GENERAL DESCRIPTIONS

OF

COMMON TYPES

OF

ONSITE SEWAGE SYSTEMS*

*Some of the systems described are not permitted for new construction under the current code in Wisconsin. See individual descriptions for details.

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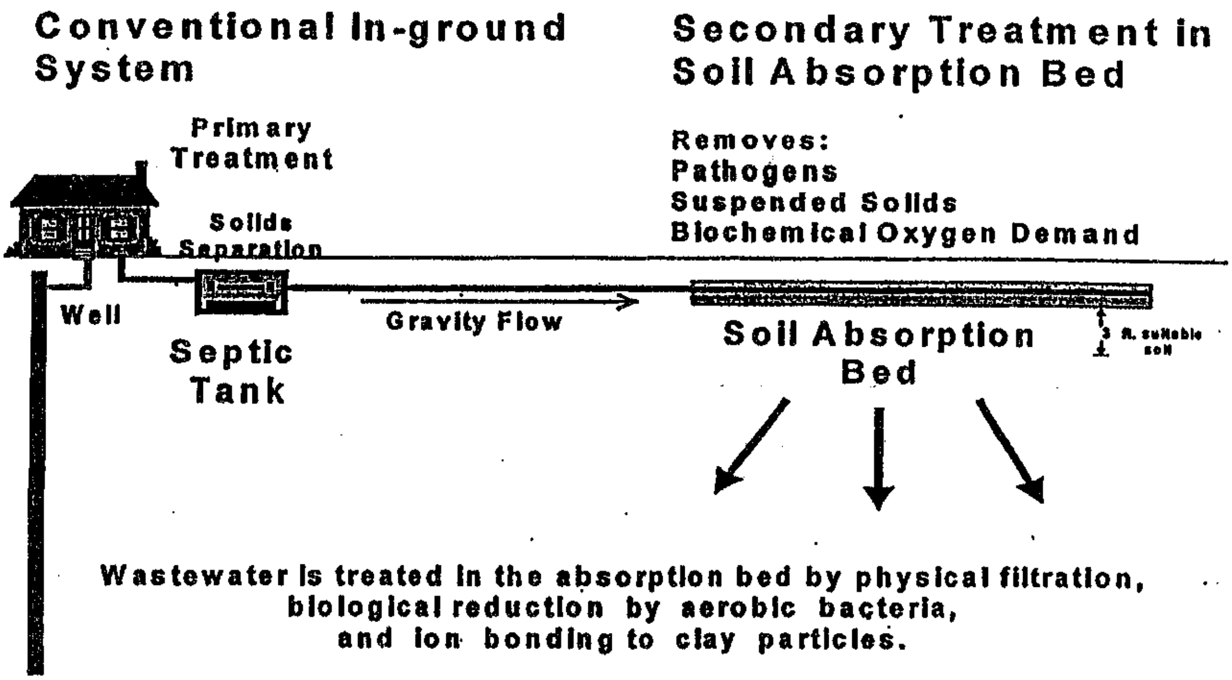
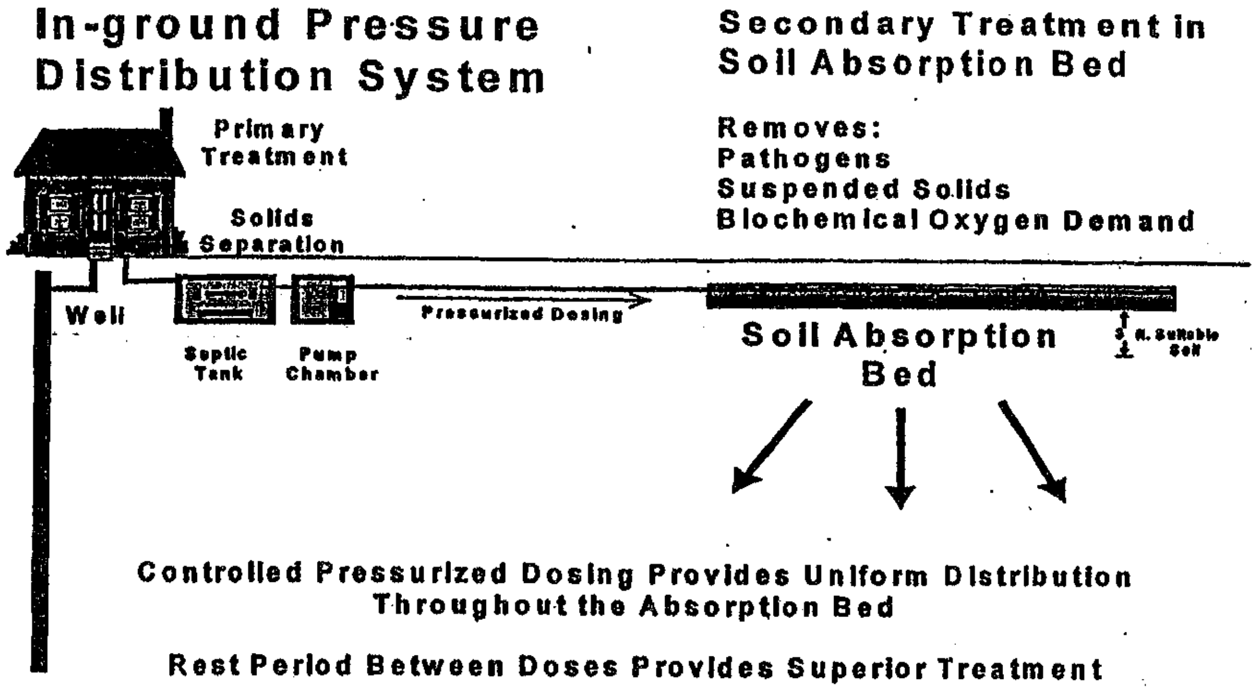


A conventional in-ground septic system consists of a septic tank and a subsurface soil absorption bed. In the septic tank, solids settle out of the waste stream and anaerobic bacteria facilitate the partial breakdown of organic matter (primary treatment). Clarified effluent from the septic tank discharges via gravity to a soil absorption bed.

