
City Health Office – San Juan
City Health Office – Taguig
City Health Office – Valenzuela
Office of the City Administrator – Manila
De La Salle Medical Center, Dasmarinas, Cavite
Health Care Without Harm – Southeast Asia
Isaac Catalina Medical Center, Balanga City
Las Pinas General Hospital and Satellite Trauma Center, Las Pinas City
Manila Central University Medical Foundation Hospital, Caloocan City
Mt. Carmel Medical Center, Bocaue, Bulacan
Pasay City General Hospital
Philippine Hospital Association
Private Hospital Association of the Philippines
Philippine Nurses Association
Provincial Health Office – La Union
Provincial Health Office – Leyte
Provincial Health Office – Occidental Mindoro
Provincial Health Office – Eastern Samar
Safewaste Inc., Pampanga
St. Luke’s Medical Center, Taguig City
San Juan De Dios Educational Foundation Inc. (Hospital)
San Juan Medical Center, San Juan
University of the Philippines- College of Public Health, Manila
The Medical City, Pasig City
University of Santo Tomas Hospital, Manila
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<td>Acquired Immune Deficiency Syndrome</td>
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<td>Adsorbable Organically Halogen</td>
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<tr>
<td>IC</td>
<td>Infection Control</td>
</tr>
<tr>
<td>ICN</td>
<td>Infection Control Nurse</td>
</tr>
<tr>
<td>ICO</td>
<td>Infection Control Officer</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
</tr>
<tr>
<td>IEC</td>
<td>Information, Education and Communication</td>
</tr>
<tr>
<td>IEE</td>
<td>Initial Environmental Examination</td>
</tr>
<tr>
<td>IRR</td>
<td>Implementing Rules and Regulations</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardizaton</td>
</tr>
<tr>
<td>IV</td>
<td>Intravenous</td>
</tr>
<tr>
<td>JAO</td>
<td>Joint Administrative Order</td>
</tr>
<tr>
<td>LCA</td>
<td>Life Cycle Analysis</td>
</tr>
<tr>
<td>LGU/s</td>
<td>Local Government Unit/s</td>
</tr>
<tr>
<td>LLDA</td>
<td>Laguna Lake Development Authority</td>
</tr>
<tr>
<td>LTO</td>
<td>License to Operate</td>
</tr>
<tr>
<td>MC</td>
<td>Memorandum Circular</td>
</tr>
<tr>
<td>MCCII</td>
<td>Medical Center Chief II</td>
</tr>
<tr>
<td>MSDS</td>
<td>Material Safety Data Sheet</td>
</tr>
<tr>
<td>N2O</td>
<td>Nitrous Oxide</td>
</tr>
<tr>
<td>NaClO</td>
<td>Sodium Hypochlorite</td>
</tr>
<tr>
<td>NCDPC</td>
<td>National Center for Disease Prevention and Control</td>
</tr>
<tr>
<td>NCHFD</td>
<td>National Center for Health Facility Development</td>
</tr>
<tr>
<td>NEC</td>
<td>National Epidemiology Center</td>
</tr>
<tr>
<td>NPCC</td>
<td>National Pollution Control Commission</td>
</tr>
<tr>
<td>NRL</td>
<td>National Reference Laboratory</td>
</tr>
<tr>
<td>NSWMC</td>
<td>National Solid Waste Management Commission</td>
</tr>
<tr>
<td>OIC</td>
<td>Officer in Charge</td>
</tr>
<tr>
<td>OIR</td>
<td>Occupational Incident Report</td>
</tr>
<tr>
<td>OPD</td>
<td>Out Patient Department</td>
</tr>
<tr>
<td>OR</td>
<td>Operating Room</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>PAM</td>
<td>Physical Asset Management</td>
</tr>
<tr>
<td>PCO</td>
<td>Pollution Control Officer</td>
</tr>
<tr>
<td>PD</td>
<td>Presidential Decree</td>
</tr>
<tr>
<td>PDCA</td>
<td>Plan-Do-Check-Act</td>
</tr>
<tr>
<td>ACRONYMS</td>
<td>EXPLANATION</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>PET</td>
<td>Polyethylene Terephthalate</td>
</tr>
<tr>
<td>PFCs</td>
<td>Perfluorocarbons</td>
</tr>
<tr>
<td>PGH</td>
<td>Philippine General Hospital</td>
</tr>
<tr>
<td>pH</td>
<td>Power of Hydrogen</td>
</tr>
<tr>
<td>PHIC</td>
<td>Philippine Health Insurance Corporation</td>
</tr>
<tr>
<td>PIO</td>
<td>Public Information Office</td>
</tr>
<tr>
<td>PME</td>
<td>Professional Mechanical Engineer</td>
</tr>
<tr>
<td>PMP</td>
<td>Preventive Maintenance Program</td>
</tr>
<tr>
<td>PNRI</td>
<td>Philippine Nuclear Research Institute</td>
</tr>
<tr>
<td>POPs</td>
<td>Persistent Organic Pollutants</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>PTB</td>
<td>Pulmonary Tuberculosis</td>
</tr>
<tr>
<td>PVC</td>
<td>Polyvinyl Chloride</td>
</tr>
<tr>
<td>RA</td>
<td>Republic Act</td>
</tr>
<tr>
<td>RBC</td>
<td>Rotating Biological Contractors</td>
</tr>
<tr>
<td>RHU</td>
<td>Rural Health Unit</td>
</tr>
<tr>
<td>SACCL</td>
<td>STD AIDS Central Cooperative Laboratory</td>
</tr>
<tr>
<td>SARS</td>
<td>Severe Acute Respiratory Syndrome</td>
</tr>
<tr>
<td>SBR</td>
<td>Sequential Batch Reactor</td>
</tr>
<tr>
<td>SF6</td>
<td>Sulphur Hexafluoride</td>
</tr>
<tr>
<td>SHO</td>
<td>Senior House Officer</td>
</tr>
<tr>
<td>SO</td>
<td>Safety Officer</td>
</tr>
<tr>
<td>STP</td>
<td>Sewage Treatment Plant</td>
</tr>
<tr>
<td>TSD</td>
<td>Treatment, Storage and Disposal</td>
</tr>
<tr>
<td>TSE</td>
<td>Transmissible Spongiform Encephalitis</td>
</tr>
<tr>
<td>TSS</td>
<td>Total Suspended Solid</td>
</tr>
<tr>
<td>TWG</td>
<td>Technical Working Group</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Program</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
<tr>
<td>UP</td>
<td>University of the Philippines</td>
</tr>
<tr>
<td>UV</td>
<td>Ultraviolet</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WMO</td>
<td>Waste Management Officer</td>
</tr>
<tr>
<td>WMP</td>
<td>Waste Minimization Program</td>
</tr>
<tr>
<td>WPRO</td>
<td>Western Pacific Regional Office</td>
</tr>
<tr>
<td>WTP</td>
<td>Wastewater Treatment Plant</td>
</tr>
</tbody>
</table>
PART 1

GENERAL CONSIDERATIONS AND OVERVIEW
CHAPTER 1: INTRODUCTION

1.1 Background

The First Edition of the Hospital Waste Management Manual was formulated and issued through the Environmental Health Service (EHS), Department of Health (DOH) in 1997. In 2004, the DOH, through the Environmental and Occupational Health Office (EOHO) in consultation with other stakeholders, issued for implementation the Second Edition of the Manual renamed as Healthcare Waste Management (HCWM) Manual. The Second Edition Manual was primarily designed to provide healthcare facilities (HCF) and other stakeholders with guidance and practical information regarding safe, efficient and environment-friendly waste management options. This has been implemented in all HCF in the country.

However, with the onset of new technologies and promulgations of new laws and issuances, there is an urgent need to review and revise the Second Edition Manual in order to provide a more effective and efficient approach in implementing an appropriate and holistic waste management in any HCF. The DOH, in partnership with the World Health Organization (WHO), Health Care Without Harm (HCWH), University of the Philippines (UP) College of Public Health (CPH), and the Department of Environment and Natural Resources (DENR), assisted by the United Nations Development Programme (UNDP) – Global Environment Facility (GEF), has been launching programs and projects geared towards the promulgation and formulation of policies relevant to HCWM.

Thus, DOH created a Technical Working Group (TWG) to review, enhance and update the DOH policies and manual of guidelines on HCWM. The primary task of the TWG is to come up with a more user-friendly manual on HCWM substantiated with the new trends and technologies adopted and accepted universally. Series of consultative meetings with healthcare administrators, DOH partners, and stakeholders were conducted to be abreast with, to gather information, and to clarify issues and concerns relevant to HCWM.

1.2 Purpose and Intent

The Third Edition also called Manual on Healthcare Waste Management will serve as a reference for HCF administrators in the implementation of an effective and efficient waste management program. The requirements for doing such are provided in the manual by listing the standards of performance, defining the mandatory requirements, providing new concepts, and by citing examples and tools. The Manual is designed to be used by all workers within the HCF – whether it is a government HCF, private HCF, Rural Health Units (RHUs), Barangay Health Stations (BHS), clinics, and private service providers who are involved in the segregation, collection, handling, storage, treatment and disposal of healthcare waste (HCW).
This Manual will also serve the purpose and activities of the regulators, policy makers, development organizations, voluntary groups, environmental groups and practitioners, advisers, researchers, and students.

1.3 Scope and Limitations
The Third Edition Manual covers all HCW produced or generated by HCFs, except other types of general wastes, such as condemned equipment, spare parts, tires, scrap and the like. These are already bound by special laws, such as existing auditing and accounting rules and regulations for government agencies and internal laws and policies of private HCF. Also, HCW generated by households, ear piercing and tattoo parlors, mortuary and autopsy centers outside of an HCF, pharmaceutical and chemical establishments and other establishments that are not considered as HCF are not covered by this Manual and are covered by existing environmental laws and policies of the different governing agencies other than the DOH.

1.4 Contents of the Manual
The Third Edition Manual on Healthcare Waste Management is composed of four (4) parts, each part is subdivided into different chapters:

- **Part I** includes the general description of HCW, an overview, categories, composition, and its impacts to human health and environment. It also includes the different laws, policies, and concepts applicable to HCWM.
- **Part II** discusses the main components of the Manual which includes the different principles and policies on HCWM. The HCW generated within an HCF shall follow an appropriate and well identified stream from waste generation, waste segregation, collection, transportation (on-site and off-site), storage, treatment to final disposal. It also discusses water quality and wastewater management.
- **Part III** contains administrative and financial requirements to implement HCWM and various administrative controls such as health and safety practices (particularly on infection control), emergency management, communication and training.
- **Part IV** contains the appendices.

1.5 Approach
The DOH recognizes the critical impact of proper HCWM and its responsibility in setting up necessary policies, guidelines, and standards for safe management of HCW. The DOH also acknowledges its responsibility in ensuring that all concerned individuals assume their share of responsibility and strictly comply with existing laws and regulations on the effective and efficient handling of wastes, and in imposing discipline.

To address the issues at hand, the following approaches will be undertaken:
• Clear definition of hazardous HCW, its various categories, and the hazards/risks involved;
• Application of concepts that can minimize risks to the patients, HCF workers and the environment such as Chain of Infection, International Organization for Standardization (ISO) hierarchy of controls and the HCWM hierarchy;
• Installation of appropriate monitoring system to ensure strict enforcement of the laws, policies, and guidelines in all concerned HCF;
• Continuous review of the applicability of the policies, guidelines and standards vis a vis latest standards, trends and technologies.

1.6   Concepts

1.6.1 Chain of Infection

The Chain of Infection is a model used to understand the infection process. The chain of infection is a circle of links, each representing a component in the cycle. Each link must be present and in sequential order for an infection to occur. The links are: infectious agent, reservoir, portal of exit from the reservoir, mode of transmission, and portal of entry into a susceptible host. Understanding the characteristics of each link and the means by which the chain of infection can be interrupted provides the HCF workers with methods for supporting vulnerable patients, preventing the spread of infection and self-protection. Breaking any link in the chain will prevent infection, although control measures are most often directed at the “mode of transmission.” The transmission of infection and its control is illustrated by the chain of infection in Figure 1.1.

The elements of infection in the context of HCW are:

• Some components of HCW are potential reservoir of disease-causing microorganisms such as culture dishes, liquid blood, pathological waste, etc.
• The infective dose depends on the virulence of the microorganisms, the portal of entry, and the susceptibility of the host.
• Modes of transmission may involve contact (e.g. contaminated needles or blood splatter), vehicle-borne (e.g. contaminated wastewater), air-borne (e.g. aerosolized pathogens from broken culture dishes or the rapture of yellow bags), and vector-borne (e.g. rodents in an HCW storage area) transmission.
• Portals of entry include breaks in the skin and mucous membranes (e.g. needle-stick injuries or blood splashes into the mucous membranes), the respiratory tract (inhalation of pathogenic aerosols), etc.
• Potential susceptible host include HCF workers, waste handlers, patients and visitors in the HCF, landfill operators, scavengers and the general public.

The consequences of improper handling and disposal of HCW are serious. For example, the reuse of improperly discarded needles by intravenous (IV) drug users or accidental
needle stick injuries suffered by recyclers sifting through waste dumps could lead to the spread of hepatitis B, HIV-AIDS and other blood-borne diseases.

1.6.2 Hierarchy of Controls
Controlling exposures to occupational hazards is the fundamental method of protecting workers. Hierarchy of controls has been used as a means of determining feasible and effective controls. One representation of this hierarchy can be summarized as follows:

- Elimination
- Substitution
- Engineering controls
- Administrative controls
- Personal Protective Equipment
The methods at the top of the list are potentially more effective and protective than those at the bottom. Following the hierarchy normally leads to the implementation of inherently safer systems, where the risk of illness or injury is substantially reduced.

**Elimination and substitution**, while most effective at reducing hazards, also tend to be the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination of hazard and substitution of control may be inexpensive and simple to implement. On existing process, major changes in equipment and procedures may be required to eliminate hazards or substitute control.

**Engineering Control** is used to remove a hazard or place a barrier between the worker and the hazard. This includes designing the facility, equipment and processes to eliminate or minimize the hazards; substituting the processes, equipment, devices, materials or other factors to lessen the hazards; isolating the hazard by enclosing the source or putting barriers between the source of hazard and the exposed workers; using interlocks, machine guards, blast sheets, protective curtains and/or other means; removing or redirecting the hazard using local exhaust ventilation; and adopting complete mechanization or computerization.

Well-designed engineering controls can be highly effective in protecting workers and are typically independent of worker interactions. The initial cost of engineering controls can be higher than the cost of administrative controls or PPE, but over the long term, operating costs are frequently lower, and in some instances, can provide cost savings in other areas of the process.

**Administrative Control** includes assessment of risks, medical controls including provision of PPEs, establishment of waste management policies, procedures, guidelines and activities, conduct of regular and effective training, management of human resources and procurement of appropriate equipment and supplies. Administrative controls and PPE are frequently used with existing processes where hazards are not particularly well controlled. While relatively inexpensive to establish, it can be very costly to sustain over the long term. These methods for protecting workers have also proven to be less effective than other measures, requiring significant effort by the affected workers. Medical control includes written policies with standard operating procedures on the following.

a) **Patient Safety** which includes proper patient identification, assurance of blood safety, safe clinical and surgical procedures, provision and maintenance of safe quality drugs and technology, strengthening of infection control, maintenance of environment care standards and energy/waste management standards. Administrative Order 2008-0023 of the DOH requires Patient Safety program to have the key elements of leadership, institutional development, reporting system, feedback and communication, adverse event prevention and risk management,
disclosure of reported serious events, professional development, and a patient centered care and empowerment.

b) **Occupational Health and Safety** which includes physical examination (pre-employment and annual), regular immunization, health education and wellness, and continuous medical monitoring and periodic evaluation of safety measures.

**PPE** is specialized clothing or equipment worn by a worker designed to protect against infectious materials or from exposure to infectious agents thus, preventing injury or illness from a specific hazard. Adequate and appropriate PPE shall be provided to HCF workers who are exposed to hazardous waste. This includes protection for the whole body – head, face, body, arms, legs and feet.

### 1.6.3 Healthcare Waste Management Hierarchy

The HCWM hierarchy as shown in Figure 1.2 illustrates that it is most preferable to prevent the generation of waste at source and reduce the quantity of waste generated by adopting different methods of safe re-use, recycling and recovery. Proper treatment and residuals disposal are the end of pipe approach. In addressing HCWM, waste minimization basically utilizes the first two elements that could help reduce the bulk of HCW for disposal; so the best waste management practice aims to address the problem at source (green procurement approach) rather than the end of pipe solution.

![Figure 1.2 Healthcare Waste Management Hierarchy](image-url)
1.7 Expected Outcome

All HCF have the responsibility of ensuring that there are no adverse health effects and environmental consequences resulting from their generation, collection, storage, treatment and disposal of HCW. With the application of the different approaches discussed and illustrated in the Third Edition Manual, the user will be able to install an appropriate waste management system that would best meet the needs of their HCF. Proper and strict compliance with the set standards will result to benefits such as those shown below:

- Protection of human health by controlling and/or reducing exposure of HCF workers, patients, visitors, comforters and the general public to hazardous HCW and minimizing indirect impacts from environmental exposures to HCW
- Progress in the compliance of HCF with set regulatory laws, policies and guidelines
- Boosting of community ecological awareness and relationship by demonstrating commitment and dedication in the implementation of HCWM programs and activities
- Contribution to the global effort to save Mother Earth from destruction caused by pollution and contaminants resulting from improper handling of HCW
- Prevention of any long-term liability resulting to any contravention or violation incurred in the implementation of HCWM laws
- Improvement of socio-economic benefits resulting from the effective and efficient application of HCWM laws, policies and procedures.
CHAPTER 2: HEALTHCARE WASTE AND ITS IMPACT

For a clearer understanding and appreciation of HCW, this Chapter will provide the definition, the types of waste generated in any HCF, the hazards/risks that waste produces, its impact on the people, community and the environment.

2.1 Definition

“Healthcare waste” (HCW) includes all the solid and liquid wastes generated as a result of any of the following:

- Diagnosis, treatment or immunization of human beings;
- Research pertaining to the above activities;
- Research using laboratory animals for the improvement of human health;
- Production or testing of biologicals; and
- Other activities performed by HCF

“Healthcare Facilities” (HCF), for this purpose, are public, private and non-governmental institutions/facilities that contribute to the improvement of the health status of an individual, which includes:

- Hospitals and medical centers
- Clinics and healthcare units related to patient care including but not limited to dispensaries, alternative medicine clinics; obstetrics and maternity lying-in clinics; out-patient clinics; dialysis centers; drug testing centers; transfusion centers; military medical services; prison hospital and clinics; emergency medical care services; physician’s offices/clinics; dental clinics; specialized healthcare establishments such as convalescing homes and Differently Abled Person (DAP) centers; derma, vein and skin clinics
- Rehabilitation centers, hospices, psychiatric centers, and centers providing long-term healthcare services
- Related laboratories and research centers such as medical and bio-medical laboratories, biotechnology laboratories and institutions, medical research centers, blood banks and blood collection services, nuclear medicine laboratories, animal research laboratories
- Ambulance and emergency care mobiles (including medical mission and health services provided in evacuation centers)
- Teaching and training hospitals and medical schools

2.2 Categories of Healthcare Waste

There are seven (7) categories of HCW generated in HCF for easy identification of the handling, mode of treatment and proper disposal. Table 2.1 illustrates the description and examples per category.
### Table 2.1 Categories of Healthcare Waste

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DESCRIPTION</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infectious</strong></td>
<td>All waste suspected to contain pathogens (or their toxins) in sufficient concentration to cause diseases to a potential host.</td>
<td>Solid wastes from patients with infectious disease (e.g., dressings, swabs, blood bags, urine bag, sputum cups)</td>
</tr>
<tr>
<td></td>
<td>Discarded materials or equipment used for diagnosis, treatment and prevention of disease of patients with infectious disease</td>
<td>Liquid wastes from patients with infectious disease (e.g., feces, urine, blood or other body secretions).</td>
</tr>
<tr>
<td></td>
<td>Highly infectious waste include microbial cultures and stocks of highly infectious agents from Medical Analysis Laboratories and biofluids from patients with highly infectious diseases. (These require disinfection at source)</td>
<td>Food wastes (liquid or solid) of patients with highly infectious disease</td>
</tr>
<tr>
<td><strong>Sharps</strong></td>
<td>Items that can cause cuts or puncture wounds.</td>
<td>Used or expired sharps e.g., hypodermic, intravenous or other needles; auto-disable syringes; syringes with attached needles; infusion sets; scalpels; pipettes; knives; blades; broken glass; wet ampules</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Except syringes and needles used for antineoplastic purposes</td>
</tr>
<tr>
<td><strong>Pathological and Anatomical</strong></td>
<td>Refers to tissue sections and body material derived from biopsies or surgical procedures that are then examined in the laboratory.</td>
<td>Placenta, internal organs, tissues used for diagnostic procedures such as biopsy, blood, fetus</td>
</tr>
<tr>
<td></td>
<td>Anatomical waste is a subgroup of pathological waste. This type of waste refers to recognizable human body parts such as amputated limbs, etc.</td>
<td>Amputated body parts like legs.</td>
</tr>
<tr>
<td>CATEGORY</td>
<td>DESCRIPTION</td>
<td>EXAMPLES</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Pharmaceutical Waste</td>
<td>Refers to expired, spilt and contaminated pharmaceutical products, drugs and vaccines. Also refers to discarded items used in handling pharmaceuticals. Pharmaceutical wastes include antineoplastic, cytotoxic, and genotoxic waste. Drugs usually used in oncology (antineoplastic drugs) or radiotherapy units have a high hazardous mutagenic or cytotoxic effect.</td>
<td>Empty vials, bottles, connective tubing Medical supplies and containers of cytotoxic drugs or chemicals;</td>
</tr>
<tr>
<td>Chemical Waste</td>
<td>Discarded chemicals (solid, liquid, or gaseous) generated during disinfecting and sterilizing procedures Chemical wastes can be further classified into corrosive, reactive, toxic and flammable Chemical wastes also include wastes with high content of heavy metals and their derivatives</td>
<td>Laboratory reagents, film developer, disinfectants and soaking solutions, solvents Concentrated ammonia solutions, concentrated hydrogen peroxide, chlorine, silver nitrate Cadmium, mercury from broken thermometers, sphygmomanometers</td>
</tr>
<tr>
<td>Radioactive Waste</td>
<td>Wastes exposed to radionuclide. Residues from shipment of radioactive materials and unwanted solution of radionuclides intended for diagnostic or therapeutic use. Liquids, gas and solids contaminated with radionuclides whose ionizing radiations have genotoxic effects.</td>
<td>Cobalt (60 Co), Technetium (99 Tc), Iodine (131 I) and Iridium (192 Ir) Contaminated waste, patient’s excretion and all materials used by patients exposed with radionuclides within 48 hours</td>
</tr>
<tr>
<td>Non-Hazardous or General Waste</td>
<td>Waste that has not been in contact with communicable or infectious agents, hazardous chemicals or radioactive substances, and does not pose a hazard</td>
<td>Papers, cardboards, empty bottles, tetra packs, scrap materials, pressurized containers, office wastes, food waste and other materials of patients with non-communicable disease, x-ray plates</td>
</tr>
</tbody>
</table>
2.2.1 Infectious Waste

These are wastes that are most likely to contain pathogens (bacteria, viruses, parasites or fungi) in sufficient concentration or quantity to cause diseases in susceptible hosts which includes:

- cultures and stocks of infectious agents from laboratory work; waste from surgeries and autopsies (e.g. tissues, materials or equipment that have been in contact with blood or other body fluids);
- waste from infected patients in isolation wards (e.g. excreta, dressings from infected or surgical wounds, clothes heavily soiled with human blood or other body fluids);
- waste that have been in contact with infected patients undergoing haemodialysis (e.g. dialysis implements such as tubing and filters, disposable towels, gowns, aprons, gloves and laboratory coats); infected animals from research laboratories; any other instruments or materials that have been in contact with infected persons or animals.

Among these, highly infectious wastes are wastes from microbial cultures and stocks of highly infectious agents from medical analysis laboratories. Body fluids from patients with highly infectious diseases are also considered as highly infectious waste. Highly infectious disease refers to those causative organisms under Biosafety Levels III and IV, such as Severe Acute Respiratory Syndrome (SARS), Human Immunodeficiency Virus (HIV), Acquired Immunodeficiency Syndrome (AIDS), pulmonary tuberculosis (PTB), anthrax and ebola (WHO Laboratory Biosafety Manual, 3rd edition, 2004).
The DOH Administrative Order 2010-33 considers diseases such as meningococcemia, viral haemorrhagic fevers, the plague, hepatitis B and C, rabies, invasive group A streptococcal infections, and transmissible spongiform encephalitis (TSE) such as Mad Cow Disease and Creutzfeldt-Jakob disease as highly infectious and dangerous diseases.

Special requirements regarding management of infectious waste must be imposed whenever waste is known or – based on medical experience – expected to be contaminated with causative agents of diseases and when this contamination gives cause for concern that the disease might spread.

2.2.2 *Sharps*

![Figure 2.2 Examples of Sharps Waste](image)

Sharps are considered as the most hazardous waste generated in HCF and must be managed with utmost care. This is because of the double danger it poses. It can cause injuries through accidental pricks, cuts or punctures. Aside from this, one can also be infected with a pathogen through these injuries. Examples of sharps include needles, syringes, scalpels, saws, blades, broken glass, infusion sets, knives, nails and any other items that can cause a cut or puncture wounds. Whether or not they are infected, such items are usually considered as highly hazardous HCW.

2.2.3 *Pathological and Anatomical Waste*

![Figure 2.3 Pathological Waste](image)
Pathological waste consists of tissues, organs, body parts, blood, body fluids, other waste from surgery and autopsies, including human fetuses and animal carcasses. Recognizable human or animal body parts are also called anatomical waste.

2.2.4 Pharmaceutical Waste Including Genotoxic/Cytotoxic/Antineoplastic Waste

Pharmaceutical waste includes expired, spilt and contaminated pharmaceutical products, drugs, vaccines and sera that are no longer required and need to be disposed of appropriately. This category also includes discarded items used in handling of pharmaceuticals such as bottles or boxes with residues, gloves, masks, connective tubing and drug vials.

Genotoxic waste causes damage to the cell’s DNA. This includes certain antineoplastic (anti-tumor) and cytotoxic (cell-killer) drugs. This type of waste is highly hazardous and may have mutagenic, teratogenic or carcinogenic effects.

Figure 2.4 Examples of Cytotoxic Pharmaceuticals

Harmful cytotoxic drugs can be categorized as follows:

- **Alkylating Agents**: These are also called DNA-damaging agents. These cause alkylation of DNA nucleotides, which leads to cross-linking and miscoding of the genetic stock;
- **Anti-metabolites**: These drugs imitate the role of purine and pyrimidine as the building blocks of DNA. Thus, they inhibit the biosynthesis of nucleic acids in the cell; mitotic inhibitors: prevent cell division
- **Plant Alkaloids and Terpenoids**: These chemicals inhibit microtubule function thereby halting cell division. Examples of these are vinca alkaloids derived from the *Catharanthus roseus* plant (Common Name: Tsitsirika)
- **Podophyllotoxins**: These compounds are derived from *Podophyllum peltatum* (Common Name: Mayapple). They prevent cell division by inhibiting the cell from entering the G1 Phase. These compounds also affect DNA synthesis
- **Intercalating Agents**: These wedge between the DNA bases, affecting the structure of the DNA and preventing polymerase and other DNA binding proteins from functioning properly.
Cytotoxic waste is generated from several sources and includes the following:

- Contaminated materials from drug preparation and administration, such as syringes, needles, gauges, vials, packaging, out-dated drugs, excess (left over) solutions and drugs returned from the wards
- Urine, feces and vomits from patients which may contain potentially hazardous amounts of the administered cytotoxic drugs and/or their metabolites and which shall be considered genotoxic for at least 48 hours and sometimes up to 1 week after drug administration.

It is necessary for patients who are taking cytotoxic medication to have a separate water closet, which is exclusive for the use of these patients. This will ensure that other patients will not be exposed to cytotoxic drugs. Moreover, it will also ensure that the urine, vomit, excreta and other body fluids coming from these patients will be adequately treated before these wastes are mixed with other wastes in the Sewage Treatment Plant (STP).

**Table 2.2 Cytotoxic Drugs Hazardous to Eyes and Skin**

<table>
<thead>
<tr>
<th>Alkylating Agents</th>
<th>Vesicant Drugs: aclarubicin, mechloretamine, cisplatin, mitomycin</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Irritant Drugs: carmustine, cyclophosphamide, dacarbazine, ifosfamide, melphalan, streptozocin, thiotepa</td>
</tr>
<tr>
<td>Anti-metabolites</td>
<td>Irritant: methotrexate, fludarabine, cytarabine</td>
</tr>
<tr>
<td>Intercalating Agents</td>
<td>Vesicant Drugs: amsacrine, dactinomycin, daunorubicin, doxorubicin, epirubicin, pirarubicin, zorubicin</td>
</tr>
<tr>
<td></td>
<td>Irritant Drugs: mitoxantrone</td>
</tr>
<tr>
<td>Vinca Alkaloids and Derivatives</td>
<td>Vesicant Drugs: vinblastine, vincristine, vindesine, vinorelbine</td>
</tr>
<tr>
<td>Podophyllotoxins</td>
<td>Irritant Drugs: teniposide</td>
</tr>
</tbody>
</table>

### 2.2.5 Chemical Waste

Chemical waste consists of discarded solid, liquid and gaseous chemicals used in diagnostic and experimental work and in cleaning, housekeeping and disinfecting procedures. Chemical waste from HCF can be hazardous or non-hazardous.
Chemical waste is considered hazardous if it has at least one of the following properties:

- **Toxic**: chemicals that have the capacity to harm biological tissue
- **Corrosive**: chemicals that can cause severe burns to skin and other biological tissues including eyes and lungs (e.g. acids of pH<2 and bases of pH>12)
- **Flammable**: chemicals that ignite/burn easily in normal working temperatures (e.g. chemicals with flashpoint below 37.8°C or 100°F)
- **Reactive**: chemicals that can react by themselves when exposed to heat, pressure, shock, friction, catalyst presence or by contact with air or water

### Table 2.3 Examples of Chemical Wastes Commonly Found in HCF

<table>
<thead>
<tr>
<th>Chemical Waste</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halogenated solvents</td>
<td>chloroform, methylene chloride, perchloroethylene, refrigerants, trichloroethylene</td>
</tr>
<tr>
<td>Non-halogenated solvents</td>
<td>acetone, acetonitrile, ethanol, ethyl acetate, formaldehyde, isopropanol, methanol, toluene, xylenes</td>
</tr>
<tr>
<td>Halogenated disinfectants</td>
<td>calcium hypochlorite, chlorine dioxide, iodine solutions, iodophors, sodium dichloroisocyanurate, sodium hypochlorite (bleach)</td>
</tr>
<tr>
<td>Aldehydes</td>
<td>formaldehyde, glutaraldehydes, ortho-phthalaldehyde</td>
</tr>
<tr>
<td>Alcohols</td>
<td>ethanol, isopropanol, phenols</td>
</tr>
<tr>
<td>Other disinfectants</td>
<td>hydrogen peroxide, peroxyacetic acid, quarternary amines</td>
</tr>
<tr>
<td>Metals</td>
<td>arsenic, cadmium, chromium, lead, mercury, silver</td>
</tr>
<tr>
<td>Acids</td>
<td>acetic, chromic, hydrochloric, nitric, sulfuric</td>
</tr>
<tr>
<td>Bases</td>
<td>ammonium hydroxide, potassium hydroxide, sodium hydroxide</td>
</tr>
<tr>
<td>Oxidizers</td>
<td>bleach, hydrogen peroxide, potassium dichromate, potassium permanganate</td>
</tr>
<tr>
<td>Reducers</td>
<td>sodium bisulfite, sodium sulfite</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>anaesthetic gases, asbestos, ethylene oxide, herbicides, paints, pesticides, waste oils</td>
</tr>
</tbody>
</table>
Non-hazardous chemical waste consists of chemicals with none of the above properties, such as sugar, amino acids and certain organic and inorganic salts.

Waste with high heavy-metal content represents a subcategory of hazardous chemical waste, and are usually highly toxic. Heavy metals refer to metallic chemical elements that have a high density and are relatively toxic at low levels. Heavy metals have a specific gravity lesser than five times the specific gravity of pure water, which is 1 at 4°C. These cannot be degraded nor destroyed by the body. Thus, heavy metals are bio-persistent and tend to bio-accumulate. The following are examples of heavy metals:

**Figure 2.6 Examples of Waste Containing Heavy Metals**

- **Mercury** is a naturally occurring silvery-white liquid metal that readily vaporizes. When released to the air, mercury is transported and deposited globally. Mercury ultimately accumulates in the lake bottom in the form of sediments, where it is transformed into its more toxic organic form, methyl mercury, which accumulates in fish tissue. There are 3 types of mercury: elemental, inorganic and organic. Mercury waste is typically generated by spillage from broken clinical equipment (mercury thermometer, sphygmomanometer, etc.). Whenever possible, spilled drops of mercury shall be recovered. Residues from dental laboratories have high mercury content.

- **Cadmium** is a soft, bluish white metal that has a rapid electrical and thermal conductivity. It is highly resistant to stress and corrosion. Cadmium waste comes mainly from discarded batteries, dental alloys, pigments and electronic devices.

- **Lead** is a bluish white lustrous metal that is highly malleable and ductile. Lead waste usually comes from batteries, petroleum, rolled and extruded products, ammunition and pipes. Also, certain “reinforced wood panels” containing lead is still being used in radiation proofing in X-ray and diagnostic departments.
2.2.6 Radioactive Waste

Radioactive waste includes disused sealed radiation sources, liquid and gaseous materials contaminated with radioactivity, excreta of patients who underwent radionuclide diagnostic and therapeutic applications, paper cups, straws, needles and syringes, test tubes and tap water washings of such paraphernalia. It is produced as a result of procedures such as in vitro analysis of body tissues and fluids, in vivo organ imaging, tumor localization and treatment and various clinical studies involving the use of radioisotopes. Radioactive HCW generally contain radionuclides with short half-lives, which lose their activity in a shorter time.

2.2.7 Non-Hazardous or General Waste

This includes all the wastes that have not been infected like general office waste, packaging, leftover food, x-ray plates and non-hazardous pharmaceutical waste. They are comparable to domestic waste, which does not pose special handling problem or hazard to human health or to the environment. They comprise around 70% of the generated waste in any HCF. General waste shall be dealt with by the municipal waste disposal system.

Non-hazardous or general waste can be further classified into:

2.2.7.1 Recyclable Waste

Examples of common recyclable materials found in HCFs:
• **Paper products**: corrugated cardboard boxes, office paper, computer printout paper, ledger paper, newspaper, magazines
• **Aluminium**: beverage cans, food cans, other aluminium containers
• **Pressurized Gas Containers**: disinfectant sprays, oxygen tanks. Many of these, once empty or of no further use (although they may still contain residues) are reusable, but certain types, notably aerosol cans, must be disposed of safely. Whether inert or potentially harmful, gases in pressurized containers shall always be handled with care.
• **Plastics**: polyethylene terephthalate (PET) plastic water bottles, PET soft drink bottles, high density polyethylene (HDPE) plastic milk containers, HDPE containers for food and mild solutions, polypropylene plastic bottles for saline solutions or sterile irrigation fluids, polystyrene packaging
• **Glass**: clear glass, colored or mixed glass, crushed vials/ampules
• **Wood**: scrap wood, wood shipping pallets
• **Durable goods**: used furniture, bed frames, carpets, curtains
• **Electronic Devices**: computer equipment, printer cartridges, photocopying toners

2.2.7.2 *Biodegradable HCW* includes leftover food of patients with non-communicable disease or garden waste such as cut grasses or tree trimmings that can be composted.

![Figure 2.9 Example of Biodegradable Waste](image-url)
2.2.7.3 *Non-recyclable/non-biodegradable HCW* includes all the non-hazardous or general wastes that do not belong to the previous two categories (2.2.7.1 and 2.2.7.2).

![Figure 2.10 Example of Non-Recyclable/ Non-Biodegradable Waste](image)

2.3 Sources and Composition of Healthcare Waste

Not all the wastes generated in HCF are hazardous. As demonstrated by Figure 2.11, most of the wastes generated by HCF are non-hazardous general waste. According to the Asian Development Bank (ADB), only 30.37% of the wastes coming from HCF are hazardous. The remaining 69.63% are general waste. It is also estimated in the same study that a hospital generates an average of 0.34 kg/bed/day of infectious, sharps and pathological waste and 0.39 kg/bed/day of general wastes.

