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Development of Municipal Solid Waste Sanitary Landfill Project for Sanitary Landfill Project for Shimla on Design, Finance, Build Operate and Transfer (DFBOT) Basis

Volume 2 – Minimum Mandatory Technical and Performance Specifications

Contents

1 Brief Description of the Project

General:

Shimla is India's one of the most popular and biggest hill-stations, that is located in the northwest Himalayas in Himachal Pradesh. It is located at latitude of 21°13' N and longitude of 81° 26' E, having an altitude of 2130 - 2205 metres above mean sea level. The City is governed by the Shimla Municipal Corporation (MCS).The area covered by this Corporation is 35.6 sq.km covering 25 Wards.

Municipal Solid Waste Scenario

The population of the city as per the 2001 Census was 1.75 lakhs. The present population is more than 1.68 lakhs with a floating tourist population in excess of 65,000. This accounts for nearly 94.5 MT of Municipal Solid Waste generated. With the increase in the population as well as in urbanization the increase in the generation of Municipal Solid Waste has become one of the pressing problems for MCS.

Currently, MCS has developed a state of art municipal solid waste processing and treatment facility at Bhariyal on a PPP mode. It is been operated by Hanjer Biotech, a leading MSW operator in the country. The plant is expected to process the mixed MSW in an environmentally efficient manner so as to limit the inerts to a maximum of 20%. Similarly, the organic content in the inert waste is expected to be less than 10%.

In order to implement an efficient, environmentally sound and financially sustainable municipal solid waste management system, which leads to significant improvements in cleanliness and hygiene conditions in the respective cities, MCS has acquired additional land for the development of a SLF adjacent to the MSW plant.

MCS has proposed to invite bids for scientific disposal of inerts generated from the WPF at Bhariyal on a DBFOT basis.

The following sections outline the minimum technical and performance standards which should form the basis of the bid.

1.1 Scope of Work

The Scope of Work is as per Appendix 1.1 of TENDER Volume 1.

2 General Technical Design Requirements and Standards

2.1 General Design Standards

All Design, Works and Operation have to be in accordance to a "General Quality Standard" that means a standard of performance which,

a. is competent, efficient, economical and in accordance with internationally accepted techniques used in the waste disposal industry;

b. is in accordance with professional engineering, accounting and consulting standards, as applicable, recognized by international professional bodies;

c. is in accordance with sound management, commercial, technical, design and engineering practices;

d. employs appropriate technology and safe and effective equipment, machinery and methods;

e. protects the interests of the Authorities;

f. is in accordance with the Municipal Solid Waste (Management and Handling) Rules, 2000; MoEF

g. is in accordance with the applicable EIA norms, the Environmental Management Plan and the respective approval documents issued by the applicable Authorities; and.

h. Performance standards are conforming to the Service Level Benchmarks specified by the Ministry of Urban Development, Govt. of India.

The Operator shall, at all times, carry out the Works and Services in accordance with the Technical Standards as specified and, where a specific technical standard of quality of performance has not been specified, the Operator shall perform the Services to the standard of "General Quality Standards" as set out above.

All Design and Works have to be conducted in such a manner that the SLF has a service life equal to the projected SLF life. Adequate maintenance, replacement and upkeep of plant and machinery have to be ensured during the projected SLF life for the waste processing plant. For landfill, tools for post closure landfill monitoring shall be ensured in line with the applicable laws.

2.2 Sanitary landfill

The Bhariyal SLF site has a total area of 9.9123 Ha. The entire processing and sanitary landfill facility required for the concession period shall be designed within this area. The life of the Sanitary landfill shall be a minimum of 25 years.

2.2.1 Sanitary Landfill and related infrastructure

The following sections have to be designed to cater to the inert disposal during the concession:

a. sanitary landfill including the road and landfill dams, disposal area,

b. leachate pond,
c. storm water pond,
d. control, administration and garage building,
e. waste treatment and intermediate storage building,
f. access road (from the main road to the landfill),
g. green belt,
h. enlargement area.

2.2.2 *Waiting Area, Entrance and Security Cabin*

Cautionary boards in appropriate languages and in readable letter size shall be displayed at various locations within and on the periphery of the SLF.

One entry / exit point will be designed for the SLF site plus one additional emergency exit. The security cabin will be designed with data and telecommunication facilities.

A dedicated vehicle parking/waiting area will be designed for incoming vehicles carrying waste. These parking areas will be concrete paved. There will be a separate parking area for cars of visitors and staff.

2.2.3 *Weigh Bridge and Control Building*

The Weigh Bridge and Control Building will be located directly behind the gate. The weighbridge will have a capacity of $\geq$ 40 t. The lengths of the Weigh Bridge will be $\geq$15 m and long enough to be suitable for all incoming waste transportation vehicles.

Weigh Bridge and Control Building will be connected by data line and communication line in order to have computer-aided registration of data. The weighbridges shall be tamper proof and should have a close circuit camera with a 60 day recording facility to monitor the activities. MCS shall have Supervisory control and data acquisition capabilities. The software used shall preferably be open source and shall be purchased in the name of MCS.

