

# Chapter 3

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*Pilot Project*

### 3 Pilot Project

#### 3.1 Objective and Methodology

The objective of the pilot project is to properly manage healthcare waste by complying with existing laws and regulations by creating a system for proper management for separation, collection and final disposal of healthcare waste which is generated from the medical centre. The system created will be a model which will be applied to other hospitals and medical centers.

##### 3.1.1 Project Design Matrix

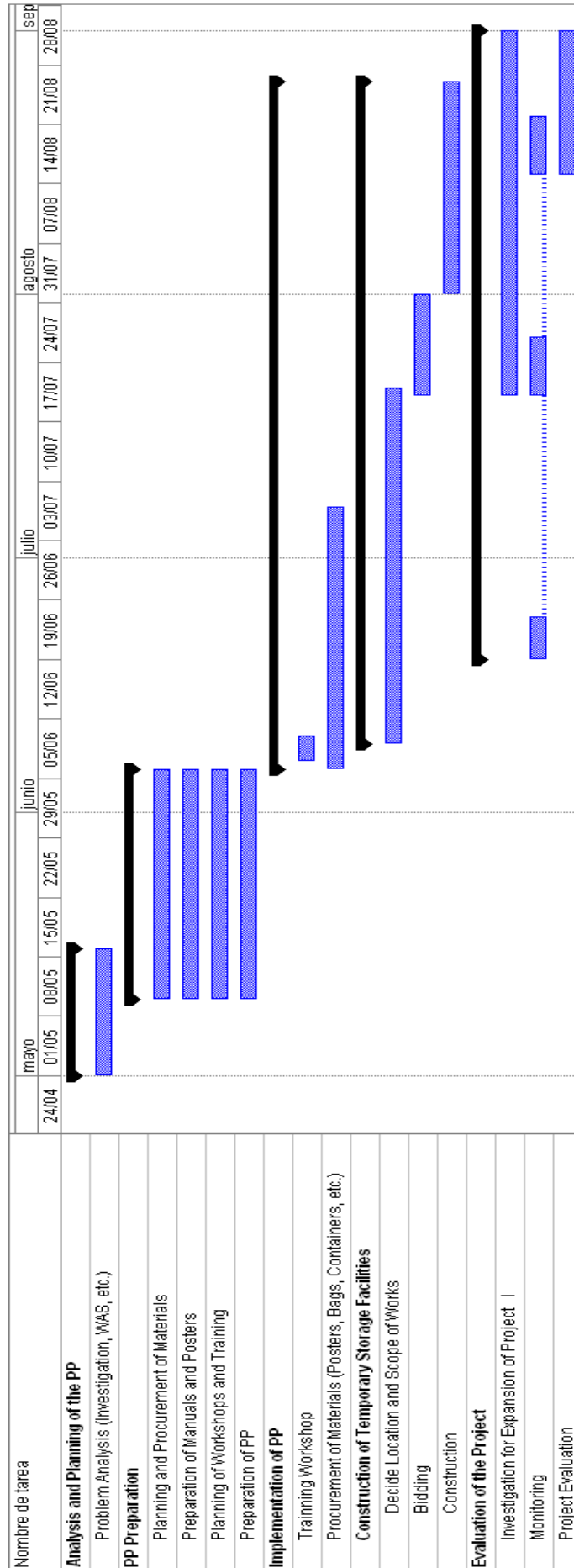
Table 3-1: Project Design Matrix for pilot project: Improvement of the healthcare waste management

Name of the Project: Improvement of the healthcare waste management		Period May 2006 – August 2006	
Target Areas: Ciudad Sanitaria “Dr. Luis E. Aybar”		Target Group: Personnel of Hospital, ADN, SESPAS and SEMARN	
Summary of the Project	Indicators	Verification Means	Important Suppositions
<p><b>Global Goal</b></p> <p>In the National District, the waste generated from hospitals is managed properly like the management method conducted in Pilot Project as a model.</p>	<ol style="list-style-type: none"> <li>1. Records of intra-hospital separation and temporal storage.</li> <li>2. Record of collection and transport.</li> <li>3. Record of final disposal.</li> </ol>	<ol style="list-style-type: none"> <li>1. The monitoring sheet and the maintenance record at the temporal storage site.</li> <li>2. Working records of the private collection and treatment companies.</li> <li>3. Working records of the operator of final disposal site.</li> </ol>	<p>SESPAS and SEMARN take initiative in expansion of the project.</p>
<p><b>Purpose of the Project</b></p> <p>The waste from the target hospitals is separated correctly. Of them, infectious waste is collected, transported exclusively and finally disposed at a special cell in the landfill site</p>	<ol style="list-style-type: none"> <li>1. Records of intra-hospital separation and temporal storage.</li> <li>2. Record of collection and transport.</li> <li>3. Record of final disposal.</li> </ol>	<ol style="list-style-type: none"> <li>1. The monitoring sheet and the maintenance record at the temporal storage site.</li> <li>2. Working records of the private collection and treatment companies.</li> <li>3. Working records of the operator of final disposal site.</li> </ol>	<p>Personnel in charge of the waste management take initiative for this project.</p>
<p><b>Results</b></p> <ol style="list-style-type: none"> <li>1. The staff of SESPAS obtains the experience and knowledge about management of healthcare waste, and become able to train people in other hospitals.</li> <li>2. Personnel of the target hospitals obtain the experience and knowledge of the management of healthcare waste and implement it.</li> <li>3. Infectious waste is appropriately collected and transported from the hospitals, treated and finally disposed at the special cell in the landfill.</li> </ol> <p>*The Target hospital possesses and operates an incinerator. It will be analyzed and its use will be determined. The manner of collection, transport and final disposal will be confirmed depending on the results of</p>	<ol style="list-style-type: none"> <li>1. Records of expansion of the project by the staff of SESPAS to other hospitals.</li> <li>2.1 Records of Separation Monitoring and workshops for personal of the hospital.</li> <li>2.2 Picture of scheme on healthcare waste management system.</li> <li>3.1 Plan of collection, transport and treatment.</li> <li>3.2 Working records of collection, transport and treatment.</li> <li>4.1 Plan of final disposal</li> </ol>	<ol style="list-style-type: none"> <li>1. Records of workshop for expansion of the project in other hospitals.</li> <li>2.1 Monitoring sheets and records of the workshop by personnel in charge at the hospital.</li> <li>2.2 Picture of scheme after planned by personnel in charge and study team.</li> <li>3.1 The contract of private service provider. The maintenance record at the temporal storage facility.</li> <li>3.2. The working records by the private service provider.</li> <li>4.1. The working records by the private service</li> </ol>	<p>The target hospital will assure the continuation of the program.</p> <p>Credibility in the services provided.</p>

### 3. Pilot Project

Summary of the Project	Indicators	Verification Means	Important Suppositions
the analysis.	4.2 Working Records of final disposal.	provider. 4.2. The working records by operator at disposal site.	
<p>Activities</p> <ol style="list-style-type: none"> <li>1. Investigation of the actual situation of healthcare waste management, together with personnel of SESPAS, the hospital and the study team.</li> <li>2. Planning the system of healthcare waste management based on the investigation.</li> <li>3. Implement the plan together with the counterparts and personnel of the hospital.               <ol style="list-style-type: none"> <li>3.1 Promote separation of waste, prepare posters, containers, and hold workshops to instruct personnel of the hospital.</li> <li>3.2 Promote exclusive collection and transport of infectious waste in the hospital, prepare the pushing carts, uniforms, protective gear and hold workshop to instruct the cleansing personnel on how to handle infectious waste.</li> <li>3.3 Prepare temporal storage facility for infectious waste in the hospital and instruct the usage of it.</li> </ol> </li> <li>4. Contract with a private company which has the permission of SEMARN for transport and treatment of infectious waste.</li> <li>5. Implement the disposal of treated infectious waste at the special cell in the landfill site.</li> <li>6. Implement the monitoring of healthcare waste management.</li> <li>7. Compile all the activities from 1-6, hold a workshop to expand the project by applying the same management in other hospitals.</li> </ol>	<p>Inputs</p> <p>&lt;Part of Dominican Republic&gt;</p> <p>SESPAS</p> <ul style="list-style-type: none"> <li>-Counterpart SESPAS</li> <li>-Staff of hospital</li> <li>-Conference room</li> </ul> <p>SEMARN</p> <ul style="list-style-type: none"> <li>Counterpart SEMARN</li> <li>ADN</li> <li>Counterpart ADN</li> <li>Final disposal site</li> <li>Staff of final disposal site</li> <li>Cells for Healthcare Waste</li> </ul> <p>&lt;Part of Japan&gt;</p> <ul style="list-style-type: none"> <li>-Member of the Study Team</li> <li>-Assistants</li> <li>-Manual, Posters</li> <li>-Pushing carts</li> <li>-Containers for separation of waste (Containers, plastic, bags and other materials)</li> <li>-Protection gears for the cleansing personnel (gloves, boots and aprons)</li> <li>-Temporal storage facility</li> <li>-Contracting with the private company for -Transport, treatment and final disposal of the waste.</li> </ul>		<p>The C/P commits to carry out the Pilot Project of the Promotion of the Citizen Participation</p>

3.1.2 Schedule



### 3.2 Investigation for Planning

Management and planning for healthcare waste should be based on basic information such as waste quality and quantity. This basic data can be obtained directly from weighing or indirectly through number of patients, beds and medical staff, types of treatment or analysis.

#### 3.2.1 Profile of Target hospitals

Target of the pilot project is Ciudad Sanitaria “Dr. Luis E. Aybar” (hereafter, referred as Ciudad Sanitaria). Ciudad Sanitaria is a complex of healthcare institutions, composed of 4 healthcare centres, which are Hospital Luis E. Aybar, Gastroenterología, Unidad de Quemados Pearl F. Ort and Centro de Educacion Medica de Amistad Dominico- Japonesa (CEMADOJA). A new institution of Cardio-Neuro-Oftamologica will begin to operate at the end of the year (2006) or beginning of 2007.

Luis E. Aybar is a general hospital, providing various medical services such as internal/external medicine, surgery, ophthalmology, pediatrics, obstetrician and gynecology. Emergency department has been relocated to the new facilities. Luis E. Aybar is also playing the role as a one of major training and educational centers for trainee doctors. Gastroenterología is specialized in gastrointestinal division. Unidad de Quemados is a special center for burn injury patients. On the other hand, CEMADOJA is specialized in the analysis by X ray or other diagnostic imagines, there are laboratories and, similarly to Luis E. Aybar, one of the important roles of this center is education for trainee doctor or specialist of diagnostic imagines in this country.

The number of personnel and beds in Ciudad Sanitaria is shown in the table below. The numbers of trainee doctors are not included in this table. Since the Ciudad Sanitaria is one of the centers for training in the country, it's important to take it into consideration that those residents also generate quite amount of healthcare waste as they conduct medical cares for patients.

Table 3-2: Number of personnel and beds in Ciudad Sanitaria

Name of establishment	Medical Doctor	Nurse	Bio-analyst	Cleansing personel	Total	Bed
Luis E. Aybar	209	531	191	60	991	278
Gastroenterología	33	52	53	34	172	29
Unidad de Quemados	15	47	9	14	85	10
CEMADOJA	8	4	3	28	43	0
<b>TOTAL</b>	<b>265</b>	<b>634</b>	<b>256</b>	<b>136</b>	<b>1291</b>	<b>317</b>

Approximately, the number of patients including internal and external is 2,201 per day, 803,376 per year.

### 3.2.2 Characteristics and volume of waste

Characteristics of waste from each centre can be shown the table below.

Table 3-3: Characteristics of waste from each center

Hospital	Type of Treatment	Type of waste
Hospital Luis E Aybar	General hospital (including, obstetrics, gynecology, ophthalmology, pediatrics, surgery, internal medicine, analysis, training and education)	Almost all types of infectious waste (syringes, needles, sheets, infectious bandage and gauze, tubes, common wastes (office paper and big volume of food waste)
CEMADOJA	Diagnostic imagine, training and education	Infectious waste, chemical waste (mostly liquid, such as developing fluid from X ray imagines), common waste (office paper, lunch box etc.)
Unidad de Quemados	Specialized in treatment for burn injury patients	Large volume of blood/body fluid adherent bandage and gauze, other disposal cloths (not heavy), needles, sheets, injections, common waste (office paper, a little food waste)
Centro de Gastroenterología	Specialized in gastrointestinal treatment	Liquid contained waste(heavy), needles, injections, leafs, bandage and gaze, tubes, Waste from laboratories (cultures, test tube and slide glass etc.), common waste (office paper, food waste)

In July 2004, SEMARN conducted a survey on the management and disposal of biomedical waste in healthcare centers of Santo Domingo and San Cristóbal; this survey included four (4) centers of the Ciudad Sanitaria.

Additionally, between 8 and 10 of June 2006, the Study team conducted a survey by weighing waste to evaluate the total quantity of waste generated at the Hospital Luis E. Aybar. The results were similar to the study of SEMARN which was conducted for 3 months; therefore, SEMARN's study was used for planning of the pilot project. The results are shown in the following table.

Table 3-4: Quantity of Waste Generated Based on the Study of SEMARN (Kg/day)

Healthcare center	Common	Infectious	Total
Hospital Luis E. Aybar	681	145	826 (701.1)
Centro de Gastroenterología	332	97	429
Unidad de Quemados	69	43	112
CEMADOJA	27		27
Grand Total	1,109	285	1,394

Note: The number in parentheses is the results of the survey by the Study Team.

### 3.2.3 Results of Investigation

#### a. Internal Structure

There was not any structure which coordinates all different actors who are involved in healthcare waste management: director, doctors, nurses, cleansing staff, administration, epidemiology, and maintenance.

#### b. Separation

Generally, there was not separation. Waste was mixed and disposed by nurses and doctors in the containers/bins. Although red bags were used, they were used for common and infectious waste indistinctively; additionally, bags were not thick enough (180C (thickness)

or less).

A better effort was made to separate sharps which were disposed in a rigid container (gallon) which was discarded by the cleansing department and contained previously detergent or soap. However, this gallon was not placed in a stable base, it was placed on the floor or hanging by a string; consequently, the gallon can easily tip over and its content (syringes mostly) can be spread over the floor.

#### **c. Internal collection and Personal Protection Gear**

Cleansing personnel collects mixed waste following an irregular route and schedule. Internal route is not followed taking into account visitors' peak hours or sensible areas such as kitchen and laundry room. Additionally, the internal route followed a path along the streets around the Ciudad Sanitaria (Streets Federico Bermudez and Federico Velazquez) which exposed the workers to injuries and pedestrian to infectious waste.

Collection carts could be suitable for common waste, but they are not suitable for infectious waste. Furthermore, cleansing workers do not use any protective gear to handle infectious waste.

#### **d. Temporal Storage Facility**

There was a temporary storage site which was used by four (4) healthcare centers; waste was discharged mixed (infectious and common waste) in this storage site. The storage facility did not isolate the infectious waste, on the contrary, neighbors and vendors disposed their scattered waste in the site; in this manner, more infectious waste should be collected (mixed waste should be considered infectious in total).

Moreover, the storage site did not have facilities to clean the site and collection carts.

#### **e. External System (Collection, Treatment, and Final Disposal)**

Mixed waste was collected by Ayuntamiento del Distrito Nacional (ADN). ADN does not have adequate nor authorized vehicles by SEMARN to transport. Municipality workers do not use special protective gear to manage infectious waste.

Regarding incineration, there is an incinerator which does not have environmental permit. Additionally, its operation could be deficient taking into account the complaints by other centers, specially Gastroenterologia, and neighbors through "junta de vecinos" (the associations of neighbors).

Disposal is conducted mixed with other municipal waste which is transported by the Municipality to Duquesa final disposal site.

### **3.3 Planning of Healthcare Waste Management**

Healthcare waste management should be planned by following adequate phases and each phase should be provided with adequate logistic. There are four (4) phases which should be followed in healthcare waste management: separation, internal collection, temporal storage, and external system (transport, treatment, and final disposal). Logistics/needs requirement for each phase can be defined in three (3) areas: organization, human resources, and procurement of materials/resources.

A healthcare waste management plan was elaborated based on the diagnostic and data collection. Adequate planning for each healthcare center should be based on the decisions from the committee of hygiene and hospital waste which is fundamental in managing healthcare waste.

### 3.3.1 The Committee of Hygiene and Hospital Waste

Healthcare institutions have full responsibility of waste that they generate, even if the waste is transported, treated and disposed of by others such as the private sector.

Main actors in healthcare waste management in a healthcare center should work inside a structure/organization which defines their responsibilities; this structure is considered in the existing legislation. In fact, the Reglamento General de Hospital (Reglamento General de Hospital (Decreto No. 351-99) defines that a hygiene and hospital waste management committee has to be established in each hospital which should manage properly the waste generated at hospitals. However no such committee had been established in Ciudad Sanitaria before the pilot project; consequently, four (4) committees were activated in Ciudad Sanitaria as part of the pilot project, one for each healthcare center.

Additionally, Decreto No. 351-99 does not define the members and their roles in the Committee. As a result, the study team, SESPAS and personnel of hospital discussed and defined the members and their responsibilities based on the proposal of hospital waste regulation.

Table 3-5: Roles of Committee members

Position	Roles and responsibilities
Director , Presidente	Coordinate the committee, allocate the budget for materials (bags, containers, transportation, etc.), and assemble members for the meetings.
Epidemiologist	Record statistic data of diseases and accidents, and coordinate the plan of education and monitoring
Chief of Nurse Chief of Laboratory Chief of Surgery center	Education, Monitoring
Chief of cleansing and maintenance personnel	Education and supervise to the cleansing personnel calculate the use of materials and apply them to the administrator, give advise for planning of education and monitoring
Chief of administrator	Review the application of materials from cleansing dept. process and apply to the director. Distribute those materials purchased (bags, containers, etc.)

Ciudad Sanitaria is composed by 4 hospitals; in addition to the committee at each hospital, one committee is specially created to coordinate the common issues among the hospitals, specially usage and management of common facilities, external transportation and final disposal. The representative or president of the committee in each hospital is a member of this committee. A basic statement of the JICA study team on this pilot project was to assist the committee of representatives.

### 3.3.2 The Scheme of the Healthcare Waste Management

The committee defined how to manage waste taking into account the particular conditions of Ciudad Sanitaria. The committee defined practical manners of separation, storage sites, operation of private service providers etc.

The waste is separated at the source of generation into infectious and non-infectious waste by disposing them in separate containers. Internal transportation is done separately by using exclusive pushing carts which collect separated waste from differentiated containers. Separated waste is subsequently discharged in separated temporary storage sites. Finally, separated waste is transported separately. Common waste is transported by ADN and disposed with other municipal waste in Duquesa whereas infectious waste is collected and



treated by a private company authorized by SEMARN which disposes the treated residue in a special cell conditioned by Duquesa.

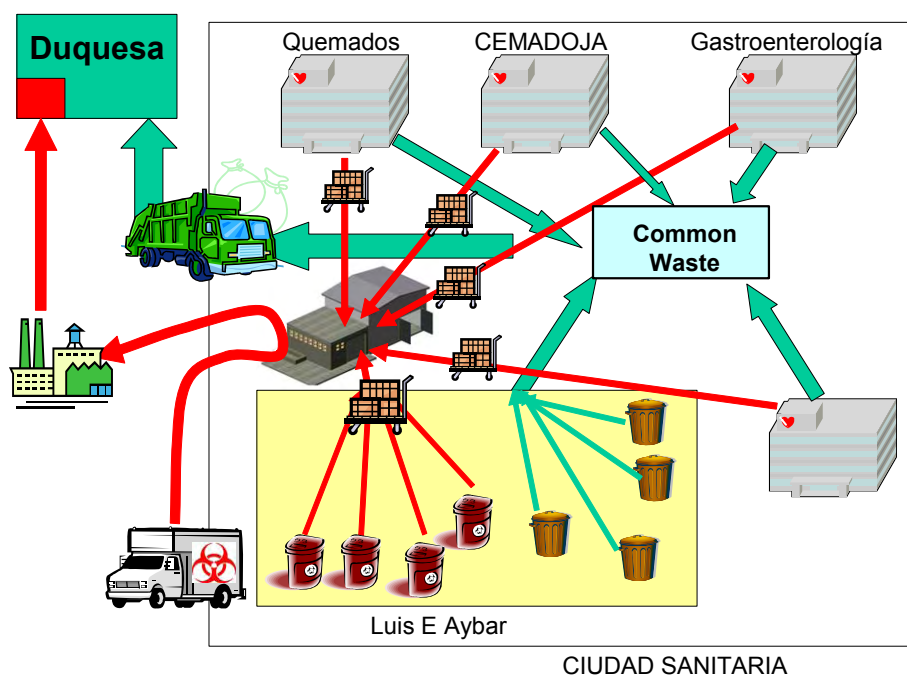


Figure 3-1: The Scheme of Waste Flow

### 3.4 Implementation of the Pilot Project

#### 3.4.1 Separation

Separation requires two important components: trained human resource and adequate materials to conduct effective separation. Workshops were conducted to train human resources. Additionally, the legislation was consulted to procure materials and whenever the law was not precise, proposals were made which should be endorsed by the committee, representative of SESPAS and SEMARN in order to implement it.

Healthcare waste can be categorized into infectious, special, and non-infectious according to the Norma. Special waste is composed of radioactive, pharmaceutical, and other chemical waste which should be treated in special manner and different from infectious waste. Consequently, the target waste for the pilot project was defined as the infectious waste only.

##### a. Workshop (7, 8, y 9, June, 2006)

Workshops were conducted for doctors, nurses, and cleansing personnel. Two days (June 7 and 9) were assigned for doctors and nurses; meanwhile, on the 8<sup>th</sup> of June, cleansing personnel was trained. Generally, training for cleansing personnel should be simpler and dominated by images because it is estimated that cleansing personnel has low scholastic level; illiteracy reaches approximately 50% in the cleansing personnel.<sup>1</sup>

<sup>1</sup> FONHOSPITAL, Sistema de Gestión y Residuos Hospitalarios y Seguridad Ambiental, Publicación Técnica No. 5, marzo 2002.

To begin the pilot project, it was necessary to let the personnel who works at Ciudad Sanitaria know about the project. There are about 1,500 persons working at Ciudad Sanitaria who were invited to the workshops; workshops were held for 3 days (2 days for nurses and doctors and 1 day for cleansing personnel). The committee and the study team prepared the programs. The training session began by explaining the legal framework of the healthcare waste management, continued with the outline of the pilot project and how to separate the waste were presented. For cleansing personnel, cases of occupational hazards were presented and they received instructions on how to prevent those risk. Members of the committee conducted the presentations; the participants received an outline of the project and mini-posters for categorization. Nurses instructed other nurses on how to separate the waste. At the end of the workshops, problems they were facing were discussed.

#### **b. Procurement of Materials**

In order to achieve an effective separation, materials which meet the Norma were procured. Whenever the Norma was not specific enough, experiences from other countries were consulted and a proposal prepared which should be endorsed by the committee of hospital waste and officers from SESPAS before the proposal was implemented.

##### **b.1 Red Bags**

The Norma only states that the bags should “leak proof”; consequently, other country’s standards were reviewed, several types of bags produced in the country were evaluated, and finally JICA study team and the committee defined the standard for red bags as “Calibre 250” in thickness and 50 liters in size.

##### **b.2 Container for red bags**

The Norma defines the maximum capacity of the container in 100 lts. for dry waste and 50 lts. for wet waste. The container should have rounded joints between wall and bottom; it should also have a tight and secure lid. The Container was selected in accordance to the size of the red bag (40 liters in size) for the Pilot Project. Colour of the container and lid are cream with the logo of bio-hazard. The bright colour makes it easier to identify dirt, and the simplicity in shape is also easy to wash.

##### **b.3 Gallon base**

Empty 1 gallon bottles are already widely used to dispose sharps at hospitals in this country. There are several types of shapes for these bottles; these gallons were originally filled with chlorine or alcohol to disinfect ions, detergents or juices. All of them are materials commonly used at hospitals and they have almost the same in size. The Norma defined the requirements of the containers to dispose sharps which must be leak proof and have rigid walls to prevent damages by sharps.

Consequently since they are easily obtained, it was decided to follow the custom already followed by nurses and to encourage the use of empty bottles to separate sharps. The study team assisted this effort by making “Base de Galon” (see picture) to stabilize the bottle to the wall because in many cases these 1 gallon bottles were put on the floor or tables, they might turned over, and scatter their content (mostly syringes). The “base the galon” was clearly identified with the logo of bio-hazard on the front.



