REGULATION ON WASTE LANDFILLING

("Official Gazette of RS ", No. 92/2010*)*

I INTRODUCTORY PROVISIONS

Subject of the Regulation

Article 1

This Regulation shall closely stipulate the conditions and criteria for the establishment of location, technical and technological conditions for design, construction and operation of landfills, waste types landfilling of which shall be prohibited, the amount of biodegradable waste which could be disposed, criteria and procedures for acceptance or non-acceptance, i.e. landfilling, the manner and operation procedures and closure of a landfill, the content and the monitoring of landfill operation manner, as well as future maintenance after the landfill closure.

The aim

Article 2

Landfilling of waste shall establish and provide for conditions that shall disable and reduce hazardous impacts on human health and the environment throughout whole landfill life cycle, particularly the pollution of surface and ground waters, soil and air, including the greenhouse effect.

Definition of terms

Article 3

Terms used in this Regulation shall have the following meaning:

1) *liquid waste* is every waste in liquid state of matter including all wastewaters apart from mud and sludge;

2) *segments* are parts of space on the landfill body itself, specified for different waste types;

3) *leachate* is the water occurring in the process of waste disposal (waste decomposition) and in action of waters reaching landfill body in any way; they are being separated at the bottom of landfill body and drained out of landfill body, using specific systems, or are partly retained in it;

4) *landfill gas* is the mixture of all the gases occurring in and released from disposed waste;

5) *sample* is the minimal amount of substance (solid, liquid, gas) necessary for laboratory testing;

6) *parameter limit values* are parameter limit values identified in the waste disposal parameter list in accordance with special regulation on categories, testing and classification of waste;

7) *testing of the waste for disposal* is testing to be performed in accordance with special regulation pertaining to categories, testing and classification of waste;

8) *waste generated on a regular basis* is the waste with settled features, generation of which is regular, i.e. facility and processes of which are clearly defined;

9) *waste not generated on a regular basis* is the waste features of which are not settled, which is not produced regularly with the same process and in the same facility;

10) *batch of waste* is the waste amount being delivered in one delivery;

11) *safety assessment* is the document containing previous risk assessment for every underground waste storage site aimed at the establishment of environmental impact of the disposed waste;

12) *regulation line* is the boundary of a landfill;

13) *the landfill body* comprises arranged space for waste disposal with the protection system of landfill bottom from leakages, drainage system and leachate treatment, degasification from the landfill and other technical facilities for operation of these systems and landfill safety;

14) *landfill bottom* is the flat, prepared surface where landfill body is formed;

15) *construction waste* is the waste generated due to construction, reconstruction, adaptation, renovation and civil engineering constructions' demolition;

16) *water permeability* is content of the material which defines liquid flow through porous conductor upon certain hydraulic gradient and is calculated as hydraulic permeability ratio expressed in m/s;

17) *drainage layer* is water permeable and filtered stable layer through which the leachate is primarily being treated;

18) *degassing system* are degassing facilities, reservoirs, installations and regulation facilities for collection and monitoring of landfill gas management, in the use of such gas or for its immediate incineration (hereinafter referred to as: degassing system);

19) *biotrn* is the individual technical facility similar to the well for waste degassing;

20) *geological barrier* is the barrier of natural or artificial origin that is such an impervious environment, identified with geological and hydrogeological characteristics which provide ground waters and geological environment protection;

21*) artificial sealing coating – foil* is the coating made of artificial material which is placed on the landfill bottom and disables leachate penetration into subsoil;

22) *natural mineral buffer* is the protection made of such consolidated layers so that certain water permeable features are met;

23) *lower impermeable layer* is the protective layer made of both natural and artificial materials formed on the landfill bottom, with the aim of subsoil, ground and surface water protection;

24) *upper impermeable layer* is the protective layer made of both natural and artificial materials formed on the upper surface of the part or of the whole landfill, after its closure, with the aim of environmental protection, precipitation water flow into the closed landfill body and vegetation culture improvement;

25) *the active phase of a landfill* is the time period of active landfill usage;

26) *the passive phase of a landfill* is the time period of thirty years after the landfill closure, during which the landfill is monitored and supervised;

27) *subsoil* is the soil beneath the landfill bottom;

28) *the cell-landfill cassette* is the area of specific dimensions in the part of a landfill where regular shape of delivered bulk waste is formed and which is covered, after its formation, with inert material;

29) *inert material* is the soil or other material which is used for covering daily formed cells, whose thickness is from 10 to 30 cm;

30) *zero state* is the initial state of facility, equipment or area operation;

31) *landfill withering process* is the process of chemical and biological reactions termination which occurs in the landfill body, products of which are leachate and landfill gas;

32) *secondary waste separation* is separation of waste with use value from the waste delivered to a landfill;

33) *underground storage* is the place where underground waste is disposed in the deep geological empty space, of natural (tectonic depression in igneous rock and the like) or artificial origin;

34) TOC is the total organic carbon;

35) DOC is soluble organic carbon;

36) BTEX are highly volatile aromatic hydrocarbons (benzene, toluene, ethyl benzene, xylene).

Implementation and exemption from implementation

Article 4

This Regulation shall be applied to all landfill classes stipulated by the Law regulating waste management (hereinafter referred to as: the Law).

This Regulation shall not be applied to:

1) sludge dispersion, including sewage sediments and sludge obtained by cleaning of the river bed and similar substances on the soil used for the purposes of fertilization or its features improvement;

2) inert waste usage which is suitable for activities of renovation, restoration and filling of the ground or for construction purposes;

3) non hazardous sludge disposal from treatment of riverbed next to smaller waterways and non hazardous sludge disposal into surface waters, including river bed and soil beneath it;

4) disposal of all types of mining waste which are the result of examination, exploitation, preparation and storage of mineral resources.

II CONDITIONS AND CRITERIA FOR LOCATION IDENTIFICATION, TECHNICAL AND TECHNOLOGICAL CONDITIONS FOR DESIGN, CONSTRUCTION AND OPEARTION OF A LANDFILL

Identification of landfill location

Article 5

Location for the landfill shall be identified when the characteristics and features of stipulated area meet the conditions stipulated by this Regulation.

When choosing the location for the landfill general conditions and criteria referring to the following shall be taken into consideration:

1) the purpose of the area and soil usage;

2) terrain topography;

3) engineering and geological, geotechnical, hydrogeological and seismic conditions on the monitored area;

4) climate, hydrological and hydrographic characteristics of the monitored area;

5) protection zones and conditions;

6) traffic and technical infrastructure;

7) possible volume and capacity of the area.

Conditions and criteria for determination waste location are closely referred to in Annex 1. – General conditions and criteria for identification of landfill location, which is printed together with this Regulation and represents its constituent part.

Landfill design

Article 6

Landfill shall be designed so that it meets conditions necessary for soil, ground and surface waters and air pollution prevention and to ensure controlled management of leachates and isolated gases.

Soil, ground and surface waters protection shall be achieved by combining geological barrier and lower impermeable layer throughout the active phase of a landfill and by combining geological barrier and upper impermeable layer throughout the passive phase after the landfill closure.