![Figure 2.11 Composition of Healthcare Waste in Metro Manila](image)

*Source: ADB, 2003*

The kind and characteristic of HCW produced depends on the type of HCF and the specific area within the HCF that generates the waste. Table 2.4 lists the different types of HCF and the typical HCW produced.
Table 2.4 Sources and Categories of Healthcare Waste (HCW)

<table>
<thead>
<tr>
<th>Sources of Healthcare Waste</th>
<th>Categories of Healthcare Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital and Medical Centers</td>
<td>Infectious Waste</td>
</tr>
<tr>
<td></td>
<td>Sharps</td>
</tr>
<tr>
<td></td>
<td>Pathological and Anatomical Waste</td>
</tr>
<tr>
<td></td>
<td>Pharmaceutical including genotoxic/cytotoxic/antineoplastic Waste</td>
</tr>
<tr>
<td></td>
<td>Chemical Waste</td>
</tr>
<tr>
<td></td>
<td>Radioactive Waste</td>
</tr>
<tr>
<td></td>
<td>Non-Hazardous or General waste</td>
</tr>
<tr>
<td>Clinics and Other HCF</td>
<td>The type of wastes generated varies. There are HCFs that generate all the categories, others produce only 2 or 3 types of HCW</td>
</tr>
<tr>
<td>Emergency Medical Care Services</td>
<td>The volume of HCW generated varies based on the type and number of clients served.</td>
</tr>
<tr>
<td>Health Centers and Dispensaries</td>
<td></td>
</tr>
<tr>
<td>Obstetrics, Maternity and Lying-in Clinics</td>
<td></td>
</tr>
<tr>
<td>Out-Patient Clinics</td>
<td></td>
</tr>
<tr>
<td>Dialysis Centers</td>
<td></td>
</tr>
<tr>
<td>Blood Banks and Blood Collection Centers</td>
<td></td>
</tr>
<tr>
<td>Drug Testing Centers</td>
<td></td>
</tr>
<tr>
<td>Rehabilitation Establishments and Hospices</td>
<td></td>
</tr>
<tr>
<td>Transfusion Centers</td>
<td></td>
</tr>
<tr>
<td>Military Medical Services</td>
<td></td>
</tr>
<tr>
<td>Prison Hospital and Clinics</td>
<td></td>
</tr>
<tr>
<td>Physician’s Offices/Clinics</td>
<td></td>
</tr>
<tr>
<td>Dental Clinics</td>
<td></td>
</tr>
<tr>
<td>Dermatology/Skin Clinics</td>
<td></td>
</tr>
<tr>
<td>Alternative Medicines Clinics such as acupuncture, chiropractic, health spa</td>
<td></td>
</tr>
<tr>
<td>Specialized HCF such as convalescing homes and Differently Abled Person (DAP) Centers</td>
<td></td>
</tr>
<tr>
<td>Related Laboratories and Research Centers</td>
<td>General waste</td>
</tr>
<tr>
<td>Medical and Bio-medical Laboratories and Institutions</td>
<td>Sharps</td>
</tr>
<tr>
<td>Biotechnology Laboratories and Institutions</td>
<td>Chemical waste</td>
</tr>
<tr>
<td>Medical Research Centers</td>
<td>Radioactive materials</td>
</tr>
<tr>
<td>Blood Banks and Blood Collection Services</td>
<td>Pathological and Anatomical waste</td>
</tr>
<tr>
<td>Nuclear Medicines Laboratories</td>
<td>Tissue samples packed in formalin or placed in containers with formalin are not considered as infectious waste.</td>
</tr>
<tr>
<td>Animal Research Laboratories</td>
<td>The tissue sample and the formalin are classified as pathological and chemical wastes, respectively.</td>
</tr>
</tbody>
</table>
Sources of Healthcare Waste | Categories of Healthcare Waste
---|---
HCF Mortuary and Autopsy Centers | Infectious waste
| Sharps
| Pathological and Anatomical waste
HCF Pharmaceutical and Chemical Department | General waste,
| Pharmaceutical and Chemical wastes (possibly cytotoxic drugs if chemotherapy treatment are prepared in the pharmacy)
Ambulances and Emergency Care Mobile Services such as mobile X-ray, mobile surgical and medical services, (including medical mission and health services provided in evacuation centers) | Infectious Waste
| Sharps
| General Waste
| Pharmaceutical Waste

The source often characterizes the composition of HCW being generated. It is important to determine the source of waste in order to provide the appropriate tools to be applied. Knowing the types and quantities of HCW generated in a HCF is important in understanding the hazard and risk that people, community and the environment maybe facing.

2.4 Impacts of Healthcare Waste to Human Health and the Environment

The inadequate handling and disposal of HCW may lead to transmission of infectious diseases. The groups most at risk are HCF workers, patients, general public, the community as well as the environment. Therefore, the framework for management shall always consider first and foremost patient’s health and HCF workers safety.

There are many potential hazards associated when dealing or handling HCW such as physical, chemical and biological hazards as well as psychosocial and ergonomic. The HCF shall identify all these specific potential environmental and occupational hazards during handling, storing, treating and disposing of HCW. A team consisting of trained industrial hygienist, safety officer, infection control, waste management officer and other HCF professionals can work together to identify potential hazards and ways to reduce if not to eliminate the hazard.

Apart from the risk to the patients and HCF workers, consideration must be given to the adverse impacts of HCW to the general public and the environment. In particular, attention shall be focused on the possible result of unmanaged waste to air, water and soil, including the community. Minimizing the risk to public health and the environment will require actions to deal with HCW within the HCF such as proper waste segregation and minimization so that it does not enter the waste stream requiring further treatment before disposal.

While the HCF workers are at greater risk of infection through injuries from contaminated sharps, other workers and waste management operators outside of the HCF
are also at risk. Certain infection, however, spread through media or caused by more resilient agents, may pose a significant risk to the public. For example, the uncontrolled discharges of wastewater from HCF such as field hospitals treating cholera patients are potential source of cholera epidemic. However, the use of strong disinfectant shall be minimized when there are alternatives as these can also chemically pollute the water.

Chemicals used in HCF are potential source of water pollution via the sewer system. Chemical waste survey is a prerequisite to the development of an effective waste management program. Any hazardous chemical waste generated shall be dealt with by a proper chemical waste management system. For safety purposes, always refer to the Material Safety Data Sheet (MSDS). Substituting chemicals with substance that have lesser environmental and health impacts is a sound practice. Accidental spillage within an HCF shall also be dealt with accordingly to minimize impact on human health and environment.

Pathogenic microorganisms have limited ability to survive in the environment. This ability is specific to each microorganism and is a function of its resistance to environmental conditions such as temperature, humidity, ultraviolet irradiation, availability of organic substrate material, presence of predators, etc.

An example of this is the hepatitis B virus, which is persistent in dry air and can survive for several weeks on a surface and brief exposure to boiling water. It can also survive exposure to some antiseptics and to 70% ethanol and remains viable for up to 10 hours at a temperature of 60°C. The Japanese Association for Research on Medical Waste found out that an infective dose of hepatitis B or C virus can survive for up to a week in a blood droplet trapped inside a hypodermic needle. In contrast, HIV is much less resistant. It only survives for no more than 15 minutes when exposed to 70% ethanol and only 3 to 7 days at ambient temperature. It can be inactivated at 56°C temperature.

Bacteria are less resistant than viruses, but less is known about the survival of prions and agents in degenerative neurological disease (Creutzfeldt-Jakob disease, kuru, etc.) which seems to be very resistant.

In evaluating the spread or survival of pathogenic microorganisms in the environment, the role of vectors (e.g. rodents and insects) shall be considered. This applies to management of HCW both within and outside HCF. Vectors such as rats, flies, cockroaches, which feed or breed on organic waste, are well known passive carriers of microbial pathogens; their population may increase dramatically where there is lack of waste management.

In addition, the public is very sensitive about the visual impact of anatomical waste, such as, recognizable body parts and fetus. The present culture in the country does not accept the disposal of anatomical waste inappropriately, such as in a landfill.
2.4.1 Person at Risk

All individuals exposed to hazardous HCW are potentially at risk, including those within the HCF that generate hazardous waste, and those outside these sources who either handle such waste or are exposed to it as a consequence of careless management. The main groups of people at risk to potential health hazards associated with HCW are the following:

- HCF staff such as physicians, nurses, healthcare auxiliaries and hospital maintenance personnel
- Personnel and workers providing support and allied services to HCF such as laundry, waste handling and transporting
- Patients in HCF or those receiving home care
- Visitors, comforters and caregivers
- Persons transporting hazardous HCW to treatment and disposal facilities
- Workers and operators of waste treatment and disposal facilities, i.e. sanitary landfill workers including scavengers
- Workers in mortuaries, funeral parlors and autopsy centers
- The general public

The hazards associated with scattered, small sources of HCW shall not be overlooked. Waste from these sources includes those that are generated by home-based healthcare such as dialysis and that of illegal drug use (usually intravenous).

2.4.2 Exposure to Hazardous Healthcare Waste

Exposure to hazardous HCW can result to disease or injury. The hazardous nature of HCW may be due to one or more of the following characteristics:

- it contains infectious agents
- it is genotoxic or cytotoxic
- it contains toxic or hazardous chemicals or pharmaceuticals
- it is radioactive
- it contains sharps

2.4.2.1 Hazards from Pathological/Anatomical Wastes, Infectious Wastes and Sharps

Infectious waste may contain any of a great variety of pathogenic organisms. Pathogenic organism present in blood and other tissues have already demonstrated their infectious and virulent characteristics. Pathogens in infectious waste may enter the human body by a number of routes:

a) through a puncture, abrasion or cut in the skin
b) through the mucous membrane
c) by inhalation
d) by ingestion
Table 2.5  Potential Infections Caused by Exposure to Healthcare Wastes, Causative Organisms and Transmission Vehicle

<table>
<thead>
<tr>
<th>Type of Infection</th>
<th>Examples of Causative Organisms</th>
<th>Transmission Vehicles (Waste items contaminated with the following:)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroenteric infection</td>
<td>Enterobacteria, e.g. <em>Salmonella</em>, <em>Shigella</em> spp.; <em>Vibrio cholera</em>; <em>Giardia lamblia</em>; <em>Clostridium difficile</em>; helminths</td>
<td>Feces and/or vomit</td>
</tr>
<tr>
<td>Respiratory infection</td>
<td><em>Mycobacterium tuberculosis</em>; measles virus; <em>Streptococcus pneumonia</em>, Severe Acute Respiratory Syndrome</td>
<td>Inhaled secretions; saliva</td>
</tr>
<tr>
<td>Ocular infection</td>
<td>Herpes virus</td>
<td>Eye secretions</td>
</tr>
<tr>
<td>Genital infection</td>
<td><em>Neisseria gonorrhoeae</em>; herpes virus</td>
<td>Genital secretions</td>
</tr>
<tr>
<td>Skin infection</td>
<td><em>Streptococcus</em> spp.</td>
<td>Pus</td>
</tr>
<tr>
<td>Anthrax</td>
<td><em>Bacillus anthracis</em></td>
<td>Skin secretions</td>
</tr>
<tr>
<td>Meningitis</td>
<td><em>Neisseria meningitides</em></td>
<td>Cerebrospinal fluid</td>
</tr>
<tr>
<td>Acquired Immunodeficiency syndrome (AIDS)</td>
<td>Human immunodeficiency virus</td>
<td>Blood, sexual secretions, body fluids</td>
</tr>
<tr>
<td>Haemorrhagic fever</td>
<td>Junin, Lassa, Ebola, and Marburg viruses</td>
<td>Feces and all body secretions</td>
</tr>
<tr>
<td>Septicaemia</td>
<td><em>Staphylococcus</em> spp.</td>
<td>Blood</td>
</tr>
<tr>
<td>Bacteraemia</td>
<td>Coagulase-negative <em>Staphylococcus</em> spp.; (including Methicillin-resistant <em>S. aureus</em>); <em>Enterobacter</em>, <em>Enterococcus</em>, <em>Klebsiella</em>, and <em>Streptococcus</em> spp.</td>
<td>Nasal secretion, skin contact</td>
</tr>
<tr>
<td>Candidaemia</td>
<td><em>Candida albicans</em></td>
<td>Blood</td>
</tr>
<tr>
<td>Viral Hepatitis A</td>
<td>Hepatitis A virus</td>
<td>Feces</td>
</tr>
<tr>
<td>Viral Hepatitis B and C</td>
<td>Hepatitis B and C viruses</td>
<td>Blood and body fluids</td>
</tr>
<tr>
<td>Avian influenza</td>
<td>H5N1 virus</td>
<td>Blood, feces</td>
</tr>
</tbody>
</table>
2.4.2.2 Hazards from Chemical and Pharmaceutical Wastes

Although chemical and pharmaceutical wastes may be found in small quantities in HCF, these substances are hazardous. They may cause intoxication, either by acute or by chronic exposure and injuries, including burns. Intoxication can result from absorption of a chemical or pharmaceutical substance through the skin or the mucous membranes, or from inhalation or ingestion. Injuries to the skin, the eyes or the mucous membranes of the airways can be caused by contact with flammable, corrosive or reactive chemicals (e.g. formaldehyde and other volatile substances). The most common injuries are burns.

Disinfectants are one of the commonly used chemical product in HCF. It is used in large quantities and is often corrosive. It shall be noted that reactive chemicals may form highly toxic secondary compounds. Like silver, they may also be priming bacteria to become antibiotic resistant (McCay et al., 2010).

Obsolete pesticides, stored in leaking containers, can directly or indirectly affect the health of anyone exposed including the ground water. Poisoning can occur through direct contact with products, inhalation of vapors, drinking of contaminated water or eating of contaminated food. Other hazards may include the possibility of fire and contamination as a result of inadequate disposal such as burning or burying.

Chemical residues discharged into the sewerage system may have adverse effects on the operation of STP or on the natural ecosystems of receiving waters. Similar problems may be caused by pharmaceutical residues, which may include antibiotics and other drugs, heavy metals such as mercury, phenol and derivatives, disinfectants and antiseptic.

Mercury is highly toxic, especially when metabolized into methyl mercury. It may be fatal if inhaled and harmful if absorbed through the skin. Around 80% of the inhaled mercury vapor is absorbed in the blood through lungs. It may cause harmful effects to the nervous, digestive, respiratory and immune systems. While the use of mercury in HCF is decreasing, another toxic heavy metal, silver, is being used in even more applications, including nanotechnology. It is a bactericide and large doses can turn a person’s skin permanently grey (Silver, 2003).

2.4.2.3 Hazards from Genotoxic and Cytotoxic/Antineoplastic Wastes

The severity of hazards for HCF workers assigned to handle or dispose genotoxic waste is governed by a combination of the substance toxicity itself and the extent and duration of exposure. Exposure to genotoxic substances in HCF may also occur during the preparation of or treatment with particular drugs or chemicals. The pathways of exposure are inhalation of dust or aerosols, absorption through the skin, ingestion as a result of improper practice, such as mouth pipetting. Exposure may also occur through contact with the body fluids and secretions of patients undergoing chemotherapy.

The cytotoxicity of many antineoplastic drugs is cell-cycle-specific, targeted on specific intracellular processes such as DNA synthesis and mitosis. Other antineoplastics, such as alkylating agents are not phase specific, but cytotoxic at any
point in the cell cycle. Many cytotoxic drugs are extremely irritating and have harmful local effects after direct contact with skin or eyes (Table 2.2). They may also cause dizziness, nausea, headache or dermatitis. Special care in handling genotoxic waste is therefore essential; any indiscriminate disposal of such waste will result to health problems.

2.4.2.4 Hazards from Radioactive Waste

Health effects caused by exposure to radioactive substance or contaminated materials can range from reddening of the skin and nausea to more serious problems such as cancer induction and genetic consequences to succeeding generations of the exposed individual. The handling of high activity sources, e.g. certain sealed and unsealed radiation sources used in cancer therapy, poses higher health risks such that adequate protective measures have to be established to minimize these risks.

The health hazards from low activity contaminated wastes may arise from external and internal exposures from undetected contaminated working environment and improper handling and storage of radioactive wastes and spent/unused radiation sources. Both the workers and other staff personnel are at risk to this health hazard.

2.4.2.5 Hazards from Wastewater

Wastewater from HCF is composed of a myriad of materials that pose a hazard to public health and to the environment. Some of the components of wastewater include the following:

1. Pathogens
2. Salts
3. Metals
4. Toxic organic compounds
5. Nutrients (nitrogen, phosphorous, potassium)
6. Organic Matter
7. Suspended Solids
8. Acids and Bases

Wastewater may contain pathogens such as bacteria, helminths, protozoa and viruses that are hazardous if the wastewater is inadequately treated or the untreated wastewater is used for irrigation of crops. The salt content in wastewater may also increase soil salinity in the area, rendering the soil useless for agricultural purposes.

Wastewater may also contain trace amounts of metals that can accumulate in the environment. Toxic organic compounds with carcinogenic, teratogenic and mutagenic effects may also be present in wastewater from HCF. Pharmaceutical residues or their by-products present in the wastewater may also contaminate surface water or ground water, thereby exposing humans through drinking water. Suspended solids in wastewater are generally non-biodegradable and may lead to clogging of drains if not treated.
Pathogens present in the wastewater can cause waterborne diseases and thus can survive in the liquid medium. The people in the HCF and the general public are in danger of contracting these waterborne diseases if the wastewater from the HCF is not given adequate treatment. Several diseases that can be transmitted via wastewater include the following:

- **Capylobacteriosis** is an infection of the gastrointestinal tract (severe form of diarrhoea). This is caused by a bacterium, usually *Campylobacter jejuni* or *C. coli*. People are exposed to the bacteria after consuming food or water contaminated with wastewater or sludge.

- **Cholera** is an acute infection of the intestine caused by the bacterium *Vibrio cholera*. It causes severe diarrhoea and vomiting leading to immediate dehydration and electrolyte imbalance in the body. People become infected after eating food or drinking water that has been contaminated by feces of infected persons. If uncontrolled, cholera is known to cause severe and widespread epidemics. Several countries are issuing travel bans to areas known to be endemic of this disease.

- **Cryptosporidiosis** is caused by the protozoan *Cryptosporidium parvum*. This causes acute diarrhoea and is dangerous to people who are immune-compromised (such as children, HIV/AIDS patients and the elderly) as it can cause death. It is spread when fecal matter from contaminated individuals enters a water body.

- **Hepatitis A and Hepatitis E** are diseases brought about by viruses. Upon ingestion of contaminated food or water, the virus infects the liver causing it to be inflamed. Infection may lead to liver failure causing death. The disease is especially fatal for pregnant women and the elderly. Both infections are transmitted via fecal-oral route, often through contaminated water due to inadequate sanitation systems.

- **Typhoid Fever** is a bacterial infection of the intestinal tract and the bloodstream caused by the bacteria *Salmonella typhi* and *Salmonella paratyphi*. The WHO considers this as a serious public health problem. It causes fevers as high as 40°C that oscillates within 24 hours, intestinal haemorrhage and delirium. It mostly affects very young children and adolescents. People become infected by drinking water that has been contaminated by wastewater containing the bacteria.
CHAPTER 3: LAWS, POLICIES, GUIDELINES AND PROTOCOLS

HCF as generators of HCW are responsible for the collection, handling, segregation, transport, treatment and disposal of the HCW they produce. It is therefore imperative for them to be cognizant of the existing international agreements, national laws, policies and specific administrative requirements related to HCWM. These agreements, national laws, policies and specific administrative requirements will provide them direction in developing their respective HCWM program.

This chapter provides the salient points of the international agreements, national laws and policies and technical guidelines that govern HCWM.

3.1 International Agreement

3.1.1 The Montreal Protocol on Substances that Deplete the Ozone Layer (1987)

The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in Montreal, Canada on 16 September 1987 and came into force, as agreed, on 1 January 1989. It sets the final objective of the Protocol to eliminate ozone depleting substances in the environment.


The Basel Convention concerns the trans-boundary movements of hazardous waste. The countries that signed the Convention accepted the principle that only legitimate trans-boundary shipments of hazardous waste are exported from countries that lack the facilities or expertise to dispose safely of certain waste to other countries that have both the facilities and expertise.”

3.1.3 The United Nations Framework Convention on Climate Change (1992)

The United Nations Framework Convention on Climate Change (UNFCCC) in 1992 included a legally non-binding pledge that by the year 2000 the major industrialized nations would voluntary reduce their greenhouse gas emissions to 1990 levels.

3.1.4 The Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997)

The Kyoto Protocol pertains to the reduction of emissions of heat-trapping gases in the atmosphere. The six gases covered by the Protocol are carbon dioxide (CO$_2$), methane (CH$_4$), nitrous oxide (N$_2$O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF$_6$).

3.1.5 The Stockholm Convention on Persistent Organic Pollutants (2001)

The Stockholm Convention is a global treaty to protect human health and the environment from persistent organic pollutants (POPs). Persistent Organic Pollutants are
chemicals that have the following characteristics: 1) remains unchanged in the environment for long periods of time; 2) accumulate in the fatty tissue of living organisms; and 3) are toxic to both humans and wildlife.

3.2 National Laws and Policies

3.2.1 Republic Act No. 4226 “Hospital Licensure Act” (1965)

The Hospital Licensure Act requires the registration and licensure of all hospitals in the country and mandates the DOH to provide guidelines for the hospital technical standards as to personnel, equipment and physical facilities.

3.2.1.1 DOH Administrative Order No. 70-A series of 2002 “Revised Rules and Regulations Governing the Registration, Licensure and Operation of Hospitals and Other Health Facilities in the Philippines”

The Administrative Order includes in the application or renewal of license, submission of plans and other design requirements under the Code of Sanitation of the Philippines, National Plumbing Code of the Philippines, Revised Fire Code of the Philippines and National Building Code of the Philippines. The Manuals on Hospital Waste Management and Health Facilities Maintenance are also required for submission for verification by the DOH- Bureau of Health Facilities and Services (BHFS).

3.2.1.2 DOH Administrative Order No. 2005-0029 dated December 12, 2005 “Amendment to Administrative Order No. 70-A series of 2002 re: Revised Rules and Regulations Governing the Registration, Licensure and Operation of Hospitals and Other Health Facilities in the Philippines”

The Administrative Order requires the HCF to submit a Healthcare Waste Management Plan to BHFS as one of its requirements for the issuance of license to operate.

3.2.1.3 DOH Administrative Order No. 2007-0027 dated August 22, 2007 “Revised Rules and Regulations Governing the Licensure and Regulation of Clinical Laboratories in the Philippines”

The Administrative Order requires written procedures for the proper disposal of healthcare waste and other hazardous substances and required written policy guidelines on bio-safety and bio-security.

3.2.2 Republic Act No. 6969 “An Act to Control Substances and Hazardous and Nuclear Wastes” (1990)

The law and its implementing rules and regulations require the registration of waste generators, waste transporters and operators of toxic and hazardous waste treatment facilities with the EMB. The waste generators are required to ensure that its hazardous wastes are properly collected, transported, treated and disposed of to a sanitary landfill.
3.2.2.1 **DENR Administrative Order No. 36, Series of 2004 “Revising DENR Administrative Order No. 29, Series 1992, to Further Strengthen the Implementation of Republic Act 6969 and Prescribing the Use of the Procedural Manual”**

The Procedural Manual requires a comprehensive documentation on the legal and technical requirements of hazardous waste management. The Manual does not include provisions regarding the management of nuclear wastes. It is composed of ten sections that discuss the classification of hazardous wastes, waste generators and transporters, storage and labelling, Treatment, Storage and Disposal (TSD) facilities, manifest system, monitoring, prohibited acts and schedule of fees.

3.2.2.2 **DOH-DENR Joint Administrative Order No. 02 series of 2005 dated August 24, 2005 entitled “Policies and Guidelines on Effective and Proper Handling, Collection, Transport, Treatment, Storage and Disposal of HCW”**

The Joint Administrative Order aims to: a) provide guidelines to generators, transporters and operators/owners of TSD Facilities on proper handling, collection, transport, storage, treatment and disposal of HCW; b) clarify the jurisdiction, authority and responsibility of the DENR and DOH with regard to HCWM; and c) harmonize the efforts of the DENR and the DOH on HCWM.

3.2.2.3 **DOH Administrative Order 2007-0014 “Guidelines on the Issuance of Certificate of Product Registration for Equipment or Devices Used for Treating Sharps, Pathological and Infectious Waste”**

The Administrative Order requires the manufacturers, importers and distributors, including generators of HCW that sell and/or use equipment and devices in treating sharps, pathological and infectious waste to secure a Certificate of Product Registration (CPR) from DOH through the Bureau of Health Devices and Technology.

3.2.3 **Republic Act No. 8749 “The Philippine Clean Air Act of 1999”**

The Act prohibits the incineration of bio-medical wastes effective July 17, 2003. It promotes the use of state of the art, environmentally sound and safe non-burn technologies for the handling, treatment, thermal destruction, utilization and disposal of sorted, unrecycled biomedical and hazardous wastes.

3.2.4 **Republic Act No. 9003 “Ecological Solid Waste Management Act of 2000”**

The Act mandates the segregation of solid wastes at the source including households and institutions like hospitals by using a separate container for each type of waste from all sources.
3.2.5 Republic Act 9275 “The Philippine Clean Water Act of 2004”
The Act shall pursue a policy of economic growth in a manner consistent with the protection, preservation and revival of the quality of the country’s fresh, brackish and marine waters.

3.2.6 Presidential Decree 813 (1975) and Executive Order 927 (1983) “Strengthening the Functions of Laguna Lake Development Authority (LLDA)”
The powers and functions of the LLDA were further strengthened to include environmental protection and jurisdiction over surface waters of the Laguna Lake basin. Through EO 927, the LLDA is empowered to issue permits for use of surface waters within Laguna de Bay.

3.2.7 Presidential Decree 856 “The Code on Sanitation of the Philippines – Chapter XVII on Sewage Collection and Excreta Disposal” (1998)
The law and its IRR on Sewage Collection and Disposal, Excreta Disposal and Drainage require the approval of the DOH in terms of the following: a) constructions of any approved type of toilet from every house including community toilets which may be allowed for a group of small houses of light material or temporary in nature; b) plans of individual sewage or sewage system and the sub-surface absorption system or other treatment device; c) location of any toilet or sewage disposal system in relation to a source of water supply; d) the discharge of untreated effluent of septic tanks and/or sewage treatment plants to bodies of water; e) manufacture of septic tanks; and f) method of disposal of sludge from septic tanks or other treatment plants.

3.2.7.1 Rules and Regulation Governing the Collection, Handling, Transport, Treatment and Disposal of Domestic Sludge and Septage, (2004), a “Supplement to the IRR of Chapter XVII on Sewage Collection and Disposal and Excreta Disposal and Drainage of 1998”
The Rules and Regulations require individuals, firms, public and private operators, owners and administrators engaged in desludging, collection, handling and transport, treatment and disposal of domestic sewage treatment plants/facilities and septage from house septic tanks to secure environmental sanitation clearances from DOH.

3.2.7.2 Chapter XVIII of Presidential Decree 856 “The Code on Sanitation of the Philippines” on Refuse Disposal (1998)
The law and its IRR on Refuse Disposal require cities and municipalities to provide an adequate and efficient system of collecting, transporting and disposing refuse in their areas of jurisdiction. It also requires occupants of buildings, institutions such as hospitals and residences to provide sufficient number of receptacles for refuse.
3.2.7.3 *Operation Manual on the Rules and Regulations Governing Domestic Sludge and Septage, June 2008*

The Manual provides detailed procedures and forms needed to comply with the IRR Governing Collection, Handling, Transport, Treatment and Disposal of Domestic Sludge and Septage. It is designed to guide private and public service providers as well as government regulators to effective sludge and septage management program in the country.

3.2.7.4 *Administrative Order 2010-0033 “Revised Implementing Rules and Regulations of PD 856 Code on Sanitation of the Philippines Chapter XXI Disposal of Dead Persons” December 2010*

The Administrative Order has placed a new restriction on open viewing of remains if the individual died of certain “dangerous communicable diseases.” It explicitly says: “The remains shall be placed in a plastic cadaver bag or other durable airtight container at the point of death and a biohazard tag attached, provided, that, this container shall not be opened for viewing or any other purpose prior to burial or cremation.”

3.2.8 *Presidential Decree No. 984 “Providing for the Revision of Republic Act No. 3931, Commonly known as the Pollution Control Law, and for Other Purposes” (1976)*

The Pollution Control Law is the primary legislation that governs discharges of potentially polluting substances to air and water. It provides the basis for the DENR regulations on water pollution through its IRR, DENR Administrative Order Nos. 34 and 35. The IRR for air emissions was initially set by DENR Administrative Order No. 14, but was later replaced by the Clean Air Act of 1999 (RA 8749).

3.2.8.1 *DENR Administrative Order No. 34 Series 1990 “Revised Water Usage and Classification/Water Quality Criteria Amending Section Nos. 68 and 69, Chapter III of the 1978 National Pollution Control Commission (NPCC now EMB) Rules and Regulations”*

The Administrative Order classified the bodies of water according to its particular designated use or uses and does not preclude use of the water for other purposes that are lower in classification provided that such use does not prejudice quality required for such waters.

3.2.8.2 *DENR Administrative Order No. 35, Series 1990, “Effluent Regulations”*

The Administrative Order lists the effluent regulations for the different levels of pollutants according to its water category/class.

3.2.8.3 *DENR Administrative Order No. 26, Series 1992, “Amending Memorandum Circular No. 02, Series of 1981: Appointment/Designation of Pollution Control Officers”*
3.2.9 Presidential Decree No. 1586 “Environmental Impact Statement (EIS) System” (1978)

The EIS System requires projects, like construction of new hospital buildings or expansion of existing hospitals, to secure an Environmental Compliance Commitment (formerly Environmental Compliance) Certificate (ECC) prior to construction and operation of the facility. An ECC is required for the installation and operation of HCW treatment systems like pyrolysis, autoclave, microwave and other treatment technology including landfills.

3.2.10 Executive Order No. 301 (2004) “Establishing a Green Procurement Program for All Departments, Bureau, Offices and Agencies of the Executive Branch of Government”

The Green Procurement Program was implemented in all government offices that aims to a) promote the culture of making environmentally-informed decisions in government, especially in the purchases and use of different products; b) include environmental criteria in public tenders, whenever possible and practicable; c) establish the specifications and requirements for products or services to be considered environmentally advantageous; and d) develop incentive programs for suppliers of environmentally advantageous products or services.

3.2.11 DOH Administrative Order No. 2008-0021 dated July 30, 2008 “Gradual Phase out of Mercury in all Philippine Healthcare Facilities and Institutions”

The Administrative Order requires all HCF to gradually phase-out the use of mercury containing devices and equipment. The initial targets of the phase-out are mercury thermometers and sphygmomanometers in the healthcare facility.

3.2.11.1 Department Memorandum No. 2011-0145, “Guidelines for the Temporary Storage of Mercury Wastes in HCF in Accordance with AO No. 0021 s. 2008 on the Gradual Phase-out of Mercury in All Philippine Healthcare Facilities and Institutions”

The Department Memorandum provides the detailed guidelines on the Temporary Storage of Mercury Containing Devices and the Management of Mercury Spills to enhance the patient safety measures in HCF, protect healthcare workers from potential hazards from mercury exposures; and to minimize the accumulation of mercury in the environment.

The Administrative Order requires the establishment and maintenance of a culture of patient safety in the HCF as the responsibility of its leadership. As such, HCF shall ensure that an enabling mechanism/strategy is in place to ensure patient safety. The key priority areas in patient safety include but are not limited to proper patient identification, assurance of blood safety, safe clinical and surgical procedures, provision and maintenance of safe quality drugs and technology, strengthening infection control standards, maintenance of the environment of care standards and energy and waste management standards.


The Second Edition Healthcare Waste Management Manual aims to achieve the following: a) improvement of regulatory compliance; b) protection of human health by reducing the exposure of workers, patients, watchers, and entire community to hazardous HCW in the work environment; c) enhancement of community relations by demonstrating a commitment to environmental protection; d) gain of economic benefits resulting from pollution prevention, products that reduce and recycle waste; e) avoidance of long-term liability; and f) increase in worker’s morale resulting from a healthier and safer work environment.

3.2.14 **Philhealth Benchbook for Quality Assurance in Healthcare (2006)**

The Philhealth Benchbook included healthcare waste management as one of its parameters in the quality assurance of healthcare.

3.2.15 **BFAD Memorandum Circular No. 22 Series of 1994, “Inventory, Proper Disposal and/or Destruction of Used Vials or Bottles” and BFAD Bureau Circular No. 16 Series of 1999: “Amending BFAD MC No. 22 dated September 8, 1994, Regarding Inventory, Proper Disposal and/or Destruction of Used Vials or Bottles”**

These circulars are released to prevent the proliferation of adulterated, misbranded and counterfeit drugs brought about by the recycling of used pharmaceutical bottles and vials. It contains the guidelines on the proper inventory and destruction of bottles and vials.

Table 3.1 provides online links to the full text of the different legislations, policies and technical guidelines mentioned in this chapter. One can access these by logging on to the World Wide Web and inputting the links to the internet server.
## Table 3.1 On-Line Links to the Legislation, Policies and Guidelines

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PART II

HEALTHCARE WASTE MANAGEMENT SYSTEM
CHAPTER 4: HEALTHCARE WASTE MINIMIZATION

The HCW generated within a HCF follows an appropriate and well identified stream from point of generation until their final disposal, that is composed of several steps that includes waste generation, segregation, collection, transportation (on-site and off-site), storage, treatment and disposal.

To illustrate, Figure 4.1 summarizes the HCW handling – the flow of waste from point of generation up to its final disposition.

### Figure 4.1 Healthcare Waste Handling

**Source: Adapted from WHO Guidance Manual for the Preparation of National Healthcare Waste Management Plans in Sub-Saharan Countries**
This chapter specifically discusses the initial phase in HCW handling (Step 0). The major tool of Waste Minimization is Resource Development, which pertains to the 3R’s: Reuse, Recycle and Recover.

The underlying principle of Waste Minimization is rooted in the Hierarchy of Controls, which was already discussed thoroughly in Chapter 1 of this manual. Figure 1.2 in Chapter 1 showed that prevention is very important, thus before producing waste; the HCF shall investigate whether the amount of waste to be generated from the daily operation of the HCF could be minimized in order to reduce the efforts in subsequent handling, treatment and disposal operations. Waste minimization can be done in two points of the healthcare waste handling. First, waste can be minimized during the procurement procedure of materials needed by the HCF (Step 0). By purchasing environmentally friendly products, one can already minimize the amount of waste that is to be generated. Second, waste can be minimized through the process of segregation. In this process, the principle of the 3 R’s is applied, thus, segregation effectively reduces the amount of waste to be treated or collected.

There is a correlation between waste minimization and environmental management system (EMS) which provides a framework for managing an organization’s environment impacts. This program is being spearheaded by the Environment Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR).

All the elements involved and illustrated in Figure 4.1 will be further discussed in succeeding topics.

4.1 Waste Minimization

The quantity of HCW generated shall always be minimized and precautions must be taken during their handling. The critical point in minimizing waste starts from the planning stage of the preparation of the Annual Procurement Plan (APP), which includes the list of items required for HCF activities.

The management of HCF must adopt the following strategies to implement waste minimization:

- Establish an updated database for the waste generation rates, current hazardous waste management strategies and current waste management costs
- Institutionalize waste minimization and sustain the program in the long run
- Have a written policy with established vision and mission to implement Waste Minimization Program (WMP)
- Be aware of their specific role in HCWM and be properly trained in waste minimization
- Adopt the Green Procurement Policy (GPP) pursuant to Executive Order 301, series of 2009.
Waste Minimization as the initial step aims at reducing as much as possible the amount or quantity of HCW that will be produced by setting up an efficient purchasing policy and having good stock management.

If waste minimization is to be undertaken by the HCF, it is important to develop a good baseline data of the amount of waste generated prior to implementation of the waste minimization program. HCW generation data from the various units of the HCF shall be properly recorded on a chart with the amount of waste displayed in descending order. This method can be used to determine the highest waste generating areas where the minimization strategies shall first be initiated. This information shall be displayed and communicated throughout the HCF.

The waste minimization strategy shall be formally approved in writing by top management within the HCF as a demonstration of their support and commitment to the program.

4.2 Principles of Waste Minimization
Waste minimization is beneficial not just to the waste-receiving environment but to the waste generators also. The cost for both the purchase of goods and waste treatment and disposal are reduced and the liabilities associated with the disposal of HCW is lessened. The extent to which a hazardous waste minimization program is implemented depends upon the HCF’s particular operations and procedures.

The principle of waste minimization is illustrated by the waste management hierarchy, applying the following techniques:

- **Green Procurement** refers to waste prevention and reduction at source
- **Resource Development (3R’s)** refers to reuse, recycling and recovery
- **End of Pipe** refers to treatment and disposal

These techniques, along with the different measures that make them possible, are discussed in the succeeding sections.

4.2.1 Green Procurement: Waste Prevention and Reduction at Source
Waste is minimized even before its generation in a HCF through proper procurement planning with the adoption of the Green Procurement Policy where items/goods to be purchased will have minimum packaging and will generate less hazardous waste; will utilize proper inventory of stocks and conduct Life Cycle Analysis for equipment.