Figure 3-2: Base de Galón

**b.4 Poster**

A Poster to encourage waste separation is placed at the separation points. Nurses as member of the committee drafted the contents to make its content practical and define the name of the materials they commonly use and practice. A simple catch phrase was defined to describe the campaign: “SEPAREMOS” (Let us Separate!!), and it was included on the poster. In addition to the poster which showed the categorization of waste, two (2) outstanding notices were prepared to indicate which containers are for infectious waste (Peligro was shown on the notice) and which container is for common waste (Basura was shown on the notice). All posters are laminated to avoid damages.



Figure 3-3: Poster

### 3.4.2 Internal Collection and transport

In addition to the training workshop on 8th June, the cleansing personnel who are in charge of waste collection were trained daily to follow the most adequate collection routes and schedule; the routes should avoid peak hours and crowded points (specially visitors) as well as avoid critical areas such as kitchen and laundry room. It was prohibited to take a route outside the hospital (Federico Bermudez St. and Federico Velazquez St.). On site training or instruction is necessary for the cleansing personnel who have low scholastic level as it was mentioned previously.

Five (5) pushing carts for internal collection were provided; one for each center (2 for Luis E. Aybar). As the Norm established, the pushing carts shall be closed to prevent leakage from bags, with silent wheel, and stable.

The cleansing personnel received protective gear: uniform, apron, boot, gloves, and mask.

### 3.4.3 Temporal Storage

The Norma establishes that the walls of temporary storage site should be covered with smooth and impermeable material. The facility should have tap water with a minimum pressure of 30 psi<sup>2</sup>, and it should have a wastewater drainage connected to the sewerage.

Two temporary storage sites were constructed: one for common and another for infectious waste which meet the Norma. A meeting with cleansing staff was held before the storage sites began to operate. The meeting was held to inform them about general measures to be observed for their use. These instructions are also included in the Cleansing Staff Manual and were pasted on the doors of the storage sites<sup>2</sup>.

### 3.4.4 External Transport, Treatment, and Final Disposal

The Norma establishes that those who provide Transportation, Treatment, and Disposal of infectious waste should be registered and have permit from SEMARN. The Study Team contracted the only company authorized (Environmental Permit No. DEA-00004-2000) by SEMARN which operates in the National District for this pilot project.

The disposal site at Duquesa has conditioned a cell for infectious waste disposal which is currently used only by hospital Marcelino Vélez Santana from Santo Domingo East. This area is isolated from the sector where municipal waste is disposed; however, this special cell does not meet all requirements by SEMARN yet.

### 3.4.5 Monitoring

Monitoring was conducted by members of the committee with emphasis on separation. Each member of the committee has been assigned specific areas of responsibility to monitor and encourage separation.

The Study Team also monitored randomly several times by using monitoring sheets<sup>3</sup>. These monitoring activities showed the strong and weak points; in general, continuous progress on separation was observed.

Cleaning staff also conducted monitoring focusing on the adequate use of red bags, location of containers, and personnel in charge of internal collection.

<sup>2</sup> See ANEX, Maintenance records and notices for the temporal storage facilities

<sup>3</sup> See ANEX, Chapter 3, The Manual for cleansing personnel

### 3.4.6 Cost

The cost of provided materials for the Pilot Project is shown in the following table.

Table 3-6: Unit Cost obtained in Pilot Project

	Unit Price (RD\$)	Unit	Cost (RD\$)
<b>I Separation</b>			
Containers with logo	243.98	100	24,398.28
Red bag	11.22	13500	151,463.52
Base de Galón	284.20	100	28,420.00
Poster	100.00	200	20,000.00
<b>II Internal Transport</b>			
Pushing cart	24,000.00	5	120,000.00
Uniform	1,657		
<b>III Temporal Storage facility</b>			
1 Storage facility for infectious waste	246,065.04	1	246,065.04
1 Storage facility for common waste	542,266.31	1	542,266.31

Note: Approximately 1US\$= RD\$32 (at September 2006)

### 3.4.7 Workshop for expansion of the Project

The Workshop for expansion of the Project was held on 27 July by SESPAS. All directors of the major hospitals in the National District were invited by SESPAS. At the workshop, the pilot project was introduced by Ciudad Sanitaria and discussed about the problems the hospitals concerns. SESPAS's role on supporting proper management of healthcare waste was confirmed.

## 3.5 Conclusions and Recommendation

### 3.5.1 Conclusions

#### a. Achievement of Expected Results

Expected Results of the Pilot Project are; 1. the staffs of SESPAS obtain the experience and knowledge about management of healthcare waste, and become able to train people in other hospitals, 2. personnel of the target hospital obtain the experience and knowledge of management of healthcare waste and implement and 3. infectious waste is appropriately collected and transported from the hospital, treated and finally disposed at the special cell at the landfill.

From the beginning of the Pilot Project until final, the staff of SESPAS and members of committee were working with the Study Team. Whole process of the Pilot Project was "learning by doing", through the experience, discussed, decided and implemented the management of healthcare waste by following the existing legislations.

At the end of the study period, the staffs of SESPAS began expanding the project to other hospital based on the experience of the Pilot Project, by this fact it can be considered that the first expected result was achieved.

At the target hospital, members of the committee became an important and effective organizational structure to implement the existing legislation. Regarding the personnel of the hospital, the necessity of waste separation was instructed to nurses and doctors, and the result of separation directly became the benefit for the cleansing personnel as the occupational risk was reduced.

The materials for the separation were selected cost effectively from the local market, and utilize the used /reusable at the hospital ( 1 gallon bottle). The containers for red bags, pushing carts, and storage facilities procured during the Pilot Project. By utilizing those materials, an effective separation has begun. During the project pilot approximately 303 Kg/day of waste were collected and treated, which almost represents the total of the calculated infectious waste in Ciudad Sanitaria. It was observed that there was still certain mixture of waste; nevertheless, it has been a remarkable improvement.

The target hospital possesses and operates an incinerator. The use of it was analyzed and decided not to incinerate infectious waste, since the incinerator was not well operated and causing mal-odor with smoke to neighbors and the other hospital. In addition, the incinerator does not have the permission of SEMARN; it was not adequate to use it. By following the legislation and by contracting with a private service provider that has the permission of SEMARN, external system of infectious waste management (collection, transport, treatment and final disposal) was prepared and continually running.

#### **b. Achievements of the Goal and Purpose of the Pilot Project**

The goal of the Pilot Project was that the waste from target hospital is separated correctly. Of them, infectious waste is collected, transported exclusively and finally disposed at a special cell at the landfill site.

As already mentioned above, whole system of management of the healthcare waste was prepared. The Pilot Project became the first system of healthcare waste management in the country.

The necessity of separation is widely known by doctors, nurses, and the cleansing personnel. The cleaning personnel have expressed its greater valuation of the project, specially, the reduction of syringes on the floor was considered as their benefit. And, the contract with the private service provider was succeeded to Ciudad Sanitaria, and continuing of the external system was secured.

### **3.5.2 Recommendations**

In general, the Norm can be in practice. Nevertheless, some articles of the Norm need to be evaluated if it's need to be defined more in detail, for example, a) the frequency to wash the containers. Because a daily washing can not be practical for the big hospitals, b) Definition of the conditions of refrigeration in the storage, and c) Definition of the standard size of the bags and the containers, recommend 3 sizes of containers

It's necessary to give the instruction of handling healthcare waste for intern trainees and the nurses newly come to the hospital. And, the cleansing personnel are working at high risk, therefore they must be able to read the instructions and follow it. It is recommended to choose the person who finished the primary school at least, in case of new hiring. In addition, the payment of this type of work must be in proportion to its degree of risk.

It is necessary to promote the minimization like following step. For this intention, it is needed to review the strategic location of the separation points (The less containers is better, for easier and safe handling of the waste, based on the volume of generation of each place). The "nurse station" will be suitable point of separation.

Healthcare management, especially financial aspects, should be evaluated under polluter pays principle and, mainly, precautionary principle (if waste is mixed then all the waste should be considered as infectious). Additionally, in healthcare management the principle of «doing something is better than doing nothing» is important and underlies any effort to initiate a system for the management of healthcare waste, i.e., shortcomings in some type of resources should not mean inaction.<sup>4</sup>

To expand the experience of the pilot project, it can be followed according to the action plan.

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<sup>4</sup> [http://www.healthcarewaste.org/en/130\\_hcw\\_intagreemts.html](http://www.healthcarewaste.org/en/130_hcw_intagreemts.html)

# Chapter 4

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*Action Plan  
of Healthcare Waste Management*



## 4 Action Plan of Healthcare Waste Management

### 4.1 Description of the Action Plan

#### 4.1.1 Outline

##### a. Basic Concept

The country has enough legal instruments which define what and by whom proper healthcare waste management should be conducted. Therefore, the Action Plan proposes as a basic concept:

***“To comply with the existing legislations.”***

Healthcare centers have full responsibility of waste generated by them, even if the waste is transported, treated and disposed of by others such as the private sector.

SESPAS has to instruct and oversee the healthcare centers; especially, those centers which are part of SESPAS system in order that the law is complied by them.

SEMARN has to instruct and oversee the healthcare centers and waste service providers, especially the activities outside the healthcare centers in order that the law is complied by them.

ADN has to collect and dispose of non-hazardous waste directly or by contracting private waste service providers. ADN does not legally have any jurisdiction over the hazardous waste.

Waste service providers, either private or public, can transport, treat and dispose of hazardous waste as long as they have a permit issued and overseen by SEMARN.

Relation of the organizations for complying with the legislations is schematized in the following figure.

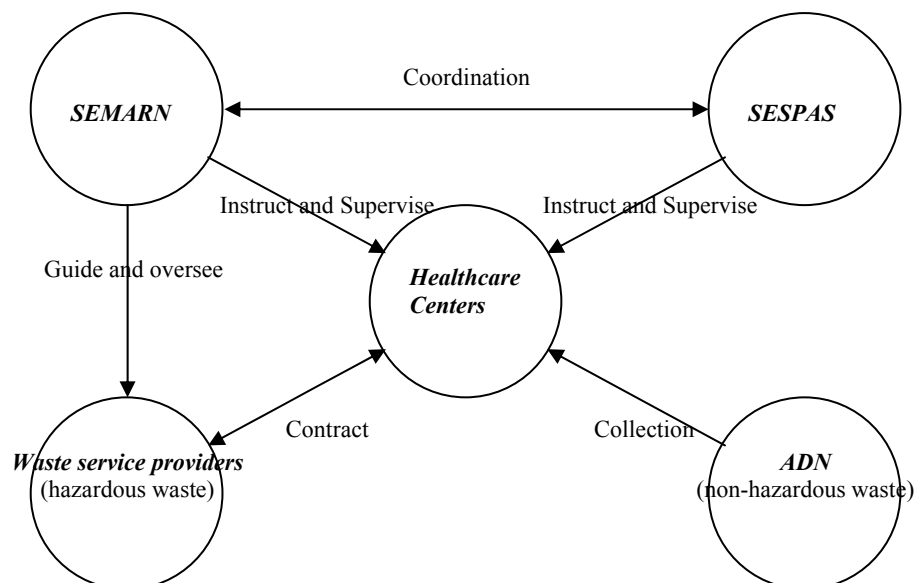


Figure 4-1: Relation of the Organizations concerned with the Healthcare Waste Management

**b. Objective**

Objective of the Action Plan is:

***“To promote proper management of healthcare waste in order to reduce health hazard to healthcare workers, patients, waste management workers and citizens in general in the National District and to protect their environment.”***

**c. Targets**

**c.1 Target Healthcare Institutions**

The Scopes of the Action Plan includes the health establishments of both public and private that are from Level I until Level III in the National District.

The levels are defined in correspondence with the Proposal of Healthcare waste Regulation prepared by SESPAS.

**Level I:** Hospitals of external consultation and smaller veterinaries. Clinical laboratories that carry out from 1 to 20 analysis per day. Odontological centers of 1 to 20 patients per day.

**Level II:** Health Centers that have from 1 to 20 beds. Clinical laboratories that carry out from 21 to 100 analysis per day. Odontological centers with more than 21 to 100 patient per day. Veterinary centers that manage from 1 to 20 animals per day.

Note: There is a breach without defining those establishments among 20 and 50 beds that are categorized as Level II for the purposes of the Action Plan.

**Level III:** Health Centers with more than 50 beds. Clinical laboratories that carry out more than 100 analysis per day, laboratories for the biological production, teaching and investigation centers, anthracic centers, veterinary centers that assist more than 50 cases.

Consequently, there are 31 Level III Healthcare centers in the National District, their total number of beds reaches 3,865. Two centers that have less than 50 beds, Unidad de Quemados and Gastroenterology that already began their operation as part of the Ciudad Sanitaria are included as Level III.

**c.2 Target Year**

Target year of this Action Plan is 2015. The period between the current year 2007 and the target year 2015 is divided into three stages, i.e., Phase I from 2007 to 2008, Phase II from 2009 to 2011, Phase III from 2012 to 2015.

**c.3 Target Waste**

According to the “*Norma Ambiental Para la Gestión Integral de Desechos Infecciosos*, Santo Domingo Julio, 2004”, Secretaría de Estado de Medio Ambiente y Recursos Naturales (*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*, Hereinafter referred to as the Norm), waste from the hospitals or other healthcare centers is composed of infectious, special and general waste. Table below shows the category of healthcare waste.

Out of the total amount of hospital waste, a large portion of hazardous healthcare waste in volume is infectious waste and it requires proper management. Special waste is supposed to be treated properly depending on the type of waste, and general waste is collected as

municipal solid waste.

This Action Plan principally deals with the infectious waste. Recommendations are made for the management of the special waste. And the common solid waste is covered with the scope of the Municipal Solid Waste Management of this Study.

Table 4-1: Categories of health-care waste

Infectious Waste	Special Waste	Common Solid Waste (Non hazardous)
-Culture media and samples	-Chemicals	-Recyclables (paper, cardboard, glass, plastics)
-Anatomical Infectious	-Pharmaceutical	-Biodegradable
-Blood and derived products	-Ontological medication	
-Sharps	-Radioactive	
-Animals	-Heavy metals	
-Biosanitary	-Pressurized containers	

Source: The Norm, Art.5

#### d. Goals

The Goal of this Action Plan is that:

***“All healthcare institutions, from Level I to Level III, in the National District will manage healthcare waste properly by 2015.”***

Each stage has a target towards the achievement of the final goal.

Stage	Targets
Phase I (2007 – 2008)	All (31) healthcare institutions of Level III manage healthcare waste properly.
Phase II (2009 – 2011)	All (31) healthcare institutions of Level II manage healthcare waste properly.
Phase III (2012 – 2015)	All (168) healthcare institutions of Level I manage healthcare waste properly.

### 4.1.2 Institutional System

#### a. Legislation

The country has prepared sufficient legal instruments for proper management of healthcare waste. Those are: General Law for Health (La Ley General de Salud), General Law for Environment and Natural Resources (Ley General del Ambiente y Recursos Naturales), General Regulation for Hospitals (Reglamento General de Hospitales), Norm for Environmental Management and Solid Waste (Norma para la Gestión Ambiental de Residuos Sólidos) and Environmental Norm for Integrated Infectious Waste Management (Norma Ambiental para la Gestión Integral de Desechos Infecciosos).

General Law 64-00 of the Environment and Natural Resources and General Law 42-01 of Health establishment state that the SEMARN is the competent organization for hazardous waste management. However, SESPAS is equally competent regarding Hazardous Waste management for Healthcare centers, specially, in the internal management for these hazardous wastes, considering that any aspect related with the health establishments corresponds to SESPAS.

In addition to the existing legal instruments, SESPAS is preparing Regulation on Healthcare Waste (Reglamento de Residuos Hospitalarios). Meanwhile SEMARN has begun a process to enact an Environmental Norm for Integrated Infectious Waste Management (Norma Ambiental para la Gestión Integral de Desechos Infecciosos).

The existing legal instruments basically describe what and by whom proper healthcare waste management should be conducted. Therefore, this Action Plan recommends complying with the existing legislations and other legislation under preparation.

#### b. Organizations

The main actors are the healthcare centers, SESPAS, SEMARN, ADN, and the private entities as suppliers of hazardous waste management service.

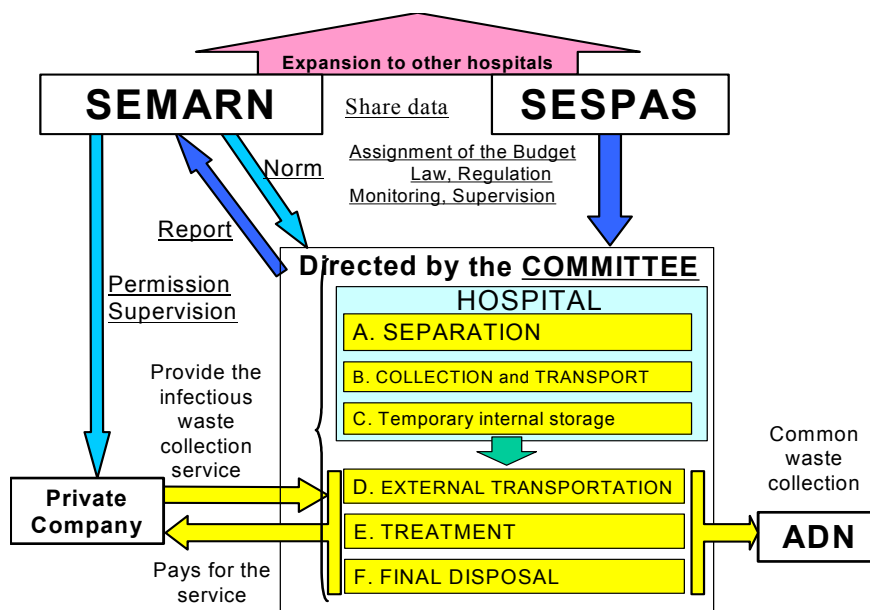


Figure 4-2: Relation of the Organizations related with the Healthcare waste management

### b.1 Healthcare Centers

The healthcare centers have full responsibility of the waste generated, even if the waste is transported, treated, and disposed by others such as the private sector. To manage healthcare waste, a committee for hygiene and healthcare waste management should be established.

Based on the Hospital General Regulation (Decree No. 351-99), CHAPTER XIII HOSPITAL WASTE, ARTICLE 49, a committee for hygiene and hospital waste management should be created. The committee is key to implement and to sustain the appropriate management of the hospital waste.

There is not a definition on who should compose the committee and their responsibilities, consequently, SESPAS, the hospital personnel, and the study team defined the members and responsibilities of the committee during the pilot project, by taking into account the proposal of healthcare waste regulation prepared by SESPAS as it is shown in the table below.

Table 4-2: Members of the Committee and their Responsibilities

Position	Roles and responsibilities
Director , Presidente	Coordinate the committee, allocate the budget for materials (bags, containers, transportation, etc.), and assemble members for the meetings.
Epidemiologist	Record statistic data of diseases and accidents, and coordinate the plan of education and monitoring
Chief of Nurse Chief of Laboratory Chief of Surgery center	Education, Monitoring
Chief of cleansing and maintenance personnel	Education and supervise to the cleansing personnel calculate the use of materials and apply them to the administrator, give advise for planning of education and monitoring
Chief of administrator	Review the application of materials from cleansing dept. process and apply to the director. Distribute those materials purchased (bags, containers, etc.)

### b.2 SESPAS

#### b.2.1 Establishment of a Task Force

It is recommended that SESPAS structures an administrative unit to conduct the training and monitoring of hazardous waste management in healthcare centers and SEMARN regulates and controls the collection, transport, treatment and final disposition activities of the hazardous waste outside of the Health centers.

Table 4-3: Members of the Task Force and their Functions

Department	Responsibilities
Occupational Health Department under the Environmental Health Directorate SESPAS	To plan the expansion, leader of the Task Force
Environmental Risk Unit under the Occupational Health Department (SESPAS)	To promote the creation of a committee inside each hospital, beginning mainly with the hospitals prioritized by SESPAS. To provide information and supervise the private hospitals.
Occupational Health Department under the Occupational Health Department (SESPAS)	To collect and manage the necessary information/data of the hospital (location, number of beds, external consults, premature quantity of generated waste, etc.), share the information with SEMARN.

Local Health Level of the Environmental Health Unit (Areas IV, V, and VI of SESPAS in the National District)	To assist the hospitals in their daily activity.
Solid Waste Unit under the Basic Sanitation Department (SESPAS)	To coordinate with the municipality or the private contractor authorized by the municipality the differentiated collection of common waste in the health establishments, preferably daily. Also, it will confirm that the separation is being carried out in an effective way verifying especially the temporary storage site for non-infectious waste.
Environmental Quality Directorate SEMARN	To issue permits to the suppliers of the private sector and supervise their current operations. To exchange information and data with SESPAS with respect to the environmental suppliers. <sup>1</sup>

**b.2.2 Utilization of the Existing Structure**

SESPAS has an organization structure over the country, i.e., National Level, Regional Level, Provincial Level, Municipal Level and Local Level. This structure should be fully utilized to conduct activities of the Action Plan. It is recommended to assign tasks to each level as follows.

**b.3 SEMARN**

The main function of the SEMARN in the hospital waste management is to supervise every aspect related to the infectious waste and any hazardous waste in general; additionally, SEMARN should provide technical support to SESPAS to the extend that it is required.

In accordance with the legislation, every healthcare center is required to inform SEMARN about its location and type of operation, taking into consideration that they have potential to generate hazardous waste. Also, any entity that manages infectious/hazardous waste must obtain a permit from SEMARN to operate.

To implement the Action Plan, SEMARN’s role will be the following; especially, it’s anticipated an active participation in the operation of the task force.

- Data management about the location of the hospitals with SESPAS with the purpose of exchanging information on where and how much waste is generated by hospital.
- To issue permits to private entities that work in the collection, treatment, and/or disposal of infectious/hazardous waste and to supervise them.
- To share information/data of the private entities working with infectious waste with SESPAS; for example, updating the list of companies every 3 or 6 months, so that SESPAS can distribute them to clinics and hospitals.
- To give technical support to SESPAS for the systems of infectious and hazardous materials management taking into account their experience in control and prevention of contamination and according to what the legislation establishes.

**b.4 Waste Service Providers**

Participation of the private sector in the healthcare waste management is essential to establish a system outside hospitals, i.e., transport, treatment and final disposal. In order to promote the

<sup>1</sup> Norma para la Gestión Integral de Desechos Infecciosos, Título V, Capítulo I, Art. 36

participation of the private, a secure market that has a certain scale and is well organized has to be developed.

Competition, transparency and accountability are keys for successful participation of the private sector in the healthcare waste management. SESPAS and SEMARN are to guide healthcare institutions to comply with the legislations so as to expand the market and to make it credible. Then, such market attracts the private sector and the market becomes competitive. Supervision of waste service providers is basically responsibility of SEMARN which should strengthen its capacity to supervise in order to increase transparency and accountability of the healthcare waste management system.

#### **b.5 ADN**

Although ADN does not have legal responsibility on the hazardous waste, it has to elaborate a program to collect and dispose of common waste generated from healthcare institutions. Large scale of healthcare institutions, such as Level III, generate considerable amount of common waste which has to be collected every day to prevent the degradation of sanitary conditions of healthcare centers where citizens come to recover their health.

It is recommended that ADN assigns enough personnel to collect common waste generated from healthcare institutions of Level III. The personnel should ensure collection as well as to check if the waste is mixed with hazardous waste. If the waste includes hazardous waste, the personnel should inform the healthcare center, SESPAS and SEMARN; they should refuse to collect such waste.

#### **c. International agreements and Principles**

The World Health Organization (WHO) suggests that the Hospital waste management is based on two international agreements and four principles.

##### **c.1 Two International Agreements**

###### **c.1.1 Basel Convention**

The main goal of the Basel Convention is “environmentally sound management (ESM)”, the aim of which is to protect human health and the environment by minimizing hazardous waste production whenever possible. The Dominican Republic signed this Convention in the year 2000.

###### **c.1.2 The Stockholm Convention on Persistent Organic Pollutants**

This Convention is a global treaty to protect human health and the environment from persistent organic pollutants (POPs). POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife. The Dominican Republic signed this Convention in the year 2001.

##### **c.2 Four Principles**

###### **c.2.1 Duty of care principle**

The principle specifies that any organization that generates waste has a **duty to dispose of the waste safely**.

###### **c.2.2 Polluter pays principle**

This principle establishes that **waste producers are legally and financially responsible for the safe handling and environmentally sound disposal of the waste they produce**.

