



UNITED NATIONS  
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SUSTAINABLE  
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# Training Guidance

## for the Management of **Medical Waste** during the COVID-19 Outbreak in China

► RESEARCH RESULTS OF FOREIGN ENVIRONMENTAL COOPERATION CENTER, MINISTRY OF ECOLOGY AND ENVIRONMENT OF CHINA

► SERIES OF BOOKS ON THE IMPLEMENTATION OF INTERNATIONAL ENVIRONMENTAL CONVENTIONS

► OUTPUT OF THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION PROJECT



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The editorial board of the Chinese edition is listed in the following page. This English edition was developed based on the original Chinese edition, which was edited by Ren Zhiyuan, Li Qiushuang, Zheng Zhe, Duan Lizhe and Qin Mingyu (executive editors and reviewers) and finally reviewed by Alessandro Flammini (UNIDO Headquarters).

Considerable appreciation is extended to all the above.

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## PREFACE

Medical waste refers to waste with direct or indirect infectivity, toxicity and other hazards produced by medical and health institutions in medical treatment, prevention, health care and other related activities. Standardized management of medical waste is of great significance in providing a high-quality, people-oriented medical service basis, safeguarding effectively people's health and environmental safety, accelerating the construction of ecological civilization and promoting sustainable economic and social development.

2020 has seen the outbreak of a pneumonia epidemic caused by the novel coronavirus (COVID-19) infection and a surge in the amount of medical waste in countries and regions affected by the epidemic. The novel coronavirus has extremely high infectivity. It is therefore crucial to ensure the proper disposal of infectious medical waste and to block effectively the secondary pollution caused by virus transmission, so as to safeguard people's health and safety and win the battle against the pandemic. Ensuring the timely, safe, orderly and efficient disposal of medical waste during the epidemic has become a difficult challenge. In order to further strengthen the standardized management and disposal of medical waste during the epidemic, the Ministry of Ecology and Environment (represented by the Foreign Environmental Cooperation Center (FECO)) and the United Nations Industrial Development Organization (UNIDO) have swiftly cooperated, developed and implemented the Emergency Response Assistance to the Outbreak of Coronavirus Disease 2019 in China, with the support and coordination of the Ministry of Commerce. Under the guidance of the Ministry of Ecology and Environment and with the support of the project, FECO coordinated the National Medical Waste Management Training Base (established by the Shanghai Solid Waste Management Center and Shanghai Solid Waste Disposal Co. Ltd.) to jointly compile and complete the *Training Guidance for the Management of Medical Waste during the COVID-19 Outbreak in China*, which benefited from the expertise of the Technical Center for Solid Waste and Chemicals Management of the Ministry of Ecology and Environment, the Basel Convention Asia Pacific Regional Center (School of Environment, Tsinghua University), the University of Chinese Academy of Sciences, the Henan Ecological Environment Department and other groups.

This Guidance, building upon China's current medical waste management system, combines actual work practices and a series of national measures on medical waste management and emergency response during the epidemic. It covers classified collection and packaging of medical waste, internal transport, temporary storage, handover and registration, disposal, environmental, health and safety (EHS) management, supervision and management within medical institutions, management regulations, management requirements for medical institutions, management requirements for medical waste disposal units, as well as management and disposal cases during the pandemic. The Guidance is also a collection of experiences and wisdom of the cities of Shanghai and Wuhan in the management and disposal of medical waste in the battle against COVID-19.

There are no national boundaries for the virus, and the epidemic endangers all races and nationalities. Mankind is a community with a shared future. Only through solidarity, cooperation and joint response can the international community overcome the epidemic. Solidarity and cooperation are the most powerful weapons. To fight the global war against COVID-19 resolutely, China is ready to share its beneficial practices in epidemic prevention and control with other countries and provide assistance within its capacity to the countries to which the epidemic is spreading. In order to promote the transformation of China's experience in effective disposal and management of infectious medical waste into a powerful tool for other countries, this Guidance was translated into English. In this global battle against the pandemic, it is believed that the publication of this book will contribute to helping mankind to overcome the epidemic.

The compilation of this book is an exploratory work. It is the result of significant joint efforts from all of the editors and reviewers, with generous guidance from relevant leaders and experts. Appreciation is extended to all of them. Due to the lack of time, certain deficiencies in this book are inevitable. Your valuable comments and suggestions are welcomed.

The Writing Group  
May 2020



# CONTENTS

<b>PART ONE Basic Concepts of Medical Waste</b>	<b>7</b>
<b>1 Definition and Overview of Medical Waste</b>	<b>8</b>
1.1 What is the definition of medical waste?	8
1.2 What are the hazards that may be caused by medical waste?	8
1.3 Whom does medical waste harm?	8
1.4 How to classify medical waste?	8
1.5 What are the requirements of WHO for the management of medical waste?	11
1.6 What are the requirements of the Stockholm Convention on persistent organic pollutants for the management of medical waste?	11
1.7 What are the requirements of the Basel Convention for the management of medical waste?	12
1.8 What laws and regulations promulgated in China are related to the management of medical waste ?	12
<b>PART TWO Whole-process Management of Medical Waste</b>	<b>13</b>
<b>2 Classified Collection and Packaging of Medical Waste</b>	<b>14</b>
2.1 Can different types of medical waste be mixed and collected together?	14
2.2 What belongs in high-risk medical waste? How to deal with it before collection?	14
2.3 How shall the medical waste generated by infectious patients be collected?	14
2.4 How shall chemical medical waste be collected and disposed of?	14
2.5 What are the requirements for the frequency and time limit for medical waste collection?	15
2.6 What requirements shall be met by classified collection points for medical waste?	15
2.7 What emergency measures shall be taken when a medical waste accident occurs in medical institutions?	15
2.8 What are the key requirements for packaging containers specific to medical waste?	15
<b>3 Transport and Temporary Storage of Medical Waste within Medical Institutions</b>	<b>16</b>
3.1 What are the requirements for transport time and route of medical waste?	16
3.2 Must the transport tools be specific to medical waste?	16
3.3 What shall be checked before transporting medical waste?	16
3.4 What shall be considered when transporting medical waste?	17
3.5 What are the requirements for the temporary storage facilities and equipment for medical waste?	17
3.6 How shall medical waste be stored if it is difficult to set up an independent temporary storage warehouse for medical waste?	17
3.7 How long is the temporary storage period of medical waste in medical institutions?	17
3.8 What are the requirements for the cleaning and disinfection of temporary storage warehouse for medical waste?	18

<b>4</b>	<b>Handover and Transfer of Medical Waste</b>	<b>18</b>
4.1	How shall medical waste in medical institutions be transferred?	18
4.2	What is the content of medical waste registration (standing book)? How long shall the registration document be kept?	18
4.3	What shall be registered for the handover of medical waste from medical institutions to centralized disposal units?	18
4.4	What requirements shall medical waste transport vehicles meet?	19
4.5	How shall medical waste transport vehicles be equipped?	19
4.6	What are the rules for the cleaning and disinfection of medical waste transport vehicles?	19
4.7	Can medical waste be transported by water/railway/air?	19
<b>5</b>	<b>Medical Waste Disposal</b>	<b>19</b>
5.1	What qualifications shall a centralized disposal unit for medical waste obtain?	19
5.2	What are the disposal methods of medical waste?	20
5.3	What are the principles and characteristics of incineration disposal technology for medical waste?	20
5.4	What are the main points for the operation and management of the incineration facility?	20
5.5	What are the principles and characteristics of autoclave treatment of medical waste?	21
5.6	What are the main points for the operation and management of autoclave treatment facility?	21
5.7	What are the principles and characteristics of chemical disinfection treatment of medical waste?	22
5.8	What are the main points for the operation and management of chemical disinfection treatment facility?	22
5.9	What are the principles and characteristics of microwave disinfection treatment of medical waste?	22
5.10	What are the main points for the operation and management of microwave disinfection treatment facility?	23
5.11	What are the principles and characteristics of high-temperature dry heat treatment of medical waste?	23
5.12	What are the main points for the operation and management of high-temperature dry heat treatment facility?	23
<b>6</b>	<b>EHS Management in Medical Waste Treatment Process</b>	<b>24</b>
6.1	What aspects does EHS management include?	24
6.2	What pollution control standards shall medical waste treatment process meet?	24
6.3	Does the centralized disposal unit for medical waste need to install an automatic monitoring system for pollutant emission?	24
6.4	Is medical waste incineration residue a kind of hazardous waste or general solid waste?	24
6.5	Where shall disposal units for medical waste be set up and what kind of warning symbols shall they carry?	25
6.6	How shall medical waste disposal practitioners carry out occupational health protection?	25
6.7	How shall medical waste collection and transport personnel implement occupational health protection?	25
6.8	How shall medical waste disposal practitioners disinfect themselves, the equipment and the protective tools they use?	25
6.9	What disinfection method shall be used for medical waste transport tools?	29
6.10	What are the roles involved in the supervision and management of medical waste disposal?	26
6.11	How to supervise and inspect medical waste in medical institutions?	26
6.12	How to supervise and inspect centralized medical waste disposal units?	26