In the initial phase, the HCF Administrators in order to reduce the generation of waste can adopt as one measure, the GPP which refers to the principle of purchasing products and services that are least damaging in terms of environmental impact, addressing the issue of HCW at the source is more economically and environmentally beneficial than looking into the perennial issue of waste management disposal.
4.2.1.1 Waste Prevention through the Adoption of Green Procurement Policy Pursuant to Executive Order 2004-31

A HCF, as part of its green procurement strategy, can consider some of the following approaches:

- Supplier Focus (through the supplier registration form with emphasis on environmental performance of supplier)
- Product and Service Focus (including environmental specifications)
- Life Cycle Analysis (internal analyses, or utilizing LCA completed by external groups)

In effect, the Green Procurement Policy urges a HCF to buy less polluting products from a less polluting supplier. The objectives of such procurement are:

- Creating awareness of environmental impact
- Developing guidelines for green procurement
- Rethinking material requirements and consumption
- Reducing the use of hazardous materials, improving energy efficiency of purchased materials
- Using recycled materials and recycling of waste

Production of goods is required to have less environmental impact to avoid environmental contamination and harm to human health. Measures must be taken to prevent hazardous substances from being released when products are used, scrapped or disposed of to ensure that the production of goods does not contain any substance that may cause damage to the environment or human health and to promote greener design and disposal activities at any HCF.

Thus, a HCF will only procure goods from companies that fulfilled the following requirements:

- Producing goods that do not contain any substance included in the EMB-DENR list of banned substances; and
- Establishing a complete elimination program for banned substances; and making a commitment to sustain the program.

Under these guidelines, a HCF can introduce measures to increase the utilization of recycled materials and the purchase of more environmental friendly equipment (for instance, computers with a high Energy-Star rating or computers with higher percentage of recyclable materials). The gradual shifting to energy efficient technology is one method to reduce energy consumption and can be achieved through green procurement guidelines.

In order to ensure the effective implementation of these guidelines, a HCF can carefully consider its existing procurement practices in order to evaluate where the major
environmental impacts lie. Methods can then be sought to integrate environmental considerations into its purchasing practices. These can be designed to fit with existing procurement methods, and to act as a support tool for the purchasing staff. The policy, procedures and practices shall not be designed to prohibit the purchase of any goods but merely to favour goods that are environmentally friendly. Other factors such as the quality, price, delivery time, etc. still remain paramount in purchasing decisions.

4.2.1.2 Waste Reduction at Source through Proper Segregation of Waste

Segregation is an important step in HCWM. There are several reasons why it is needed:

• Segregation minimizes the amount of waste that needs to be managed as hazardous waste (since mixing non-hazardous waste with hazardous waste renders the combined waste as hazardous);
• Segregation facilitates waste minimization by generating a solid waste stream which can be easily, safely and cost-effectively managed through recycling or composting;
• Segregation reduces the amount of hazardous substances released to the environment through disposal of general waste (i.e. by removing mercury from general waste);
• Segregation makes it easier to conduct assessment of the quantity and composition of different waste streams thereby allowing a HCF to obtain baseline data, identify options, determine waste management costs and evaluate the effectiveness of waste minimization strategies.

Further discussion of this topic can be found in Chapter 5 of this Manual.

4.2.2 Resource Development (The 3 R’s)

Another principle applied in waste minimization is Resource Development referring to Safe Re-use, Recycle and Recovery programs.

4.2.2.1 Safe Re-use

Re-use is not only finding another use for a product but, more importantly, reusing the product over and over again for a given function as intended. Promoting re-use entails the selection of reusable rather than disposable products whenever possible. Re-use will also entail setting reliable standards for disinfection and sterilization of equipment and materials for use.

In general, the purchase and use of non-disposable items in a HCF shall be encouraged as much as possible. When considering reuse it is important to make a distinction between different types of products:

• Non-medical supplies, particularly disposable items used in catering services, shall be avoided
• Medical devices that pose no cross-infection risk, e.g. blood pressure meters
• Medical devices specifically designed for reuse, e.g. surgical instruments
Single use devices such as syringes and hypodermic needles must not be reused because of the risk of cross-infection. Where there is an option to purchase a reusable device or to purchase a single use device, the former is always preferable.

Safe re-use may involve a combination or all of the sterilization methods, such as cleaning, reconditioning, autoclaving, disinfection and decontamination.

4.2.2.2 Recycling and Recovery

Recycling involves processing of used materials (waste) into new products to prevent loss of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution and water pollution (from land filling) by reducing the need for “conventional” waste disposal and lower greenhouse gas emissions as compared to virgin production.

Recyclable materials include many kinds of glass, paper, metal, plastics, textiles and electronics. Although similar in effect, the composting or other re-use of biodegradable waste, such as food or garden waste, is not typically considered recycling. Materials to be recycled are brought to a collection center or picked up from the curb side, then sorted, cleaned and reprocessed into new materials bound for manufacturing.

Through the use of the Life Cycle Analysis tool (LCA), which is discussed in Chapter 8 of this Manual, the administrators of the HCF will be able to decide which product or service will be most suitable or applicable for its operations. LCA is a compilation and evaluation of the input, output and potential environmental impacts of a product or system throughout its life cycle.

LCA is the assessment of environmental impacts associated with a product, process or service throughout its life cycle, from the extraction of the raw materials through to processing, transport, use, re-use, recycling or disposal. It is also known as the cradle-to-grave analysis.

The goal of LCA is to compare the full range of environmental damages assignable to products and services. Following this assessment, businesses can identify the most effective improvement that they can make in terms of environmental impacts and use of resources.

Benefits:

- Identify the most efficient and cost effective options for increasing the environmental performance of a product or service.
- Identify opportunities for efficiency improvement

LCA can also be used for comparing the environmental credentials of similar products and services to be able to choose the least burdensome ones. For each stage, the impact is measured in terms of resource use and environmental impacts.
Example:
To determine whether beverage packaging made of glass is more or less burdensome than plastic bottles, all life cycle phases for both options shall therefore be investigated.

- For glass bottles, the phases would include the mining of glass minerals, bottle production, bottling, transport, and final disposal.

- For plastic bottles the phases are raw oil production, oil refining, polymer production, bottle production, bottling, transports, and final disposal.

In a strict sense, recycling of a material would produce a fresh supply of the same material. For example, used office paper would be converted into new office paper or used foamed polystyrene would be converted into new polystyrene. However, this is often difficult or too expensive (compared with producing the same product from raw materials or other sources), so “recycling” of many products or materials involve their re-use in producing different materials (e.g. paperboard) instead. Another form of recycling is the salvage of certain materials from complex products, either due to their intrinsic value (e.g. lead from car batteries, gold from computer components) or due to their hazardous nature (e.g. removal and re-use of mercury from various items. However, this practice is now banned because of the hazards involved during its recovery).

The recovery of waste is defined in two ways. Most simply, recovery refers to energy recovery, whereby waste is converted to fuel for generating electricity or for direct heating of premises. Alternatively, waste recovery is a term used to encompass three sub-sets of waste recovery: recycling, composting and energy recovery.

In determining the economic viability of recycling it is important to take account of the cost of alternative disposal methods and not just the cost of recycling process and the value of the reclaimed materials.
4.2.3   End of Pipe: Treatment and Disposal
Waste treatment refers to the process of changing the biological and chemical character of the waste to minimize its potential to cause harm.
Waste disposal refers to discharge, deposit, placing or release of any health care waste into or on any air land or water.
One common strategy used is composting waste such as food discards, kitchen waste, cardboard and yard waste. Some HCF in other countries have also successfully composted placenta waste. Sufficient land space for on-site composting, adequately distant from patient care and public access area, would be needed. Food scraps can provide most of the nitrogen, while bulking agents commonly found in HCF such as cardboard and wooden chips could provide carbon. Composting techniques range from simple un-aerated static piles to aerated windrows to vermin-composting. The resulting rich compost can be sold or donated to local farmers and gardeners or can be used for plants around HCF grounds. Further illustration and discussion of this topic can be found in Chapter 6 of this Manual.

4.3   Administrative Control Measures
Green Procurement, 3 R’s and End of Pipe solutions can be achieved through, among others, administrative control measures such as:

- Adopting Environmental Management System (EMS)
- Systemized use of product ‘first in, first out (FIFO)’ or ‘first to expire, first out (FEFO)” for chemical and pharmaceutical products
- Monitoring of chemical flows within the healthy facility from receipt as raw materials to disposal as hazardous waste
- Elimination of medical supplies and equipment containing hazardous chemicals like mercury
- Using less hazardous method in cleaning such as steam disinfection instead of chemical disinfection
- Checking the expiry date of all products at the time of delivery and based on its optimum consumption rate

Environmental Management System (EMS) refers to the management of an organization’s environmental programs in a comprehensive, systematic, planned and documented manner. It includes the organizational structure, planning and resources for developing, implementing and maintaining a policy for environmental protection. This is further discussed in Chapter 8: Administrative Requirement.
4.4 **Benefits of Waste Minimization**

Institutionalization of Waste Minimization Program will enhance the HCF as to:

**Financial**

- Cost savings through effective waste management and more efficient use of natural resources (electricity, water, gas and fuels).
- Additional income generated from sale of recyclable waste.
- Fines and penalties are avoided in meeting environmental legislation by identifying environmental risks and addressing weaknesses.
- Reduction of insurance and health costs by demonstrating better risk management.

**Operational and Internal**

- Improved overall performance and efficiency
- Compliance with the PHIC Benchbook Performance Indicator

**External**

- Better public perception of the HCF
- Reduction of the adverse environmental impact (i.e. land, air and water pollution)
- Promoting environmental sustainability
Chapter 5: Segregation, Collection, Storage and Transport of Healthcare Waste

The management of HCF has a duty to ensure that all HCW are managed properly and in a safe manner. Under the Basel Convention (“The Basel Convention on the Control of the Trans-boundary Movements of Hazardous Waste and their Disposal”), the Stockholm Convention on Persistent Organic Pollutants and Republic Act 6969 (An Act to Control Toxic Substances and Hazardous and Nuclear Wastes”), HCW is classified as hazardous. This chapter describes the proper segregation of HCW at the point of generation, collection, storage and transport for treatment prior to its final disposal. Segregation is the key to effective waste management and only implementation of proper waste management can ensure all HCW will be treated according to the hazards.

General Principles:

- HCW must be segregated, collected, stored and transported in a safe manner considering the risk and occupational safety and in accordance with existing laws, policies and guidelines.
- The HCF must have a Waste Management Officer (WMO) who will be responsible for HCWM.
- Hazardous and general waste must not be mixed during collection, transport and storage.
- Staff must be well-trained on the risk and safety procedures on handling waste.
- Appropriate labelling, signage, route and segregation system must be established.
- Plastic liners preferably containing ¾ full of waste must be sealed when transported from waste generating source to the waste storage area.
- The storage area must be designed based on the volume of waste generated by the HCF and must be provided with compartments for general, hazardous and recyclable wastes.
- A separate storage area for phase-out mercury containing devices and products must be provided (Administrative Order 2008-21 Regarding the Phase-Out of Mercury Devices in HCF and Department Memorandum 2011-0145 on temporary storage of mercury wastes).
- The HCF must register as waste generator with the DENR and secure a DENR waste generator identification number.

5.1 Waste Segregation

The effective management of HCW considers the basic elements of waste minimization, segregation and proper identification of the waste. Appropriate handling, treatment and disposal of waste by type reduce costs and do much to protect public health. Segregation at source shall always be the responsibility of the waste generator.
Segregation shall take place as close as possible to where the waste is generated and shall be maintained in storage areas and during transport.

Segregation is the process of separating different types of waste at the point of generation until its final disposal. Appropriate resource recovery and recycling technique can be applied to each separate waste stream. Moreover, the amount of hazardous waste that needs to be treated will be minimized or reduced subsequently prolonging the operational life of the disposal facility and may gain benefit in terms of conservation of resources.

Segregation is the separation of the entire waste generated from the HCF according to the specific treatment and disposal requirements. Depending on the type of facility, 10% - 25% of waste generated by HCF is considered hazardous. On the other hand, the hazardous waste produced by HCFs in the Philippines is around 30% (ADB, 2003). This only shows that the HCWM system in the country must be improved.

Hazardous wastes generated require special treatment methods for the safety of HCF workers, patients, visitors and the general public. Segregating the hazardous waste will significantly reduce the waste management costs.

Segregation of waste must be strictly implemented at source. It must be applied from the point of generation, during collection, transport, storage and at the treatment site prior to final disposal.

Hazardous waste shall be placed in clearly marked waste bins with plastic liners that meet the standard thickness of 0.009mm and are appropriately labelled for the type and weight of the waste. Sharps shall be placed in puncture-proof containers. Hazardous chemical liquid waste can be placed in amber disposal bottles or its equivalent.

To improve segregation efficiency and minimize incorrect use of bins, proper placement, labelling of waste bins and use of color-coded plastic liner must be strictly implemented. Waste bins with yellow liners for infectious wastes shall be placed in, but not limited to, the following areas: Emergency Room, Out Patient Department, Laboratory, Radiology, Dental and Isolation Rooms, Infectious Wards, Dialysis and Nurses Stations.

5.1.1 Labelling, Marking and Color-Coding of Waste Bins and Plastic Liners

The system of segregation must be enforced throughout the country. The purpose of color coding is to make it easier for HCF workers to put the waste into correct bins and maintain segregation during collection, storage, transport, treatment and disposal. The color coding scheme for HCW as shown in Table 5.1 shall be adopted.
<table>
<thead>
<tr>
<th>TYPE OF WASTE</th>
<th>PLASTIC LINERS</th>
<th>BINS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MARKINGS AND</td>
<td>SPECIFICATION</td>
</tr>
<tr>
<td></td>
<td>LABELLING</td>
<td></td>
</tr>
<tr>
<td>INFECTIOUS WASTE</td>
<td>Properly labelled “INFECTIOUS WASTE” Tag indicating source and weight of waste generated, date of collection Biohazard symbol optional</td>
<td>Yellow plastic that can withstand autoclaving Thickness: 0.009mm Sample sizes: XL size 39cm x 39cm x 95cm Size varies depending on the volume of waste</td>
</tr>
<tr>
<td>PATHOLOGICAL AND ANATOMICAL WASTE</td>
<td>Properly labelled “PATHOLOGICAL/ANATOMICAL WASTE” Tag indicating source, weight of waste generated, date of collection Biohazard symbol optional</td>
<td>Yellow Thickness: 0.009mm Sample sizes: XL size 39cm x 39cm x 95cm Size varies depending on the volume of waste</td>
</tr>
<tr>
<td>SHARPS</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>PHARMACEUTICAL</td>
<td>Properly labelled “PHARMACEUTICAL WASTE” Tag indicating source, weight of waste generated, date of collection</td>
<td>Yellow with black band Thickness: 0.009mm Sample sizes: XL size 39cm x 39cm x 95cm Size varies depending on the volume of waste</td>
</tr>
<tr>
<td>TYPE OF WASTE</td>
<td>PLASTIC LINERS</td>
<td>BINS</td>
</tr>
<tr>
<td>---------------------</td>
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</tr>
<tr>
<td></td>
<td>MARKINGS AND LABELLING</td>
<td>SPECIFICATION</td>
</tr>
<tr>
<td>CHEMICAL WASTE</td>
<td>Properly labelled “CHEMICAL WASTE” Tag indicating source, weight of waste generated, date of collection</td>
<td>Yellow with black band Thickness: 0.009mm Sample sizes: XL size 39cm x 39cm x 95cm Size varies depending on the volume of waste</td>
</tr>
<tr>
<td>RADIOACTIVE WASTE</td>
<td>Properly labelled “RADIOACTIVE” Labellled with the name of radionuclide and date of deposition</td>
<td>Orange Thickness: 0.009mm</td>
</tr>
<tr>
<td>NON-HAZARDOUS OR GENERAL WASTE</td>
<td>Tag indicating source, weight of waste generated, date of collection</td>
<td>Black or colorless (non-biodegradable) Green (biodegradable) Thickness: 0.009mm Sample sizes: XL size 39cm x 39cm x 95cm Size varies depending on the volume of waste</td>
</tr>
</tbody>
</table>

Note: The use of colorless plastic liner shall be allowed for security purposes and for easier monitoring of proper waste segregation.
HCFs may adopt the color coded waste bin or innovate using recycled materials. However, strict compliance shall be observed in the use of corresponding plastic liners and proper labelling.

Proper tagging of plastic liners is to be strictly implemented. The tag of the plastic liner shall indicate the name of the HCF, the area of the HCF where the waste was generated (or the source), the type of waste, the weight and the date of collection on-site. Tags are placed on the liners before the plastic liner is placed on the waste bin. Figure 5.1 is an example of a sticker tag used by a HCF.

![Figure 5.1 Sample Tag](Courtesy of the Philippine Heart Center, Quezon City)

Aside from the information placed on the tag, yellow plastic liners should also be labelled with a symbol appropriate for the type of waste it contains. Figure 5.2 illustrates the DENR-EMB symbols for corrosive, explosives, flammable liquids and solids, toxic, reactives and infectious; and these symbols shall have the following specifications:

1. The minimum size of the symbol is 25 cm x 25 cm for vessels, containers and tanks and 30 cm x 30 cm for conveyances carrying vessels, containers and tanks.
2. Basic shape of the symbols is a square rotated 45 degrees to form a diamond.
3. At each of the four sides, a parallel line shall be drawn to form an inner diamond of the outer diamond.
4. The color should follow the colors specified in the figures below.
In the implementation of a color-coding system, the following practices shall be observed:

1. Highly infectious waste must be disinfected at source.
2. Anatomical waste including recognizable body parts, placenta waste and fetus are disposed of through safe burial or cremation.
3. Pathological waste must be refrigerated if not collected/treated within 24 hours.
4. Sharps waste must be shredded or crushed before transport to landfill.

5. Chemical and pharmaceutical wastes shall be segregated and collected separately. Wastes with high content of heavy metals, except mercury, shall be collected separately and sent to the waste treatment facility. Waste containing mercury shall be collected separately. Mercury waste management are discussed in DOH Department Memorandum 2011-0145. Hazardous chemical waste shall never be mixed or disposed down the drain but shall be stored in strong chemical resistant leak-proof container or amber disposal bottles. Expired and discoloured pharmaceuticals shall be returned to the pharmacy for temporary storage and be returned to the manufacturer/supplier. Pharmaceuticals shall be kept in their original packaging for proper identification and to prevent possible reaction with other chemicals.

6. The radioactive waste has to be decayed to background radiation levels (this is the natural radiation level on earth’s crust). If it has reached the background radiation level and is not mixed with infectious or chemical waste, then radioactive waste is considered as regular non-infectious waste.

7. All waste bins must be properly covered to prevent cross contamination.

8. Aerosol containers can be collected with the general waste.

5.1.2 Specifications of Waste Bins and Plastic Liners

Waste bins are of different types. Some bins are designed for automated system others are re-used plastic and metal containers. The most important is the quality of material – it shall be sturdy and leak-proof. Bins shall have well-fitting lids, either removable by hand or operated by a foot pedal. Both the bins and the plastic liners shall be preferably of the same color for the type of waste intended to be placed. This is to avoid confusion and poor segregation.

Figures 5.3, 5.4 and 5.5 show examples of bins and plastic liners used in HCF.
Figure 5.3 Example of Bins and Plastic Liners Used in HCF
*Courtesy of San Juan de Dios Educational Foundation, Inc. (Hospital), Pasay City and San Lazaro Hospital, Manila*

Figure 5.4 Example of Sharp Containers Used in HCF
*Courtesy of San Juan de Dios Educational Foundation, Inc. (Hospital), Pasay City and San Lazaro Hospital, Manila*

Figure 5.5 Example of Containers for Liquid Chemical and Expired Pharmaceutical Waste Used in HCF
*Courtesy of UP-National Institute of Health, Manila and San Juan de Dios Educational Foundation, Inc. (Hospital), Pasay City*
Yellow Plastic liners to be used must withstand autoclaving at 121°C – 130°C. Recommended thickness of plastic liners is 0.009mm. Only bins for general waste shall be placed in public areas. Radioactive waste shall be placed in radiation proof containers that are leak proof and lead-lined as shown in Figure 5.3. Sharps should be placed in strong, puncture-proof containers that have wide mouths and well-fitting lids as shown in Figure 5.4. Improvised bin using recyclable materials can be adopted such as used x-ray film and hard carton/boxes.

Liquid chemical wastes shall be stored in glass amber-colored bottles, with at least a 4L capacity as shown in Figure 5.5. Pharmaceutical wastes including cytotoxic and genotoxic waste most of which is produced in major hospitals or research facilities, shall be collected in strong, leak-proof containers clearly labelled ‘CYTOTOXIC WASTE” and “GENOTOXIC WASTE,” respectively. These signs shall have the minimum specification of 250 mm x 250 mm.

Figure 5.6 Cytotoxic Waste Label (at least 250 mm x 250mm)

5.2 Waste Storage

All untreated HCW inside plastic liners shall be collected using standard trolley and deposited to a waste storage area until transported to a designated off-site treatment facility.

The waste in plastic liners or waste bins shall be stored in a separate area, room or building of a size appropriate to the quantities of waste produced. There shall be a schedule of collection depending on waste generated. In cases where the HCF lacks the space, daily collection and treatment shall be imposed prior to disposal.
The HCF shall have storage areas for the following:
1. General wastes
2. Recyclable materials
3. Hazardous waste (other than phased-out mercury devices)
4. Phased-out mercury devices
   If there is area available for composting of biodegradable wastes, storage area is not necessary. It has to be disposed of directly in composting site.

5.2.1 **Requirements for the Storage Area (except for phased-out mercury devices)**

The Storage Area shall:
1. Be located within the HCF or research facility. However, these areas must be located away from the dietary section, patient rooms, laboratories, hospital function/operation rooms or any public access areas. It shall be protected from rain, strong winds, floods, etc.
2. Allow easy access to the staff in charge of handling the waste.
3. Allow easy access for waste collection vehicle without entering hospital premises.
4. Has a floor level higher than the anticipated flood level of the area during heavy rainfall with concrete flooring that is waterproofed and adequately sloped for easy cleaning and finished with ceramic tiles.
5. Have good drainage system and connected to WTP.
6. Have continuous water supply for cleaning purposes.
7. Be locked at all times to prevent access by unauthorized persons.
8. Be inaccessible to animals, insects and birds.
9. Have adequate ventilation, lighting and electrical supply.
10. Have supply of cleaning implements such as a water hose with spray nozzle, scrubber with long handle, disinfectant, protective clothing, waste bags or bins and fire-fighting equipment/devices located conveniently close to the storage area.
11. Have floors, walls and ceilings clean at all times.
12. Have the warning sign posted in a conspicuous place: “CAUTION: HEALTHCARE WASTE STORAGE AREA – UNAUTHORIZED PERSONS KEEP OUT.”
13. Post the HCW route plan from point of generation to the storage area.
Central HCW Storage for General, Recyclable, Biodegradable and Infectious Waste

Courtesy of San Juan de Dios Educational Foundation, Inc. (Hospital), Pasay City

Central HCW Storage for General, Recyclable, Biodegradable and Infectious Waste. A separate storage is constructed for condemned mercury devices, fluorescent and busted lamps.

Courtesy of San Lazaro Hospital, Manila

Figure 5.7 Sample of Central HCW Storage for Hazardous and General Waste Including Separate Storage for Condemned Fluorescent and Busted Lamps.

Cytotoxic waste shall be stored separately from other wastes in a designated secured location. Radioactive wastes shall be stored separately in containers that prevent dispersion of radiation, and if necessary, behind lead shielding. Waste that is to be stored during radioactive decay shall be labelled with the type of radionuclide, the date and details of required storage conditions. Storage facility for radioactive waste must bear the sign “RADIOACTIVE WASTE” placed conspicuously. Methods of treatment and disposal of radioactive waste shall conform to the requirements and guidelines of the PNRI.

During “storage for decay,” radioactive waste shall be separated according to the length of time needed for storage. For example, short-term storage (half-lives less than 30 days) and long-term storage (half-lives from 30 to 65 days). Low level radioactive waste shall be stored for a minimum of ten times the half-life of the longest-lived radionuclide in the container and until radioactivity decays to background levels as
confirmed by a radiation survey. The lead container and orange plastic for radioactive waste are usually provided by PNRI.

Empty containers of radionuclides solution are stored in dedicated empty room for certain number of days until it decays to background level.

Mercury wastes shall be collected and stored in the designated storage area. It shall be clear that the mercury wastes require a more thorough storage system. Mercury containing products must be stored in non-breakable containers with tight-fitting lids. The containers must be clearly labelled as to their contents. Rooms where mercury containing items are stored shall be tested periodically using a mercury vapour sniffer or analyzer. Even after the use of mercury has long been discontinued in the HCF, mercury containing products may still be in storage from past uses. All HCF shall check storage areas for old, damaged or outdated equipment. If mercury-containing products are found, contact the healthcare waste management officer. After the removal of the mercury-containing products, the areas shall be checked with the mercury vapour sniffer or analyzer. HCF shall keep a permanent record of all materials brought in and out of the mercury storage area. The safe handling, transport and temporary storage of mercury waste are discussed thoroughly in Annex A of Department Memorandum No. 2011-0145 dated April 11, 2011. Also, the management of mercury spills is spelled-out in details in Annex B of the said Memorandum.
5.3 Collection and Transport of HCW

Proper collection and transport of HCW is an important component in HCWM. Its implementation requires commitment and cooperation of the HCF’s maintenance, housekeeping and motor pool services personnel and all the HCF workers.

HCW collection practices shall be designed to achieve an efficient movement of waste from point of generation to storage or treatment while minimizing the risk to personnel.

Suggested collection frequency on room to room basis is once every shift or as often as necessary depending on the volume of waste generated. Collection of waste shall be completed by the end of every shift.

5.3.1 On-Site Collection of HCW

This refers to the collection of waste using transport trolleys from the waste bins to the central storage area of the HCF by the general service personnel. The following guidelines shall be observed by HCF worker directly involved in waste handling and collection:

1. Follow the established plan for the collection and transport of HCW.
2. Collect daily (or as frequently as required) and transport HCW to the designated central storage area.
3. Ensure that plastic liners are tightly closed or sealed and properly tagged with source and weight.
4. Replace the plastic liners immediately with new ones of the same color upon collection.

5.3.2 On-Site Transport of HCW

This refers to the transport of waste from the point of generation to the treatment facility in the HCF or to the central storage area.

5.3.2.1 Standard Requirements (Tools, Devices and Equipment and PPE)

In any HCF, the standard requirements to transport HCW from source to the designated central storage area include:

There shall be dedicated trolleys for each waste category - one for infectious waste; one for non-biodegradable and one for biodegradable/recyclable waste. No mixing of waste must be done.
Transport trolleys shall be dedicated to waste transport. Use on-site transport trolley that can “accommodate” three collection bins and shall meet the following requirements:

- Easy loading and unloading
- Easy to clean
- Heavy duty wheel caster

Figure 5.10 On-Site Collection of Healthcare Waste.  
*Courtesy of San Juan de Dios Educational Foundation, Inc. (Hospital), Pasay City*

Figure 5.11 a: Dedicated Trolley That Can Carry at Least Three Big Containers for Infectious and General Waste (Biodegradable and Non-Biodegradable)  
*Courtesy of Dr. Jose R. Reyes Memorial Medical Center, Manila*
On-site transport of HCW in HCF with more than two storey building/s shall use service elevators, mechanical pulley, hoist or ramp. In the case of elevators or ramps, the schedule of on-site transport of HCW shall be prior to the end of shift of workers, preferably not coinciding with scheduled visiting hours. The trolleys shall be disinfected after every use.

The on-site transport trolley shall be cleaned and disinfected daily using 4-5% concentration of sodium hypochlorite (NaClO).

Workers transporting the waste must be equipped with appropriate PPE (see Chapter 9 on Health and Safety Practices).
5.3.2.2 Healthcare Waste Transport Routing

HCW shall be transported through the quickest or shortest possible route and shall be planned before the trip begins. Upon departure from the source, no further handling shall be done. An efficient and effective collection system route shall consider the following:

- Collection schedule either by route or zone
- Assignment of worker responsible for the zone or area
- Logical planning of the route (shall avoid passing congested areas)
- Start from farthest point of the designated transfer station and progress towards the waste storage area.
- Practical routes
- All logical progression of HCW
- Suggested collection frequency on room to room basis is once every shift or as often as necessary depending on the volume of wastes.
- Schedule of collection
- Established routing plan can be revised if circumstances warrant it.

Figure 5.13 illustrates a sample routing plan.

Figure 5.13 Sample Transport Route Plan for Healthcare Waste
Courtesy of San Lazaro Hospital, Manila
5.3.3 Off-Site Collection of HCW

This refers to the collection of waste from the central storage area by an accredited DENR transporter, Municipal Collector or Supplier into their respective vehicles. The waste collector at this point will depend on the type of waste collected. The off-site collector of HCW shall provide collection bins that meet the following requirements:

- Puncture-proof for sharps
- Resistant to aggressive chemicals
- Made of high density polyethylene materials (HDPE)
- Must be leak-proof and be fitted with a self-sealing lid that is tight enough to withstand turbulence during transport in the vehicle
- Must follow the requirements of EMB-DENR

Infectious and pathological waste must be placed in appropriate color-coded or other special bins when transported.

In case of radioactive wastes, it must be packaged for off-site collection and transported in accordance with the accepted criteria for low level radioactive wastes established by PNRI (AO No. 01 series of 1990).

5.3.4 Off-Site Transport of HCW

This refers to the transport of waste from the central storage of the HCF to a TSD or to the final disposal site. The HCW generator is responsible for the safe packaging and adequate labelling of waste to be transported off-site for treatment and disposal. Packaging and labelling shall comply with the national regulation governing the transport of hazardous wastes (RA 6969) and present no danger to the public during transport. Likewise, the waste generators are ultimately responsible for ensuring that their HCW are properly treated and disposed of in an approved disposal facility. Tracking of HCW could be done with the implementation of the consignment system.

The transporter shall comply with DENR requirements and be registered with the DENR as waste transporter.

Consignment Note

All HCW to be transported to an approved off-site waste treatment facility shall be transported only by a DENR-accredited transporter or carrier, except non-hazardous HCW which are collected by the municipal collection system. The authorized transporter/carrier shall maintain a completed consignment note (see Annex B for a prototype Consignment Note) of all HCW for treatment or disposal and an updated transport permit.

Upon the receipt of the wastes, the transporter shall provide the waste generator with a copy of the consignment note for the generator’s waste records.
The transporter and generator shall separately maintain a copy of the consignment note. The consignment note shall include, but is not limited to the following information:

- The name, address, telephone number and accreditation number of the transporter, unless the transporter is the generator.
- The type and quantity of HCW transported.
- The name, address and telephone number of the generator.
- The name, address, telephone number, permit number and the signature of an authorized representative of the approved facility receiving the HCW.
- The date that the HCW is collected or removed from the generator’s facility, the date that the HCW is received by the transfer station or point of consolidation (if applicable) and the date that the HCW is received by the treatment facility.

If the HCW generator transports the waste or directs a member of its staff to transport the HCW to an approved waste treatment and disposal facility, the consignment note for the HCW shall show the name, address and telephone number of the HCW generator when the HCW are transported to the waste treatment and disposal facility.

The transporter or generator transporting the HCW shall have the consignment note in his or her possession in the vehicle while transporting the waste. The tracking document shall be available upon demand by any traffic enforcement agency personnel. The transporter shall provide the facility receiving the waste with a copy of the original tracking document.

5.3.5 Emergency Contingency Plan for HCW Transporter

The development of a plan of action shall be considered in the event of an accidental spill, loss of containment, equipment failure or other unexpected circumstances.

The owner/operator of vehicles used in the transport of HCW shall carry contingency plans for emergencies that address the following:

- Plan for the disinfection of the truck and any contaminated surface if a leaking container is discovered.
- A notification list of individuals or agencies to be contacted in the event of a transport accident.
- Clean-up and decontamination of potentially contaminated surfaces, designation of back-up transport for the HCW, a description of the plans for the repackaging and labelling of HCW where bins are no longer intact.
- Procedures for the management of leaking container/s.
- Other EMB-DENR requirements.
5.3.5.1 Requirements for Off-site Transport Vehicles

Transport vehicles for HCW shall not be used for the transport of any other materials that could be seriously affected by contamination such as food, livestock or retail goods. The vehicle shall have an enclosed leak-proof body and capable of being locked to secure the HCW. HCW can be loaded directly to a specially designed vehicle, but it is safer to place them first in containers (e.g. cardboard boxes or wheeled, rigid, lidded plastic or galvanized bins). The design of the collection vehicle must conform to the following:

- The body shall be of suitable size commensurate with the design of the vehicle.
- It shall have a totally enclosed car body with the driver’s seat separated from the load to prevent coming into contact with the HCW in the event of a collision/accident.
- The body of the vehicle shall display the international biohazard sign including emergency telephone number.
- The body shall be marked with the name and address of the waste carrier.
- It shall have a suitable system for securing the load during transport.
- It shall be easy to clean.
- The internal surface of the body shall be smooth enough to allow it to be cleaned with wet steam or hot water.
- The internal surface of the body shall have round corners.
- It shall be equipped with a separate compartment containing empty plastic bags, suitable protective clothing, cleaning equipment, tools, disinfectants and special kits for dealing with liquid spills.
- It shall strictly comply with EMB-DENR requirements.
Chapter 6: Waste Treatment and Disposal System

Healthcare waste treatment is necessary to ensure the safety and protection of HCF workers, patients and the general public as well as to protect the environment from hazards of HCWs. This chapter will illustrate the different technologies and methods in waste treatment and disposal.

6.1 Healthcare Waste Treatment

In determining the method to be used in waste treatment and disposal by any HCF, the HCF administrator has to look into several requirements and conditions relevant to HCWM. The purpose of treating HCW is to change the biological and chemical character of the waste to minimize its potential to cause harm. There are a number of terms used to denote the level of treatment of HCWs, such as sterilization, disinfection and decontamination.

Defining safe management of HCW treatment will demonstrate the ability to reduce the number of infectious pathogens in HCW to an acceptable level to protect workers or the public against any contamination/infection. One of the universally accepted methods of treatment is sterilization.

Sterilization is defined as a $6\log_{10}$ survival probability of the most resistant microorganism of concern in a given process. On the other hand, Disinfection is defined as low, intermediate or high (using the Spaulding system) depending on the survival probability of specific microbial groups. For medical waste disinfection, however, the emerging international consensus is to define levels of microbial inactivation as follows:

- **Level I** Inactivation of vegetative bacteria, fungi and lipophilic viruses at $6\log_{10}$ reduction or greater
- **Level II** Inactivation of vegetative, fungi, lipophilic/hydrophilic viruses, parasites and mycobacteria at $6\log_{10}$ reduction or greater
- **Level III** Inactivation of vegetative bacteria, fungi, lipophilic/hydrophilic viruses, parasites and mycobacteria at a $6\log_{10}$ reduction or greater; and inactivation of $B.\ stearothermophilus$ spores and $B.\ subtilis$ spores at $4\log_{10}$ reduction or greater
- **Level IV** Inactivation of vegetative bacteria, fungi, lipophilic/hydrophilic viruses, parasites and mycobacteria and $B.\ stearothermophilus$ spores at a $6\log_{10}$ reduction or greater

Mechanical grinding devices are sometimes needed prior to treatment, during treatment and/or at the end of the treatment process. Some technologies, however, depend on shredding as an integral part of the treatment process, i.e. those systems that shred prior to treatment and during treatment. Shredders are typically a high maintenance item due to unavoidable volumes of trapped waste in the waste stream, such as high-quality...
stainless steel found in orthopaedic blades, drills, reamers and prosthetic devices. Glass is also inherent in HCWs and overtime glass wears the cutting surface of the shredder blades. Therefore, if the facility intends to shred wastes either in pre- or post-treatment, anticipate that a rigorous maintenance schedule with associated cost would be required. Shredding the waste simply to render it unrecognizable makes the task more burdensome and more expensive than necessary and a cost benefit analysis must be conducted prior to making that decision. Also, the potential down time when the shredder is out of commission should be considered.

6.2 Selection Criteria of Healthcare Waste Treatment Technology

In selecting an HCW treatment and disposal method, the HCF shall perform a preliminary assessment and determine the issues that are important to the facility and develop a list of selection criteria and rank in order of importance. Various key points should be taken into account, such as the following:

- Treatment efficiency
- Occupational health and safety and environmental considerations
- Volume and mass reduction
- Types and quantity of waste for treatment and disposal / capacity of the system
- Infrastructure and space requirements
- Locally available treatment options for final disposal
- Training requirements for operation of the method
- Cost of operation and maintenance
- Location/surroundings of the treatment site and disposal facility
- Regulatory requirements
- Social and political acceptability

The selection of HCW technology goes far beyond cost implications since this may have significant impact on the environment, the workers in the treatment and disposal facilities and the surrounding community. Several questions need to be asked and answered regarding this matter.

On-site treatment of HCW allows the HCF to have more control over both the waste treatment process and cost. Off-site treatment maybe a cost-effective alternative and many of its manufacturers have already simplified their systems so that processing is relatively effortless.

