

**SOLID WASTE DISPOSAL FACILITY OPERATOR  
STUDY GUIDE**

**For  
SITE OPERATOR CERTIFICATION**

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## **PREFACE**

This STUDY GUIDE represents an effort on behalf of the Department to assist those seeking certification as Solid Waste Disposal Facility Site Operators. The material contained should be used as a study guide supplement to Wisconsin Administrative Codes NR 500 - 590, especially 502, 503, 504 and 506 and other sources of information (e.g., landfill related books and other informational publications).

## **PURPOSE**

This STUDY GUIDE contains the minimum basic information a candidate for the Solid Waste Disposal Facility Site Operators certification examination needs to know. The information contained in the study guide may not be sufficient to pass the certification examination. Every certified site operator shall have sufficient knowledge regarding landfill design, operation and maintenance, health and safety issues, and heavy equipment management to safeguard the environment and public health and welfare.

### **Types of Landfills & Certification**

There are primarily two types of Landfills; Natural Attenuation type and Engineered or Containment type. Natural Attenuation landfills do not have a liner where as engineered landfills have a liner. Small construction and demolition landfills are natural attenuation type landfills; all other landfills are engineered.

In Wisconsin, based on waste type, landfills are divided into three categories: Construction and Demolition (C&D), Municipal, and High Volume Industrial waste. Based on waste volume, C&D landfills are subdivided into two categories: small (waste volume, up to 50,000 cubic yards) and intermediate (waste volume: more than 50,000 cubic yards but no more than 250,000 cubic yards). C&D waste typically consists of concrete, bricks, bituminous concrete, wood, glass, masonry, roofing, siding and plaster, alone or in combinations. However, waste paint, solvents, sealers, adhesives and similar materials are not considered as C & D waste.

A certified site operator must be present during hours of operation at all types of landfills except high volume industrial waste landfills. Non-certified site operators may run high volume industrial waste landfills provided they have landfill design and operation related knowledge as required by NR 524, Wisconsin Administrative Code. A site operator certificate issued by Wisconsin Department of Natural Resources (DNR) is valid for 2 years. To renew a certificate, site operators must complete 4 hours of continuing education training in solid or hazardous waste management related subjects.

## Landfill Design

A natural attenuation landfill has no liner at the base, however a final cover is required for this landfill type. The final cover for these landfills are constructed with two feet of compacted fine grained soil sloped enough to allow storm water run off.

All engineered landfill are constructed with a base liner and a leachate collection system. The primary purpose of the liner is to prevent groundwater pollution. The liner is sloped to direct leachate to a collection system. The leachate collection system helps withdraw leachate from landfills and thus helps prevent groundwater pollution. The liner may consist of clay only or be a combination of geomembrane and clay (known as composite liner). The minimum thickness of clay liners is 5 feet except in intermediate C&D landfills where 3 feet is allowed. In a composite liner, a synthetic membrane is placed directly over a 4 foot thick clay layer. Composite liners are required for all new municipal waste landfills. The maximum allowable permeability of clay liners is  $1 \times 10^{-7}$  cm/sec. A drainage blanket made of sand or gravel is placed over the liner. The minimum allowable permeability of the leachate collection blanket is  $1 \times 10^{-2}$  cm/sec for non-municipal waste landfills and 1 cm/sec for municipal waste landfills.

The clay liner must be protected from freeze – thaw damage during winter months, because freezing and thawing increases permeability of the clay. While constructing clay liners, clods larger than 4 inches should be broken up and the compacted layers must not be greater than six inches in thickness. The clay must be compacted wet of optimum moisture content.

The final cover on engineered landfills, except low strength sludge landfills, consists of a six inch grading layer, a two foot thick clay capping layer, a minimum of two and a half foot drainage and rooting zone layer, a one foot drainage layer, and a six inch top soil layer. If the

landfill has a composite liner, then the final cover must also include a synthetic membrane placed directly over the clay capping layer. The top soil layer is vegetated to reduce the amount of precipitation entering the waste.

Two other types of cover are used in landfills: intermediate cover and daily cover. Intermediate cover must be constructed over areas below final grade that are not going to receive waste for six months or more. If soil is used as daily cover, then it must be six inches thick. Materials other than soil may be used as daily cover.

Surface erosion must be minimized during landfill construction and also in active and closed landfills. Drainage ditches and berms on and around landfills are constructed to divert surface water run off properly. Properly designed surface water control helps to reduce leachate production and soil erosion. Sedimentation basins are constructed to trap eroded soil and thus help to reduce surface water pollution. Drainage ditches, berms around landfills, and sedimentation basins are important for surface water control at landfills.

Precipitation (rain and water from ice melt) is the primary source of leachate formation in landfills. If the landfill base is below the water table, then water may enter the landfill through the base liner. The water already present in the waste, also known as moisture content, generates leachate. If proper surface water control structures are not constructed, then surface water entering a landfill will generate leachate. In summary, the quantity of leachate generated in a landfill depends on the amount of precipitation falling on the landfill, moisture content of the waste, the groundwater and surface water entering a landfill.