<b>PART THREE Management of Medical Waste during an Epidemic</b>	<b>27</b>
<b>7 Regulations on the Management of Medical Waste during an Epidemic</b>	<b>28</b>
7.1 What normative documents did China issue on the management of medical waste during the COVID-19 epidemic?	28
7.2 How is COVID-19 epidemic-related medical waste defined?	28
7.3 How shall the technical route for emergency disposal of medical waste be determined during the COVID-19 epidemic?	28
7.4 How to manage and dispose of medical waste in rural areas?	29
7.5 What are the special management requirements for the qualification of medical waste disposal facilities during an epidemic?	29
7.6 How shall areas with insufficient medical waste disposal capacity manage and dispose of medical waste during an epidemic?	29
7.7 How shall medical waste disposal be reported during the coronavirus (COVID-19) epidemic?	29
<b>8 Management Requirements for Medical Institutions during an Epidemic</b>	<b>30</b>
8.1 How shall the used masks be treated during an epidemic?	30
8.2 During an epidemic, is the household garbage at the initial diagnosis isolation point considered medical waste?	30
8.3 What are the special requirements for classified collection of medical waste during an epidemic?	30
8.4 What are the special requirements for medical waste packaging during an epidemic?	30
8.5 What are the special requirements to transport medical waste in medical institutions during an epidemic?	31
8.6 What are the special requirements for the temporary storage of medical waste during an epidemic?	31
8.7 What are the special requirements for medical waste accounting during an epidemic?	31
8.8 What are the requirements for temporary hospitals to build temporary storage warehouses during an epidemic?	32
<b>9 Management Requirements for Medical Waste Disposal Units during an Epidemic</b>	<b>32</b>
9.1 What are the special requirements for the collection and transport of medical waste during an epidemic?	32
9.2 What exemptions can be provided to facilitate emergency disposal of COVID-19-related medical waste?	32
9.3 What are the special requirements for the storage time limit of medical waste in centralized disposal units during an epidemic?	32
9.4 Is it necessary to set up an isolation area for medical waste disposal during an epidemic?	33
9.5 What are the disinfection requirements for medical waste disposal sites during an epidemic?	33
9.6 What are the special requirements for occupational health protection during an epidemic?	33
9.7 How to choose the disposal method for medical waste generated by COVID-19 patients?	39
9.8 What are the technical requirements and matters needing attention for emergency disposal of medical waste by non-professional disposal facilities?	33
<b>10 Management and Disposal Cases during the COVID-19 Epidemic</b>	<b>34</b>
10.1 A case of emergency disposal of medical waste using household garbage incineration facilities	34
10.2 A case of disposal of medical waste using cement kiln co-processing technology	34
10.3 Using mobile emergency disposal system for medical waste (Case 1)	35
10.4 Using mobile emergency disposal system for medical waste (Case 2)	35





**PART ONE**

**BASIC CONCEPTS OF**

**MEDICAL WASTE**

# 1 DEFINITION AND OVERVIEW OF MEDICAL WASTE

## 1.1 What is the definition of medical waste?

In the *Regulations on the Management of Medical Waste*, medical waste refers to waste with direct or indirect infectivity, toxicity and other hazards generated by medical and health institutions in medical treatment, prevention, health care and other relevant activities. Household garbage generated by infectious patients or suspected infectious patients treated by medical and health institutions shall be managed and disposed of as medical waste. In addition, the management of directly or indirectly infectious waste, toxic waste and other hazardous waste generated in technical services for family planning, medical scientific research, teaching, autopsy and other related activities shall be carried out in accordance with this Regulation. The management of anesthetic, psychotropic, radioactive, toxic drugs and related waste discarded by medical and health institutions shall be carried out in accordance with the relevant national laws, administrative regulations, rules and standards.

## 1.2 What are the hazards that may be caused by medical waste?



- 1 Infectious waste, pathological waste and medical sharp instruments may cause infectious diseases and even epidemic infectious diseases, such as hepatitis B, hepatitis C and AIDS.
- 2 Genotoxic waste may cause gene mutation leading to hereditary diseases.
- 3 Pharmaceutical waste and chemical waste may result in drug poisoning and chemical damage.



## 1.3 Whom does medical waste harm?

Anyone in contact (exposed, in direct and indirect contact) with medical waste who is potentially exposed to threats, including staff and visitors of medical institutions producing medical waste, people in direct contact with medical waste during home health care, staff collecting, transferring and disposing medical waste, staff supervising medical waste and involved in epidemic prevention, the population exposed due to ineffective management of medical waste, as well as the population exposed to toxic and harmful substances generated by heat treatment of medical waste.

## 1.4 How to classify medical waste?

According to the *Classified Catalogue of Medical Waste*, medical waste can be divided into five categories: infectious waste, pathological waste, sharps waste, pharmaceutical waste and chemical waste. Refer to the following table for the description of different kinds of medical waste.

CATEGORY	DESCRIPTION	COMMON COMPONENTS	PHOTOS
<b>INFECTIOUS WASTE</b>	<p>Infectious waste refers to the medical waste that carries pathogenic micro-organisms and can potentially lead to the spread of infectious diseases.</p>	<p>Supplies contaminated by patients' blood, bodily fluid and excrement, including cotton ball, cotton swab, drainage cotton strip, gauze and other dressings; disposable sanitation supplies, disposable medical supplies and disposable medical devices; discarded bedding and clothing; other articles contaminated by patients' blood, bodily fluids and excrement.</p>	
		<p>Household garbage generated by isolated infectious patients or suspected infectious patients treated by medical institutions.</p>	
		<p>Pathogen culture medium and specimens, and preservation solution of strains and virus seed.</p>	
		<p>Various discarded medical specimens.</p>	
		<p>Discarded blood and serum.</p>	
		<p>Used disposable medical supplies and disposable medical devices.</p>	
<b>PATHOLOGICAL WASTE</b>	<p>Pathological waste refers to human body waste generated during diagnosis and treatment, as well as animal carcasses from medical experiments.</p>	<p>Discarded human tissue and organs resulting from surgery, diagnosis or treatment processes.</p>	
		<p>Animal tissue and carcasses from medical experiments.</p>	
		<p>Human tissue and pathological wax blocks discarded after pathological sections.</p>	
<b>SHARPS WASTE</b>	<p>Sharps waste refers to discarded medical sharp instruments that can stab or cut the human body.</p>	<p>Medical needles and suture needles.</p>	
		<p>All kinds of medical sharp instruments, including scalpels, surgical knives, skin preparation knives and surgical saws.</p>	
		<p>Glass slides, glass test tubes, and glass ampoules.</p>	

CATEGORY	DESCRIPTION	COMMON COMPONENTS	PHOTOS
<b>PHARMACEUTICAL WASTE</b>	Pharmaceutical waste refers to discarded medicines that are expired, eliminated, deteriorated or contaminated.	Discarded common medicines, such as antibiotics and over-the-counter medicines.	
		Discarded cytotoxic drugs and genotoxic drugs, including carcinogenic drugs, such as azathioprine, chlorambucil, chlornaphazine, cyclosporine, cyclophosphamide, amphetamine hydrochloride, semustine, tamoxifen and thio-TEPA; suspected carcinogenic drugs, such as cis-platinum, mitomycin, adriamycin and phenobarbital; immune inhibitors.	
		Discarded vaccines and blood products.	
<b>CHEMICAL WASTE</b>	Chemical waste refers to discarded chemical articles that are toxic, corrosive, flammable and explosive.	Discarded chemical reagents from medical imaging room and laboratory.	
		Discarded chemical disinfectants such as peroxyacetic acid and glutaraldehyde.	
		Discarded mercury sphygmomanometer and mercury thermometer.	

**TREATING THE INFECTIOUS AND SHARPS WASTE WITH AUTOCLAVE DISINFECTION EQUIPMENT**



## 1.5 What are the requirements of WHO for the management of medical waste?

In 1998, the World Health Organization (WHO) issued a report presenting requirements for the management of medical waste in terms of national legislation and management action plans, internal management of medical institutions, medical waste reduction measures, collection, classification, packaging, transport, treatment and disposal of medical waste, preferentially-supported activities, and development strategies. The report also points out that safe and reliable medical waste disposal methods are of the utmost importance – the effective management and disposal of medical waste objectively requires the cooperation and coordination of the whole society. Establishing a complete set of laws and regulations, carrying out personnel training and raising public awareness are vital for the successful implementation of the management and disposal of medical waste.