The following are some guide questions that the HCF can use when deciding what technology to use.
6.2.1 On-Site Treatment Technologies

- How important is volume reduction in choosing a technology? What is the ratio of HCW produced by your HCF to the HCW treated by the treatment technology? Is the technology dependent on the volume of waste?
- How would waste reduction programs affect the process? If the waste volume changes radically for any reason (e.g. reduced patient-days, merger, better waste minimization efforts) will this technology still be the treatment needed?
- Have workers from your HCF talked to colleagues at other HCFs about their treatment options, made comparisons, discussed technologies, contracts and services, as well as violation histories and ranges of service costs?
- What is the Philippine regulatory climate for on-site treatment technologies? (Some types of technologies require more complicated permits than others)
- Does your HCF have workers on-site that are trained and certified to fulfil the testing requirements, time, etc. involved in these permits? If not, consider those staffing and testing costs in your evaluation.
- How long has the treatment technology been effectively in use and where?
- What is the estimated “life” of this equipment?
- What volume of waste can the technology handle and treat?
- Will it always be operating at peak capacity or will there be wide variations in the amount of HCW treated?
- What are the operational cost implications of using this technology? What are the environmental and fiscal impacts of utilities usage (electricity, water and sewer)?
- What is the safety and repair history of the waste treatment equipment?
- What worker safety and on-going equipment education are required and who provides it?
- What are the cost/s of equipment failure and need for a back-up or alternative system?
- Is waste fed into the treatment system automatically (by machine) or by hand (stop feed)? What impact does this have on your HCF workers limitations?
- Can equipment repair be completed within 24 hours without an emergency clause and/or additional costs?
- Does the technology require ancillary equipment such as shredders? Are they an integral part of the treatment process?
- What are the total associated costs for this equipment?
- Are there any worker-safety concerns with this equipment?
- How is the volume and weight of the HCW measured?
- Who measures it? Is it cost-effective to weigh the wastes on-site?
6.2.2 Off-Site TSD Facility

- How many trucks will enter and leave the HCF daily? Will traffic vary by day of the week or remain fairly constant?
- From what geographic area will HCW be accepted? What sort(s) of waste will be treated?
- Is it possible to bargain collectively with TSD for waste treatment and disposal services?
- Are there any equipment violations against the TSD your HCF is considering? Is the TSD fully permitted?
- Are there any community or environmental health concerns associated with this TSD?

If the decision is to let a TSD treat the HCW, then the cost to be considered would only be the charge of the TSD and the associated transportation cost. However, if the decision is to invest in an on-site facility, then the following costs need to be considered:

- Capital equipment costs
- Installation and facility costs: installation labor, facility modifications – cement pad/s, curb cuts, sewers, electricity, space, security, etc.
- Costs of pollution control equipment if required to control emissions and effluents from the treatment facility
- Direct labor costs: number of employees needed to operate the treatment equipment
- “Down time” costs: including repair (parts and labor), and alternative treatment
- Operating costs if the facility uses special chemicals and catalysts
- Utility costs
- Permitting and compliance fees: water and air quality monitoring fees
- Fines: depending on permitting requirements, national and local regulations, violations of permits or emissions
- All transportation, processing and tipping fees
- Supply costs – PPE, spill supplies, special bags (for example some autoclaving systems require particular bags), collection bins (boxes or reusable containers)
- Community approval costs if a public hearing is required

6.3 Healthcare Waste Treatment Technologies/Processes

Most common technologies and methods used in HCW treatment are:

1. Thermal
2. Chemical
3. Irradiation
4. Biological Process
5. Encapsulation
6. Inertization
Table 6.1 Acceptable Technologies and Methods Used in the Treatment of HCW

<table>
<thead>
<tr>
<th>HCW TREATMENT TECHNOLOGY/METHODS</th>
<th>DESCRIPTION</th>
<th>APPLICABILITY</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Pyrolysis</strong></td>
<td>Thermal decomposition of HCW in the absence of supplied molecular oxygen in the destruction chamber in which the said HCW is converted into gaseous, liquid, or solid form. Pyrolysis can handle the full range of HCW. Waste residues may be in form of greasy aggregates or slugs, recoverable metals, or carbon black. These residues are disposed of in a landfill.</td>
<td>All types of waste except mercury waste</td>
<td>Costly. Not yet available in the country</td>
</tr>
<tr>
<td>2. <strong>Autoclave</strong></td>
<td>Uses steam sterilization to render waste harmless and is an efficient wet thermal disinfection process. This technique has been used for many years in hospitals for the sterilization of reusable medical equipment. Autoclaves come in a wide range of sizes. A typical autoclave designed for medical waste treats about 100 kg per cycle (a cycle being about 1 hour) to several hundred kilograms per cycle for larger hospitals. Autoclaves used in centralized treatment facilities can handle as much as 3,000 kg in one cycle. The microbial inactivation efficacy of autoclaves shall be checked periodically. For autoclaves that do not shred waste during steam disinfection, color-changing indicator strips may be inserted inside the yellow bag in the middle of each load and that the strip shall be checked to ensure that steam penetration has occurred. In addition, a microbiological test (using for example commercially available validation kits containing <em>Bacillus stearothermophilus</em> spore strips, vials or packs) shall be conducted periodically or as the need arises.</td>
<td>All types of waste except anatomical/pathological, expired pharmaceutical drugs, cytotoxic, chemical, radioactive waste, and mercury waste Autoclaves used for HCW should have a built-in shredder.</td>
<td>Relatively low investment and operating costs. Available in different models and capacity to suit the needs of big and small HCF Has no significant environmental adverse impact</td>
</tr>
</tbody>
</table>
### 3. Microwave

**Description:** This technology typically incorporates some type of size reduction device. Shredding of wastes is done before disinfection. In this process, waste is exposed to microwaves that raises the temperature to 100°C (237.6°F) for at least 30 minutes. Microorganisms are destroyed by moist heat which irreversibly coagulates and denatures enzymes and structural proteins.

**Applicability:** The process is inappropriate for the treatment of anatomical waste and animal carcasses, and will not efficiently treat chemical or pharmaceutical waste.

**Remarks:** The system has a relatively high investment and operating costs. Not recommended for individual HCF application. Application of this method shall only be done when there is no available treatment facility in the area to prevent environmental problems associated in the indiscriminate use of chemicals as required by RA 8749 or the Clean Air Act and RA 9275 or the Clean Water Act.

### 4. Chemical Disinfection

**Description:** Chemical disinfection is also being used for treatment of HCW. Chemicals like sodium hypochlorite, hydrogen peroxide, peroxyacetic acid and heated alkali are added to HCW to kill or inactivate pathogens present. It is recommended that sodium hypochlorite (bleach) with a concentration of 5% be used for chemical disinfection. If possible, HCW shall be shredded to increase the extent of contact between HCW and the disinfectant by increasing the surface area and eliminating the enclosed space. Some precautionary measures should be taken into consideration before using chemical disinfection:

- Shredding and/or milling of waste is usually necessary before disinfection; the shredder is often the weak point in the treatment chain, being subject to frequent mechanical failure or breakdown.
- Powerful disinfectants are required, which are themselves also hazardous and should be used only by well trained and adequately protected personnel.
- Disinfection efficiency depends on operational conditions.
- Only the surface of intact solid waste will be disinfected.

**Applicability:** Chemical disinfection is most suitable in treating blood, urine, stools and sewage. This method is used in disinfecting highly infectious wastes at source as defined in this manual.

**Remarks:** Application of this method shall only be done when there is no available treatment facility in the area to prevent environmental problems associated in the indiscriminate use of chemicals as required by RA 8749 or the Clean Air Act and RA 9275 or the Clean Water Act.
### HCW TREATMENT TECHNOLOGY/ METHODS

<table>
<thead>
<tr>
<th>HCW TREATMENT TECHNOLOGY/ METHODS</th>
<th>DESCRIPTION</th>
<th>APPLICABILITY</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. <strong>Biological Processes</strong></td>
<td>The process uses an enzyme mixture to decontaminate HCW. The resulting by-product is put through an extruder to remove water for wastewater disposal. The technology is suited for large applications and is also being developed for possible use in the agricultural sector. However, the technology requires regulation of temperature, pH, enzyme level, and other variables. Composting and vermin-culture as biological processes for food waste, yard trimmings and other organic waste are also recommended.</td>
<td>Biodegradable wastes such as food waste, etc.</td>
<td>Design application is mainly for regional H C W t r e a t m e n t center.</td>
</tr>
<tr>
<td>6. <strong>Encapsulation</strong></td>
<td>Encapsulation involves the filling of containers with waste, adding and immobilizing material, and sealing the containers. The process uses either cubic boxes made of high-density polyethylene or metallic drums, that are three-quarters filled with sharps or chemical or pharmaceutical residues. The containers or boxes are then filled up with a medium such as plastic foam, bituminous sand and cement mortar. After the medium has dried, the containers are sealed and disposed of in landfill.</td>
<td>The process is particularly a p p r o p r i a t e d for the disposal of sharps and chemical (solid form) or pharmaceutical residues.</td>
<td>The main advantage of the process is that it is very effective in reducing the risk of scavengers gaining access to the HCW.</td>
</tr>
<tr>
<td>7. <strong>Inertization</strong></td>
<td>Especially suitable for pharmaceutical waste is the process of inertization that involves the mixing of the waste with cement and other substances before disposal. For the inertization of pharmaceutical waste, the packaging shall be removed, the pharmaceuticals ground, and a mixture of water, lime and cement added. The homogenous mass produced can be transported to a suitable storage site. Alternatively, the homogeneous mixture can be transported in liquid state to a landfill and poured into municipal waste. The process is relatively inexpensive and can be performed using relatively unsophisticated equipment. The following is the typical proportion for the mixture: 65% pharmaceutical waste, 15% lime, 15% cement and 5% water.</td>
<td>The process is particularly appropriate for the disposal of sharps and chemical (solid form) or pharmaceutical residues.</td>
<td>This is to minimize the risk of toxic substances contained in the waste from migrating into the surface water or ground water.</td>
</tr>
</tbody>
</table>
It should be noted that there may be other technologies efficient and effective in the treatment of HCW that are not mentioned in the above table. These other treatment technologies may be used in the treatment of HCW in the Philippines, provided they are approved and certified by the DOH and the DENR.

In choosing the application of chemical disinfection the following considerations shall be looked into:

- Studies showed that chlorine-based technologies using sodium hypochlorite and chlorine dioxide as well as its by-products in wastewater may possibly have long-term environmental effects.
- Non-chlorine based technologies are quite varied in the way they operate and the chemical agents they employ. Others use peroxyacetic acid, ozone gas, lime-based dry powder, acid and metal catalyst or biodegradable disinfectants. Occupational and safety exposures shall be monitored when using the chemical process.
- In planning the use of chemical disinfection, requirements for the eventual disposal of the residues should be carefully considered. Improper disposal could give rise to serious environmental problems.

### 6.4 On-Site Waste Treatment Facilities

A hospital may opt to have an on-site treatment of their HCW. However, some factors should be considered before going into this option.

The treatment facility shall:

1. Have safe transfer routes.
2. Be located within the HCF. However, these areas must be located away from the dietary section, patient rooms, laboratories, hospital function/operation rooms or any public access areas.
3. Be located in a way that it does not produce nuisance such as odor, noise, the visual impact of HCW operations on patients and visitors.
4. Public access and security.
5. Consider the proximity of the treatment facility to the temporary or central storage.
6. Be strategically placed so as not to cause traffic problems in the entry and exit of vehicles.
7. Consider the volume of waste generated by the HCF when it comes to the size of the treatment facility.
8. Be protected from rain, strong winds, floods, etc.
9. Have elevated, concrete finish flooring and with waterproofing, adequately sloped for easy cleaning.
10. Have a good drainage system and connected to a WTP.
11. Have continuous water supply for cleaning purposes.
12. Have locking device to prevent access by unauthorized persons.
13. Be inaccessible to animals, insects and birds.
14. Have adequate ventilation and lighting.
15. Have supplies of cleaning implements such as a water hose with spray nozzle, scrubber with long handle, disinfectant, protective clothing, waste bags or bins and fire-fighting equipment/devices located conveniently close to the storage area.
16. Have space allowances needed by workers to maneuver safely around the treatment facility.
17. Have floors, walls and ceilings that are clean at all times.

Each technology has different requirements for space, foundation, utility service connections, ventilation and support equipment.

6.5 Waste Disposal System
6.5.1 Landfill

Landfill is an engineered method designed to keep the waste isolated from the environment. Appropriate engineering preparations and corresponding permits from DENR shall be completed before the site is allowed to accept waste. There shall be a trained staff present on-site to control and manage the operations.

The landfill shall:

- Be accessible to site and working areas for easy passage of delivery access
- Have landfill personnel capable of effective control of daily operations
- Divide the site into manageable phases, which are appropriately prepared, before disposal of wastes
• Have adequate sealing of the base and sides to minimize the movement of wastewater (leachate)
• Have adequate mechanisms for leachate collection and treatment systems
• Have an organized deposit of waste in a small area, allowing waste to be spread, compacted and covered daily
• Have surface water collection trenches around site boundaries
• Have a construction of a final cover to minimize rainwater infiltration when each phase of the landfill is completed

Figure 6.2  Metro Clark Sanitary Landfill
*Courtesy of Infratex Philippines Incorporated*

HCW that is properly treated with the applicable technology as stated in this Manual can be mixed with general waste provided DOH issues a certification that the microbes in the treated HCW are inert and will not regenerate. DOH will formulate the guidelines for the issuance of the certification. Certification for the treated HCW can be secured from the DOH provided it conforms to the following:

1. The waste treatment facility/system passed the standards for microbial inactivation test;
2. The properly treated HCW passed the spore strip test;
3. The waste treatment facility/system has a valid CPR from the DOH-Bureau of Health Devices and Technology (BHDT); and
4. The waste treatment facility is an EMB-registered TSD.
6.5.2 Safe Burial at HCF Located in Remote Areas

Safe burial as a disposal method is applicable only to treated infectious waste, sharps waste, pathological and anatomical waste, small quantities of encapsulated/inertisized solid chemical and pharmaceutical wastes.

![Figure 6.3 Safe Burial Pit (volume of 1m x 1m x 1.8m)](image)

Safe burial of HCW is allowed in the following situations:

1. HCF is located in a remote and far-flung area
2. HCF does not have access to TSD facilities
3. HCF is located in an LGU with an income classification of 5th or 6th Class
4. HCF located in 1st to 4th Class LGU has available area within the HCF premises (only pathological, anatomical, expired drugs and sharps wastes can be buried)
5. Safe burial of HCW within the HCF premises is the only viable option at a specific period of time.

The Safe Burial Site shall:

- Be accessible only to authorized personnel.
- Be lined with a material of low permeability, such as clay or HPDE, to prevent pollution of shallow groundwater that may subsequently reach nearby wells.
- Allow only hazardous HCW to be buried. If general HCW are also buried on the premises, available space would be quickly filled-up.
- Be managed as a landfill, with each layer of waste covered with a layer of earth to prevent odor, as well as to prevent proliferation of rodents and insects.
- Not be located in flood prone areas.
- Be secured (e.g. fenced with warning signs).
- Be downhill or down-gradient from any nearby wells and about 50 meters away from any water body such as rivers or lakes to prevent contaminating water source.
- Have the bottom of the pit located at least 1.5 meters above ground water level.

HCF shall keep a permanent record of the size and location of all their on-site burial pits to prevent construction workers, builders and others from digging in those areas in the future. The safe burial of waste depends critically on rational operational practices. It shall be noted that safe on-site burial is practicable only for relatively limited period, about 1 to 2 years, and for relatively small quantities of waste, about 5 to 10 tons in total. When these conditions have been exceeded, a long-term solution will be needed.

6.5.3 Septic/Concrete Vault

This method is especially suitable for the disposal of used sharps and syringes. The following steps shall be observed:

1. Select a site that is isolated and at least 150 meters away from the water supply sources and dwelling units.
2. Dig a pit (minimum size of 1m x 1m x 1.8m depth) enough to accommodate sharps and syringes for an estimated period of time without reaching the groundwater level.
3. Construct concrete walls and slabs of pit.
4. Provide slab with opening or manhole for easy deposition of collected sharps and syringes. The manhole shall be extended a few centimeters above the soil surface to overcome infiltration of surface water.
5. Deposit the collected safety boxes filled with used sharps and needles inside the concrete vault.
6. Install a security fence around the site with signage.
6.6 Summary of Healthcare Waste Handling

Based on the discussion of Chapters Five and Six, there are seven important points in waste handling. These include the following:

1. Waste Generation
2. Waste Segregation
3. Waste Collection
4. Waste Transportation
5. Waste Storage
6. Waste Treatment
7. Waste Disposal

Waste management will vary depending on the type of wastes being handled. Table 6.2 summarizes the options in handling the different types of wastes.
Table 6.2 Healthcare Waste Handling

<table>
<thead>
<tr>
<th>Responsibility of the HCF</th>
<th>Responsibility of the Local Government/TSD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFECTIOUS WASTE</strong></td>
<td></td>
</tr>
<tr>
<td>Infectious Waste</td>
<td>Collection Off-site</td>
</tr>
<tr>
<td>Central Storage</td>
<td>Disposal Off-site</td>
</tr>
<tr>
<td></td>
<td>Collection Off-site EMB registered transporter</td>
</tr>
<tr>
<td></td>
<td>Treatment Off-Site</td>
</tr>
<tr>
<td><strong>SHARPS (including empty vials and ampoules)</strong></td>
<td></td>
</tr>
<tr>
<td>Sharps</td>
<td>Collection Off-site</td>
</tr>
<tr>
<td>Central Storage</td>
<td>Disposal Off-site</td>
</tr>
<tr>
<td></td>
<td>Collection Off-site EMB registered transporter</td>
</tr>
<tr>
<td></td>
<td>Treatment Off-Site</td>
</tr>
<tr>
<td>Empty/ Unused in original packaging</td>
<td></td>
</tr>
<tr>
<td>Pharmacy</td>
<td>Collection Off-site</td>
</tr>
<tr>
<td>Crushing</td>
<td>Disposal Off-site</td>
</tr>
<tr>
<td>Central Storage</td>
<td>Collection Off-site EMB registered transporter</td>
</tr>
<tr>
<td></td>
<td>Treatment Off-Site</td>
</tr>
<tr>
<td>Junk Shop</td>
<td>Disposal Off-site</td>
</tr>
<tr>
<td>Recycle</td>
<td></td>
</tr>
</tbody>
</table>
WASTE TREATMENT AND DISPOSAL SYSTEM

Responsibility of the HCF

PATHOLOGICAL / ANATOMICAL WASTE

- Refrigerate
- Disposal On-Site (not applicable for anatomical waste)

Responsibility of the Local Government/TSD

- Collection Off-site: EMB registered transporter
- Disposal Off-Site

PHARMACEUTICAL WASTE

- Expired/ Spoiled Drugs
- Pharmacy
- Treatment On-site
- Disposal On-Site: EMB registered transporter
- Collection Off-site: Supplier

CHEMICAL WASTE

- Chemical Waste
- Liquid
- Solid
- Disposal On-site: Down the drain (for non-hazardous)
- Disposal On-site: Disposal Bottles (for hazardous)
- Collection Off-site: EMB registered transporter
- Treatment Off-Site

Central Storage
### Responsibility of the HCF

#### MERCURY AND OTHER HEAVY METALS
- Mercury and other Heavy Metals
- Central Storage
- Collection Off-site: EMB registered transporter
- Storage Off-site: Final Storage Area

#### RADIOACTIVE WASTE
- Radioactive Waste
- Storage On-site: Lead containers (Delay to decay)
- Collection Off-site: PNRI

#### BIODEGRADABLE GENERAL WASTE
- Biodegradable Waste (Food Waste)
- Central Storage
- Disposal On-Site: Composting
- Collection Off-site: Municipal Collection System
- Disposal Off-Site: Landfill

#### NON-BIODEGRADABLE/NON-RECYCLABLE GENERAL WASTE
- Non-Biodegradable Non-Recyclable Waste
- Central Storage
- Collection Off-site: Municipal Collection System
- Disposal Off-Site: Landfill
<table>
<thead>
<tr>
<th>Responsibility of the HCF</th>
<th>Responsibility of the Local Government/TSD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NON-BIODEGRADABLE/RECYCLABLE GENERAL WASTE</strong></td>
<td></td>
</tr>
<tr>
<td>Non-Biodegradable/ Recyclable Waste</td>
<td>Central Storage</td>
</tr>
<tr>
<td></td>
<td>Recycling</td>
</tr>
<tr>
<td><strong>AEROSOL AND PRESSURIZED CONTAINERS</strong></td>
<td></td>
</tr>
<tr>
<td>Aerosol and Pressurized Containers</td>
<td>Central Storage</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6.2 presents the general rule in handling HCW. However, there are some important points to remember in the handling of wastes:

1. In order for properly treated HCW to be collected and disposed together with general waste, there should be a certification issued by the DOH that the microbes in the properly treated HCW are inert and will not regenerate. The guidelines to implement this provision will be issued by DOH.

2. Not all yellow plastic liners are autoclaveable. In this Manual, yellow autoclaveable plastic liner for infectious waste is stipulated. For other types of waste, a non-autoclaveable yellow plastic liner with the correct specifications may be used.

3. Chemical disinfection as a treatment method will only be used when all other treatment technologies are not available to the HCF. Precautionary measures to be applied when using chemical disinfection are discussed in Section 6.3 and Table 6.1 of this chapter.

4. The HCF should be guided by the Chain of Infection in handling highly infectious wastes contaminated with heat and chemical resistant pathogens (such as transmissible spongiform encephalitis brought about by prions).
The Philippine Clean Water Act of 2004 requires the government to implement anti-degradation measures to preserve the quality of water bodies and proper water quality management programs. It includes the following: monitoring, inspection and survey of firms and establishments within the jurisdiction of its offices; effluent monitoring and sampling; and ambient water quality monitoring of water bodies.

The passage of the Clean Water Act mandated the putting up of Wastewater Treatment Plants (WTP) and provision of sanitation facilities in each locality. Human excreta are the principal vehicle for the transmission and spread of wide range of communicable diseases. Excreta from healthcare patients may be expected to contain far higher concentration of pathogens, and therefore are far more infectious than excreta from households. This underlines the prime importance of providing access to adequate sanitation in every HCF. The HCF shall be connected to a municipal WTP or must have its own WTP.

WHO defines wastewater as liquid waste discharged from, among others, HCF to individual disposal systems or to municipal sewer pipes and which contains mainly human excreta and used water.

All HCFs shall have their own WTP or be connected to a municipal or common WTP or equivalent system for small HCFs (with bed capacity of 25 or less).

### 7.1 Composition of Wastewater

Wastewater from HCFs contains organic particles (feces, hairs, food, vomit, paper fibres, etc.), soluble organic material (urea, proteins, pharmaceuticals, etc.), inorganic particles (sand, grit and metal particles), soluble inorganic material (ammonia, cyanide, hydrogen sulphide, thiosulphates) and other substances. The composition depends on the source of origin.

### 7.2 Sources of Wastewater and Its Characteristics

Table 7.1 indicates the possible sources of wastewater within the HCF and the different characteristics of the wastewater produced in each source.
### Table 7.1 Sources of Wastewater and Its Characteristics

<table>
<thead>
<tr>
<th>HCF Department</th>
<th>Wastewater Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration and Wards</td>
<td>Urine of patients from some wards (surgery wards, oncology, infectious disease ward, etc.) might contain higher amounts of antibiotics, cytotoxic and X-ray contrast media.</td>
</tr>
<tr>
<td>Kitchen</td>
<td>Food leftovers, waste from food processing, disinfectants and detergents, starch, grease and oil.</td>
</tr>
<tr>
<td>Laundry</td>
<td>The wastewater often is hot, has a high pH (alkaline) and might contain high amounts of phosphate, surfactants and AOX (adsorbable organically bound halogens) if chlorine based disinfectants are used.</td>
</tr>
<tr>
<td>Operating Room and ICU</td>
<td>Higher contents of disinfectants, detergents and pharmaceuticals. Organic content can be high due to the disposal of body fluids and rinsing liquids (suction containers).</td>
</tr>
<tr>
<td>Laboratories</td>
<td>Halogenated and organic solvents, colorants from the histology and haematology (gram staining), cyanides (haematology) and formaldehyde and xylem (pathology) and other reagents, wastewater from autoclaves.</td>
</tr>
<tr>
<td>Radiology</td>
<td>Photochemical (developing and fixing solutions) containing waste water and potentially contaminated rinsing water, fixers and developers.</td>
</tr>
<tr>
<td>Renal Department</td>
<td>Body fluids from machine, disinfectants, dialyzer solutions, wastewater from reverse osmosis process.</td>
</tr>
<tr>
<td>Dental Department</td>
<td>Mercury (amalgam) if no amalgam separators are installed; disinfectant, body fluids, wastewater from autoclaves.</td>
</tr>
<tr>
<td>Central Sterilization Room</td>
<td>Disinfection solution, including aldehyde based disinfectants. Hot water from the sterilizers and detergents from the CD Machine (Cleaning and Disinfection) wastewater from autoclaves and sterilizing equipment.</td>
</tr>
</tbody>
</table>

Knowing the characteristic of the wastewater produced by the HCFs will give an idea of the risks associated with the discharge. This will also determine the type of treatment that the wastewater needs before it can be released or reused.
7.3 Collection, Treatment and Disposal of Wastewater
Depending on wastewater characteristic, the HCF may provide a pre-treatment system, connected to a centralized wastewater system, or provide its own on-site wastewater treatment system. According to DENR AO No. 35 of 1990, wastewater with a minimum BOD of 3,000mg/L is considered strong wastewater and its effluent is to be discharged to Class C and D bodies of water with a minimum concentration of 50 mg/L.

7.4 Connection of HCF Wastewater to a Centralized Wastewater System
Subject to the guidelines of the DENR and wastewater service provider, the HCF shall connect its existing septic tanks to the centralized wastewater treatment facility.

7.5 On-site Wastewater Treatment Plant (WTP)

a) Exterior View, with control room on the far left

b) Primary Treatment

c) Secondary and Tertiary Treatment

d) Effluent
7.5.1 Pre-Treatment Stage

The basic principle underlying effective wastewater management is a strict limit on the discharge of hazardous liquids to sewers. For wastewater streams from certain departments, such as the laboratory, a pre-treatment is recommended. Hazardous Chemical Waste, especially photo-chemicals, aldehydes (formaldehyde and glutaraldehyde), colorants and pharmaceuticals shall not be discharged in the sewer lines but separately collected and treated. Other chemicals that cannot be disposed down the drain are those included in DENR AO 36-2004. Solid wastes, chemicals, pharmaceuticals, grease, oil and paints in large quantities shall not be discharged into the sewer.

Chlorine-based disinfectants (such as sodium hypochlorite) shall not be disposed of in a septic tank as it will harm the bacteria used for the biological treatment process.

Body-fluids and the contents of suction systems from infectious patients from the operating room shall be thermally treated first (e.g. by autoclave reserved for waste treatment) before being discharged down the drain.

Expired blood bags shall not be emptied into a sink because of the risk of infection from blood splatters.

Grease traps shall be installed to collect grease, oil and other floating materials from the kitchen. Collected grease must be removed daily.
Body fluids, blood and rinsing liquids from the OR and the ICU shall first be disinfected preferably with a thermal method, especially if the patient is suffering from infectious disease.

Wastewater from the dental department shall be pre-treated by installing amalgam strainer/separator.

Patients given high doses of radioactive isotope for therapy shall be given toilet facility separate from those used by “non-radioactive” patients; and radioactive patients shall be instructed to use the same toilet bowl at all times and flush it at least three times after use.

7.5.2 **Primary Treatment Stage**
This involves physical treatment to remove settleable solids, large objects such as sand, grit and stones; and floating materials such as grease and plastics. These items shall be removed so as not to affect the secondary treatment. Primary treatment includes multi-chamber septic tanks, mechanical screens, grit chambers and settling tanks.

7.5.3 **Secondary Treatment Stage**
This involves biological treatment to remove dissolved organic substances using microbes. The bacteria and protozoa consume biodegradable soluble organic contaminants (sugars, fats, organic short-chain carbon molecules, etc.). Oxygen has to be supplied to microbes to accelerate their growth and the process of consumption. Examples of technologies applied are trickling filters, activated sludge, anaerobic baffled reactor (ABR), sequencing batch reactor (SBR), waste stabilization pond and engineered reed bed.

7.5.4 **Tertiary Treatment Stage**
This final stage removes microorganism and excessive nutrients in wastewater, such as nitrogen and phosphorus that may adversely affect the quality of the receiving body of water. Examples are UV-hygienization and chlorine disinfection. Quality of effluent to be disposed after tertiary treatment shall be subject to DENR AO No. 35.

- Biological Oxygen Demand (BOD) 50 mg/L or below
- Chemical Oxygen Demand (COD) 100 mg/L or below
- Total Suspended Solids (TSS) 70 mg/L or below
- Settleable Solids 0.3 mg/L or below
- Oil and Grease 5 mg/L or below
- Surfactant 5.0 mg/L or below
- pH 6 – 9
- Total Coliform (E.coli) 5000 MPN/100ml or below
7.6 Factors to be Considered in the Establishment of an On-Site WTP

To have an efficient and cost-effective establishment of on-site WTP, it is important to have an objective approach in considering the following factors:

- **Regulatory Requirements**: Prior to application for Discharge Permit, the following shall be secured:
  1. Environmental Compliance Certificate (ECC) or Certificate of Non-Coverage
  2. Application Form from DENR or LLDA
  3. Designated and Accredited Pollution Control Officer (PCO)
     - Curriculum Vitae
     - Undergo 40 hours accreditation training course by DENR or LLDA
  4. Working Plan signed by Professional Mechanical Engineer (PME)
  5. Engineer’s Report
  6. Submission of Quarterly Self-Monitoring Report to LLDA

- **Location of the treatment and disposal facility**: Under the latest Fire Code of the Philippines, underground or basement WTP must be avoided for the following reasons:
  1. Possible accumulation of methane gas during breakdown
  2. Difficult to access, thus delaying the response during emergency
  3. Risk on the part of the full time WTP operator due to the poor indoor air quality in basements

- **Space Availability**: This determines the technology/type or treatment given the volume and characteristic of wastewater. Smaller space available requires a more compact type of WTP.

- **Infrastructure Requirements**: Generally upon construction, WTP chambers shall be water proofed and can withstand pressure of air blowers and pumping during operation. It is necessary to provide an air vent in air diffusers to avoid fatigue of the blower component. Proper ventilation and lighting illumination are also necessary. Proper warning and signage in strategic areas must be provided.

- **Locally available equipment and parts**: In selecting WTP technology, the Terms of Reference (TOR), should include the criteria that the equipment parts must be readily available in the local market for at least five (5) years. This will ensure that there will be a supply of equipment parts in cases when repairs are needed.

- **Treatment Efficiency**: The main objective of treating wastewater is to prevent pollution and protect the receiving body of water. This can be achieved by maintaining treatment efficiency that meets the DENR/EMB/LLDA effluent standards.

- **Quantity of Wastewater for Treatment and Disposal**: The influent of wastewater for treatment and disposal depends on the day to day consumption of water.

- **Reuse of Treated Wastewater**: Treated wastewater can be used for cooling towers, watering of ornamental plants and trees, cleaning of hospital buildings and grounds.
and for flushing of urinals and toilets. Separate piping for toilets is necessary in using treated wastewater. By using treated wastewater, over extraction of ground water and preserved water resources can be prevented.

- **Characteristic of Wastewater for Treatment**: In order to select the best technology option, there is need to know the characteristics of the HCF’s wastewater through water analysis.

- **Sludge and Septage Disposal**: Disposal of accumulated sludge and septage shall be included in the selection of WTP technology in compliance with the IRR of Chapter 17 of PD856 and the Operational Manual on Sludge and Septage Treatment.

- **Operation and Maintenance**: It is important to hire a WTP Operator or a service provider for the efficient operation and maintenance, monitoring and recording of parameters. It is a must to have a readily available consumable stock of needed equipment and treatment materials for continuous WTP operation.

- **Training Requirement for Operation**: It is the responsibility of the awarded contractor to conduct the on-site or off-site training for the service, operation and proper preventive maintenance of the WTP. In compliance with the DENR requirements, the WTP operator shall undergo training before renewal of the discharge permit. A newly hired or newly assigned operator must first undergo training with the DENR.

- **Investment and Operating Cost**: Since it is a mandatory requirement of the government, the management of the HCF shall allocate a budget for the acquisition and maintenance of the WTP. Maintenance cost, manpower and operational (electrical and water) costs of the WTP shall be included in the annual budget of the HCF.

For a comparison of the Advantages and Disadvantages of the Different Types of WTP’s please refer to Annex G.
Figure 7.2  Flow of Wastewater from HCF Departments to WTP

Figure 7.3  Flow of Wastewater within the WTP
7.7 Operation, Maintenance and Monitoring of the WTP

7.7.1 Operation and Maintenance
The following elements must be in place for the efficient and effective operation and maintenance of the WTP system:

- Awareness among the management and senior staff on wastewater problems;
- Physical Assent Management (PAM) and Preventive Maintenance Program (PMP);
- Basic tools to carry out regular maintenance;
- PPE and other safety equipment measures;
- Trained operators and workers;
- Budget for operational costs and regular maintenance

The management shall designate wastewater treatment operator who will be responsible for the operation and maintenance of the WTP. A maintenance plan which includes corrective as well as preventive maintenance shall be set up for the collection, pre-treatment and treatment of wastewater.

7.7.2 Wastewater Quality Monitoring
If an on-site treatment plant is operated, regular testing of the influent as well as the effluent shall be monitored to test the efficiency of the treatment plant. Parameters required by DENR AO No. 35 will be tested based on the prescribed frequency.
PART III

ADMINISTRATIVE CONTROLS AND REQUIREMENTS
CHAPTER 8: ADMINISTRATIVE REQUIREMENTS

The success in the implementation of the HCWM depends on the political will of the head of the organization and the motivation, dedication and commitment of all the HCF workers. The planning, directing, implementing and review depend on the capability of the designated members of the HCWM committee to sustain the program. Appropriate HCWM practices depend largely on the administration and organization and require adequate legislative and financial support as well as the active participation by trained and informed staff.

8.1 Oversight and Management at the National and Local Levels

In the Joint Administrative Order of the DOH-DENR No. 2 Series of 2005, specific duties and responsibilities have been indicated for the DENR through the Environmental Management Bureau (EMB) and its regional offices, the National Solid Waste Management Commission (NSWMC) and the DOH through its Center for Health Development (CHD), Bureau of Health Devices and Technology (BHDT), Environmental and Occupational Health Office (EOHO) of the National Center for Disease Prevention and Control (NCDPC), the National Center for Health Facility Development (NCHFD) and the National Reference Laboratory (NRL) – East Avenue Medical Center, Quezon City.

8.1.1 DENR

The DENR through the EMB and its regional offices shall:

- Formulate and implement pertinent rules and regulations on the management of healthcare waste in the Philippines, particularly concerning the issuance of necessary permits and clearances for the Transport, Treatment, Storage and Disposal of such wastes, as governed by PD 1586, RA 6969, RA 8749, RA 9275 and RA 9003;
- Formulate policies, standards and guidelines on the transport, treatment, storage and disposal of HCW;
- Oversee compliance by generators, transporters, TSD facility operators and/or final disposal facility operators with the proper transport, treatment, storage and disposal of HCW;
- Conduct regular sampling and monitoring of wastewater in HCFs and TSD facilities to determine compliance with the provisions of RA 9275;
- Require TSD facility operators and on-site treaters to present to the DENR copies of the results of microbiological tests on the HCW treated using autoclave, microwave, hydroclave and other disinfection facilities prior to the renewal of their Permits under RA 6969;
- Provide technical assistance and support to the advocacy programs on HCWM; and
• Notify the DOH on cases of non-compliance or notice of violation issued to HCF, institutions and establishments licensed by the DOH.

8.1.2 DOH

The DOH shall:
• Include HCWM criteria in the licensing and accreditation requirements for HCFs. Formulate policies, plans, standards, guidelines, systems and procedures on the management of HCW;
• Develop training programs and corresponding modules on HCWM;
• Provide technical and resource mobilization to ensure an effective and efficient implementation of HCWM program;
• Require all HCW TSD facility operators and HCW generators with on-site waste treatment facilities to use DOH-BHDT registered equipment or devices used for the treatment of HCW;
• Conduct regular performance evaluation of equipment/devices used for the treatment of HCW by the DOH-BHDT;
• Monitor the microbiological test of treated wastes to ensure compliance with DOH standards;
• Evaluate the HCF’s compliance with proper HCWM program and provide incentive program for compliant hospital and for best practices;
• Issue Department Circulars to ensure that all environmental requirements are complied with; and
• Notify the DENR on actions taken on cases of non-compliance or notice of violation issued to HCF, institutions and business establishments.