Air protection shall be achieved by establishment of the adequate system for degassing and by regular waste covering with the inert material.

Landfill construction

Article 7

Technical and technological conditions for landfill construction on the chosen location shall refer to:

1) landfill body;

2) manipulative serving plateau;

3) facility for secondary waste separation;

4) road and necessary infrastructure;

5) plateau for wastewater treatment facility (if necessary);

6) vegetative protective zone.

Technical and technological conditions for design and construction are closely referred to in Annex 2- Technical and technological conditions for design, construction and commissioning of a landfill, which is printed together with this Regulation and represents its constituent part.

Commissioning of a landfill

Article 8

The landfill shall be commissioned, that is shall operate in accordance with technical and technological conditions stipulated by design and technical documentation, permit, the Law and this Regulation.

Landfill operation could be ratified if conditions referred to in Articles 5 and 7 of this Regulation are met or corrective measures that should be taken, that is if it is determined that the landfill shall not represent the risk to human health and the environment.

III WASTE LANDFILLING

Waste types landfilling of which is prohibited

Article 9

It shall be prohibited to landfill the following:

1) liquid waste;

2) waste which could, in landfill conditions, explode, acidify, or is flammable and has other characteristics which make it hazardous in accordance with special regulation pertaining to categories, testing and classification of waste;

3) hazardous medical and veterinary waste generated in medical and veterinary institutions, having infectious features in accordance with special regulation;

4) waste batteries and accumulators;

5) waste oils;

6) waste tires;

7) waste electrical and electronic products;

8) waste fluorescent pipes containing mercury;

9) waste containing PCB;

10) waste vehicles;

11) thermally unprocessed waste generated in institutions that provide health care services;

12) pressure tanks;

13) separately collected waste fractions – secondary raw materials;

14) every other waste whose disposal is prohibited in accordance with special regulation and not meeting criteria for waste acceptance stipulated by this Regulation.

Waste mixtures cannot be diluted with the aim of meeting requirements for landfilling.

In underground storage, it shall be prohibited to dispose waste types whose disposal shall lead to physical, chemical or biological changes which would endanger underground storage or represent the danger for pollution of the environment and human health, referred to in Annex 3- Waste disposal into underground storages and safety assessment, which is printed together with this Regulation and represents its constituent part.

The quantities of biodegradable waste that can be landfilled

Article 10

For the purposes of establishing the system of controlled biodegradable waste disposal to the landfill, the following disposal rates shall be identified:

1) in the period from 2012. to 2016. – minimum 25% of the total amount (per weight) of biodegradable municipal waste;

2) in the period from 2017. to 2019. – minimum 50% of the total amount (per weight) of biodegradable municipal waste;

3) in the period from 2020. to 2026. – minimum 65% of the total amount (per weight) of biodegradable municipal waste;

The procedure of biodegradable waste amount decrease referred to in paragraph 1 of this Article which is landfilled shall be implemented in accordance with the national plan, in accordance with the Law.

IV CRITERIA AND PROCEDURES FOR WASTE ACCEPTANCE, NON ACCEPTANCE AND LANDFILLING

Criteria for waste acceptance, non acceptance and disposal

Article 11

Waste shall be accepted to the landfill only if it meet shall meet criteria for waste acceptance for every waste class.

Criteria for waste acceptance or non acceptance to the landfill shall be parameter limit values for landfilling, in accordance with the special regulation.

Article 12

Waste shall be disposed to all landfill classes regulated by the Law.

Only pre-treated waste shall be landfilled, in accordance with the Law and other regulations.

Disposal of inert waste can be approved without pre-treatment, if treatemtn of such waste is not physically feasible and disposal of other waste if its processing does not contribute to the goals pertaining to reduction of waste amount or to reduction of hazards for human health or the environment.

Article 13

Waste disposed to different landfill classes should meet parameter limit values in accordance with the parameter lists for testing of waste for disposal stipulated by special regulation pertaining to categories, testing and classification of waste (hereinafter referred to as: parameter limit values for landfilling).

Hazardous waste which meets parameter limit values for hazardous waste disposal shall be disposed to the hazardous waste landfill.

The following shall be disposed to the non-hazardous waste landfill:

1) municipal waste;

2) non-hazardous waste of any origin meeting parameter limit values for non hazardous waste disposal;

3) solid, non reactive hazardous waste (solidified) whose leachate is the equivalent of the one for non hazardous waste referred to in point 2 of this paragraph and which shall meet parameter limit values for hazardous waste disposal to the non hazardous waste landfills.

Hazardous waste referred to in paragraph 3, point 3 of this Article shall be disposed to the specific landfill segment, separated from the cassettes for biodegradable non-hazardous waste.

Non-hazardous gypsum-based waste shall be disposed on a specific, separated non hazardous waste landfill segment where biodegradable waste shall not be disposed.

Waste referred to in paragraph 5 of this Article should meet parameter limit values for TOC and DOC in accordance with special regulation on categories, testing and classification of waste.

Construction asbestos-containing waste and other asbestos waste meeting the conditions in accordance with the special regulation shall be disposed to the non-hazardous waste landfill without being tested, particularly:

1) the waste should not contain other hazardous substances apart from bound asbestos;

2) final covering should be put on the landfill for the purposes of avoiding fiber dispersion.

For non-hazardous landfill, location plan for such landfill that contain clearly marked micro locations of the cassettes where gypsum-based non-hazardous waste, asbestos-containing and solid non-reactive non hazardous waste is disposed, shall be kept even after the landfill closure.

For the landfills referred to in paragraph 8 of this Article, necessary measures shall be taken so as to limit future usage of the soil after landfill closure, with the aim to protect of human health and environment.

Inert waste meeting parameter limit values for inert waste disposal shall be disposed to inert waste landfill.

Hazardous, non-hazardous and inert waste can be disposed to underground storages, in accordance with the conditions and criteria referred to in Annex 3 and special regulations of competent authorities and institutions.

Exemptions from criteria application

Article 14

Exceptionally from the provision referred to in Article 11, paragraph 2 of this Regulation, disposal of the waste whose parameter values exceed stipulated limit value for maximum three times could be permitted, if:

1) in the specific case, a permit for specific waste disposal to the landfill has been issued, taking into account features of the landfill and its environment;

2) emissions, including leachate from the landfill, in accordance with risk assessment and parameter limit values, shall not represent the hazard for human health and the environment.

The provision referred to in paragraph 1 of this Article shall not be applied to the following parameters:

1) soluble organic carbon (DOC), BTEX, PCB and mineral oils, if they belong to the inert waste;

2) total organic carbon (TOC) and pH, for stable and non reactive hazardous waste, which could be disposed to the non hazardous waste landfill;

3) loss of ignition (LOI) and/or total organic carbon (TOC), for hazardous waste;

4) total organic carbon (TOC) for inert waste, which can exceed parameter limit values maximum two times.

Procedures for waste acceptance and landfilling

Article 15

Waste acceptance shall be performed under the procedure which shall comprise the following:

1) testing of the waste for disposal;

2) compliance verification;

3) verification on the terrain - on site.