**c.2.3 Precautionary principle**

A principle that defines that **one must always assume that waste is hazardous until shown to be safe**. It means that if there is uncertainty due to limitations of the science, data, or resources, what the hazard may be, it is important to take all the necessary precautions.

**c.2.4 Principle of Proximity**

This principle recommends that **treatment and disposal of hazardous waste take place at the closest possible location to its source** in order to minimize the risks involved in its transport.



### 4.1.3 Technical System

#### a. Waste Amount

##### a.1 Generation Amount and Discharge Amount

In this Action Plan, generation amount and discharge amount of infectious waste are assumed to be different. Normally, generation amount is not significant compared to common waste. However, discharge amount becomes larger than generation amount due to mixture with common waste. In case that intra-hospital separation is conducted well, discharge amount is small, and vice versa.

The Investigation on Management and Disposal of Biomedical Waste in Healthcare Centers in Santo Domingo and San Cristóbal elaborated by SEMARN in 2004 defined a generation rate of infectious waste of 0.78 kg/bed/day. However, the reality showed that the discharged quantity (after the separation in the hospitals) was of 1.33 times more than the estimated, according to the weight record obtained during the pilot project. Therefore, the Action Plan assumes a generation rate and a discharge rate in the following way:

$$\text{Generation amount} = (\text{Nos. of bed}) \times (0.78 \text{ kg/bed/day})$$

$$\text{Discharge amount} = (\text{Nos. of bed}) \times (0.78 \text{ kg/bed/day}) \times (\text{coefficient } 1.33)$$

As the intra-hospital separation is practiced, the coefficient will become lower. The Action Plan recommends recording waste amount continuously in each hospital as one of activities of management.

##### a.2 Increase Rate

It is assumed in this Action Plan that total waste amount will increase along with number of population, 1.425% per year.

##### a.3 Waste Amount

Generation amount, discharge amount and targeted discharge amount in each year are shown in the table below.

Table 4-4: Waste Amount of the target year (ton/day)

Year	Amount Potentially Generate				Target Amount to be Separated			
	Level	Levell	Levelll	Total	Level	Levell	Levelll	Total
2006	0.17	0.64	4.01	4.82				
2007	0.17	0.65	4.07	4.89			2.44	2.44
2008	0.17	0.66	4.12	4.95			4.12	4.12
2009	0.18	0.67	4.18	5.03		0.2	4.18	4.38
2010	0.18	0.68	4.24	5.1		0.41	4.24	4.65
2011	0.18	0.69	4.3	5.17		0.69	4.3	4.99
2012	0.18	0.7	4.36	5.24	0.05	0.7	4.36	5.11
2013	0.19	0.71	4.43	5.33	0.11	0.71	4.43	5.25
2014	0.19	0.72	4.49	5.4	0.17	0.72	4.49	5.38
2015	0.19	0.73	4.55	5.47	0.19	0.73	4.55	5.47

#### b. Intra-hospital Separation

The technical requirements for the separation of the infectious waste inside the hospital should be ruled by the Norma. It can also be used like reference the FONHOSPITAL report "Program of Modernization and Restructuring of the Health Sector, Fonhospital: Hospital

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Waste Administration System and Environmental Security, Technical Publication No.5, Santo Domingo, R.D. March 2002" and WHO (1999) "Safe Management of wastes from health care activities"<sup>2</sup> ("Careful manage of the waste coming from the health care activities").

##### b.1.1 Packing

The containers of the infectious waste are red plastic bags waterproof, and containers/boxes of rigid plastic or of metal for the sharps.

According to the Norm, the containers of the waste coming from the health care are classified in 5 types. See enclosed table.

Table 4-5: Colors, Labeled and Type of containers according to the waste classification

Type/Type of waste	Color	Labeled	Symbol	Type of Container
Infectious Waste	Red	International Symbol of the "Infectious Waste"		Waterproof Bag or container safe against breaks
Sharps	Red	"Sharps waste"		Waterproof containers, rigid walls, plastic or metal against cutting.
Chemical, pharmaceutical and other hazardous waste	Yellow	Depends on the type of waste	Depends on the type of waste	Waterproof plastic bag and/or rigid container depends the case
Radioactive waste	According to the Environmental Management Norm of the Radioactive Waste (NA-DR-001-03)	According to the Environmental Management Norm of the Radioactive Waste (NA-DR-001-03) International Symbol of the radioactive material		According to the Environmental Management Norm of the Radioactive Waste (NA-DR-001-03)
Common Solid Waste	Black	According to the Environmental Management Norm of the Non Hazardous Waste (NA-DR-001-03)	N/A	Plastic bag

Source: The Norm, Article 6.

Requirements of the containers used for the solid waste and management forms according to the Norm:

<sup>2</sup> [http://www.who.int/water\\_sanitation\\_health/medicalwaste/wastemanag/en/](http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/)

*From the Norm....*

*Art.11 The bags that will be used will be waterproof and compatible with the processes proposed for the treatment of the wastes that contain them.*

*Art. 15 Before placing a new bag in the containers, these should be washed with abundant water, detergents, and disinfectant according to the procedures that has established the Secretary of State for Public Health and Social Assistance on the hospital hygiene.*

*Art. 22 The bags and containers will be sealed and transported to the place of transitory storage specifically designed for these purposes, or to the treatment facility in the event of having enabled one inside the establishment.*

*Art. 24 The routes for the internal movement will be planned, signaled and known by the personnel that work in the establishment.*

*Art. 28 The containers (containers or bags) should not be crawl on the floor in any case, but rather they will be moved in the described vehicles.*

The implementation of the pilot project showed that the following practices are effective for the separation:

- It is recommended to use the 1 gallon bottle for sharps.
- It is recommended that the thickness of the red bags should be the same or bigger than 250C (unit of thickness) to prevent any filtration of some contained fluid.
- The containers to place the red bags should be sufficiently strong, of simple form, and clear color in order to carry out a frequent cleaning and any dirt can be identified easily.
- In most of the areas, the waste containers should have lids, although in some surgery rooms, the lids can be inconvenient during the period of great activity during the operations.



Figure 4-3: Pictures of the Infectious Waste Container (The red bag with a container, the base of gallon with a gallon bottle)

##### **b.1.2 Separation in the Consultation/Treatment Room of the External Patient**

A large number of outpatients visit the consultation/treatment room for a short time, the waste they generate need to be classified and disposed in containers. Consequently, the collaboration of the patients is needed and of the medical personnel to discharge the waste in a separate way through clear and simple instructions for the patients and companions. The containers of the common waste should not necessarily be closed with a lid. However, the containers where infectious waste is disposed, such as the cotton with alcohol used to clean the blood after injecting, should be closed for their subsequent isolation. On the other hand, the containers for the sharps (for example the syringes) should be rigid, for example, the empty 1-gallon bottles of detergent or the boxes of medicines or exclusive containers. The quantity of generated waste is little and the container for this establishment should be small approximately of 20 lts.

##### **b.1.3 Separation in the Internal Patient Rooms and in the Consultation Rooms**

Most of the medical consultations are carried out in the rooms of the internal patients and in the room of the external patients. These medical consultations are also made in different places, such as the visits of the doctors and/or nurses. Consequently, the mobile platforms/carts for the medical treatments should be equipped with several containers for the separation of the infectious waste (for example, rigid containers for the sharps, etc.) based on the characteristics that have the platforms/cars.

##### **b.1.4 Separation in the Surgery/Operation Rooms**

The waste generated in the operation/surgery should be classified as medical waste. These infectious wastes should be packed and sealed in the place of the operation/surgery.

The blood and the fluids of the body coming from the operations/surgeries should only be disposed in specific drainages with treatment facilities for wastewater. In case that the medical centers do not have these facilities, wastewater should be considered and controlled as "infectious and pathological waste". A larger amount of infectious waste is generated in a relatively short time; therefore, it is recommended to have a larger bin (50 lts.).

##### **b.1.5 Separation in the laboratories and the blood banks**

The laboratories and the blood banks generate the infectious waste. There are many small generation places in the areas of testing/examine. It is recommended to use small bins (less than 20 lts.) which bags can be disposed later in a waste container of more capacity (between 40 and 50 lts.) for their subsequent transfer to a temporary storage.

Some of the wastes will be classified as "special waste", which should be treated in specific forms defined by the regulations.

##### **b.1.6 Separation in the Isolation Rooms**

The basic practices of the separation of waste in the isolation rooms are the same ones that are carried out in the internal patient rooms. However, the infectious waste of the isolation rooms should be closed immediately and deposited in special containers.

**b.1.7 Internal Movements**

The Internal Movements of the infectious waste require additional precautions, according to what is established in the Norm. See the enclosed articles:

*From the Norm...*

*Art. 26 The vehicles for the internal movement of infectious residuals will be stable, silent, hygienic, of closed and appropriate design for their use and transport to the facilities.*

*Art. 26 Paragraph. The infectious waste will be taken in the same vehicle from the generation source to the location of transitory storage or treatment facilities which are operating inside the establishment, as it is the case.*

*Art. 30 The vehicles used for the internal movement will be disinfected after each collection operation.*

**b.1.8 Storage**

Each hospital should prepare a place inside their facilities exclusively to store the infectious waste. The manners to store waste are specified next:

*From the Norm...*

*Art.31 The place dedicated for the transitory storage of the waste will have separate spaces to store the different types of waste; it will be safe, with limited access to the authorized personnel, and covered, providing this way protection against high temperatures, pH, humidity, climatic conditions, natural disasters and animals. Its capacity will be such that it provides enough space for an accumulation of at least two (2) continuous days.*

*Art. 32 The areas for the transitory storage will be built and/or covered with flat and waterproof materials that allow their cleaning and disinfection in the event of spills, and they will have sanitary facilities, water supply (preferably hot water) under a low minimum pressure of 30 psi<sup>2</sup> (206.8 kPa); they will also have drainage control connected to the wastewater treatment system of the establishment.*

*Art.32 Paragraph. These areas should also be far from windows and ventilation systems toward other areas of the health centers, and provided with means of fires extinction as well as with roads of easy access for the vehicles of internal and external transport.*

*Art. 34 All infectious waste which requires will be kept under refrigeration until the moment of its treatment in situ or its transportation outside of the health establishment to be treated.*

**c. Collection and Transport**

**c.1 Collection and Transport Network**

The healthcare centers of Level III should take measures to transport the infectious waste; They can use their own transport or hire the service. Taking into account that the quantity of waste generated by healthcare center is small, one truck can cover several health establishments. Therefore, the cluster of these health centers taking into account their vicinity is an efficient way to collect and transport waste.

Collection will be conducted point by point to reduce risks in the transportation of waste to a temporary point of transfer.

The participation of micro-companies is not recommended for infectious waste collection because when the environmental and health risks associated with the infectious waste are known, the micro-companies could discharge this waste in no-authorized places. However, it is recommended the participation of micro-companies in the collection of common waste of the health establishments. In any way, any supplier of transport services will have to meet the Norma for the Integral Infectious Waste Management in Title IV.

SESPAS Region-0 covers the complete Santo Domingo Province. Table 1-5 and Table 1-6 show truck requirements for the whole Action Plan and for the Phase I, while the figure below shows the trucks requirements for the Health Areas IV, V, VI in the Region 0 for the final year of Phase I (2008).

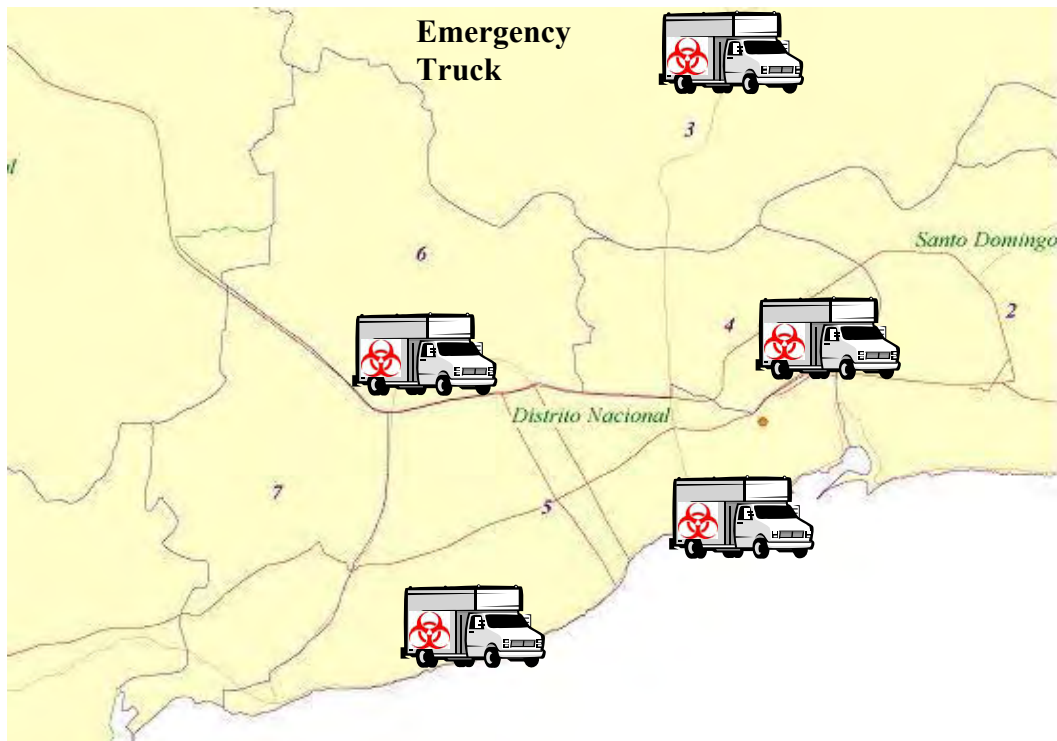


Figure 4-4: Collection and Transport Network Scheme for Final Year of Phase I in the Health Regions IV, V, y VI of Region O (2008)

Table 4-6: Basic Data to Calculate the Trucks

Capacity	20	Drums
	0.2	Cubic meter per drum
Density	103	kg/m <sup>3</sup>
Kg. per trip	412	kg/trip
Trips	3	per day
Amount per Truck	1.24	ton/truck/day

Table 4-7: Truck Requirements for the Action Plan

Phase	Present	Phase I	Phase II	Phase III
Components	2006	2008	2011	2015
Waste Amount(ton/day)	0.303 (0.484)	4.12	4.99	5.47
Operational Trucks	1	4	5	5
Emergency Trucks	1	1	1	1
Total No. of Trucks	2	5	6	6

Table 4-8: Truck Requirements for the Areas IV, V, and VI in Region 0 of Health for Phase I

Phase	Present		Phase I
Components	2006	2007	2008
AreaIV			
Waste Amount (ton/day)	1.16	1.17	1.19
Trucks	1	1	1
AreaV			
Waste Amount (ton/day)	2.26	2.29	2.32
Trucks	2	2	2
AreaVI			
Waste Amount (ton/day)	0.59	0.60	0.61
Trucks	1	1	1

It is suggested to define routes preferably inside each health area of the National District and by Region. In case SESPAS should group and request budget for small establishments; it can be easier to manage it administratively by area in the National District or by Regions at national level. The route should be prepared by the supplier of the service and approved by SEMARN.

#### d. Treatment

##### d.1 Individual vs. Centralized

In total, there are 10 hospitals at national level that have their own incinerator: Hospital San Vicente de Paul in the Duarte County, Hospital Luis Bogaert in Valverde's County, Hospital Pascasio Toribio Piantini in Salcedo, Hospital Jaime Mota in Barahona, also, Hospital Central de las Fuerzas Armadas, Hospital Maternidad Nuestra Señora de Altigracia, Hospital Maternidad los Minas, Hospital Moscoso Puello, Children Hospital Robert Reid Cabral, and the Complex Luis E. Aybar in the National District. These incinerators were obtained through an application carried out by SESPAS in 1999 to the Executive Commission for the Reformation of the Health Sector (CERSS) as part of the Project of Provincial Systems of Health financed by the World Bank and a parallel project financed by the IDB <sup>3</sup>.

In general, the incinerators are not operated appropriately due to deficient instruction of the

<sup>3</sup> Documento de Evaluación del Préstamo Propuesto por la Cantidad de US\$30 millones para la República Dominicana para el Proyecto de Apoyo a la Reforma del Sector Salud en Apoyo a la Primera Fase del Programa de Apoyo a la Reforma de Salud, World Bank, 5 de Junio 2003.

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operators, lack of budget for fuel, large amount of waste treated due to poor separation, etc. For the peculiar case of the Ciudad Sanitaria, they were also complaints from neighbors, personnel of the hospital and patient due to the bad odor and smoke coming from the operation of the incinerator which was the fundamental reason for not using this treatment facility. Consequently, it was decided to contract out the services to a private company during the Pilot Project.

However, the decision on using or not those incinerators for treatment depends on the circumstances of each hospital. It is recommended that SESPAS and SEMARN obtain a decision in this respect from the healthcare establishments that have incinerators. In case of using incinerators, it is necessary to obtain a permit from SEMARN.

The centralized system of treatment is a common measure in big cities due to many reasons: to treat small amount of waste is not economically effective, incinerators in the city usually cause complaints from neighbors, etc. The National District has a high population density and healthcare centers a located close to each other. Therefore, a centralized system is generally recommended for the city, although there is a principle that infectious waste should be treated at the source.

The following table compares the individual and centralized systems for the National District. The results of the comparison show advantages of the centralized system over the individual in view of the "security in the operation", "simplicity in the control/management", and "costs."

Table 4-9: Comparison of Individual and Centralized System

Item	Individual	Centralized
1. Separation in the hospital	Separation at source	Separation at source
2. Collection / Transport	Exclusive Collection/transport (it is relatively safe to transport the treated waste, however, they still need to be managed carefully).	Exclusive Collection/transport (the transport/collection requires an extra care).
3. Treatment	Individualized treatment	Centralized treatment
1) Security in the operation	Able to move away the waste before taking them out of the hospital. In the event of interruption of operation, the untreated infectious waste would require an additional care for their storage and transport. The infectious waste requires in any form an exclusive collection.	It requires storage, a collection and a transport in a careful way until it is treated in the facilities. In case the facilities are out of service, the waste is already stored outside of the hospital and in a sure place next to the facilities.
2) Simplicity in the management/control	Personnel trained to operate the facilities in each hospital costs more than one that operates the complete centralized system. All the hospitals that have these installations need to be monitored.	Able to concentrate on the personnel's training that operates the facilities. It is easier monitor/control an installation.
3) Costs	Assuming that each one of the 31 main hospitals has a small auto-key.	Assuming that each one of the 31 main hospitals has a centralized auto-key.
3.1) Capital Cost (US\$)	$150,000 \times 26 = 3,900,000$	$275,000 \times 1 = 275,000$
3.2) Operation Cost US\$ /day	$0.02 \times 2731.56 = 54.6$	$0.02 \times 2731.56 = 54.6$
4. Final Disposal	In a special cell of the landfill.	In an special cell of the landfill.

#### d.2 Treatment Method

Several treatment technologies have been developed. Among them, incineration and autoclaving are common. The table below compares various treatment technologies. The comparison resulted in the autoclave (hydroclave) is preferable for the National District in views of applicability to various types of waste, capacity, and cost.



Table 4-10: Infectious waste treatment technical options

Technology	Advantage	Disadvantage	Manufacturer/ Technology	Waste Type	Volume reduction	Capacity kg/hr	Treatment cost US\$/kg	Unit Cost 1000US\$
Autoclave (Rotoclave)	Low hazard residue	Not suitable for pathological, No volume reduction, Inadequate for anatomical, pharmaceutical and chemical waste.	Sterilizing the waste.	I	X no volume reduction	102-510	0.12	26-45
Autoclave (Hydroclave)	Suitable most of types of waste, low hazard residue	Inadequate for anatomical, pharmaceutical and chemical waste.	Sterilizing and dehydrate the waste	ISP	o volume reduction	91-1134	0.02	150-275
Microwave	Absence of liquid discharge	Not suitable for sharps, possible air emission	The waste are being moistened, saturated with hot steam.	IPC	o 80% volume reduction	100-408	0.06-0.12	453-595
Microwave	Absence of liquid discharge	High investment cost, possible air emission,	Some are not suitable for liquid blood and hazardous chemical substances	ISP	o Volume Reduction	n.a.	0.12	3,000
Plasma Pyrolysis	Heat recovery potential	High investment cost	Radiating plasma	ALL	o 90%volume reduction	750lbs/hour	n.a.	600-1,000
Small incinerator	Small investment cost	Public opposition, Air & ash may be hazard, Not suitable for the dense urban city, Bottom and fly ash may be hazard,	Manual Loading, de-ashing, one combustion chamber, without flue-gas cleaning	ALL	o Volume reduction	50kg/day =6kg/hour	n.a.	20
Incineration		High investment cost, Public opposition, Bottom and fly ash may be hazard	Mechanical/Automatic loading, >1000C, with/without flue-gas cleaning and emission monitoring	ALL	o Volume reduction	100-400	n.a.	400-1,700

\*I=infectious waste, P=pathological waste, S=sharps, C=Chemotherapy waste

Source: Waste Prevention Association "3R", *Medical Waste Treatment Technologies-Alternatives to Incineration*. WHO (1999), *Safe management of wastes from health-care activities*. Health Care Without Harm (2001), Non-incineration medical waste treatment technologies. <http://www.hydroclave.com/tech.html>. WNW International. Inc, *Emerging Technologies for the Treatment of Medical Waste, Consideration for the Commonwealth of Dominica*.

### **d.3 Recommended Treatment System**

Taking into account the discussions above, this Action Plan recommends the following treatment system in each stage.

#### **Phase I Stage (2006 - 2008)**

This is a transition period from the individual system to the centralized one. Hospitals having incinerators should decide if they use those continuously or not, taking into account its convenience, nuisance, expenditure and remaining service life. Once it is decided to use incinerator, a permit has to be obtained from SEMARN.

Currently, one private company, Alianza Innovadora de Servicios Ambientales, has a permit from SEMARN for transporting and treating infectious waste, although their main business is to deal with waste generated by ships coming from abroad. According to them, they have a capacity of about 35m<sup>3</sup>/day (about 3.6 ton/day) for treating infectious waste.

#### **Phase II (2009 – 2011)**

A centralized treatment system is to be established. Autoclaving (Hydroclaving) is recommendable, however, incineration is also acceptable if it complies with legislations and economically reasonable.

#### **Phase III (2012 – 2015)**

Continuously, the centralized treatment system is to be operated.

### **e. Final Disposal**

According to the Norm, the minimum requirements for infectious waste disposal are three: to prevent open dump, to dispose them separately from the general waste, and norms and technical specifications from SEMARN should be followed.

Besides these requirements, we recommend for the 1st stage of the plan (2006-2008) that the special cell should be surrounded by a trench and a fence should be prepared in the exclusive place for infectious waste. According to the following figure, the security fence should be prepared to protect the waste pickers from the polluted waste and prevent that someone come closer to the area without being noticed. The trench serves to prevent surface water (rain water) from entering into the compartment. The waste should be covered with soil in order to prevent animals from scattering and spreading pollution.

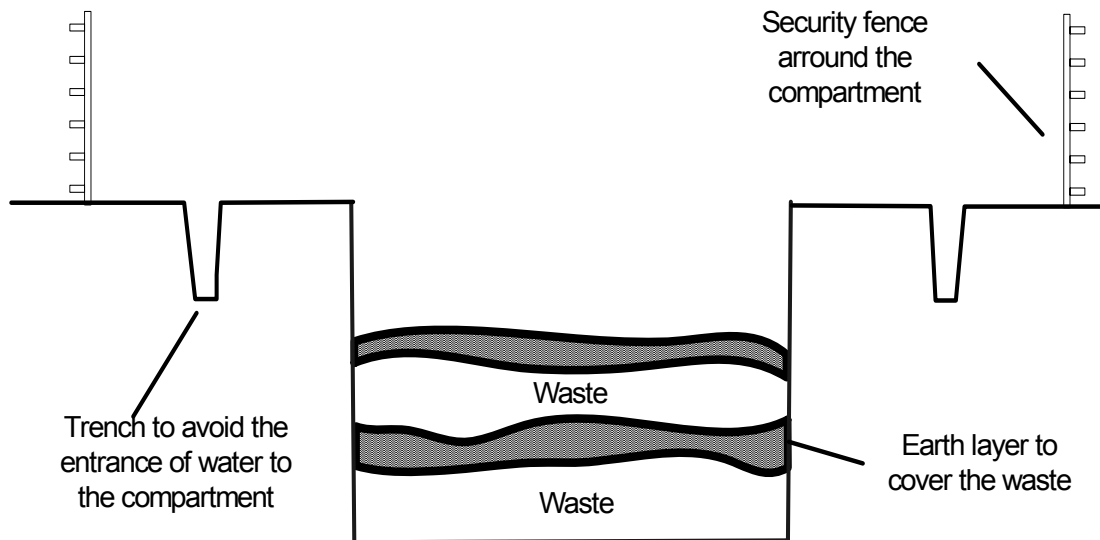


Figure 4-5: Example of a Tentative Compartment for the Infectious Waste

For the 2nd Phase of the plan, the final disposal site of the solid waste should be located in the new landfill. Taking in consideration the place and the environment that surrounds it, the special cell should satisfy completely the regulations and the norms defined by SEMARN.