8.1.3 DOH Centers for Health Development

The DOH Centers for Health Development shall:
• Advocate HCWM practices to the Local Chief Executives, key leaders and other stakeholders;
• Monitor HCWM implementation and compliance of DOH-licensed HCF and submit reports to DOH;
• Provide technical assistance on HCWM through:
  1. Training
  2. Issuance of advisory on the preparation of HCWM plans as a requirement for licensing or renewal thereof
  3. Dissemination of policies, guidelines and information
  4. Monitoring and validation of the implementation of HCWM
  5. Development, reproduction and dissemination of HCWM IEC materials
  6. Participation in any public hearing related to HCWM
8.1.4 Philippine Health Insurance Corporation (PHIC)

The Philippine Health Insurance Corporation (PHIC) and other accrediting bodies/agencies shall incorporate the following in the core indicator requirements for HCFs to qualify as Center of Safety, Center of Quality and/or Center for Excellence:

- HCWM Plan being implemented and monitored within the HCF;
- Functional organized and established HCWM Committee;
- Proper waste management segregation and compliance to color-coding;
- On-site or off-site treatment disposal;
- Updated discharge permit;
- Waste generator ID
- Adequate signage in place for HCW deposition and other established criteria for an HCF to meet the standards for safety, quality and excellence.

8.1.5 Department of Interior and Local Government (DILG)

The Department of Interior and Local Government (DILG) through the different Local Government Units (LGU) shall:

- Monitor the compliance of HCFs under its jurisdiction on the proper waste management, segregation and disposal
- Provide assistance in the provision of an appropriate landfill, collection of waste and installation of the WTP within the municipality
- Ensure HCF’s compliance with mandatory requirements for the transport, treatment storage and disposal of HCW as governed by PD 1586, RA 6969, RA 8749, RA 9275 and RA 9003.

8.2 Administrative Requirements at the Healthcare Facility

The HCF has to comply with certain administrative requirements for a functional HCWM. Discussed in succeeding topics are the mandatory requirements needed to make the HCF compliant.

8.2.1 Organization and Functions

The entire organization of the HCF must be responsible for the proper segregation, collection, storage, treatment and disposal of waste generated by the facility. However, there are certain units and individuals in the HCF that usually have more responsibility relative to HCWM. To sustain the implementation of HCWM within the HCF, the Office of the Administrator and/or Head of the HCF shall have the following duties and responsibilities and ensure the following:

- Organization of a Healthcare Waste Management Committee (HCWMC) that is fully represented by all medical, nursing and administrative services in the HCF;
• Designation / appointment of a Waste Management Officer (WMO) or its equivalent Pollution Control Officer (PCO) to supervise and coordinate the HCWM planning and its subsequent implementation;
• An up-dated healthcare waste management plan (HCWMP) that incorporates monitoring procedures;
• Allocation of sufficient financial and personnel resources to ensure effective and efficient implementation of the HCWMP;
• Appointment / designation of alternative members in the event of personnel leaving key positions in the HCWMC or temporarily assign responsibility to another staff member until another one can be formally appointed/designated;
• Adequate training for key members and designate the staff responsible for coordinating and implementing training courses;
• Speedy resolution of complaints and other related legal matters;
• Good working relationship with other related agencies by proper referral, consultation and cooperation concerning HCWM.

8.2.2 Healthcare Waste Management Committee

Appointment or designation of specific committee to handle HCWM in the hospital is critical on the part of the Administrator or head of the HCF. The qualification and political will of the person to be designated would determine the success of the program.

Figure 8.1 illustrates the link between the designated WMO with the other key personnel of the HCF.

Figure 8.1 Linkages of Key Personnel Involved in Healthcare Waste Management
All HCFs are required to have a HCWMC. However, small HCFs with limited staff are required to have an appointed WMO.

The HCWMC shall be responsible for the following functions:

- Formulate a policy formalizing the commitment of the HCF to proper management of its waste with the goal of protecting health and the environment.
- Establish baseline data and develop the HCF’s HCWMP which shall include a minimization plan, training and written guidelines on waste management.
- Implement the HCWMP; review and update the policy, plans and guidelines on an annual basis.
- Ensure adequate financial and human resources for implementation of the HCWMP.
- Conduct regular committee meeting and submit minutes of meeting.
- Regularly monitor and evaluate the efficiency and effectiveness of the HCWMP.
- Ensure strict compliance with existing laws, policies and guidelines.

The HCWMC shall be composed of at least a minimum of five (5) members as the Core Team to be composed of:

- The chairperson shall be the Head/Administrator of the HCF who will oversee the implementation and monitoring of the HCWMP in the HCF and imposition of possible administrative sanctions for any deficiencies and/or violation committed in the process;
- The WMO to be appointed or designated shall be third ranking plantilla position in the HCF. He/she shall be the alter ego of the Chairperson in the implementation of the HCWMP within the HCF;
- Infection Control Officer to be appointed or designated shall be at least a supervising nurse level with appropriate training on infection control principles;
- Pollution Control Officer to be appointed or designated shall be at least a permanent HCF worker preferably an engineer who had undergone proper training on pollution control principles;
- Finance/Budget Officer and Supply Officer who are in-charge of preparing annual plan for HCF operation to ensure the continuity of logistic requirements in the implementation of the program.

The Core Team shall be responsible for the following duties and responsibilities:

- Organize and establish the HCWM sub-committees or group who will directly implement within specific units of the HCF the HCWM policies and guidelines;
- Prepare the budgetary plan for the logistic requirements to implement HCWM within the HCF;
• Formulate policies and guidelines in the implementation of HCWM including granting of incentives for best practices;
• Approve request for unit activities and programs which will include training;
• Provide assistance to all units relative to proper orientation of all staff;
• Document and prepare report on regular basis; and
• Perform specific duties and responsibilities as follows:

1. **Administrator of the HCF** designated as Chairperson of the HCWMC shall be responsible in ensuring that the HCW shall be managed in accordance with the national policies and guidelines; formally appoint/designate dedicated personnel as WMO, PCO and other core members of the HCWMC indicating the specific duties and responsibilities, including their accountabilities; directs and controls the implementation of the different programs and activities of the HCWMC and conducts regular review of the policies subject for revision and assessment.

2. **Waste Management Officer (WMO)** designated as Co-Chair of the HCWMC will be responsible for the day to day operation and monitoring of the waste management system in the hospital. The WMO is directly responsible to the Head/Administrator of the HCF. He or she shall establish linkage with the Infection Control Officer, the Chief Pharmacist and the Radiation Officer in order to become familiar with the correct procedures for handling and disposing of pathological, pharmaceutical, chemical and radioactive waste. The duties and responsibilities of the WMO shall include the following:
   ○ Ensure that the internal regular collection of waste observe the proper waste segregation, collection and transport policies and guidelines;
   ○ Observe and direct the provision of continuous availability of waste bins, plastic liners, personal protective equipment and collection bins/carts and direct supervision of collection crews;
   ○ Check and direct correct use of central storage facility, which shall be kept locked but accessible to authorized staff at all times;
   ○ Coordinate and monitor waste treatment, disposal operations, waste transport for both on-site and off-site;
   ○ Coordinate with the Senior Nursing Officer and Department Heads to ensure that nursing staff and medical assistants as well as doctors and other qualified clinical staff are aware of their responsibilities for segregation and storage of waste; and
   ○ Ensure that written emergency procedures are available and that personnel are aware of the action to be taken in the event of an emergency. Investigate and review reported incidents concerning the handling of HCW.
3. **Designated Pollution Control Officer (PCO)** shall be responsible for the HCF compliance to the requirements mandated by EMB-DENR and other regulatory agencies. He/she shall be responsible for the following duties and responsibilities:

- Attend to requirements of the HCF prior to the construction or installation of pollution control facilities including the application and securing of necessary pollution permits and renewal;
- Monitor activities pertaining to the installation or construction of pollution source and control facilities with the end in view of ensuring their compliance with air, noise and water quality standards; the PCO and the head of the HCF shall be held responsible for any violations of PD 984 and its implementing rules and regulations committed by the establishment where the officer is employed;
- Supervise the proper operation and maintenance of pollution control facilities of the establishment or agency;
- Report within reasonable time to the EMB-DENR the breakdown of any pollution control facility and the estimated and actual date of completion/repair and operation;
- Promptly submit validated/certified as correct by the HCF Administrator periodic reports as required by the EMB-DENR;
- Act as liaison officer and maintain linkage with the DOH, DENR, EMB and designated PCO of other agencies including the local government unit;
- Keep himself abreast with the requirements of DENR-EMB and the latest available technology on the prevention, control and abatement of pollution; and
- Attend the meetings for PCO’s which may from time to time be called by the monitoring agency.

4. **Designated / Appointed Infection Control Officer (ICO) / Safety Officer (SO)** shall be responsible for the following duties and responsibilities:

- Maintain linkage with the WMO on a continuous basis and provide advice concerning the control of infection and the standards of the waste disposal system.
- Identify training requirements according to staff grade and occupation;
- Organize and supervise staff training courses on safe waste management;
- Liaise with the department heads and Senior Nursing Officer regarding the training of their staff;
- Handle the overall responsibility for chemical disinfection, sound management of chemical stores and chemical waste minimization;
- Ensure that all chemical used in the HCF has a Material Safety Data Sheet (MSDS).
5. Finance / Budget Officer and Supply Officer

Finance/Budget Officer shall be responsible in assuring the provision of continuous logistics, maintaining and sustaining the programs and activities of the HCWM Committee and including them in the annual procurement plan. Supply Officer shall:

- Liaise with the WMO to ensure a continuous supply of the items required for waste management (plastic liners and bins of the right specifications, spare parts for the on-site waste treatment equipment, etc.). These items shall be ordered within a reasonable time to ensure that these are readily available at the HCF at all times. However, excessive accumulation of these items should be avoided.
- Investigate the possibility of purchasing environmental-friendly products (e.g. PVC-free plastic items) by adopting the principles of Green Procurement Policy.

All HCF management and support staff play a vital part in the success of the program. Equally important are the specific roles and contribution of the following specific key personnel in any HCF:

1. Division Heads of the Medical, Nursing and Administrative Services shall:
   - Ensure strict compliance of their respective staff with the policies and guidelines being implemented by the HCWMC;
   - Disseminate polices and guidelines down the line including all the support staff in the HCF;
   - Conduct regular orientation and reorientation among their HCF workers;
   - Maintain linkage with designated WMO

2. Department Heads are responsible within their respective areas of concern to ensure that all members of their department are aware of the hospital waste management plan as to segregation and storage procedures and that strict compliance is observed. They shall also:
   - Ensure that all doctors, nurses, clinical and non-clinical professional staff in their departments are aware of the segregation and storage procedures and that all personnel comply with the highest standards in HCWM;
   - Liaise with the WMO to monitor working practices against failures or mistakes;
   - Ensure that key staff members in their department are given training in waste segregation and disposal procedures; and
   - Encourage medical and nursing staff to be vigilant so as to ensure that hospital attendants and ancillary staff follow correct procedures at all times.

3. The Senior Nursing Officer is responsible for the training of the nursing staff, medical assistants, hospital attendants and ancillary staff on the correct procedures for the segregation, storage, transport and disposal of waste. He/she shall:
Liaise with the WMO and the advisers (Infection Control Officer, Chief Pharmacist, and Radiation Officer) to maintain the highest standards in HCWM;

Participate in staff introduction to and continuous training in the handling and disposal of waste; and

Liaise with the Department Heads to ensure coordination of training activities, other waste management issues specific to particular departments.

4. The Chief Pharmacist is responsible for the sound management of pharmaceutical storage and for pharmaceutical waste minimization. Hs/she shall:

Liaise with the Department Heads, the WMO, the Senior Nursing Officer and give advice, in accordance with the national policy and guidelines, on the appropriate procedures for pharmaceutical waste disposal;

Coordinate continuous monitoring of compliance with procedures for the storage and disposal of pharmaceutical waste;

Ensure that personnel involved in pharmaceutical waste handling and disposal receive adequate training; and

Ensure safe utilization of genotoxic products and safe management of genotoxic waste.

5. The Radiation Officer shall

Ensure proper waste management of radioactive waste;

Liaise with the Department Heads, the WMO, the Senior Nursing Officer and give advice, in accordance with the national policy and guidelines, on the appropriate procedures for radioactive waste disposal including its continuous monitoring;

Ensure that personnel involved in radioactive waste handling and disposal receive adequate training.

6. The Head of the General Services including the unit heads of housekeeping and janitorial services shall:

Maintain cleanliness and orderliness of the HCF premises for aesthetic reasons;

Assist in the preparation of the HCWMP;

Initiate a sanitary manner of implementing the pre-treatment process, appropriate collection system/procedures and disposal of waste either by TSD or municipal system;

Establish baseline data, ensure generation of data for regular recording and monitoring; and maintain proper filing system and update program records;

Maintain constant good working relationship with all HCF workers for their support and full participation in implementing the program;

Enhance or provide continuous training for housekeeping/janitorial services on waste management and government policies.

7. Maintenance and Ground Services shall:

Assist in the proper collection, pre-treatment and disposal of HCW;
○ Carry out directly the activities related to the operation and maintenance of pre-treatment, collection and disposal system with importance to the drainage system and plumbing facilities of the establishment;
○ Attend immediately to problems arising from the repair/installation of waste equipment.

8. **The Motor Pool and Ground Services** shall

○ Assist in the provision of vehicle for transporting HCW to transfer station or disposal sites;
○ Prepare and plan the collection system routes and frequency of collection of HCW;
○ Inspect and schedule maintenance work on vehicles used for transporting HCW;
○ Observe proper infection control measures in the maintenance of vehicles used for the transportation of HCW

9. **The HCF Engineer** or the designated in-charge of engineering services shall:

○ Be responsible for installing and maintaining waste storage facilities and comply with the specifications of the national guidelines;
○ Be accountable for the adequate operation and maintenance of any on-site waste treatment equipment;
○ Be responsible for compliance with mandatory requirements of pollution control;
○ Be responsible for the staff involved in waste treatment; ensure that the staff designated to operate the on-site waste treatment facilities are trained in their operation and maintenance.

However, for other HCF, the composition may vary depending on the category and availability of personnel. The Administrator of HCF shall formally appoint/designate the members of the HCWMC indicating their specific duties and responsibilities.

8.2.3 **Healthcare Waste Management Plan**

A comprehensive HCWMP is the key ingredient to a successful waste management within an HCF. It is important that the plan be understood or followed to be of great value to the organization. Training of staff to ensure that they are familiar with and understand the plan is critical to its successful implementation and the effective handling of HCWs.

The HCWM plan shall consider three major concerns. Specific plan of actions shall be formulated to respond to each concern which shall include in its performance indicators the involvement of all HCF personnel and its clients; improvement of HCF facilities; training and enhancement of skills necessary to have an effective handling of HCWs.

In developing a comprehensive HCWMP, the following major concerns shall be addressed:

1. **Assessment of waste generation and waste disposal.** In developing a HCWMP, the HCWMC needs to make an assessment of all waste generated in the HCF. The WMO
shall be responsible for coordinating such a survey and for the analysis of the results. The assessment shall include:

- Average daily volume of waste generated per category within a given period of time;
- Site and location of the HCF vis a vis the existence of accredited TSD within the locality;
- Assessment of any future changes in the facility, departmental growth or the establishment of new departments. Data from the waste generation survey shall be a basis of the waste management plan.

2. **Review of existing HCWM policies and procedures being implemented.** To have a clear overview of this concern, the following activities have to be included in the plan, namely:

- Understanding of existing policies, laws and regulations related to HCWM;
- Review of the present waste management system to include where the waste is generated, what types of waste are being generated, how and where it is stored and the cost effectiveness of the current handling processes; and
- Revision and redesigning of the HCWMP to ensure that all issues have been addressed.

3. **Formulation and drafting of HCWMP**
   
   In the drafting and formulation of the HCWMP, the following may be used as guide:

   a. Short description of the plan and the HCF. This will include the background of the HCF including its mandates, type of clients being served, demographic profile and geographic location of the HCF. This will also discuss briefly the different national, local and international laws, policies and issuances relevant to the implementation of HCWM within the HCF.
   
   b. Objective and rationale of the plan – this will briefly discuss the purpose of the plan, targets, its coverage, scope and limitations.
   
   c. Composition of HCWMC, its structure, duties and responsibilities; roles and responsibilities of the other staff of the HCF.
   
   d. HCWM plan – from point of generation up to its final disposal including flow chart, route plans and schedules. This will also identify the different activities and persons responsible for handling specific activities and whom to be responsible for. This will also include the milestones or strategies to move the current HCWM system into the system envisioned in the plan, the minimization plan, the procurement plan and others.
   
   e. Education, training, information and communication activities – a comprehensive training and orientation of HCF worker shall be conducted. Each HCF staff must know their specific roles in the effective implementation of the HCWMP. Every HCF worker must be aware of the policy, the significant health and environmental impacts of their work activities, their roles and responsibilities, the procedures that
apply to their work and the importance of conforming with the requirements as well as the consequences of not following the requirements. The plan will identify the timetable and the responsible persons for the development of training materials and conduct training for the different categories of HCFs, the development of advocacy materials (if needed) and the conduct of orientation for patients and watchers.

f. HCF worker protection and safety – this will include the plans for HCF worker’s occupational health and safety program including emergency management for possible related risks or accidents during the process. This will also indicate the Infection Control policies and procedures to be observed in handling HCW specifically infectious and mercury waste,

g. Monitoring and evaluation – action plan for the conduct of regular monitoring of the implementation and submission of required reports. This will include the self-monitoring tools, assessment of findings and submission of recommendations and follow-up of status.

h. Financial Requirements for the implementation of the plan

i. Provision for feedback mechanism, updating and revision of plan.

The HCWMP basic components as discussed may vary depending on the level and capability of the HCF.

8.2.4 Life Cycle Analysis (LCA)

One of the approaches that can be helpful in developing a HCWMP is the Life Cycle Analysis (LCA). LCA is a “cradle to grave” approach to estimate the cumulative environmental impacts associated with the life cycle (manufacture, use and maintenance to its final disposal) of a product, process or service by:

- Compiling and inventory of relevant energy and material inputs and environmental releases
- Evaluating the potential environmental impacts associated with identified inputs and releases
- Interpreting the results to help decision-makers make a more informed decision.

LCA provides a more accurate picture of the true environmental trade-offs in product and process selection. An LCA can help decision-makers select the product or process that result in the least impact to the environment. This information can be used with other factors, such as cost and performance data to select a product or process. LCA data identifies the transfer of environmental impacts from one media to another (e.g. eliminating air emissions by creating a wastewater effluent instead) and/or from one life cycle stage to another (e.g. form use to reuse of the product to the raw material acquisition phase).
This ability to track and document shifts in environmental impacts can help decision makers and managers fully characterize the environmental trade-offs associated with product or process alternatives. By performing an LCA, analysts can:

- Develop a systematic evaluation of the environmental consequences associated with given product.
- Analyse the environmental trade-offs associated with one or more specific products/processes to help gain stakeholder (state, community, etc.) acceptance for planned action.
- Quantify environmental releases to air, water and land in relation to each life cycle stage and/or contributing process.
- Assist the human and ecological effects of material consumption and environmental releases to the local community, region and the world.
- Compare the health and ecological impacts between two or more rival products/processes or identify the impacts of a specific product or process.
- Identify impacts to one or more specific environmental area of concern.

8.2.5 Environmental Management System (ISO 14001)

Another approach that can be adopted particularly those aiming for an ISO accreditation is the development of an Environmental Management System as implemented under the ISO 14001.

An Environmental Management System (EMS) is a continuous process of improvement which involves environmental planning, implementation, checking and management review on the programs being implemented within the HCF in compliance with existing environmental and HCWM laws and policies.
An EMS follows a Plan-Do-Check-Act Cycle or PDCA. The diagram shows the process of first developing an environmental policy, planning the EMS and the implementation. The process also includes checking the system and acting on it. Constant review and revision by the organization is vital for the continuous improvement of the EMS.

![Diagram of Environmental Management System (EMS) Cycle]

**Figure 8.3 The Environmental Management System (EMS) Cycle**

### 8.2.5.1 Key Elements of the EMS

The following are the key elements of the EMS cycle:

- **Policy Statement** – a statement of the organization’s commitment to the environment
- **Identification of Significant Environmental Impacts** – environmental attributes of products, activities and services; and their effects on the environment
- **Development of Objectives and Targets** – environmental goals for the organization
- **Implementation** – plans to meet objectives and targets
- **Training** – instruction to ensure HCF workers are aware and capable of fulfilling their environmental responsibilities
- **Management Review**

The EMS can be integrated with the HCWM plans and activities being implemented by the HCF. It is flexible and does not necessarily require organizations to “retool” their existing activities. An EMS establishes a management framework by which an
organization’s impact on the environment can be systematically identified and reduced. For example, many organizations, including cities and municipalities, have active and effective pollution prevention activities underway; these could be incorporated into the overall EMS.

8.2.5.2 Benefits of the EMS
Adopting an EMS:

- Serves as a tool to improve performance
- Provides a systematic way of managing an organization’s environmental affairs
- Addresses the organization’s overall management structure for the immediate and long-term impacts of its products, services and processes on the environment
- Gives order and consistency for organizations to address environmental concerns through the allocation of resources, assignment of responsibility and on-going evaluation of practices, procedures and processes
- Focuses on continuous improvement of the system

Application of the EMS in the system will provide benefits which include cost reductions through reduced energy consumption, waste and recycling, minimizing other negative impacts on the environment, and even improved public image.

The EMS framework encompasses the environmental aspects of waste including reduction, reuse and recycling. It also has considerable relevance to environmentally preferable purchasing; the HCF has a choice with regards to the purchase of products or services. It is becoming increasingly common that HCFs require suppliers to have an EMS in place.

8.2.6 Monitoring and Evaluation of the HCWM Plan

To validate the effectiveness and the efficiency of the HCWMP, regular monitoring and evaluation is necessary. There are several methods which can be adapted to document the assessment and evaluation of the program. This includes using the designated tools such as Self-Monitoring Sheet (for samples, please refer to Annex C and D). By doing self-monitoring, it will be possible to grade the actual success of the Plan for every unit of the HCF.

The six major parameters that will be used to determine the extent of the Plan implementation are the following:

1. Waste Minimization Practices
2. Waste Segregation
3. Waste On-Site Collection, Transport and Disposal
4. Waste Treatment On-Site (if applicable)
5. Wastewater Management
6. Administrative Control
In Table 8.1, the necessary forms needed to be submitted by the HCF are listed alongside with the on-line links where the forms can be downloaded from.

Table 8.1 List of Necessary Forms to be Submitted by the HCF

<table>
<thead>
<tr>
<th>FORMS NEEDED</th>
<th>Links</th>
</tr>
</thead>
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<td>LLDA Clearance</td>
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</tr>
<tr>
<td>Hazardous Waste Treater Registration Form</td>
<td><a href="http://www.emb.gov.ph/hazardous/Forms/RegForm_HWTreater.PDF">http://www.emb.gov.ph/hazardous/Forms/RegForm_HWTreater.PDF</a></td>
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<tr>
<td>Hazardous Waste Treater Affidavit</td>
<td><a href="http://www.emb.gov.ph/hazardous/Forms/affidavit_HWtreater.PDF">http://www.emb.gov.ph/hazardous/Forms/affidavit_HWtreater.PDF</a></td>
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8.3 Communication and Training

All HCFs, the DOH and the EMB-DENR have the responsibility and a “duty of care” for the environment and public health, particularly in the institutionalization of awareness among HCW and the general public.

The need to promote appropriate handling and disposal of HCW is important to public health. Every member of the HCF and the community has the right to be informed about the potential health hazards associated with HCW. Inadequate handling of HCW may have serious public health consequences and impacts on environmental health protection.
Public awareness through formal or informal education plays an important role in HCWM. Development of information, education and communication (IEC) programs and materials shall be given due course.

The objectives are:
- To transmit the basic skills and knowledge in establishing a healthy, secure and safe environment for HCW and the general public.
- To inform the public about the risks linked to HCW, focusing on people either living or working in close proximity to, or visiting HCF, families of patients being treated at home and scavengers on waste dumps.
- To foster responsibility among hospital patients and visitors to HCF regarding hygiene and HCWM.
- To prevent exposure to HCW and related health hazards, this exposure may be voluntary in the case of scavengers or accidental as a consequence of unsafe disposal methods.
- To increase awareness of the impact of HCW on environment and ecology.
- To influence behaviour of patients, watchers, HCF workers to implement proper HCWM.

In developing the education, training, information and communication tools, there are several concerns that need to be addressed. These are:
- Specific targeted subjects or participants, including their level of understanding and involvement in the implementation of the HCWMP;
- Availability of funds and logistics to sustain the program;
- Support of the HCF management to the program.

8.3.1 Methods of Communication and Training Used

To effectively communicate the importance of knowing the hazards of HCW and its management to targeted participants, the following methods can be considered:
- Graphics and audio-visuals which may be in the form of brochures, posters, display boards, video tapes, slides, CD/DVDs, flyers, flip charts, leaflets, etc.
- Use of tri-media such as announcements or commercial ads featured in radios, movies, television, newspaper, magazines and the internet.
- Orientation/re-orientation seminars, training and workshops; community and health teachings for hospital patients, watchers and other clients using IEC materials and didactic exercise.
- Issuance of written HCF policies to disseminate the information and awareness among HCF workers. There shall be corresponding sanctions to be implemented for non-compliance with issued policies.
8.3.2 Training of Healthcare Workers

Training is essentially the transferring of knowledge, skills and capacity building of targeted participants. In any HCF, it is mandatory to implement education and training programs to make all the HCF workers aware of the hazards involved in HCW and their specific roles.

All HCF workers shall receive training tailored to their different needs at various levels or functions in the HCF. The overall aim of the training is to develop awareness on the health, safety and environmental issues relating to HCW, and how these can affect HCF workers in their daily work. It shall also highlight the roles and responsibilities of the HCF workers.

Separate training activities shall be designed for each of the following targeted categories of personnel:

- HCF managers and administrative staff responsible for implementing regulations on HCWM
- Medical doctors
- Nurses and assistant nurses
- Cleaners, porters, auxiliary staff and waste handlers

The training for waste generators as well as waste handlers is equally important. Medical doctors may be educated through senior staff workshops and general hospital staff through formal seminars. The training of waste managers and regulators could take place outside the hospital at public health schools or university departments. Basic education program for HCF worker shall include:

- Information on and justification for all aspects of the HCW policy;
- Information on the role and responsibilities of each HCF worker in implementing the policy;
- Technical instructions, relevant for the target group, on the application of waste management practices.

All HCF workers must receive initial and annual training. A trained individual must be available during training sessions. The instructors shall have experience in teaching and training, and be ideally familiar with the hazards and practices of HCWM; they should also have experience in waste handling.

8.3.3 Suggested Training Package for Each Target Group

The development of a training package shall be suitable for the various types of HCFs, including government, private and teaching hospitals; dental clinics, polyclinics, health centers, healthcare research institutions, clinical laboratories and similar establishments.
8.3.3.1 For Personnel Providing Healthcare

The training course shall provide an overview of the waste management policy and underlying rationale and information on practices relevant to trainees’ responsibilities. Waste segregation is a key element for this training in waste management. All HCF workers that generate HCW shall be responsible for its segregation, and shall therefore receive training in the basic principles and practical applications of segregation. Training shall make the staff aware of the potentially serious implications of the mismanagement of waste to the health of waste handlers and patients; provide them with an overview of the fate of waste after collection and removal from the ward and teach them the importance of proper segregation.

8.3.3.2 For Waste Handlers

Topics covered may include the waste management policy, health hazards, on-site transportation, storage, safety practices and emergency response. Among staffs who routinely handle HCW, awareness of the need for safety may decrease with time, which will increase the risk of injury. Periodic refresher course is therefore recommended.

8.3.3.3 For Healthcare Waste Management Operators

The training course shall include:

- Information of the risk associated with the handling of HCW;
- Procedures for dealing with spillage and other accidents;
- Correct use of protective clothing.

8.3.3.4 For Staff who Transport the Waste

In carrying out the responsibility of waste transportation, the drivers and waste handlers shall be aware of the nature and risk of the transported waste. Transport staff shall be able to carry out all procedures for:

- Handling, loading and unloading of waste bags and bins;
- Dealing with spillage or accidents;
- The use of PPE; and
- Documentation and recording of HCW, e.g. by means of consignment note system to allow waste to be traced from the point of collection to the final place of disposal.

8.3.3.5 For Treatment Plant Operators

HCFs shall make arrangements to provide training to prospective treatment plant operators specifically on the following areas:

- General operations of the treatment facility;
- Health, safety and environmental implications of treatment operations;
- Technical procedures for plant operations;
• Emergency response, in case of equipment failures and/or alarms;
• Maintenance of the plant and record keeping;
• Surveillance of the quality of emissions and discharges, according to the specifications.

8.3.3.6 Orientation Module for Patients

HCF shall provide patients and watchers an orientation of the HCWM policies and system of the hospital as part of the admission procedure. The orientation will include, at the minimum, the following:

• Policies on HCWM relevant to patients and watchers such as the ban on Styrofoam and non-reusable plastic food containers, proper segregation of waste
• Impact of improper segregation and Styrofoam/non-reusable plastic food containers on health, safety and environment

Figure 8.4 IEC Material: Leaflet given to patient upon admission to hospital

Courtesy of San Lazaro Hospital, Manila
8.4 Budgetary Requirements to Implement the HCWM Program

The benefits of HCWM are in terms of infection control, protection of HCF workers, and the protection of the environment and the accreditation of the HCF with the national social health insurance scheme or PhilHealth. To realize these benefits and be compliant with the existing laws and policies, the HCF needs to identify the most cost-effective option that fits its needs and financial capacities. This section will provide guidance to HCF by looking at the costs elements of HCWM, identifying measures to reduce costs and examining available options for financing.

8.4.1 Investment and Operations Cost

The “polluter pays” principle mandates each HCF to be financially liable for the safe management of its HCW. The costs of separate collection, packaging and on-site handling are internal to the establishment; while costs of off-site transport, treatment and final disposal are external and paid to the contractors who provide the service. The costs that will be incurred by the HCF in managing HCW will include:

8.4.1.1 Waste Segregation and On-Site Handling

Proper segregation and on-site handling of wastes includes the cost for the following materials, goods and services:

- Waste bins, color-coded plastic liners that shall be placed in appropriate locations in the hospital, transport trolleys and collection bins.
- Proper labels for the waste bins, tags for the plastic liners and signage/posters.
- Training of personnel to place wastes in the appropriate containers and to handle them in a safe manner
- IEC materials
- Storage spaces for HCW within the HCF, spill kits and measure to secure and protect the wastes when needed.
- PPE needed to safely and properly handle wastes
- Occupational health and safety measures such as immunization
- Sealer for plastic liners and packing the wastes for transport if the treatment facility is located at a distance from the HCF
- Transportation borne by the HCF
- Operating and maintenance costs including salaries and wages

Segregation of wastes effectively reduces the amount of wastes needed for transport (if located off-site), treatment and disposal at the treatment facility. Investments in training and equipment may not be offset by lower costs. However, total costs to the environment will diminish because the inclusion of materials that may release harmful substances to the environment during treatment processes is lessened.
8.4.1.2 Waste Treatment

Establishing and operating an on-site waste treatment include the investment and operating costs listed below:

- Non-burn waste treatment technology and its accessories and related processes (e.g. shredder and additional processes such as encapsulation and inertization in cases where the waste treatment system do not deactivate chemical and toxic agents)
- Microbiological testing equipment and supplies
- Installation and facility costs: installation labor, facility modifications – cement pad/s, curb cuts, sewers, electricity, space, security, etc.
- Costs of pollution control equipment if required to control emissions and effluents from the facility (e.g. wastewater treatment plant)
- Construction of temporary storage and hauling areas for treated wastes
- Direct labor costs: number of HCF workers needed to operate the treatment and disposal equipment
- “Down time” costs: including repair (parts and labor) and alternative treatment
- Operating costs if the facility uses special chemicals and catalysts
- Utility costs
- Permitting and compliance fees: water and air monitoring fees, Environmental Compliance Certificate (ECC), Discharge Permit, Permit to Operate Pollution Source Equipment (e.g. generators) and registration with the DENR as waste generator, treater and/or transporter
- Fines: depending on permit requirements, national and local regulations; violations of permits or emissions which may result to the payment of fines
- All transportation, processing and tipping fees
- Supply costs – personal protective equipment, spill supplies, special bags (e.g. some autoclaving systems require specific bags), collection containers (boxes or reusable containers)
- Community approval cost if a public hearing is required
- Sterilization equipment

In cases where the HCF enters into a contract with a DENR-accredited TSD, the costs that will be incurred by the HCF will be charges of the waste treater and the associated transportation costs.

Investment in on-site treatment facilities may be costly but allows the HCF to control the manner by which the waste is treated as well as the costs associated with treatment. Off-site treatment facilities, when available, may be more costly in the long run but it allows the HCF to concentrate on its basic occupational function and not on operations it is not built to do, which is the treatment of waste.
8.4.1.3 Disposal

Disposal to a sanitary landfill is considerably more costly than disposal in open dumpsites; sanitary landfills may charge a higher fee for waste coming from HCFs. In evaluating treatment options, costs with relation to final disposal shall be considered since treatment systems can almost eliminate wastes altogether (pyrolysis) but some even increase the weight of wastes (steam systems without dryers). Care shall also be taken to render the wastes unrecognizable. The following are some costs that should be considered when using an on-site facility for the disposal of treated waste:

- Construction of temporary storage and hauling areas for treated waste
- Costs related to wastes not handled by the hauler
- Cost of encapsulation, inertization, septic vault
- Labor costs for hauling, labelling, waste documentation, security and maintenance of temporary storage areas
- Hauling costs
- Transport containers
- Landfill tipping fees

The WHO prepared two (2) costing tools, the Costing Analysis Tool (CAT) and the Expanded Costing Analysis Tool (ECAT) to help calculate the true cost of setting up an HCWM system. The CAT estimates the costs of HCWM at the national and HCF levels. The ECAT, which is a modified version of the CAT, estimates costs at the HCF, central treatment facility or cluster and national levels. These tools may be downloaded from [http://www.healthcarewaste.org/en/documents.html?id=218](http://www.healthcarewaste.org/en/documents.html?id=218)

8.4.2 Measures to Reduce Costs

In the long run, cost reductions can be achieved by implementing the following measures at the different stages in the management of wastes:

1. Comprehensive Planning
   - Development and implementation of a comprehensive HCWMP which includes the recommendations below on on-site management
   - Designing all elements of the system to be of adequate capacity in order to obviate the need for subsequent costly modifications
   - Anticipating future trends in waste production and the likelihood of legislation becoming more stringent
   - Planning collection and transport in such a way that all operations are safe and cost-efficient
   - Possible cooperative use of regional waste treatment facilities, including private sector facilities when appropriate
   - Establishment of wastewater disposal plan
2. **On-site Management (source reduction, recycling and re-use)**
   - Comprehensive management of chemicals and pharmaceuticals stores, which includes centralized purchase and use of chemicals and pharmaceuticals; and the centralized monitoring of chemical flows within the HCF.
   - Improved waste identification to simplify segregation, treatment and recycling.
   - Reduction of the amount of material used to accomplish tasks. Examples are the use of email instead of paper and the use of smaller amounts of disinfectant to clean rooms.
   - Reduction of toxicity of the materials used in order to reduce the disposal costs and the hazards to the HCF workers. Purchase of materials that may be reused and recycled such as in the case of disposable medical care items and reusable salad plates for the hospital cafeteria.
   - Practice just in time delivery in order to minimize on wastes incurred due to the expiry of items like drugs and chemicals.
   - Adequate segregation of waste to avoid costly or inadequate treatment of waste that does not require it.

3. **Adequate treatment and disposal method**
   - Selection of a treatment and disposal option that is appropriate for waste type and local circumstances.
   - Use of treatment equipment appropriate type and capacity.
   - Possible cooperation between local HCFs.

4. **Measures at worker level**
   - Establishment of training programs for HCF workers to improve the quality and quantity of work.
   - Protection of HCF workers against occupational risks.

5. **Documentation**
   - Documentation of waste management and assessment of the true costs makes it easier to identify priorities for cost reduction and to monitor progress in the achievement of objectives.

### 8.4.3 Options for Financing

HCWM may be financed through in-house funds of the HCF, revenues from recyclable waste, loans from credit facilities and through sub-contracting, partnerships or joint-venture with other institutions providing TSD services (sharing WTP, waste treatment, mercury storage).

Government-owned or private HCF may use internal revenues to pay for the cost of the HCWM system. The costs of managing HCW shall be covered by a separate budget line item in the HCF budget. In case in-house funds are not available, HCF and TSD facilities can avail of credit financing for the investment and operation costs of HCW treatment, wastewater treatment and air pollution control devices from loan facilities.
such as the Environmental Infrastructure Support Credit Program (EISCP) of the Development Bank of the Philippines (DBP).

Privatization is a method of financing various types of public works, including HCWM. Under such an arrangement a private entity finances, designs, builds, owns and operates the treatment facilities and sells its collection and disposal services to government and private HCF. Privatization is an option that may be considered under the following conditions:

- Inability of hospitals to raise the needed capital
- Expected greater efficiency in the private sector because of fewer constraints than in the public sector (e.g. greater flexibility in purchasing and personnel policies, allowing for more rapid adaptation to changing needs)
- Transfer of responsibility for proper operation and maintenance to an organization with more resources for minimizing risk.