2.2.4 *Sampling Area*

A Sampling Area of appropriate dimensions shall be designed which will serve to collect samples of waste from the vehicles.

The Sampling Area will be paved with concrete and designed with a proper collection system for spilled waste if any. These spilled wastes have to be treated and disposed appropriately.

2.2.5 *Administration/ Operation Building*

The Administration/ Operation building will consist of office space for managers and other office staff. It also has the basic amenities for workers and visitors.

The area of the Administration/ Operation Building has to be appropriate for the purpose foreseen.

2.2.6 Analytical Laboratory/Storage Facility

The laboratory shall have facility to characterise and measure the quantum of inerts and biodegradable in the incoming waste as well as the waste going to the landfill. An analytical laboratory to perform the necessary analysis of samples from the leachate/process water for discharge will be installed at the SLF. The laboratory installation shall comply with the relevant regulations for occupational health and safety features.

Sufficient sets of minor equipment for a routine test lab for leachate from SLF have to be provided. This might include eg. glassware (beakers, flasks, pipettes, etc.), other tools and devices such as laboratory and analytical balances, heating and cooling devices, stirring equipment etc.

The laboratory will also be equipped for monitoring of ground water, air, noise and other monitoring parameters in and around the SLF. The parameters to be analysed shall be as per the MSW Rules, 2000.

There shall also be provision for storing samples of waste received at the SLF as referral material.

2.2.7 Public Relations Office or Information Centre

A reception/lobby area with an information centre will be designed. This room will have communication facilities and a facility for audio-visual projection systems.

2.2.8 Meeting Room

A meeting room with adequate acoustics to be designed.

2.2.9 MCS/ Contracting Authority Room

Separate office space (one room) for MCS/ Contracting Authority staff will be designed. This will accommodate the Project Engineer designated by the MCS.

2.2.10 Canteen and Kitchen

A canteen and kitchen area to be designed.

2.2.11 Cloak Rooms and Toilets

Separate rest rooms with toilets will be designed for men and women employees. The rest rooms will have facility for lockers. Showers and change rooms will also be designed. Another general toilet will be designed for the vehicles drivers and other workers who are not in the campus.

2.3 Vehicle Washing Unit

A vehicle and container washing unit with pressure washing equipment has to be designed near the exit area.

2.4 Workshop and Garage

This building serves as a shelter and a maintenance area for all mechanical equipment to be used at the SLF and transportation vehicles.

Furthermore, a storage room, a restroom, sanitary facilities and separate office space should be included in the building.

2.5 Equipment Requirements

All buildings described above need to be fully equipped and furnished in order to be fit for its designated purpose. This includes but is not limited to installing furniture of all offices, meeting rooms, staff rooms, weigh bridge and control building etc.

Workshop, garage and treatment section need to be fully equipped with the required tools, mobile equipment, mechanical loading and unloading device etc.

In addition all offices, weigh-bridge building etc. need to be fully equipped with computer systems fit for purpose defined.

Although it is the task of the bidder to determine the necessary stationary and mobile equipment according to his proposed processing technology, it is assumed that the following major mobile equipment has to be supplied in minimum:

a. Bulldozer for waste compaction
b. Excavator, wheel loader
c. Internal transportation vehicle,
d. Tractor, including tanker trailer, watering equipment, road cleaning equipment
e. Any other equipment as deemed to be required by the Operator in order to minimise rejects and maximise the recovery of recyclables.

2.6 Green Belt

There shall be a provision for a green belt area surrounding the SLF, as specified in the EIA. The green belt should be provided in the periphery of the processing plant adjacent to the fence.

The type of species, the extent of green cover, and the pattern in which the green Belt will be designed have to be determined in accordance with the REIA study.

2.7 Enlargement Area

There shall be a provision for an enlargement area that offers sufficient capacity for an extenson of the facility as necessary for its life of 30 years.

2.8 General Infrastructure

2.8.1 Water Supply

The water supply for the SLF project has to be designed as per BIS:1172 basic requirement for Water Supply, Drainage and Sanitation. The calculation of the water supply has to ensure sufficient capacity for the operation of the SLF.

The main water tank will feed water to the underground storage tank. The water is pumped to the overhead water tank by means of an electrical pump.

The water from the overhead tank flows by gravity to the individual building.

2.8.2 Sewage Water Treatment

The facility shall be designed as a Zero discharge facility. The domestic waste water has to be estimated as per the norms prescribed in BIS:1172 (Basic requirement for water supply drainage and sanitation). A decentralised/onsite wastewater treatment unit has to be designed.

2.8.3 Telecommunication and IT Infrastructure

Telecommunication and intercom facilities have to be supplied in all the buildings.

2.8.4 Fire Protection

An automatic fire alarm system is intended for early warning of fires before it spreads so that suitable action would be initiated to control and subside the fire before it causes any damages. Fire alarms systems are to be designed in all buildings for early warning in the case of fire accidents.

2.8.5 Electricity Connection and Electrical Planning

The main electrical loads in the SLF are lighting loads within the buildings, in the parking areas, roadways and perimeter lighting. Lighting plans/levels have to be designed in accordance with BIS 3646 and National Building Code. The System needs to feed from different nearer power sources.