In 2014, WHO issued a revised edition of the *Safe Management of Wastes from Health-care Activities*, which provides guidance for the management of medical waste under normal and emergency situations. In December 2014, WHO released a series of documents on the Ebola virus, providing guidance on the simple treatment and disposal of medical waste. Among these, the disposal of medical waste during natural disasters, emergency or conflict is referred to as follows: “When resources are unavailable, medical waste can be treated and disposed of by the following minimum methods: burying in the pit or trench on site, burning in a simple two-chamber incinerator, packaging sharps waste or a small amount of drugs and then burying on site or burying them in a special area of municipal landfills, burning in a high-temperature industrial incinerator (provided there is a safe vehicle for transport), and sterilizing infectious waste and sharps waste with a small high-pressure sterilizer.” Both the *Infection prevention and control during health care for probable or confirmed cases of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infection - Interim guidance*, issued by WHO in June 2015, and the *Infection prevention and control during health care when novel coronavirus (COVID-19) infection is suspected*, issued by WHO in January 2020, have pointed out that “medical waste should be managed in accordance with safe routine procedures”.

## 1.6 What are the requirements of the Stockholm Convention on persistent organic pollutants for the management of medical waste?

Dioxins are the primary unintentionally-produced pollutants that are required to be controlled by the Stockholm Convention on persistent organic pollutants, with medical waste incineration one of the most important sources of dioxins emissions. The Convention requires that parties adopt the best available techniques and the best environmental practices (BAT/BEP) to reduce dioxin emissions. General BAT/BEP measures related to the management of medical waste in Annex C of the Convention include: (1) Reduction; (2) Stop open burning or simple burning; (3) Give priority to incineration alternative measures to be adopted in newly-built facilities; (4) Reduce pollution emissions during disposal.

The Guidelines on BAT and provisional guidance on BEP relevant to Article 5 and Annex C of the Stockholm Convention on Persistent Organic Pollutants highlight that, although incineration technology is the most mature technology for medical waste disposal, it also has also environmental risks, while the use of non-incineration alternative technologies, such as high-temperature steam (autoclave), microwave and chemical treatment, are encouraged. Specific requirements for the sound management and disposal of medical waste are as follows: (1) Improve government legislation; (2) Establish a classified catalogue of medical waste; (3) Promote reduction at source, strictly distinguishing household garbage from medical waste, and reducing the use of disposable medical supplies; (4) Reduce the use of chlorine-containing medical supplies; (5) Establish an effective medical waste management system; (6) Adapt classification to disposal methods; (7) Build new medical waste incinerators only when necessary, to reduce the release from incineration; (8) Advocate the recycling of resources as much as possible; (9) Encourage the use of advanced technologies and eliminate

obsolete disposal technologies; (10) Support the development and promotion of waste reduction technology research, promoting the development and application of environmentally friendly disposal technologies.

## 1.7 What are the requirements of the Basel Convention for the management of medical waste?

The *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal* points out that medical waste is infectious and is one important component of hazardous waste. The Convention lists medical waste in Annex I, aiming to realize environmentally sound management, protect human health and reduce its damage to the environment. In order to promote the implementation of the Convention, the Secretariat of the Basel Convention has prepared the *Technical Guidelines for the Environmentally Sound Management of Biomedical and Health Care Waste (Y<sub>1</sub>; Y<sub>3</sub>)* in accordance with the Convention.

The Guidelines put forward corresponding requirements on how to avoid and prevent waste generation, how to classify, collect, mark and transfer the waste, how to transport and temporarily store the waste, and how to recycle the waste. In terms of specific disposal methods, the Guidelines also put forward corresponding suggestions and recommended disposal methods for different waste types, such as autoclave treatment, chemical disinfection treatment, microwave irradiation treatment and incineration treatment.

## 1.8 What laws and regulations promulgated in China are related to the management of medical waste?

The management of medical waste in China is mainly regulated by the *Regulations on the Management of Medical Waste* promulgated in 2003. The Regulations are applicable to the collection, transport, storage, disposal, supervision and management of medical waste. The Regulations stipulate that the Health Department and the Environmental Protection Department are the two main supervision departments – the former is responsible for supervising the prevention and treatment of disease in the whole process management, while the latter is in charge of supervising the prevention and control of environmental pollution in the whole process management. In order to perform their functions and powers, the two departments have respectively formulated the *Measures for the Administration of Medical Waste in Medical and Health Institutions* and the *Technical Specifications for Concentrated Disposal of Medical Waste*. In addition, in order to define legal responsibilities, the *Administrative Punishment Measures for the Management of Medical Waste* is formulated. China has also issued the *Classified Catalogue of Medical Waste*, various disposal technical specifications and local legal regulations.



**PART TWO**

**WHOLE-PROCESS**

**MANAGEMENT OF**

**MEDICAL WASTE**

## 2 CLASSIFIED COLLECTION AND PACKAGING OF MEDICAL WASTE

### 2.1 Can different types of medical waste be mixed and collected together?

Medical and health institutions shall implement classified management of medical waste according to the *Classified Catalogue of Medical Waste*. Schematic diagrams or written descriptions of classified collection methods of medical waste shall be set up at the place where medical waste is generated to make it clear that infectious waste, pathological waste, sharps waste, pharmaceutical waste and chemical waste cannot be mixed together. A small amount of pharmaceutical waste can be mixed into infectious waste, but it shall be indicated on the label. It is prohibited to mix medical waste with other wastes and household garbage.

Special reminder: There are particular requirements for high-risk waste, medical waste and excrement generated by patients with infectious diseases. The purpose of classified collection of some types of medical waste is to send them to specialized institutions for disposal, instead of the centralized disposal units for mixed disposal. The management of anesthetic, psychotropic, radioactive and toxic drugs and related waste discarded by medical and health institutions shall be carried out in accordance with the relevant laws, administrative regulations, rules and standards of the state.

### 2.2 What belongs in high-risk medical waste? How to deal with it before collection?

The *Regulations on the Management of Medical Waste* stipulate that high-risk waste such as pathogen culture medium and specimens, preservation solution of strains and virus seed in medical waste shall be treated by pressure steam sterilization or chemical disinfection treatment at the place of generation, and subsequently collected and treated as infectious waste.

### 2.3 How shall the medical waste generated by infectious patients be collected?

Household garbage generated by infectious patients or suspected infectious patients treated by medical and health institutions shall be managed and disposed of as medical waste. Double-layer packaging material shall be used and shall be sealed in time.

### 2.4 How shall chemical medical waste be collected and disposed of?

Chemical medical waste shall be placed in special packaging containers. It is forbidden to mix it with other types of medical waste. Flammable and explosive chemical waste shall be collected and transported separately. Medical and health institutions shall, in accordance with relevant procedures for hazardous waste disposal, hand it over to hazardous waste disposal units with disposal capability. Centralized disposal units for medical waste shall assist in confirming relevant disposal destinations.



## 2.5 What are the requirements for the frequency and time limit for medical waste collection?

Medical waste generation units shall collect medical waste generated in their own units no less than once a day. Medical waste generated in medical activities such as medical tour and on-site first aid shall be collected immediately after the end of medical activities.

## 2.6 What requirements shall be met by classified collection points for medical waste?

Classified collection points refer to temporary storage points receiving medical waste sent by medical personnel in various medical positions. Classified collection points are set up in outpatient (emergency) clinics, medical departments, medical technology departments and wards (inpatient area) for the classified collection, packaging and management of medical waste before delivery to the temporary storage warehouse of the institution. Classified collection points for medical waste in small medical institutions such as clinics are usually set up together with temporary storage warehouse and temporary storage cabinets.

## 2.7 What emergency measures shall be taken when a medical waste accident occurs in medical institutions?

Identify the type and amount of medical waste lost, leaked and diffused, and the time, affected scope and severity of the accident. Organize relative personnel to clean the leaked and diffused site according to the emergency plan.

When cleaning the area polluted by medical waste, the effect on patients, medical staff, other personnel on site and the environment shall be minimized.

Take proper safety disposal measures, conduct disinfection or other harmless treatment measures to the leakage and polluted areas and supplies, and lock down the polluted area if necessary.

When disinfecting the area polluted by infectious waste, the disinfection work shall be started from the less polluted area. The tools that may be polluted shall also be disinfected. The staff shall carry out their work only after ensuring their own health and protection. After the disposal, the medical institution shall investigate the cause of the event and take effective preventive measures to prevent similar events.

The emergency report of the medical institution mainly contains the time, place and brief overview of the accident; the type and amount of the medical waste lost, leaked or diffused; the possible cause of the accident; the hazard and impact caused by the accident; and emergency disposal measures and results.

## 2.8 What are the key requirements for packaging containers specific to medical waste?

The *Standard of Packaging Bags, Containers and Warning Symbols Specific to Medical Waste* (HJ 421-2008) stipulates the technical requirements for packaging bags, sharps boxes and recycle boxes (bins) specific to medical waste, corresponding test methods and inspection rules and warning symbols for medical waste.

When the volume of medical waste reaches three quarters of the full size of the packaging material or container, an effective sealing method shall be used to make the sealing of the packaging material or container tight.

Medical waste placed in the packaging material or container shall not be unpacked and taken out again during the whole process of collection, transport, storage and disposal.

Sharps medical waste including medical needles, suture needles, all kinds of medical sharp instruments, glass slides, glass test tubes, and glass ampoules shall be contained in disposable special rigid containers, i.e. sharp boxes.