#### e.1 Others

##### e.1.1 Special Waste

The chemical, pharmacists and other special waste are not infectious waste. It is necessary to follow the respective regulations or Norms.

There is the norm for radioactive waste management as shown below.

*From the Norm...*

Art.10 The radioactive waste included in this classification will meet what is established in the Norm for the Environmental Radioactive Waste Management (NA-DR-001-03) and the other sub-classifications inside the special waste are guided by the regulation related with substances and hazardous waste.

##### e.1.2 Treatments in the House

In recent years, treatments carried out in the patients' home have become popular. Most of the wastes generated from in-house treatment are: blood (for example, patient in hem dialysis equipped with machines); incontinence pads; dressings, or syringe and hypodermic needles (for example the diabetic patients). If there are not appropriate instructions, those infectious wastes will be discharged jointly with the common waste. As the volume of the infectious waste generated in the patient's house is very low, the medical institutions in charge of following these treatments should show the patient or their assistant how to store the infectious waste temporarily in a specific container in the house with the purpose to prevent mixing it with the common waste. A special container for sharps (such as the hypodermic needles) should be supplied by the medical institutions. After a specific time the containers should be given to the medical institutions.

4.1.4 Preliminary Cost Estimate

Table 4-11: Basic data to formulate the A/P

Basic Data		
Incremental growth	1.425	
Potential generation	0.78	kg/bed
Separation factor	1.33	
Generation of small est.	1	kg/est/day

Table 4-12: Basic Costs to Formulate the A/P

Basic Costs			
Separation	295.53	US\$/ton	
Treatment y Transport	376.71	US\$/ton	
Disposal	10.61	US\$/ton	Phase I and Phase II
Disposal	21.21	US\$/ton	Phase III

Table 4-13: Action Plan by Phases

AP 1											
Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	US\$/ton
Intra-hospital separation	263	445	473	502	538	552	566	580	590	4,509	
Transport & Treatment	335	567	603	639	686	704	721	739	753	5,747	
Disposal	2	3	17	18	19	20	20	21	21	141	
Administration 10%	60	102	109	116	124	128	131	134	136	1,040	
<b>Total</b>	<b>660</b>	<b>1,117</b>	<b>1,202</b>	<b>1,275</b>	<b>1,367</b>	<b>1,404</b>	<b>1,438</b>	<b>1,474</b>	<b>1,500</b>	<b>11,437</b>	<b>750</b>
AP 2											
Item	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total	US\$/ton
Intra-hospital separation	263	445	473	502	538	552	566	580	590	4,509	
Transport & Treatment	335	567	603	639	686	704	721	739	753	5,747	
Disposal	2	3	17	18	19	40	41	42	42	224	
Administration 10%	60	102	109	116	124	130	133	136	139	1,049	
<b>Total</b>	<b>660</b>	<b>1,117</b>	<b>1,202</b>	<b>1,275</b>	<b>1,367</b>	<b>1,426</b>	<b>1,461</b>	<b>1,497</b>	<b>1,524</b>	<b>11,529</b>	<b>756</b>

Note: AP 1 establishes the cost only for the use of Duquesa for the different phases.  
 AP 2 establishes the cost only for the use of Duquesa until 2011 and then for the use of the new landfill.

4.1.5 Waste stream

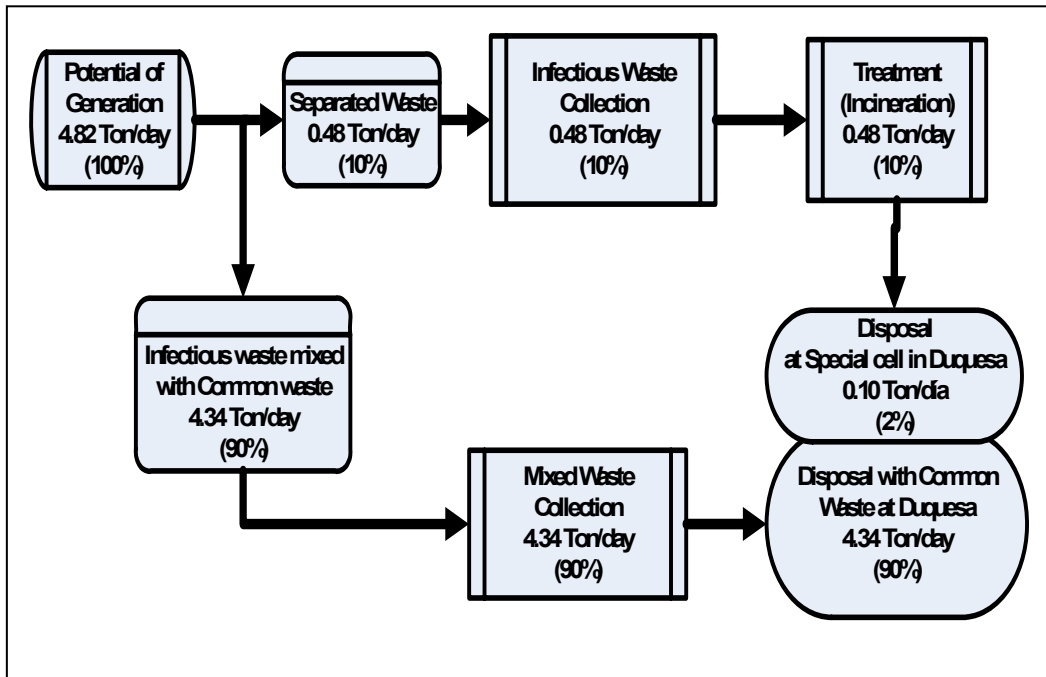


Figure 4-6: Actual Waste Stream (2006)

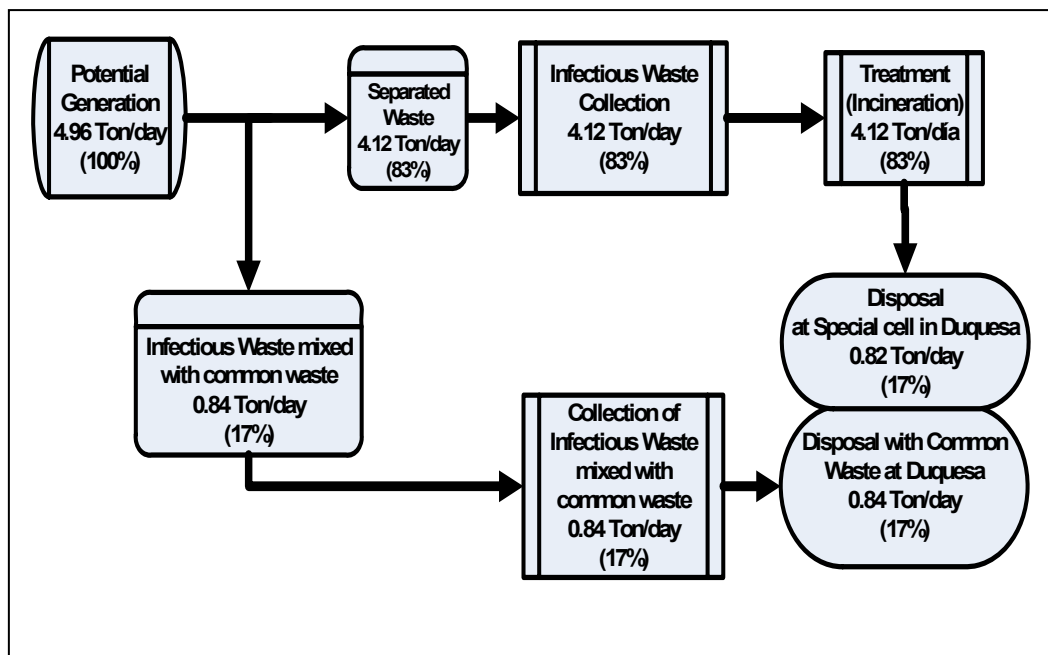


Figure 4-7: Waste Stream Phase I (2008)

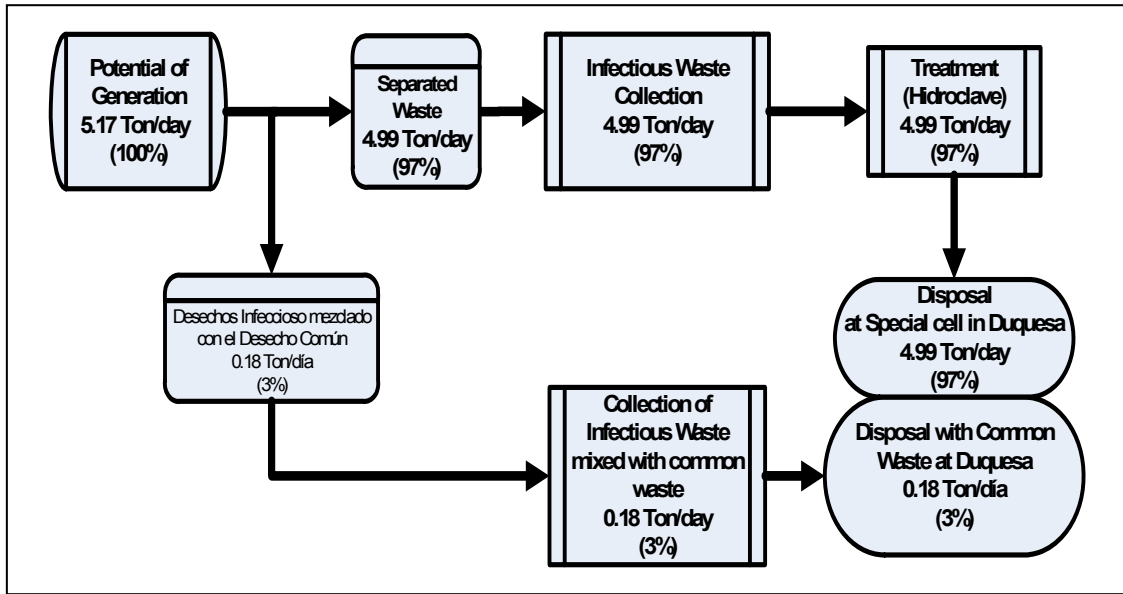


Figure 4-8: Waste stream Phase II (2011)

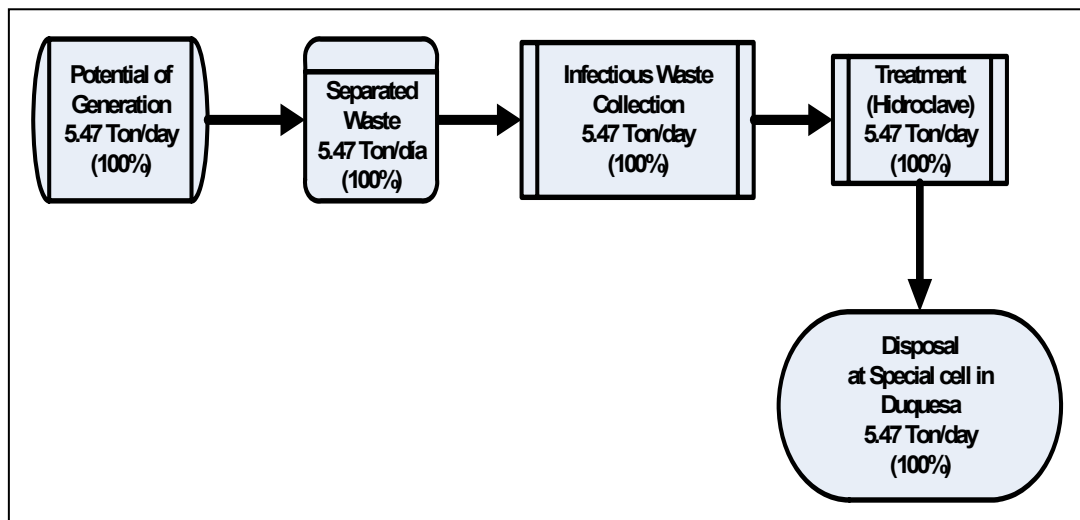


Figure 4-9: Waste Stream Phase III (2015)

## 4.2 Action Program

This chapter describes the actions to be taken in Phases of the Action Plan.

The action program will follow the following main guides:

- a. A region or action area is defined in agreement with a region or administrative area of SESPAS if possible.**

The purpose is to establish external capacities (transport, treatment, and disposition) where there is none in the region or area, as well as to strengthen and organize the existing human resource of Environmental Health from SESPAS at local Level. It will be evaluated together with SEMARN the existing external capacity and alternatives suggested previous to the implementation.

- b. To begin with the hospitals prioritized by SESPAS in each region or area.**

The purpose is to establish the basic conditions (especially external capacities and local human resource of SESPAS) and necessary through initial management by SESPAS in their prioritized hospitals; consequently, these pre-conditions can be available subsequently for other centers both publics and private in the action area.

- c. The program is expanded toward the private clinics and other public establishments of Level III inside the region or action area.**

Making use of the initial capacities established by means of the implementation of the program in the SESPAS hospitals prioritized, SESPAS will proceed to expand the program to private clinics and other public establishments of Level III. The main function of SESPAS will be informative toward the private clinics and, jointly with the Qualification Department, it will sanction to the clinics that fail the supervision of their Department for third time.

- d. The program is expanded toward the private clinics and other public establishments of Level II inside the region or action area.**

External capacities will be verified (transport, treatment, and disposition) jointly with SEMARN; additionally, the local human resource will be confirmed and trained prior to the expansion.

- e. The program is expanded toward the private clinics and other public establishments of Level I inside the region or action area.**

The external capacity will be verified (transport, treatment, and disposition) together with SEMARN. For the peculiar case of Level I, alternative disposal on-site should be evaluated, especially for the area VI with semi-rural characteristics. Additionally, the local human resource will be confirmed and trained prior to the expansion.

Some small laboratories and brood banks might not be taken into consideration as institutions of Level I. ADN together with SESPAS and SEMARN once again shall identify those institutions and should involve them in the action plan.

4. Action Plan of Healthcare Waste Management

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**4.3 Program for the Implementation of the Action Plan**

Implementation by Phases	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Phase I (31 Center of Level III)										
Expansion Area IV		■	■							
Expansion Area V		■	■							
Expansion Area VI			■							
Phase II (31 Center of Level II)				■	■	■				
Phase II (168 Centers of Level I)							■	■	■	■



## 4.4 Program of Phase I:

### 4.4.1 Target Hospitals

Table 4-14: List of the Target Hospitals for Phase I

Area IV					
No	Name	BEDS	Institution	Daily Generation Potential in Kg (0.78 kg/bed x 1.33 (SF))	Volume (m <sup>3</sup> )
1	Salvador B. Gautier	410	IDSS	425.33	4.13
2	Luis E. Aybar	220	SESPAS	228.23	2.22
3	Francisco Moscoso Puello	174	SESPAS	180.51	1.75
4	Del Billetero	110	IDSS	114.11	1.11
5	Centro Clínico Las Mercedes CxA	60	Private	62.24	0.60
6	Clínica Dr Cruz Jiminian	54	Private	56.02	0.54
7	C M Alcántara y González	50	Private	51.87	0.50
8	Centro de Gastroenterología	28	SESPAS	29.05	0.28
9	Unidad de Quemados	10	SESPAS	10.37	0.10
Sub-Total No. of Beds		1116		1157.74	11.24
Area V					
No.	Name	BEDS			
10	Infantil Robert Reid Cabral	350	SESPAS	363.09	3.53
11	Maternidad Nuestra Sra. de la Altigracia	300	SESPAS	311.22	3.02
12	Central de las FF.AA	250	ISSFAPOL	259.35	2.52
13	C M de la UCE	150	Private	155.61	1.51
14	Padre Billini	130	SESPAS	134.86	1.31
15	Hospital De la Mujer Dominicana	125	IDSS	129.68	1.26
16	Instituto de Oncología Dr. Heriberto Pieter	122	SESPAS/Other	126.56	1.23
17	Clínica Dr Rodríguez Santos CxA	100	Private	103.74	1.01
18	Clínica Independencia	100	Private	103.74	1.01
19	Seguro Médico para Maestros (SEMMA)	81	Private	84.03	0.82
20	Clínica Gómez Patiño	78	Private	80.92	0.79
21	Clínica Abreu	62	Private	64.32	0.62
22	Centro de Obstetricia y Ginecología	60	Private	62.24	0.60
23	Instituto de Maternidad San Rafael	57	Private	59.13	0.57
24	C M Dominicano	56	Private	58.09	0.56
25	Clínica Abel González	56	Private	58.09	0.56
26	C M Dr Betances	51	Private	52.91	0.51
27	Centro de Otorrinolaringología y Especialidades	50	Private	51.87	0.50
Sub-Total No. of Beds		2178		2259.46	21.94
Area VI					
No.	Name	BEDS			
28	Plaza de la Salud	301	SESPAS/Other	312.26	3.03
29	Inst. Nac.de Diabetes, Endocrinología y Nutrición	110	SESPAS/Other	114.11	1.11
30	Infantil Nac. de Enf. Resp. Santo Socorro	100	SESPAS	103.74	1.01
31	Instituto Dominicano de Cardiología	60	SESPAS/Other	62.24	0.60
Sub-Total No. of Beds		571		592.36	5.75
Grand Total Area IV, V, and VI		3865		4009.55	38.93

Source: Basic Sanitation Department, SESPAS

Note: Density used to calculate volume is 103 kg/m<sup>3</sup> which was obtained in the Pilot Project

### 4.4.2 Expansion Región-0 SESPAS or National District

#### a. Area IV

The National District (Region R-0 of SESPAS) consists of 3 areas: area IV, V, and VI. The Pilot Project was carried out in the area IV, in Ciudad Sanitaria Luis E. Aybar. It was confirmed that the external capacity of the company authorized to transport and treat infectious waste is of 35 m<sup>3</sup>; this capacity is sufficient to satisfy the treatment demand of Area IV for the establishments of Level III which can reach up to 11 m<sup>3</sup>.

Also, the Pilot Project was good to work together and confirm the capacity the human resource of the area IV. These preconditions defined that it is viable the expansion of the pilot project to other hospital prioritized inside the area IV (Hospital Moscoso Puello) and subsequently include the rest of the healthcare centers of Level III in the same area.

**b. Area V**

The demand of the external capacity (treatment and transport) in the Area V is approximately of 22 m<sup>3</sup> which added to the demand of the Area IV reaches 33 m<sup>3</sup> and it is almost similar to the installed capacity of the only authorized company (35 m<sup>3</sup>). Therefore, it is suggested that in the first trimester of the 2007 the expansion plans of the only company that provides the service in the National District sector are verified and an updated listing to SEMARN should be requested of companies that provide this service in case they have authorized new ones.

In the area V there are three prioritized establishments: Hospital Padre Billini, Hospital Robert Reid Cabral, and Hospital Nuestra Señora de la Altagracia, it is recommended to expand the program in that same order. The experience in the Hospital Padre Billini will be used to confirm and to qualify the local personnel of SESPAS who will work in the expansion of the hospitals prioritized and in the rest of the hospitals of Level III of the area V.

**c. Area VI**

The demand of external capacity (treatment and transport) in the Area VI are approximately 6 m<sup>3</sup> that added to the demand of the Area IV (11 m<sup>3</sup>) and Area V (22 m<sup>3</sup>) surpasses the installed capacity of the only authorized company (35 m<sup>3</sup>). Therefore, it is suggested that in the last trimester of the 2007 the plans of expansion of the only company that provides the service in the National District sector are verified and an updated listing to SEMARN should be requested of companies that provide this service in case they have authorized new ones.

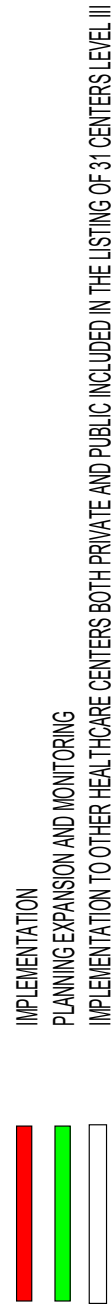
In the area VI there are two prioritized establishments: Hospital Santo Socorro and Hospital General Materno Infantil Plaza de la Salud. It is recommended to expand the program in that same order. The experience in the Hospital Santo Socorro will be used to confirm and to qualify the local personnel of SESPAS that will work in the expansion of the hospitals prioritized and in the rest of the hospitals of Level III of the area VI.

**4.4.3 Activities and Chronogram of the Action Plan**

The activities and program of the Action Plan are presented in the following table.

**Table 4-15: Action Program Phase I (2006-2008)**

R/O	aug-06	sep-06	oct-06	nov-06	dec-06	jan-7	feb-07	mar-07	apr-07	may-07	jun-07	jul-07	aug-07	sep-07	oct-07	nov-07	dec-07	jan-08	feb-08	mar-08	apr-08	may-08	jun-08	jul-08	aug-08	sep-08	oct-08	nov-08	dec-08	
AREA IV																														
HOSP. LUIS E. AYBAR (MORGAN)																														
HOSP. FCO. MOSCOSO PUELO																														
EXPANSION HACIA OTROS CENTROS NIVEL III																														
AREA V																														
HOSP. PADRE BILLINI																														
HOSP. ROBERT REID CABRAL																														
HOSP. MAT. Ntra. Sta. De la ALTAGRACIA																														
EXPANSION HACIA OTROS CENTROS NIVEL III																														
AREA VI																														
HOSP. SANTO SOCORRO																														
HOSP. GRAL. MAT INF. PLAZA de la SALUD																														
EXPANSION HACIA OTROS CENTROS NIVEL III																														



# Chapter 5

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*Evaluation*

## 5 Evaluation

### 5.1 Institutional Evaluation

There is sufficient legislation for proper management of healthcare waste in the country. In addition, SESPAS is preparing Regulation on Hospital Waste (Reglamento de Residuos Hospitalarios).

Institutionally, there are major actors for the healthcare waste management; Hospitals, SESPAS, SEMARN and Private Service provider.

In SESPAS and SEMARN, there are certain post/department that in charge of managing the healthcare waste. It should be taken into consideration to allocate more resources in those areas; especially personnel to attend the task of enforcing the law by supporting the hospital enable to manage their waste. Also, SESPAS and SEMARN shall be able to let the private service provider under their supervision and monitor the performance and quality of service.

At the hospital, the significance role of the committee of hygiene and hospital waste management which is obliged to be established by law was proved through implementation of the Pilot Project. The committee will be the key to improve the healthcare waste management at the upstream, i.e. waste separation.

### 5.2 Technical Evaluation

Technical specifications are defined in the Norm of Ministry of Environment and Natural Resources.

As for waste separation, the containers for the bags can be easily obtained at the local market, The current practice to reuse gallons to separate sharps is evaluated adequate; the “base de galón” is an important and simple feature which can be produced by local blacksmiths. Red bags with the specifications (caliber 250) can also be procured by local manufacturers. Posters for instructions are simple and easy to reproduce. Those materials were used in the Pilot Project and showed effectiveness.

As for internal collection, SESPAS’s personnel will instruct the most adequate internal route to be followed to cleansing personnel. The pushing carts designed for the Pilot Project and proposed for the A/P is simple and can be made by local blacksmiths.

Referring the international standard and through the discussion with SESPAS and the study team, refrigeration was not employed for the Pilot Project. In stead of refrigeration, daily collection was applied by contracting the private service provider. The temporal storage was constructed by local contractors with a simple design that can be washed easily to keep ideal sanitary condition. As long as the site is kept clean and disinfected, it seems that the site without refrigeration is more practical from view points of finance and maintenance. To review the specifications in the Norm about refrigeration of temporal storage for infectious waste is recommendable.

In the Pilot Project, a centralized system with incineration was taken, since there is existing only one private service provider for transport and incineration of the waste which has the permission of SEMARN.

According to the legislation, the waste shall be treated before transporting from the healthcare center. Some major hospitals have their own incinerator for waste treatment. However, incinerators are facing a strong public opposition. In fact during the pilot project; the incinerator was not operated properly and had opposition against using it from nearby community.