The electrical planning to be provided by the Operator has to cover at least:

a. Administrative block lighting,

b. Other Service Buildings,

c. Street Lighting,

d. Outdoor lighting in administration area and at entrance gate, and

e. Perimeter lighting.

2.8.6 Roads and Road Connection

The following roads and pavements need to be designed and constructed:

a. Operation roads (minimum widths of roadway 4.5 m

b. Maintenance roads (minimum widths of roadway 3 m)

The maximum speed within the SLF is limited to 20 km/h, respective road signs need to be installed. The minimum turning radius for this design speed is 15 m. An extra width of $\geq$1.5 m needs to be provided at turnings.

The thickness of the pavement has to be selected using the IRC (Indian Roads Congress) approach by using CBR (California Bearing Ratio) values for the sub grade soil. The cross-slope of the roads is at least 2.5 % from the road axis. The slopes begin from the road base.

2.9 Storm water Collection System

The Operator has to present an estimation of the storm water generation for the whole lifetime of the SLF.

For an estimation and calculation of storm water generation appropriate assumptions have to be taken into consideration such as the intensity of rainfall for a particular time of concentration, catchment area and the runoff coefficient.

Appropriate rain water tanks (storm water ponds) with sufficient capacity need to be designed and constructed in order to secure zero overflow from the system. Suitable deviations and bypass for the existing rainwater trenches deviations around the landfill has to be constructed

Design and construction has to protect site from flooding and to ensure that there is no contamination of groundwater or surface water.

2.10 Public Grievance Handling System

The Operator has to maintain a round the clock computerised call centre facility for receiving the public grievances and customer complaints pertaining to the Project. The grievances and complaints are to be forwarded to the concerned in the field for resolution. The Operator is expected to meet the resolution timelines committed. The details of the actions taken for resolution shall be recorded in the system.

The Operator shall provide the complainant with a docket number acknowledging receipt of his complaint within one week from the receipt of the complaint. Also, the operator shall revert to the complainant with the details of the action taken / remedy proposed within a reasonable time, which in any case not later than one month from the receipt of the complaint. The Project Engineer (or any such representative) from the side of the Corporation shall monitor the mechanism to ensure compliance.

2.11 Health and Safety

The Operator shall ensure that the sanitary workers shall be provided with uniforms and other accessories required as per the applicable norms. The workers shall not come into physical contact with the waste during any stage of the SLF related activities. The operator shall incorporate suitable odour control measures as per the CPCB guidelines for the processing facility.

2.12 Certifications

The Operator shall ensure that the processing and landfill facility will obtain various quality certifications like ISO 9000, ISO 14000 etc within three years of commencement of operations.

3 Landfill Design Requirements and Standards

3.1 Required Volume of the Landfill and Capacity Calculation

The landfill area should be designed in such a manner that a total expected accumulated waste quantity arising in the project area in a 20 year period can be disposed. The average quantity of MSW inerts / rejects to be landfilled is estimated at 7300 tons per year. Additional quantities might arise from the restoration of wild dumpsites or during breakdown of process plant.

The respective total design volume has been defined as a minimum of 1,82,500 m^3. The operator needs to optimise the processing efficiency so as to achieve this. During the operation period quantities of waste disposed as well as density actually achieved need to be monitored in order to adjust capacity calculations.

The planned capacity for landfillable wastes and the construction of the respective landfill sections should be established within a phased manner. Based on a topographical survey the total landfill area needs to be divided into different construction phases which each consist of a defined number of cells.

Preference would be given to designs/planning that can ensure higher storage within the designated area of 9.9123 ha. The Operator is free to propose a higher capacity for the landfill/ extension of the landfill area to the Contracting Authority/ MCS at any time during the operation period. Implementation of such higher capacity for the landfill/ extension of the landfill area will depend on approval from the Statutory Authorities.

3.2 Earth Works

The design has to consider that all planed areas have sufficient inclination to guarantee an unhindered run off of leachate and storm water. The design of the landfill has to be prepared in such a manner, that the amount of cut and fills are finally in a balance. Required cover material need to be considered and has to be made available. Filling and compacting must be carried out in layers of up to 40 cm maximum.

The landfill should be constructed according to the Ravine method with a high retaining dam on the base of the landfill.

3.3 Base Sealing System

3.3.1 Basic Elements

The sealing system has to fulfil the guidelines and technical requirements as defined in the EIA and in the MSW Rules 2000. ***Any variation should be supported by detailed calculations and duly approved by Central pollution control Board (CPCB) or any other competent authority approved in writing by CPCB/ HPSPC. The decision of MCS is final in this regard.***

3.3.2 Mineral Sealing Layer

The mineral sealing layer of 900mm depth will be installed in four layers of at least 225 mm thickness each. A suitable binding material (suitable

combination of coarse and fine particles) should be used. This material must be installed during

a. at least 10 mass-% of clay particles with a high adsorptive capacity,
b. maximum 5 mass-% of organic substances and
c. maximum 15 mass-% of carbonate.

