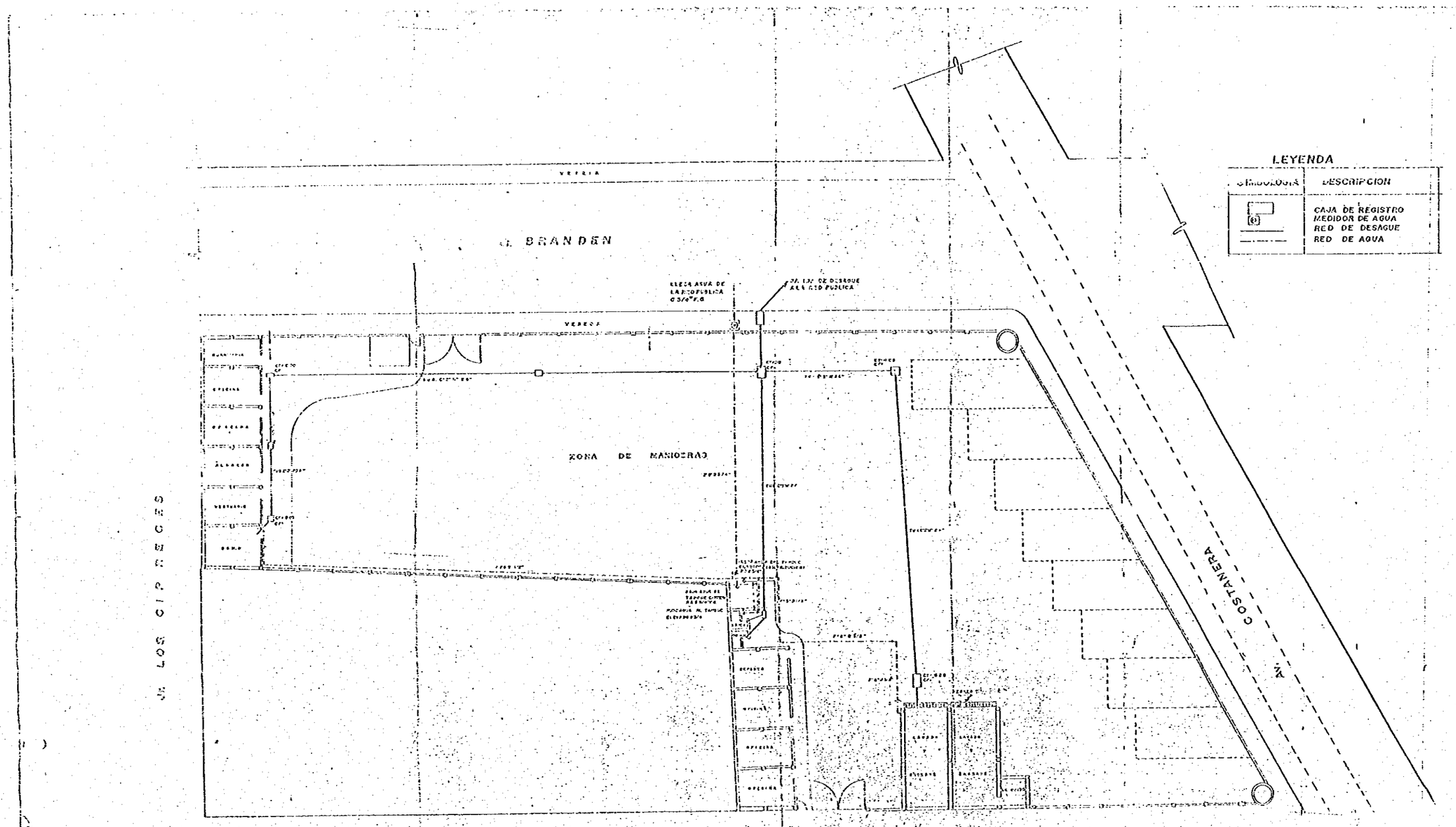


INSTALACIONES SANITARIAS

July. 7.'91

MUNICIPALIDAD PROVINCIAL DE PUNO

PROYECTO: TALLER DE MAESTRANZA

PLANO: INSTALACIONES SANITARIAS

4 – 141

UBICACION	ESCALA	FECHA	REV. J.S.M.P.
	1/500	DIC. 97	V°B° P.P.J.

CONTEN. P-2

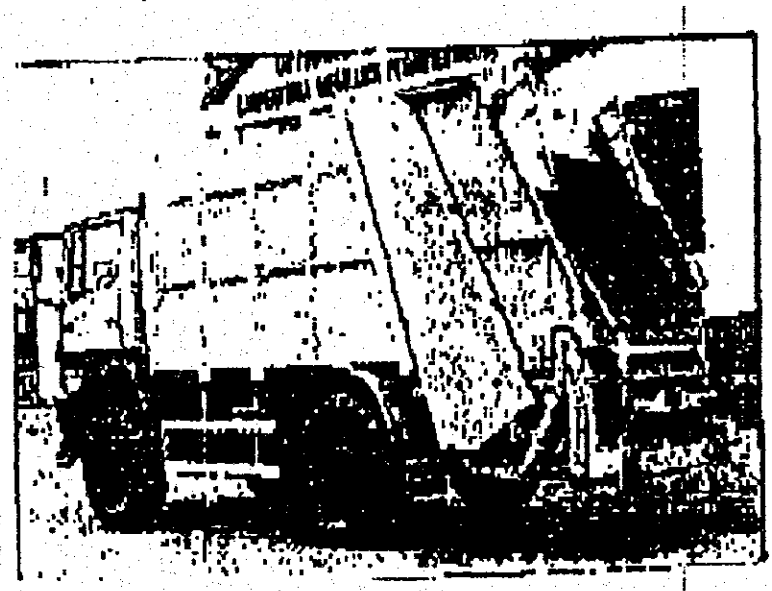
(3) Project of Reinforcement and Repair for Public Services, 1999

PROYECTO

AMPLIACIÓN Y REFLOTAMIENTO DEL SERVICIO DE LIMPIEZA PÚBLICA

ENTIDAD EJECUTORA: MUNICIPALIDAD PROVINCIAL DE PUNO

DIRECCIÓN DE SERVICIO A LA COMUNIDAD



Puno, marzo de 1999

CONTENIDO

I.- NOMBRE DEL PROYECTO AMPLIACION Y REFLOTAMIENTO DEL SERVICIO DE LIMPIEZA PUBLICA.

II.- UBICACIÓN DEL PROYECTO:

Departamento	:	Puno
Provincia	:	Puno
Municipio	:	Puno

III.-PLANTEAMIENTO DEL PROBLEMA

1.- Características geográficas de la ciudad de Puno.

Como característica geográfica de la ciudad de Puno, el Lago Titicaca presenta la forma de una cuenca que se convierte en el centro y la ciudad de Puno se divide en el área plana y el área montañosa que componen esta cuenca. La actividad de recolección es realizada por camiones recolectores de basura (incluyendo carros recolectores de basura que funcionan con la fuerza del hombre tales como triciclos, etc) que recogen la basura fácilmente en el área plana. La recolección en el área montañosa, debido a que las características geográficas del terreno es escarpado, el servicio es restringido. A saber , unas cuantas áreas en la parte montañosa donde las actividades de recolección son menos frecuentes que en el centro de la ciudad de Puno, o unas cuantas áreas donde las actividades de recolección no existen. En estas áreas, existe una porción de viviendas que no tienen instalaciones de baño, por lo tanto la acumulación de residuos sólidos (papel higiénico) en las micro cuencas es mayor.

En la Ciudad de Puno con 108,498 habitantes (según datos recogidos por el estudio JICA), existen 57 vecindarios, 20 urbanizaciones, 01 grupo habitacional, 04 asociaciones de vivienda, 03 asentimientos humanos y 02 pueblos,la mayor parte de ellos están Asociados a la Central Única de Barrios y Urbanizaciones Populares de Puno, CUBUPP.