## 5. Evaluation

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The A/P evaluated individual vs. centralized treatment method, and techniques of treatment (comparison of incineration and autoclaving, the predominant treatment technique). The results of the comparison showed advantages of the centralized and autoclaving system over the individual and incineration in view of the "security in the operation", "simplicity in the control/management", and "costs."

Consequently, the A/P proposed autoclaving and centralized system in future, and to use incineration only for Phase I and, subsequently, to use autoclave. Current treatment method and technique should be assumed as transitional (only for Phase I) and changed for Phase II. However, if SEMARN gives permissions to those individual incinerators' operation at the hospital, the system can be supported under its supervision.

### 5.3 Environmental and Social Considerations

As already described above at the section of Technical evaluation, the issue of environmental and social considerations is also related to the treatment method and final disposal of the waste.

As far as the infectious waste is treated and disposed well based on the A/P, pathogenic pollution to the natural environment at the landfill site will reduce.

Implementation of the Action Plan will also bring the benefit for society in general by reducing the risk of infectious waste exposure.

At the hospitals, implementation of the Action Plan will result in an adequate separation by nurses and doctors. Training to handle infectious waste and appropriate protective equipment for cleansing workers will substantially protect them compared to current practices or non-implementation of the Action Plan.

The design of internal collection routes and adequate handling of infectious waste of the Action Plan will protect patients and visitors. Risk to become infected with a nosocomial disease by the discarded waste will reduce compared to the current situation or non-implementation of the Action Plan.

Proper management of the waste at the hospital will result in protection of the health of neighbors around the hospital.

For municipal waste collection workers, they are facing at their health risk when they handle the waste, as all the waste from the hospital is mixed. By separation of the waste based on the Action Plan, such risk will reduce since they only collect common waste.

Regarding the final disposal of the waste, currently there are a lot of waste pickers working in Duquesa landfill site. They have no choice but to pick up valuables from the waste mixed with infectious waste. The A/P proposed that infectious waste is disposed in a special cell where waste pickers are not able to access and the disposed waste has already been treated. In this way, they will have less risk of the infectious waste.

### 5.4 Financial and Economic Evaluation

The generator is responsible for its adequate disposal of the healthcare waste, that is, it requires financial burden to manage the waste.

The financial evaluation establishes that mixed waste will be considered infectious and its management will cost correspondingly. On the other hand, when separation takes place, common waste management will be regarded as municipal waste.

During the Pilot Project, 303 Kg/day<sup>1</sup> of infectious waste were separated out of a total of 1,394 Kg/day<sup>2</sup> of waste generated in Ciudad Sanitaria. The portion of infectious waste was 22%.

The unit costs for management of infectious and common waste are shown in the following table.

Table 5-1: Unit Cost for Infectious and Common Waste Management (US\$/Ton)

A/P Option	Infectious Waste	Municipal Waste
A P - 1	750	45.88
A P - 2	756	48.91

Cost reduction expected by implementing the A/P is shown in the table below. A 22% of infectious waste is applied to the calculation.

Table 5-2: Cost Reduction Due to Implementation of A/P vs. Non-Implementation

	Cost (USD/Ton)	Cost Reduction
AP 1		
With AP	201	73%
Without AP	750	
AP 2		
With AP	204	73%
Without AP	756	

Due to the limitation of the study, affordability of the cost for the generator was not sufficiently examined. On the other hand, the Ciudad Sanitaria has been purchasing the red bags and succeeded the contract with the private service provider from the study team by their own budget. Also, one of the target hospitals, Moscoso Puello starts contracting out of transportation, treatment and final disposal of the infectious waste by their own budget, the same as the Ciudad Sanitaria. In case of introducing the healthcare waste management, it will be good for the hospital to refer their financial management. And, it is still recommended to do further examination of the financial aspects for implementation of the A/P.

It was also too limited data available to do the economical evaluation. However, social benefit such as reducing the cases of accidents at the hospital by the appropriate healthcare management can be said as economic saving such as reducing the healthcare cost etc. It should be said that it worth paying the waste management cost for saving valuable human health.

## 5.5 Overall Evaluation

Considering the capable human resources of the institutions, affordable and adequate materials and methods for technical management of the waste, the benefit of reducing the environmental pollution and health risk for the society, overall, the implementation of the A/P can be considered necessary and beneficial.

<sup>1</sup> Data from the private service provider, which is in the ANEX of this report

<sup>2</sup> Diagnóstico de Manejo y Disposición Residuos Biomédicos en Centros de Salud de Santo Domingo y San Cristobal, SEMARN,2004

# Chapter 6

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*Conclusion and Recommendations*



## 6 Conclusion and Recommendations

### 6.1 Conclusion

#### 6.1.1 Current Situation

##### a. Institutional Situation

Although, there are laws and regulations regarding the healthcare waste management, almost all of them are not followed appropriately. To comply the laws, there are mainly three actors involved in this field, SESPAS, SEMARN and the healthcare institutions.

SESPAS and SEMARN are in charge of supervising those healthcare centers to follow the legislation; however, they have not enough resources for enforcement.

At the healthcare centers, obligation to create the committee of hygiene and hospital waste management is not followed.

##### b. Technical Situation

Almost no separation of the waste is conducted. Containers and intra-movement which are designated by the Norm are not followed.

Mixture of the waste at the hospital causes several occupational hazards. Because of the mixture of the waste all the waste can be considered as the infectious waste. Especially to the cleansing personnel at the hospitals and the waste collection worker of the Municipality, are facing at the risk of needle stick accidents and infection of diseases from the waste.

For the Municipality, the huge amount of waste discharged by the mayor hospitals is disturbing the smooth collection. Even it can be cause of non-collection, since the collection vehicle is full of the waste of the big hospital; it makes unable the vehicle to collect surrounding area. While, irregular collection by the Municipality makes the temporal storage area of the hospital severe in-hygienic condition.

At the final disposal site, the waste pickers are facing the risk of infection by touching the infectious waste.

#### 6.1.2 Action Plan

Action Plan was made. When the Action Plan is implemented, waste flow will be changed as follows.

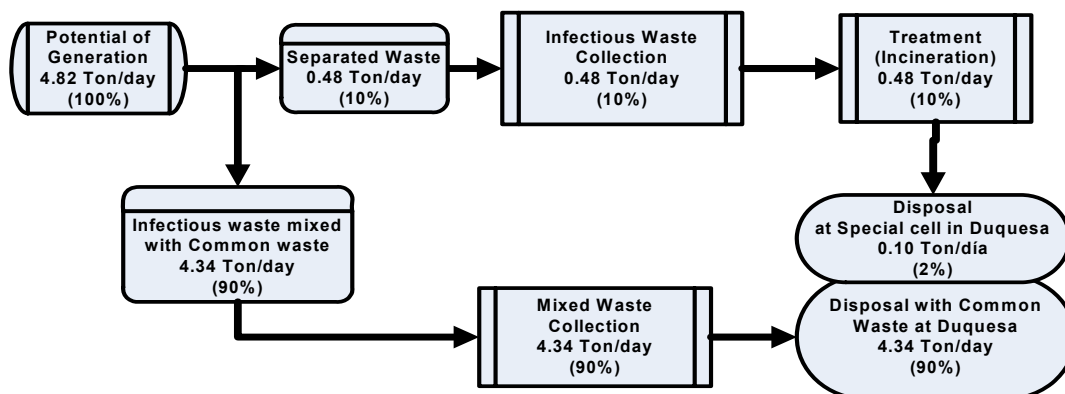


Figure 6-1: Waste flow of Current Situation (2006)

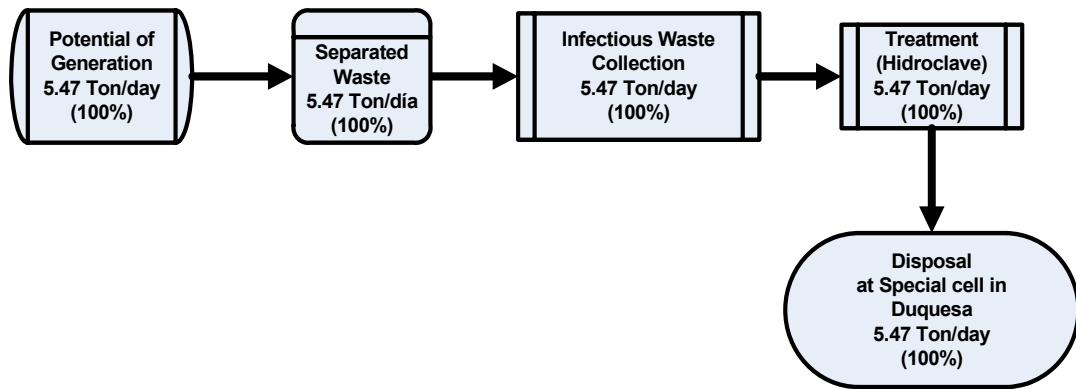


Figure 6-2: Expected Waste flow of Target year (2015)

Following practical measures for improvement are shown in the Action Plan to achieve the goal in 2015.

**a. Institutional System**

The main actors are the healthcare centers, SESPAS, SEMARN, ADN, and the private entities as suppliers of hazardous waste management service.

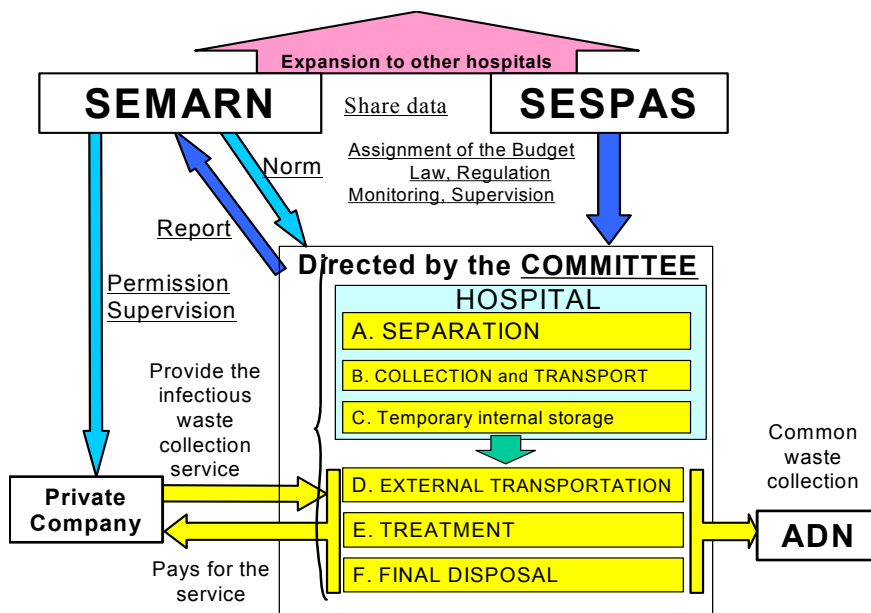


Figure 6-3: Relation of the Organizations related with the Healthcare waste management

**a.1 Healthcare Centers**

The healthcare centers have full responsibility of the waste generated, even if the waste is transported, treated, and disposed by others such as the private sector. To manage healthcare waste, a committee for hygiene and healthcare waste management should be established.

## **a.2 SESPAS**

### **a.2.1 Establishment of a Task Force**

It is recommended that SESPAS structures an administrative unit to conduct the training and monitoring of hazardous waste management in healthcare centers and SEMARN regulates and controls the collection, transport, treatment and final disposition activities of the hazardous waste outside of the Health centers.

### **a.2.2 Utilization of the Existing Structure**

SESPAS has an organization structure over the country, i.e., National Level, Regional Level, Provincial Level, Municipal Level and Local Level. This structure should be fully utilized to conduct activities of the Action Plan. It is recommended to assign tasks to each level as follows.

## **a.3 SEMARN**

The main function of the SEMARN in the hospital waste management is to supervise every aspect related to the infectious waste and any hazardous waste in general; additionally, SEMARN should provide technical support to SESPAS to the extend that it is required.

## **a.4 Waste Service Providers**

Participation of the private sector in the healthcare waste management is key to establish a system outside hospitals, i.e., transport, treatment and final disposal. In order to promote the participation of the private, a secure market that has a certain scale and is well organized has to be developed.

## **a.5 ADN**

Although ADN does not have legal responsibility on the hazardous waste, it has to elaborate a program to collect and dispose of common waste generated from healthcare institutions. Large scale of healthcare institutions, such as Level III, generate considerable amount of common waste which has to be collected every day to prevent the degradation of sanitary conditions of healthcare centers where citizens come to recover their health.

It is recommended that ADN assigns enough personnel to collect common waste generated from healthcare institutions of Level III. The personnel should ensure collection as well as to check if the waste is mixed with hazardous waste. If the waste includes hazardous waste, the personnel should inform the healthcare center, SESPAS and SEMARN; they should refuse to collect such waste.

## **b. Technical System**

### **b.1 Record of Generation Amount and Discharge Amount**

The Action Plan assumes a generation rate and a discharge rate in the following way:

Discharge amount = (Nos. of bed) x (0.78 kg/bed/day) x (coefficient 1.33)

As the intra-hospital separation is practiced, the coefficient will become lower. The Action Plan recommends recording waste amount continuously in each hospital as one of activities of management.

### **b.2 Separation, internal movement and temporal storage**

The implementation of the pilot project showed that the following practices are effective.

- It is recommended to use the 1 gallon bottle for sharps.
- It is recommended that the thickness of the red bags should be the same or bigger than 250 thicknesses to prevent any filtration of some contained fluid.
- The containers to place the red bags should be sufficiently strong, of simple form, and clear color in order to carry out a frequent cleaning and any dirt can be identified easily.
- In most of the areas, the waste containers should have lids, although in some surgery rooms, the lids can be inconvenient during the period of great activity during the operations.
- Using exclusive pushing cart, works must be protected by gears (uniform, boots, gloves and mask) for internal movement and temporal storage.

### **b.3 Transport and Treatment**

Transporters and Treatment operators must have the permission of SEMARN.

### **b.4 Collection and Transport Network**

Taking into account that the quantity of waste generated by healthcare center is small, one truck can cover several health establishments. Therefore, the cluster of these health centers taking into account their vicinity is an efficient way to collect and transport waste.

### **b.5 Recommended Treatment System**

Taking into account the discussions above, this Action Plan recommends the following treatment system in each stage.

**Phase I Stage (2007 - 2008):** This is a transition period from the individual system to the centralized one. Hospitals having incinerators should decide if they use those continuously or not, taking into account its convenience, nuisance, expenditure and remaining service life. Once it is decided to use incinerator, a permit has to be obtained from SEMARN.

**Phase II (2009 – 2011):** A centralized treatment system is to be established. Autoclaving (Hydroclaving) is recommendable, however, incineration is also acceptable if it complies with legislations and economically reasonable.

**Phase III (2012 – 2015):** Continuously, the centralized treatment system is to be operated.

### **c. Final Disposal**

According to the Norm, there are the minimum requirements for infectious waste disposal. Besides these requirements, we recommend for the 1st stage of the plan (2006-2008) that the special cell should be surrounded by a trench and a fence should be prepared in the exclusive place for infectious waste. The security fence should be prepared to protect the waste pickers from the polluted waste and prevent that someone come closer to the area without being noticed. The trench serves to prevent surface water (rain water) from entering into the compartment. The waste should be covered with soil in order to prevent animals from scattering and spreading pollution.

## **6.2 Recommendations for implementation of the Action Plan**

### **a. Institutional system**

SESPAS and SEMARN take initiative to expand the project, especially SESPAS could play role of supporting the target hospitals to set up the committee of hygiene and hospital waste management.

**b. Separation and intra-collection and transport**

Setting up the committee of hygiene and hospital waste management is the key to manage the waste in the hospitals with support and assistance by SESPAS, including the allocation of necessary resources.

**c. Transport and Treatment**

Development of the market of private healthcare waste service providers will be essential by SEMARN. Especially, SEMARN is required to supervise and control those entities.

**d. Final Disposal**

SEMARN shall monitor the disposal of infectious waste operation at the landfill.

According to the law, from discharging the waste until final disposal, the hospital as a discharger has responsibility of the waste.

On 25<sup>th</sup> October 2006, the end of the project period, Ministers of SESPAS and SEMARN signed the declaration of healthcare waste management in the country under the witness of ADN Mayor as a result of this pilot project. Both declare to disseminate the waste management system starting from Santo Domingo de Guzman, National District to the whole country. The study team sincerely hopes the expansion of the project for the health of the people in Dominican Republic.

# ANNEX



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## **A Field Survey on Medical Waste Management**

### **A.1 Objectives**

The Dominican Republic has a specific norm: Norm for the Integral Management of Medical Waste; Norm for the Environmental Management of radioactive Waste; Norm for the Environmental Management of Solid Waste—Secretariat of State of Environment and Natural Resources. These standards are subsidiary of the General Law of the Environment No. 64-00. Additionally, the General Law of Health also sets provisions regarding medical waste handling.

The first standard aims at regulating all activities in infectious waste handling, and shall apply to all facilities, at national level, both public and private.

The objective of the study is to obtain the necessary information to evaluate the current situation in handling solid medical waste in the National District and propose an action plan to improve it.

### **A.2 Method**

The diagnosis was made with the support of the authorities of the Environmental Health Management of the Secretariat of State of Public Health, the Pan American Health Organization, the Secretariat of State of the Environment and Natural Resources, and the National District Township, all of which made available valuable information. Consulting enterprise FH Marketing Active was assigned to conduct survey's application and prepare the report on results and findings.

Fieldwork was performed by two (2) teams consisting of 3 health industry professional interviewers and a supervisor per team, all with ample experience in this type of studies, amounting to a total of eight people.

Evaluations were reviewed in 10% of the field, while the rest were analyzed in the office to guarantee fieldwork quality. This study is supported by photographic illustrations.

The Diagnosis development was structured in five phases; each had its own objectives and application instruments and its activities calendar.

First Phase: Select, with the SESPAS Environmental Health Management, the establishments of health assistance that would make up the survey sample; and validation of the questionnaire.

Second Phase: The purpose of this phase was to train the evaluating medics and supervisors teams in the procedure of executing the survey, their individual role, the way to carry out the interview, and a detailed analysis of the questionnaire. The visiting schedule to the establishments was structured.

Third Phase: To inform directors of selected establishments about the JICA project regarding medical waste handling and the need for their collaboration in executing the survey. For the purpose, a workshop in the JICA auditorium was held. The consulting enterprise established the necessary contact networking and managed to coordinate the visits schedule.

Fourth Phase: In this phase, the selected establishments were visited and the survey was done. Methodology used in this stage was Interview and Observation.

Table A-1: The survey schedule

Activity	Beginning date	Finishing date
Prepare the questionnaire	July, 27	August, 4
Choose the health assistance establishments	August 10	August 16
Explain and coordinate with directors of health assistance establishments	September 21	September 22
Validate and adjust the questionnaire	September 22	September 23
Meet with directors of health assistance establishments (JICA)	September 26	September 26
Survey of health assistance establishments	September 28	October 5
Submit Report on the part of surveying enterprise	October 6	October 13
Results and Findings	October 14	October 15
Diagnosis	October 17	October 20

The survey took place between September 28<sup>th</sup> and October 5<sup>th</sup>, with the participation of two teams of health professionals. Two health assistance establishments were visited.

The following table shows those establishments that were subject to the survey.

Table A-2: The establishments selected for the survey

Health attention establishment	No. of Beds	Owner	Circ.	Main interviewee/position
Hospital Padre Bellini	130	SESPAS	C-1	Dr. Olivo Mejia
Maternidad Nuestra Señora de la Altagracia	300	SESPAS	C-1	Dr. Claribel Vargas
Hospital Luis E. Aybar	220	SESPAS	C-3	Dr. Mercedes Castro
Hospital Francisco Moscoso Puello	174	SESPAS	C-3	Dr. Belkis Pimentel
Instituto Oncológico Dr. Heriberto Pieter	122	Semi private	C-1	Dr. Catalina Rodriguez
Hospital Infantil Robert Reid Cabral	350	SESPAS	C-1	Dr. Pedro Mancebo
Hospital Plaza de la Salud	301	Semi private	C-3	Eng. Helio Fernandez
Hospital Salvador Gautier IDSS	410	Semi private	C-3	Dr. Isabel Santana
Clinica Abreu	62	Private	C-1	Dr. Bernardo Baez

Note: the government and the non-governments jointly fund semi-private institutions.

The nine health assistance establishments are Level II (>50 beds); five are SESPAS property, three are semi private, and one is private; five are located in ADN Circumscription No. 1 and four in Circumscription No. 3.

For sample validity effects, twenty two Level II health assistance establishments are located in the ADN; that is, the survey considered 41% of all Level II establishments.

Fifth Phase: The consulting enterprise submits its Report and the Diagnosis was prepared.

### A.3 Results

#### a. General Information

The season of greater occupancy is between the months of May / June and that of least occupancy of the establishments is December / February, as reflected in the following table. In establishments with more than 200 beds the number of consultations per year ranges between 98,000 and 149,000, while in establishments with less than 200 beds the numbers range between 9000 and 79,000 consultations/year.

Table A-3: Season of occupancy

Month	Greatest Occupancy						Least Occupancy					
	Category				Total	%	Category				Total	%
	I	II	III	IV			I	II	III	IV		
January		1			1	11	5	3			8	89
February		1			1	11	2	1			3	33
March	2	1			3	33	1	1			2	22
April	2	1			3	33	1				1	11
May	3	4			7	78						
June	3	4			7	78						
July	2	4			6	67						
August	3	3			6	67						
September	2	1			3	33						
October	1	1			2	22						
November	1	1			2	22						
December							3	3			6	67

Notice: the least occupancy period owes to Christmas celebrations

Note: Figure shows the number of medical institutions answered "Greatest occupancy" or "Least occupancy".

Table A-4: Profiles of selected hospitals

Health assistance establishment	Bed- day/year	Consultations times/yr	Employees people	Medical & nursing staff people	Admin. staff people
Hospital Padre Bellini	2,975	49,693	737	447	290
Maternidad Nuestra Señora de la Altagracia	30,000	87,016	863	580	283
Hospital Luis E. Aybar	44.625	106,906	897	543	354
Hospital Francisco Moscoso Puello	Missing	115,230	851	566	285
Instituto Oncologico Dr. Heriberto Pieter	1,094	79,175	380	235	145
Hospital Infantil Robert Reid Cabral	Missing	149,081	833	512	321
Hospital Plaza de la Salud	10,137	142,380	1,343	731	612
Hospital Salvador Gautier	5,868	98,204	1,507	810	701
Clinica Abreu	3,312	9,660	255	566	285

Classification of waste considered in the survey was as follows:

(1) Blood, (2) Infectious agent (cultures, fungi), (3) Non pathological residues, (4) Pathological residues, (5) Puncturing-cutting materials (needles, scalpels), (6) Chemical residues, (7) Radioactive residues, and (8) Common (remains of food preparation, paper).

## b. Handling of medical waste

### b.1 Generation

The scope of the survey does not cover the waste generation factor determination. The results of two studies are shown below for the reference.

*In the SEMARN's document "Diagnostico de Manejo y Disposicion de Residuos Biomedicos en Centros de Salud de Santo Domingo y San Cristobal" (Diagnostic of Biomedical Waste Handling and Disposal in Santo Domingo and San Cristobal Health Centers) of July, 2004, it is stated that the average of common waste generation is of 2.13 kg/bed/day and of 0.78*

*kg/bed/day medical waste.*

*In the “Diagnostico del Manejo de los Desechos Hospitalarios en El Salvador” (Diagnostic of Handling of Medical Waste in El Salvador) (V. Ojeda and G. Umaña) it is stated that hazardous medical waste generation is 0.65 kg/bed/day.*

## **b.2 Training**

When questioned about a training instrument or handbook proceedings for handling SWM/ in the institution, 67% of establishments answer was yes, the remaining 33% answered no. However, the document could not be produced in all cases.

With the purpose of doing an insightful reflection on people’s behavior regarding the handling of SWM/P, a question was posed to determine the frequency with which these trainings take place. Forty five percent answered that when they begin working, 33% answered once a year and 22% said very often.

*Environmental standard for Integral Management of Infectious Waste—SEMARN July 2004*

*The establishments’ staff must be trained in sorting techniques such that they associate colors of plastic bags with the type of waste assigned, as well as risks implied with this task.*

*Transporters shall prepare and set a training plan for their new staff, as well as periodic and updated (annual) reviews for the remaining staff.*

*Records of these shall be kept.*

## **b.3 Separation**

Waste storage is done separately in 78% of centers and unsorted at 22%.