A permeability of the mineral sealing layer of $k_f \leq 1 \times 10^{-9}$ m/s has to be ensured. For the material and its installation the following requirements must be considered:

a. homogenous material that has a homogenous water content and homogenous incorporation of the material,
b. proctor density (Dpr) of each layer of Dpr ≥ 95 %, and
c. water content (w) must be higher than the proctor water content (wpr).

In case, a Geo-composite mat with bentonite, to increase the efficiency of the SLF,it is the responsibility of the operator to assure that the approvals are received from CPCB and the State Pollution Control Board

3.3.3 HDPE Geo-Membrane

The second sealing liner will be a HDPE geo-membrane with a minimum thickness of 2.0 mm. The geo-membrane can only be installed during favourable weather conditions. For the constructing of the layer the following items have to be considered:

a. Welding of the HDPE layer is only possible if the sun does not shine directly on the HDPE layer in summer time (danger of blistering),
b. Water is not allowed on the landfill base of the HDPE layer,
c. Before work starts, the way of placing has to be defined in a plan,
d. The placed HDPE layer must be fixed (e. g. sandbags),
e. No equipment must drive on the welded HDPE layers (only the necessary equipment for welding), and
f. Every welding seam has to be double checked (stability, density with under pressure method, thickness, visual inspection).

3.3.4 Geo-Textile – Protection Layer

For protection of the HDPE layer, a geo-textile must be applied. A geo-textile material, which is needle-punched and non-woven will be used as a protection layer. For incorporation of the layer, the following items have to be considered:

a. Weight of geo-textile ≥ 1200 g/m²,
b. Proof of stamp pushing through force,

c. Proof of strip tensile strength,

d. Static proof, and

e. Proof of stability and resistance to sliding during building and final state.

Laying of the geo-textile is carried out after acceptance of the layers laying underneath. No vehicles must drive on the geo-textile no equipment or machines should be stored on this layer. The position of the layer must be secured by appropriate measures to prevent them from getting lifted up (e. g. sand bags).

3.3.5 Drainage Layer

A drainage layer, consisting of gravel with a grain size of 16/32 mm will be applied to assist drainage of leachate. Gravel will consist of uniform sizes and be washed to ensure a high permeability.

Perforated HDPE leachate collection pipes will be embedded in the drainage layer to further assist leachate collection. Leachate will drain towards the leachate pond. The thickness of the drainage layer will be at least 300 mm. The gravel has to fulfil the following quality standards:

a. permeability $k_f \geq 1 \times 10^{-3}$ m/s and

b. maximum 20 mass-% of carbonate.

3.4 Surface Sealing System

3.4.1 General

To avoid negative impact of the landfill body a surface sealing system has to be installed after the filling of the landfill or parts of it (landfill cells) are completed.

The sealing system has to fulfil the guidelines and technical requirements as defined in the EIA and in the MSW Rules 2000.

The surface sealing system has to fulfil the following requirements:

1) 300 mm compensation layer,

2) 600 mm mineral sealing layer (clay), $k_f < = 1 \times 10^{-9}$ m/s

3) 150 mm drainage layer, $k_f \geq 1 \times 10^{-2}$ m/s

4) 450 mm re-cultivation layer.

After reaching the highest level of each construction phase, as final cover, the surface sealing system has to be placed on top of the waste body.

The surface sealing system will be constructed with a maximum slope of 33 % in the embankment area. Wherever, composites are proposed, appropriate design and implementation approvals are to be provided

3.4.2 Compensation Layer

After completing the waste filling, the waste surface will be re-profiled according to the planned inclination of the surface sealing system.

Above the waste surface, the compensation layer made of a homogenous non-binding material will be applied. The thickness of the layer will be 300 mm. The layer will be the foundation for the mineral-sealing layer.

3.4.3 Mineral Sealing Layer

On top of the compensation layer a mineral sealing layer with a thickness of 600 mm (after compaction) will be placed.

This layer will be incorporated in two layers of 300mm each (after compaction). The mineral sealing layer of the surface has to fulfil the same quality standards as the mineral sealing layer of the base.

3.4.4 Drainage Layer

The drainage layer consisting of gravel with a grain size of 16/32 mm will be used for discharging the rainwater, which will infiltrate into the re-cultivation layer.

The thickness of the drainage layer will be at least 150 mm. The gravel has to fulfil the same quality standards as described for the drainage layer of the base sealing system.

3.4.5 Re-cultivation Layer

The re-cultivation layer (topsoil) will be used for the final restoration of the site. The re-cultivation layer will have a thickness of at least 450 mm.

Plants will be placed in accordance to the local flora as provided in the vicinity of the site. In order to protect the sealing system, deep rooting plants must be avoided.

The plants have to protect the total sealing system against wind and water erosion and have to minimise rainwater infiltration.

3.5 Tests and Samples during Construction of the Sealing Systems

The tests and samples during construction of the sealing system need to be agreed with the Contracting Authority but it is likely that they will include the following items.