2.- La gestión del servicio de limpieza pública

No existen servicios de limpieza pública encomendados a empresas privadas, todos los servicios son ejecutados por el Municipio en lo que respecta a recolección, transporte, tratamiento y eliminación de desechos sólidos.

Se esta llevando a cabo dos tipos de recolección. Una es la recolección de barrido de calles y otra es la recolección de basura de un residente. El barrido de calles es realizado junto a un barredor de calles, carros recolectores tales como triciclos, camiones recolectores de basura, como camiones compactadores y camiones volquetes.

Los desechos son recogidos mediante 02 camiones volquetes y 02 recolectores, compactadores, son llevados hasta el lugar de disposición final de Cancharani, que esta ubicado a 7 kms de la parte central de la ciudad. Hay que mencionar que existen 03 vehículos de recolección inoperativos de los cuales se puede rescatar 01 Camión compactadorde 12M3 de capacidad.

La producción de desechos sólidos en la ciudad de Puno alcanza a 67.61TM/día y los desechos recolectados llegan a 34.4TM/día lo que significa un déficit de 33.2TM/día. Es decir, 49.1% de déficit (Estudio misión JICA).

En el relleno sanitario ubicado en Cancharani no se realizan en forma significativa procesos de reciclamiento, incineración, combustión ni de fertilización, etc, de los desechos que se recolectan.

IV.- JUSTIFICACION

La ampliación y reflotamiento del servicio de limpieza pública en la ciudad de Puno se justifica por las siguientes razones:

1.- EL CRECIMIENTO DEMOGRAFICO DE LA CIUDAD DE PUNO.

CUADRO N° 1: LA POBLACIÓNDE LA CIUDAD DE PUNO (1)

Año Censal	Población Distrital	Población Urbana	Tasa de Crecimiento
1961	34,636	24,459	-
1972	51,648	40,453	4.68
1981	78,195	67,628	5.88
1993	100,168	91,877	2.59
1995	109,094	100,802	4.70
1998(2)	-.-	108,498	2.48 (3)
2000	123,302	115,904	2,22 (3)

(1): Fuente: HIDROSERVICE /BWAS – PRONAD
(2): Fuente: JICA.
(3): Cálculos propios

La ciudad de Puno muestra un crecimiento demográfico acelerado, que representa una demanda creciente por servicios públicos, en particular por servicios de limpieza pública.

Si observamos el cuadro N° 1 en 1993 la población urbana puneña contaba con 91,877 habitantes la ciudad crecía a un ritmo de 2.59%. En 1998 tenemos 108,498 habitantes con crecimiento a una tasa anual de 2.48%. La proyección para el año 2000 alcanzaría 115,904 habitantes con una tasa de crecimiento de 2.22% anual. Estos indicadores demuestran el ritmo acelerado de crecimiento demográfico de la ciudad de Puno.

2.- PUNO DESTINO TURISTICO

CUADRO N°2 : NUMERO DE TURISTAS EN LA PROVINCIA DE PUNO

AÑO	NACIONALES	EXTRANJEROS	TOTAL
1993	50,268	23,018	73,286
1995	54,394	50,395	104,789
1996	51,236	61,224	113,199
1997	54,236	56,065	110,301
1998(1)	42,845	46,640	89,485

fuente : INEI
x(1)1998 . hasta octubre

El Municipio esta sentando bases para convertir a Puno en destino turístico y una de estas bases es tener una ciudad limpia. Según podemos observar el cuadro N° 2 el crecimiento del turismo es sostenible y ascendente, particularmente en el segmento del turismo receptivo. Para JICA en el año2005 el numero de turistas será de 300 mil y de 600 mil en el año 2015. El número de estadías por noche será 5 veces mayor en el 2015 que el numero actual en todo el departamento de Puno. Este crecimiento proyectado exige tomar medidas efectivas en gestión del servicio de limpieza pública que permita mostrar una ciudad bella y limpia.

3.- LA SITUACION DEL SERVICIO DE LIMPIEZA PUBLICA

CUADRO N°3 : PRODUCION DE DESECHOS SOLIDOS EN LA CIUDAD DE PUNO

	1995(1)			1997(2)		
		TM/día	%		TM/d	%
Población Urbana	97,717	33.3	59.9	98,592	34.0	49.0
Establecimientos comer. Servicios e industriales	6,627	19.9	35.8	8,267	26.0	37.0
Mercados y com. Ambul.	402(3)	2.4	4.3	2,905	10.0	14.0
TOTAL		56.6	100.0		70.0	100.0

Fuente:

(1) Plan Urbano de Puno INADUR 1996
(2) : División de Salud y Saneamiento Ambiental. M.P.P.
(3) : Solo mercados.

CUADRO N° 4 SITUACION DEL SERVICIO DE LIMPIEZA PUBLICA

AÑO	Población.	Desechos Sólidos Producidos TM/día	Desechos Sólidos Recolectad. TM/día	Recol. %	Déficit
1995(1)	96,717	56.6	24.4	43.9	56.1
1997(2)	98,592	70.0	30.0	43.0	57.0
1998(3)	108,498	67.6	34.0	50.3	49.3

33 (c)

Fuente : (1) División de Salud y Saneamiento Ambiental
(2) Plan Urbano de Puno
(3) Estudio JICA 1998.

La limpieza pública es realizada por el Municipio, con niveles deficitarios de cobertura. De acuerdo al cuadro N° 3, en 1995 la producción de desechos sólidos en la ciudad se distribuía en 33.3TM/día los vecinos, 19.9TM los establecimientos comerciales, de servicios e industrias y 2.4TM de la basura era producido por los mercados, la producción diaria alcanzaba 56.6TM.

En 1997 la producción diaria ascendía a 70.0 TM, es decir en dos años se presentaba un incremento de 23.7%. Sin embargo, hay que relativizar estos datos en la medida del análisis de la confiabilidad de los métodos de medición utilizados para determinar estos resultados. Lo importante es señalar que la participación de la producción de basura generada por establecimientos formales por una parte, los mercados y ambulantes por otra, se incrementan significativamente a 37% y 14 % respectivamente.

Por otra parte respecto a los niveles de cobertura del servicio de limpieza pública, analizando el cuadro N° 4, tenemos que en el año de 1995 el déficit de recojo de basura era del orden del 56.1%, en 1997 subía ligeramente a 57% y en 1998 descendía a 49.3%. es decir el servicio es ampliamente deficitario, en el último año de análisis se recogía 34 TM de desechos sólidos, contra 33.6 TM que no se recogían.

4.- CAPACIDAD OPERATIVA DEL SERVICIO DE LIMPIEZA PUBLICA

CUADRO N° 5 VEHÍCULOS DE RECOLECCION DE DESECHOS SOLIDOS

N°	UNIDAD VEHICULAR	CANTIDA	CAPACIDAD	AÑO DE COMPRA	PAIS DE ORIGEN	MARCA	SITUACION
1	COMPACTADORA D-500	1	7	1976	USA	DODGE	OPERATIVO
2	VOLQUETE D500	1	5	1981	USA	DODGE	OPERATIVO
3	VOLQUETE 3041	1	7	1983	ESPAÑA	PEGASO	BAJA
4	VOLQUETE	1	5	1988	ESPAÑA	DINA	OPERATIVO
5	COMPACTADORA D-500	1	12	1981	USA	VOLVO	OPERATIVO
6	COMPACTADORA	1	12	1981	USA	FORD	BAJA
7	CAMION	1	-	1983	ESPAÑA	TORFERS	BAJA

CUADRO N° 6 CAPACIDAD INSTALADA PARA EL RECOJO DE RESIDUOS SOLIDOS EN LA CIUDAD DE PUNO

Unidad Vehicular	Capacidad cantidad	Capacidad M3	Capacidad TM	Número de viajes	cobertura TM / día	Estado
Compatadora D-500	1	7	6.58	2	13.16	R
Camión Volquete D-500	1	5	2.35	2	4.7	R
CAMIÓN Volquete	1	5	2.35	2	4.7	R
Compatadora D-500	1	12	11.28	1	11.28	M
TOTAL	4	29	22.56	7	33.84	

R= Regular, M= Malo

En relación a la capacidad operativa del servicio de limpieza pública, analizando el cuadro N° 05, la división contaba con 07 unidades vehiculares para el servicio, 03 carros compactadores, 03 volquetes y un camión. En la actualidad se encuentran en funcionamiento 4 unidades, 02 compactadoras y 02 volquetes, en estado operativo de regular para abajo, con un promedio de antigüedad mayor a los 15 años. De las tres unidades inoperativas, la compactadora Ford de 12 M3 de capacidad puede recuperarse mediante la adquisición de un motor y una caja de cambio nueva.