Biological activities within a landfill lead to the generation of gas. Mainly methane and carbon dioxide gases are generated in municipal and paper mill sludge landfills. Landfill gas may also contain several other gases, like nitrogen, oxygen, hydrogen sulfide, and hazardous air contaminants. In general, an active gas extraction system (that uses pumps or blowers to remove gas) is required for all big municipal waste landfills. Passive gas vents (that do not use pumps or blower) are installed in some C&D, and paper mill sludge landfills where the gas generation is relatively low. The maintenance of passive gas vents include periodic visual examination to assure that it has not been plugged or damaged. The maintenance of active gas venting system is more complicated.

## Landfill Operation and Maintenance

Proper operation of a landfill is essential to minimize odor, noise, insect and rodent problems, wind blown paper, and dust. Site operators are primarily responsible for placement of daily cover and compaction of waste dumped in landfills. Odor from municipal landfills may be minimized by using daily cover, proper collection and treatment of landfill gas, and correcting leachate seeps. If clay soil is used for daily cover, then the daily cover must be scarified or removed before placing the next lift of waste. To control dust in ash or foundry sand landfills, waste should be dumped in areas sheltered out of wind, constructing paved or graveled roads inside landfills, and by not disturbing crusted compacted waste. Unstable waste slope is a problem in sludge landfills. Slope stability of a sludge landfill can be improved by disposing low moisture sludge with a low waste slope. Knowing how to determine the elevation or grade is essential to know whether an active landfill area is close to the grade for which the landfill has been designed. Materials containing Friable asbestos containing materials must be covered with three feet of waste after disposal and the disposal location must be recorded. Every precaution must be taken to prevent landfill fires. In most cases landfill fires are started by hot waste loads.

All landfills must be secured properly using fences, gates or other physical barrier. Surveillance of site visitors and site users is needed for site security and to prevent dumping of unauthorized materials.

Leachate lines must be cleaned with a high pressure water jet immediately after construction and annually there after. Eroded landfill surface areas must be repaired immediately to prevent erosion from spreading. Although waste oil, yard waste, lead acid batteries, major appliances, infectious waste, and recyclable plastics are not allowed to be disposed in landfills, household hazardous waste may be disposed in Wisconsin landfills.

An effective maintenance program for landfill structures and equipment minimizes costly repairs. Random load inspections must be done in all municipal waste landfills. The following items must be recorded during a random load inspection: the date and time the load for inspection was received, the name of the waste hauling firm, the name of the driver, the license plate number and Wisconsin solid waste transporter license number, the community or communities in which the solid waste was generated, the waste type (i.e. commercial, industrial, residential or a combined load), name of the manager or site operator inspecting the load, and

comments regarding the inspection. All landfills should have a contingency plan for injuries, illness, and spills and releases. All spills and releases must be reported to DNR immediately.

## Health and Safety

Health and safety rules must be followed by all landfill personnel working in landfills, irrespective of whether he/she is a supervisor or site operator. All employees must have a good understanding of the health and safety rules. To prevent accident, public access to the landfill working face must be restricted. In addition, the following practices are essential for accident prevention: regular and effective training of landfill personnel, use of personal protective equipment where appropriate and observing Occupational Safety and Health Administration (OSHA) requirements such as confined space entry guidance. No landfill personnel should enter a trench which is five feet or more in depth. Examples of confined space in landfills include leachate storage tank man-way, six feet or deeper trench within or outside of a landfill, manholes within or outside of landfills. Concentration of oxygen, methane, and hydrogen sulfide within a confined space must be checked before entering it. Special care should be taken while handling friable asbestos because airborne asbestos particles pose a significant health risk. Friable asbestos containing materials must not be burned because such burning causes release of asbestos fibers into the air.

Although burns and vehicle accidents occur in landfills, the most common causes of injuries in landfills are slips, trips and falls. In addition, the following health and safety problems are usually associated with landfill operation: long-term exposure to loud equipment noise, hypothermia (lowing of the body temperature due to exposure to cold weather), frostbite, heat exhaustion and heat stroke.

## Heavy equipment management

Many heavy equipment is used to perform tasks at a landfill such as waste compaction, maintenance of roadways inside and outside of landfills, spreading of daily cover. It is essential to have a good working knowledge about operation and maintenance of this equipment. An effective maintenance program consists of start-up checks, shutdown procedures, record keeping of equipment performance, and routine maintenance. Usually a pre-operating checklist consists of checking fluid levels, checking radiator screen and air filters for clogging, and checking tracks for wear, damage or freezing. Pre-operating check out, attention to gauges and warning lights, and record keeping are all part of maintenance program for heavy equipment.