3.5.1 Aptitude Test

The fundamental suitability (aptitude test) of the used materials provided for the mineral base and surface sealing system must be proven before construction works start.

The suitability tests of the used mineral sealing material have to be approved by laboratory tests and a test field. The following laboratory testing is required:

a. grain-size distribution
b. water content
c. consistency of material
d. water absorption of material
e. portion of organic materials

f. portion of carbonate
g. density
h. proctor density
i. water permeability
j. homogeneity

The suitability of the used drainage material has to be also approved by laboratory tests. The following tests are required:

a. grain-size distribution
b. content of organic materials
c. content of carbonate

3.5.2 Test Field

Within a test field the suitability of the clay must be proven under the supposed site conditions. These test fields are the basis for all conditions stipulated for later application by an independent supervisor.

Construction starts with 4 layers of 225 mm each and includes all above mentioned laboratory tests and examinations required for each layer by taking some samples. Visual tests have to be performed by trial pits. The test fields have to be performed outside of the sealing areas.

The results from the test field (including the results of the laboratory tests) must be evaluated and documented including the following statements with regard to the design of the mineral sealing system:

a. Compacting methods
b. Compacting equipment
c. Number of compacting transitions
d. Operation speed of compacting equipment
e. Thickness of un-compacted layers (before compaction)
f. Type of homogenisation

The test field must be at least 20 m in length, the minimum width must be 2 machine widths plus the required ramps 1: 10 and the embankments 1: 5 as well as the distance of acceleration and deceleration with driving tracks as wide as the equipment, which are arranged alongside.

The test fields should be located at the bottom and embankment area of the landfill. They should represent the same slopes as landfill. After the mineral sealing material has been tested, the application of the other sealing compounds, protection layer and drainage layer will be tested in the test field accordingly. This will be done for the base sealing as well as for the surface sealing.

3.5.3 Quality Assurance during Construction Works

For the quality assurance during construction works the requirements are as follows:

a. The mineral sealing layers must be built under weather conditions which are in compliance with required conditions (water content, degree of compression, coefficient of permeability; example: no construction during heavy rain fall)

b. The top of each completed layer of the mineral sealing system must be dewatered sufficiently. Shrinkage cracks must be avoided by taking technical measures.

c. Soil lumps which are bigger than 32 mm shall not be used for construction the mineral sealing.

d. The sealing material must be homogenous and show regular placement water content. The layers must achieve a homogenous sealing mass. The layers shall overlap.

e. After completion of each compacted layer an acceptance test must be carried out before starting the next layer.

f. During and after incorporation the following tests and checks must be carried out especially for the mineral-sealing layer (for re-cultivation layer, drainage layer and compensation layer the test has to be done similar):

    a. density
    b. thickness of each layer
    c. flatness of each layer
    d. grain-size distribution
    e. water content
    f. consistency of material
    g. water absorption of material
    h. proctor density
    i. permeability
    j. content of organic parts
    k. content of carbonate

These tests should be carried according to a defined scheme. The size of testing area should be 1000 m². The laboratory test for the aptitude test and the quality assurance during construction works have to be carried out by a qualified geo-technical institute.

3.6 Leachate Collection System

3.6.1 Estimation of Leachate Generation

The Operator has to present an estimation of leachate generation for the whole lifetime of the Sanitary Land Fill (SLF).

The volume of the leachate pond has to be calculated with the appropriate rainfall data and evaporation rates in order to ensure a sufficient storage

capacity with no need to discharge any leachate water at any time during operation and for landfill including for the Post Closure period.

3.6.2 Leachate Collection Pipes

Leachate has to be collected via HDPE leachate drain pipes. Static calculations have to be prepared in order to prove stability of the collection pipes within the landfill.

The leachate system has to be designed in order to enable inspections (e.g. via manholes) during operation and for landfill including for the Post Closure period.

3.6.3 Leachate Management and Treatment

The Operator has to ensure that the generation of leachate in the landfill area caused by storm water is minimised. On no account shall the leachate from Sanitary landfill be used in processing without assuring the absence of heavy metals and other contaminants. It is the responsibility of the Operator to prove the same.

An adequate leachate treatment system has to be implemented and operated. Any sludge that is generated has to be dried and then landfilled.

It has to be secured during the whole operation and for landfill including for the Post Closure period that no leachate is discharged without treatment either to surrounding sewage system or to the subsoil).

3.7 Storm water Collection System

The Operator has to present an estimation of the storm water generation for the whole lifetime of the SLF.

For an estimation and calculation of storm water generation appropriate assumptions have to be taken into consideration such as the intensity of rainfall for a particular time of concentration, catchment area and the runoff coefficient.

Appropriate rain water tanks (storm water ponds) with sufficient capacity need to be designed and constructed in order to secure zero overflow from the system.

Design and construction has to protect site from flooding and to ensure that there is no contamination of groundwater or surface water.