Las rutas de recolección de vehículos recolectores no son permanentes, realizan cada una un promedio de 2 viajes diariamente. De acuerdo a la capacidad de carga de las unidades, con una densidad de basura suelta de 0.47 TM/M3 (Estudio del Banco Mundial) y considerando una relación de compactación de 2:1 de los compactados, en la ciudad de Puno se recogen 33.84TM/día (cuadro N°6).

Por otra parte, en el año de 1998 para cubrir el déficit en el recojo de la basura, se tomo la decisión de alquilar dos camiones volquete de 14 y 15 M3 de capacidad, a 30 soles la hora de alquiler. Los costos de alquiler de estas unidades en 1998 sumaron S/ 91,074.0.

Las razones expuestas en este punto, demuestran ampliamente la necesidad de ampliar la cobertura y capacidad instalada del servicio de limpieza pública, entendiendo que en el corto plazo no existe ninguna propuesta por parte de la empresa privada de solicitar en concesión o bajo cualquier otra forma la administración y gestión del recojo y tratamiento de los desechos sólidos en la ciudad de Puno. Consideramos que es responsabilidad del Municipio Provincial de Puno tomar las previsiones del caso y plantearse mejorar la eficiencia del servicio, frente a una ciudad en crecimiento vertiginoso, con un aumento del turismo Nacional y Extranjero y superar las fuertes limitaciones de la cobertura y la capacidad instalada de la limpieza pública.

V.- DESCRIPCION DEL PROYECTO

El propósito del proyecto esta orientado a ampliar la cobertura y la capacidad instalada del servicio de limpieza pública, solicitando la adquisición y reflotamiento de vehículos compactadores de basura para la División de Limpieza Pública. Para lo

cual se requiere complementar con los costos de mantenimiento y servicio de dichas unidades compactadoras.

VI.- OBJETIVOS DEL PROYECTO

OBJETIVO GENERAL

Ampliar la cobertura de atención del servicio de limpieza pública en la ciudad de Puno, elevando la calidad y gestión de servicio y obteniendo un nivel tecnológico adecuado para el recojo y disposición final de los desechos sólidos.

OBJETIVOS ESPECIFICOS

Incrementar las unidades operativas de limpieza pública mediante la compra de vehículos y repotenciamiento de los vehículos inoperativos.

Superar el déficit de la atención del servicio de limpieza pública en la ciudad de Puno,b ampliando la cobertura de rutas y el acceso a zonas difíciles.

VII.- REQUERIMIENTO PARA LA INVERSION

Para el requerimiento de la inversión se tiene diferentes alternativas para la elección de las compactadoras.

1.- REFLOTAMIENTO DE UNIDADES

Se propone reflotar y poner operativas a la compactadora Ford de 12 M3 de capacidad que requiere una caja de cambio y un motor nuevo, así como complementar la puesta en operatividad del vehículo con un chasis que no es de urgencia.

ALTERNATIVA A:ADQUISICIÓN DE UN MOTOR Y CAJA DE CAMBIOS
Fuente : Proforma VOLVO Automotriz Andina S.A.

Detalle	Cantidad	Precios$
Motor Nuevo TD TIG Armado	1	26,038.92
Caja de Cambos ZF S6 65 GS/GV80	1	16,465.25
SUB TOTAL		42,504.17
10% Dscto.compra al contado		38253.75

T.C. 3.40 = S/. 130262.75

ALTERNATIVA B: Adquisición de Cabina y Chasis Con Motor Completo

DETALLE	MODELO	MARCA	POTENCIA		PRECIOS $
CHASIS CABINA	FL614		180HP		$ 73,160.00
TOTAL					$ 73,160.00

Fuente : VOLVO Automotriz Andina S.A incluye IGV- Precio Contado.

2.-ADQUISICIÓN DE UNIDADES NUEVAS:

Una alternativa importante es la adquisición de vehículos recolectores nuevos, tienen la ventaja de una mayor vida util y menores costos de mantenimiento, sin embargo existe la limitación presupuestal para el presente año.

Detalle	CAPACIDAD	Precios$
CAMION NISSAN CONDOR CARGA LATERAL	4M3	47,340.00
CAMION NISSAN CONDOR 7TNS COMPACTADORA LATERAL	8M3	56,380.00
CAMION NISSAN CONDOR 9TNS COMPACTADORA LATERAL	12M3	64982.00
CAMION INTERNACIONAL COMPACTADORA CAMENA	15M3	96,650.00

X2 = 321912
160,956.00
81,692.00
Tc. 3.40

Fuente : Proforma Empresa LIAZA S.A., Proforma Empresa CAMENA CON IGV

3.- ADQUISICION DE UNIDADES DE SEGUNDO USO

ALTERNATIVA A: IMPORTADOS DE EUROPA

DETALLE	CAPACIDAD	COSTO UNIT. NO INCLUYE IGV
CAMION VOLVO AÑO 90 COMPACTADORA NORBA	12.5M3	50,779.66
CAMION VOLVO AÑO 90 COMPACTADORA	12.5M3	39,890.00

FUENTE : Proforma Enviromental Engenering SAC

ALTERNATIVA B: CETICOS ILO

DETALLE	CAPACIDAD	COSTO UNIT. NO INCLUYE IGV
CAMION MITSUBISHI CANTER COMPACTADORA AÑO 90	2 M3	7,200.00
CAMION NISSAN ATLAS COMPACTADORA AÑO 91	2 M3	7,200.00
CAMION HINO/ISUZU/FUSO COMPACTADORA AÑO 93	4M3	14,000

✓ 23 800
14000

FUENTE : Gran Horizonte Importación de Vehículos, Sakura Importaciones S.A

208,760
52.2
100 x 2

VIII.- COSTOS OPERATIVOS

Los costos operativos mensuales de personal y mantenimiento por unidad vehícular varían, según sea una unidad nueva o de segundo uso, o la capacidad de carga. Una unidad de segundo uso tiene un costo operativo de S/. 1,690.00 mensuales. Por su parte una unidad nueva los costos operativos alcanzan S/. 1360.00. si la unidad es de 12M3de capacidad hay que añadir los costos de dos ayudantes es decir S/. 800.00. Si la compactadora es menor capacidad , hay que sumar un ayudante mas , es decir S/. 400.00.