In contracting with the private sector, the agreement between the private operator and the HCF shall include agreements on the following issues:

- Minimum risk level of service, especially with regards to reliability, safety, public health risk and future expansions;
- Future increases in cost resulting from factors that cannot be fully assessed at the outset;
- Environmental concerns;
- Future transfer of ownership of the facilities;
- Regular inspection and regulatory control.
Chapter 9: Health and Safety Practices

9.1 Principles

HCWM policies, plans and programs shall include provision for the health and safety of HCF workers. Educating the HCF workers on the risks associated with HCW shall be part of this policy. Established policies and procedures ensuring the health and safety of HCF workers during the management of HCW from generation, segregation, collection, transport, storage, treatment and disposal shall be consistently implemented and complied by all concerned.

In a setting like an HCF, it takes team effort to have an effective HCWMP, as wastes are generated and produced in different areas with interconnected work processes. The support of the top management including the Administrator of the HCF is very vital in ensuring that the program is established, implemented, monitored, evaluated and continually improved. Essential occupational health and safety measures include:

- Education, training and awareness of HCF workers
- Provision of appropriate PPE
- Establishment of an effective occupational health and safety program that includes pre-employment immunization, pre and post exposure prophylactic treatment, hazard identification and risk assessment and continuous medical surveillance
- Information, Education, and Communication (IEC) activities

9.2 Education, Training and Awareness of Healthcare Facility Workers

Everyone within the HCF plays a vital role in the management of HCW, for this reason, the training program shall cast a wide network. Every HCF worker shall be made aware of the policy, the significant health and environmental impacts of their work activities, their roles and responsibilities, the procedure that apply to their work and the importance of conformance with the requirements. The worker shall understand the potential consequences of NOT following the requirements.

A training module shall be part of the Orientation/re-orientation Program for newly-hired and existing workers to ensure consistency in compliance by all HCF workers. The use of IEC materials, issuances and advisories shall be utilized to raise awareness and ensure effective implementation of the program.

9.3 Worker’s Protection

All HCF workers who are directly involved in the handling of HCW must be provided with adequate protection from the hazards associated with it. Protection against personal injury is very important for all HCF workers at risk. The individual responsible to the management of HCW shall ensure that all these risks are identified and that suitable protection is provided. The installation of the required protection measures will proceed after the conduct of a comprehensive risk assessment of the
activities in HCWM. The design of the measure will focus on the prevention of workers exposure or at least exposure within safe limits.

Suitable training shall be provided to the HCF workers on this aspect. In regular cleaning of waste bins, HCF worker shall observe infection control measures.

9.4 Personal Protective Equipment (PPE)

PPE is a specialized clothing or equipment worn by a worker designed to protect against infectious materials or form exposure to infectious agents (OSHA) thus, preventing injury or illness from specific hazards.

Every effort shall be made to eliminate it so that workers are not harmed or at least lessen the risk of hazards associated in their work processes. It can be done by considering the hierarchy of controls, that is elimination, substitution, engineering and administrative controls. However, if this is not possible, the use of PPE is necessary. PPE can also provide an added protection to the worker even if the hazard is being controlled by other means.

HCWM program requires that the following PPE shall be made available to all HCF workers who collect and handle HCW:

![Personal Protective Equipment](image)

Figure 9.1 Personal Protective Equipment
• Disposable gloves (for medical staff) or heavy duty gloves (for waste handlers) – obligatory
• Face masks – obligatory for waste handlers and for other HCF workers depending on the nature of work and exposure
• Hard hats with or without visor – depending on the nature of work and exposure
• Eye protectors / Safety goggle – depending on the nature of work and exposure
• Overalls (coveralls) – depending on the nature of work and exposure
• Industrial aprons – depending on the nature of work and exposure
• Leg protectors and/or industrial shoes/boots – depending on the nature of work and exposure
• Respiratory (HEPA) filters – depending on the nature of work and exposure
• Ear muffs - depending on the nature of work and exposure

Industrial boots and heavy-duty gloves are particularly important for waste handlers. If segregation is improper, needles or other sharp items may have been placed in plastic bags, such items may also pierce thin-walled or weak plastic containers. The thick soles of the boots offer protection in the storage area, as a precaution from spilled sharps; and where floors are wet and slippery. Leg protectors may also be worn to prevent HCW liners from coming in contact with the workers’ legs during handling.

HCF workers should know the correct usage and maintenance of the equipment. PPE shall conform to established standards. Training on PPE shall include:

1. Description on the type of hazard and the condition of the work environment - determination of waste management concerns, working conditions, materials, equipment and substances used, the exposed populations and conditions of exposure, taking into account the adverse effects on human health and to the environment.
2. Explanation on why a certain type of PPE has been selected - based on the hazards present, the type of materials used and the manner in which they will be handled.
3. Explanation on its proper use, maintenance and storage - PPE shall be kept safe and in good condition. Defective PPE shall be discarded. Since PPEs have limitations and useful life, these must be regularly inspected for its effectiveness.

9.5 Occupational Health and Safety Program
9.5.1 Personal Hygiene

Handwashing with soap and water has been considered as a measure of personal hygiene. Provision for washing facilities (with soap and warm water) and instruction shall be made available at the point needed to ensure that proper handwashing is observed. If clean running water is not accessible, use soap and available water. If soap and water are unavailable, use an alcohol-based hand sanitizer that contains at least 60% alcohol to clean hands. (CDC: Handwashing: Clean Hands Save Lives)
Hand hygiene is an essential component of an effective infection prevention and control program. Good technique ensures that all surfaces of the hands come into contact with decontaminating agent. This has been accepted for many years and is acknowledged in current guidelines.

When should you wash your hands?
- Before, during and after preparing food
- Before eating
- After using the toilet
- After changing diapers or cleaning up a child who has used the toilet
- Before and after caring for someone who is sick
- After touching animal or animal waste
- After touching garbage
- Before and after treating a cut or wound

Bathing after a waste-related emergency shall be done for complete decontamination.

9.5.2 Immunization
1. Pre-employment Immunization
   HCF workers shall be given immunization to prevent or ameliorate the effects of infection by many pathogens such as virus causing hepatitis B and tetanus infection. Many HCF workers are at risk of exposure to and possible transmission of vaccine-preventable diseases because of their contact with infectious materials from patients such as HCW. Maintenance of immunity is therefore an essential part of the prevention and infection control programs for HCF workers.

2. Post Prophylactic Immunization
   Persons exposed to hazardous risk such as needle prick, splashing and other work-related injury shall be given a post prophylactic immunization as prescribed by the attending physician.
Figure 9.2 Procedures for Proper Handwashing

Source: http://www.who.int/gpsc/5may/How_To_HandWash_Poster.pdf
Figure 9.3 Procedures for Proper Handrubbing

Source: http://www.who.int/gpsc/5may/How_To_HandRub_Poster.pdf
9.6 Emergency Management Plan

As defined by the WHO “contingency planning and emergency preparedness is a program of long-term development activities whose goals are to strengthen the overall capacity and capability of a country to manage efficiently all types of emergency and to bring an orderly transition from relief through recovery and back to sustain development.”

Adopting the policy of WHO, there are three (3) phases for the safe management of HCW in emergencies:

- Phase One: Mitigation and Preparedness
- Phase Two: Emergency Response
- Phase Three: Recovery

9.6.1 Mitigation and Preparedness

As defined, mitigation refers to the systematic reduction in the extent of exposure to a risk and/or the likelihood of its occurrence. On the other hand, preparedness refers to the HCF’s readiness to respond to any emergency. This includes the specific strategies, plans and actions to respond to the occurrence of any hazard such as exposure to hazardous substances, whether infectious, chemical and biological spillage and other toxic substance. To determine the readiness of the HCF, the following activities shall be done:

**9.6.1.1 Rapid Initial Assessment** – This is the collection of subjective and objective information to measure damage and identify those basic needs of the affected population that require immediate response within 24 hours (DOH-HEMS, WHO-WPRO 2007). An assessment team shall conduct this initial phase which may include relief or awareness activities. To work effectively, the team shall have a clear cut disposition and priority whether to gather information or perform relief actions.

Based on the assessment report, hazards due to waste shall be prioritized according to the following elements:
1. Severity
2. Frequency
3. Extent
4. Duration
5. Manageability

**9.6.1.2 Availability of first aid kit for use of injured workers.** First aid kit shall contain different-sized kits intended to serve groups of different sizes.

In general, the first aid kit required in a workplace varies depending on the size of the facility and by the following factors:
• The laws and regulations of governing agencies
• The type of hazards present in the workplace
• The number of workers in the workplace
• The number of sections in a HCF

For a waste spill hazard, the basic first aid kit shall contain the following:
- Adhesive bandages/tape (band-aids, sticking plasters)
- Dressing (sterile, applied directly to wound)
  - Sterile eye pads
  - Sterile gauze pads
- Bandages (for securing dressings, not necessarily sterile)
- Butterfly closure strips
- Saline Soap
- Antiseptic

Practices to mitigate / prevent waste spill include the following:
- Provision of safety reminders and signage on strategic areas
- Education and training on proper sealing of waste plastic liners
- Minimal handling of waste
- Collection of waste shall be done when bin is three-fourths (3/4) full
- Provision of plastic liner in accordance to standard specification (please see Chapter 5)
- Provision of leak proof container
- Proper use of standard waste trolleys during transport
- Opening of sealed bags shall be avoided
- Availability of Spill Kit
- Strict compliance to all policies and procedures

9.6.2 Emergency Response

Emergency response refers to the activity carried out by a group of well-trained HCF worker after activation of the HCF response team. This includes implementation of the emergency management plan such as the activation of the incident command system relevant to exposure to hazardous substance, whether infectious, chemical and biological spillage and toxic substance.

The area where the hazardous waste was accidentally contaminated must be cleaned thoroughly by the team following standards of emergency response (e.g. isolation, wearing PPE, incident command system, etc.). A designated triage with medical and nursing staff shall handle individuals who are contaminated before transport to the Emergency Room for further treatment. Figure 9.5 illustrates an example of an emergency response to incident on chemical and biological spillage.
9.6.2.1 Needle Prick Injury

Needle stick safety shall always be a priority. The following steps in handling a needle stick injury are highly recommended:

- **Step One** – Cleaning the Wound
  Clean the wound with soap and water. Do not pinch or squeeze blood out of the wound or apply bleach.

- **Step Two** – Testing
  It is critical that the injured HCF worker is tested for HIV, hepatitis B and hepatitis C as soon as possible.

- **Step Three** – Report the incident
  In order to maintain needle stick safety, always report incidence of needle stick injury through an incident report according to infection control protocol.

- **Step Four** – Retesting
  Injured HCF worker shall be retested for hepatitis C six (6) weeks after the needle stick injury and after four to six (4 – 6) months for hepatitis C virus antibodies and elevated liver enzymes. After HIV exposure, the injured shall get tested at the sixth (6th) week and again on the third (3rd), sixth (6th) and twelfth (12th) month for antibodies to HIV. The frequency will vary depending on the risk of transmission.

9.6.2.2 Prevention of Needle Stick Injuries

In order to prevent needle stick injuries, the principle of minimal handling is recommended. The HCF worker shall never attempt to manually recap a used syringe, as this method had the highest probability of injury. Needle/hub cutters are recommended for use.

The HCF can develop a simple technology that will allow the HCF worker to safely recap the syringe, thus allowing the needle to be separated from the barrel and disposing the two in separate waste containers. An example of an invented Needle Recapper, developed by San Juan de Dios Educational Foundation Inc. (Hospital), is illustrated in Figure 9.4.
Needle Recapper Procedure

1. Place Needle Recapper on a stable surface where it can be leaned on the wall for added support.

2. Place needle cap on one of the holes.

3. Insert the syringe into the cap securely.

4. Turn the syringe in order to unscrew it from the barrel.

5. Once separated, the needle can now be disposed of safely in a sharps container.

Figure 9.4 Needle Recapper Procedure

Courtesy of San Juan de Dios Educational Foundation Inc. (Hospital), Pasay City
9.6.2.3 **Spill Control**

Spillage usually requires clean-up only of the contaminated area. For spillage of infectious material, however, it is important to determine the type of infectious agent. The Infection Control Officer can be asked for assistance regarding proper management and clean-up of the spill due to infectious waste. In some cases, evacuation of the area may be necessary. Procedures for dealing with spillage shall specify safe handling operation and appropriate protective clothing. In case of skin and eye contact with hazardous substance, there shall be immediate decontamination. The exposed person shall be removed from the area of the incident for decontamination, generally with copious amounts of water. Special attention shall be paid to the eyes and any open wounds. In case of eye contact with corrosive chemicals, the eyes shall be irrigated continuously with clean water for 10 – 30 minutes; the entire face shall be washed in a basin, with the eyes being continuously opened and closed. An eye wash assembly can be installed in the unit for immediate response.

9.6.2.4 **Immediate Actions**

- Secure the affected area
- Check for any person involved
- Person contaminated with waste spill shall be decontaminated for at least fifteen (15) minutes (emergency shower) and taken for medical examination
- If eyes are affected, do not rub eyes to avoid further irritation
- Administer first aid
- Isolate the spill (if safe to do so)
- Contact the Safety Officer and Pollution Control Officer for high risk spills
- Follow the spill clean-up procedure
- Document the occurrence of the spill through incident/accident report.

9.6.2.5 **General Guidance for Spill Control**

1. Vacate and secure the area to prevent further exposure of other individuals.
2. Provide first aid and medical care to injured individuals.
3. Inform WMO who shall coordinate the necessary actions.
4. Determine the nature of the spill. Refer to the MSDS if necessary.
5. Provide appropriate clothing to personnel involved in cleaning-up.
6. Limit the spread of the spill.

| Information Contained in the Materials Safety Data Sheet on Specific Chemical |
|---------------------------------|---------------------------------|
| 1. Identification               | 2. Hazard(s) Identification     |
| 3. Composition / information on ingredients | 4. First-aid measures |
| 5. Fire-fighting measures       | 6. Accidental release measures  |
| 7. Handling and storage         | 8. Exposure controls / personal protection |
| 9. Physical and chemical properties | 10. Stability and reactivity |
| 11. Toxicology information      | 12. Ecological information      |
| 15. Regulatory information      | 16. Other relevant information  |
7. Activate exhaust system or keep the area well-ventilated particularly if the spill is due to volatile organic solvents or corrosive agents.
8. Neutralize or disinfect the spilled or contaminated material if indicated.
9. Collect all spilled and contaminated materials (sharps shall never be picked up by hand; brushed and pans or other suitable tools shall be used). Spilled materials and disposable contaminated items for cleaning shall be placed in appropriate waste bags or containers and properly labelled and documented before final disposal.
10. Decontaminate or disinfect the area, wiping with absorbent cloth. The cloth (or other absorbent material) shall NOT be turned during this process, because this will spread the contamination. Work from the least to the most contaminated part of the spill while changing cloth at each stage to carry out the decontamination. Dry cloth shall be used in the case of liquid spillage and spillage of solids, while wet cloth shall be used for acidic, base or neutral chemicals.
11. Decontaminate or disinfect all tools used.
12. Seek medical attention if exposure to hazardous material has occurred during the operation.
13. Normal operation may continue once the disinfected area is thoroughly cleaned and dried.

The clean-up kit for spill shall contain the following items:

a. One (1) pair of latex gloves
b. One (1) N95 mask (for blood, body fluids and chemotherapeutics/cytotoxics spills)
c. Respirator with specific filter for the type of chemicals
d. One (1) Zip lock bag – small
e. One (1) Zip lock bag – big
f. Absorbable cloth
g. Appropriate disinfectant solution for spills due to blood, body fluids and chemotherapeutics/cytotoxics
h. Neutralizing solution specific for acids or alkali
i. Eye goggles (for big spill)
j. Labeling materials
k. Small pail with putty clay at the bottom (for chemical spill)
l. Miscellaneous items which the HCF may require to meet their need

A summary of emergency procedures to be done for specific type of waste spills are listed in Table 9.1.
Table 9.1 Procedures for Emergency Response to Waste Spills

<table>
<thead>
<tr>
<th>Type of Waste Spill</th>
<th>Immediate Response</th>
<th>Follow-up Procedures</th>
<th>Person In-charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Biohazardous Waste Spill</td>
<td>1.) Make sure that the biosafety cabinet continues to operate 2.) If only a small quantity is spilled, decontaminate the surfaces within the cabinet, wearing gloves and using 16% bleach solution 3.) If a large quantity is spilled, entire cabinet including fans, filters, airflow plenums, will need to be decontaminated (40% solution required)</td>
<td>1.) Know the nature of the organism involved 2.) Report to the person-in-charge</td>
<td>Infection Control Officer</td>
</tr>
<tr>
<td>1.1 Minor spill - occurs inside biosafety cabinet, no one is exposed</td>
<td>1.) Evacuate the room, breathing as little as possible of any aerosols 2.) Close the door of the room Remove any and all contaminated clothing and place it in sealed plastic containers 3.) Thoroughly wash hands and face with disinfectant soap. Shower if necessary</td>
<td>1.) Know the nature of the organism involved 2.) Report to the person-in-charge</td>
<td>Infection Control Officer</td>
</tr>
<tr>
<td>1.2 Major spill - occurs outside biosafety cabinet, people are exposed</td>
<td>1.) If corrosive gets contact with eyes, go immediately to eyewash station 2.) Remove contact lenses, if any 3.) Flush eyes for 15-20 minutes</td>
<td>1.) Do not apply any neutralizers or ointments to the eyes 2.) Seek medical attention</td>
<td>Safety Officer</td>
</tr>
<tr>
<td>2. Chemical Waste Spill</td>
<td>1.) Leave the area quickly 2.) Close the doors 3.) Go directly to the eyewash station, shower, or fresh air area</td>
<td>1.) Inform person in-charge 2.) Seek medical attention</td>
<td>Safety Officer</td>
</tr>
<tr>
<td>2.1 Corrosives (acids and bases)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 Reactives (explosives, oxidizers, unstable chemicals)</td>
<td>1.) If inhaled, go to fresh air area right away 2.) If swallowed, seek medical help immediately. 3.) If it got into your eyes, go to the nearest eyewash station. Remove contact lenses, if any. Flush eyes for 15-20 minutes 4.) If on skin, don’t rub the affected area. Rinse with running water for 15-20 minutes 5.) Remove all contaminated clothing</td>
<td>1.) Get medical help 2.) If swallowed, do not induce vomiting nor eat/drink anything unless instructed to do so in the MSDS or by medical personnel</td>
<td>Safety Officer</td>
</tr>
<tr>
<td>2.3 Toxins and Poisons</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The functions of the Safety Officer may include: a) conduct investigation on accidents and incidents related to waste management including spills and leaks; b) provides assistance to government agencies in the conduct of health and safety inspection, accident/incident investigation or any other related problems; and c) maintains or helps in the maintenance of an efficient accident/incident record system and coordinates actions taken by the HCF.

Source: American Hospital Association, 1992
Figure 9.5 Emergency Response to Waste Spillage

_Courtesy of San Lazaro Hospital, Manila_
9.6.3 Recovery Phase

The recovery phase can be characterized as a return to normal situation that is similar to the situation that existed prior to the incident. Recovery phase activities can include the following:

- Preparation of incident/accident report
- Inventory of used items
- Provision of new supplies to replace the used items in the kit
- Psychosocial debriefing of the injured person, as necessary

9.6.3.1 Reporting Accidents and Incidents

HCF workers shall report all accidents and incidents, e.g. spillage to the Health and Safety Committee for appropriate action. They shall be educated on the possible effects of hazardous materials once spilled to encourage prompt reporting. Accidents or incidents, including near-misses, spillage, damaged containers, inappropriate segregation and any incident involving sharps shall be reported to the HCWMC (if waste is involved) or to another designated person. The report shall include the following details:

1. The nature and magnitude of the accident or incident
2. The place, date and time of the accident or incident
3. The staff who is directly involved
4. Immediate response taken
5. Any other relevant circumstances
6. Recommendations, if any

The WMO or other responsible officer, who shall take possible action to prevent recurrence, shall investigate the cause of the accident or incident. The records of the investigation and recommendations must be submitted to the management for review and approval. Any amendment in the policies and procedural guidelines must be integrated in the HCWMP of the HCF. Updates shall be disseminated to all HCF workers for information and guidance. All records of spill management must be kept for future reference. An example of a reporting flow for a tertiary hospital is shown in Figure 9.4.

Sample of the Occupational Incident/Accident Report Form is attached in Annex E The Sample Flowchart on the Management of Occupational Accident/Incident for Tertiary Hospitals is found in Annex F.

There shall be an established reporting system in all HCWM-related incidents. A clear investigating system must be ensured and effective corrective action must be employed.
9.6.3.2 Inventory of Used items

HCWMP of respective HCF shall identify person responsible for the inventory of used items during the clean-up and ensure replenishment of the first aid and spill kits. Usually the WMO, Head Nurse or Supervisor of the affected area is designated for this function.

9.6.3.2 Provision of New Supplies

The Central Storage Facility of the HCF shall provide replacement of the used items and ensure continuity of supplies. Actual cost incurred during clean-up shall be documented accordingly.

9.6.3.3 Psychosocial Debriefing of Victims

Trained and qualified personnel shall conduct psychosocial debriefing on the victim/s, as necessary. Debriefing shall be conducted immediately after the incident/accident. If the HCF has no capability to conduct this activity, the victim may be referred to other HCF providing such service. Record of management shall be kept for future reference.
PART IV

GLOSSARY OF TERMS
ANNEXES
AND
REFERENCES
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antineoplastic</td>
<td>Inhibiting the development of neoplasms or abnormal tissue growth.</td>
</tr>
<tr>
<td>Autoclaving</td>
<td>Method of sterilization using an equipment for effective sterilization by steam under pressure and temperature.</td>
</tr>
<tr>
<td>Collection</td>
<td>Act of safe transporting of HCW from source or from a central storage area.</td>
</tr>
<tr>
<td>Cytotoxic</td>
<td>A substance possessing a specific destructive action on certain cells; used in particular in referring to the lysis (disintegration or dissolution) of cells brought about by immune phenomena and to antineoplastic drugs that selectively kill dividing cells.</td>
</tr>
<tr>
<td>Decontamination</td>
<td>Reduction of microbiological contamination to a safe level.</td>
</tr>
<tr>
<td>Disinfection</td>
<td>Reduction or removal of disease-causing microorganisms (pathogens) in order to minimize the potential for disease transmission</td>
</tr>
<tr>
<td>Disposal</td>
<td>Discharge, deposit, placing or release of any healthcare waste into or on any air, land, or water.</td>
</tr>
<tr>
<td>Half-life</td>
<td>Specific period that a radiation element decays.</td>
</tr>
<tr>
<td>Genotoxic</td>
<td>A substance that is capable of interacting directly with genetic material, causing DNA damage that can be assayed. The term may refer to carcinogenic, mutagenic, or teratogenic substances.</td>
</tr>
<tr>
<td>Hazardous waste</td>
<td>All waste generated by HCF except general waste shall refer to all staff in the HCF i.e., doctors, nurses, administrative staff, paramedical, ancillary workers, institution workers, nursing attendants, dental aides, laboratory aides, janitors, maintenance, radiology aide, social workers, etc.</td>
</tr>
<tr>
<td>Healthcare Workers</td>
<td>Cultures and stocks of highly infectious agents; waste from autopsies, animal bodies, and other waste items that have been inoculated, infected or in contact with such agents. Wastes contaminated with organisms belonging to Biosafety Levels 3 and 4. Wastes contaminated with pathogens mentioned in DOH Administrative Order 2010-0033</td>
</tr>
<tr>
<td>Highly infectious waste</td>
<td>Wastes produced from activities within the household.</td>
</tr>
<tr>
<td>Infectious Waste</td>
<td>Waste that contain pathogens like bacteria, viruses, parasites or fungi in sufficient concentration or quantity to cause disease in susceptible hosts.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Leachate</td>
<td>Liquid produced when healthcare waste undergoes decomposition, and when water percolates through solid waste undergoing decomposition. It is a contaminated liquid that contains dissolved and suspended materials.</td>
</tr>
<tr>
<td>Non-hazardous waste</td>
<td>Waste that has not been in contact with infectious agents, hazardous chemicals or radioactive substances, and that does not pose a sharps hazard</td>
</tr>
<tr>
<td>Off-site collection</td>
<td>Collection and transfer of segregated HCW from the HCF-Central Storage Area (CSA) to DENR Accredited Transporter/ Municipal Waste Collector/ Supplier</td>
</tr>
<tr>
<td>Off-site transport</td>
<td>Transport of segregated HCW from HCF to Treatment Facilities or to Final Disposal Area</td>
</tr>
<tr>
<td>On-site collection</td>
<td>Collection of segregated HCW from the point of generation to designated color-coded bins</td>
</tr>
<tr>
<td>On-site transport</td>
<td>Transport of collected segregated HCW from the designated color-coded bins to CSA</td>
</tr>
<tr>
<td>Pyrolysis</td>
<td>Thermal decomposition of substance and materials in the absence of supplied molecular oxygen in the destruction chamber in which the said material is converted into gaseous, liquid, or solid form.</td>
</tr>
<tr>
<td>Radioactive Waste</td>
<td>Material that contains, or is contaminated with, radionuclides at concentrations or activities greater than clearance levels.</td>
</tr>
<tr>
<td>Recyclable</td>
<td>Any waste material retrieved from the waste stream and free from contamination that can still be converted into suitable and beneficial use or for other purposes, including, but not limited to cardboard, glass, office paper, drink cans, newspapers, magazines and polyethylene or polypropylene plastics (PE and PET).</td>
</tr>
<tr>
<td>Recycling</td>
<td>Processing of used materials (waste) into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution and water pollution (from land filling) by reducing the need for “conventional” waste disposal, and lower greenhouse gas emissions as compared to virgin production.</td>
</tr>
<tr>
<td>Re-use</td>
<td>Process of recovering materials intended for the same or different purpose without the alteration of physical and chemical characteristics.</td>
</tr>
<tr>
<td>Sanitary Landfill</td>
<td>An engineered method designed to keep the waste isolated from the environment.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Segregation</td>
<td>Separating the waste generated by the healthcare facility according to the specific treatment and disposal requirements.</td>
</tr>
<tr>
<td>Sludge</td>
<td>Accumulated solids that separate from liquids such as water or wastewater during processing, or deposits on the bottom of streams or other bodies of water.</td>
</tr>
<tr>
<td>Sterilization</td>
<td>Destruction of all microbial life</td>
</tr>
<tr>
<td>Storage</td>
<td>Area or place where healthcare waste is temporarily stored after generation and prior to collection for ultimate recovery or disposal.</td>
</tr>
<tr>
<td>Waste Disposal</td>
<td>Refers to the intentional burial, deposit, discharge, dumping, placing, or release of any waste material into or on air, land, or water</td>
</tr>
<tr>
<td>Waste Generator</td>
<td>Any person, organization, or facility engaged in activities that generate waste</td>
</tr>
<tr>
<td>Waste Management</td>
<td>All the activities, administrative and operational, involved in the handling, treatment, storage, collection, transportation, and disposal of wastes</td>
</tr>
<tr>
<td>Waste Treatment</td>
<td>Any method, technique, or process for altering the biological, chemical, or physical characteristics of waste to reduce the hazards it presents and facilitate or reduce the costs of disposal. The basic treatment objectives include volume reduction, disinfection, neutralization, or other change of composition to reduce hazards including removal of radionuclides from radioactive wastes</td>
</tr>
</tbody>
</table>
ANNEX A

World Health Organization Technical Guidelines


The WHO Guidebook (more commonly known as the “Blue Book”) is the first global and comprehensive document about healthcare waste management. It is aimed at national and local administrators, HCF managers, policy makers, and public health professionals. It discusses the different aspects of healthcare waste, such as its health impacts, legislative and policy aspects, HCW Management Planning, waste minimization, handling, storage and transportation of wastes, treatment and disposal strategies, waste water management, health and safety of healthcare personnel, emergency response, infection control and training.

A teacher’s guide accompanies the Bluebook for training purposes. This guide, entitled, “Management of Wastes from Healthcare Activities”, is designed for a three-day training course. It includes overhead slides, handouts, and exercises.


This guidebook was created in response to the need for an efficient infection control program in the advent of emerging diseases such as the Severe Acute Respiratory Syndrome (SARS) and re-emerging diseases such as the bubonic plague and tuberculosis. The guidebook was directed to healthcare facility workers who are tasked to protect themselves and other people from disease transmission. This guidebook was also directed towards healthcare facility administrators who need to implement a successful infection control program in their institution.


Classification of Microorganisms is based on the Risk Group it belongs to. The grouping done is based on several characteristics of the microorganism, such as its pathogenicity, mode of transmission, and host range. In turn, these characteristics may be influenced by the existing levels of immunity, density and movement of the host population, presence of appropriate vectors, and the standards of environmental hygiene in the area. The following are the four levels of risk groups, wherein Group 1 has the lowest risk, and Group 4 has the highest risk.

a. WHO Risk Group 1 (no or low individual and community risk). A microorganism that is unlikely to cause human disease or animal disease
b. WHO Risk Group 2 (moderate individual risk, low community risk). A pathogen that can cause human or animal disease but is unlikely to be a serious hazard to laboratory workers, the community, livestock or the environment. Laboratory exposures may cause serious infection, but effective treatment and preventative measures are available and the risk of spread of infection is limited.

c. WHO Risk Group 3 (high individual risk, low community risk). A pathogen that usually causes serious human or animal disease but does not ordinarily spread from one infected individual to another. Effective treatment and preventive measures are available.

d. WHO Risk Group 4 (high individual and community risk). A pathogen that usually causes serious human or animal disease and that can be readily transmitted from one individual to another, directly or indirectly. Effective treatment and preventive measures are not usually available.
ANNEX B

CONSIGNMENT NOTE
(Sample Format)

A. TRANSPORTER
Name: ____________________________
Address: ____________________________
Telephone No.: _____________________ Accreditation No.: _____________________
Type of Waste Transported: __________________________ Quantity (kg): _________

B. GENERATOR
Name: ____________________________
Address: ____________________________
Telephone No.: _____________________

C. TREATMENT FACILITY
Name of Manager/Authorized Representative: ____________________________
Address: ____________________________ Telephone No.: _____________________
Permit to Operate: (Permit No.) ____________________________
Signature of Manager/Authorized Representative:

B. DATE WASTES ARE COLLECTED/TRANSPORTED/RECEIVED
Date Collected/Removed from Generator’s Facility:
___________________________________
Date Received by the Transfer Station (Point of Consolidation):
___________________________________
Date Received by the Treatment Facility:
___________________________________
## SAMPLE SELF-MONITORING SHEET

Healthcare Waste Management Program

**AREA OF THE HOSPITAL:** _____________________________________________

**DATE OF INSPECTION:**________________**MONITORING RATING:**________

<table>
<thead>
<tr>
<th>A. WASTE MINIMIZATION PRACTICES</th>
<th>SCORE</th>
<th>INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20%</td>
<td>Reference</td>
</tr>
<tr>
<td>1. Re-uses/recycles used containers, articles, papers, etc.</td>
<td>10</td>
<td>Percentage of recyclable wastes that were recycled multiplied to 0.10</td>
</tr>
<tr>
<td>2. Use of only environment friendly products and materials</td>
<td>10</td>
<td>No Styrofoam (polystyrene) and plastic (PVC) = 5, otherwise, the score is 0; and No mercury containing devices used = 5, otherwise, the score is 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. WASTE SEGREGATION</th>
<th>SCORE</th>
<th>INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25%</td>
<td>Reference</td>
</tr>
<tr>
<td>1. Waste properly segregated in correct plastic liners</td>
<td>5</td>
<td>No mixed wastes seen at all times= 5, otherwise, the score is 0</td>
</tr>
<tr>
<td>- <strong>Black/Clear:</strong> Non-Biodegradable General Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- <strong>Green:</strong> Biodegradable General Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- <strong>Yellow:</strong> Infectious Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Color-coded plastic liners with proper tagging and labeling</td>
<td>4</td>
<td>Color coding and proper tagging and labeling strictly followed at all times= 4, otherwise, the score is 0</td>
</tr>
<tr>
<td>3. Use puncture-resistant and leak-proof sharps container for sharps</td>
<td>4</td>
<td>Only puncture-resistant and leak-proof sharps container used for sharps waste = 4, otherwise the score is 0</td>
</tr>
<tr>
<td>4. Waste bins strategically placed in designated area</td>
<td>4</td>
<td>Waste bins are placed in strategically designated areas = 4, otherwise, the score is 0</td>
</tr>
<tr>
<td>5. Proper segregation of recyclable items</td>
<td>4</td>
<td>Proper segregation practiced at all times= 4, otherwise, the score is 0</td>
</tr>
<tr>
<td>6. Empty vials brought to the pharmacy section by the nursing attendant/personnel-in-charge for proper recording and crushing (logbook available)</td>
<td>4</td>
<td>Proper management of empty vials practiced at all times= 4, otherwise, the score is 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. WASTE ON-SITE COLLECTION, TRANSPORT AND STORAGE</th>
<th>SCORE</th>
<th>INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20%</td>
<td>Reference</td>
</tr>
<tr>
<td>1. On-site collection scheduled strictly followed</td>
<td>2</td>
<td>Strict adherence to on-site collection schedule = 2, otherwise, the score is 0</td>
</tr>
<tr>
<td>2. Janitorial Service uses standard trolley with enclosure in collecting waste</td>
<td>3</td>
<td>Standard trolley is used to collect waste on-site= 3, otherwise, the score is 0</td>
</tr>
<tr>
<td>3. Janitorial Service directly transports waste collected to Central Storage Area</td>
<td>3</td>
<td>Waste is directly transported to Central Storage Area= 3, otherwise, the score is 0</td>
</tr>
<tr>
<td>4. No presence of spillage during collection and transport</td>
<td>3</td>
<td>No occurrence of spillage during collection and transport= 3, otherwise, the score is 0</td>
</tr>
</tbody>
</table>
5. Waste bins thoroughly cleaned/washed by janitors | 3 | Waste bins thoroughly cleaned at all times= 3, otherwise, the score is 0
6. Waste transportation route followed | 3 | Waste transportation route strictly followed at all times= 3, otherwise, the score is 0
7. Final disposal of waste in approved DENR facility | 3 | Final disposal of waste in accredited DENR facility= 3, otherwise, the score is 0

D. WASTE TREATMENT ON SITE (If applicable) | 10%
1. Treatment of highly infectious waste conducted | 4 | Highly infectious waste treated at all times= 4, otherwise, the score is 0
2. In case of chemical disinfection, used only allowed chemicals such as Sodium Hypochlorite, Chlorine Dioxide and Hydrogen Peroxide | 3 | Only the allowed chemicals are used for chemical disinfection= 3, otherwise, the score is 0
3. In case of the use of microwave or autoclave, the equipment has passed the validation test | 3 | Equipment has passed the validation test= 3, otherwise, the score is 0

E. WASTE WATER MANAGEMENT (Personnel in-charge) | 15%
1. Regular testing of effluents | 5 | Effluents tested regularly= 5, otherwise, the score is 0
2. Preventive maintenance schedule for Sewage Treatment Plant (STP) followed | 10 | Strict adherence to STP maintenance schedule= 10, otherwise, the score is 0

F. ADMINISTRATIVE | 10%
1. Staff with formal training and education on proper healthcare waste management (HCWM) | 2 | Staff had undergone formal training and education on proper HCWM= 2, otherwise, the score is 0
2. Infection control protocol observed and practiced | 4 | Strict adherence to infection control protocols at all times= 4, otherwise, the score is 0
3. Posters and other IEC materials available on-site | 2 | On-site presence and visibility of posters and other IEC materials= 2, otherwise, the score is 0
4. Accident/incident reports submitted if any | 2 | Prompt submission of complete accident/incident reports, if any= 2, otherwise, the score is 0

TOTAL PERCENTAGE | 100%

MONITORING TEAM: ____________________________ ____________________________

Signature of Area Supervisor: ______________________________

**Monitoring Rating**

Grade/Actual Score/Interpretation

<table>
<thead>
<tr>
<th>Score</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 – 100%</td>
<td>Excellent, with full compliance</td>
</tr>
<tr>
<td>4 – 91-99%</td>
<td>Highly Satisfactory, with highly adequate compliance</td>
</tr>
<tr>
<td>3 – 81-90%</td>
<td>Satisfactory, with adequate compliance</td>
</tr>
<tr>
<td>2 – 75-80%</td>
<td>Fair, with compliance</td>
</tr>
<tr>
<td>1 – 74% and below</td>
<td>Poor, low compliance</td>
</tr>
</tbody>
</table>
# SAMPLE MONITORING TOOL FOR THE WASTE COLLECTOR

**AREA OF THE HOSPITAL:** ________________________________  
**MONTH OF COLLECTION:** ________________________________  
**AREA SUPERVISOR:** ____________________________________