Testing of the waste for disposal

Article 16

Testing of the waste for disposal shall be performed for every waste type, in accordance with special regulation, while sampling shall be performed in accordance with stipulated standards.

Data obtained by testing of the waste for landfilling, in particular shall refer to:

1) description of the previous waste processing or statement that the waste can be disposed without previous processing;

2) waste and leachate content;

3) class of the landfill where waste is disposed;

4) the evidence that the waste does not belong to the waste referred to in Article 9 of this Regulation;

5) special requirements and measures that need to be taken upon disposal, in accordance with Article 13 of this Regulation;

6) special key parameters for compliance verification, as well as its dynamics.

For the waste produced on a regular basis under the same procedure and in the same facility, by testing referred to in paragraph 1 of this Article data particularly referring to the following shall be obtained:

1) content changeability of certain waste types;

2) changeability limits of significant features.

For the waste produced on a regular basis under the same procedure but in different facilities, by testing referred to in paragraph 1 of this Article data referring to waste from every facility are obtained, based on specific number of measurements performed.

Testing of the waste intended for disposal shall be performed by professional organizations for waste testing in accordance with the Law.

Data obtained by testing of the waste referred to in this Article are a constituent part of the report on testing of the waste for disposal, in accordance with the special regulation.

Special testing

Article 17

For the waste produced on a regular basis under the same procedure and in the same facility, for which data specified in Article 16, paragraph 2 and 3 exist, provided that the measuring results illustrate little deviations in relation to parameter limit values for disposal, testing shall be performed upon the first delivery, followed by periodical compliance verification in accordance to this Regulation.

For the waste produced on a regular basis under the same procedure but in different facilities, for which data specified in Article 16, paragraph 2, 3 and 4 exist, testing shall be performed upon the first delivery, followed by periodical compliance verification in accordance with this Regulation, unless there has been a significant change in the procedures of waste generation.

For the waste not being produced on a regular basis under the same procedure and in the same facility, as well as for the waste whose features are changeable, testing of the waste for disposal shall be performed for every waste batch, for which compliance verification is not performed.

Compliance verification

Article 18

Compliance verification is periodical verification of the waste delivered for disposal on the regular basis so as to establish whether parameters of that waste correspond to parameters obtained by testing of the waste for disposal and whether they comply with parameter limit values for landfilling.

Parameters for compliance verification and implementation dynamics of compliance verification are included in the report referred to in Article 16, paragraph 6 of this Regulation.

Compliance verification shall be performed only for those parameters which were determined as critical upon the testing of the waste for disposal.

Upon the compliance verification, the same testing used upon the testing of the waste for disposal shall be applied.

Compliance verification shall be performed at least once a year, and landfill operator shall ensure that it is being performed according to the span and dynamics in accordance with this Regulation.

For municipal waste which is being accepted to the landfill without testing, compliance verification shall not be performed.

Verification in the field – on site

Article 19

Verification on site shall contain visual testing of every waste batch before and after unloading, as well as documentation verification in accordance with this Regulation.

Waste shall be accepted to the landfill if it is established on site that it is identical to the waste for which testing was performed, that is for which compliance is verified, as well as the description in the report referred to in Article 16, paragraph 6 of this Regulation.

Exemptions when the inert waste is accepted to the landfill without testing

Article 20

Inert waste from the list referred to in Annex 4 –Inert waste which is disposed to the inert waste landfill without testing shall be disposed to the inert waste landfill without testing, which is printed together with this Regulation and represents its constituent part.

If inert waste is not in Annex 4 of this Regulation or in the case of the doubt that the waste referred to in paragraph 1 of this Article does not comply with stipulated conditions, waste testing shall be performed.

Exemptions when municipal waste is accepted to the landfill without testing

Article 21

On the non hazardous waste landfill, without previous testing, municipal waste shall be accepted which is marked as non hazardous in accordance with special regulation pertaining to categories, testing and classification of waste, and shall be disposed to the landfill segments where waste referred to in Article 13, paragraph 3, point 3 of this Regulation is not disposed.

On the non hazardous waste landfill municipal waste shall not be accepted if it was not processed prior to the disposal in accordance with the law and special regulation or if it is contaminated in the amount which justifies its disposal to the second class landfill.

Daily record that is annual report of the landfill operator shall particularly contain data on accepted waste amount for which testing was not performed and data on occasional storage waste which was not accepted.

Procedures for waste non acceptance to the landfill

Article 22

Acceptance of delivered waste shall be rejected when the waste shall not meet the conditions on disposal stipulated by the permit, when different types of waste are mixed that is when delivered waste represents the risk for human health and the environment and when conditions for disposal regulated with this Regulation and the Law are not met.

If acceptance of waste for which it is established that supplement or new testing is needed is rejected, temporary waste storage can be permitted on the stipulated landfill area, for the period not longer than four months.

Competent authority for issuing permits shall be informed on waste non acceptance to the landfill, in accordance with the Law.

V OPERATION MEANS AND PROCEDURES AND LANDFILL CLOSURE

Landfill operation means and procedures

Article 23

Landfill operation means and procedures, that is operation plan of the waste landfill, appointing of the qualified person for the work at the landfill, responsibilities of the operator at the landfill, technical and technological conditions for design, construction, operation and equipment of the landfill, waste management organization on the landfill, landfilling operations, issuing permits for landfilling, daily record, annual report on the waste, expenses of design, construction, operation, closure of the landfill and its maintenance after the closure, shall be implemented in accordance with the Law, this Regulation and special regulations.

Upon waste disposal to the landfill procedures and landfill operation regime referring to the following shall be obeyed:

1) movement regime and operation procedures for all vehicles entering the complex of a landfill;

2) rules applied during waste disposal;

3) control of the technical processes of landfill operation;

4) leachate and trated liquid generation and quality control at the landfill;

5) gas separation control.

Procedures and regime of landfill operation which are implemented upon technical landfill exploitation process are specified in Annex 5. - Procedures and regime of landfill

operation, which is printed together with this Regulation and represents its constituent part.

Landfill closure means and procedures

Article 24

The surface of a landfill or one of its parts shall be closed when conditions specified in the permit and main project for the closure of the whole landfill or one of its parts are met.

All landfill classes are covered and protection layers are applied in accordance with the procedures and regime of landfill operation referred to in Annex 5 of this Regulation, aimed at prevention of precipitation waters inflow to the landfill body, the increase of leachate amount and landfill withering process prolongation.

Upon landfill closure smooth functioning of the system for degassing (biotrn) shall be provided, as long as the need for it exists, in accordance with this Regulation.

Closed landfill maintenance and control

Article 25

Landfill or part of a landfill shall be closed in accordance with the permit, when conditions for landfill closure are met or upon unpredicted circumstances endangering the environment, in accordance with special regulations.

Upon landfill closure, the following shall be provided:

1) closed landfill maintenance and protection;

2) closed landfill control and monitoring in accordance with this Regulation.

Landfill or its part shall finally be closed for further disposal when all requirements referred to in Article 24, paragraph 2 of this Regulation are met, in accordance with the permit of a competent authority on landfill operation cessation.