CUADRO Nº 7 : COSTOS OPERATIVOS POR COMPACTADORA

DETALLE	UNI DE MED.	MENSUAL UNIDAD EN USO	UNIDAD NUEVA MENSUAL
Costos directos		S/.	S7
Chofer para Conpactadora Primer vehículo	1	450	450
Ayudante	1	400	400
Combustibles	Gls	450	450
Lubricantes	Gls	100	40
repuesto	Varios	80	-
Mantenimiento	servicios	160	20
otros	varios		
TOTAL S/.		1690.00	1.360

IX SELECCIÓN DE ALTERNATIVA

CUADRO N°8 ALTERNATIVA PARA SELECCIÓN DE COMPACTADORAS

UNIDAD VEHICULAR	Nº DE UNID.	COSTO	CAPACIDAD		COSTO PERSONAL	COSTO DE MANTENI.	AHORRO PERSONAL	TOT HMA
Reflotamiento de compactador FORD	1	38,253.75 1)	12M3	11.8TM	2) 4714.29	2,400	3) 6,857.14 CE=257.15	4) 2400
CAMION NISSAN COMPACTADOR CARGA LATER.	1	47,340.00	4M3	3.76TM	3,571.43	1457.14	4571.43 CE=457.14	2400
CAMION VOLVO COMPACTADOR AÑO 90 中古	1	47,070.20	12.5M3	11.75TM	4,714.29	2,400	6,857.14 CE=257.14	2400
CAMION MITSUB. CANTER 90 中古 COMPACTADOR	2	14,400.00	4M3	3.76TM	7142.86	4,800.00	11,428.58 CE=514.28	4800
CAMION HINOS/FUSO 93 COMPACTADOR 中古	2	28,000	8M3	7.52TM	7142.86	4,800.00	11,428.58 CE 514.28	4800

1) Costo Incluye IGV.
2) Costo de personal carro grande 12M3 un chofer y 3 ayudantes, carro chico 1 chofer y 2 ayudantes.
3) Ahorro personal
   Carro grande 6 x 400 x 10 x S/ = 24000 = $ 6857.14
   Carro chico 5 x 2 x 10 = 20000 = $ 5714.29
4) Horas / Maquina: 8horas/día x 30 días x 10 meses x 10 unidades
   C.E = Costo Efectivo = Costo personal + C. Mantenim - ahorro en personal
   T.C = S/. 3.50
   Presupuesto = 10 meses

En el cuadro Nº 8 se presentan las alternativas de inversión para la adquisición de vehículos compactados, se han añadido las variables de capacidad de carga, costos de personal y costos de mantenimiento (en dólares) , por otra parte se confrontan los costos incurridos (personal y mantenimiento con los costos ahorrados en contratación de personal, al ponerse en operatividad uno o dos vehículos compactados, resultando el costo efectivo (CE). Un factor adicional para la decisión de una de las alternativas son las horas/maquinas trabajadas.

Tomando la información presentada en el cuadro Nº 8, el proyecto propone en primer lugar el reflotamiento del compactador FORD con la que se incrementaría la capacidad instalada del servicio de limpieza en 11.28TM, por viaje y el costo operativo efectivo sería de $ 257.15. En segundo lugar, el proyecto propone la adquisición de 04 unidades de 2 y 4 M3 de capacidad, sumados amplían la capacidad instalada del servicio de limpieza pública en 11.28TM por viaje. El costo efectivo es de $ 1028.56 superior a otra alternativa, pero tiene la ventaja de sumar 9,600 horas/ maquina de servicio y la flexibilidad de ingresar a las estrechas calles céntricas de la ciudad y de cubrir las zonas montañosas de la ciudad, principalmente los barrios Urbanos marginales periféricos.

La inversión total par la ampliación y reflotamiento de estas unidades alcanza $80,653.75, y los costos efectivos operativos por los 10 meses restantes del año suman $ 1.335.71.

X.- FINANCIAMIENTO.

El financiamiento se cubrirá con ingresos propios presupuestados para este periodo de acuerdo a la desagregación del presupuesto, que suma S/ 400,000.00 que al tipo de cambio de S/ 3.50 por dólar es de $ 114,285.71 si restamos la inversión requerida que asciende a $ 80, 653.75, representa un ahorro $ 33,631.96.

XI.- CONCLUSION

1. El proyecto propone reflotar un camión compactador marca FORD de 11.28TM de capacidad de carga por viaje, lo que significa que si consideramos 2 viajes como mínimo, la cobertura del servicio de limpieza se ampliara a 22.56TM de recojo de desechos sólidos por día.

2. El proyecto adquirirá 04 camiones compactados de segundo uso, en stock de CETICOS ILO, que por su tamaño cubrirá mayores rutas de recojo de desechos sólidos, tanto en calles estrechas de la ciudad , como en barrios periféricos que se encuentran en las zonas escarpadas de Puno. El servicio de limpieza ampliara su capacidad instalada a 11.28TM, por viaje, pretendiendo realizar 3 viajes por día, la cobertura diaria de limpieza pública se ampliara a 33.84TM.

3. Con la puesta en funcionamiento de las unidades compactadoras se cubrirá el déficit de recojo de desechos sólidos, sin tener que alquilar volquetes que el año 1998. Representaron un egreso de S/ 91,000.00.

4. La inversión del proyecto es de $80,653.75 que respecto al presupuesto de inversión representan un ahorro de $33,631.96.

* Repotenciar Motor + caja $ 38253.75
* 2 Compact. 2M3 14400.00
* 2 compact 4M3 28000.00
$ 80653.75

XII.- RECOMENDACIONES

Recomendamos la financiación inmediata del proyecto para ampliar el número de vehículos conpactadores, puesto que existe una necesidad de recojo de basura de 49.3% de déficit de esta forma presentamos una alternativa de solución del problema y todos los efectos que esta causa como es contaminación ambiental y de salud mediante enfermedades que afectan la población en su conjunto, la proliferación de montículos de basura de desperdicios en los mercados y ante el crecimiento de la población la necesidad de contar con dicho servicio es de vital importancia.

Complementariamente a la puesta de operación de la flota de vehículos compactadores, el proyecto recomienda una campaña por medios de comunicación para colaborar con el sistema de campaneo para el recojo de desechos sólidos.

Ⅱ. DATACONCERNED TO THE FINAL DISPOSAL

2.1 PROPSAL OF TECHNICAL STANDARD FOR LOCATION, DESIGN, CONSTRUCTION, OPERATION AND MONITORING OF AUTOMATED SANITARY LANDFILL

OPS/CEPIS/95.23(MRS)
Original: Spanish

PROPOSAL OF TECHNICAL STANDARD FOR LOCATION, DESIGN, CONSTRUCTION, OPERATION AND MONITORING OF AUTOMATED SANITARY LANDFILL

Engineer Gladys Monge Talavera
Engineer Milton Miranda Zuzunaga
Engineer Walter Red walls
Consultants ©PS/OMS

Center for Pan-American of Sanitary Engineering and Sciences of the Environment
Representative Office of the OPS/OMS in Peru
Program of Health and Atmosphere
Pan-American Organization of the Health
Pan-American Sanitary office - Regional Office of the
World Health Organization

Lima

1995

PAN AMERICAN CENTER FOR SANITARY ENGINEERING
AND ACADEMY OF ENVIRONMENT
REPRESENTAVE OFFICE OF THE OPS/OMS IN PERU

PROPOSAL OF TECHNICAL STANDARD FOR THE LOCATION, DESIGN, CONSTRUCTION, OPERATION AND MONITORING OF AUTOMATED SANITARY LANDFILL

Authors:

Engineer Walter Red Walls
Engineer Gladys Monge Talavera
Engineer Nlilton Miranda Zuzunaga

Lima

April 1995

INDEX

PROJECT OF TECHNICAL STANDARD FOR LOCATION, DESIGN, CONSTRUCTION, OPERATION AND MONITORING OF AUTOMATED SANITARY LANDFILL

I

CHAPTER I - GENERAL DISPOSITIONS

Objective and Scope of Standard

Article I The present technical standard has for objective of the final disposition of the urban dangerous solid residuals and they establish the requirements for the location, design, construction, operation and monitoring of automated sanitary landfill..

Article 2 The standard of public order for social interest of national reach which people, companies and institutions obliged to comply with and execute irrespective to not related of direct way or indirect with the process of final disposition of the dangerous solid wastes.

Legal Mark

Article 3 **The legal mark of the present standard constituted by the following guidance:**

-Code of the environment and of the natural resources (Legislation Decree 613 of 07/09/90)
-Code for sanitation(Decree Law No. 17505 of the 18/03/79)
Regulation of urban toilet (Decree Supreme NON 033-81-INC of the 03/12/81 and Supreme Decree (No. 037-83-INC of the 22/09/83)
-Regulation for the disposition of garbage by means of the method of sanitary land-filling (Decree Supreme No 6-STN of the 09/01/64)
-Law for Organization of Municipalities (Law No. 23853 of the 08/06/84).