For medical waste treated by high-temperature thermal treatment technology, PVC materials shall not be used for packaging bags and sharp boxes.

When the outer surface of the packaging material or container is contaminated by infectious waste, the contaminated part shall be disinfected or an extra layer of packaging shall be used.

## 3 TRANSPORT AND TEMPORARY STORAGE OF MEDICAL WASTE WITHIN MEDICAL INSTITUTIONS

### 3.1 What are the requirements for transport time and route of medical waste?

The time and route for transporting medical waste within the hospital shall be determined. The selection of the transport route shall be based on the principle of minimum flow of people and goods. Transport time shall avoid peak hours. In the process of transport, the transporter shall not leave the vehicle. Medical waste shall be transported to the designated temporary storage sites. Transport time and route cannot be changed randomly.

### 3.2 Must the transport tools be specific to medical waste?

Transport tools (including transport vehicles and containers) specific to medical waste transport shall be anti-leakage, spill-proof, free of sharp edges and corners and easy for loading and unloading and cleaning, while warning symbols and written instructions for medical waste shall be printed (or sprayed) on the outer surface. After the daily transport has ended, the delivery tools shall be cleaned and disinfected in a timely manner. Medical waste shall not be transported using special tools that have not been disinfected or cleaned.

### 3.3 What shall be checked before transporting medical waste?

Before transporting medical waste, transporters shall check whether special packaging bags and sharps boxes are used for the classification and collection of medical waste, whether the label content on each medical waste packaging bag and sharps box meets the requirements, whether the packaging bags are damaged and whether the sealing is tight. If it is found that these requirements are not met, correction requests shall be put forward to the relevant personnel responsible for the management of medical waste, and medical waste can be transported only after the requirements are met. Medical waste that fails to meet the requirements shall not be transported to the temporary storage sites.

### 3.4 What shall be considered when transporting medical waste?

It is forbidden to discard medical waste during transport. Article 18 of the *Measures for the Administration of Medical Waste in Medical and Health Institutions* stipulates that, when transporting medical waste, it is necessary to prevent damage to packaging materials or containers, as well as loss, leakage and diffusion of medical waste, and to prevent medical waste from directly contacting the body.

### 3.5 What are the requirements for the temporary storage facilities and equipment for medical waste?

Medical and health institutions shall not store medical waste in the open air. They shall establish temporary storage facilities and equipment for medical waste which shall meet the following requirements: (1) They shall be far away from the medical area, food processing area, personnel activity area and household garbage storage place, and should also facilitate the access of medical waste transport personnel, transport tools and vehicles; (2) They shall be tightly shut, while special (parttime) staff shall be assigned for management and non-staff shall be prevented from contacting medical waste; (3) There shall be safety measures against rats, mosquitoes, flies and cockroaches; (4) There shall be measures against leakage and rain erosion; (5) They shall be convenient to clean and disinfect; (6) Direct sunlight shall be avoided; (7) There shall be obvious medical waste warning symbols and signs carrying the warning “禁止吸烟、饮食” (“No Smoking or Eating”).

### 3.6 How shall medical waste be stored if it is difficult to set up an independent temporary storage warehouse for medical waste?

Medical and health institutions that do not have inpatient beds, such as outpatient departments, clinics, medical education institutions and scientific research institutions, shall set up temporary storage cabinets (boxes) specific to medical waste when it is difficult for them to set up an independent temporary storage warehouse for medical waste, and the following requirements shall be met: the temporary storage cabinets (boxes) specific to medical waste must be separated from the place in which the household garbage is stored with measures against rain and scattering, and must meet fire safety requirements; after the classified and packaged medical waste is placed in the turnover box, it shall be placed in the special temporary storage cabinet (box). The cabinet (box) shall be sealed, and safety measures taken, such as locking and fixing, so that irrelevant personnel cannot move it, and warning symbols shall be set outside; refrigerated cabinets (boxes) can be used as special temporary storage cabinets (boxes) for medical waste; the cabinets (boxes) can also be made of metal or rigid plastic with a certain strength and anti-leakage performance.

### 3.7 How long is the temporary storage period of medical waste in medical institutions?

Medical waste shall be cleared every day, as far as possible. If this cannot be achieved and the local maximum temperature is higher than 25°C, medical waste shall be temporarily stored at a temperature lower than 20°C for a maximum of 48 hours.

Temporary storage of pathological waste, in addition to meeting the requirements for temporary storage of medical waste, shall also ensure a low-temperature or antiseptic environment.

### 3.8 What are the requirements for the cleaning and disinfection of temporary storage warehouse for medical waste?

After medical waste is transferred out, temporary storage sites and facilities shall be cleaned and disinfected in time.

The temporary storage warehouse for medical waste shall be disinfected and flushed every day after the waste is removed and transported. Flushing liquid shall be discharged into the disinfection and treatment system for medical waste water in medical and health institutions. Temporary storage cabinets (boxes) for medical waste shall be disinfected once a day.

## 4 HANDOVER AND TRANSFER OF MEDICAL WASTE

### 4.1 How shall medical waste in medical institutions be transferred?

Within the medical institution, medical waste shall be handed over from the responsible medical personnel to the responsible collection and management personnel of each department, before being transferred to the special medical waste transfer personnel of the institution and, finally, to the temporary storage and management personnel of the institution. Handover records shall be prepared for each handover. It shall eventually be handed over to the collection personnel of the centralized disposal unit.

### 4.2 What is the content of medical waste registration (standing book)? How long shall the registration document be kept?

Medical and health institutions and centralized medical waste disposal units shall register information of medical waste respectively, and the content of registration shall include items such as the source, category, weight or quantity, handover time, disposal methods, final destination and signature of the personnel handling the waste. The registration document shall be kept for at least three years for inspections by the local environmental protection department and health department.

### 4.3 What shall be registered for the handover of medical waste from medical institutions to centralized disposal units?

For medical waste handed over by medical and health institutions for disposal, the *Duplicate Tables for the Transfer of Hazardous Waste* (specific to medical waste) shall be filled in. After inspection and verification, if the packaging and identification of the received medical waste comply with the regulations and the type and weight are consistent with the items contained in the duplicate tables for the transfer, the handover personnel of the medical and health institution and the transport personnel of the centralized disposal unit, respectively, shall sign and confirm the duplicate tables. One Registration Card for Medical Waste Transport is for one vehicle, which shall be filled in and signed during the handover by the personnel responsible for the management of medical waste of the medical and health institution. When medical waste is transported to the disposal unit, the receiving personnel of the centralized disposal unit shall sign after confirming that the quantity of medical waste in the Registration Card is true and accurate.

#### 4.4 What requirements shall medical waste transport vehicles meet?

Medical waste transport vehicles shall comply with the provisions of the state on the transport and management of dangerous goods, have obvious medical waste identification and meet the requirements of anti-seepage, spill-proof and other environmental protection and health requirements. After the vehicle is used, it shall be disinfected and cleaned in a timely manner in the centralized disposal site for medical waste. Special vehicles transporting medical waste shall not transport other supplies.

#### 4.5 How shall medical waste transport vehicles be equipped?

Transport vehicles shall be equipped with the following: a copy of the *Technical Specifications for Concentrated Disposal of Medical Waste (Trial)*, Duplicate Tables for the Transfer of Hazardous Waste (specific to medical waste), the Registration Card for Medical Waste Transport, a transport route map, communication equipment, a name list of medical waste generating units with contacts of management personnel, an accident emergency plan and a name list of contact units with phone numbers of the relevant personnel, as well as tools for collecting medical waste, disinfection equipment and medicines, spare bags and sharps boxes specific to medical waste and spare personnel protective supplies.

#### 4.6 What are the rules for the cleaning and disinfection of medical waste transport vehicles?

After each transport journey made by the special medical waste transport vehicle, the inner wall of the van shall be disinfected in the disposal unit and the van shall be sealed for at least 30 minutes following the spraying of disinfectant. Medical waste transport vehicles shall be cleaned at least once every two days, or immediately after the inner wall or/and the outer surface of the van is contaminated. It is forbidden to clean medical waste transport vehicles in cleaning places for general vehicles.

#### 4.7 Can medical waste be transported by water/railway/air?

It is forbidden to mail medical waste. It is forbidden to transport medical waste by railway or air. If a land route exists, it is forbidden to transport medical waste by water. If there is no land route and medical waste must be transported by water, it shall be approved by the competent department of environmental protection administration of the People's Government at or above the municipal level, and strict environmental protection measures shall be taken before it can be transported by water. It is forbidden to transport medical waste on the water body in protected areas to source drinking water.

## 5 MEDICAL WASTE DISPOSAL

### 5.1 What qualifications shall a centralized disposal unit for medical waste obtain?

Any unit engaged in the centralized disposal of medical waste must obtain the hazardous waste business licence.

## 5.2 What are the disposal methods of medical waste?

At present, the mainstream treatment and disposal methods of medical waste include incineration, autoclave (by using high-temperature steam) disinfection, microwave disinfection, chemical disinfection and high-temperature dry heat disinfection.