VI CONTENT AND MEANS OF LANDFILL OPERATION MONITORING AND MAINTAINANCE AFTER THE CLOSURE

Landfill operation monitoring

Article 26

Landfill operation monitoring shall be performed during the active and passive landfill phase.

Monitoring shall be performed at the landfill, thereof:

1) meteorological parameters monitoring;

2) surface water monitoring;

3) leachate monitoring;

4) gas emission monitoring;

5) ground water monitoring;

6) precipitation water amount monitoring;

7) landfill body stability monitoring;

8) protective layers monitoring;

9) pedological and geological characteristics monitoring.

Monitoring referred to in paragraph 2 of this Article shall be performed by sampling and measuring in a way specified in Annex 6- Landfill operation monitoring, which is printed together with this Regulation and represents its constituent part.

Sampling and measuring

Article 27

Sampling and measuring referred to in Article 26, paragraph 3, of this Regulation shall be performed:

1) in the landfill laboratory where certain tests are performed daily;

2) in the accredited laboratory in specific intervals regulated by this Regulation or more frequently, if data in the landfill laboratory show that any accident situation has occurred or deviation from zero state of certain parameters.

All data obtained by monitoring referred to in Article 26 of this Regulation shall be delivered to the Agency for Environmental Protection.

VII FINAL PROVISION

Article 28

This Regulation shall enter into force eight days after the publication in the “Official Gazette of RS”.

Annex 1

GENERAL CONDITIONS AND CRITERIA FOR LANDFILL LOCATION IDENTIFICATION

Upon establishing the location for the landfill general conditions and criteria for all landfill classes shall be taken into consideration, thereof:

1. According to space purpose and land usage

Conditions for space purpose and land usage shall be taken from the general urban design.

The distance between the outer location boundary of a landfill and the closest facility of the settled area, where people reside continually, cannot be less than 500 meters.

Landfill shall be located on a distance of minimum 300 meters from independent houses out of the settlement and other facilities where people work and reside, if it is sheltered so that the landfill body is not in the sight.

Landfill is being planned so that monitored area should satisfy capacity needed that is the volume and spatial location of all necessary facilities.

2. According to terrain topography

Landfill shall be located, usually, in the dips sheltered by the side terrain, former land borrow pits and flat terrains without running or still waters.

Steep terrains with the slope above 25% could be used for a landfill with the application of adequate technical measures (design, rejection, supporting etc.).

3. According to hydrogeological, engineering and geological and geotechnical conditions on monitored area

Landfill cannot be located on:

1) the terrain with very cracked rocky foundation with high water permeability and non defined movement directions of ground waters;

2) terrains with free ground water level where the seasonal level is higher than two meters, and in specific hydrogeological and hydrological conditions;

3) the area affected with the slides, collapses, soil consolidation or other land mass movements, if such a phenomenon cannot be prevented by technical measures;

4) the area with uneven geotechnical features on the surface and under the surface which affect the landfill, if such a phenomenon cannot be prevented by technical measures.

4. According to climate, hydrological and hydrographic characteristics of the monitored area

Upon choosing the location for the landfill the following meteorological, hydrological and hydrographic characteristics shall be considered:

1) wind rose, the frequency and speed with maximal, minimal and arithmetic mean and stillness;

2) average and maximal annual temperature with duration length and the number of winter days with the temperature below 0°C;

3) the number of days with snow cover, snow cover average heights, precipitation in normal and extreme conditions in millimeters.

Landfill cannot be located on:

1) area protected by water identified in accordance with regulations pertaining to water protection;

2) protected area of thermal and mineral waters, identified in accordance with regulations pertaining to water protection;

3) flood area identified in accordance with regulations pertaining to water protection;

4) terrains outside flood area if the return period of high waters is twenty years and if it is not possible to exercise its protection by using technical measures.

4. According to protection zones and conditions

Landfill can be located on:

1) certain distance from the coast of rivers, lakes and accumulations in accordance with special regulations and conditions of competent authorities and institutions;

2) certain distance from health care facility for stationery treatment, natural spas and the like, in accordance with special regulations and conditions of competent authorities and institutions;

3) certain distance from determined immoveable cultural heritage (cultural monuments, spatial cultural and historical entity, archeological sites and historic landmarks), as well as its protected environment or protected natural resources in accordance with special regulations and conditions of competent authorities and institutions;

4) certain distance from flammable materials' warehouse and military facility in accordance with special regulations and conditions of competent authorities and institutions.

Landfill cannot be located on the terrain in the zones of sanitary protection of drinking water supply source.

6. According to transportation and technical infrastructure

Landfill cannot be located:

1) in the transportation or technical infrastructure protection zone, in accordance with special regulations and conditions of competent authorities and institutions;

2) above built in installations for artificial irrigation, as well as other ground infrastructures, above – tunnels, subways, shelters and similar facilities, in accordance with special regulations and conditions of competent authorities and institutions;

3) in certain radius from airport benchmark and within certain length of runaway paths for all airplane types, in accordance with special regulations and conditions of competent authorities and institutions;

4) on certain distance from water, gas, oil pipelines and power lines, in accordance with special regulations and conditions of competent authorities and institutions.

7. According to possible capacity that is volume of a landfill

Volume and capacity of a landfill shall be determined based on comparable data obtained by measuring of waste amount which should be disposed, waste volume weight (mass) on the landfill, the amount of covered material and compression density, according to the following form:

$$V_{area} = \frac{(G_{ot} + G_{pm})}{\rho_{ot}\ \rho_{pm}}$$

where:
V – needed landfill volume (m_3);
Got – waste weight (t);
Gpm – cover material weight (t);
ρot – average density of compressed waste (t/m_3);
ρpm – average density of compressed inert material (t/m_3).

The landfill shall be planned for the period longer than 20 years in accordance with the appropriate urban design plan. The landfill shall be planned for the period of less than 20

years when it is necessary to fill natural depression, excavation or to level certain surfaces near the settlement.

Annex 2

TECHNICAL AND TECHNOLOGICAL CONDITIONS FOR DESIGN, CONSTRUCTION AND COMMISSIONING OF A LANDFILL

1. Conditions for the landfill body

On the landfills landfill bottom and slope shall be regulated, that is lateral sides in a way which shall enable landfill stability, provide sealing that is water tightness which, together with the system for leachate reception and drainage disables its penetration into landfill subsoil.

Technical and technological conditions for enabling water tightness of a landfill bottom, controlled management of leachate, and all waters gravitating towards a landfill or generate in it, landfill gas, measures for decreasing reek spreading and external negative effects and measures for enabling landfill stability are the following:

1) conditions regarding landfill bottom- Bottom and lateral sides of the landfill body should contain natural geological barriers complying with requirements of permeability and thickness with combined effect regarding soil, ground and surface water protection, at least equal to the effect which is a result of the following requirements:

- hazardous waste landfill: $K \leq 1,0 \times 10^{-9}$ m/s; layer thickness≥ 5 m;

- non hazardous waste landfill: $K \leq 1,0 \times 10^{-9}$ m/s; layer thickness ≥1 m;

- inert waste landfill: $K \leq 1,0 \times 10^{-7}$ m/s; layer thickness ≥1 m.