Competent entities

Article 4 The Ministry of Health and the Municipalities assure that the final disposition of the solid wastes ends under appropriate conditions for the protection of the environment, the health and the welfare of the people is taken.

CHAPTER 11 - DEFINITIONS

Article 5 For the effectiveness of the present standard, the following definitions are considered;

Aerobic Process that is developed in presence of air or of free oxygenates.

Underground water Existence of Waters under the surface of the land.

Anti-Aerobic Process that is developed without presence of air or free oxygenates.

Garbage It is defined what is denominated in these standard for solid wastes.

Biogas Mixes of gases taken place by the decomposition of anti-aerobic of the organic residuals, compound mainly for methane and dioxide of coal.

Waste Disposal Site Where the wastes throw it to open sky in indiscriminate form and not carried out but any prosecution later.

Cell Combined of cells in sanitary landfill.

Cellar Unit formed by solid wastes compacted and cutleries totally with soils another inert material.

Covering Soil Layer or another inert material that it is placed to cover the exposed surface of the wastes in a sanitary landfill.

Compaction. Reduction of the volume of the wastes with increase of their density for means manuals or automated, in the recollection units or in sanitary landfill.

Contamination Witnesses in the environment by any physical agent, chemical or biological combination of them that are noxious for the man, the animal life or vegetable.

Density Relation among the weight of the garbage and the volume that it occupies.

Discard Final synonymous wastes.

Final Disposal Depositor Action the residuals in form definitive. It constitutes the final activity of the system of public cleaning.

Runoff Water that on the terrestrial surface it reflects.

Administration Final synonymous handling.

Leachate Water that *percola* to inclination of the solid wastes, dissolved material dragging and suspended. It takes place for the water provenience of pluvial precipitations, runoff, the humidity of the garbage and the decomposition of the organic matter.

Management of Wastes. Combined activities that have for objective to achieve the urban cleans and the destination appropriate but of the residuals according to characteristic their, with the purpose of 1to prevent damages or risks to the human health or the means ambles you. It includes the gathering, storage, transfer, transport, analysis, treatment, final disposition or any other necessary activity.

Permeability. bigger or smaller easiness of infiltration of to I liquidate to inclination of to means porous. It is expressed in longitude / time units (e.g. meter / second).

Prosecution of the wastes. Activities dedicated to achieve the appropriate final disposal of the wastes. It understands the one spread, the compaction and the covering of the same ones.

Burning in open sky. Uncontrolled and incomplete Combustion from the solid wastes to the
bleakness that produces contamination of the air for emissions of gases and particles.

Recycling. Process by means of which the segregated materials of the wastes are reinstated as the recycled product.

Sanitary Landfill. Place where you makes the final disposition of the residuals accustomed to on the floor, using engineering technical for their appropriate *confinamiento*, which understand the one spread, the compaction, the covering with soil or another materials at least daily and the control of the gases and leachate, with the purpose to avoid the contamination of the environment and to protect the *sold* of the population.

Automated Sanitary Landfill. Sanitary land which operation is carried out using automation for recommendable population more than 30 000 inhabitants.

Safety Landfill. **Sanitary landfill** dedicated to the adapted final disposicion of those industrial and dangerous wastes.

Wastes. Generated from combined materiales of any process or waste operacion as useless material

Pathogenis Wastes. **Wastes** that contain microorganisms or toxins able to take place illnesses.

Dangerous Wastes. Wastes that for their corrosive characteristics explosive, toxicity, inflammability or pathogenic, capable to cause damages to the health human or to the environment and for decreases. Treated by special handling.

Solid Wastes. Combined heterogeno of the solid waste and semi solid coming of urban activities (domestic, commercial, industrial waste, of callles sweeping, of hospital establishments, of markets and other).

Segregation. Activity that consists in separating recyclable materials or reusable of wastes.

Vectors. Beings capable of transmission of illnesses (flies, rodent mosquito and others animals).

Life. Period of operation of the sanitary landfill.

CHAPTER III - RESTRICTIONS FOR LOCATION

The Mechanical Sanitary Land-filling should not be located in places that don't complete those condition suitable to be used continuously:

Security for Airport

Article 6 The mechanical sanitary land-filling should not be located at a distance less than 3000m from airport or landing way.

Integrity of the Natural Resources and Cultural Goods

Article 7 The location should not be chosen where damages is caused to the water resources (water superficial and underground, sources of thermal or medicinal waters), to the flora, to the fauna, to agricultural areas neither other elements of the natural landscape. Neither to choose areas is owed where cultural goods be affected (historic monuments, archeological ruins, etc.).

Areas with geological flaws, unstable or inundated

Article 8 Areas should not be chosen that present geological flaws, unstable places, beds of gulches, areas with landslide possibility neither prone to floods in periods of rotation of 50 years or less.

Seismic areas

Article 9. In seismic areas, the sanitary land-filling should not be located in prone places - head to suffer crack, detachments, displacements or other movements of masses that put in risk the people's security or the operation of the landfill.

Existing Infrastructure

Article 10 Location should not be selected inside the areas of influence of infrastructure works, such like reservoirs, dam, refineries, hydroelectric, and others.

Urban plan and projects of regional or national development

Article 11 The sanitary land-filling should not be located in incompatible areas with the plan of urban development of the city. Distances from the land-filling to the housings but near non rots to be less than 500 m. Neither is owed to uses areas foreseen for projects of regional or national development (hydro-electric, airports, dam, etc.).

CHAPTER IV - CRITERIA OF: SELECTION

The selection of the place appropriate for the establishment of sanitary land-filling it should be made taking into account the following criteria:

Readiness and property of the land

Article 12 It should be preferred those places without any impediments that they threaten the life of use of the sanitary landfill.

Accessibility

Article 30 The selected place should be close to the point that facilitates the access of the collection units and transports of the wastes.

Topographic, Geological and Hydro-geological Conditions

Article 14 Those areas should be preferred where not exist superficial or underground waters that could be contaminated by eventual flows of leachate. Also, those places that present favorable geologic condition of the underground (stability, permeability, thickness and extension) to avoid the infiltration of leachate. Ace for the topographic, it should be preferred the places with mourns surfaces or with control slopes.

Utilization Life

Article 15 **The utilization life of the selected place should be 10 years.**

Covering material

Article 16 The place selected should have enough extraction. It prefer is owed, areas with material arena-loamy of low permeability. If the one material was scarce in the selected area, to guarantee will be owed useful of the land-filling to hoist their acquisition during the life useful of the land-filling.

Climatologic

Article 17 The predominant direction of the winds owes to be from the Area location urban toward the place of the filler. When it is not possible, they should be taken such measures as the siembra of Trees and thick vegetation in the perimeter of the landfill.

Flora and fauna

Article 18 It should be preferred those areas where the location of the sanitary land-filling causes the smallest damages possible to the flora and fauna. For 6sto presenter the plan is owed that contains the mitigation measures to make.

CHAPTER V - PROJECT

Prerequisites

Article 19 The project of mechanical sanitary land-filling should be begun when the person *natural or artificial* responsible for its implementation counts with:

a) the approval, for the provincial municipality, previous conformity of the municipality districts and of the dependence respective of the Ministry of Health, of the report that sustains the selection of the place whose content is indicated in the annex I;

b) the certification of compatibility of uses of the floor, sent by the provincial municipality where the land-filling is located; and

c) the titles of terrestrial property.

Responsibility and authorization of the project

Article 20 The project should be elaborated by civil or sanitary engineer, inscribed in the School of Engineers of the Peru (CIP), of preference with experience in the handling of accustomed to residuals. Statement professional will have the responsibility of the project.