**LEGEND:**
- I – Infectious Waste
- S – Sharp
- P – Pathological Waste
- A – Anatomical Waste
- PH (A) – Pharmacological Waste (Expired/Used Drugs)
- PH (B) – Pharmacological Waste (Cytotoxic/Genotoxic/Antineoplastic)
- PH (C) – Pharmacological Waste (Empty Vials/Ampoules)
- Hg – Mercury and Other Heavy Metals
- C – Chemical Waste
- G (A) – Biodegradable / Non-Recyclable Waste
- G (B) – Non-biodegradable / Recyclable Waste
- G (C) – Non-biodegradable / Non-Recyclable Waste
- G (D) – Aerosol and Pressurized Containers

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>VOLUME OF WASTE</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I   S   P   A</td>
<td>PH (A)   PH (B)   PH (C)   C   Hg   R   G (A)   G (B)   G (C)   G (D)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1   2   3</td>
<td>1  2  3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
|      |      |      |      | _  _  _  Bins in good condition? If not, repairs needed:  
|      |      |      |      | _  _  _  PPE's used? If not,  
|      |      |      |      | _  _  _  PPE's in good condition? If not, repairs/ new equipment needed:  
|      |      |      |      | Name and Signature of Collector:  
| Shift 1 | | | | | |
| Shift 2 | | | | | |
| Shift 3 | | | | | |
| Shift 1 | | | | | |
| Shift 2 | | | | | |
| Shift 3 | | | | | |

**TOTAL**  
**SUMMARY OF NOTES:**  
___/___/___/Conc. of Disinfectant: ___/___/___/  
Name and Signature of Collector:  
Shift 1  
Shift 2  
Shift 3
ANNEX E

Name of Hospital
Infection Control Committee

SAMPLE OCCUPATIONAL INCIDENT/ACCIDENT REPORT (OIR) FORM

Part 1

1. Name: ____________________ Date of Incident/Accident: __/__/__ Time: _____ (A.M./P.M.)

2. Describe the incident fully:
   a. Actual task during the incident: _____________________________________________
   b. Area of assignment during the incident: _______________________________________
   c. Type of Exposure: (tick only the box that apply)
      - Sharp Injury
      - Blood/body fluids exposure
      - Needle
      - Surgical Instrument
      - Glass
      - Other sharp item, specify ______
      - Splash
      - Spillage
      - Vomitus
      - CSF
      - Sputum
      - Pleural Fluid
      - Saliva
      - Urine
      - Blood/blood products
      - Others, specify ______

   d. Location of Exposure/Injury o the body part (tick only the box that apply)
      - Intact Skin
      - Wound
      - Eyes
      - Nose
      - Mouth
      - Others, specify ______

   e. Personal Protective Equipment worn at the time of exposure(tick all the boxes that apply)
      - Gloves, single pair
      - Goggles
      - Surgical Mask
      - N95 respirator
      - Lab. Coat/gown
      - Gloves, double pair
      - Face Shield
      - Disposable Gown
      - Other sharp item, specify ______

   f. Immunization Status: Hep B  Tetanus  Unknown  Others, specify: ________________

3. Risk Assessment (tick only one):
   - High Risk Exposure (source of exposure from HIV* ans HBV/air-borne diseases)
   - Low Risk Exposure (source of exposure from HIV* ans HBV/air-borne diseases)

4. A. Corrective action undertaken: ________________________________________________
   B. Plans to prevent similar incidents from occurring in the future:
   ____________________________________________________________________________
   ____________________________________________________________________________
   _________________________________________________________________________

5. Referred to Emergency Medical Service / Emergency Room Physician?
   - Yes  Date: __/__/__  - No  Why? ________________________________
Accomplished By:

Name and Signature: ___________________________ Date: __/__/__

Department / Section: ____________________________

======================================================================

Part II (To be filled-up by ICN)

1. Name of Attending Physician: ____________________________

2. Advice/Treatment Given: ____________________________
   ____________________________
   ____________________________

3. Additional recommendation/suggestions: ____________________________
   ____________________________
   ____________________________

ALL MEDICAL DATA IS CONFIDENTIAL

Note: For HIV exposure, refer to HACT for further evaluation and management.
**ANNEX F**

**SAMPLE FLOWCHART ON THE MANAGEMENT OF OCCUPATIONAL ACCIDENT/INCIDENT FOR TERTIARY HOSPITALS**

**OCCUPATIONAL INCIDENT/ACCIDENT**

- Hospital employee
- Student Affiliates

**DO “Immediate First Aid Care”**
- For major accidents, CALL FOR HELP

**Nurses/Med. Tech.**

**Medical Intern**

**NOTIFY IC Link Staff**
- (Nurse Supervisor/Doctor/Head of Link Staff)

**NOTIFY Point Person (CI/NTO In-Charge Med. Tech. Staff)**

**NOTIFY MTO In-Charge (during office hour) & MOIII in areas of assignment (after office hour)**

**Link-staff/Point Person LOGS incident and FILLS-UP Occupational Incident (OIR) Form**

**ADVICE** concerned employee to bring properly filled-up OIR form to EMS (during office hours) for appropriate management

**ENDORSE** student affiliate to ER together with properly filled-up OIR form for appropriate management

**ICN COLLECTS OIR form from Emergency Medical Service/ER IC Link-Staff**

**Infection Control Committee**

1. KEEP original OIR at ICC for safe-keeping and FOLLOW-UP of cases
2. GIVE duplicate copy of OIR to EMS IC link-staff/student affiliates point person for safe-keeping
3. PROVIDE copy of OIR on waste associated incident to Chair, Waste Management Committee

**Legend:**

**IMMEDIATE FIRST AID CARE**
- For wounds/needle sticks:
  - Allow the wound to bleed freely or squeeze lightly to facilitate bleeding
  - Wash wounds/cuts with soap and water thoroughly then apply povidone iodine
- For mucous membrane splash:
  - Flush splashes of the nose, mouth or the exposed area immediately with water for 10-15 minutes
  - Irrigate eyes with clean water, sterile eyewash or saline irrigating solution
- For skin contamination:
  - Stop the procedure as soon as exposure has occurred
  - Wash the exposed area thoroughly with soap and running water
  - If desired, use alcohol as an antiseptic after thorough handwashing

**MEANING OF ACRONYMS**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTO</td>
<td>Medical Training Officer</td>
</tr>
<tr>
<td>NTO</td>
<td>Nursing Training Officer</td>
</tr>
<tr>
<td>CI</td>
<td>Clinical Instructor</td>
</tr>
<tr>
<td>MO</td>
<td>Medical Officer</td>
</tr>
<tr>
<td>IC</td>
<td>Infection Control</td>
</tr>
<tr>
<td>ICN</td>
<td>Infection Control Officer</td>
</tr>
<tr>
<td>OIR</td>
<td>Occupational Incident Report</td>
</tr>
</tbody>
</table>


# Annex G

### Advantages and Disadvantages of the Different Types of WTP

<table>
<thead>
<tr>
<th>WTP Technology</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Anaerobic Baffled Reactor (ABR)</td>
<td>• Suitable for smaller and larger settlements&lt;br&gt;• Little space required due to underground construction&lt;br&gt;• Low investment costs&lt;br&gt;• Very low operation and maintenance costs. No moving parts power needed. Hardly any blockage&lt;br&gt;• Simple and durable&lt;br&gt;• High treatment efficiency</td>
<td>• Experts are required for the design and supervision&lt;br&gt;• Master mason is required for water-tight plastering&lt;br&gt;• Effluent is not completely odorless&lt;br&gt;• Slow growth rate of anaerobic bacteria means long start-up period&lt;br&gt;• Less efficient with weak wastewater</td>
</tr>
<tr>
<td>2. Waste Stabilization Ponds</td>
<td>• Simple to build, reliable and easy to maintain&lt;br&gt;• Provides pathogen removal which is better than the conventional treatment&lt;br&gt;• Used in small communities&lt;br&gt;• Low in construction and operating cost</td>
<td>• Large area requirement&lt;br&gt;• Poor quality of treated effluent&lt;br&gt;• May promote breeding of insects in the pond&lt;br&gt;• Needs to be located far from communities</td>
</tr>
<tr>
<td>3. Engineered Reed Bed</td>
<td>• Easy and simple to maintain and operate&lt;br&gt;• Low-cost secondary treatment option&lt;br&gt;• Pleasant landscaping is possible</td>
<td>• Requires larger land area&lt;br&gt;• Low treatment efficiency&lt;br&gt;• Professional/specialist needed in design and construction</td>
</tr>
<tr>
<td>WTP Technology</td>
<td>Advantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4. Sequencing Batch Reactor (SBR)</td>
<td>• Efficient Treatment</td>
<td>• Most of the component parts are patented and comes from abroad</td>
</tr>
<tr>
<td></td>
<td>• Tolerates hydraulic and organic shock loads (high inlet variation)</td>
<td>• Capacities are fixed and no flexibility</td>
</tr>
<tr>
<td></td>
<td>• Modular construction facilitates future expansion</td>
<td>• More expensive than other treatment methods</td>
</tr>
<tr>
<td></td>
<td>• Provides a simple, reliable, automatic, wastewater treatment process with a basin (simple</td>
<td>• In case of power failure, reactor may overflow</td>
</tr>
<tr>
<td></td>
<td>design and construction)</td>
<td>• Requires more skilled attention</td>
</tr>
<tr>
<td></td>
<td>• Fully automatic (simple and easy control and operation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Relatively small space requirement</td>
<td></td>
</tr>
<tr>
<td>5. Rotating Biological Contractors</td>
<td>• Low space requirement</td>
<td>• Contact media are not readily available in the market</td>
</tr>
<tr>
<td>(RBC)</td>
<td>• Can withstand hydraulic and organic surges more effectively</td>
<td>• High capital cost of equipment</td>
</tr>
<tr>
<td></td>
<td>• High treatment efficiency</td>
<td>• Must be covered for protection against rain, wing, sunlight and vandalism</td>
</tr>
<tr>
<td></td>
<td>• Low energy and maintenance requirement</td>
<td>• Failures in shaft and media</td>
</tr>
<tr>
<td></td>
<td>• Well drainable excess sludge</td>
<td>• Odor problems</td>
</tr>
<tr>
<td>6. Sludge Drying Bed</td>
<td>• Simple to operate</td>
<td>• Filtrate/seepage water has to be treated</td>
</tr>
<tr>
<td></td>
<td>• Lowest cost option among sludge dewatering methods</td>
<td>• Requires solar power</td>
</tr>
<tr>
<td></td>
<td>• Energy-saving</td>
<td>• May produce odor and flies nuisance</td>
</tr>
</tbody>
</table>

Source: Philippine Sanitation Sourcebook and Decision Aid, 2005
ANNEX H

August 24, 2005

JOINT DENR-DOH
ADMINISTRATIVE ORDER
No. 02, series of 2005

SUBJECT: Policies and Guidelines on effective and proper handling, collection, transport, treatment, storage and disposal of health care wastes.

I. RATIONALE

The Department of Environment and Natural Resources (DENR) and the Department of Health (DOH) hereby jointly provide the following guidelines on the management of health care wastes pursuant to, among others, the following laws, rules and regulations:

- Clean Air Act of 1999 (Republic Act 8749);
- Toxic Substances, Hazardous Waste, and Nuclear Waste Control Act of 1990 (Republic Act 6969);
- Ecological Solid Waste Management Act of 2000 (Republic Act 9003);
- Refuse Disposal of the Sanitation Code of the Philippines [Chapter XVIII, Implementing Rules and Regulations, Presidential Decree 856];
- Clean Water Act of 2004 [Republic Act 9275];
- Environmental Impact Statement (EIS) System (Presidential Decree 1586);
- Hospital Licensure Act [Republic Act 4226]

II. OBJECTIVES

A. To provide guidelines to generators, transporters and owners or operators of treatment, storage, disposal (TSD) facilities of health care waste on the proper handling, collection, transport, treatment, storage and disposal thereof;

B. To clarify the jurisdiction, authority and responsibilities of the DENR and DOH with regard to health care waste management; and

C. To harmonize efforts of the DENR and DOH on proper health care waste management.

III. SCOPE AND COVERAGE

These policies and guidelines shall apply to health care waste generators, transporters and owners or operators of TSD and final disposal facilities.

IV. DEFINITION OF TERMS

A. Health Care Wastes – include all wastes generated as a result of the following:
   1. Diagnosis, treatment, management and immunization of humans or animals;
   2. Research pertaining to the above activities;
   3. Producing or testing of biological products; and
4. Waste originating from minor or scattered sources (i.e. dental clinics, alternative medicine clinics, etc.)

The categories of health care wastes are enumerated in Annex “A”.

B. Health Care Waste Generators - include health care facilities, institutions, business establishments and other small health care services with activities or work processes that generate health care waste.

1. Hospitals (Primary Care, Secondary Care and Tertiary Care)
2. Infirmaries
3. Birthing Homes
4. Clinics
   [a] Medical
   [b] Ambulatory
   [c] Dialysis
   [d] Health care centers and dispensaries
   [e] Surgical
   [f] Alternative medicine
   [g] Dental
   [h] Veterinary
5. Laboratories and Research Centers
   [a] Medical and biomedical laboratories
   [b] Medical research centers
   [c] Blood bands and blood collection services
   [d] Dental prosthetic laboratories
   [e] Nuclear medicine laboratories
   [f] Biotechnology laboratories
   [g] Animal research and testing
   [h] Drug testing laboratories
   [i] HIV testing laboratories
6. Drug Manufacturers
7. Institutions
   [a] Drug rehabilitation center
   [b] Training centers for embalmers
   [c] Med-tech intern training centers
   [d] Schools of Radiologic Technology
   [e] Medical Schools
   [f] Nursing Homes
   [g] Dental Schools
8. Mortuary and Autopsy Centers

C. Health Care Waste Transporter – a person licensed by the DENR Environmental Management Bureau to convey healthcare waste through air, water or land.

D. Treatment, Storage and Disposal (TSD) Facilities – facilities where hazardous wastes are stored, treated, recycled, reprocessed and/or disposed of, as prescribed under DENR AO No. 2004-36, Chapter 6-2 (Categories of TSD Facilities).

V. RESPONSIBILITIES OF IMPLEMENTING & COOPERATING AGENCIES

This Joint Administrative Order shall be implemented by the DENR through the Environmental Management Bureau (EMB) and its Regional Offices, the National Solid Waste Management Commission (NSWMC), and by the DOH through its Centers for Health
Development (CHD), Bureau of Health Facilities and Services (BHFS), Bureau of Health Devices and Technology (BHDT), Environmental and Occupational Health Office (EOHO) of the National Center for Disease Prevention and Control (NCDPC), the National Center for Health Facility Development (NCHFD), and the National Reference Laboratory (NRL) - East Avenue Medical Center, Quezon City.

A. The DENR-EMB shall:

1. Be the primary government agency responsible for implementing pertinent rules and regulation on the management of health care waste in the Philippines, particularly concerning the issuance of necessary permits and clearances for the Transport, Treatment, Storage, and Disposal of such wastes, as governed by RA 6969, RA 8749, RA 9275, RA 9003 and PD1586;

2. Formulate policies, standards and guidelines on the transport, treatment, storage and disposal of health care wastes.

3. Oversee compliance by generators, transporters, TSD facility operators, and/or final disposal facility operators with the proper transport, treatment, storage, and disposal of health care wastes;

4. Conduct regular sampling and monitoring of wastewater in health care and TSD facilities to determine compliance with the provision of RA 9275;

5. **Require TSD facility operators and on-site treaters to present to the DENR copies of the results of microbiological tests on the health care waste treated using autoclave, microwave, hydroclave and other disinfection facilities prior to renewal of Permits under RA 6969**;

6. Provide technical assistance and support to the advocacy programs on health care waste management;

7. Notify the DOH on cases on non-compliance or notice of violation issued to health care facilities, institutions and establishments licensed by the DOH.

B. The DOH shall:

1. Regulate all hospitals and other health facilities through licensure and accreditation under the Hospital Licensure Act (Republic Act No. 4226);

2. Formulate policies, standards, guidelines systems and procedures on the management of health care waste;

3. Develop training programs and corresponding modules on health care waste management;

4. Provide technical assistance in the preparation of health care waste management plan as a requirement for licensing or renewal thereof;

5. Provide technical assistance to ensure an effective and efficient implementation of health care waste management program;

6. Require all health care waste TSD facility operators and health care waste generators with on-site waste treatment facilities to use DOH-BHDT registered equipment or devices used for the treatment of health care wastes;

7. Conduct regular performance evaluation of equipment/devices used for the treatment of health care wastes by the DOH-BHDT;
8. Monitor the microbiological test of treated wastes to ensure compliance with DOH standards;
9. Evaluate DOH hospitals’ compliance with proper health care waste management program;
10. Issue Department Circulars to ensure that all environmental requirements are complied with; and
11. Notify DENR on actions taken on cases of non-compliance or notice of violation issued to health care facilities, institutions, and business establishments.

C. The DOH-Centers for Health Development shall:
1. Advocate health care waste management [HCWM] practices to the Local Chief Executives, key leaders and other stakeholders;
2. Monitor health care waste management practices in all hospitals and other health care facilities;
3. Provide technical assistance on health care waste management [HCWM] through:
   a. Training
   b. Advisory on the preparation of HCWM plans as a requirement for licensing or renewal thereof
   c. Dissemination of policies, guidelines and information
   d. Monitoring and validation of implementation of HCWM
   e. Develop, reproduce, and disseminate HCWM IEC material. Participate in any public hearings related to HCWM.
   f. Ensure compliance by health care waste generators with all pertinent laws, rules and regulations on HCWM.

VI. GUIDELINES AND PROCEDURES

A. ENVIRONMENTAL COMPLIANCE REQUIREMENTS

A.1 Documentary Requirements

A.1.1 Health Care Waste Generators

Health care waste generators are required, based on existing laws, rules and regulations, to register and secure the following permits:

A.1.1.1 From the DENR-Environmental Management Bureau

1. Environmental Compliance Certificate (ECC) – for the establishment of hospitals, health care facilities covered by the provisions of PD 1586 from the EMB Central Office or its Regional Offices.
2. Permit to Operate (P/O) – for Air Pollution Source and Control Installation from the EMB Regional Office.
3. Discharge Permit will be issued by the EMB Regional Office and the Laguna Lake Development Authority (LLDA) based on RS 9275 or the Clean Water Act of 2004 (See Annex “B” LLDA Jurisdiction)
A.1.1.2 From the DOH-Bureau of Health Facilities and Services:

1. **Licenses** for hospitals, laboratories, dialysis clinics, birthing homes, infirmaries, psychiatric hospitals, dental prosthetic laboratories, blood banks, ambulatory clinics, and drug treatment and rehabilitation centers.

2. **Certificate of Accreditation** for Overseas Filipino Workers (OFW) medical clinics, surgical clinics, drug testing laboratories, HIV testing laboratories, water testing laboratories, medical technologist intern training centers and training centers for embalmers.

A.1.2 Health Care Waste Transporters

Health care waste transporters are required, based on existing laws rules and regulations, to undertake the following:

1. Register with EMB Central Office as healthcare waste transporter;
2. Secure Transport Permit from the DENR-EMB Regional Office;
3. Comply with the DENR Manifest System; and
4. Comply with other requirements specified in the Implementing Rules and Regulations of RA 6969.

A.1.3 TSD Facilities

Owners or Operators of TSD facilities are required based on existing rules and regulations to secure the following permits and clearances from DENR-EMB and DOH;

1. **Environmental Compliance Certificate (ECC)** for the Sanitary Landfill (SLF) and TSD Facility from the EMB Central Office or Regional Office
2. **Notice to Proceed** for controlled dump facility to be used as repository of health care waste from the EMB Regional Office
3. **Registration as TSD facility** based on the Implementing Rules and regulations of RA 6969 from EMB Central Office
4. **Technology Approval** for non-burning technologies from the EMB Central Office prior to the issuance of Permit to Operate
5. **Permit to Operate (P/O)** Air Pollution Source and Control Installation from EMB Regional Office
6. **Discharge Permit** from the EMB Regional Office or LLDA
7. **Certificate of Product Registration** for equipment or devices used for treating health care wastes from the DOH-BHDT
8. **Certificate of Technical Evaluation** for equipment or devices used for treating health care wastes from NRL-EAMC

B.  PROCEDURES FOR SECURING PERMITS AND LICENSES

Permits and licenses shall be secured following the established procedures of the DENR and DOH.
C. SPECIFIC CRITERIA, STANDARDS, AND GUIDELINES

C.1 Handling, Collection, Standard and Transport

Handling, collection, storage and transport of health care wastes shall be in accordance with the provisions of RA 8749, RA 6969, and RA 9003, and the DOH Health Care Waste Management Manual (Chapter 5).

C.2 Treatment

1. Facilities shall consider technologies and processes used in health care waste treatment such as (1) thermal, (2) chemical, (3) irradiation, (4) biological processes, (5) encapsulation, and (6) inertization, as outlined in the DOH Health Care Waste Management Manual and subject to compliance with the provisions of RA 8749, RA 6969, and RA 9003.

2. Autoclave, microwave and hydroclave facilities shall use microbiological test to determine the treatment efficiency of the units. The results of the microbiological test shall be recorded and reported to DENR under RA 6969 and RA 9003.

3. Health care waste generators and TSD facilities shall observe a level of microbial inactivation of $6\log_{10}$ reduction or greater than the most resistant microorganism of concern in a given process.

4. Treated wastes and inert residues from TSD facilities must be disposed in controlled disposal or sanitary landfill facilities duly licensed by the DENR to handle the same.

5. Inertization is a suitable treatment for pharmaceutical wastes while encapsulation and other immobilization techniques are treatment methods considered for sharps, chemicals and pharmaceutical wastes and should therefore be placed in final disposal facilities indicated under the subsequent Section.

C.3 Final Waste Disposal Systems and Facilities

The use of the proceeding disposal facilities should only be limited to health care wastes which have undergone the necessary treatment provided under the prescribed standards stipulated in the DOH Health Care Waste Management Manual.

C.3.1 Controlled Dump Facility

1. A Controlled Dump Facility (CDF) is an interim\(^1\) disposal facility for municipal solid waste or those that are considered as non-hazardous and non-toxic substances. In the absence of a sanitary landfill, a controlled dumpsite could accept health care waste after the indicative treatment thereof.

2. In addition to the operational guidelines stipulated under Section 2 of Rule XIII of the Implementing Rules and Regulations of RA 9003 or as indicated in the conditions stipulated in the issuance of the NTP, a CDF that is commissioned to

---

\(^1\) As stipulated in Section 37 of RA 9003, no open dumps shall be established and operated, nor any practice or disposal of solid waste by any person, including LGUs, which constitutes the use of open dumps for solid waste, be allowed after the effectivity of this Act (February 16, 2001). Provided, that within three (3) years after the effectivity of this Act (February 16, 2004), every LGU shall convert its open dumps into controlled dumps, in accordance with the guidelines set in Section 41 of the Act. Provided, further, that no controlled dumps shall be allowed five (5) years following effectivity of the Act (February 16, 2006).
accept treated health care waste should also be operated in accordance with the following specific requirements:

a. Identify a particular cell within the facility to serve as a site for the disposal of treated health care waste. The capacity of the allotted cell/cell(s) should be measured in order to determine the actual volume of wastes that can be accommodated in the facility.

b. Adequate signage should be placed in the health care waste deposition area.

c. The cell should be lined with a material of low permeability, such as clay or a geo-membrane such as a high-density polyethylene (HDPE) plastic liner to contain the leachate and prevent contamination of groundwater sources within the area.

d. Ensure that adequate soil cover is placed on the cells right after each waste spreading.

e. Basic record keeping of the incoming waste indicating the time of receipt, volume or weight, source identification (i.e. name of generator or source), certification of treatment (or any similar form indicating that the waste have undergone the necessary treatment) and the general condition of the waste to be disposed.

C.3.2 Sanitary Landfill Facility

1. A Sanitary Landfill Facility (SLF) is a disposal site designed, constructed, operated and maintained in a manner that exerts engineering control over significant potential environmental impacts arising from the development and operation thereof.

2. The required dedicated cells for treated health care wastes should be built or developed prior to its operation to prevent the mixing thereof with municipal solid wastes and other wastes.

3. Aside from the ECC, which is required for such facility, the construction and development of an SLF must conform to RA 9003 and its Implementing Rules and Regulations, particularly Sections 1 and 2, Rule XIV.

4. Existing sanitary landfill with approved ECC for the disposal of municipal solid waste must secure and amendment of their ECC before accepting health care waste for disposal thereat.

C.3.3 Safe Burial on Healthcare Facility Premises

1. Safe burial within the premises of healthcare facilities shall be allowed in remote locations and rural areas where no TSD facilities are available. In such activity of safe burial, the health care facility must ensure that the load or capacity of the on-site burial pit is not exceeded.

2. Chemical treatment or disinfection is required prior to safe burial on hospital premises.

3. The standards for safe burial within the healthcare facility premises shall follow the guidelines specified in the DOH health Care Waste Management Manual (See Annex “C”).
4. Relative to the guidelines provided by DOH, the operation of safe burial should be in accordance with the minimum requirements for landfill.

C.3.4 Sharps and Syringes Disposal Through Concrete Vault

1. Disposal using concrete vault shall be allowed only as an alternative means of disposal of used sharps and syringes.

2. Concrete vault shall be marked with proper signage: CAUTION: HAZARDOUS WASTE OR SHARPS DISPOSAL AREA – UNAUTHORIZED PERSONS KEEP OUT.

3. Concrete vault should be watertight and must be constructed at least 1.5 meters above the groundwater level.

4. The procedures for the safe burial of sharps and syringes through concrete vault shall follow the guidelines in the DOH Health Care Waste Management Manual (See Annex “D”).

C.4 WASTEWATER TREATMENT FACILITY

Healthcare facilities shall have their own Wastewater Treatment Facilities (WTF) or maybe connected into a sewage treatment plant. However, facilities with laboratories shall be required to pre-treat their wastewater prior to discharge into a sewage treatment plant.

VII. REPEALING CLAUSE

All other issuances whose provisions of DENR and DOH Administrative Order, Memorandum Circulars or other issuances inconsistent herewith are hereby repealed or modified accordingly.

VIII. PENALTY CLAUSE

Failure to comply with the policies/guidelines shall be subject to the penalty provision(s) of the applicable laws stated herein.

IX. EFFECTIVITY

This Order shall take effect immediately.

MICHAEL T. DEFENSOR
Secretary
Department of Environment and Natural Resources

FRANCISCO T. DUQUE III, MD, MSE
Secretary
Department of Health

Published: Manila Standard Today
September 1, 2005
ANNEX “A” – Categories of Health Care Waste

1. **General Waste** – Comparable to domestic waste, this type of waste does not pose special handling problem or hazard to human health or to the environment. It comes mostly from the administrative and housekeeping functions of health care establishments and may also include waste generated during maintenance of health care premises. General waste should be dealt with by the municipal waste disposal system.

2. **Infectious Waste** – this type of waste is suspected to contain pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. This includes:
   2.1 Cultures and stock of infectious agents from laboratory work;
   2.2 Waste from surgery and autopsies on patient with infectious diseases (e.g. tissues, materials and equipment that have been in contact with blood or other body fluids);
   2.3 Waste from infected patients in isolation wards (e.g. excreta, dressings from infected or surgical wounds, clothes heavily soiled with human blood or other bodily fluids);
   2.4 Waste that has been in contact with infected patients undergoing hemodialysis (e.g. dialysis equipment such as tubing and filter, disposable towels, gowns, aprons, gloves and laboratory coats);
   2.5 Infected animal from laboratories; and
   2.6 Any other instrument or materials that have been in contact with infected persons or animals.

3. **Pathological Waste** – Pathological waste consists of tissues, organs, body parts, human fetus and animal carcasses, blood and body fluids. Within this category, recognizable human and animal body parts are also called anatomical waste. This category should be considered as a subcategory of infectious waste, even though it may also include healthy body parts.

4. **Sharps** – Include needles, syringes, scalpels, saws, blades, broken glass, infusion sets, knives, nails and any other items that can cause a cut or puncture wounds. Whether or not they are infected, such items are usually considered as highly hazardous health care waste.

5. **Pharmaceutical waste** – Includes expired, unused, split, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer required and need to be disposed of appropriately. This category also includes discarded items used in handling of pharmaceuticals such as bottles or boxes with residues, gloves, masks, connecting tubing and drug vials.

6. **Genotoxic Waste** – Genotoxic waste may include certain cytostatic drugs, vomit, urine, or feces from patients treated with cytostatic drugs, chemicals, and radioactive materials. This type of waste is high hazardous and may have mutagenic, teragenic, or carcinogenic properties.
   6.1 Harmful cytostatic drugs can be categorized as follows:
      6.1.1 Alkylating agents cause alkylation of DNA nucleotides, which leads to cross-linking and miscoding of the genetic stock;
      6.1.2 Anti-metabolites: inhibit the biosynthesis of nucleic acids in the cell; mitotic inhibitors: prevent cell replication
6.2 Cytotoxic wastes are generated from several sources and include the following:

6.2.1 Contaminated materials from drug preparation and administration, such as, syringes, needles, gauges, vials, packaging; outdated drugs, excess (left over) solutions, and drug returned from the wards;

6.2.2 Urine, feces, and vomit from patients which may contain potentially hazardous amounts of administered cytotoxic drugs or of their metabolites and which should be considered genotoxic for at least 48 hours and sometimes up to 1 week after drug administration.

7. Chemical Waste – Chemical waste consists of discarded solid, liquid, and gaseous chemicals, for example from diagnostic and experimental works and from cleaning, housekeeping, and disinfecting procedures. Chemical waste from health care may be hazardous or non-hazardous.

7.1 Chemical waste is considered hazardous if it has at least one of the following properties:

7.1.1 Toxic
7.1.2 Corrosive (e.g. acids of pH <2 and bases of pH>12)
7.1.3 Flammable
7.1.4 Reactive (explosive, water-reactive, shock-sensitive)
7.1.5 Genotoxic (e.g. cytostatic drugs)

7.2 Non-hazardous chemical waste consists of chemicals with none of the above properties, such as sugars, amino acids, and certain organic and inorganic salts.

8. Waste with high content of heavy metals – Wastes with a high heavy-metal content represent a subcategory of hazardous chemical waste, and are usually highly toxic. Mercury wastes are typically generated by spillage from broken clinical equipment (thermometers, blood pressure gauges, etc.). Whenever possible, spilled drops of mercury should be recovered. Residues from dentistry have high mercury content. Cadmium waste comes mainly from discarded batteries. Certain “reinforced wood panels” containing lead is still being used in radiation proofing of X-ray and diagnostic departments. A number of drugs contain arsenic but these are treated here as pharmaceutical waste.

9. Pressurized Containers – Many types of gas are used in health care and are often stored in pressurized cylinders, cartridges, and aerosol cans. Many of these, once empty or of no further use (although they may still contain residues), are reusable, but certain types notably aerosol cans, must be disposed of. Whether inert or potentially harmful; gases in pressurized containers should always be handled with care; containers may explode if incinerated or accidentally punctured.

10. Radioactive Waste – Includes disused sealed radiation sources, liquid and gaseous materials contaminated with radioactivity, excreta of patients who underwent radio-nuclide diagnostic and therapeutic applications, paper cups, straws, needles and syringes, test tubes, and tap water washings of such paraphernalia. It is produced as a result of procedures such as in vitro analysis of body tissues and fluid, in vivo organ imaging, tumor location and treatment, and various clinical studies involving the use of radioisotopes. Radioactive health care wastes generally contain radionuclides with short half-lives, which ose their activity in a shorter time. However, certain radionuclides e.g. C-14 contaminated wastes have much longer half-life, more than a thousand years, which need to be specially managed in a centralized treatment facility for radioactive wastes. The same is required for the management of disused sealed radiation sources used for cancer treatment.
ANNEX “B” – Laguna Lake Development Authority Jurisdiction

The Laguna Lake jurisdiction is limited to the water shed of the Laguna Lake which consist of the following: Rizal Provinces (13 towns); Laguna Provinces (27 towns); chartered cities of San Pablo, Antipolo, Tagaytay, Tanauan, Calamba, Sta. Rosa; Sto. Tomas and Malvar, Batangas; Silang, Carmona and GMA, Cavite; Luceban, Quezon; Taguig and Pateros, Metro Manila; chartered cities of Pasay, Caloocan, Quezon, Manila, Muntinlupa, Marikina and Pasig.
ANNEX “C” – Guidelines for Safe Burial within Hospital Premises

Safe burial within the hospital premises shall be in accordance with the guidelines specified in the DOH Health Care Waste Management Manual as follows:

1. Access to the disposal site should be restricted to authorized personnel only.

2. The burial site should be lined with a material of low permeability, such as clay, or geomembrane such as a high-density polyethylene (HDPE) plastic liner at the bottom of the pit to prevent contaminating groundwater and avoid pollution.

3. Only hazardous health care waste should be buried. If general health care waste were also buried on the premises, available space would be quickly filled-up.

4. Large quantities (>1kg) of chemical/pharmaceutical wastes should not be buried.

5. The burial site should be managed as a landfill, with each layer of waste covered with a layer of earth to prevent odor, as well as to prevent proliferation of rodents and insects.

6. Burial site should not be located in flood prone areas.

7. Hospital ground should be secured. (e.g. fenced with warning signs).

8. The location of waste burial pit should be downhill or down-gradient from any nearby wells and about 50 meters away from any water body such as rivers or lakes to prevent contaminating sources of water.

9. Health care facilities should keep a permanent record of the size and location of all their on-site burial pits to prevent construction workers, builders, and others from digging in those areas in the future.

10. The safe burial of waste depends critically on rational operational practices. The bottom of the pit should at least be 1.50 meters higher than the ground water level.

11. It should be noted that safe on-site burial practicable only for relatively limited period, say 1 to 2 years, and for relatively small quantities of waste, say up to 5 to 10 tons in total. Where these conditions are exceeded, a long-term solution will be needed.
ANNEX “D” – Procedures for the Safe Burial of Sharps and Syringes through Concrete Vault

The procedures for the safe burial of sharps and syringes through concrete vault shall be in accordance with the guidelines in the DOH Health Care Waste Management Manual as follows:

1. Dig a pit (minimum size of 1m x 1m x 1.8m depth), enough to accommodate sharps and syringes for an estimated period of time without reaching the groundwater level. The site must be isolated and at least 152 meters away from the groundwater supply sources and dwelling units.

2. Construct concrete walls and slabs of the pit. Provide slab opening or manhole for easy deposition of collected sharps and syringes. The manhole should be extended a few centimeters above the soil surface to overcome infiltration of surface water.

3. Deposit the collected safety boxes filled with used sharps and needles inside the concrete vault.

4. Install a security fence around the site.
ANNEX I

Republic of the Philippines
Department of Health
OFFICE OF THE SECRETARY
Bldg. No. 1, San Lazaro Compound, Rizal Avenue, Sta. Cruz, Manila 1003
Tel. Nos. (632)711-95-02, 711-95-03; Telefax (632) 743-18-29

July 30, 2008

ADMINISTRATIVE ORDER
No.2008-0021

SUBJECT: Gradual Phase-out of Mercury in all Philippine Health Care Facilities and Institutions

I. RATIONAL / BACKGROUND

Mercury is a naturally occurring heavy metal. At ambient temperature and pressure, mercury is a silvery-white liquid that readily vaporizes and may stay in the atmosphere for up to a year. When released to the air, mercury is transported and deposited globally. Mercury ultimately accumulates in lake bottom sediments, where it is transformed into its more toxic organic form, methyl mercury, which accumulates in fish tissue.

Mercury is highly toxic, especially when metabolized into methyl mercury. It may be fatal if inhaled and harmful if absorbed through skin. Around 80% of the inhaled mercury vapour is absorbed in the blood through the lungs. It may cause harmful effects to the nervous, digestive, respiratory, immune system and to the kidneys, besides causing lung damage. Adverse health effects from mercury exposure can be: tremors, impaired vision and hearing, paralysis, insomnia, emotional instability, developmental deficit during fetal development, and attention deficit and developmental delays during childhood.

In 1991, the World Health Organization (WHO) concluded that a safe level of mercury exposure, below which no adverse effects, has never been established.

Several European countries Sweden, France, Denmark and Norway, have also banned mercury-containing thermometers from as early as 1991. A European wide resolution on the issue of mercury is pending.

In the Unites States, hospitals have significantly reduced the amount of mercury found in facilities and are demonstrating a clear preference for safer alternatives. Many hospitals across the country have taken steps to address the issue, including labelling mercury-containing devices and phasing out their purchase in favour of safer, equally effective alternatives. More than 1,000 hospitals across the US have pledge to virtually eliminate mercury medical device and more than 90% of pharmacy chains have stopped selling mercury fever thermometers. Three of the five largest healthcare group purchasing organizations in the US now have mercury-free purchasing policies.
On 25 January 2006, at the opening of the First Southeast Asian Conference on Mercury in Health Care held at the Philippine Heart Center, the Department of Health pronounce the gradual elimination of mercury-use in the Philippine healthcare system.