Note: (m/s: meter/second);

2) conditions regarding leachate - when natural geological barrier does not comply with stipulated values, it is provided by coating landfill bottom with synthetic materials or natural mineral buffer which must be consolidated in a way to obtain equivalent bottom value regarding its water permeable features.

Natural mineral buffer must not be lower than 0.5 meters.

Additional landfill bottom protection should be provided on a landfill in order to prevent migration of leachate into landfill subsoil, in the following manner:

Landfill class	For hazardous waste	For non hazardous waste
Artificial sealing coating- foil	required	required
Drainage layer ≥ 0,5 m	required	required

For coating of landfill bottom and lateral sides of a landfill other methods and techniques could be used, which provide conditions given in the table.

Project of drainage layer, drainage pipes and drainage canals shall be made based on water balance calculations in order to enable the impact of systems for leachate drainage and treatment, operation control and maintenance of a landfill.

Conditions regarding landfill bottom and leachate shall not be applied on inert waste landfills, which in decomposition process have no effect on the environment that is where leachate drainage into the environment has no negative effects on soil, ground and surface waters quality.

On a hazardous and non hazardous waste landfill special system for collection and drainage of leachate through drainage layer should be provided where drainage pipes for its drainage into designed system for its treatment are put.

Waste penetration into drainage system shall be prevented with adequate acceptable technical solutions.

For control and maintenance of drainage pipes for leachate collection, a sufficient number of manholes should be built, which have to be stable and leaned on the subsoil.

For temporary retention of leachate which is collected from landfill body, collective manhole should be installed, resistant to chemical effects, protected from explosion and reek emission.

Leachate collection, prior to drainage into receiver shall be processed that is treated in accordance with special regulations pertaining to water protection;

3) conditions regarding surface, ground and precipitation waters- on the landfill technical conditions shall be provided, which shall disable surface, ground and precipitation waters from surrounding surfaces or areas out of the landfill from coming into contact with landfill body.

Leachate from landfill, technological waste waters and precipitation waters, shall be collected separately and separately shall be drained to the facility for waste water treatment or adequate designed recipient.

In the case that both hazardous and non hazardous waste are disposed on the same location, which could be disposed to the same location according to this Regulation, leachate and precipitation waters from covered surfaces in the area of these specific landfill segments, must not be mixed.

These conditions shall not be applied to the landfills where construction waste is disposed, waste which contains tightly bound asbestos, as well as to inert waste landfills;

4) conditions regarding landfill gas- it is necessary to take adequate measures on a landfill with the aim of accumulation, migration and control of landfill gas.

Controlled management and collection of landfill gas shall be enforced on all landfills where biodegradable waste is disposed using adequate degassing system.

Collected landfill gas shall be processed and used for energy generation.

If collected landfill gas cannot be used for energy generation, it shall be burned on the landfill.

Size, number and strength of degassing system installation shall be designed so as to comply with estimated amount of gas generated on the landfill, with the aim of explosion prevention, as well as its usage.

Collection, processing and usage of landfill gas should be enforced in a way which decreases hazardous effect on human health and the environment to the minimum;

5) conditions regarding reeks and external negative effects- On a landfill, measures for decreasing reek and dust spreading, decreasing spreading of light fraction by wind, prevention of birds', insects and pests' coming into contact with the waste, noise decrease and fire possibility decrease;

6) conditions regarding stability- Upon waste disposal on a landfill, disposed waste mass stability should be provided as well as supporting infrastructure, particularly regarding slide prevention.

Stability of landfill bottom and landfill body shall be provided for longer period, so that possible deformations do not induce negative effect, particularly on lower artificial sealing foundation, drainage leachete and degassing system.

Upon stability planning waste weight and characteristics, material aging and meteorological effects shall particularly be taken into consideration.

2. Conditions for manipulative serving plateau

At the entrance to the landfill, a board shall be put containing the name, landfill operator's name, landfill class, address of the company disposing the waste, working hours, types of waste whose disposal is permitted and types of waste whose disposal is not permitted and other significant information.

The board shall be made of permanent material with indelible label.

All facilities within the landfill shall be located inside the regional line that is the landfill fence.

At the entrance to the landfill, a facility for the control shall be put, aimed at prevention of uncontrolled access and waste disposal to the landfill.

Total landfill area shall be surrounded by fixed wire fence, minimum two meter high in order to prevent uncontrolled access of humans and animals.

The entrance to the landfill shall be locked before and after working hours.

Waste weight measuring shall be provided at the landfill.

Space big enough for enforcing the procedures of accepting and checking of delivered waste and for parking and movement of the vehicles by which the waste is delivered shall be provided on the manipulative serving plateau.

Space big enough for temporary storage of the waste not complying with conditions for disposal stipulated by this Regulation shall be provided on the manipulative serving plateau.

Space for the facility for secondary separation of raw materials from delivered waste intended for disposal shall be provided on the manipulative serving plateau.

Space for administrative business facility (offices, workers' space, sanitary block, laboratories etc.) shall be provided on the manipulative serving plateau and shall be equipped in accordance with existing regulations.

Space for facilities for mechanization maintenance and storage shall be provided on the manipulative serving plateau.

Landfill shall be equipped with the facilities for prevention of filth transmission and infection agents to public roads, via vehicle by which the waste is delivered to the landfill.

3. Conditions for the facility for secondary waste separation

Space for the secondary separation facility of the waste delivered where separation of waste with use value is performed shall be provided at the landfill, with the aim of property renewal and landfill exploitation period prolongation, as well as the space for storage of secondary separated raw material.

Space for the secondary separation of delivered waste could be included in the system during landfill exploitation, as soon as the conditions are met.

4. Conditions for the road and necessary infrastructure

Landfill shall be connected with existing road network prior to the start of its operation.

The number of accessible roads shall be determined in accordance with the working process on the landfill and vehicle number, size and weight.

It shall be provided that accessible roads are passable in all weather conditions.

Width of accessible road towards the landfill shall be the following:

1) 6m- for settlements with more than 50, 000 residents, and

2) ≥ 3,5 m- for settlements with less than 50,000 residents provided that occasional enlargements for vehicle passing are provided.

Accessible road ascent shall be maximum 14%.

For smooth landfill operation sufficient amount of drinking water and technological water for washing the containers' vehicles etc. shall be provided.

Landfill shall be equipped for accepting precipitation waters, leachate, sewage and technical waters.

Landfill shall be equipped with the facilities and installations for users' power supply, for outer lighting, lightning conductor installation, installation for fire and explosion alarm, TT and internet networks.

5. Conditions for plateau for wastewater treatment facility

Plateau for wastewater treatment facility shall be put on the lowest landfill and service road elevation where facilities necessary for wastewater treatment system operation are located, that is for leachate up to the level stipulated for drainage into the recipient in accordance with design and technical documentation, permit, special regulations on water protection and conditions stipulated by this Regulation.

6. Conditions for vegetative protective zone

Along regulation line of a landfill vegetative protective zone shall be raised for the purposes of preventing lifting and spreading light waste fractions and dust from the landfill to longer distances and air pollution decrease, having at the same time visual and aesthetic role, in accordance with special regulations and conditions of competent authorities and institutions, as well as with conditions stipulated by this Regulation.