Regarding the reasons for not separating waste, 22% said that there is no reason for doing so, one said that was too complicated and because education, as well as, the required economic funds are lacking.

Waste disposal is unsorted in 55% of the establishments and only 45% of them stores and disposes separately.

Regarding centers that store separately but disposal is mixed, 57-14% mix separate waste in the collector. It is important to stress that collectors cannot identify the different types of residues as they are all packed equally. Likewise, all waste is sent to La Duquesa, where they are all handled jointly.

*Environmental Norm for the Integral Management of Infectious Waste—SEMARN July 2004*

*It’s the responsibility of the Director, Sub-directors, Heads of Divisions, doctors, nurses and medical assistants, maintenance and cleaning staff and operative staff for guaranteeing that waste is separated, placed in waste deposits or removed without risking human health and without using environmentally harmful procedures or methods.*

*Procedures about waste separation and identification must be placed in a visible and readable form in every collection point as a staff reminder.*

*Infectious liquid waste shall be directly deposited in rigid waterproof, impact resistant recipients with leakproof lids.*

*Puncturing-cutting waste and instruments shall be conditioned in the generation place itself and placed in rigid wall waterproof recipients, puncture proof and labeled warning about their contents.*

*Recipient size and number shall be adequate for the expected amount of waste generated in each room/area.*

#### **b.4 Bottling, packing**

All-purpose black trash bags are used in 78% of all establishments. Red bags for collecting hazardous waste appeared in the remaining 22%; it was noticed that red bags are equally used for common waste, confirming there is no control on the handling of these packages.

Different items of waste generated in hospitals, such as blood, infectious agents and non-anatomical waste are handled in plastic bags in 67%, 89% and 89% respectively, reflecting a high percentage of bag handling. Thirty three percent use bags to handle puncturing-cutting materials, 44% use plastic packing and 22% incineration.

*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*

*Bags shall be leak-proof and compatible with the processes proposed for treating the waste contained.*

*Before placing a new bag in the recipients, the containers must be washed in plenty of water, detergents and disinfectants according to established procedures.*

Recipients containing infectious material shall be labeled with the name of the establishment and the international symbol of Infectious Residue clearly identifying them.

#### **b.5 Collection and internal movement in the establishment**

Regarding the internal collection system it was noticed that establishment do not have a standard system of containers. Plastic containers serving in the hazardous waste generation areas carry no identification; a considerable amount of containers have no lids.

As the frequency of internal collection of medical waste, results reflect that only 18% do so once a day; 43% two times, and 39% three or more times a day, resulting in an 82% collection frequency of two times a day or more.

Waste such as blood, infectious agents, cultures, fungi, non-anatomic waste, hazardous and mixed waste are collected two or more times a day, giving an 89% frequency. Collection frequency of puncturing-cutting material is of 88%.

*Environmental Norm for the Integral Management of Infectious Waste—SEMARN July 2004*

*Bags and recipients shall be sealed and transported to the transitory storage site specifically designed for the purpose, or to the installed facility inside the establishment.*

*Routes for internal movements shall be planned, signaled and known by the establishments' staff.*

*Vehicles for internal movements of infectious waste shall be stable, silent, and hygienic, of closed design adequate for the use and transit through the premises.*

*Infectious waste shall be moved in the same vehicle from the site of generation to the site of transitory storage or treatment facility prepared inside the establishment, as the case requires so.*

*Packing (recipients or bags) shall not be dragged around the floor at any time, but rather shall be moved in the described vehicles.*

*Vehicles used for the internal movement shall be disinfected after each collection operation.*

### **b.6 Storage**

67.67 % establishments do not have low-temperature storage sites to dispose of pathological waste; however, 33.33% said they did have such an area, although equipments were not working at the time.

88.89% have central waste collection sites in their facilities. 66.67% said they had no specific collection site and 33.33% answered no.

Regarding collection sites disinfection frequency, 44.44% stated this is done once a week; 11.11% when considered necessary, and 44.44% (others) disinfect (1 establishment) two times a week, (2 establishments) every other day and (1 establishment) daily.

In regards to safety of collection sites, 11.11% of establishments has a deposit with railing, and under lock and key exclusive for hazardous waste; 22.22% is surrounded by fence or railing under lock and key; another 22.22% surrounded by railing but not lock and key, and 44.45% has no railing and no key or other type of safety, representing a high degree of risk.

Most of the collection sites were placed outdoors and unrestricted in regards to access or signaling pointing to some separation of waste. 77.77% of health establishments mentioned having free access to collecting vehicles, but both the physical location and disrespect make it on many occasions, the collection of waste difficult, so it may take several days while waste accumulates before the collecting truck has free access to the collection site.

Only 40% of establishments have a hazardous waste storage area with railings, lock and key.

*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*

*The site destined for transitory storage of waste shall have separate spaces for storing different types of waste; sites must be secure, with access limited to authorized staff and covered, thus supplying protection against high temperatures, pH, humidity, weather conditions, natural disaster and animals. Its capacity shall be such that it provides sufficient space for at least two (2) days continuous accumulation.*

*Areas for transitory storage shall be made of and/or lined with smooth and waterproof materials allowing their cleaning and disinfection in the event of spillage and having sanitary facilities, point of water (preferably hot water) and under minimum pressure of 30 psi<sup>2</sup> (206.8 kPa); they must also have drainage control connected to the establishment waste water treating system.*

*They must also be removed from windows or air vents of ventilation systems toward other areas of the health establishment, provided with fire department access and easy access ways for internal and external transportation vehicles.*

*All infectious waste that requires so, shall be maintained under refrigeration until the time of its treatment in situ or its transportation outside of the health establishment for treatment.*

### **b.7 External moving**

In all cases medical waste, both hazardous and common, are moved together within the same vehicles rendering the collection and moving service of municipal solid waste.

*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*

*Commercial or juridical taxpayers, the public or individuals performing or planning to perform transportation of infectious waste shall appear in front of the State Secretariat of the*



*Environment and Natural Resources for inscription and to obtain their accreditation as transporting enterprise (hereon transporter) of hazardous waste.*

*Transporters and their staff shall only accept infectious waste for transportation when packed, labeled and marked as specified in the ruling and accompanied by duly prepared manifestos.*

*The transporter shall adopt necessary provisions for the operative staff to have the corresponding apparel, hygiene and personal protection elements and to receive necessary instructions for adequately handling during loading, unloading or transportation.*

*Vehicles used in transporting contaminated infectious waste shall have a completely closed freight box provided with safety lock, leak-proof and with a minimum height of one (1) meter and eighty (80) centimeters; whose inner surface is smooth with no sharp edges but with sanitary angles covered, of easy cleaning and disinfected; all compaction and triturating mechanisms are strictly forbidden.*

*All natural or juridical person managing a health establishment, treatment facility, biomedical waste transporter and deposit/disposal facility shall have the following responsibilities, notwithstanding others: send the Secretariat of State of the Environment and Natural Resources and the Secretariat of State of Health and Social Assistance copy of manifestos giving the route and information of waste generated from its origin to its final disposal site.*

#### **b.8 Treatment**

In the treatment of waste prior to its final disposal only 11.11% use incinerators and another 11.11% use other process which leaves a percentage of 77.78% of establishments that do not apply any previous treatment at all.

*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*

*Treatment of infectious waste shall only be made in facilities, public or private, previously authorized for rendering these services.*

*Said facilities shall have a corresponding environmental license or permit after meeting the authorization procedures specified in the Ruling of the Environmental Permits and Licenses System (issued under Resolution No. 05-2002) by the Secretary of Environment and Natural Resources.*

*The same provisions apply to health establishments generators of waste which, in turn directly treat their own residues.*

*The facility's treatment staff shall have the corresponding garments, as well as hygiene and protection elements and shall have previously received the necessary training for the adequate handling of waste, without directly having contact with said waste, during the discharge and treatment.*

#### **b.9 Management of Radioactive Waste and Other Sub-classifications**

For radioactive waste storage 77.78% have no specific area.

In the special case of Hospital Dr. Heriberto Pieter, (Oncology), handling of radioactive waste is supervised by the National Commission of Nuclear Matters (CONAN) and then personally dropped off at the National Deposit of Nuclear Waste in the Sierra Prieta, Provincia Bonao, and locality.

*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*

*Radioactive waste shall be handled according to provisions in the Standard for the Environmental Management of Radioactive Waste (NA-DR-001-03) and other sub-classifications within special waste are governed by the ruling related with hazardous substances and waste.*

**b.10 Final disposal**

66.67% claimed that final disposal of waste is done at municipal dumps, which we know is not true, not so much because they seemed sure but from the deduction that ADN is in charge of almost all of the collection of that waste. Further, 33.33% answered they ignore what is the final disposal of waste.

*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*

*Disposal of infectious waste without previous treatment shall not be accepted and shall also not be disposed in open-sky sites.*

*Sanitary fillings authorized by the Secretariat of State of Environment and Natural Resources for receiving waste from health assistance establishments shall have separate cells for disposing of treated infectious waste and ashes generated from the incineration, in case that other kinds of waste are deposited in the land plot.*

*Final disposal of infectious waste by means of sanitary fillings shall adjust to standards and technical specifications issued by the Secretariat of State for the Environment and Natural Resources, which shall advise the competent municipal authorities.*

**b.11 Environmental Permits**

Once this norm takes effect, the Ruling for Environmental Permits and Licenses will allow one year for health assistance establishments to obtain their environmental license or permit.

No establishment has been able to obtain the permit yet, although the Ruling took effect last July, 2004.

*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*

*Existing facilities or currently in operation lacking the environmental permit shall apply for, or have applied for the corresponding environmental permit by means of the Procedure to Negotiate the Environmental Permit of Existing Facilities established and considered in the Ruling of the Environmental Permits and Licenses System, in a term no longer than one year to start as soon as this Norm takes effect.*

*Health establishments shall clearly include waste minimization policies that they shall adopt in their Environmental Handling and Adequacy Plan to be submitted to the Secretariat of State of the Environment and Natural Resources when applying for the environmental license or permit, as suitable.*

**b.12 Common waste management**

Regarding common waste storage, all 100% of the cases mix them all.

These were the stated reasons of why they do not separate common waste:

22.22% said there is no reason for separating, 11.11% said it is complex, and 66.67% (others), (1 establishment) for lack of education, (1 establishment) because there is no culture of doing so, and (3 establishments) because this has never been done. This proves that procedures for the purpose have not been put in practice.

In collection of common waste: 77.78% receives the service from ADN and the remaining 22.22% waste is collected by a private company engaged by the hospital itself.

In 44% of the establishments waste is collected door-to-door, in 34% waste is collected in-site and in 22.22% waste is collected by the sidewalk.

Regarding weekly collection frequency: 55.56% states that over 5 times, the frequency for 11.11% is 4 of 5 times and 3 times or less also for 11.11%; however, 22.22% answered that their waste collection is completely irregular.

Collection schedule according to 44.44% is observed, another 44.44% states that the schedule is not observed, and 11.11% does not know whether the schedule is regular.

*Environmental Standard for the Integral Management of Infectious Waste—SEMARN July 2004*

*Provision in Standard for the Environmental Management of Non-hazardous Solid Waste NA-RS-001-03 issued by the Secretariat of State for the Environment and Natural Resources applies in handling common solid waste.*

### **b.13 Financial aspects**

Health establishments make a single payment to ADN without specifying or distinguishing common and hazardous waste.

Water and electrical services for public establishments are directly subsidized by the Central Government or through SESPAS.

Private or semi-private establishments pay for their water and electricity services.

Exception: Hospital Robert Reid Cabral and Oncologico Heriberto Pieter pay a symbolic sum for water service.

For most of the interviewed, the cost trend in handling solid waste is stable.

Table A-5: Monthly payment for public services

Health establishment	Hazardous Waste	Common Waste	Water Service	Electrical Service
Padre Bellini	Doesn't pay	Doesn't pay	Doesn't pay	Doesn't pay
Maternidad Nuestra Señora de Altagracia	(1)	32,000.00	Doesn't pay	Doesn't pay
Luis E. Aybar	Doesn't pay	Doesn't pay	Doesn't pay	Doesn't pay
Francisco Moscoso Puello	Doesn't pay	Doesn't pay	Doesn't pay	Doesn't pay
Oncologico Heriberto Pieter	(1)	26,207.00	1,000.00	Doesn't pay
Robert Reid Cabral	Doesn't pay	Doesn't pay	5,000.00	Doesn't pay
Plaza de la Salud	(1)	150,000.00	71,000.00	6,500,000.00
Salvador B. Gautier	(1)	580,000.00	56,000.00	1,207,000.00
Clinica Abreu	8,000.00	Doesn't pay	48,000.00	900,000.00

(1) Payment for common waste handling includes hazardous waste

#### b.14 Cooperation in waste management

Most of the establishments do not have institutional policies directly oriented to the medical solid waste. However, 100% of those surveyed stated their willingness to make suggestions regarding improvement in handling MSW/D.

55.56% say that waste must be appropriately treated; the second option most voted with 22.22% is to recycle waste and, lastly, also with 22.22%, to take research action.

Interviewees were questioned regarding the support that health establishments must give in handling solid waste and 100% agreed that medical institutions should cooperate with the country and/or ADN in this regard. All agreed that solid waste handling is a top priority issue.

In questioning as to the kind of support required, 88.88% point to the need for technical support and 66.66% require financial-type support.

#### A.4 Findings

- Separating common and hazardous waste is not practical; in the end all waste is mixed in the external transport and/or in the Duquesa dump site.
- Generation of hazardous medical waste is 0.78 kg/bed/day and El Salvador is 0.65 kg/bed/day.
- There is no usual practice of separating in the source (operating rooms, rooms, external consultation).
- Only 22% of establishments uses red bags for hazardous waste.
- Containers differ in characteristics and size; they regularly have no lid; they are not washed or disinfected. Plastic bags do not meet gauge specifications and are inadequate for the kind of material they contain. Puncturing-cutting material is placed in plastic recipients, which are not visible to protect the staff's handling them.
- Collection and internal movements' staff do not have elementary protection gear (uniform, rubber aprons, shoes, gloves, breathing filters, etc).
- Intra-hospital transportation of hazardous waste is done without following the safety and hygiene rules or procedures. Carts do not have security characteristics and hand carrying or dragging of waste is usual. Carts are not disinfected.
- Transitory storage places do not fulfill the minimal health and environment protection conditions. Bags with waste are placed mixed in containers placed in public parking lot zones. Bags found here are torn and there is a considerable contents spillage.

- 
- Five of the establishments have incinerating systems but they were not operational at the time of the interview. Most of the hazardous waste is transported and finally disposed at dumps without previous treatment.
  - External transportation is done in vehicles not meeting conditions for transporting hazardous waste.
  - Although there is a standard on medical waste, it is not observed.
  - The necessary statistic regarding medical waste: generation, labor accidents, hospital illness are not kept.
  - No routine-training program exists at any levels.
  - Hazardous waste handling costs are not recorded.
  - Establishment authorities are aware of the need to adequately handle medical waste to protect health and preserve the environment; to enforce hazardous waste segregation; to pay the cost of proper handling of waste; to promote a positive attitude in practices of minimizing common and hazardous waste; to promote participation of specialized private sector.
  - Collection and transportation service is irregular and deficient.
  - No public or private entity lends technical assistance to the network of establishments at national level.
  - As a result of the Diagnosis it is necessary to restructure an Action Plan submitting the collection of activities that must be performed to begin the improvement in handling medical solid waste.

**B Data****B.1 Waste Amount Survey**

Table B-1: Waste Amount Survey Hospital Luis E. Aybar (9 March 2006)

Place (Unit or Room)	Weight(kg)	Comment	
		Infectious	Common
Ginecology	5.25	x	
Emergency of Internal Medicine	6.77	x	
Emergency (Surgery)	3.5	x	
Emergency (Ginecology)	4.6	x	
X Ray	5.5	x	
Patients' Room	3.05	x	
Patients' Room	3.275	x	
Patients' Room	2.5	x	
Patients' Room	1.5		x
Patients' Room	2.3		x
Patients' Room	2.625	x	
Patients' Room	3.7	x	
Patients' Room	2.125	x	
Patients' Room	1.5	x	
Emergency (Surgery)	?	x	
Hallway	1.55		x
Hallway	1.775		x
Emergency of Internal Medicine	3.55	x	
Vaccination	3.375	x	
Hallway	1.075		x
Internal Medicine	6.55	x	
Patients' Room	2.775	x	
Patients' Room	4.7	x	
Common	1.725		x
Patients' Room	2.225	x	
Pediatrics	2.75	x	
Kitchen	4.45		x
Dialysis	6.8	x	
Patients' Room	7.775	x	
Hallway	2.55		x
Patients' Room	3.275	x	
Patients' Room	4.25	x	
Hallway	1.175		x
Hallway	2.55		x
Maternity	1.75	x	
Foodhall	1.4		x
Ginecology	3.875	x	
Ginecology	7.75	x	
Maternity	9.6	x	
Garden	3.05		x
Maternity	1.75	x	
Patients' Room	15.675	x	
Toco Surgery room	16.3	x	
Toco Surgery room	2.7	x	
Toco Surgery room	3.4	x	
Patients' Room	6.5	x	
Delivery Room	6.8	x	
Special Room	3.0	x	

Maternity	7.8	x	
Maternity	1.75	x	
Surgery	7.75	x	
Farmacy	7.75		x
Kitchen	1.625		x
Hallway	7.75		x
Maternity	2.25	x	
Hallway	5.0		x
Maternity	2.75	x	
Patients' Room	5.0	x	
Kitchen	6.75		x
Perinatology	3.55		x
Pediatrics	1.65		x
Kitchen	1.775		x
Emergency	2.7	x	
Gynecology	1.6		x
Kitchen	18.7		x
Internal Medicine	6.75		x
Internal Medicine	1.625		x
Hallway	6		x
Emergency Surgery	9.5	x	
Gynecology	5.5		x
Patients' Room	6.8	x	
Internal Medicine	4.675	x	
Emergency (Surgery)	2.5	x	
Patients' Room	3.1		x
Storage	14.875		x
Office	5.75		x
Gynecology	3.25		x
Patients' Room	10.2	x	
Patients' Room	4.8	x	
Patients' Room	2.625	x	
Patients' Room	0.875		x
Patients' Room	14.2	x	
Patients' Room	1.75		x
Pediatrics	6.05	x	
Internal Medicine	6		x
Hallway	1.875		x
Kitchen	8.375		x
Gynecology	1.75	x	
Patients' Room	13.125	x	
Patients' Room	13.5	x	
Patients' Room	5.5	x	
Dialysis	1.75	x	
Dialysis	5.75	x	
Hallway	5.6		x
Hallway	3.2		x
Hallway	3		x
Patients' Room	8.5		x
Patients' Room	1.2		x
Surgery	1.2		x
Surgery	3	x	
	Subtotal		
	Total	476.9	
	Kg/bed	2.08	

Table B-2: Waste Amount Survey Hospital Luis E Aybar (10 March 2006)

Place (Unit or Room)	Weight (kg)	Comment	
		Infectious	Common
Medicine Internal	1.550	x	
Maternity	6.275	x	
Dialysis	9.850		x
Special room	5.100	x	
1M2 A, B, C	11.550	x	
1 H-3	4.000	x	
Hallway	5.400		x
Room 12 D Maternity	14.125	x	
Maternity	2.075	x	
Deliver Room/Toco	3.875	x	
Deliver room/Toco	4.600	x	
1 H-1	8.250	x	
Room 2 M-1, 2 M-2	8.000	x	
Kitchen	8.750		x
Room 1 M B, C	7.450	x	
Station 1 A, Nurses	2.375		x
Maternity	3.250	x	
H 4, H 2, H 5 Special	2.400	x	
Maternity	3.300	x	
Special Surgery	4.375	x	
Medicine Internal	6.700	x	
1 H-3, 1 H-4, 1 H-5	3.900	x	
Medicine Internal	7.000	x	
Medicine Internal	1.150	x	
Consultant	1.200		x
Material Gastable	1.250		x
Room Hospitalization	1.500	x	
Room Hospitalization	7.150	x	
Room Hospitalization	2.300	x	
Ophthalmology	1.750	x	
Room Hospitalization	4.025	x	
Room Hospitalization	3.250	x	
Surgery	3.200	x	
Pediatric (Emergencies)	3.050	x	
Deliver Room	10.300	x	
Deliver room	4.750	x	
Hallway	5.500		x
Hallway	0.475		x
Kitchen	8.475		x
Visitors	2.325		x
Visitors	2.400		x
Medicine Internal	2.750	x	
Consultant	0.300		x
Surgery	6.050	x	
Dialysis	4.225	x	
Dialysis	3.825	x	
Dialysis	1.625	x	
Dialysis	2.750	x	
Dialysis	5.550	x	
Dialysis	2.450	x	
Dialysis	3.500	x	
Dialysis	2.300	x	



Dialysis	4.125	x	
Dialysis	2.175	x	
Dialysis	12.000	x	
Special Room	6.050	x	
Emergency Gynecology	7.875	x	
Emergency	1.300	x	
Emergency Surgery	1.250	x	
Emergency Gynecology	2.000	x	
Maternity	5.000	x	
X Ray	7.050	x	
Visitors (Hallway)	3.550		x
Neurology	3.550	x	
Pediatric	7.575		x
Room Hospitalization	3.325	x	
Room Hospitalization	7.450	x	
Room Hospitalization	2.425	x	
Hallway	0.625		x
Perinatology	8.625		x
Pharmacy	7.200		x
Maternity	2.500	x	
Pediatric	2.500		x
Emergency	3.750		
Internment	2.800		
Laboratory	1.500		
Emergency Internal	2.500		
Toco Surgery	3.700		
Kitchen	10.200		
Medicine Internal	17.000		
Emergency	1.500		
Kitchen	0.750		
Cafeteria	10.500		
Cafeteria	9.500		
Internment	2.200		
Archive Clinic	16.075		
Kitchen	9.250		
Emergency Medicine Internal	8.250		
Emergency	2.375		
Room Hospitalization	3.625		
Room Hospitalization	2.500		
Room Hospitalization	2.750		
Room Hospitalization	5.050		
Room Hospitalization	1.450		
Room Hospitalization	2.450		
Room Hospitalization	3.770		
Room Hospitalization	3.250		
Emergency Gynecology	2.125		
Emergency Gynecology	1.125		
Kitchen (Emergency)	7.000		
Emergency (Medicine Internal)	10.500	x	
Emergency Pediatric	2.850	x	
Emergency Pediatric	1.200	x	
Hallway	2.355		x
Hallway	2.440		x
Ophthalmology	9.800	x	
Room 1 H-3, 1 H-2, 1 H-1	2.750	x	

B. Data

Room 1 H-2	1.200	x	
Room 2 H-1 A, B, C	7.775	x	
Room Hospitalization	2.500	x	
Room 2 H-3, 2 H-2, y 2 H-4	1.755	x	
Room Hospitalization	1.800	x	
Hallway	1.500		x
Room Hospitalization	6.850	x	
Room 2 H-3, 2 H-4, 2 H-5	2.750	x	
Room 1 H-5, 1 H-4	2.500	x	
Kitchen	12.750		x
Ophthalmology	1.500	x	
Room Pediatric	1.750	x	
Room of Pediatric	1.650	x	
Room 2 H-2, 2 H-3, y 2 H-4	1.570	x	
Foodhall for doctors	3.850		x
Dialysis	12.800	x	
Emergency Pediatric	5.750	x	
Foodhall for doctors	6.500		x
Room of delivery	7.750	x	
Hallway	1.550		x
Kitchen	3.550		x
Maternity	4.550	x	
Maternity	3.800	x	
Kitchen	7.550		x
Hallway	1.550		x
Hallway	2.200		x
Room 2 H-1	5.750	x	
Kitchen	9.500		x
Ophthalmology	2.075		x
Kitchen Administration	5.775		x
Archive	1.250		x
Common waste	6.800		x
Hallway	4.750		x
Pie Diabetic	3.250	x	
Archive	5.750		x
	Subtotal		
	Total	654.7	
	Kg/bad	2.86	

Table B-3: Waste Amount Survey Hospital Luis E Aybar (11 March 2006)

Place (Unit or Room)	Weight (kg)	Comment	
		Infectious	Common
Emergency (Medicine Internal)	3.150	x	
Emergency (Surgery)	1.150	x	
Cafeteria	6.550		x
Cafeteria	5.875		x
Emergency (Surgery)	2.325	x	
Emergency (Surgery)	3.250	x	
Emergency (Medicine Internal)	5.550	x	
Archive Clinic	10.250		x
Archive Clinic	14.000		x
Archive Clinic	8.175		x

