

## 11.2.6 Design of a Medical Waste Disposal Site

### a. Fundamental Issues

#### a.1 Target Wastes

Target waste to be disposed at medical waste Disposal site is defined as shown in Table 11-18, according to the regulation on control of medical wastes.

Table 11-18: Target wastes to be disposed at Medical Waste Disposal Site in Cimsa

Type	Target	Definition
<b>infected</b>	<b>yes</b>	all sorts of human tissues and organs, urine containers, blood or placenta contaminated waste bacteria cultures, infectious diseases ward and emergency ward wastes, bacteria and virus retaining air filters, feces and feces-contaminated articles corpses of biological research animals and wastes of quarantined patients of likely to be contaminated by disease agents(collection after sterilisation)
<b>pathogenic</b>	<b>yes</b>	waste bearing pathogenic factors(collection after sterilisation)
<b>Pathological</b>	<b>yes</b>	organs, parts of body, animal corpses, blood and other body fluid, pathogenic or bearing the risk of pathogenicity.
<b>Radioactive waste</b>	<b>no</b>	Disposal in accordance with statue (2690.9.7.1982)
<b>safe chemicals</b>	<b>no</b>	irrecoverable waste(through municipal collection) liquid waste(by water pollution control regulation)
<b>dangerous chemicals</b>	<b>no</b>	(1)recoverable dangerous waste and expired medicines(individual collection with care to eliminate undesirable reactions. (2) Mercury (separate collection) (3)shock-sensitive substances and materials reacting or readily reactional with water(separately destroy with attention to noxious effects)
<b>waste of domestic nature</b>	<b>no</b>	uninfected kitchen waste garden waste, office package materials bottles and like

#### a.2 Location of the Medical Waste Disposal Site

As shown in Figure 11-13, a medical waste disposal site will be constructed at the eastern centre of the proposed Cimsa disposal site.