Annex 3

LANDFILLING INTO UNDERGROUND STORAGES AND SAFETY ASSESSMENT

1. Landfilling into underground storages

Safety assessment shall be performed for underground storages for every location.

Only the waste complying with conditions shall be disposed into underground storages, for each location individually, stipulated in accordance with safety assessment study.

Waste shall be disposed into underground storage, only if it is separated from mining activities, in accordance with special regulations.

Only the waste complying with conditions referred to in Article 13, paragraph 3, point 3 of this Regulation and parameter limit values for waste disposal shall be disposed into underground storages for hazardous waste disposal.

The waste complying with conditions referred to in this Regulation and parameter limit values for waste disposal shall be disposed into underground storages for non hazardous waste disposal.

Inert waste shall be disposed into underground storages for inert waste disposal, without the application of parameter limit values for disposal, if it shall comply with the conditions stipulated by safety assessment study for monitored location.

The procedure for waste acceptance into underground storage shall be performed in accordance with this Regulation.

Upon waste storage into underground storages it is necessary to determine waste compatibility, while incompatible waste should be separated physically.

Waste shall be disposed into underground storage under conditions stipulated by this Regulation and permit in accordance with the law regulating waste management.

Criteria for waste acceptance into underground storage can be made only on the ground of local conditions, whereat it should be demonstrated that layers comply with storage construction conditions, that is it is necessary to perform permeability safety assessment taking into consideration the whole waste storage system, technical solutions and cavities in storage rocky mass.

2. Natural systems for biosphere protection

Compliance with these conditions shall be stipulated based on risk occurring by permanent waste conservation in underground space, which should comply with requirements for underground storage operation permit, where the following shall be assessed for every storage:

(1) negative effects influence on the biosphere, particularly on ground waters;

(2) the way by which waste can access biosphere;

(3) the effect of substance impact which can access biosphere from disposed waste.

Suitability assessment of geological characteristics of rocky masses, protective layers' assessment, from natural (geological barriers) and artificial isolation protection systems (geomembranes) for underground storage provision shall be performed so that technical disposals, constructed underground facilities structure and geological features of rocky masses are taken into consideration.

3. Safety assessment

Safety assessment shall comprise the following:

1) geological assessment;

2) hydrogeological assessment;

3) engineering and geological assessment;

4) seismic assessment;

5) geochemical assessment;

6) safety assessment on biosphere;

7) impact assessment of permanent storage operational phase;

8) long term impact assessment of permanent storage;

9) impact assessment of surface facilities for waste reception;

10) other risks' assessment.

Safety assessment shall be performed for the active phase period and for the period after underground storages closure.

Waste could be accepted to the underground storage, if safety assessment indicates that protective layers' possibilities are those which could protect biosphere from all aspects.

Pursuant to safety assessment necessary control and monitoring measures shall be performed with the aim of continual observation of underground waste storage safety.

Pursuant to safety assessment criteria for waste acceptance into underground storage shall be identified.

1) Geological assessment

Detailed geological research should be performed with the aim of determining geological characteristics of rocky mass.

Geological assessment shall prove location suitability for underground storage.

Location, frequency and structure of cracks of neighbouring geological layers and potential impact of seismic activity on those structures should be integrated in the assessment.

2) Hydrological assessment

Detailed hydrogeological research and testing should be performed with the aim of defining hydrogeological environmental conditions.

3) Engineering and geological assessments

Underground space stability shall be demonstrated with adequate research and stipulations.

In the case of assessment disposed waste weight and amount should be taken into consideration.

The processes should be analyzed and documented systematically.

It should be proved that:

- during and after the creation of possibly new underground space no significant deformity is expected in the underground space nor at the soil surface, which could violate underground storage function that is create the passage towards biosphere;

- the bearing capacity of the underground space is sufficient, so as not to cause cave in during the operation;

- disposed material contains needed stability regarding engineering and geological features of underground space rocky mass.

4) Seismic assessment

This assessment shall be performed based on microseismic reionization, and if necessary, by seismic terrain testing, with which geological and tectonic terrain texture is determined, that is neo tectonic characteristics of the area.

5) Geochemical assessment

It is necessary to perform detailed research of the rock and ground water content in order to determine “zero state” of ground waters and possible changes during the time, type and amount of minerals filling the cracks, as well as quantitative mineral description of the main rock.

Changeability impact on geochemical content of main rocky mass and ground waters should be assessed.

6) Assessment of impact on biosphere

It is necessary to perform research of the biosphere which could be affected by underground storage and the analysis of current condition in order to determine local natural levels of relevant substances.

7) Impact assessment of permanent storage operational phase

For active operational phase, the following should be demonstrated with the analysis:

- underground space stability, as stated in engineering and geological assessment;

- that there are no unacceptable creation risks of contact between the waste and biosphere;

- that there are no unacceptable risks which would have an impact on facility operation.

When demonstrating the operation security, systematic analysis of facility operation should be performed, based on specific data on waste register and facility management and operation plan.

It should be demonstrated that no chemical and physical reactions shall occur between the waste and the rock, which could violate solidity and impermeability of the rock and violate the storage itself.

The waste that is prohibited to be disposed in accordance with this Regulation shall not be accepted into underground storages, as well as the waste which is inclined towards self-combustion in the storage conditions (temperature, humidity), gas products, easily flammable waste nor the waste originating from unidentified mixtures.

The following should be stipulated:

- events that could lead to creation of the contact between the waste and biosphere in the operational phase;

- different types of potential operational risks according to certain categories with the assessment of their performance;

- measures in the case of extraordinary events.

It is necessary to demonstrate that there is no unacceptable risk which could violate impermeability of underground storage.

8) Long term impact assessment of permanent storage

Safety assessment shall be made on long term basis, in order to demonstrate that after the closure of underground storage the contact between the waste and biosphere shall not occur.

Long term qualitative assessment of the barriers on the location of underground storage should be made, as well as the assessment of neighbouring layers and covers and adequate mark based on data for certain location should be given.
Thereat geochemical, geological and hydrogeological conditions should be taken into consideration, particularly ground waters, barrier efficiency, natural attenuation and behaviour upon disposed waste assessment.

Long term safety of the underground storage should be demonstrated by the assessment comprising initial condition description in certain moment (e.g. closure

moment) with stipulation of important changes which are expected during geological period.

In the end, consequences of relevant substances drainage from underground storage for different situations that is stipulations which maintain certain long term changes of the biosphere, geosphere and underground storage should be taken into consideration.

Containers and watertight coatings of underground storage should not be taken into consideration when assessing long term risk from disposed waste given that their lifespan is short.

9) Impact assessment of surface facilities for waste reception

Prior to storage into underground storages waste shall be unloaded, tested and depending on the need, temporarily stored on the surface.

Facilities for temporary reception of the waste which is stored in underground storages, have to be designed and constructed in a way to prevent their hazardous effect on human health and the environment and they have to comply with the conditions stipulated for waste reception facilities.