4 Operation and Performance Requirements

4.1 SLF Operation Plan and Programme

The Operator has to prepare a detailed and comprehensive Operation Plan and Programme for the SLF which includes:

1 Descriptions,

2 Requirements and responsibilities,

3 Operation procedures and

4 Procedural manuals

The Operation Plan and Programme at least has to cover the following elements (further requirements are detailed in the following sections):

4.1.1 Waste Reception and Analysis

Including description, requirements and procedures for

a. Entry, exit, weighing,
b. Sampling and pre-acceptance tests, characterisation, and quantity

4.1.2 Landfilling of Waste

Including description, requirements and operation procedures for

a. Waste placement/ filling plan (cells, capacity, filling and closure),
b. Initial filling,
c. Tipping and compaction,
d. Covering during rainy days/ monsoon period, final covering,
e. Stormwater minimisation, management and treatment, and
f. Leachate management, treatment and inspection of leachate collection system.

4.1.3 Environmental and Operational Monitoring

a. Waste quantities and characteristics (transport, SLF input, treatment, storage),
b. Quantity of inerts disposal to Landfill facility),
c. Meteorological data,
d. Surface water quantity and quality,
e. Groundwater (flow, sampling, quantity and quality),
f. Leachate sampling quantity and quality,
g. Quality and quantity of any other byproducts
h. Accidents and incidents,
i. Mitigation measures, and
j. Reporting requirements.

4.1.4 Health and Safety

a. Fire prevention and fighting,

b. Spillage and accident prevention and management,

c. Personnel protection equipment, and

d. Training

4.1.5 Information and Customer/ Public Relation

a. Development and operation of an information centre

b. Management of complaints from customers and the public

4.2 Waste Reception and Types of Acceptable Waste

4.2.1 Procedures for SLF Entry/ Exit

The entry / exit point shall be manned by security guards on a 24 hour basis. Entry of persons or livestock shall be prevented during Operation of the facility. Register of entry and exit shall be maintained.

The vehicles will be sent for weighing to the Weigh Bridge. At the weighbridge the vehicles will be weighed, the weight will be compared to the data indicated on the manifest sheet and recorded via computer-aided registration. The outgoing vehicle will also be checked, weighed and the data verified.

4.2.2 Sampling and Conformity Control in Laboratory

Incoming waste material shall be sampled to check conformity to acceptance standards.

Acceptance Criteria: Random Sampling of the waste that is delivered at the SLF shall be undertaken. The sampling procedure is to be undertaken on at least 5% of the incoming waste subject to a minimum of two waste loads on a daily basis by the committee/ Independent Engineer along with representative of the WPLF operator as well as the SLF operator. The following shall be recorded.

Acceptability Criterion for landfill waste: Ratio of Inert waste to total waste shall not be less than 80%. Similarly, the biodegradable content in the total rejects shall not be more than 10%.

4.2.3 Traffic Restrictions and Vehicle Washing

The vehicle washing unit will only be used for contaminated vehicles and containers / bins. Effluent generated from the vehicle washing unit will be stored in a storage tank and later pumped to the leachate management system for treatment. The concessionaire shall extend all cooperation to the WCTO operator to wash the transport vehicles and dumper bins.

4.2.4 House keeping and Maintenance of Buildings and Equipment

The Operator has to prepare a well thought-out housekeeping programme that:

a. Protects the public and surrounding environment from nuisance effects of SLF operations;

b. Enhances public perception and acceptance of the SLF site; and

c. Control nuisances as noise, dust, litter, odour etc.

The SLF buildings and equipment should be maintained regularly and frequently, to provide sanitary, safe, and efficient working conditions for the employees and users at all times.

The site infrastructure should be maintained in a proactive manner, so as to perform preventive maintenance before any major repair work is required. All buildings should be part of the checklist and items needing attention should be reported immediately to the site supervisor. A log should be maintained for all building maintenance issues.

Special attention has to be given to maintenance of

a. Storm water collection system

b. Leachate collection and treatment system

c. Environmental Monitoring Installations.

4.3 Landfilling of Waste

4.3.1 Filling Plan

The Operator has to prepare a detailed filling plan indicating each landfill cell their capacity (total and remaining) and the method and procedures for waste placement and filling.

4.3.2 Initial Lift

Major requirements for the initial lift are listed as follows:

a. A light or medium sized bulldozer should be used to push and level the waste for the initial lift. Under no circumstances the machines should be allowed to pass the liner system before filing as they can damage the liner system

b. Bulldozer drivers should take extreme care in levelling the waste, as no compaction should be applied other than during spreading of the initial lift. The bulldozer driver should not attempt to drive over the leading edge of the lift.

c. At no time should the thickness of the waste on which the equipment is operating for the initial lift be less than 2m above the upper element of the leachate collection system.

4.3.3 Tipping of Waste

The tipping face is the active part of the landfill (active cell), where waste is placed and compacted on a daily basis. The location of the tipping face within the site changes as more waste is added. As waste accumulates in the landfill, the tipping face also proceeds higher in elevation along with the increase in the height of the deposited waste in the respective landfill cell.

The operations at the tipping face consist of the following primary tasks:

a. Directing the vehicle at the tipping face;

b. Spread waste to 0.5 m thick, and as a minimum, maintaining slope less than 1(V) to 3 (H); and

c. Compact waste using the bulldozer.