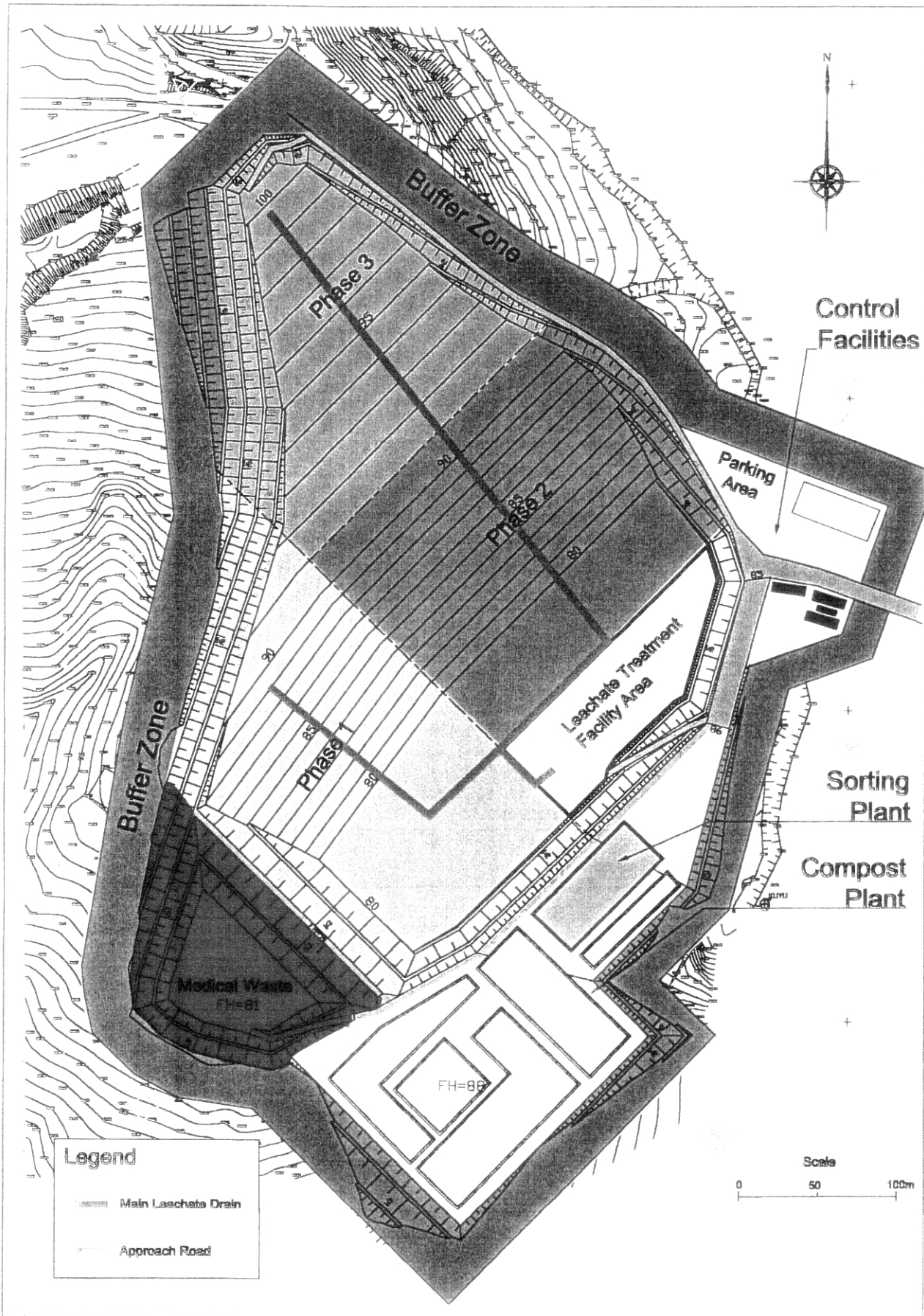


Figure 11-13: Proposed Medical Waste Disposal Site in Sofulu

Figure 11-13: Proposed Medical Waste Disposal Site in Sofulu

**b. Design of the Medical Waste Disposal Site**

**b.1 Design Standard**

The design standard to be followed is mainly the Regulation on Control of Medical Wastes except the distance to the residential area, which must be more than 3,000 meters.

**b.2 Preliminary Design of the Medical Waste Final Disposal Site**

**b.2.1 Basic Concept of the Preliminary Design**

Basic concept of preliminary design of medical waste disposal site in Cimsa is summarised as shown in Table 11-19.

Table 11-19: Basic Concept of Preliminary Design of Medical Waste Final Disposal Site in Cimsa

Item	Sub-Item	During Operation
(1) Landfill planning	basic idea	- open dumping to sanitary landfill(Sofulu) - from trench method to sanitary landfill
(2) Landfill Implementation	landfill method	-cover soil immediately after dumping of medical waste - landfill division by divider(1 year / divider) - cover soil from quarry site in landfill site
	final disposal foundation	article 34 of design standard
	Disposal site floor	article 35 of design standard
	drainage system	article 36 of design standard
	deposition of waste	article 37 of design standard
	top cover	article 38 of design standard
	gas removal	Every 50 meters(vertically and horizontally)
	vegetation of disposal site	article 39 of design standard
(3) Leachate	system	-circulation system -gravity fall from slope surface(every 30 m)
(4) Rainwater	drainage system	-individual collection and direct discharge
(5) Monitoring	hauled waste	-weighing at the entrance of Sofulu site -visual observation of truck, quantity and quality of waste -visual observation after unloading of medical waste -record and report to Municipality every month
	Leachate	-quantities and qualities of leachate -Report of quantities and qualities to MoE -cancellation of circulation system after closure of the landfill site
	Discharge	-report to MoE
	underground water	- installation of monitoring well at 3 points for each sites - monitoring before starting landfill - monitoring during operation: - 10 years monitoring after closure of landfill site
	Gas removal	-during landfill and 10 years after closure of landfill site(every 50 meters vertically and horizontally)
	Security of landfill site	fence and gate at the entrance
(5) Slope	gradient	Cut part : 1:2 embankment part: 1:3
	berm width	2 meters
	vertical interval of berm	5 meters

(6) road planning	maintenance road	-8 m width, asphalt paved,
	onsite road	-4 m width, crushed stone paved,

### b.2.2 Outline of the Medical Waste Final Disposal Site

Outline of the Medical Waste Final Disposal Site is shown in Table 11-20.