10) Other risks' assessment

In the interest of the workers, waste shall be disposed only into underground storages which are separated from mining activities.

Waste should not be accepted if it contains or could produce during the storage hazardous substances which could have hazardous effect on human health, e.g. pathogenic germs of transmitted diseases.

4. Waste types disposal of which into underground storage is prohibited

In the underground storage it shall be prohibited to store waste types whose disposal can induce physical, chemical or biological changes which would endanger underground storage or represent the hazard for environmental pollution and human health, particularly:

1) waste in inadequate containers or out of them which, in the conditions of underground storage, can react with water or basic rock and lead to volume change, creation of self-combustible, toxic, explosive substances or gases, as well as any reaction which would endanger safety of underground storage operation;

2) biodegradable waste;

3) waste with acrid smell;

4) waste which could create toxic network mixture of gas and air, particularly referring to waste generating toxic gases concentrations due to partial pressures of its components and wastes which generate concentrations higher than 1/10 of lower explosion limit in the containers;

5) waste which is not stable in geomechanical conditions of underground storages;

6) waste which is self combustible or which can be self combustible in the conditions of underground storage, gas substance, easily volatile waste, waste of unknown content etc.

5. Operating conditions in underground storages

The operation of underground storage should be provided in accordance with special regulations for this type of activity and conditions regulated by this Regulation.

Annex 4

INERT WASTE DISPOSED TO THE LANDFILL WITHOUT TESTING

The following inert waste could be disposed to inert waste landfill without disposed waste testing:

Password EPO	Description	Limits
1011 03	Glass based fiber waste materials	Alone without organic binders
1501 07	Glass package	
1701 01	Concrete	Only chosen construction waste and demolition waste*
1701 02	Brick	Only chosen construction waste and demolition waste*
1701 03	Slate/ tiles and ceramics	Only chosen construction waste and demolition waste*
1701 07	Mixture of concrete, brick, slate/ tiles and ceramics	Only chosen construction waste and demolition waste*
1702 02	Glass	
1705 04	Soil and rocks	Excluding: surface soil layer; peat land; excluding soil and rocks from contaminated locations
1912 05	Glass	
2001 02	Glass	Only separated collected glass
2002 02	Soil and rocks	Only waste from gardens and parks

(*) Chosen construction waste and demolition waste: with the low content of other material types
(as metals, plastics, soil, organic materials, wood, rubber, etc.) Waste origin has to be well known.
- without construction waste and demolition waste polluted with inorganic or organic hazardous materials, e.g. due to production procedures during construction, soil pollution, storage and pesticide usage or other hazardous materials etc., unless it is demonstrated that demolished construction was not significantly polluted.
- without construction waste and demolition waste which was processed, covered or painted with materials containing significant amounts of hazardous substances.

Waste referred to in the table originates from one waste source (only one source), containing one waste type, in accordance with special regulation on categories, testing and classification of waste.

Different waste types referred to in the table could be accepted together provided that they originate from the same source.

Annex 5

PROCEDURES AND REGIME OF LANDFILL OPERATION

1) Movement regime and operation procedure for all vehicles entering landfill complex:

(1) waste control at the entrance;

(2) waste measuring with truck scale:

(3) movement along service roads to active part of a landfill;

(4) waste unloading on stipulated landfill part-segment, according to the plan;

(5) washing and disinfection of empty vehicle after unloading in the facility for washing and disinfection;

(6) departure of a clean vehicle from the landfill or temporary parking on stipulated place;

(7) in landfill operation zone there are vehicles for waste spreading and compacting, and they do not leave the landfill;

2) Rules applied during waste disposal:

1) waste disposal shall start on the lowest landfill elevation;

2) it should be provided that daily, operational surface is as little as possible;

3) every delivered waste batch shall immediately be spread and compacted;

4) waste “cells” and ”layers” shall be formed up to designed heights;

5) designed slopes of operational surface should be provided;

6) everyday covering of operational surface with inert material should be provided;

7) individual segments on the landfill body for all waste types accepted to the landfill should be provided and defined;

8) compressed waste layer shall be sprayed with a disinfectant once a day during the summer period;

3) Control of waste technical operation process:

1) control of unloaded waste type and amount;

2) control of separated secondary raw materials type and amount;

3) control of enforcement of designed technical exploitation process of landfill and facility for secondary waste separation;

4) control of landfill body and road maintenance;

5) control of washing and disinfection quality of transport vehicles;

6) disease cause control;

7) leachate quantity and quality control;

8) separated gas content and quantity control;

9) workers’ protection control;

4) Control of generation and quality of leashate and treated liquid at the landfill- control of leachate and treated liquid at the landfill shall be performed daily based on the following parameters:

(1) temperature at the entrance into designed facility and neighbouring air temperature;

(2) pH value of leachate at the entrance and leachate at the exit from constructed facility;

(3) permanganate consumption;

(4) BOC (biological oxygen consumption);

5) Gas separation control- gas separation control shall comprise monitoring of its content and quantity, particularly methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2).

Landfill gas control regarding H_2S content, H_2 shall be performed if present in landfill gas.

In the facilities at a landfill system for explosive quantity of methane presence detection shall be put.

Manner and procedure for landfill closure

After finished exploitation period, landfill shall be closed for further disposal by creating upper covering layer which shall comply with the following technical and technological conditions:

Applied measures regarding upper covering layer formation		Land fill class	
	For non hazardous waste	For hazardous waste	For inert waste
Landfill gas drainage layer ≥ 0,3 m	required	not required	not required
Artificial watertight coating- foil	not required	required	not required
Impermeable mineral layer ≥ 0,5 m	required	required	not required
Reclamation layer ≥ 0,5 m	required	required	not required

Technical and technological measures given in the table shall not be applied on the landfills where construction waste is disposed, waste containing tightly bound asbestos, as well as on the landfills for inert waste, which in the process of decomposition does not have an impact on the environment, that is where leachate drainage into the environment does not have negative effect on the quality of soil and ground and surface waters.

For the reclamation layer compost or waste obtained with other biological treatment technologies, whose content complies with parameter limit values for landfilling.

After the landfill closure, until its withering operator at the landfill takes measures referring to the following:

(1) maintenance, surveillance, control and monitoring of landfill area, in accordance with this Regulation and the law;

(2) making of the report on landfill condition for every calendar year and its delivery to the competent authority no later than 31 March for previous calendar year;

(3) notification on malfunction determined by control and monitoring, which could have a hazardous effect on the environment, which is delivered to the competent institutions, within 7 days from the day of determination.

Measures for prevention or decrease of pollution of the environment shall be performed by the operator at its own expense and in due course, and in accordance with the Law.

Annex 6

MONITORING OF LANDFILL OPERATION

1) Monitoring of meteorological parameters

Measuring of meteorological parameters shall be performed in a way referred to in Table 1:

	Active phase	Passive phase
1. Precipitation amount	daily	Daily, monthly value is added
2. Temperature (min, max. at 14.00)	daily	Monthly average
3. Speed and direction of air flux	daily	Not necessary
4. Evaporation (lysimeter*)	daily	Daily, monthly value is added
5. Atmospheric humidity (at 14.00)	daily	Monthly average

* or other adequate method

Measuring shall be processed in landfill laboratories or are taken from the closest meteorological station until competent authority requires it in accordance with the Law and this Regulation.