It should be noted that the Operator should provide for all required cover material.

4.3.4 Spreading and Compaction of Waste

The Operator should direct the vehicle such that all wastes are unloaded in the designated working area. Systematically placing the loads will assist the bulldozer operator to spread and compact the waste.

The Operator must increase the density of the waste delivered at the site, through compaction.

4.3.5 Surface Sealing

After filling of a landfill cell the Operator has to install a surface sealing system according to the Landfill Requirements and Standards as listed above (section 3.4 Surface Sealing System).

4.4 Leachate Management

The operation plan to be prepared by the Operator has to outline the operative measures related to management and treatment based on the Landfill Requirements and Standards as listed above

Inspections of the leachate collection system (especially the drainage pipes inside the landfill) have to be conducted according to the applicable requirements, at least on an annual basis.

4.5 Monitoring

4.5.1 Introduction

The waste, which is deposited in a landfill and the equipment of the SLF have to be regularly controlled and monitored.

Emission standards including water, air phase, soil phase, noise, odour shall be specified in the environmental authorisation issued by HPPCB which might be amended from time to time.

Minimum procedures for monitoring have to be agreed with HPPPCB and MCS in order to confirm that:

a. Waste has been accepted to disposal in accordance with the criteria set for the Municipal Solid waste category of landfill,

b. The processes within the landfill proceed as desired,

c. The environmental protection systems are functioning fully as intended,

d. The permit conditions for the landfill are fulfilled.

4.5.2 Meteorological Data

Water balances are an effective tool for evaluating whether leachate is building up in the landfill body or whether the site is leaking, it is recommended that the following data are collected from monitoring at the

landfill or from the nearest meteorological station, as long as required by the competent authority:

	Operation phase	After-care phase
Volume of precipitation	Daily	Daily, added to monthly values
Temperature (min., max, 14.00 h IST)	Daily	Monthly average
Direction and force of prevailing wind	Daily	Not required
Evaporation (Lysimeter or through other suitable methods)	Daily	Daily, added to monthly values
Atmospheric humidity (14.00 h IST)	Daily	Monthly average

4.5.3 Monitoring Emission Data from Landfill: Water and Leachate

Sampling of leachate and surface water, if present, must be collected at representative points. Sampling and measuring (volume and composition) of leachate must be performed separately at each point at which leachate is discharged from the landfill site. Reference: general guidelines on sampling technology, ISO 5667-2 (1991).

Monitoring of surface water that is present shall be carried out at not less than two points, one upstream from the landfill and one downstream. The frequency of sampling could be adapted on the basis of the morphology of the landfill waste (in tumulus, buried, etc). This has to be specified in the permit.

	Operating phase	After-care phase
Leachate volume	Monthly	Every six months
Leachate composition	Quarterly	Every six months
Volume and composition of surface water	Quarterly	Every six months

4.5.4 Monitoring of Groundwater

Sampling:

The measurements collected should provide information on groundwater likely to be affected by the discharging of waste, with at least one measuring point in the groundwater inflow region and two in the outflow region. This number can be increased on the basis of a specific hydro-geological survey and the need for an early identification of accidental leachate released in the groundwater.

Sampling must be carried out in at least three locations before the filling operations, in order to establish reference values for future sampling. Reference: Sampling Groundwater, ISO 5667, Part 11, 1993.

Monitoring:

The parameters to be analysed in the samples taken must be derived from the

expected composition of the leachate and the groundwater quality in the area. In selecting the parameters for analysis, the mobility in the groundwater zone should also be accounted. Parameters could include indicator parameters in order to ensure an early recognition of change in water quality. Recommended parameters are as per the Schedule III of the MSW Rules, 2000:

Trigger levels

Significant adverse environmental effects should be considered to have occurred in the case of groundwater, when an analysis of a groundwater sample shows a significant change in water quality. A trigger level must be determined taking account of the specific hydro-geological formations in the location of the landfill and groundwater quality. The trigger level must be laid down in the permit whenever possible.

The observations must be evaluated by means of control charts with established control rules and levels for each down gradient well. The control levels must be determined from local variations in groundwater quality.

4.5.5 Topography of the site: data on the landfill body

The topography of the site and the determination of the landfill volume has to be conducted according to the following requirement.

	Operating phase	**After-care phase**
Structure and composition of landfill body	Yearly	Not required
Total volume and volume disposed in the respective year	Yearly	Not required
Settling behaviour of the level of the landfill body	Yearly	Yearly reading

4.5.6 Monitoring of Leachate and Surface Water

A standard programme is to analyse a set of parameters of leachate and additionally whenever it is required (once every 3 months). This standard programme (parameter list) may be adjusted according to needs every three years after a comprehensive survey programme is carried out (long list of parameters).

4.6 Reporting

A day to day record with weekly, monthly, quarterly and annual extracts is required. The record system should base electronic data processing.