## 5.3 What are the principles and characteristics of incineration disposal technology for medical waste?

The medical waste incineration disposal process uses high-temperature heat treatment to make the organic components in the medical waste undergo oxidation/decomposition reactions, thereby reducing waste volume and making medical waste harmless, mainly through pyrolysis incineration technology and rotary kiln incineration technology. It is suitable for the disposal of infectious, injury, pathological, chemical and pharmaceutical medical waste.

The rotary kiln incineration system consists of a rotary kiln and a secondary combustion chamber. Medical waste is burned in the rotary kiln with oxygen-rich combustion to complete the process of drying, incineration, burnout and cooling. The boiling steam and combustion gas enter the secondary combustion chamber for complete combustion.

The pyrolysis incineration system consists of a pyrolysis gasifier and a secondary combustion chamber. The pyrolysis gasifier uses the principle of pyrolysis to supply an insufficient amount of combustion air, so that medical waste is cracked into short-chain flammable gas. The cracked gas enters the secondary combustion chamber for complete combustion.



## 5.4 What are the main points for the operation and management of the incineration facility?

An incineration facility shall ensure stable combustion in the incinerator during feeding. The feeding inlet shall be kept airtight. It shall ensure smooth feeding and prevent waste from blocking. The medical waste packaging bag shall be kept intact before entering the furnace. The feeding system shall be in a negative pressure state to prevent harmful gases from overflowing.

During the normal operation of the medical waste incineration disposal facility, the incinerator shall be in a negative micro-pressure combustion state and shall control the flue gas temperature in the secondary combustion chamber, ensuring that it is no lower than 850°C (the incineration of chemical waste and pharmaceutical waste requires the flue gas temperature in the secondary combustion chamber to be no lower

than 1 100°C), and that the flue gas residence time is no less than two seconds. The combustion efficiency of the equipment shall be no lower than 99.9%, while the thermal reduction rate of the incineration residue shall be less than 5%. The oxygen content in the flue gas at the outlet of the incinerator shall be controlled within the range of 6-10% (dry gas).

Medical waste shall be completely incinerated, and the temperature, residence time and turbulent conditions of the flue gas in the combustion chamber shall be strictly controlled. Rapid cooling measures shall be taken for the high-temperature flue gas generated by the combustion of medical waste, and the residence time of the flue gas at 200~500°C shall be less than one second.

The slag generated can be sent to a designated municipal waste sanitary landfill. Residues such as incineration fly ash and activated carbon-adsorbing dioxins and other harmful components shall be managed as hazardous waste.

## 5.5 What are the principles and characteristics of autoclave treatment of medical waste?

The autoclave treatment process of medical waste uses the latent heat released by water vapour to cause protein denaturation and coagulation of pathogenic micro-organisms to disinfect the medical waste, through two main types of process, namely steam treatment followed by crushing and steam treatment and crushing at the same time. The process is characterized by low investment, low operating costs, simple operation and less environmental pollution, and is suitable for the treatment of infectious and injury medical waste.



## 5.6 What are the main points for the operation and management of autoclave treatment facility?

**Feeding link:** Try to avoid the feeding container (or feeding vehicle) being in direct contact with a human body if manual feeding is adopted. The medical waste filling in the feeding container (or feeding vehicle) shall be set to the appropriate loose status and the largest loading capacity shall not surpass 70% of the volume of the disinfection room.

**Autoclave treatment link:** The indoor temperature of the disinfection room shall be no lower than 134°C, its pressure no lower than 220kPa (gauge pressure) and the treatment time no less than 45 minutes. The steam supply pressure shall be maintained within 0.3~0.6 MPa. Waving capacity shall be no greater than 10% and non-condensable gas (volume fraction) no more than 5%. Overheating shall not exceed 2°C. After high-temperature steaming (autoclave) and drying, the water content of medical waste residues shall not exceed 20% of the total weight.

**Crushing link:** Maintenance of crushing equipment for medical waste shall be carried out regularly. The particle size of crushed medical waste shall be maintained at less than 5 cm. When crushing medical waste that has not yet been sterilized, the leakproofness of the operation workshop shall be ensured and the crushing shall be conducted in a negative pressure state.

**Detection of disinfection effect:** Use *bacillus stearothermophilus* as an indicating bacterium to make sure that the killing log value is no less than 4.

## 5.7 What are the principles and characteristics of chemical disinfection treatment of medical waste?

Chemical disinfection of medical waste involves mixing well the crushed medical waste and chemical disinfectant (such as lime powder, sodium hypochlorite, calcium hypochlorite, chlorine dioxide, etc.) and allowing it to remain long enough for the organic substance to be resolved and infectious bacteria to be killed or inactivated during the disinfection.

The process has the advantages of low capital investment, low operating costs, and is both economically attractive and low in pollution. It is suitable for the treatment of infectious and injury medical waste.

**CHEMICAL DISINFECTION TREATMENT FACILITY FOR MEDICAL WASTE**



## 5.8 What are the main points for the operation and management of chemical disinfection treatment facility?

Before operating the chemical disinfection treatment unit, it shall be ensured that the crushing unit operates in airtight and negative pressure state and that the air within it shall be released at the end of the disinfection. Workers shall receive sufficient disinfection before making inspections.

Chemical disinfectant's killing efficiency of micro-organisms is a function of their contact time, temperature, concentration, pH value (acid or alkaline environment) and the quantity and type of micro-organisms. In order to obtain the effect of inactivation, chemical disinfectant must have adequate contact reaction time with the disinfection surface of medical waste and enough input volume of disinfectant must be ensured.

Currently, the commonly used method in China is dry chemical disinfection. Lime powder is the most common ingredient for sterilization, with a purity of 88-95% and a contact reaction time longer than 120 minutes. The dosage of input (lime powder/medical waste) shall be greater than 0.075 kg/kg, while the pH of the strong alkaline environment under reaction control shall be 11.0-12.5.

Effect detection: *Bacillus subtilis* spores are adopted as an indicating bacterium to ensure that the killing log value of micro-organisms is no less than 4 in order to meet the requirements.

## 5.9 What are the principles and characteristics of microwave disinfection treatment of medical waste?

Microwave disinfection treatment of medical waste adopts the heat generated from microwave vibration of water molecules to inactivate infectious bacteria and disinfect medical waste. The technology has the characteristics of broad bactericidal spectrum, no residue, a good deodorizing effect and cleanliness. It is applicable for the treatment of infectious and injury medical waste.

**MICROWAVE DISINFECTION TREATMENT FACILITY FOR MEDICAL WASTE**





## 5.10 What are the main points for the operation and management of microwave disinfection treatment facility?

**Feeding link:** Once the equipment starts working, feeding shall remain unobstructed and blocking shall be prevented. The package volume of medical waste shall match the size of the feeding inlet to ensure that medical waste and its package enter the process unit intact. When the feeding equipment starts to operate, the air-extractor shall be turned on to maintain the system under negative pressure.

**Microwave disinfection link:** The frequency of microwaves shall be (915±25) MHz or (2450±50) MHz. The temperature shall be no lower than 95°C and the residence time shall be no less than 45 minutes. If pressure is applied during the treatment, the temperature of the materials treated by microwave shall be lower than 170°C to avoid secondary pollution caused by decomposition of chlorine-containing compounds such as plastics in medical waste. Under the combined action of steam and microwave, when the temperature is no lower than 135°C, the action time is no less than 5 minutes. Check the safety protection procedure for microwave disinfection equipment before operation to avoid electromagnetic wave leakage.

**Crushing link:** Maintenance of crushing equipment for medical waste shall be carried out regularly. The particle size of crushed medical waste shall be maintained at less than 5 cm. The crushing process shall be conducted under a airtight and negative pressure state.

**Effect detection:** *Bacillus subtilis* spores are adopted as an indicating bacterium to ensure that the killing log value of micro-organisms is no less than 4 in order to meet the requirements.

## 5.11 What are the principles and characteristics of high-temperature dry heat treatment of medical waste?

The principle of high-temperature dry heat treatment of medical waste is to expose medical waste to a negative-pressure and high-temperature environment after high intensity grinding, let it stay for some time, and apply a precise transferring program to transfer heat effectively to the medical waste to be treated, so that pathogenic micro-organisms undergo protein denaturation and coagulation. This results in the death of pathogenic micro-organisms and makes medical waste harmless. High-temperature dry heat treatment technology is suitable for the treatment of infectious and injury waste.



## 5.12 What are the main points for the operation and management of hightemperature dry heat treatment facility?

**Feeding link:** Once the equipment starts working, feeding shall remain unobstructed and blocking shall be prevented. The package volume of medical waste shall match the size of the feeding inlet to ensure that the medical waste enters the process unit intact. When the feeding equipment starts to operate, the air-extractor shall be turned on to maintain the system operating under negative pressure.

