Sanitary Landfill Design

Municipal Solid Waste (MSW)

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Base liner system

- Waste
- Drainage layer (e.g. gravel)
- Leachate pipe
- Protection layer
- Geomembrane liner
- Clay sealing
- Geological landfill base
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Base liner system
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Base liner system
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Base liner system

- Construction failures – reasons of damage
  - Stone puncture (70%)
  - Heavy equipment (16%)
  - Welds (6%)
  - Cuts (1%)
  - Workers (6%)
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Waste operations

- fresh waste
- crushing the waste
- spreading the waste, layer < 0.30 m
- compacting the waste, thin layer < 0.20 m
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Waste operations
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Waste operations
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Final Cap or Final Cover Layer

- waste
- drainage layer (gas)
- clay sealing layer
- geomembrane layer
- protection layer
- drainage layer (water)
- recultivation layer
- vegetation
- waste layer
- protection layer
- geomembrane layer
- drainage layer (water)
- recultivation layer
- vegetation
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Final Cap or Final Cover Layer
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Final Cap or Final Cover Layer
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Toe design
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Degasification System

- Collectors for landfill gas in the landfill body vertical and horizontal elements
- Collecting pipes from the landfill body to substations
- Gas transport pipes from substations to central gas station
- Condensate trap at deepest point of gas collection system
- Compressor station
- High temperature flare and Combined Heat and Power Plant (CHP)
- Power feeding to grid or own utilization of power
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Materials for sealing layers

• Natural mineral material
  Very low permeability, high clay content, high content of swelling material (like smectites)

• Sand-bentonite mixtures
  specified sand water
  bentonite (swelling material)

• Geomembrane HDPE
  thickness density
  mechanical properties resistance (UV, chemical, biological, stress-cracking)
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Degasification System
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Degasification System
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Leachate collection and treatment

- Leachate pipes at the base liner of the landfill
- Steady decline to a low point outside the landfill body
- Collecting in a circular pipeline around the landfill
- Intermediate storage in a leachate pond
- Leachate treatment plant or disposal to a waste water treatment plant
- Introducing into water, a river or a sewer
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Leachate collection and treatment

Leachate pipe

Intermediate Storage
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Leachate collection and treatment
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Leachate collection and treatment

Multi-Stage Leachate Treatment Plant

- Biological Pre-Treatment (Tanks or Basins)
  Nitrification and De-Nitrification
- Membrane Filtration
  7 Bar excess pressure, retention of bacteria
- Chemical Wet-Oxidation
  Ozone treatment, cracking of long-chain hydrocarbons
- Biological Retreatment
  percolation or trickling filter
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Entrance and administration building