The record keeping information to be provided can be summarised as below:

1) Municipal Solid Waste Generation
    a. Date
    b) Daily incoming waste as recorded at processing plant
2) Description of Inert waste

a. physical form
b. chemical form
c. quantity (volume and weight)
d. extent of segregation

3) Details of transportation
   a. Vehicle number
4) Details of disposal of Inerts / rejects
   a. date of disposal
   b. quantity of waste disposed (volume and weight and percentage to total daily waste)
   c. Quantity and percentage of Biodegradables in landfill rejects
   d. Location of disposal in SLF (Grid coordinates- X, Y,Z)
   e. Fuel consumption, and manpower employed
5) Data on environmental surveillance
   a. date of measurement
   b. meteorological data (including stormwater generation and treatment)
   c. groundwater (sampling location, depth of sampling, results)
   d. leachate generation (sampling, quantity, quality)
   e. leachate treatment (sampling, quantity, quality, total level of leachate in treatment pond)
   f. soil (sampling location, depth of sampling results)
   g. air (sampling location, data)
6) Details of inert/municipal solid waste reused / recycled
   a. quantity of waste received at site
   b. quantity of waste minimized by reuse and recycle
   c. record of any waste which was rejected on account of it being non conforming
7) Accident Reporting
   a. date and time of accident
   b. Sequence of events leading to accident
   c. emergency measure taken
   d. step to prevent recurrence of such wastes

8) Reporting of Complaints
    a. complaints received
    b. type of actions taken
    c. results
9) Any other reported (keep record)
    a. malfunctions
    b. type actions taken
    c. results

4.7 Health and Safety

4.7.1 General Requirements

In the SLF several kinds of Municipal Solid waste are handled. Workers and staff might be exposed to high levels of toxins, pollution and pathogenic environment.

The Operator shall be responsible for all aspects of site safety, and ensure safety for the public in the site and in areas adjoining the SLF.

The Operator shall take all necessary measures to safeguard the health and welfare of the persons entitled to be on the site and ensure the SLF operation is carried out in a safe manner.

The Operator should comply in all respects to the provisions of any relevant statutory requirements as may be considered applicable to the SLF operations, and also with the rules applicable to any industrial/ commercial establishment in India.

All above aspects inter-alia as prescribed under the Factory Act, 1948 amended in 1987 and the rules framed there under will have to be complied with. The detailed risk analysis as per the technology adopted, and an on-site risk mitigation plan should be prepared and the impact on the occupational health of the workers should be mitigated as identified in the plan.

4.7.2 Major Requirements

A medical room, concession for workers in working hours, not employing the people of tender age or old age, early retirement benefits, daily nutritional support group insurance schemes and other such measures shall have to be adopted.

Safe work environment should be considered, provided and maintained for the staff by the Operator. Safety and security considerations should be made for all facets like pre-treatment at secondary storage site, loading, transportation and unloading of Municipal Solid waste, spill control, treatment and laboratory.

Personal protection equipment and fire control systems should be provided at site (e.g. fire extinguishers, sand pails, water tanks, etc.). Aspects like ventilation, illumination and safe duration of limited working hours would also have to be considered.

The Operator should offer waste inspection training to new personnel, and it should be provided as a refresher periodically to existing personnel. Safety procedures for waste inspection should be reviewed on a regular basis. Training and mock drills etc. should be conducted with staff for emergency situations. A complete primary health unit with medicines/antidotes would have to be provided as per the Factory Act, 1948 and 1987.

Periodical check-up of health shall be undertaken and the persons be kept rotated. This should also cover other emergencies like snake bites or sabotage. EIA recommendations, statutory rules and regulations, acts etc, should be considered while providing for this aspect of operations.

An onsite contingency plan and emergency procedure shall be prepared and approved by district emergency officer who in turn will prepare the off-site management plan. The contingency plan shall describe the responses in case of fires, explosion, unforeseen acts or events, sudden releases due to natural calamities.

The strategic administrative arrangement, with local police, fire dept, medical facilities of the area, dept dealing with safety, health & environment, offices of MCS and revenue authorities shall be designed. Latest phone and fax numbers of concerned authorities shall be printed and distributed. Evacuation plan with evacuation routes shall be demonstrated by mock drills. Documentation should be immediately prepared for benefits of future planning. Other considerations as per EIA have to be integrated within this aspect of the operations of the SLF.

Inspectors should be informed of potentially new materials suspected in the waste and preventative measures required when inspecting loads. Employees performing waste inspections should be provided with information on new materials, banned substances, waste reduction programmes and the level of compliance required for each programme.

4.8 Information and Customer/ Public Relation

An information centre will maintain all records of the SLF and should display the day to day details of the SLF like quantity and quality of waste, manifest details, complaints received, type of actions taken, problems faced, monitoring results etc.

This information centre will have a complaint cell which will register the complaints of customers or public regarding the operation of the SLF. A liaison officer will be posted in the SLF who will monitor and evaluate the day to day functioning of the facility and attend to the grievances of the villagers.

5 Existing Infrastructure

The Bidders are expected to assess the condition of the existing assets with the MCS and accordingly make suitable modifications in their project costs so as to make their bids competitive. The Bidder is advised to check the condition of these assets and may use the same wherever possible after due modification/refurbishment.