**Dry heat treatment link:** The pressure in the sterilizer shall be 300Pa, which is close to the vacuum, while the temperature in the sterilizer shall be 180-200°C. The residence time shall be no less than 20 minutes

and the stirring device shall operate at a speed no lower than 30r/min. Man-made interference shall be avoided during the operation of the dry head treatment equipment to prevent the equipment from man-made shutdown before completing the disinfection of medical waste.

Crushing link: Maintenance of crushing equipment for medical waste shall be carried out regularly. The particle size of crushed medical waste shall be maintained at less than 5cm. The crushing process shall be conducted under an airtight and negative pressure state.

## 6 EHS MANAGEMENT IN MEDICAL WASTE TREATMENT PROCESS

### 6.1 What aspects does EHS management include?

The environment, health and safety (EHS) management system is the integration of the environmental management system (EMS) and the occupational health and safety management system (OHSMS).

### 6.2 What pollution control standards shall medical waste treatment process meet?

In the medical waste treatment process, the impact on the environment caused by environmental hazard factors such as water, air, sound and slag shall be strictly controlled. The emission standards of various pollutants must conform to the national, local and industry-related control standards for waste water, waste gas, noise and solid pollutants, such as *Integrated Emission Standard of Air Pollutants*, *Standards for Pollution Control on Hazardous Waste Incineration*, *Emission Standards for Odor Pollutants*, *Integrated Wastewater Discharge Standard*, *Wastewater Quality Standards for Discharge to Municipal Sewers* and *Emission Standard for Industrial Enterprises Noise at Boundary*.

### 6.3 Does the centralized disposal unit for medical waste need to install an automatic monitoring system for pollutant emission?

Centralized disposal units for incineration of medical waste shall install a continuous automatic monitoring system for flue gas emission from fixed pollution sources. The monitoring items shall, at the least, include sulfur dioxide, nitrogen oxides, particulate matter, carbon monoxide, oxygen content, hydrogen chloride, flue gas temperature, flue gas pressure, flue gas flow velocity or flow rate and moisture content of flue gas. Automatic monitoring data can be used for environmental law enforcement.

### 6.4 Is medical waste incineration residue a kind of hazardous waste or general solid waste?

Incineration residues mainly include fly ash generated by dust removal equipment and slag generated from incineration. Fly ash is a type of hazardous waste and must be collected and stored in a sealed environment, and solidified for landfill disposal in accordance with GB18598 *Standard for Pollution Control on the Hazardous Waste Landfill*. Slag can be sent to household garbage landfills.

## 6.5 Where shall disposal units for medical waste be set up and what kind of warning symbols shall they carry?

Disposal units for medical waste shall set up hazardous waste warning symbols and medical waste warning symbols at the entrance and exit of the factory area, temporary storage facilities and disposal sites.

## 6.6 How shall medical waste disposal practitioners carry out occupational health protection?

Medical and health institutions and centralized medical waste disposal units shall take effective occupational health protective measures and provide necessary protective equipment for personnel engaged in medical waste collection, transport, storage and disposal as well as management. Operators shall wear protective gloves, masks, work clothes, boots and other protective supplies during operations. In case of danger caused by liquid or molten material spillage, operators shall also wear goggles. Regular health checks shall be conduct. In addition, when necessary, the relevant personnel shall be immunized against health risks.

## 6.7 How shall medical waste collection and transport personnel implement occupational health protection?

Transport personnel shall wear protective gloves, masks, work clothes, boots and other protective supplies during the transport of medical waste. Transport personnel shall conduct physical examinations twice a year and, if necessary, receive preventive immunization.

## 6.8 How shall medical waste disposal practitioners disinfect themselves, the equipment and the protective tools they use?

Disinfection of hands and skin: Soak or wipe hands with 0.5% iodophor solution (containing 5 000 mg/l of effective iodine) for 1-3 minutes.

Disinfection of instruments and equipment: Wipe and disinfect with 0.2% peracetic acid, 500 mg/l chlorine dioxide or disinfectant solution of available chlorine or bromine.

Disinfection of protective supplies: Heat-resistant supplies can be disinfected with circulating steam for 20-30 minutes or with pressure steam at 121°C for 20-30 minutes. Moisture-resistant supplies (including protective glasses) can be soaked in disinfectant with available chlorine content of 1 000 mg/l for 30 minutes.

## 6.9 What disinfection method shall be used for medical waste transport tools?

Disinfection of the surface and environment of transport vehicles, turnover boxes (bins), storage facilities and other related supplies: Sprinkle, spray or wipe with 0.2% peracetic acid solution or disinfectant with available chlorine content of 1 000 mg/l – 2 000 mg/l, and wash off after 60 minutes.



**FIGURE 7:**  
**1 COMMON PERSONAL**  
**PROTECTIVE EQUIPMENT**

Floor disinfection: Use chlorine dioxide with content of 500 mg/l – 1 000 mg/l or disinfectant with available chlorine or available bromine content of 1 000 mg/l – 2 000 mg/l to spray or mop the floor.

## 6.10 What are the roles involved in the supervision and management of medical waste disposal?

Supervision and management of medical waste involves local People's Government, the hygiene and health management department, the ecological environment department, medical and health institutions, centralized disposal units for medical waste and the transport department.

## 6.11 How to supervise and inspect medical waste in medical institutions?

Focus on the supervision and inspection of the establishment of a responsibility system for medical waste management at all levels and types of medical institutions, the staffing of monitoring departments and specialized (part-time) management personnel, the implementation of a management system and emergency plan, the development of occupational health and safety protection and training for staff, the classified collection, internal transport, handover and registration, temporary storage and centralized disposal of medical waste to prevent the loss, leakage and spread of medical waste.

## 6.12 How to supervise and inspect centralized medical waste disposal units?

According to the regulation and requirements for the supervision and management of operation of centralized incineration facilities for medical waste, the setting of hazardous waste identification marks, the formulation of hazardous waste management plans, the implementation of management systems such as hazardous waste declaration and registration, duplicate tables for transfer, business licence, emergency plan filing, as well as a conformity check of the storage, utilization and disposal of hazardous waste to relevant standards and specifications, shall be checked item by item.

**TRAINED STAFFS COULD OPERATE THE MEDICAL WASTE DISINFECTION SYSTEM IN A NORMALIZED WAY ACCORDING TO RELATED REGULATIONS AND NORMS**





**PART THREE**

**MANAGEMENT OF  
MEDICAL WASTE**

**DURING AN EPIDEMIC**

## 7 REGULATIONS ON THE MANAGEMENT OF MEDICAL WASTE DURING AN EPIDEMIC

### 7.1 What normative documents did China issue on the management of medical waste during the COVID-19 epidemic?

During the novel coronavirus pneumonia epidemic (referred to as the “COVID-19 epidemic”), the General Office of National Health Commission of the People’s Republic of China issued the *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic*; the Ministry of Ecology and Environment of the People’s Republic of China issued the *Notification on the Environmental Management of Medical Waste during the Novel Coronavirus Pneumonia Epidemic* and the *Technical Guidelines on the Emergency Disposal of Medical Waste from the Treatment of COVID-19 (Trial)* and certain local governments issued policies for the management of medical waste. The National Health Commission demands the strengthening of management of institutions and personnel that provide logistics services and organize training. The Commission also urges them to master the basic requirements for the management of medical waste, thoroughly perform their duties and dispose of the medical waste in a timely manner.

### 7.2 How is COVID-19 epidemic-related medical waste defined?

According to the *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic* (GWBYH [2020] No.81) issued by the National Health Commission of the People’s Republic of China, medical waste of COVID-19 epidemic is waste generated in fever clinics and inpatient areas (wards) of medical institutions during the diagnosis and treatment of COVID-19 patients and suspected COVID-19 patients, including medical waste and household garbage.

### 7.3 How shall the technical route for emergency disposal of medical waste be determined during the COVID-19 epidemic?

Firstly, centralized medical waste disposal units shall give priority to the disposal of epidemic-related medical waste.

Secondly, professional mobile medical waste disposal facilities and non-professional facilities for medical waste disposal can be selected as alternative resources for the emergency disposal of medical waste. Professional mobile medical waste disposal facilities include incineration, autoclave disinfection, microwave disinfection and chemical disinfection. Non-professional disposal facilities for medical waste refer to solid waste disposal facilities adopting incineration technology, such as hazardous waste incineration facilities (with incineration temperature higher than 1100°C), household garbage incineration facilities (with incineration temperature higher than 850°C) and industrial furnaces (with furnace temperature higher than 850°C).

Thirdly, epidemic-related medical waste can be transferred to the centralized disposal facilities for medical waste in neighbouring areas for disposal according to the cross-regional coordination mechanism for emergency disposal.

Fourthly, infectious medical waste and other medical waste generated in the process of epidemic prevention and control shall be classified and managed separately.

Fifthly, medical institutions should be facilitated to adopt mobile medical waste disposal facilities for emergency disposal of epidemic-related medical waste and be exempted from environmental impact assessment and other procedures.