Table 11-20: Outline of the Medical Waste Final Disposal Site in Cimsa

Items	Description
Land Area	Total Area :2ha
Landfill Volume	Capacity :57,500m <sup>3</sup> Disposal Period :2002-2020
Road	Access road(Asphalt paved) : width4.0m,lenght280m Operation road
Leachate control facility	Leachate collection pipe 100mm:110m Main leachate drain 200mm:120m Pumping station:1 set Pump: 2set Leachate pipe 200mm:300m
Drain for runoff water	Open concrete drain :280m Pipe drain for rain fall :110m
Environmental protection facilities	Fence :500m Gas removal facility(Vertical) :30m Gas removal facility(Horizon) :110m

### b.2.3 Volume of Medical Waste Final Disposal Site

Medical waste amount generated and final disposal amount are shown in Table 11-21.

Table 11-21: Final Disposal Amount in Cimsa (2002-2020)

Item	unit	formula	2,002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Waste discharge amount	ton/day	a	1.9	2.0	2.1	2.2	2.3	2.5	2.6	2.7	2.9	3.1	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.9
	ton/day	b=ax365	694	730	767	803	840	913	949	986	1,059	1,132	1,168	1,241	1,314	1,387	1,460	1,533	1,606	1,679	1,789
Waste + Cover soil	m <sup>3</sup> /year	c=bx1.5/0.7	1785	1,877	1,972	2,065	2,160	2,348	2,440	2,535	2,723	2,911	3,003	3,191	3,379	3,567	3,754	3,942	4,130	4,317	4,600
Total	m <sup>3</sup>	c	1785	3,662	5,634	7,699	9,859	12,207	14,647	17,182	19,905	22,816	25,819	29,010	32,389	35,956	39,710	43,652	47,782	52,099	56,699

## **b.2.4 Leachate Collection Facilities and Regulation Pit**

### **i. During Operation**

A strict leachate circulation system shall be applied to the landfill to prevent rain water intrusion, the leachate will be circulated and stored in the site to prevent it from leaving the site.

A regulation pit with pumps, large enough to store the excess leachate in winter, shall be constructed in the medical waste disposal site.

### **ii. Post Closure of the Disposal Site**

Since the disposal site will be covered with water-proof liner after the closure of medical waste disposal site, no leachate will be received in the regulation pit. Therefore, the leachate circulation system will be closed in one year after the closure of the disposal site.

## **b.2.5 The Landfill's Impermeable Strata**

After completion of the medical waste disposal, a top cover will be formed by building-up the layers shown below.

In order to provide for ultimate land use of disposal site plants will be grown. The thickness of farm soil shall be determined according to root depths of plants to be planted or grown.

The inclination of farm soil layer shall be more than 3 %, so that the top soil does not erode during excessive rain.

Structure of the top cover of the medical disposal site is shown in the following table.

Table 11-22: Structure of Top Cover of Medical Disposal Site

item	depth or gradient	permeability
homogeneous and non-cohesive soil	not less than 0.5m thick,	
impervious mineral layer	not less than 0.5m thick	$1.0 \times 10^{-9}$ m/s or less
plastic membrane	minimum 2.5mm thick	
Final inclination of top cover surface	greater than 5%	
Drain layer	0.3 meter thick	
agriculture soil layer on impervious membrane	not less than 1 m	

The landfill's impermeable strata of slope, top cover and bottom are shown in following figures.