2) Monitoring of surface waters

Monitoring of surface waters, if existing in immediate landfill zone, depending on hydrogeological environmental conditions and their distance from a landfill, shall be performed:

(1) before commissioning landfill into exploitation, by sampling surface waters that is determining “zero state”;

(2) in the process of dump exploitation with the aim of comparing it with “zero state”, particularly in the beginning of landfill exploitation (the first year) - monthly, and later every three months,

(3) upon cessation of landfill exploitation in the firs five years, every six months, and later, until landfill withering, if monitoring results show that accident situation did not occur.

If surface waters are present, sampling shall be performed on at least two points, one upstream from the landfill, and the other downstream from the landfill.

Surface waters sampling and testing performed in stipulated time intervals, shall be performed by accredited institutions for that kind of sampling.

Constant surface water monitoring during landfill exploitation with contracted chemical and bacteriological analysis shall be performed every 15 days in landfill laboratory.

3) Monitoring of leachate

Monitoring of leachate shall be performed on the representative number of samples on every point where liquid is drained from the location in a controlled way.

Measuring of volume and content that is quantitative and qualitative leachate parameters shall be performed once a month during landfill exploitation.

Listed measuring shall be performed also upon cessation of landfill exploitation every six months in the first five years, and then once a year after landfill withering.

4) Monitoring of gas emission

Monitoring of gas emission shall be performed on the representative number of samples stipulated by the permit.

Emission and concentration measuring of gases CH_4, CO_2, and O_2 shall be performed once a month during landfill exploitation.

Listed measuring shall be performed also upon cessation of landfill exploitation in the first ten years every six months, and then every second year from landfill withering.

Other landfill gases measuring (H_2S, H_2 and other) shall be performed depending on the content of disposed waste, in accordance with the permit.

Sampling and measuring frequency referred to in points 2, 3 and 4 of this Annex shall be performed in a way referred to in Table 2:

	Active phase	Passive phase (3)
1. Leachate volume	Monthly (1)(3)	every six months
2. Leachate content (2)	Quarterly (3)	every six months
3. Surface water volume and content (7)	Quarterly (3)	every six months
4. Potential emission of gases and atmospheric pressure 4) (CH_4, CO_2, and O_2 H_2S, H_2 etc.)	Monthly (3)(5)	every six months
(1) *Sampling frequency can be adjusted based on morphological content, and shall*		

be determined by the permit.

(2) *Parameters for measuring which are analyzed depending on disposed waste content shall be determined by the permit.*

(3) *If data assessment indicates that longer intervals are equally efficient measuring can be performed in those intervals, but inevitably, once a year.*

(4) *These measurements shall refer to biodegradable waste.*

(5) *CH_4, CO_2, and O_2 regularly, other gases when needed, depending on disposed waste content.*

(6) *Degassing system efficiency must regularly be checked.*

(7) *Based on landfill location characteristics, authorized institution providing conditions can determine that these measurement processes are not needed and inform competent authority about it.*

(8) *And (2) shall be applied to landfill class where leachate collection is performed.*

5) Monitoring of ground waters

Monitoring of ground waters shall be performed in three stages:

(1) sampling:

(2) surveillance;

(3) critical values determination.

Monitoring of ground waters below the landfill bottom and in immediate landfill zone of landfill impact has to be such as to provide information on ground waters which could be polluted as a consequence of landfill operation.

As referent values for ground water monitoring performance samples are taken prior to putting into landfill exploitation and mark as “zero state”, in accordance with ISO 5667-2nd part 11, 1993.

Ground water samples are taken from hydrogeological facilities (piezometers, bacteria from piezometer or observation wells) from at least three points, whose schedule shall follow ground water movement. Final number of measured facilities is defined by hydrogeological environmental conditions.

These ground water samplings shall be performed with the aim of possible occurrence identification of accidental situations in landfill protective layers that is ground water pollution identification.

Apart from ground water content identification permanent measuring of ground water level shall be performed.

The frequency of measuring ground water level and content are referred to in Table 3:

	Active phase	Passive phase

Ground water level	Every six months (1)	Every six months (1)
Ground water content	Frequency depending on terrain particularity (2) (3)	Frequency depending on terrain particularity (2) (3)

(1) *By increasing frequency of ground water level change, the frequency of sampling should be increased.*

(2) *If critical level is reached, frequency has to be based on possibility of taking corrective measures between two samplings that is frequency has to be identified based on knowledge and assessment of ground water flow speed.*

(3) *When critical level is reached, verification performed by repeated sampling is necessary. When the level is confirmed, the plan for unpredicted circumstances (stipulated in the permit) has to be enforced.*

In the first six months of landfill operation, every 15 days measuring and testing (contracted chemical and biological analyses) of ground waters shall be performed, and after this period according to the frequency referred to in Table 3.

Ground water samples, taken in time intervals referred to in Table 3, shall be performed as complete chemical and bacteriological analyses in accredited institutions for that type of testing.

If the testing results of samples taken indicate that deviation from limit values has occurred in accordance with the Law regulating waters, it shall be considered that accident situation of landfill protective layers has occurred.

In which case additional hydrogeological facilities shall be built taking into consideration hydrogeological environmental conditions.

All processed data shall be shown in control diagrams with stipulated control rules of limit values for every ground water measuring point.

6) Monitoring of precipitation water quantity

Monitoring of precipitation water quantity in the landfill area, its supporting facilities in the wider protection zone, shall be performed in accordance with the Law regulating waters.

7) Monitoring of landfill body stability

Monitoring of landfill body stability shall be performed through observation of data on landfill body and sensor observation of sealing coating – foil.

Landfill body stability shall be identified in a way referred to in Table 4:

	Active phase	Passive phase
1. Structure and content of landfill body (1)	Annually	
2. Landfill body level consolidation feature	Annually	Annual reading
(1) *data for identification of existing landfill condition, surface occupied by the waste, waste volume and content, disposal manner, disposal period and duration, calculation of*		

remaining landfill capacity.

7) Monitoring of protective layers

Monitoring of protective landfill layers shall be performed incessantly with sensors built in the artificial watertight coating (if built in), and data shall be monitored in the landfill laboratory.

Monitoring of protective landfill layers shall be performed incessantly during landfill exploitation, and upon exploitation cessation data monitoring and processing shall be performed in the intervals stipulated in the permit for landfill operation.

8) Monitoring of pedological and geological characteristics

Monitoring of pedological soil characteristics and geological ground characteristics in the immediate landfill zone for “zero state”, shall be performed by sampling shallow and deep probe pits, as well as bores periodically made with the aim of sampling geological environment from deeper layers in the immediate landfill zone.

Sampling results shall be performed in accredited institutions and shall be compared with limit values stipulated by landfill operation permit.

Samplings shall be performed once a year during exploitation period, and upon landfill operation cessation once in every five years until landfill withering.

All data obtained by monitoring shall be recorded in landfill laboratory and delivered to the Agency for Environmental Protection.