Article 21 The plans and other documents related to the project should have the signature and the responsible engineer's stamp. In the cases that it is required, it should also be had the signature and the specialist professionals' stamp in the areas of their competition.

Presentation of the project and approval application

Article 22 The project should be presented to the provincial municipality with copy to the dependence respective of the Ministry of Health and the municipality *distrital* where the sanitary filler is located, by means of letter requesting its approval, model according to indicated in the annex 2.

Approval of the project

Article 23 The provincial municipality approved the project by means of Mayor's office resolution, provided it there is the conformity of the municipality *distrital* and with the resolution of approval of the dependence respective of the Ministry of Health in the sanitary aspects of the project.

Content of the project

Article 24 The project should necessarily contain the following thing:

a) Memory descriptive
b) Designs and technical specifications
c) Equipment
d) Ejecuci6n chronogram
e) Costs and budgets
f) Annexes:
   - Inform of selection of the place
   - Geologic, Hydrological and geo-technologic Study
   - Evaluation of environmental impact
   - Calculations Memorandum
   - Plans.

a) Description Memorandum

Article 25 The Description Memorandum constitutes the general summary of the project and at least it will contain the following aspects:

- Conception and justification of the project description of the selected place
- Description of the basic elements of the project (disposal areas, operation form, drainage, facilities, etc.)
- Information on the wastes (quantity, composition, density, etc.)
- Plan of operations (access, fence in and around, preparation of the place, transports and final disposition of the wastes, treatment systems, control of waters, etc.)
- Measures of security and contingencies plan
- Closing plan and post closure measure
- Future use of the area
- Evaluation of environmental impact
- Others.

b) Designs and technical specifications

Article 26 The designs and the technical specifications contain minimum as following:

- Access road
- Distribution of the area of the landfilling
- Peripheral Fence

? - Identification poster
- Auxiliary facilities
- Banks
- *Impermeabilizatio*n of the bases of the landfilling
- Cells
- Drainage of superficial waters
- Drainage of gases
- Drainage of Leachate
- Treatment of gases and leachate
- Covering
- Future Use

Access Road

Article 27 The access road to the sanitary land-filling shall be projected according to the technical standard for the designs of highways of the Ministry of Transports, Communications, Housing and Construction. The road will be built with a rolling surface that allows the use of the units under any climatic condition.

Distribution of the Area of the Land-filling

Article 28 The designs of the land-filling should be considered, at least to be area for the disposition of the wastes, another areas for administration and of services, circulation area and green or free areas, those distributed in harmonic way. Of being necessary it should be considered also areas for the treatment of the wastes and their outflow. The disposal and treatment areas should be, as much as possible, surrounded by green areas.

Peripheral Fence

Article 29 The peripheral fence should be projected under the main object of impeding the access of strange people and of animals. The construction is made using of most preferable and available materials in the place, with a height, minimum of 1,50m. Additionally it was placed, as much as possible, a fence and bushes that it serves as isolation.

Identification poster

Article 30 In the entrance of the landfilling site, the poster should be placed in the one that is indicated the presence of the sanitary landfilling, name of the property, the operation authorization and the time schedule of the service. The minimum dimensions of the poster will be of 2.0 m x 3.0 m and it shall be placed to a height 3.0 meters.

Auxiliary Facilities

Article 31 It refers to the facilities required for the development of the administrative activities and of services. The project considered as environment, at least minimum requirement for the responsibility of the operation of the land-filling, the auxiliary personnel, warehouse, dining room, wardrobe, hygienic services and surveillance. It should be also considered as facilities for the maintenance teams, supply of fuels and lubricant, weighing of vehicles, etc. Preferably you will build with material available in the area whose duration is compatible with the life of use for the land-filling.

Banks

Article 32 The Banks of section and landfiling should be projected in such way that makes sure their stability, taking into account the heights, the floor types and any other factor that it affects them. The advisable banks is pointed out in the annex 3.

Impermeabilization of the Base of the land-filling

Article 33 If natural geologic barrier that impedes the contamination of the underground waters for effect of those leached, doesn't exist, it should be projected an impermeabilization system with clay layers or other materials (geo-membranas and geo-textiles) of appropriate characteristic for this end, taking into account the natural conditions of the place at the location of the sanitary landfilling(floors, climate, etc.).

The permeability of the material to use won't be larger than $k=10^{-5}$cm/s and the minimum total thickness of the clay layers will be in function of the depth of the napa phreatic and of the pluvial precipitation of the place, according to those indicated in the Annex 4.

Cells

Article 34 The cells should be designed with maximum height of 2.50m and the dimensions of the area that it you clasp will be in function of the daily volume of residuals to he/she prepares, of the foreseen advance and of the covering frequency._Of preference each cell won't exceed of $300m^3$ of compacted wastes and it will be built in layers made with a thickness not more than 0.60m.

Drainage of Underground Waters

Article 35 To intercept rain waters gliding into the sanitary landfilling, deviation by projected channels, temporary and permanent, should be considered according to the precipitation conditions such as tributary area, type of floors, vegetation, topography, etc. The permanent channels will serve as main draining constituting a protection of perimeter landfilling. The temporary channels will be good as internal draining to prevent the rain waters falling inside the landfilling then entering to the cells.

Preferrably, the channels is designed of trapezoid section, with minimum dimensions of 0.30m in the base and 0.50m of depth and a maximum slope of 4%. In floors easily erosible or where it is unavoidable to build the channels with more slopes to 4%, these they will be had. The minimum distance of the permanent channel concerning limit of the disposition area will be of 3m. To facilitate the glide of the rain waters, the exposed surfaces of the cells should have a minimum slope of 2%.

Drainage of gases

Article 36 To control the migration of the biogas generated in to sanitary landfilling, to system of vertical evacuation should be designed, in the connected possible to the drainage system of leachate located in the bases of the landfilling.

Preferably, the chimneys or ventilations will be of square section, of 0.30m x 0.30m like minimum, of variable height in function of the height of the landfilling and distributed in halfway form each 30m at maximum. The materials to use will be sticks, mesh metallic type *henhouse* and stones with a maximum size of 0.15m. It should be also used pipes perforated of diameter 0.15m at minimum, manufactured with material resistant to the physical-chemical actions of the wastes. The chimneys or ventilation should conclude in a burner for the combustion of the biogas. The combustion accessory will be located to a minimum height of 1.50m above the final level of the landfilling. In optional form they should be developed to projects of use of the biogas.

Drainage of Leachate

Article 37 For the reception and evacuation of leachate, draining is projected so much installed in the bases of the landfilling (in form of fish thorn, taking advantage of the system of natural drainage or other forms), to the foot of the banks of each platform. The draining made by gutters of stones, perforated pipes or of another type, with a minimum longitudinal slope of 2% and compatible dimensions with the prospective flows of leachate.

Treatment of Gases and Leachate

Article 38 According to the caracteristicas of leachate generated in the sanitary landfilling, treatment system is projected to reduce to permissible limit of contaminants, such as re-circulation, percolated filters, stabilization lagoons, anaerobios reactors of upward flow, or others.

Covering

Article 39 The sanitary landfill should consider for each cell to be covered, minimum of 0, 15 m of consistent thickness in an soil layer (preferably areno-loamy) or another inert material of appropriate characteristics. The final covering at mimum thickness for 0,60 m of compacted materials should be considered.

Future Use

Article 40 The landfill should consider the uses of the area of the sanitary landfill to extend their life of use to be ones compatible with their environment.

c) Equipment

Article 41 It should be specified the team and the necessary heavy machinery for the qualification, operation and at the closure of the sanitary filler, compatible with the quantity of wastes to be prepared.

d) *Execution Chronogram*

Article 42 The chronogram presented in to diagram of bars that will point out the main activities for the qualification, operation, closure and post-closure of the sanitary landfilling, including the dates and the predicted terms.

e) Costs and budgets

Article 43 It should be presented the analysis of unit costs of qualification, operation, closing and post-closing of the sanitary landfill, those including manpower, team and heavy machinery, tools, materials, etc.