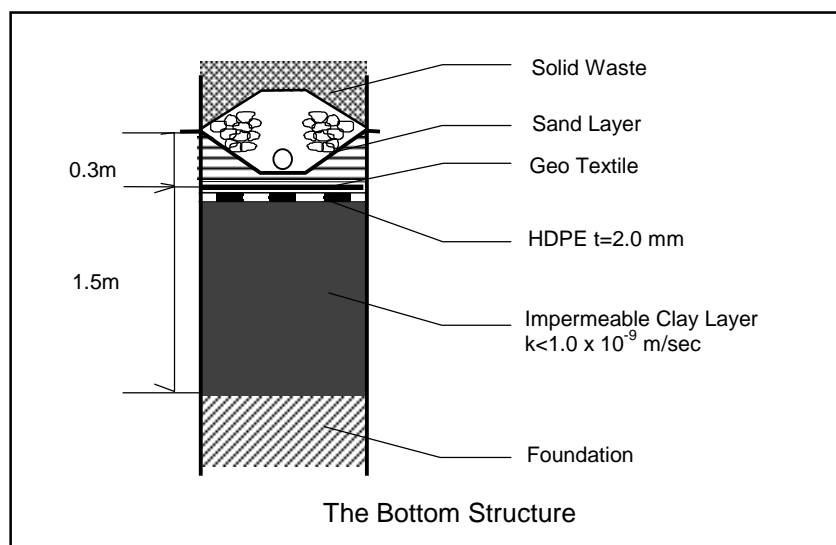
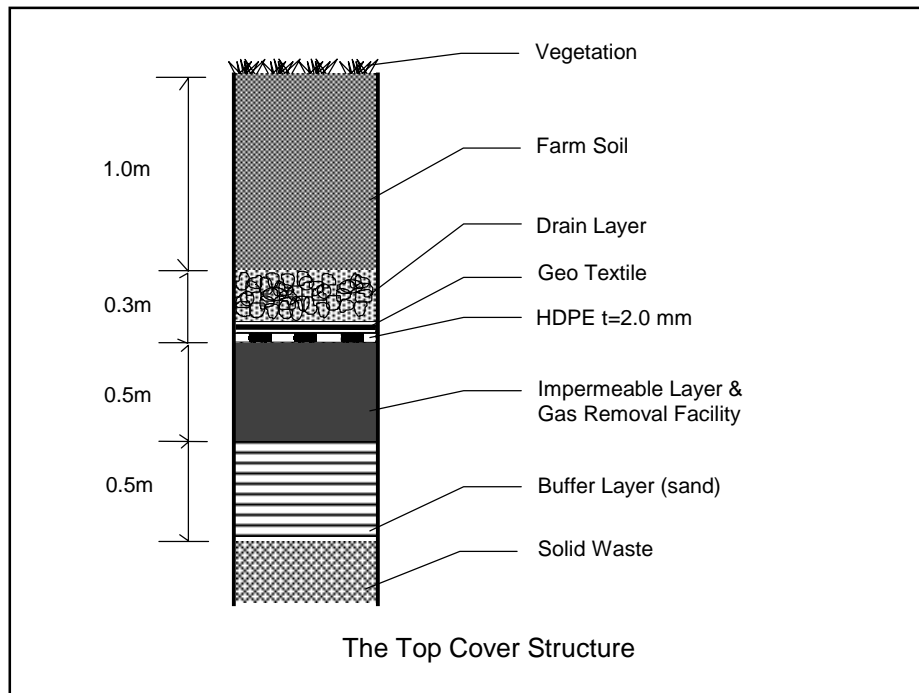
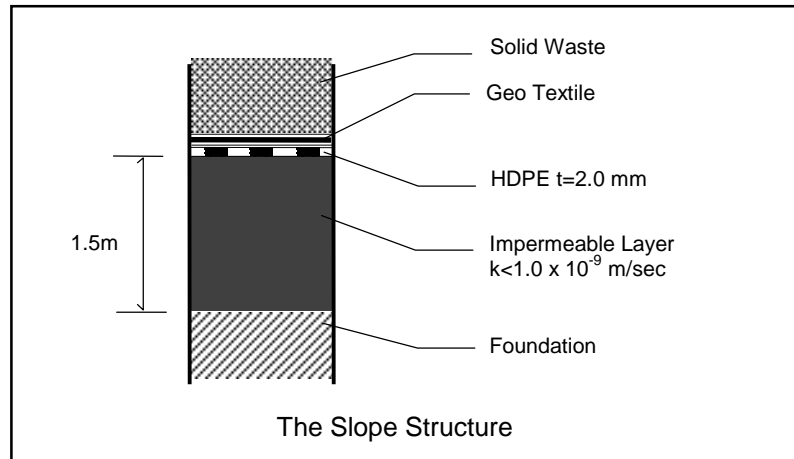


Figure 11-14: Diagrams of the Landfill's Impermeable Strata (Slope, Top Cover and Bottom)