Archive Clinic	11.500		x
Archive Clinic	12.250		x
Archive Clinic	4.750		x
Emergency (Surgery)	6.700	x	
Emergency (Pediatric)	3.075	x	
Cafeteria	8.875		x
Surgery	1.650	x	
Special room	3.475	x	
Room Hospitalization	3.100	x	
Room Hospitalization	0.750	x	
Room Hospitalization	2.875		x
Administration	5.625		x
Room Hospitalization	2.500	x	
Room Hospitalization	4.150	x	
Room Hospitalization	3.625	x	
Hallway	3.000		x
Room of Patients'	1.200	x	
Hallway	2.550		x
Intensive	3.100	x	
Room Pediatric	2.550	x	
Residential /Doctor	2.250		x
Residential /Doctor	3.550		x
Residential /Doctors	1.550		x
ICU	2.550	x	
Room 2 H-2, 2 H-5	10.500	x	
Room 2 H-3, 2 H-2	2.750	x	
Emergency Surgery	5.800	x	
Room Pediatric	3.200	x	
Room Pediatric	1.750	x	
Room 1 M-1, 1 M-2 A, B, C	8.220	x	
Room 2 H-1, 2 H-2, 2 H-3	6.700	x	
Room 1 H-4	2.025	x	
ICU	8.550	x	
Room 1 H-1, 1 H-2	2.750	x	
Ophthalmology	5.250	x	
Room Pediatric	1.550	x	
Emergency Surgery	5.550	x	
Emergency Surgery	2.750	x	
Dialysis	8.550	x	
Room 2 H-2, 2 H-3	1.550	x	
Dialysis	8.750	x	
Medicine Internal	6.650	x	
Medicine Internal	12.275	x	
Cafeteria	2.775		x
Archive	2.200		x
Pharmacy	2.550		x
Maternity	6.000	x	
Toco	12.200	x	
Toco (Maternity)	7.750	x	
Hallway	2.200		x
Room 1 H-1, 1 H-2	6.550	x	
Room Perinatal	5.550	x	
Maternity	12.550	x	
Emergency (Surgery)	3.550	x	
Internal Medicine	7.475	x	

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Kitchen	2.900		x
Toco (Maternity)	8.250	x	
Maternity	4.250	x	
Emergency	2.225		x
Maternity	9.975	x	
Maternity	1.900	x	
Room 1 H-4, 1 H-2, 1 H-3	2.750	x	
Room 1 H-4, 1 H-5	4.275	x	
Room 1 H-2, 1 H-3	5.125	x	
Room 1 H-3, 1 H-4, 1 H-5	2.250	x	
Room 2 H-3	8.600	x	
Room 2 H-3, 2 H-2	11.875	x	
Perinatology	6.125	x	
Hallway and Pediatrics	8.550		x
Room 2 H-3	3.500	x	
Room 1 M-1 A, B, C	14.000	x	
Room of Pediatrics	4.255	x	
Room of Pediatrics	3.400		x
Oftalmology	1.450	x	
Oftalmology	1.200	x	
Room 1 M-1 A, B, C	11.100	x	
Room H-4	6.255	x	
Room 1 M-1 A, B, C	8.225	x	
Room 1 H-1, 1 H-2	10.400	x	
Room A, B, C	8.750	x	
Room H-4	2.900	x	
Room Wemen Special	5.875	x	
Dialysis	2.500	x	
Dialysis	2.050	x	
Dialysis	5.450	x	
Dialysis	14.100	x	
Room 1 M-1 A, B, C	9.500	x	
Doctors' Foodhall	10.875		x
Kitechen	9.550		x
Toco	7.900	x	
Maternity	9.475		
Administration Hallway	4.500	x	
Maternity	1.550	x	
NUMO	1.100	x	
Room 1 H-3, 1 H-4	13.500	x	
Consult Room	2.900	x	
Maternity	2.650		x
?	6.550	x	
Kitchen	10.500		x
Maternity	1.250	x	
Internal Medicine	2.800		x
Kitchen	8.550		x
Kitchen	4.875		x
Kitchen	2.975		x
Kitchen	7.500		x
Consult room	1.750	x	
Room of Pediatrics	3.800	x	
Doctor's food hall	4.550		x
Doctor's food hall	5.750		x
Dialysis	12.550	x	

Room of Pediatrics	2.550	x	
Room of Pediatrics	1.220	x	
Room of Pediatrics	2.800	x	
Room of Pediatrics	1.550	x	
Hallway	2.750		x
Internal Medicine	6.750	x	
Internal Medicine	8.550	x	
Internal Medicine	5.600	x	
Emergency	7.800	x	
Emergency Surgery	5.500	x	
Toco	4.525	x	
X Ray	5.000	x	
Toco	18.000	x	
Archive	6.125		x
?	3.500		
	Subtotal		
	Total	747.5	
	Kg/bed	3.26	

Table B-4: Amount of waste transported and treated by the private service provider

Date	Weight by Pound	Number of tank
13-Jun	470	10
14-Jun	478	10
15-Jun	940	20
16-Jun	752	16
17-Jun	752	16
19-Jun	658	14
20-Jun	799	17
21-Jun	564	12
22-Jun	846	18
23-Jun	799	17
24-Jun	611	13
26-Jun	564	12
27-Jun	658	14
28-Jun	658	14
29-Jun	564	12
30-Jun	611	13
1-Jul	1,222	26
3-Jul	752	16
4-Jul	705	15
5-Jul	564	12
6-Jul	799	17
7-Jul	658	14
8-Jul	705	15
10-Jul	1,034	22
11-Jul	940	20
12-Jul	893	19
13-Jul	752	16
14-Jul	799	17
15-Jul	987	21
17-Jul	893	19
18-Jul	846	18
19-Jul	987	21
20-Jul	940	20

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21-Jul	658	14
22-Jul	752	16
24-Jul	1,175	25
25-Jul	893	19
26-Jul	564	12
27-Jul	611	13
28-Jul	658	14
29-Jul	564	12
31-Jul	705	15
1-Aug	752	16
2-Aug	1,222	26
3-Aug	1,128	24
4-Aug	846	18
5-Aug	705	15
7-Aug	1,034	22
8-Aug	752	16
9-Aug	611	13
10-Aug	658	14
11-Aug	564	12
TOTAL	40,052.00	852
Average	770	16
	770 lb = 349.3 kg	

## C COST

### C.1 Waste Amount Survey

Table C-1: Results of the Waste Amount Survey for Hospital Luis E. Aybar

Weighing Day	Generation (Kg/day)	Unit Generation (Kg/bed)
08/05/2006	476.9	1.50
09/05/2006	654.7	2.07
10/05/2006	747.5	2.36
Total Average	626.4	1.98
Average of Two (2) last days	701.1	2.21

Total number of beds at Hospital Luis E. Aybar is 317; this figure was used to calculate unit generation. On the other hand, for the purposes of the Pilot Project, the average of the last two days was defined as generation for this survey; the first day's sample was discarded due to usual uncertainties of the first day.

### C.2 Analysis of Alternatives – System Out of the Hospital -

#### C.2.1 Description of Alternatives

Three alternatives are considered to find an adequate and feasible manner to manage infectious solid waste outside the hospital. The alternatives are the following:

- 1) Direct Operation; transportation
- 2) Direct Operation; incineration
- 3) Operation by the private sector

##### a. Operation; Only Transportation

This alternative is as follows: the hospital operates its own vehicle, transport infectious solid waste in the vehicle to the final disposal site in Duquesa, and dispose waste in an exclusive site assigned for infectious solid waste.

If this system is used, the hospital needs to obtain a permit from Secretaría de Estado de Medio Ambiente y Recursos Naturales (SEMARN) to transport infectious solid waste. The vehicle should meet the requirements defined by SEMARN.

The laws require that infectious solid wastes are treated before their final disposal. However, this system does not include treatment. Furthermore, Duquesa does not have a site which meets the norms to dispose of hospital waste. Consequently, this system should be considered as a temporary measure.

##### b. Operation; Use of Own Incineration

This alternative is as follows: the hospital operates the incinerator installed in its premises, incinerates the infectious waste, and takes the ashes in its own vehicle to the final disposal site in Duquesa.

If this system is used, the hospital needs to obtain a permit to incinerate and transport from SEMARN. It is also necessary to deposit the ashes in a site which has permit from SEMARN. However, there is not a site which has the required permits neither in the National District nor the surroundings.

**c. Operation by a Private Company**

This alternative is as follows: the private company has permits for transportation and incineration for infectious solid waste. This company will transport, incinerate, and dispose wastes. However, there is not a site which has the required permits neither in the National District nor the surroundings.

**C.2.2 Costs****a. Infectious Solid Waste**

Generation	300kg/day
Density	0.2 ton/m <sup>3</sup>
Volume	1.5 m <sup>3</sup> /day
Operation Days	6 days/week
Planned Volume	1.75 m <sup>3</sup> /day (1.5 x 7/6)
Planned Weight	350 kg/day (300 x 7/6)

**b. Operation; Only Transportation**

## 1) Storage

Drum 200 liters	RD\$1,600/unit
Nos. Of Drums	26 nos./day (1.75 m <sup>3</sup> /day / 200 liters x 2* x 1.5**)
	* Taking into account transportation, two sets are needed.
	** Safety Factor

Service Life	2 years
Washing	RD\$0 (by workers at the hospital)
Cost per year	RD\$20,800 (1,600 x 26 / 2)

## 2) Transportation

Vehicle and workers	RD\$3,000/day
Cost per year	RD\$938,571/year (3,000 x 365 x 6/7)

## 3) Treatment

No treatment	RD\$0
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## 4) Final Disposal

Exclusive site*	RD\$250/ton
Cost per year	RD\$27,375/year (0.35 x 365 x 6/7 x 250)
	* Temporary Final Disposal

**c. Operation; Use of Own Incinerator**

## 1) Storage

## a) before incineration

Drum of 200 liters	RD\$1,600/unit
Nos. of drums	13 nos./day (1.75m <sup>3</sup> /day / 200 liters x 1.5)
Service Life	2 years
Washing	RD\$0 (by workers at the hospital)
Cost per year	RD\$10,400 (1,600 x 13 / 2)

## b) after incineration

Drum of 200 liters	RD\$1,600/unit
Nos. of drums	1 nos.
Service Life	2 years
Washing	RD\$0 (by hospital workers)
Cost per year	RD\$800 (1,600 x 1 / 2)

## c) Total cost for storage

Cost per year	RD\$11,200/year
---------------	-----------------



- 2) Incineration
- capacity 80 kg/hour
  - hours of operation 5 hours/day (350 / 80)
  - gas consumption 8 gallons/hour  
40 gallons/day
  - gas price RD\$110/gallon
  - Cost per year RD\$1,376,571 (40 gallon x 365 days x 6/7 x 110)
- \* This cost does not include neither maintenance nor depreciation.**
- 3) Transportation
- Vehicle and workers RD\$3,000/day
  - Cost per year RD\$156,429/year (3,000 x 365 x 1/7\*)
- \* transportation once per week
- 4) Final Disposal
- Exclusive Site RD\$250/ton
  - Amount of Ash 35 kg/day (350kg/day x 1/10)
  - Cost per year RD\$2,738/year (0.035 x 365 x 6/7 x 250)
- d. Operation by a private company**
- 1) Storage
- Drum 200 liters RD\$0 (included in transportation cost)
- 2) Transportation
- Vehicle y workers RD\$1,500/day (RD\$1,500/trip x 1 trip)
  - Cost per year RD\$469,286/year (1,500 x 365 x 6/7)
- 3) Treatment
- Incineration RD\$711,750 (RD\$1,300/m<sup>3</sup> x 1.75m<sup>3</sup>/day x 365 x 6/7)
- 4) Final Disposal
- Cost per year RD\$0 (included in the treatment)

Table C-2: Cost Comparison (RD\$/year)

item	Operation of Direct Transportation	Operation of Direct Incineration	Private Sector
Storage	20,800	11,200	0
Transportation	938,571	156,429	469,286
Treatment	0	1,376,571	711,750
Final Disposal	27,375	2,738	0
Total	986,746	1,546,938	1,181,036

## **D The Manual for cleansing personnel**

### **D.1 GENERAL OBJECTIVE**

In this manual we want you to learn how to manage and transport the infectious waste and have always in your mind what to do, to be careful at your work place from the risk of your health, and your life.

- LEARN HOW TO TRANSPORT THE INFECTIOUS AND COMMON WASTE APPROPRIATELY
- AVOID THE POSSIBILITY OF CONTRACTING CONTAGIOUS ILLNESSES.

Taking into account that the infectious waste of the hospitals has been the direct cause in the transmission of the HIV agent that produces AIDS and, still with more frequency, of the virus that transmits the hepatitis B or C, through the lesions caused by needles and other sharp objects (scalpel, etc.) contaminated with human blood.

#### **D.1.1 THE WORKERS THAT ARE FACING THE HEALTH RISK ARE:**

The assistants of consultation, nurses, the cleansing personnel, maintenance and the kitchen personnel, since they are dealing with the waste directly and daily, due to this, they have more risk of adverse effect for health.

#### **D.1.2 THE HEALTHCARE WASTES THAT MORE LIKELY CAUSE ACCIDENT:**

- Sharp, hypodermic needles, syringes, Pasteur pipettes, needles, scalpel, tubes, cultivations badges, whole or broken glassware, etc.
- The chemical compounds.
- The radioactive waste.

#### **D.1.3 HOW THESE WASTES CAN CAUSE DISEASES?**

- With puncture of needles
- By cuts of glasses or objects
- By contacts or splashes of body fluid toward the mucous or small injuries.

#### **D.1.4 WHICH DISEASES CAN CAUSE?**

- HIV (aids)
- Hepatitis B
- Hepatitis C

### **D.2 WHAT IS THE HEALTHCARE WASTE?**

The Healthcare waste are those produced by a healthcare center, can be categorized into common and hazardous waste.

### **D.2.1 COMMON WASTE**

Those that is not more dangerous than the waste of our house, such as food containers, spoons and disposable forks, glasses, plastic plates, napkins, cartons of milk or juices, bags and paper.

Also, covers of needles, syringes and tubes, the solutions that are NOT in contact with the patients are common waste.

### **D.2.2 HAZARDOUS WASTE**

Is considered as hazardous waste those that can affect the human health and the environment and can be infectious or chemicals waste.

#### **a. Infectious waste**

The infectious wastes are those that since they have had contact with body fluid or blood can cause diseases such as the HIV (AIDS), hepatitis B and C which lead to death in some cases.

The waste with blood and its derived products are the infectious waste, such as gauzes, cotton, gloves, masks, towels, bench marks, syringes WITHOUT needles, tubes, Intra Venous (IV) feed tube, urinary catheter and naso gastric tube, box of enemas, urine collectors, depressors, and culture medias, test tubes of the laboratory.

#### **b. Chemical Waste**

Chemical waste are those that can cause burns, also intoxicate because they are inflammable, explosive and toxic.

## **D.3 STAGES FOR THE INFECTIOUS WASTE MANAGEMENT**

### **D.3.1 STAGE I: SPARATION**

For the separation of the Healthcare waste, those items will be used:

- Waste containers with the logo of biohazard on the surface and their bag with red color for the non-sharp infectious waste.
- Gallon bottles placed in an iron base for the sharps.

For the separation of the common solid waste will be used:

- Waste containers with black bags.

### **D.3.2 STAGE II: COLLECTION, INTERNAL TRANSPORT AND STORAGE**

#### **a. General Measures for the Collection and Internal Transport of Infectious Waste**

- Take the bag far from the body to avoid injuries with sharps disposed by mistake/accidentally.
- Don't drag the bags because they could be broken
- Don't put the bags on your backs
- Don't open the bags after these are closed

- If the bag has broken and liquid or any content are leaked from the bag, the waste with it container and transport them by the collection carts, and at the deposit put it in another bag with no deterioration.
- b. Specific Measures for the Collection and internal Transport of Infectious Waste**
  - Waste Collection shall be done early before patients' visiting; the first shift must finish before 7:00 am.
  - A second collection shall be carried out when the shift change at 1:00 pm; in this second shift, only the bags that are full more than the half shall be changed.
  - In the first shift (before 7:00 am) all the bags must be changed.
  - For each Shift, the cleansing personnel wait until the internal collection car pass to make the delivery of the bags tied.
  - The infectious waste should only be transported by the collection pushing carts that has been designated for the wastes to transport to the temporary Storage.
  - The transport of the infectious waste should not be used to load clothes or any other supply.
- c. General Measures for the Collection and Internal Transport of Common Waste**
  - They should be picked up after transporting the bio-infectious waste.
  - They should be taken to the deposit where they will be collected by the municipality.

#### **D.4 Temporal Storage:**

##### **D.4.1 General Measures for the Temporary Storage of the COMMON WASTE**

- It has to be coordinated between the Municipality or Private collection and the hospital about collection hours to open the door, and close the door with the key after taking out the waste.
- The waste must be discharged in bags. It is totally FORBIDDEN to discharge the waste SCATTERED. The storage cleansing manager shall be able to reject the collection carts that arrive to the site with SCATTERED waste.
- The Bags shall not be thrown from the Platform, but they shall be taken by using the stairs until the Storage floor. And the bags shall be placed from the front of the facility (from the stair side) to the back (to the street Osvaldo); it needs to be left a distance of half meter between the doors toward the street Osvaldo Basil in order to open the door when the collector truck arrives.
- The place shall be washed every time that the wastes are disposed and the surroundings will be kept clean.
- The responsible for the Cleansing signs his signature and cleaning hour in the registration sheet at the storage door once he has concluded his work.
- The drainage meshes and the drainage and washing area for the collection carts shall be kept free from any solid materials.

**D.4.2 General Measures for the Temporary Storage of the INFECTIOUS WASTE**

- The place need be washed every time that the wastes are disposed and the surroundings need be kept clean.
- The responsible for the Cleansing signs his signature and the cleaning hour in the registration sheet in the storage door once he has concluded his work.
- The access toward the storage site shall keep free. The vehicles have FORBIDDEN PARKING in the access to the storage.
- The drainage and its meshes and washing area for the collection carts must be kept clean to prevent clogging.
- The tanks shall be filled FROM FRONT TO BACK. Once the tank is filled, cover by the metal lid of tank.

**D.5 Cleaning Norms of the transport and containers of the Hospital Solid Waste (HSW)**

- The collection carts of transporting the Waste shall be cleaned every day.
- Make sure cleansing of the waste baskets.
- Wash the waste baskets every time that they have been spilled with liquid.
- Wash the waste baskets three times per week before placing the red bags by using running water and detergent.
- Make sure that the waste baskets are dried well before placing the bag.

**D.6 Hygienic Measures for the cleansing and maintenance personnel in charge of the internal management of the Healthcare and Common wastes**

- They shall always use the clothes given for the waste collection, following the instructions for their appropriate use.
- They shall check that the uniforms are always clean.
- They shall frequently wash their hands with alcohol every time that they go to the personnel's rest room to drink, eat, put on makeup, etc., anytime after pick up or take out the waste of the waste containers.

**D.7 Maintenance Checking Sheet for the Temporal Storage Facilities**

**General Measures for the Temporary Storage  
of the COMMON WASTE**



- It has to be coordinated between the Municipality or Private collection and the hospital about collection hours to open the door, and close the door with the key after taking out the waste.
- The waste must be discharged in bags. It is totally **FORBIDDEN** to discharge the waste **SCATTERED**. The storage cleansing manager shall be able to reject the collection carts that arrive to the site with **SCATTERED** waste.
- The Bags shall not be thrown from the Platform, but they shall be taken by using the stairs until the Storage floor. And the bags shall be placed from the front of the facility to the back; it needs to be left a distance of half meter between the door toward the street Osvaldo Basil and the bags in order to open the door when the collector truck arrives.
- The place shall be washed every time that the wastes are disposed and the surroundings will be kept clean.
- The responsible for the Cleansing signs his signature and cleaning hour in the registration sheet at the storage door once he has concluded his work.
- The drainage meshes and the drainage and washing area for the collection carts shall be kept free from any solid materials.

# CLEANSING CONTROL SHEET

MONTH: \_\_\_\_\_

<b>DAY</b>	<b>PERSONNEL IN CHARGE</b>	<b>HOUR OF CLEANSING</b>
1		
2		
3		
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31		

## **General Measures for the Temporary Storage of the INFECTIOUS WASTE**



- **The place need be washed every time that the wastes are disposed and the surroundings need be kept clean.**
- **The responsible for the Cleansing signs his signature and the cleaning hour in the registration sheet in the storage door once he has concluded his work.**
- **The access toward the storage site shall keep free. The vehicles have **FORBIDDEN PARKING** in the access to the storage.**
- **The drainage meshes and the drainage and washing area for the collection carts shall be kept free from any solid materials.**
- **The tanks will be filled from the front to the back. Once the tank is filled, cover by the metal lid of tank.**



# CLEANSING CONTROL SHEET

MONTH:

DAY	PERSONNEL IN CHARGE	HOUR OF CLEANSING
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
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31		

E The specification of Materials

E.1 Poster



# SEPARAMOS

## Desechos Infecciosos GALON FUNDA ROJA

### CORTOPUNZANTES

- Agujas
- Bisturís
- Cateter
- Ampolletas
- Porta / Cubre Objeto
- Otros Efectos Cortopunzante

Puede disponer las jeringas con la aguja



### LOS DESECHOS CON SANGRE Y PRODUCTOS DERIVADOS

- Gasas
- Algodón
- Guantes
- Mascarillas
- Toallas
- Botas...
- Jeringas SIN AGUJAS
- Tubos
- Bajantes de Soluciones
- Sondas vesical y nasogastricas
- Box de enemas
- Colectores de orina
- Depresores
- Cultivos, Probetas y otros



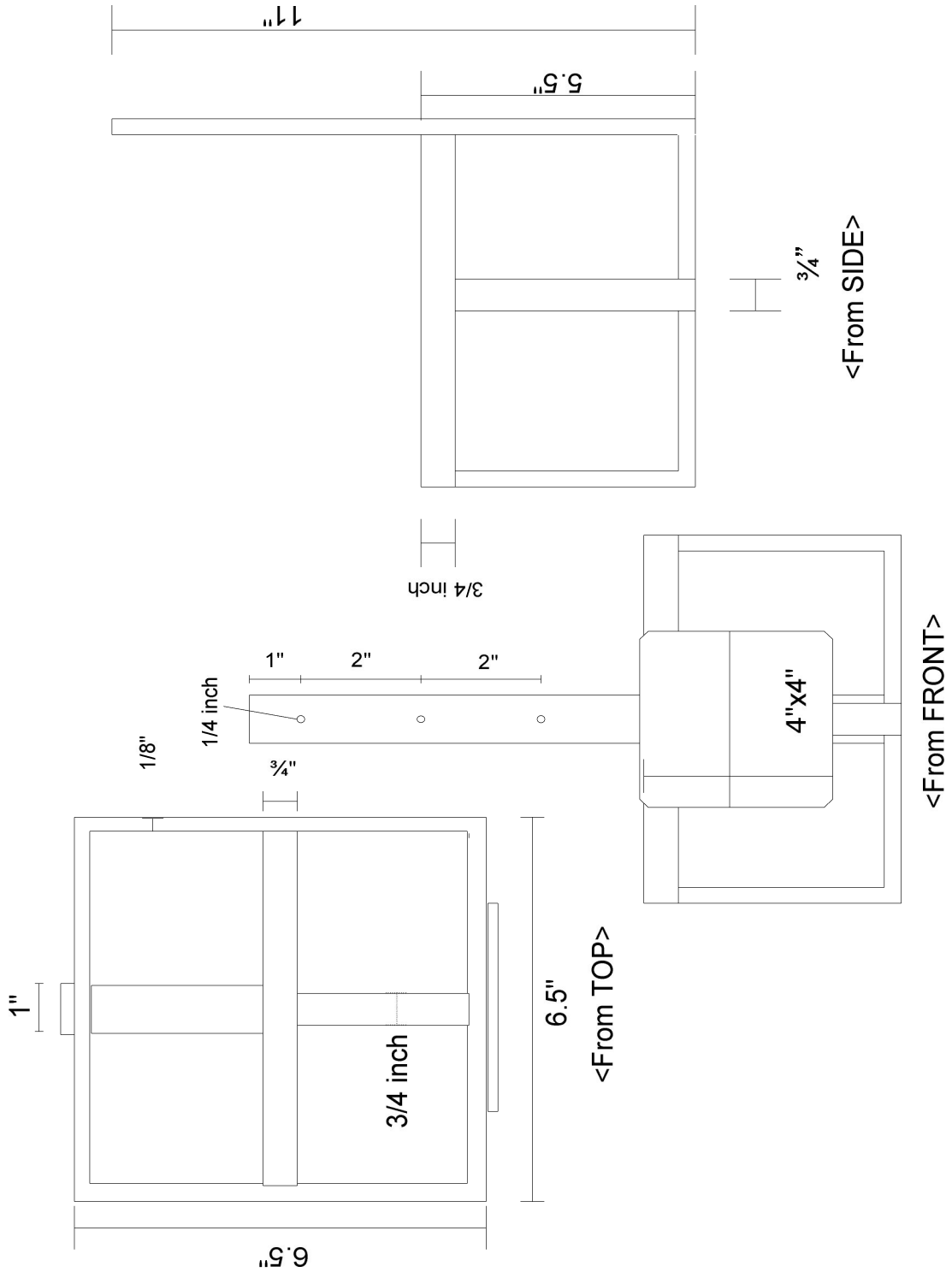
## Desechos Comunes FUNDA NEGRA

### OTROS NO INFECCIOSOS

- ENVOLTURAS DE:
  - Agujas, Jeringas y Tubos
  - Las Soluciones que NO están en contacto con los pacientes.
- Envases para Comidas
- Cucharas y Tenedores Desechables
- Vasos, Platos Plásticos
- Servilletas
- Cartones de Leche o Jugos
- Fundas y Papeles



E.2 Gallon base



## **F The specification of the temporal storage facilities**

### **F.1.1 Specifications to Condition the Temporary Storage Site for Infectious Waste**

#### **a. Floor**

Floors should be smooth, without expansion joints or any other type of conduits which prevents cleansing or evacuation of liquids from the storage area. Floors should have a 2% slope in the opposite direction to the entrance which should allow collection to screens that stop solid wastes and discharge the liquid wastes to the sewerage system.