The cost of qualification will understand those at the beginning of the operations of the sanitary landfill, such as the cleaning and deforestation, movement of lands, access road, drainage, peripheral fence, auxiliary facilities, identification poster, etc.

The cost of operation includes the costs necessary to make the disposal of the wastes, such as discharge, spread, compaction, covering, drainage of gases and leachate, treatments, etc.

The cost of closing includes the costs of the predicted activities from the operation of the sanitary landfill until achieving their integration to the surrounding landscape and their use for recreational or other ends, such as final covering, arborizacion, qualification of sport areas, etc.

The post closing cost will understand the costs of maintenance of the final covering, the reception systems and treatment of gases and leachate or other systems such as the costs necessary to make the control of the environmental contamination and eventuates reparation works.

Arlicle 44 The following budgets should be presented:
-Budget of pre-investment (studies, project, etc.) -
-Budget of investment (cost of the land, qualification, equipment, etc.)
-Budget of operation
-Budget of closing
-Budget of post-closing

f) Annexes.

Formless of selection of the place

Article 45 The report of selection of the place, referred in the Article 19, it should take into account of The Chapters III AND IV.

Geologic, Hydro-logical AND Geo-technical Study

Article 46 The study geologic, hydrological and geotecnical of the place where the sanitary landfill is located, it should contain relating aspects to the morphology, litologia, floors, geodinamica, climatology, underground and superficial waters etc., specifying the risks of contamination of the waters and the conditions of stability of the foundation land and of the terrestrial ad firebrands tied.

The study will understand this way the sondajes execution or geophysical prospectings like laboratory tests for determing the thickness of the strata of the underground, the, depth of the napa phreatic and the characteristic physical of the different strata (permeability, density, humidity, absorption, etc.).

Evaluation of Environmental Impact

Article 47 The evaluation of environmental impact should contain description and evaluation of the situation of the place where you located the sanitary landfill, information about the effects and changes that could take place as consequence of the qualification, operation, closing and post-cclosing of the sanitary landfill, as the necessary measures to prevent, to reduces or remedy-the negative impacts. The evaluation should understand the aspects referred in the annex 5.

Calculations Memorandom

Article 48 The calculations memory constitutes the sustenance technical of the designs and it should contain the dates, parameters, you formulate, hypothesis, etc. such as the calculation for the dimension of the sanitary landfill, the life of use, the systems of drainage of gases, leachate and superficial waters, the treatment system of having leached and other necessary ones.

Plans

Article 9 The project should contain following :
-Location (Scale 1/5 000 or 1/10 000)
-Topographical with curved of level each to put as maximum (scale 1/500,1/1000 or 1/2 000)
-Profile longitudinal and traverse (scale 1/200, 1/500, 1/1 000 or1/2000)
-Access Roads and other (scale 1/200, 1/500, 1/1 000 or 1/2 000)
-Distribution of the sanitary filler (scale 1/500, 1/1 000 or 1/2 000)
-Facilities auxillares (scale 1/50 or 1/100)
-Distribution of cells or platforms (scale 1/500, 1/1000 or 1/2 000)
-Cut longitudinal and traverse of the cells or platforms (scale 1/200,1/500, 1/1 000 or 1/2 000)
-Drainage of superficial waters (scale 1/500, 1/1 000 or 1/2 000)
-System of drainage of gases and leached (scale 1/500, 1/1 000 or 1/2 000)
-Treatment system of having leached (variable scale)
-Process of construction of the cells (variable scale)
-Representation of the concluded sanitary landfill (variable scale)
-Control of the contamination of waters during or thereafter of the operation of the sanitary filler
-Other (details, etc.).

The details include in the it mourns rots to be graficados to variable scales.

CHAPTER VI - QUALIFICATION AND OPERATION

Qualification

Article 50. The qualification refers to the previous works to the beginning of the operation of sanitary landfill, such as the cleaning and deforestation of the land, the land movement, to clarify the conditions of the projected areas, construction of the access road, the peripheral fence, the auxiliary facilities, the impermeabilization system, the drainage, etc., those should comply with the following construction standards and Articles 27 and 38.

Operation

Article 51 The operation of the sanitary landfill refers to the necessary activities for final disposition of the wastes, which requires professional personnel, qualified technician, and appropriate heavy machinery. The operation shall be considered by the following activities:

a) Control and registration of the carry-in of residuals
b) Discharges
c) Spread and compaction
d) Covering
e) Drainage of superficial waters, gases and leachate
f) Control of the contamination of underground waters.
g) Control of Burning of Wastes
h) Control of Vectors and Rodents
i) Control of the segregation
j) Measures of security and contingencies plan
k) Corrective Work.

a) Control and Registration of Carry-in of Wastes

Article 52 Those transports units at their arrival to the sanitary landfill should be inspected to avoid the carry-in of dangerous wastes that it requires to be prepared in safety of landfill. Registration is required for quantity and type of wastes, proceeding date, unit of transporter etc.

b) Disposal

Article 53 The discharge of the residuals was carried out in the work front, following the predicted cases for the conformation of the cells. It should make sure that the disposal area sufficiently stable as to allow the circulation of the units of transport.

c) Spread and Compaction

Article 54 The spread compaction made in layers not more 0.60 m using tractors such as caterpillars. The compaction is carried out with tractors such as caterpillars or rollers compactors until to achieve to minimum density of 0.60 ton/m^3.

d) Covering

Article 55. The covering of the wastes using soils (areno-loamy preferably) or another material of appropriate characteristics, in layers compaction of 0,15 m at minimum. The covering at least should be elevated each day, when concluding the day of work.

e) Drainage of superficial waters, gases and leachate

Article 56 The systems of drainage of superficial waters, gases and leachate build-in progressively as it advances the reception and treatment of the wastes, giving continuity to that executed in the qualification stage. During the treatment of the wastes should be taken in the necessary cautions to avoid damages and interruption of the systems of drainage.

f) Control of the contamination of underground waters

Article 57. For detecting some eventual filtration of having leached that it could contaminate underground water dug in the vicinities of the landfill and below the level of their bases, gutters or wells of appropriate depths. Additionally, the quality of the water should be controlled from the wells near but to the sanitary landfill at least twice to year.

g) Control of Burning of Wastes

Article 58. Under any circumstance it is not permitted burning of wastes in the sanitary landfill.

h) Control of vectors and rodents

Article 59. To rigorous control of the proliferation of vectors should be made and rodent, assuring the opportune and appropriate covering of the wastes and in the event of being necessary by means of fumigations.

i) Control of the Segregation

Article 60. To avoid risks to the health and difficulties in the operation, it is not permitted segregation in the sanitary landfill.

i) Measures of Security and Contingencies plan

Article 61 The personnel of the sanitary landfill are obliged to use protection instruments (standard uniform, raincoats, gloves, boots, mask or breather, helmet, etc.), to have a box of first aids, extinguishers for cases of emergency which equipped to be qualified for it's use. As preventive measure, medical check should be carried out for the personnel of the landfill at least once a year.

In the event of some contingency being presented, the personnel of the sanitary landfill acts according to the responsibilities and procedures predicted in the corresponding plan.

k) Corrective Work

Article 62. In the event of being detected some type of contamination of the waters, floor or air, it should implement the pertinent corrective actions, such as confinement of the contaminated flow, extraction of the polluted water, reparation in situ, restriction and control of the uses of the affected waters, etc.

CHAPTER VII – CLOSURE AND POST-CLOSURE

Closure

Article 63. The closing refers to the works foreseen once concluded the operation of the stuff until achieving their integration to the surrounding landscape or their use for ends recreational or others. It should consider the following thing:

a) Final covering
b) Use future of the area.