## 7.4 How to manage and dispose of medical waste in rural areas?

Rural areas that are not able to carry out centralized disposal of medical waste shall dispose of the medical waste generated on their own site. Self-disposal of medical waste shall meet the following basic requirements: the used disposable medical instruments and medical waste that can easily cause injuries shall be disinfected and destroyed, medical waste that can be burned shall be burned, while medical waste that cannot be burned shall be put together to be landfilled after disinfection.

## 7.5 What are the special management requirements for the qualification of medical waste disposal facilities during an epidemic?

The *Technical Guidelines on the Emergency Disposal of Medical Waste from the Treatment of COVID-19 (Trial)* states that medical institutions that use mobile medical waste disposal facilities to dispose of medical waste on their own or in neighbouring medical institutions can be exempted from environmental impact assessment, medical waste business licence and other procedures, but shall reasonably set up disposal sites, avoid environmentally-sensitive areas such as protected areas for sourcing drinking water and concentrated residential areas and shall report to the municipal authorities of health and ecological environment.

## 7.6 How shall areas with insufficient medical waste disposal capacity manage and dispose of medical waste during an epidemic?

The *Management Plan for Medical Waste in Response to Influenza A (H1N1) Epidemic* issued by the former Ministry of Environmental Protection of China on May 18, 2008 states that areas with insufficient disposal capacity for medical waste shall dispose of it according to the emergency plan. For areas that have no capability for centralized disposal of medical waste for special reasons, in particular remote rural areas, medical and health institutions can carry out on-site incineration of medical waste.

The *Technical Guidelines on the Emergency Disposal of Medical Waste from the Treatment of COVID-19 (Trial)* issued by the Ministry of Ecology and Environment of the People's Republic of China on January 28, 2020 states that cities with gaps in medical waste disposal capacity shall coordinate with other cities to establish a cross-regional mechanism for emergency disposal. If centralized disposal cannot be carried out for special reasons, medical waste can be incinerated on site according to the plan determined by the local government.

## 7.7 How shall medical waste disposal be reported during the coronavirus (COVID19) epidemic?

In accordance with the requirements of the Ministry of Ecology and Environment and of local government, the relevant local departments of ecology and environment administration at all levels shall report medical waste disposal information in a timely manner.

Centralized medical waste disposal units shall regularly report the collection and centralized disposal of medical waste to local ecology and environment authorities above the county level, daily or weekly, according to the specific situation and needs.

## 8 MANAGEMENT REQUIREMENTS FOR MEDICAL INSTITUTIONS DURING AN EPIDEMIC

### 8.1 How shall the used masks be treated during an epidemic?

The *Guidelines for the Protection of People at Different Risks of Infection from COVID-19* issued by the National Health Committee state that masks used by healthy people shall be treated as household garbage. Masks worn by suspected patients or confirmed patients shall be regarded as medical waste and treated in strict accordance with the relevant medical waste procedures.

### 8.2 During an epidemic, is the household garbage at the initial diagnosis isolation point considered medical waste?

According to the *Notification on Strengthening the Medical Management of the Initial Diagnosis Isolation Point of Novel Coronavirus Pneumonia* issued by the National Health Committee, the initial diagnosis isolation point is designated by the local government, outside medical institutions, and is used to treat suspected COVID-19 patients with mild symptoms. These can be hotels, guesthouses and inns with certain conditions. Waste generated from initial diagnosis isolation points during the diagnosis and treatment, including medical waste and household garbage, shall be managed as medical waste in accordance with the *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic* (GWBYH [2020] No.81).

### 8.3 What are the special requirements for classified collection of medical waste during an epidemic?

Regarding the collection of COVID-19-related medical waste, the *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic* (GWBYH [2020] No.81) further requires that the collection bin for medical waste shall be equipped with a foot pedal and a cover. When classifying and collecting used disposable isolation gowns and protective suits, squeezing is strictly prohibited.

The *Technical Guidelines on the Emergency Disposal of Medical Waste from the Treatment of COVID-19 (Trial)* clearly states that infectious medical waste generated during the prevention and treatment of the pneumonia epidemic shall be disinfected, packaged in strict accordance with the *Standard of Packaging Bags, Containers and Warning Marks Specific to Medical Waste*, and subsequently placed in designated turnover bins (boxes) or disposable special packaging containers.

### 8.4 What are the special requirements for medical waste packaging during an epidemic?

Regarding the packaging of COVID-19-related medical waste, the *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic* (GWBYH [2020] No.81) further requires that double-layer packaging bags be used to contain medical waste. Gooseneck-type sealing shall be adopted and each layer sealed separately. When the outer surface of the packaging bag and sharps box containing medical waste is contaminated by infectious waste, an extra layer of packaging bag shall be added. The special note on the label of each packaging bag and sharp box shall be marked with “新型冠状病毒感染的肺炎” (“Novel Coronavirus Pneumonia”) or abbreviated as “新冠” (“Coronavirus”). Medical waste



generated in potentially contaminated areas and contaminated areas of fever clinics and inpatient areas (wards) for COVID-19 patients and suspected COVID-19 patients shall be disinfected by spraying uniformly 1 000 mg/l chlorine-containing disinfectant or shall be covered with a layer of medical waste packaging bag before leaving the contaminated areas.

## 8.5 What are the special requirements to transport medical waste in medical institutions during an epidemic?

The *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic* (GWBYH [2020] No.81) requires that, when transporting medical waste, transport staff prevent the special packaging bags and sharps boxes containing medical waste from damage, avoid contact between themselves and the medical waste and avoid the leakage and spread of medical waste. At the end of each day, transport tools shall be cleaned and disinfected with 1 000 mg/l chlorine-containing disinfectant. If the transport tools are contaminated by infectious medical waste, they should be disinfected in a timely manner.

## 8.6 What are the special requirements for the temporary storage of medical waste during an epidemic?

The *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic* (GWBYH [2020] No.81) requires that medical and health institutions with the necessary capabilities store infectious medical waste generated during the prevention and treatment of pneumonia epidemic in a temporary storage place at a special site and under the management of a special person. This shall not be mixed with other medical waste and household garbage.

During the COVID-19 epidemic, the temporary storage time of medical waste in medical and health institutions shall not exceed 24 hours.

The temporary storage places of medical waste in medical and health institutions shall be disinfected by specifically-designated persons by spraying the wall or mopping the floor with 0.2%–0.5% peracetic acid or 1 000 to 2 000 mg/l of chlorine-containing disinfectant, once every morning and once every afternoon.

## 8.7 What are the special requirements for medical waste accounting during an epidemic?

The *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic* (GWBYH [2020] No.81) requires that layer-by-layer registration and transfer be carried out between medical waste generation department, transport personnel, staff at the temporary storage place and transfer personnel of the medical waste disposal unit. It shall be clarified that the medical waste is from COVID-19 patients or suspected COVID-19 patients.

The *Notification on the Management of Medical Waste in Medical Institutions during the Novel Coronavirus Pneumonia Epidemic* (GWBYH [2020] No.81) requires that, in areas where the conditions permit it, fixed special vehicles be arranged to transport separately infectious medical waste generated during the prevention and treatment of pneumonia epidemic. Duplicate tables for the transfer shall be filled in separately from other medical wastes, while hard copy records shall be maintained.

## 8.8 What are the requirements for temporary hospitals to build temporary storage warehouses during an epidemic?

Construction shall be carried out in accordance with the requirements for temporary storage warehouses for medical waste in infectious disease hospitals. The construction quality shall not be lowered due to the fact that the storage is temporary. The main requirements include the following: constructions shall be away from medical areas, food processing areas, personnel activity areas and household garbage storage places, shall facilitate the entry and exit of medical waste transporters, transport tools and vehicles, shall be equipped with strict sealing measures, shall be managed by special (part-time) staff to prevent non-staff from contacting medical waste, shall be equipped with measures against rats, mosquitoes, flies and cockroaches, shall be equipped with measures against leakage and rain erosion, shall be convenient for cleaning and disinfection, shall avoid direct sunlight and shall carry evident warning symbols for hazardous waste, warning symbols for medical waste and warning symbols with the message “禁止吸烟、饮食” (“No Smoking or Eating”). For temporary storage of pathological waste, low-temperature storage or anti-corrosion conditions shall be provided.

## 9 MANAGEMENT REQUIREMENTS FOR MEDICAL WASTE DISPOSAL UNITS DURING AN EPIDEMIC

### 9.1 What are the special requirements for the collection and transport of medical waste during an epidemic?

Infectious medical waste generated in the prevention and treatment process of the COVID-19 epidemic shall be transported by special medical waste transport vehicles or by vehicles temporarily re-purposed according to the requirements for medical waste transport vehicles. Special driving routes should be planned to avoid densely populated areas and rush hours should be avoided. “新型冠状病毒感染的肺炎” (“Novel Coronavirus Pneumonia”) or “新冠” (“COVID-19”) must be affixed.