The Department of Health (DOH) provides the following policies and guidelines for the gradual phase-out of mercury in all Philippine health care facilities pursuant to, among others, the following laws, rules and regulations:

- “Toxic Substances and Hazardous Nuclear Waste Control Act of 1990” (Republic Act 6969);
- Procedural Manual for Title III: Hazardous Waste Management;
- Management of Chemicals and Toxic Substances (Implementing Rules and Regulations for Title II, DENR A.O. 92-09);
- “Chemical Control Order for Mercury and Mercury Compound” (Implementing Rules and Regulations under DENR A.O. 97-38);
- Clean Water Act of 2004, (Republic Act No. 9275);
- “Policies and Guidelines on effective and proper handling, collection, transport, treatment, storage and disposal of health care wastes”, (Joint DOH-DENR Administrative Order No. 02-2005)
- “Revised Rules and Regulations Governing the Registration, Licensure and Operation of Hospitals and other Health Care Facilities in the Philippines” (DOH Administrative Order 70-A as amended);
- Hospital Licensure Act (Republic Act No. 4226)
- The Consumer Act of the Philippines of the Department of Trade and Industry (DTI), covering various chemicals, Article 10-Injurious, Dangerous & Unsafe Products (RA 7394)

II. SCOPE AND COVERAGE

These policies and guidelines shall apply to all Health Care Facilities as defined by this document.

III. DEFINITION OF TERMS

1. HEALTH CARE FACILITIES mean any of the following:

a. HOSPITALS – place devoted primarily to the maintenance and operation of facilities for the diagnosis, treatment and care of individuals suffering from illness, disease, injury or deformity or in need of obstetrical or other medical and nursing care. The term “hospital” shall also be construed as any institution, building or place where there are installed beds or cribs or bassinets for twenty-four hour use or longer by patients in the treatment of diseases, diseased-condition, injuries, deformities or abnormal physical and mental states, maternity cases, and sanitorial or sanitarial care infirmities, nurseries, dispensaries, and such other means by which they may be designated.

b. INFIRMARY – a health facility that provides treatment and care to the sick and injured, as well as clinical care and management to mothers and newborn babies.
c. BIRTHING HOME – a health facility that provides maternity service on pre-natal and post-natal care, normal spontaneous delivery and care of newborn babies.

d. CLINIC – shall mean a place in which patients avail of medical consultations or treatment on an out-patient basis and shall include the following:
   d.1 Medical
   d.2 Ambulatory
   d.3 Dialysis
   d.4 Health Care Centers and Dispensaries
   d.5 Surgical
   d.6 Alternative Medicine
   d.7 Dental
   d.8 Other clinical facilities not mentioned above that require a license/certification/accreditation from DOH.

2. Mercury – means any substance containing element mercury, either in its pure form, as metallic salts or organometallic compounds.

3. Mercury Audit – a mercury audit aims to identify all the uses and sources of mercury and the amount present in the facility.

4. Alternatives to Mercury-containing devices/products – mercury-reduced and mercury-free products that are considered to be viable replacements for mercury containing devices/products.

5. Hospital Waste Management Committee (HWMC) – means a group in the Health Care Facility with the overall responsibility of ensuring that health care wastes management plan are promoted and implemented.

6. Waste Management Officer (WMO) – means a person in the Health Care Facility responsible for the day-to-day operation and monitoring of the waste management system. In cases where the Health Care Facility has no HCWM, the WMO shall be the person to assume the responsibility of ensuring the health care waste management plan of the facility as promoted and implemented.

7. Mercury Minimization Program - means a gradual phase-out for the MDEP by a Health Care Facility in accordance with Section V and following the management plan described in Annex B of the Administrative Order.

IV. GENERAL PROVISIONS

Recognizing the unnecessary risks posed by the continued use of mercury containing products in the healthcare system, the DOH hereby orders that:

1. All Hospitals shall immediately discontinue the distribution of mercury thermometers to patients through the distribution of hospital admission/discharge kits.

2. All Hospitals shall follow the guidelines for the gradual phase-out of mercury in health care facilities described in this document in the timeline period.
3. All new Health Care Facilities applying for a License to Operate shall submit an inventory of all mercury-containing devices that will be used in their facilities and a corresponding mercury elimination program.

4. All other Health Care Facilities other than hospital shall make a Mercury Minimization Program based on the guidelines set by this administrative order.

V. GUIDELINES FOR THE GRADUAL PHASE-OUT OF MERCURY IN HEALTH CARE FACILITIES

1. In order to ensure safety and contamination control, steps taken towards mercury elimination in facility must be consistent and predetermined. It is therefore a must to involve the whole facility in a dedicated Mercury Management and Minimization Program, with the goal of:
   a. Raising awareness on the dangers posed by mercury and mercury-containing devices in all health care facilities and institutions.
   b. Developing a clear preference for the use of Alternatives to Mercury-containing Devices among health care personnel.
   c. In the short term, preventing the further release of mercury to the environment through proper disposal.

2. All Health Care Facilities are hereby tasked to designate a dedicated Mercury Management Team within 2 months from the issuance of this order. This team should be directly under the Hospital Waste Management Committee. For the first 6 months from their inception, the Mercury Management Team should have:
   a. Conducted a Mercury Audit of their facility (Refer to Annex “A” Sample Mercury Audit Form). This should include an assessment of the costs of switching to alternatives to mercury-containing devices.
   b. Developed and managed a Mercury Minimization Program for their facility (Refer to Annex “B” Sample Mercury Minimization Program).
   c. Drafted and implemented a purchasing policy that requires vendors to sign a mercury-content disclosure agreement (Refer to Annex “C” Sample Vendor Product Mercury-Content Disclosure) covering products intended for purchase. A clear preference for Alternatives to Mercury-containing Devices where applicable should be in effect. Efforts should be made to communicate with suppliers about an eventual mercury-free purchasing policy and to work with staff on finding Alternatives to Mercury-containing Devices.
   d. Conducted a facility-wide information campaign and employee education on the consequences of continued mercury-use. Personnel training on preventing and proper handling of mercury spills should be accomplished (Refer to Annex “D” How to Handle Mercury Spills)
   e. Identified and removed unnecessary practices that promote the use and distribution of mercury-containing devices.

3. Within 24 months from the effectivity of this order, all hospitals should have accomplished the following:
   a. Fully implemented the Mercury Minimization Program developed for their facility.
   b. Switched to alternatives from mercury-containing devices.
   c. Developed and implemented a program of waste segregation and recycling to further reduce the mercury waste stream in cases where no alternative products exist. For instance, mercury containing batteries and fluorescent light bulbs should be collected and processed for recycling or should be properly stored.
d. Identified a dedicated mercury collection area within the facility.
e. Developed a proper temporary mercury storage room in the facility inaccessible to the public (Refer to Annex “E” Guidelines for setting up a Proper Temporary Mercury Storage Area).
f. Incorporated a mercury management module in their training program for new personnel.
g. Information materials on mercury are displayed and/or available in their facility for the benefit of their patients and the general public.

VI. EFFECTIVITY

This order shall take effect 30 Days after the publication in the Official Gazette and major newspapers and shall supersede all issuance inconsistent herewith.

FRANCISCO T. DUQUE III, MD, MSc
Secretary of Health
With heightened awareness of the dangers and risks of the use of mercury in health care practices in recent years, DOH issued Administrative Order 0021, series 2008 or the *Gradual Phase-Out of Mercury in All Philippine Health Care Facilities and Institutions*, dated July 30, 2008.

Ideally, mercury wastes or mercurial medical devices that are phased-out and are no longer used should be transferred out of the health facilities and managed by treatment, storage and disposal (TSD) facilities that are accredited by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR). However, there is yet no TSD facility developed and accredited by the EMB-DENR for the elemental mercury found in mercurial thermometers and sphygmomanometers, and it would take some time before these facilities are made available to health facilities all over the country. Thus, providing the appropriate temporary storage conditions within the health service facility and ensuring safe handling by healthcare personnel of the phased out medical devices, including busted mercury lamps, become the responsibility of the DOH.

A study by Engr. Ana Rivera (DOH-National Center for Disease Prevention and Control) in 2007 showed that mercury vapour of the indoor air environment of 7 randomly selected tertiary hospitals could be above the time-weighted average threshold limit value (TVL) of 25µg/m³ for adults on 40-hour workweeks. Using a Jerome 431X mercury vapour direct reading instrument ambient mercury levels exceeded the TVL in and around loosely covered containers, receptacles and sinks that had been used for disposing or washing broken thermometer glass and defective sphygmomanometers. When the odourless and colorless elemental mercury vapor is inhaled, it readily enters the bloodstream and crosses the blood-brain barrier, which is the most common mode of exposure to mercury.

To enhance patient safety measures in health care facilities, to protect health workers from the potential hazards from mercury exposure and to minimize the accumulation of mercury in the environment, all heads, chiefs and directors of healthcare facilities are hereby enjoined to refer to and apply the Guidelines on Temporary Storage of Mercury-Containing Devices and Management of Mercury Spills, as detailed in Annexes A and B of this Department Memorandum.

*ENRIQUE T. ONA, MD, FPSP, FACS*
Secretary of Health
ANNEX A

GUIDELINES FOR THE TEMPORARY STORAGE OF
MERCURY-CONTAINING MEDICAL DEVICES AND MERCURY-CONTAINING WASTES
IN HEALTHCARE FACILITIES

I. Rationale

Mercury is a naturally occurring heavy metal that can harm human health. In healthcare settings, it is most often observed in its liquid form in thermometers and sphygmomanometers. Liquid or elemental mercury vaporizes in temperatures above 25 degrees Celsius.

People are exposed to mercury by breathing contaminated air, by accidental ingestion of mercury compounds, and through direct contact with skin or the mucosa. Health effects from these kinds of exposures are acute and can be directly linked to mercury exposure. On the other hand, chronic or prolonged exposure to mercury can damage the central nervous system, cause chronic skin disorders and reduce fertility. This occurs when food or water sources have been contaminated at levels that do not produce immediate and alarming effects, or with prolonged exposure to mercury vapors. Case studies have shown that mercury, once in the blood stream, can cross the blood-brain barrier and the placental barrier as well. Mercury-related cases of severe neural or brain damage of foetuses that range from delay in learning to walk to severe disabling neuromuscular disorders have been documented.

Thus, it is imperative that DOH issue these guidelines for the safe storage of mercurial thermometers and blood pressure apparatuses and for the management of mercury spills if accidents occur.

II. Scope of Application

This Department Memorandum applies to all types of healthcare facilities in the country. Health care facilities include: hospitals, free-standing clinics, laboratories, various diagnostics and treatment facilities.

III. Objectives

The General Objective is to provide guidance for appropriate temporary on-site storage of mercury-containing medical devices and other mercury-containing waste materials in healthcare facilities.

The Specific Objectives are:
1. Provide specifications for the establishment of the physical infrastructure for on-site storage of mercury wastes
2. Describe the procedures for managing the storage of mercury
3. Describe the procedures for managing mercury spills
4. Redefine the functions of healthcare waste management committees in hospitals in relation to the mercury phase-out policy
5. Prescribe the competencies and skills of healthcare staff to manage mercury clean-up and temporary storage
6. Describe the monitoring scheme for the management of mercury-containing materials and wastes in healthcare facilities
V. General Guidelines

1. These Guidelines shall apply to the following mercury-containing devices found in health facilities:
   a. mercury-containing body/fever thermometers
   b. mercury-containing sphygmomanometers
   c. mercury lamps
   The above mercury-containing devices have known technically acceptable alternatives to these that are widely available in the market.

2. All chief or heads of hospitals and outpatient clinics, and administrators of other health facilities shall discontinue the purchase and use of them mercury-containing body/fever thermometers and sphygmomanometers. In place of the mercurial thermometers, digital thermometers are recommended. Instead of mercurial sphygmomanometers, aneroid sphygmomanometers are recommended. Digital sphygmomanometers may also be used in hospitals or specialty care units.

3. All chiefs or heads of hospitals and outpatient clinics and administrators of health facilities other than hospitals shall ensure that mercury-containing thermometers and sphygmomanometers are temporarily stored within the healthcare facility in a manner that will pose the least risk to patients, clients and health personnel. They shall ensure secure storage, and appropriate and timely disposal of used or busted mercury lamps in their facilities through transport, storage and disposal (TSD) facilities that are accredited by the Department of Environment and Natural Resources (DENR).

4. All health facilities shall register and secure a license from the Environmental Management Bureau of DENR, according to the Joint DENR-DOH Administrative Order No. 02, series of 2005, otherwise known as the “Policies and Guidelines on Effective and Proper Handling, Collection, Transport, Treatment, Storage and Disposal of Health Care Wastes.”

5. Heads of all health facilities shall be responsible for ensuring that there is a dedicated and secure storage area for mercury wastes that shall be directly managed by a team of designated and trained healthcare waste management officers or pollution control officers.

6. The Healthcare Waste Management Committee (HCWMC) in each hospital facility shall ensure the implementation of the guidelines described in this Department Memorandum. For hospitals, at least two of the members if the HCWMC shall preferable by a medical doctor, nurse or engineer and have the competencies required for the management of mercury storage and spills which are the following:
   a. Training in basic mercury management and
   b. Training in basic life support and emergency response.

7. Licensing and accreditation of health facilities by PhilHealth shall be modified in order to enforce the total phase-out of the use of mercury-containing thermometers and sphygmomanometers and likewise, the appropriate installation and maintenance of proper storage of mercury wastes within health facility premises.


9. Each DOH health facility shall allot funds from its MOOE for the implementation of Administrative Order 0021, series 2008.
10. The National Center for Health Facility Development (NCHFD), National Center for Disease Prevention and Control (NCDPC) and the Bureau of Health Devices and Technology shall coordinate closely to provide technical assistance to health facility managers, with approval from their Cluster Heads. The Centers for Health Development (CHD) shall undertake periodic assessment of the implementation of Administrative Order 0021, s. 2008 and this Department Memorandum by DOH-administered hospitals.

VI. Specific Guidelines
(The main reference used for the specific guidelines that follow is the “Guidance on the Cleanup, Temporary or Intermediate Storage and Transport of Mercury Waste from Healthcare Facilities” by the United Nations Development Programme-GEF Global Healthcare Waste Project.)

1. Physical Infrastructure Requirements and Adaptation for On-Site Storage

1.1 Siting and Preparation:
   1.1.1 The storage space should be located in a secure, restricted-access area away from wards and other services areas, and not easily affected by floods.
   1.1.2 If the storage space is in a multi-purpose building, it should be a locked room or a locked partitioned space which cannot be easily entered or accessed, in order to prevent theft of breakage of mercury containing materials.
   1.1.3 The storage space should be readily accessible to personnel who are responsible for and authorized to collect, store, and transport wastes.
   1.1.4 The exhaust vent of the storage space should direct air away from work areas or from populated areas and should be far from any air intake vents.
   1.1.5 Estimate the anticipated volume of mercury and mercury waste to be stored and use this estimate to determine the minimum size of the storage space, and the types and sizes of containers to be used.
   1.1.6 Mercury waste should be segregated from regular waste, infectious waste, and other types of healthcare wastes and from flammables.

1.2 Storage Space Design Requirements
   1.2.1 The storage space should have roof and walls that protect the packed devices from weather, insects or pests and other animals. If feasible, the floor should have bunding or barriers.
   1.2.2 The floor should be made of material that is smooth and impervious to mercury. Examples of flooring materials that at impervious to mercury are: polyurethane paint coated floor, seamless rubber, epoxy-coated cement and polyester flooring.
   1.2.3 The drain in the storage space should have an easily accessible and replaceable drain trap to capture mercury in the event of a spill.
   1.2.4 The storage access doors should have locks to render it inaccessible to the public.
   1.2.5 The storage space should have ventilation that can eject air from the space directly to the outside and ventilation system that can prevent air circulation from the storage space to the inside of the healthcare service areas.
   1.2.6 Spill containment trays should be placed directly under the waste containers or packages to catch spills if these occur and prevent them from spreading.
   1.2.7 Personal Protective Equipment (PPE), a spill kit, and wash areas should be located near (but not in) the storage space for easy access by authorized personnel. The wash area should allow for eyewash and shower with adequate water supply.
   1.2.8 The storage space should be kept cool and dry, ideally below 25°C to minimize volatilization of mercury.
1.2.8.1 Use air-conditioning and other cooling equipment only if it allows for swift and adequate elimination of indoor air or vapors.

1.2.8.2 Cooling without the use of air-conditioning can be achieved through the following:
   a) Installation of ceiling fans, box fans or whole house fan with timer
   b) Evaporative cooler to regulate humidity
   c) Solar screens or heat-reflecting films and retractable awnings over windows that are on the side of noonday sun
   d) Use of light colored paint because it absorbs less heat.
   e) Maintenance of shady trees that could reduce external heat around the storage areas (Choose hadry trees over those whose limbs easily break.
   f) Choosing roofing material that reduces ambient room temperature.

1.2.8.3 If the volume of mercury wastes has been reduced adequately and after these have been sealed in primary and secondary containers, these can be refrigerated under the ideal temperature. Assign or dedicate a refrigerator or cool box exclusively for mercury wastes. Secure the refrigerator, cool box and other cooling equipment stably inside the storage area.

1.2.9 Signage – The entrance and exit doors of the storage space should be marked with warning signs, such as “Danger: Hazardous Mercury Waste” and the skull and crossbones symbol for toxic or poisonous wastes (xico)

2. Storage Procedures for Mercury Wastes

2.1 Storage of Elemental Mercury – As a rule, keep elemental mercury intact inside the original glass tubing of thermometers and sphygmomanometers. NEVER extract the liquid mercury from thermometers. Only health personnel trained in the maintenance of hospital equipment and medical devices wearing complete personal protective equipment should attempt to dismantle sphygmomanometers.

2.1.1 As a redundant safety measure to prevent the release of mercury vapour, ALWAYS use two containers, primary and secondary, to store elemental mercury waste that has been collected from broken medical devices or surrendered for safekeeping. Waste of this type primarily includes broken glass or tubing tainted with mercury and also mercury-contaminated rags, paper towels, pieces of carpet, slippers and other objects that have been exposed or used for clean-up. Since intact mercurial thermometers and sphygmomanometers which contain substantial amounts of elemental mercury have the potential to be broken at any time during storage in the health facility, these are also considered as hazardous wastes that should be treated in the same manner as freed up or spilled elemental mercury (double packing).

2.1.2 The primary and secondary containers should have the following characteristics:
   a) Easy-to-open and re-sealable
   b) Leak-proof and air-tight
   c) Puncture-proof and unbreakable
   d) Made of material that does not react with or amalgamate with mercury, such as plastic, wood or cardboard
   e) Made of material that resists corrosion
   f) Easy to lift or portable
   g) Plastic wrappers and containers of clear and transparent material
2.1.3 A vapour suppression agent like sulphur powder, commercial absorbent pads or water should be added to the primary container to protect health staff in charge of collection and storage.

2.1.4 Perform the sealing off of mercury wastes into containers one after another or double packaging over a plastic pan or basin or spill control tray in order to catch any spill.

2.1.5 Label the primary container to indicate what type of mercury waste it contains. The waste containers should be labelled “Hazardous Mercury Waste” along with a description of the contents (what objects these are and whether these are intact or broken); the initial date mercury was first placed in the storage container and the identification of the waste generator or name of the health facility:

HAZARDOUS MERCURY WASTE

| Contents: ___________________ |
| Date Packed: ________________ |
| Generator: _________________ |
| Address: ___________________ |

If the secondary container is not transparent enough such that the label on the primary container is not readable, a label should also be placed on the second container.

2.1.6 Mercury waste containers that are meant to be stored for some time within the health facility should be securely placed on top of a plastic pan, basic or spill-control tray. The containment volume of the pan or tray should exceed the total volume of liquid mercury stored in the container.

2.2 Storage of Mercury Lamps – Unbroken fluorescent lamps are stored with the aim to prevent breakage within the short period between storage and transfer to accredited treatment, storage and disposal (TSD) facilities. Broken fluorescent lamps, on the other hand, are stored as mercury-containing wastes, following guideline no 2.1 (2.1.1 thru 2.1.5).

2.2.1 Unbroken lamps should be stored in a primary container that prevents breakage, preferably the original box in which the lamps were shipped. If the original box is not available, a box with a well-sealed vapour-resistant liner, such as plastic foil liner, is recommended. Otherwise, a long box or other box that fits the shape of the lamp can be used.

2.2.2 If the fluorescent lamps are stored in their original shipping cases or in a box with vapour-resistant liner or in an approved fluorescent lamp or drum container, there is no need for a secondary container.

2.2.3 If the fluorescent lamps need secondary containers, taped plastic sheets that prevent the release of mercury vapour can be used. Labelling follows no. 2.1.4.

2.2.4 Stack up fluorescent lamps in a stable position. Stack them into adequately-sized shelves that protect the entire length of the lamps or stand them up into all plastic drums.

2.3 Management of the Mercury Storage Area

2.3.1 All personnel involved in collection, storage, on-site transport and supervision of mercury waste should have training in mercury waste management and spill cleanup.

2.3.2 General rules for safe maintenance of the storage area are:

2.3.2.1 There should be no smoking or eating in and around the storage area.
2.3.2.2 Regular pest and vermin control program should be instituted for the storage area to ensure that packed mercury wastes are not tampered with, and that no contaminated pests bring out mercury out if the storage area.

2.3.2.3 Inspect the storage space at least once a month to check for leaks, corroded or broken containers, improper methods of storage, ventilation, condition of PPEs and wash area, spill kit contents and records.

2.3.2.4 The chair of the healthcare waste management committee or the head of the healthcare facility should keep updated about information on the availability of Environmental Management Bureau (EMB)-accredited treatment, storage and disposal facilities for elemental mercury (in thermometers and sphygmomanometers) that can serve his/her respective health facility, and coordinate the transfer of accumulated mercury waste in the soonest possible time.

2.3.2.5 Inventory records should be kept of the types of mercury waste, description, quantities in storage and initial dates of storage. The date of inspections, findings and name of inspector should also be recorded. Information in this inventory record will be used to fill-up the hazardous waste registration form of the DENR-EMB prior to transport of the mercury waste outside the health facility.

A sample inventory record logbook and its entries are shown below:

<table>
<thead>
<tr>
<th>Date of Initial Storage</th>
<th>Specific Area-Source On-Site</th>
<th>Type of Mercury Waste</th>
<th>Quantity (specify unit)</th>
<th>Description (intact or broken)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Date of Inspection</th>
<th>Findings</th>
<th>Actions Taken</th>
<th>Recommendations</th>
<th>Name &amp; Signature of Inspector</th>
</tr>
</thead>
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<tr>
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</table>

3. **Management of Mercury Spills** – The main purpose of managing mercury spills in a healthcare facility is to minimize the exposure of patients, health workers and the surrounding community to the hazardous health and environmental effect of mercury.

3.1 The first information to gather about mercury spills is the estimated volume of mercury spilled. **Large spills** are spills estimated to be more than two tablespoons.

In case of a large spill, do the following:

3.1.1 Inform the highest ranking officer/s available in the facility of the incident.

3.1.2 Seal off ALL possible points of exit of mercury vapors in the storage area and cordon off the premises.

3.1.3 Organize for the immediate evacuation of patients and healthcare workers. Be sure that people leaving the site had not stepped on mercury by directing them away from the spill site. Those who have come in contact with mercury should be directed to the nearest safe location and stay there until clean up and decontamination procedures have been instituted.

3.1.4 NO health facility personnel, not even the members of the Healthcare Waste Management Committee should clean up the spill. Seek professional assistance.

3.1.5 Call the nearest fire department of the local government or Bureau of Fire Protection (Department of Interior and Local Government) to manage the large spill.
Small Spills can be managed by designated members of the healthcare waste management committee, pollution control officer or other health personnel who have had training in mercury spill management.

3.2 Management procedures for small spills have the following components:
(1) Preparation – prior to a spill event; (2) Cleanup Procedure – during mercury spill; and, (3) Post-exposure Monitoring. The step-by-step procedures for the above components are described in Annex B.

4. Monitoring Mercury Management in Healthcare Facilities

4.1 On-Site Monitoring by Healthcare Facility Managers or Healthcare Waste Management Committee – The on-site monitoring checklist should include the parameters enumerated below.

4.1.1 On a daily basis, visit the storage site to:
  4.1.1.1 Check integrity of the storage access doors and enclosures
  4.1.1.2 Check for evidence of intrusion of vermin or pests and unauthorized personnel
  4.1.1.3 Regulate cooling and air vent systems

4.1.2 On a monthly basis, inspect the storage site for:
  4.1.2.1 Presence of leaks, corroded or broken containers
  4.1.2.2 Methods of storage
  4.1.2.3 Ventilation and condition of cooling systems
  4.1.2.4 Condition and completeness of PPE
  4.1.2.5 Condition and completeness of spill kit
  4.1.2.6 Functionality of wash area
  4.1.2.7 Timeliness of records
  4.1.2.8 Immediate necessary actions on observed problems

4.1.3 The composition of the on-site monitoring team of hospitals and other large healthcare facilities should include any 3 (three) or more of the following:
  4.1.3.1 Chief of Clinics or Chief of Medical Professional Staff
  4.1.3.2 Chief Administrative Officer
  4.1.3.3 Patient Safety Officer
  4.1.3.4 Supply Officer
  4.1.3.5 Health Facility Engineer
  4.1.3.6 Pollution Control Officer
  4.1.3.7 Waste Management Officer

4.2 Monitoring by the Department of Health – The National Center for Health Facility Development (NCHFD) shall design a rapid assessment checklist or guide for the periodic assessment by DOH Central Office managers and managers of the Centers for Health Development (CHD) of the implementation of Administrative Order 2008-0021 and this Department Memorandum.

All healthcare facilities keeping or storing mercury-containing thermometers and sphygmomanometers and other mercury wastes should implement these guidelines as soon as possible in order to reduce the risk of spilling mercury into the environment and to protect the health of its workers and clients. The initiative to phase-out the use of mercury-containing devices is relatively new in the country, but as soon as better technology and resources are available for the purpose, the Department of Health will keep its partners in health care informed through similar appropriated issuances.
ANNEX B
Management of Mercury Spill

1. Pre-Spill Preparations
   a. The Mercury Spill Response Team shall be trained and organized to respond to a mercury spill.
   b. The senior staff involved in the clean up shall:
      i. Ensure that the contents of the kit are complete at any point in time.
      ii. Monitor the expiration dates of the contents of the spill kits.
   c. A minimum of two sets of spill kits shall be made available in a designated secured and accessible place outside the mercury storage area.
   d. The component of the spill kits are listed in Box 1, below.

<table>
<thead>
<tr>
<th>Box 1: Components of a Mercury Spill Kit</th>
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<tbody>
<tr>
<td>1) Step-by-step instructions (on laminated paper)</td>
</tr>
<tr>
<td>2) Personal protective equipment (PPE):</td>
</tr>
<tr>
<td>(a) Several pairs of rubber or nitrile gloves</td>
</tr>
<tr>
<td>(b) Safety goggles or protective eyewear</td>
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<tr>
<td>(c) Respiratory protection (full-tested, full- or half-face piece, air-purifying respirator with mercury vapor cartridges, or a face mask with a 0.3 micron HEPA filter to capture amalgam particles and mercury-laden dust (However, it should be noted that regular masks do not protect against mercury vapour.)</td>
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<tr>
<td>(d) Coveralls, apron, and other protective clothing</td>
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<tr>
<td>(e) Disposable shoe covers or booties</td>
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<tr>
<td>3) Containers:</td>
</tr>
<tr>
<td>(a) Air-tight, sealable, plastic bags (ziplock)</td>
</tr>
<tr>
<td>(b) Small, air-tight, rigid clear plastic container with non-metal cover</td>
</tr>
<tr>
<td>(c) Air-tight, puncture-resistant, rigid plastic or steel jar or container with a wide opening for collecting mercury-contaminated broken glass</td>
</tr>
<tr>
<td>(d) Plastic tray</td>
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<tr>
<td>(e) Small transparent bags, 2 to 6 mils or 50 to 150 microns thick HDPE-high density polyethylene</td>
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<tr>
<td>4) Tools for removing mercury:</td>
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<tr>
<td>(a) Flash light to locate shiny mercury beads</td>
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<tr>
<td>(b) Plastic-coated playing cards or index cards, cardboards to scoop mercury beads</td>
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<tr>
<td>(c) Small plastic scoop or plastic dust pan to catch mercury beads</td>
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<tr>
<td>(d) Tweezers to remove small broken glass pieces</td>
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<tr>
<td>(e) Eyedropper or syringe (without needle) to draw up large mercury beads</td>
</tr>
<tr>
<td>(f) Duct tape or sticky tape to pick up tiny mercury droplets</td>
</tr>
<tr>
<td>(g) Vapour suppression agents: Sulphur powder to absorb mercury by forming mercuric sulphide; toothpaste; brush to remove mercury-sulphur dust</td>
</tr>
<tr>
<td>(h) Utility knife blade</td>
</tr>
<tr>
<td>5) Materials for spill site decontamination</td>
</tr>
<tr>
<td>(a) Hydrogen peroxide and cotton swabs for final cleaning</td>
</tr>
<tr>
<td>(b) Alkaline soap and paper towels</td>
</tr>
<tr>
<td>(c) Decontamination solution</td>
</tr>
<tr>
<td>6) Materials for Decontamination of Response Team</td>
</tr>
<tr>
<td>(a) Water, alkaline soap and basin to contain water from</td>
</tr>
<tr>
<td>(b) Robe, towel and clean clothes to be used after decontamination and shower</td>
</tr>
<tr>
<td>7) “Danger: Mercury Waste” labels to put on waste containers</td>
</tr>
</tbody>
</table>
2. Clean-up Procedures During Mercury Spill

In case of an actual spill, a step-by-step cleanup procedure shall be followed as indicated in this Annex. The enumerated Steps 1 to 20 shall be posted near the entrance of the storage site.

**Step 1: Quickly determine the extent of the spill**
Determine on what surfaces that mercury spilled and how far the mercury beads travelled. Check mercury beads in crevices (in floors, walls, junctions).

**Step 2: Immediately block off the contaminated area**
If the extent of a small spill is not immediately obvious, cordon off the area with a radius of about 2 meters around the center of the spill.

**Step 3: Evacuate the area**
Check to see if anyone’s skin, shoes or clothing was splashed with mercury. Remove all contaminated clothing or shoes which should be left in the spill area. Have everyone else leave the area; don’t let anyone walk through the mercury spill on their way out. Give priority to pregnant women and children.

Seek assistance to provide first-aid to anyone requiring immediate medical attention. Contaminated skin should be washed with alkaline soap and water.

**Step 4: Contain the spill**
If necessary, prevent the mercury beads from travelling further by blocking the path with rags or impervious material. Take steps to keep mercury from falling into drains or cracks.

**Step 5: Minimize the spread of vapors to interior areas**
Close all interior doors that lead to the other indoor areas. Turn off central ventilation, exhaust and air-conditioning systems that circulate from the spill site to other areas of the building.

**Step 6: Reduce vapor concentrations in the spill area if possible**
For small spills, open all windows and external doors to dilute the vapor concentrations in the room. Prevent access to spill areas by putting up signs and then leave the area to prepare for cleanup.

**Step 7: Prepare for cleanup**
Remove jewelry, watch, cellular phones and other metal-containing items. Get hold of the mercury spill kit.

**Step 8: Put on personal protective equipment (PPE)**
Put on the apron, or coveralls, disposable shoe covers, rubber or nitrile gloves, goggles, and face mask before re-entering the spill site. Make sure metal items such as eyeglass frames are covered by PPE.

**Step 9: Remove visible mercury beads and broken glass**
Place the jar containers on the plastic tray. Starting from the outside of the spill site and moving towards the center, carefully remove visible mercury beads and broken glass. Use tweezers to remove broken glass pieces and place them in a jar or wide-mouthed container over the tray. Using playing cards, cardboards or index cards, slide the mercury beads onto the plastic dustpan or similar receptacle and scoop away from any porous surface. Use slow sweeping motions to keep mercury from becoming uncontrollable. Carefully place the mercury beads into the plastic container partially filled with water. Do this over the tray to catch any spillage. An eyedropper or syringe for small beads can be used. Hold the eyedropper or syringe almost parallel to the floor to draw in the beads and keep the eyedropper or syringe horizontal when transferring the beads to the plastic container so as to prevent the mercury from falling out.
Step 10: Search for and remove tiny mercury droplets and glass
Look for remaining mercury droplets and glass pieces by shining flashlight, holding it at a low angle close to the floor in a darkened room and look for additional glistening beads of mercury that may be sticking to the surface or in small cracked areas of the surface. Put toothpaste on top of a small paint brush and gently “dot” the affected area to pick up smaller hard-to-see beads. Duct tapes can also be used to pick up these small droplets. Place the tape or paintbrush in a sealable plastic bag.

Step 11: Clean up cracks and hard surface
Sprinkle sulphur powder on cracks and crevices and on hard surfaces that have come in contact with mercury. A color change in the powder from yellow to reddish brown indicates that mercury is still present and more cleanup is necessary. Use the brush to remove the powder and place them in the sealable bag. Clean the hard surface with hydrogen-soaked swabs and place the swabs in a sealable plastic bag.

Step 12: Remove contaminated soft materials
Use the utility knife to cut out pieces of soft materials such as curtains and bedding that are contaminated with mercury. Place the contaminated materials in a sealable plastic bag.

Step 13: Clean out contaminated drains
If the mercury was spilled over a drain, sink or wash basin, work with the facility engineer to remove and replace the “J”, “U”, or “S” trap. Put a plastic tray under the work area to catch any mercury that might spill out. Hold the old trap over a tray while transferring the mercury to the air-tight container. Dispose of the old trap as hazardous waste.

Step 14: Dispose or decontaminate cleanup material
Place all contaminated materials used during the cleanup into leak-proof, sealable plastic bag or transparent bags.

Step 15: Label and seal all contaminated material
Check that the air-tight jar and container are filled with enough water to cover the elemental mercury and broken glassware. The jar or container shall be tightly sealed, properly labelled and placed individually in re-sealable bags. Place all sealed plastic bags with mercury-contaminated waste inside a second plastic bag, seal the outer bag using duct tape and affix a label such as “Mercury: Hazardous Waste” and include a brief description of the contents. Send the bags to the temporarily on-site storage area.

Step 16: Remove and dispose decontaminated PPE
Remove PPE beginning with the shoe covers which should be placed in another sealable bag. Then remove the gloves by grasping one glove with the other, peeling off the first glove, sliding the fingers under the remaining glove at the wrist, peeling off the second glove, and discarding both gloves in the sealable plastic bag. Next, remove goggles by the head band or ear pieces. Remove the apron or coverall without touching the front and turn inside out. Finally, remove the face mask or respirator without touching the front. Dispose of the gloves, shoe covers, apron and regular face mask if used in lieu of a specialty mask in the sealable plastic bag which should be stored together with the mercury waste. Decontaminate gloves and respirators using decontamination solution.

Step 17: Do self-decontamination
1. Proceed to the designated decontamination or wash area.
2. Take a bath using alkaline soap and water to decontaminate all exposed skin.
3. Change to clean clothes.

Step 18: Ventilate the spill area
Place a fan next to the spill area to volatilize mercury and a second fan aimed towards a window or doorway to move air to the outside air for 48 hours or more. If this is not
possible due to central heating or air conditioning, increase the air exchange rate for the building for several days to reduce any mercury vapour concentrations.

**Step 19: Medical monitoring**
If the spill resulted in acute exposure to a patient or health worker, refer the patient to hospitals with capability for toxicology services.

**Step 20: Write a report on the spill incident**
Document the incident in keeping with the procedures of the health facility. The report can be used to improve safety in the facility. The HEARS Field Report form by the Health Emergency Management Staff of the DOH is recommended to be used for this report.

### Box 2: The following should NOT be done in the event of a spill:

- Do not use a vacuum cleaner to pick up the mercury and mercury-contaminated items. The mercury will become airborne by way of the vacuum’s exhaust and spread the contamination. Moreover, the vacuum cleaner will become contaminated and would have to be disposed as hazardous waste.
- Do not wash mercury-contaminated clothing, rugs or other fabrics in a washing machine. The washing machine and wastewater may become contaminated.
- Do not use a broom to sweep up the mercury. It can break the mercury into smaller beads, spreading them.
- Do not pour mercury down the drain. You may contaminate your plumbing, septic system, or your local sewage treatment plant.
- Do not spread mercury that has gotten onto your shoes. If possible, clean the shoes with the decontaminant solution. If the shoes cannot be decontaminated wrap them in a plastic bag and dispose of them properly.

3. **Post-Exposure Monitoring**
   a. For further evaluation, referral should be made to the DENR-EMB Regional Office, the East Avenue Medical Center or to the DOLE-Occupational Safety and Health Center to perform ambient air mercury monitoring. This will guide decision-making with regards need for further cleanup.
   b. Medical monitoring shall be done for a patient, healthcare worker or responder with acute exposure, by conducting a medical examination which includes urine and blood mercury determination. Appropriate treatment shall be done in case of frank poisoning. Proper referral to a nearest poison control center shall be performed for advice and further medical management.
Box 3: First Aid Measures

**Inhalation:**
Move exposed person/s to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Ingestion:**
Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Skin Contact:**
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Use alkaline soap to facilitate washing. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

**Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.
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