In the existing site where the incinerator is located, the floor will be conditioned to meet the requirements established in the previous paragraph.

#### **b. Walls**

Walls should be smooth (reinforced concrete blocks) for easy cleansing with ventilation openings which are provided with protection against rodents and insects. The joints between wall and wall, and between wall and floor should be rounded to facilitate cleansing.

The walls height should have a minimum of 2.8 mts. measured from the finished elevation of the floor. Additionally, the existing intermediate beam will be used to attach the annex walls to the existing construction.

In the existing incinerator site, the joints will also be rounded as stated in the previous paragraph and the walls will be painted with oil paints in white or beige.

#### **c. Doors**

The access door may be an overhead door.

In the existing incinerator site an opening will be made.

#### **d. Roof**

Roof should cover completely the storage site and should be in good conditions to prevent leaking.

#### **e. Ceiling Insulation**

Ceiling is placed for aesthetical, insulating, and temperature control purposes. A material easily available in the local market which can be used both for coating and as ceiling is recommended.

#### **f. Area to Wash Containers and Carts**

Next to the main storage site a pond to wash containers and carts will be constructed; the tap will provide a minimum pressure of 30 psi<sup>2</sup> (206.8 kPa).

#### **g. Services**

The pond and drainage of the storage facility will be connected to the sewerage system. The pond and storage site will have water tap for cleansing with a minimum pressure of 30 psi<sup>2</sup> (206.8 kPa). The storage site will have electricity for a fluorescent lamp.

**h. Access**

The site will be conditioned to provide access to internal waste collection carts to the annex area and the area to wash containers and carts.

**i. Signalization**

The facility will have the international symbol for infectious waste on the doors and lateral walls.

**j. Abidance to Local Construction Codes**

Every structural element, such as, foundations, space between beam hangers, seismic beam, distance to intermediate beam, top beams, etc. will follow the construction local code; in case there is not any local code, the construction elements will follow the manuals and bulletins approved by Comisión Nacional de Reglamentos Técnicos de la Ingeniería, la Arquitectura y ramas afines (CONARTIA).

**k. Security**

The contractor will coordinate security with the Ciudad Sanitaria security to prevent any breach of security during the construction works.

**l. Construction Period**

Works will be completed within 30 calendar days.

**m. Alternative Design**

The contractor may present a design in more detail and/or an alternative design. Pre-cast material can be used which are easily obtained in the local market and are easy to install. However, costs of the facility as it is shown in these specifications should also be provided.

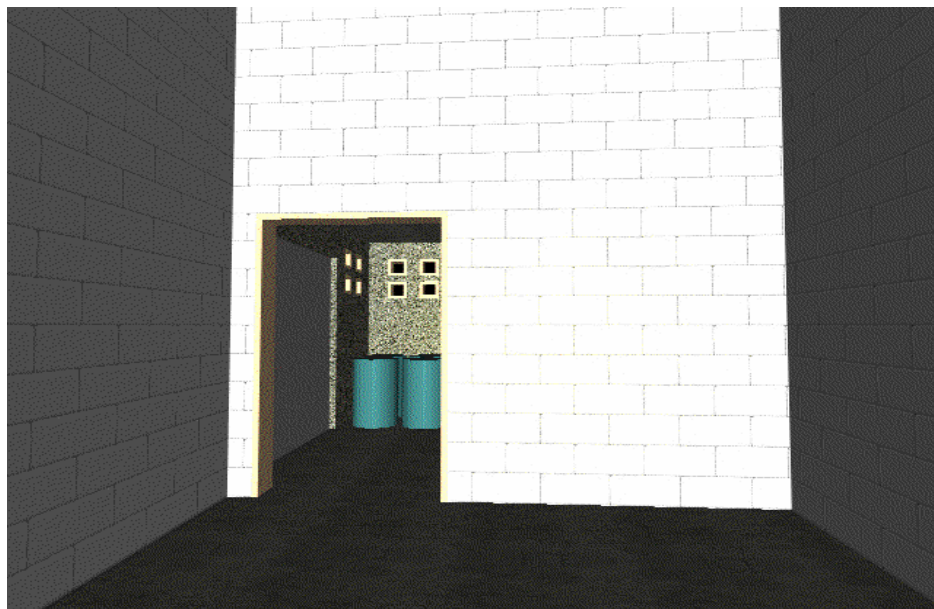


Figure F-1: View of the Opening from the Current Site in the Incinerator towards the Annex

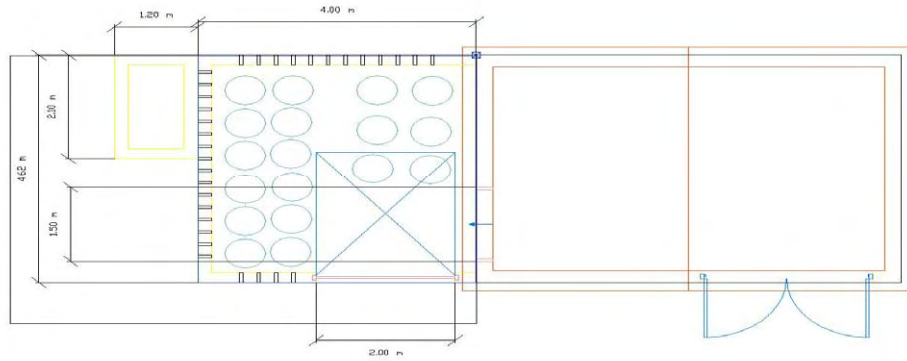


Figure F-2: Top View of Infectious Waste Storage Site Next to the Existing Incinerator

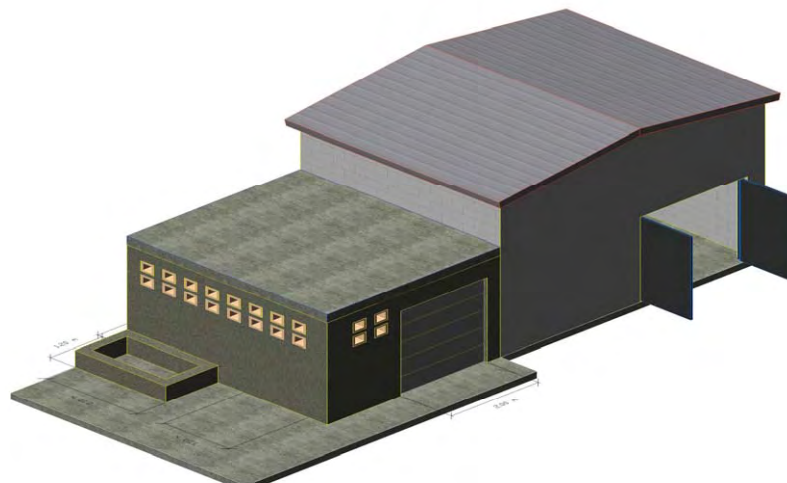


Figure F-3: Isometric Scheme of Infectious Waste Storage Site Next to the Incinerator

### **F.1.2 Specifications for the Temporary Storage Site for Non-Infectious Waste in Unidad de Quemados**

**a. Floor:**

Floor should be smooth, without expansion joints or any other type of conduits which prevents cleansing or evacuation of liquids from the storage area. Floor should have a 2% slope in the opposite direction to the entrance which should allow collection to screens that stop solid wastes and discharge the liquid wastes to the sewerage system.

**b. Walls:**

Walls should be smooth (reinforced concrete blocks) for easy cleansing, with ventilation openings which are provided with protection against rodents and insects. The walls height should have a minimum of 2.5 mts. measured from the finished elevation of the floor.

**c. Doors:**

The facility will have two (2) doors. One (1) door will be used to provide access to waste carts from inside de Ciudad Sanitaria and one (1) door will be used to evacuate the waste through Osvaldo Basil street. These two doors will be preferably lateral sliding doors constructed with black iron with triangular shape at the edge or a double hinged door which opens outwards.

**d. Roof:**

It will be a gable roof.

**e. Area to Wash Containers and Carts:**

Next to the main storage site a pond to wash containers and carts will be constructed.

**f. Services**

The pond and drainage of the storage facility will be connected to the sewerage system. The pond and storage site will have water tap for cleansing. The storage site will have electricity for a fluorescent lamp.

**g. Platform and Stairs**

There is a level difference of approximately 1 meter between the Unidad de Quemados parking lot and Osvaldo Basil street. A platform (2 m x 2 m) will be constructed to park the waste carts and discharge them at Unidad de Quemados level; subsequently, bags will be placed in containers which will be located at the Osvaldo Basil street.

**h. Construction Period**

Works will be completed within 30 calendar days.

**i. Abidance to Local Construction Codes**

Every structural element, such as, foundations, space between beam hangers, seismic beam, distance to intermediate beam, top beams, etc. will follow the construction local code; in case there is not any local code, the construction elements will follow the manuals and bulletins approved by Comisión Nacional de Reglamentos Técnicos de la Ingeniería, la Arquitectura y ramas afines (CONARTIA).



**j. Security**

The contractor will coordinate security with the Ciudad Sanitaria security to prevent any breach of security during the construction works.

**k. Alternative Design**

The contractor may present a design in more detail and/or an alternative design. Pre-cast material can be used which are easily obtained in the local market and are easy to install. However, costs of the facility as it is shown in these specifications should also be provided.

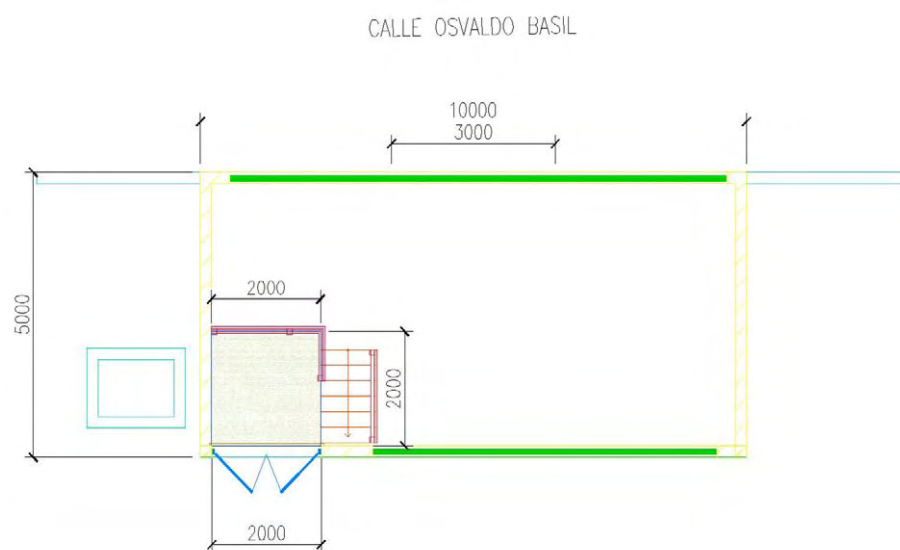


Figure F-4: Top View of Non-Infectious Waste in Unidad de Quemados Parking Lot (Units in mm)



Figure F-5: Isometric Scheme of the Facility Viewed from Unidad de Quemados Parking lot towards Osvaldo Basil Street

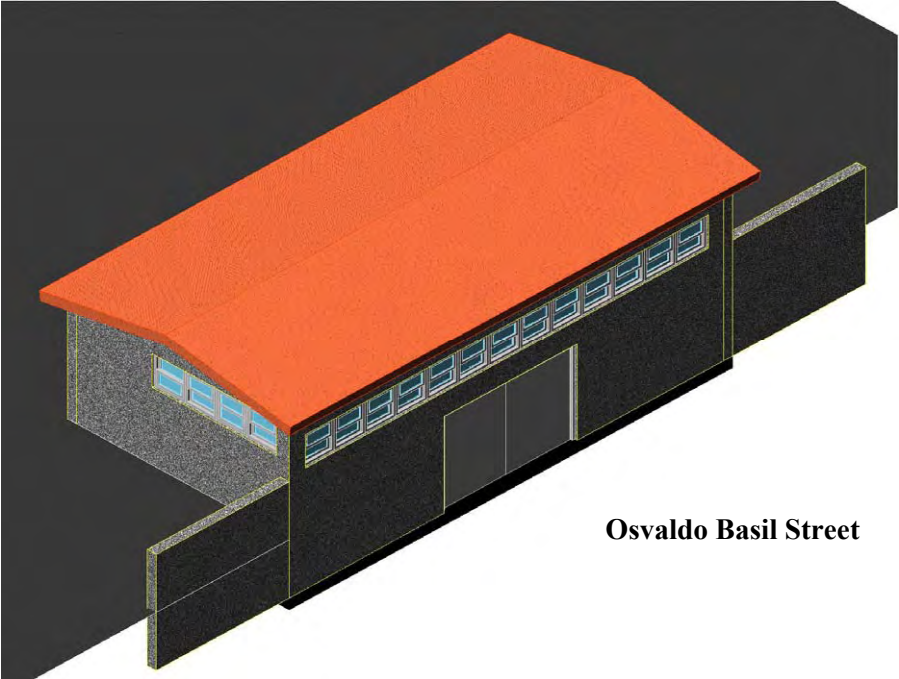


Figure F-6: Isometric Schemed of the Facility Viewed from Osvaldo Basil Street towards Unidad de Quemados Parking Lot

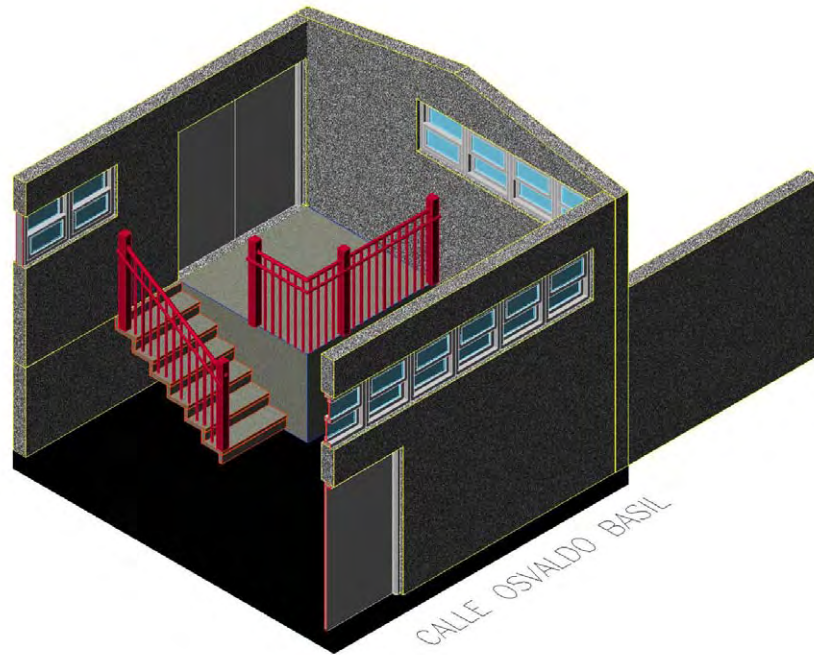


Figure F-7: Section of Platform and Stairs

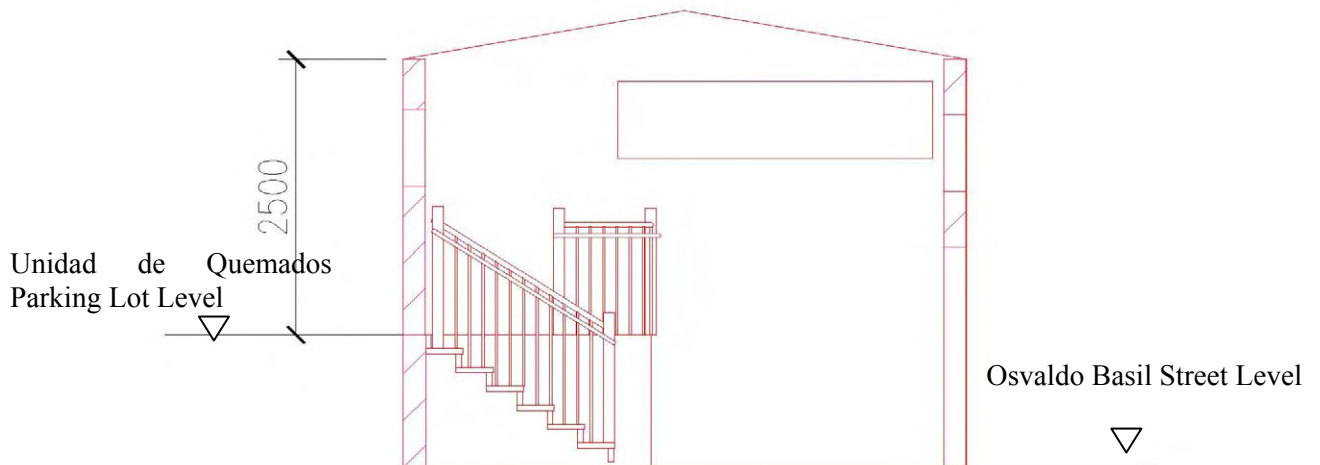


Figure F-8: Section Showing Walls and Floor Elevation (in mm)

## G Monitoring

### G.1 Monitoring forms of the hospitals

The tables below show the monitoring form of each hospital in Ciudad Sanitaria and the words filled are also shown as an example.

Date of the Supervision:

SUPERVISION by	Rooms	No. of Containers			GALLON	CHECK	Observations about Separation
		Large	Medium	Small			
	Magnetica	1					<i>Only small amount of Desechos infecciosos, small zafacone is enough</i>
	Recuperation	1			1		
	X Ray	1			1		
	Tomography	1					<i>Better set 1, Galon have is on the cart.</i>
	Sonography A		1				
	Sonography B		1				
	Lab. Public Health	0		2	1		
	Lab. Public Health	1			1		
	<b>TOTAL</b>	5	2	2	4		

**HOSPITAL LUIS E AYBER**

DATE:

No.	Rooms	Containers	GALLON	Observation about Separation	Supervision by
<b>First floor of the Morgan building</b>					
1	TOCO	2	3	2 Gallons in one surgery room, 1 dentro del Quirófano	Dra. Ana Julia Casin
	Prep. room			The container for common waste is missing	
2	High Risk	1	1	Bad	
3	Puerperal Pathology	1	0	Bad	
4	Puerperal Post	1	0	Bad	
5	Gynecology	1	0	Bad	
6	Puerperal Post 2	1	1	Bad	
7	Puerperal Physicology	1	0	Bad	
8	Room 1H1	1	1	so so	
9	Neurology	1	0	Very bad use of the container	
10	Room 1H2	1	1	Mixed Use, very close to patients	
11	Room 1M1 Room 1 A	1	1	Bad	
12	Room 1M1 Room 2 B	1	1	OK	
13	Room 1M1 Room 3 C	1	1	OK	
14	Room 1M2	1	1	Bad	
15	Room 1M3	1	0	Bad	
16	Room 1M4	1	1	Bad	
17	Room 1M5	1	1	Staffer	
<b>Second Floor of the Morgan building</b>					
18	Recuperation Post-Anesthesiology	1	0		Dra. Mercedes Castro Balle
19	Area of surgery	6	5	?	
20	ICU	2	1	?	
21	Oftalmology	1	0	Bad	
22	Urology 2H2	0	0		
23	Room 2H3	1	1		
24	Room 2H4	1	1		
25	Room 2H5	1	1		
26	Room 2H1	1	1		

Rooms	Containers	GALLON	Observation about Separation	Supervision by
27 Dialysis	6	1	<i>Very bad</i>	<i>Dra. Mercedes Castro Balle</i>
28 Room 2M1-A	1	1	<i>Bad use</i>	
29 Room 2M1-B	0	0		
30 Room 2M1-C	1	1	<i>Bad</i>	
31 Perinatology	1	1		
32 Pediatrics/Surgery Minor	1	0		
33 Emergency Pediatrics	1	2	<i>Mixed</i>	
34 Hall of Pediatrics	1	1		
35 Room 7/Pediatrics	0	0		
36 Room 6/Pediatrics	0	0		
37 Room 5/Pediatrics	0	0		
38 Room 4/Pediatrics	0	0		<i>Dra. Ana Julia Cetin</i>
<b>ANEX</b>				
39 Blood bank	1	1		
40 Emergency Pediatrics	1	1	<i>Good</i>	
41 Vaccination	1	0		
42 Emergency Surgery	1	0		
43 Emergency Surgery	1	0		
44 Emergency Surgery	1	1	<i>OK</i>	
45 Emergency Obstetrics	1	0		
46 Emergency Consultant	1	1		<i>Dra. Barbara Garcia,</i> <i>Dra. Sonia Valdez</i>
46 Emergency Internal Medicine	5	2		

57 36

## GASTRO

Date of the Supervision

	Room	Contai			Observaciones sobre Separación
		Cantidad	GALO	Check	
<b>SUPERVISION by</b>	<b>AREA OF INTERNAL MEDICINE</b>				
	Room No. 4	1	1		
	Room No. 3	1	1		
	Room No. 2	1	1		
	Pediatrics	1	1		
	Private	0	0		
	ICU	1	1		<i>Galon No setting (no space)</i>
	Nurse station	1	1		
	ENDOSCOPIA	1	1		
	LAPAROSCOPIA	1	1		<i>Galon No setting (no space)</i>
	X Ray	0	0		
	<b>ADMISSION</b>				
	Area de Admisión o emergencia	1	0		<i>Already 1 galon base</i>
	<b>CONSULTING</b>				
	For children				
	Consulting room 1				
	Consulting room 2	1	1		<i>Galon no setting, under the sink,</i>
	For adults				
	Consulting room 1				
	Consulting room 2				
	Consulting room 3				
	Consulting room 4				
	Consulting room 5				
	Consulting room 6				
	Consulting room 7				
	Consulting room 8	1	1		<i>Galon No setting (no space)</i>
	<b>AREA of Laboratory and Microbiology</b>				
	Blood bank area	1	3		<i>Data Receicing place (1), Blood bank area (2)</i>
	Blood bank	1			
	Area of Chemical	1			
	Area of Uroanalysis	?			
	Area of Hemathology	1			
	Area of Serology	1			
	Area of Estirilization	?			
	Area of Lab. Of Emergency	?			
	Area of Microbiology	2			
	Pathology	1	1		
	Paraphycology	1			
	<b>TOTAL</b>	<b>20</b>	<b>14</b>		

Unidad de Quemados (Burn Unit)

DATE:

Emergency	SURPERVISION BY	Quantity of containers	GALLON	Check	Observations about Separationiones
		Surgery		1	
Room		ICU			
		Operation room1		1	
		Operation room2		1	
		AREA W		5	
		Room R		1	
		Room J		1	
		RoomX		1	
		TOTAL		11	