### 9.2 What exemptions can be provided to facilitate emergency disposal of COVID19-related medical waste?

The *Technical Guidelines on the Emergency Disposal of Medical Waste from the Treatment of COVID-19 (Trial)* state that medical institutions that use mobile medical waste disposal facilities to dispose of medical waste on their own or in neighbouring medical institutions can be exempted from environmental impact assessment, medical waste business licence and other procedures, but shall reasonably set up disposal sites, avoid environmentally-sensitive areas such as protected areas for sourcing drinking water and concentrated residential areas and shall report to the municipal health and ecological environment authorities. The supplier of mobile medical waste disposal facilities shall ensure that the disposal of medical waste meets the requirements of relevant standards and technical specifications.

### 9.3 What are the special requirements for the storage time limit of medical waste in centralized disposal units during an epidemic?

During the COVID-19 epidemic, medical waste delivered to the disposal site shall be disposed of as soon as possible and the temporary storage time in the disposal unit shall not exceed 12 hours.

## 9.4 Is it necessary to set up an isolation area for medical waste disposal during an epidemic?

The disposal unit must set up an isolation area for medical waste disposal. The isolation zone shall be clearly marked and only relevant personnel shall be allowed to enter. The isolation area of the disposal unit must be under the responsibility of special personnel, and shall be disinfected by spraying the wall, floor and surface of articles or by mopping the floor according to the methods and frequencies required by the competent health department.

## 9.5 What are the disinfection requirements for medical waste disposal sites during an epidemic?

The isolation area for medical waste disposal must be managed by special personnel responsible for disinfection by spraying the wall, floor and surface of articles or by mopping the floor with 0.20.5% peracetic acid or 1 000 – 2 000 mg/l chlorine-containing disinfectant, once every morning and once every afternoon.

## 9.6 What are the special requirements for occupational health protection during an epidemic?

During an epidemic, daily temperature monitoring of operators shall be strengthened. Where conditions permit, it can be arranged that front-line operators for medical waste collection, storage, transport and disposal live together. Medical and health waste treatment/disposal personnel shall wash their hands and disinfect themselves immediately after the transport or disposal operation is completed, while personnel returning from special areas shall take a bath before leaving the work area. The staff must disinfect the used tools with chlorine-containing disinfectant.

## 9.7 How to choose the disposal method for medical waste generated by COVID-19 patients?

Medical waste generated by COVID-19 patients can be disposed of by incineration or non-incineration methods such as autoclave disinfection, microwave disinfection and chemical disinfection, while ensuring effective disposal.

## 9.8 What are the technical requirements and matters needing attention for emergency disposal of medical waste by non-professional disposal facilities?

In order to carry out emergency disposal of the COVID-19-related medical waste by nonprofessional disposal facilities for medical waste, such as hazardous waste incineration facilities, household garbage incineration facilities and industrial furnaces, it is first necessary to carry out health management and epidemic prevention in accordance with the requirements of the competent health department. Secondly, special unloading and receiving areas, as well as cleaning and disinfection areas, shall be designated for medical waste, necessary rainproof and leak-proof measures added and special driving routes planned for medical waste transport vehicles and managed by special personnel. Thirdly, warning symbols shall be set up at medical waste receiving sites and restriction measures shall be carried out. Fourthly, special feeding equipment is recommended in order to prevent secondary crosscontamination caused by contact between medical waste and other incineration materials. Fifthly, attention shall be paid to the compatibility of medical waste and other incineration materials to ensure stable and controllable operation of the processing equipment. Sixthly, technical operators shall receive the necessary technical training.

## 10 MANAGEMENT AND DISPOSAL CASES DURING THE COVID-19 EPIDEMIC

### 10.1 A case of emergency disposal of medical waste using household garbage incineration facilities

In order to cope with emergency situations, such as the shutdown in early 2014 of medical waste incineration facilities for overhaul and public health emergencies, with the support of Shanghai Municipal Bureau of Ecology and Environment, the Shanghai Municipal Health Commission and the Shanghai Landscaping & City Appearance Administrative Bureau, the Shanghai Chengtou Group Corporation developed the *Shanghai Medical Waste Emergency Disposal Guarantee Plan* and completed the construction of supporting facilities for loading and unloading areas for a medical waste turnover box, a cleaning and disinfection area, a stacking area and sewage collection in the pretreatment workshop of Laogang General Industrial Solid Waste Landfill Site. They also completed the construction of supporting facilities such as a medical waste unloading area, a loading elevator, a medical waste feeding device and sanitation and epidemic prevention control in the Laogang Renewable Energy Utilization Center. After the emergency disposal facilities were checked and approved by experts, the first emergency disposal of medical waste using household garbage incineration facilities in Shanghai was started in February 2014. From 2014 to 2019, the annual emergency disposal volume of medical waste in Shanghai municipal household garbage incineration facilities was 850 tons, 1 930 tons, 4 630 tons, 7 560 tons, 9 310 tons and 14 490 tons respectively. In the emergency disposal process, health and epidemic prevention control have been carried out in accordance with the *Shanghai Municipal Health Management Code for Medical Waste* and the *Disinfection Methods for Supplies Related to Medical Waste Management*. The hourly proportion of mixed incineration of medical waste and household garbage has been controlled within 5%. The pollutant emission index is subject to the *Standard for Pollution Control on the Municipal Solid Waste Incineration* (DB31/768-2013).

### 10.2 A case of disposal of medical waste using cement kiln co-processing technology

After the outbreak of the COVID-19 epidemic, several factories under a cement group entered an emergency disposal state, testing related equipment and conducting personnel operation drills, ready to receive and dispose of medical waste at any time. At the beginning of February, the enterprise received the task of emergency disposal of medical waste. The Group and its disposal factories immediately recalled relevant technicians and operators, set up isolation areas and carried out preparations such as deployment of protective materials and personnel drills in an orderly manner. Every link in the treatment process, including disinfection, collection and transport, delivery and disposal, was carefully arranged. During the medical waste disposal, the subordinate environmental companies arranged for several fully-sealed, leak-proof container horizontal type dumpers to be equipped with GPS to undertake medical waste transport tasks. Each dumper is equipped with a pace car to ensure safe transport. At the same time, there is no transfer point or hold-up in the disposal process in order to dispose of the waste generated within the same day. This not only ensures the safety of employees and the safety and efficiency of the disposal process, but also completely eliminates the risk of secondary pollution of medical waste. From February 4 to March 6, a total of 55 tons of medical waste was disposed of.

### 10.3 Using mobile emergency disposal system for medical waste (Case 1)

An enterprise with a mobile disposal system for medical waste participated in the emergency treatment of epidemic-related medical waste in Wuhan City, Hubei Province, and was responsible for the emergency disposal of medical waste in the First People’s Hospital of Jiangxia District, taking into account Leishenshan Hospital at the same time. The system adopts skid-mounted, autoclave technology for medical waste disposal, which can be fixed or vehicle-mounted, and consists mainly of medical waste sterilizer, a sterilization trolley, a cooling circulating water auxiliary system, a crusher, an unloader, an automatic vehicle access mechanism (or cylinder propulsion device) and an elevator. The equipment itself is equipped with a steam generator and an air compressor, meaning that it does not need to be connected to an external steam source, but needs only connection with power electricity and water sources, thereby allowing it to be easily adopted by medical institutions in epidemic areas. The daily processing capacity of the equipment is 1.5 tons of waste.

### 10.4 Using mobile emergency disposal system for medical waste (Case 2)

In order to fully support China’s fight against the COVID-19 epidemic, the United Nations Industrial Development Organization and the Foreign Environmental Cooperation Center of the Ministry of Ecology and Environment of China have jointly developed and implemented an emergency response project for the COVID-19 epidemic in China. A set of mobile autoclave equipment for medical waste emergency treatment with a disposal capacity of 1.8 tons/day was put into use in Hongshan District of Wuhan City. The service scope of the equipment covers all designated hospitals for COVID-19 in Hongshan District and treats high-risk and highly infectious medical waste, with daily treatment capacity of medical waste of up to 1.8 tons. Considering the actual needs of the epidemic area and in combination with the technical experience of the previously completed Global Environment Facility (GEF) *China Medical Waste Environmental Sustainable Management Project*, vehicle-mounted mobile autoclave medical waste treatment technology has been adopted. This technology not only reduces the risk of infection during the long-distance transport of medical waste, but also effectively avoids dioxin generation and emissions into the air. It can not only provide mobile and on-site treatment services during an epidemic, but also supplements the standby treatment capacity during the overhaul of centralized treatment equipment, thus achieving the longterm goal of improving the emergency treatment capacity of medical waste in the epidemic area.

**A MOBILE EMERGENCY MEDICAL WASTE DISPOSAL SYSTEM WAS SETTLED TO PROVIDE EPIDEMIC MEDICAL WASTE ON-SITE TREATMENT TO A MODULE HOSPITAL IN WUHAN**



SMASHING THE RESIDUES



INSTALLATION AND COMMISSIONING



DISINFECTION ON THE SURFACE



UPLOADING 1



SAMPLING FOR DISINFECTION EFFICACY



UPLOADING 2



STERILIZATION INDICATOR CARD



PROGRAMME INTERFACE







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