The works should begin maximum 30 days of having carried out the final disposal of wastes. The final covering and the conditioning of the area for future uses will have a maximum duration of 180 days.

a) Final Covering

Article 64. The final covering is consisted of compacted clay layers and soil with thickness total minimum of 0,60 m (according to that indicated in the Annex 6), placed on it final layer of daily covering. Additionally, and depending on the future uses of the landfill, a floor layer was placed possible to sustain a local typical vegetation. As much as possible, this activity should be made in form progressive according to the conclusion of the operation of each disposal area.

b) Future Use of the Area

Article 65. The arborizacion works, qualification of recreational areas, etc. , corresponding to the future uses of the area landfilled, it made according to that foreseen in the project.

Post Closure

Article 66 The post closure should be referred to the activities necessary to maintain in good state of the sanitary landfill during a period of 10 years and it will be understood the following thing:

a) Maintenance of the final covering
b) Control of the contamination of the underground water
C) Maintenance and operation of the drainage systems
d) Corrective Work

a) Maintenance of the Final covering

Article 67 The necessary works should be considered for conserving the integrity of the final covering (material reinstatement, etc.).

b) Control of the contamination of the underground water

Article 68. It should be continued the control of the contamination of the underground water in the same frequency made during the operation of the sanitary landfill.

c) Maintenance and operation of the drainage systems

Article 69. The systems of drainage of superficial water, gases and leachate should stay in appropriate operation conditions.

d) Corrective Work

Article 70. in the event of being detected some type of contamination of the waters, floor, air, or proliferation of vectors and rodents should be implemented, the same as in the operation stage, the pertinent corrective actions.

CHAPTER VII- FINAL DISPOSAL

Closure of Landfill and Existent Dumping

Article 71. The landfill that don't fulfill the requirements of the present standard, should be closed within hundred twenty (120) days since the date of notification of the competent authority of the Ministry of Health. Also, the existent dumping should be closed, in a brief term,

The proprietor's Responsibility of the Sanitary Landfill

Article 72. The proprietor of the sanitary landfill is responsible for the faithful execution of settled down in the approved project, from the beginning of the activities until the culmination of the period of post closure.

In the event of non-fulfillment, the Ministry of Health sanctioned the proprietor of the sanitary landfill by means of the application of tickets and rots to have the execution had measured in corrective way or the closing of the same according to the graveness of the lack.

Disposal of Pathogenesis Wastes

Article 73. As long as it is not considered as safety of landfill, the pathogenesis wastes may be admitted in the automated sanitary landfill, when those prepared in an isolated cell which is used for their treatment by covering of its' files (minimum 2,50 kg / m3), prior to the daily covering with soils.

Unpredicted Cases

Article 74. The unpredicted marries in the present Standard will be solved by the competent entities which they rot to adapt the established requirements provided it is guaranteed, by means of the sustenance corresponding technical that such adaptations non occasion problems to the public health neither the environment.

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ANNEX 1

MINIMUM CONTENT OF THE STUDY OF SELECTION OF THE PLACE

CHAPTER 1 GENERALITIES

Antecentes

Objectives

CHAPTER 2 IDENTIFICATION OF ALTERNATIVE

Location restrictions.

- Security aeroportuaria.
- Integrity of the natural resources and cultural goods.
- Areas geologic, unstable confallas or inundables.
- Seismic areas.
- Existent infrastructure.
- Urban plan and projects of regional or national development.

Selected places.

CHAPTER 3 EVALUATION OF ALTERNATIVE

- Readiness and property of the land
- Accessibility
- Useful life
- Covering material
- Climatology
- Flora and fauna.

CHAPTER 4 SELECTION OF THE PLACE

- Selection methodology
- Description of the place selecionado.

CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS

ANNEXES

- Planes, geographical letters, pictures
- Statistical information
- Others

ANNEX 2
MODEL OF LETTER OF PRESENTATION OF THE PROJECT OF SANITARY LANDFILL SITE AUTOMATED

City or place....., of.....of.....
Mr.
Mayor of the Municipality of Provincial of.....

Of my consideration

(Name of the natural or artificial person that presents the project), I put to consideration of their office the project of enclosed Automated Sanitary Landfill Site, elaborated for (Names of the Engineer Autor of the project), the same one that consists of,

a) Descriptive memory
b) Designs and technical specifications
c) Equipment
d) Execution chronogram
e) Costs and budgets
f) Annexes,

Inform of selection of the place
Study geologic,
Hydrological and geotécnico
Impact evaluation
Environmental

Memory of calculations
Planes

The project is presented to requirement of (Municipality, other), in order to (to begin, to improve, etc.) the final disposition of the solid residuals.

I declare to have full knowledge of the technical Norms for the location, design, construction, operation and monitoring of automated sanitary landfill sites, and that the non observance of the same ones will cause the rejection of the project.

Sincerely,

Name and it signs of the person engineer
Natural or artificial
HIM Not
RUN Not
I domicile legal

Name and it signs of the

author of the project
REG. CIP Not
HIM Not
RUN Not

ANNEX 3
RECOMMENDED BANKS
SQUARE 1 BANKS OF CUTS

TYPE OF MATERIAL	BANKS	
	V	H
Loose rock	4.0	1.0
Conglomerate	3.0	1.0
Compact earth (several lands)	2.0	1.0
Sand	0.5	1.0

SQUARE 2 BANKS OF FILLER

TYPE	BANKS	
	V	H
Several lands	1.0	1.5
Sand	1.0	2.0
Solid residuals	1.0	3.0

V=vertical
H=horizontal

I ANNEX 4
RECOMMENDED MINIMUM THICKNESS OF THE LAYER OF CLAY FOR THE IMPERMEABILITY OF THE BASE OF THE SANITARY FILLSITE (m)

PHREATIC NAPA	Deep (more than 100 m)	Intermediate (30 - 100 m)	Superficial (up to 30 m)
It lowers (up to 50 mm / year)	0.30	0.60	0.90
Moderade (50 - 300 mm / anño)	0.60	0.90	1.20
High (more than 300mm / year)	0.90	1.20	1.50

He/she notices The arcila he/she should have a maximum permeability of k = 10-5 cm/s and being compactada in thickness not bigger than 0.15 m.

ANEX 5
MINIMUM CONTENT OF THE STUDY OF ENVIRONMENTAL IMPACT

CHAPTER 1 GENERALITIES

Introduction
Objectivos of the study
Description of the project of padded automated saitario.

CHAPTER 2 CURRENT ENVIRONMENTAL SITUATION OF THE AREA OF THE PROJECT

Population, flora, fauna
I am accustomed to, it dilutes, air, climate, landscape
Interaction among the previous factors
Material goods and cultural patrimony.

CHAPTER 3 IDENTIFICATION AND EVALUATION OF IMPACTS

Identification of impacts

to) Qualification stage
- Deforestation
- Powder emissions
- Noise
- I increase of the traffic
- Risk of accidents

b) Operation stage
- Powder emissions
- Noise
- Scents
- Biogás
- I increase of the traffic
- Leached
- Stability of the land, residual
- Vectors

c) Closing stage and posclausura.
- Powder emissions
- Leached
- Biogás
- Stability of the land, residual
- Risk of accidents
- Scents.

d) Socio-economic repercussions.

Menstruation of impacts
Valuation of impacts.

CHAPTER 4 PREVENTION AND MITIGATION OF NEGATIVE IMPACTS

Qualification stage
Operation stage
Closing stage and posclausura.

ANNEXES

Planes, geographical letters, pictures
Statistical information
Others.

ANNEX 6
RECOMMENDED MINIMUM FINAL COVERING FOR THE SANITARY FILLER AUTOMATED

Pluvial precipitation (mm / year)	Layer thickness Clay	Earth	Total
It lowers (up to 50)	" " " " "	0.60	0.60
Moderate (50 - 300)	0.30	0.30	0.60
High (more than 300)	0.60	-------	0.60

He/she notices--- The clay will have a maximum permeability of k=10-5 cm / s and it will not be compactada in thickness bigger than 0.15 m.