The soil absorption bed removes pathogens, organic matter, and suspended solids from the septic tank effluent via physical filtration, biological reduction of contaminants by aerobic microorganisms, and ion bonding to negatively charged clay particles. The soil serves as a fixed porous medium on which beneficial aerobic microorganisms grow. These organisms feed on organic matter present in the wastewater and help eliminate pathogens. Research indicates that 3 feet of suitable soil between the distribution trench and bedrock or high groundwater is sufficient to protect public health and groundwater quality. Because a conventional system includes a gravel distribution trench and overlying fill material, the system requires about 5 feet of suitable native soil.

The conventional system is a passive system that relies on gravity flow. The flow volume entering the septic tank controls the volume discharge to the soil. The discharge enters the distribution pipe via gravity, and usually drains out of the first few holes in the pipe, creating areas of favored distribution. This type of distribution can result in localized clogging along the trench as solids and bacterial biomass accumulates in these areas of preferential flow. The effectiveness of a conventional system depends on the type and permeability of native soils and the slope and drainage pattern of the site. The septic tank requires periodic pumping of accumulated solids, as well as inspection to determine that the tank remains watertight.

The conventional system is typically the least expensive system in use in Wisconsin and it is also the most common. These simple, passive systems that rely solely on unsaturated soil for wastewater treatment have been codified in Wisconsin since 1969 and could be used on 47% of the state's land area. They are also in use in most other states. In Wisconsin, they still constitute approximately 63% of all new systems installed and 57% of all replacements.



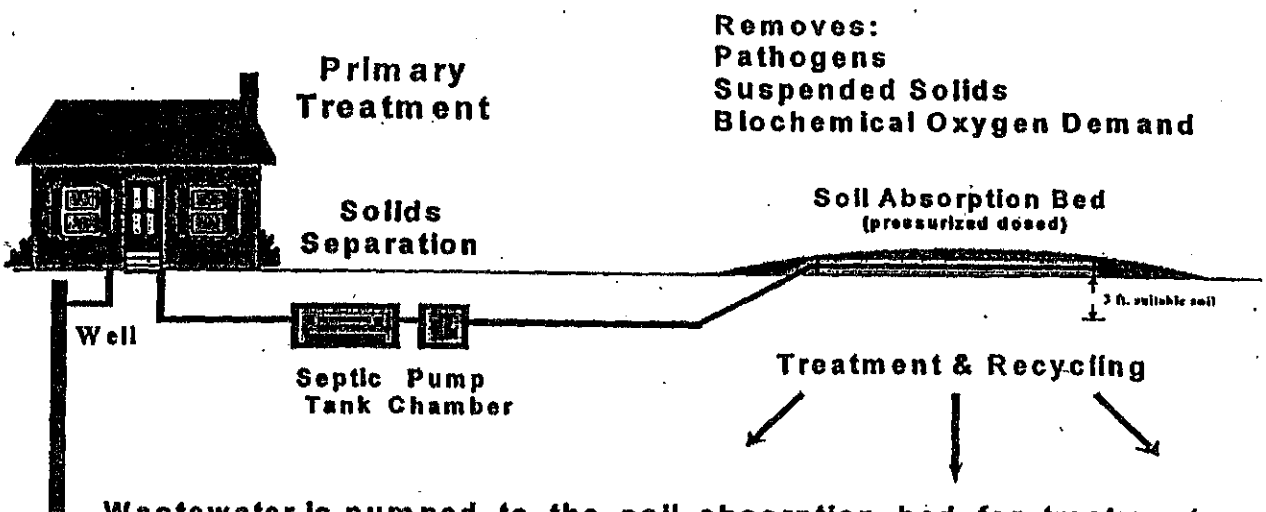
An in-ground pressure distribution system consists of a septic tank, pump chamber, and a subsurface soil absorption bed. Including space for the drain tile, gravel trench and overlying fill, the minimum native soil requirements range from 49 to 53 inches depending on the diameter of the distribution pipes. Like a conventional system, 36 inches of suitable native soil above bedrock or groundwater is required for the absorption bed.
The treatment mechanisms of in-ground pressure distribution systems are very similar to those of conventional systems, that is, 36 inches of native soil constitute a fixed porous medium on which aerobic bacteria provide secondary treatment of wastewater. The principle difference is the addition of a pump chamber that delivers septic tank effluent to the soil absorption bed in controlled timed doses. Delivering septic tank effluent in controlled pressurized doses ensures that the wastewater is equally distributed across the soil absorption bed, thus reducing the potential for the localized clogging that often occurs in conventional gravity dosed systems. Research has also shown that discharging effluent in controlled, properly timed doses gives the absorption bed a drying period between doses that can result in enhanced treatment with regard to pathogen and nutrient removal.

Septic tanks require periodic pumping of accumulated solids, as well as inspection to determine that the tank remains watertight. Solids must also be removed from the pump chamber periodically to insure proper functioning of the pump mechanism.

The components of these systems are not different than those of conventional and mound systems, which have a long history in Wisconsin. They are used under the current code. Their advantage is the potential of less clogging of the soil absorption bed. In Wisconsin, permits for in-ground pressure distribution systems constitute a very small number of the new systems and replacements--less than one-half of one percent.

At-Grade

Secondary Treatment in – Soil Absorption Bed



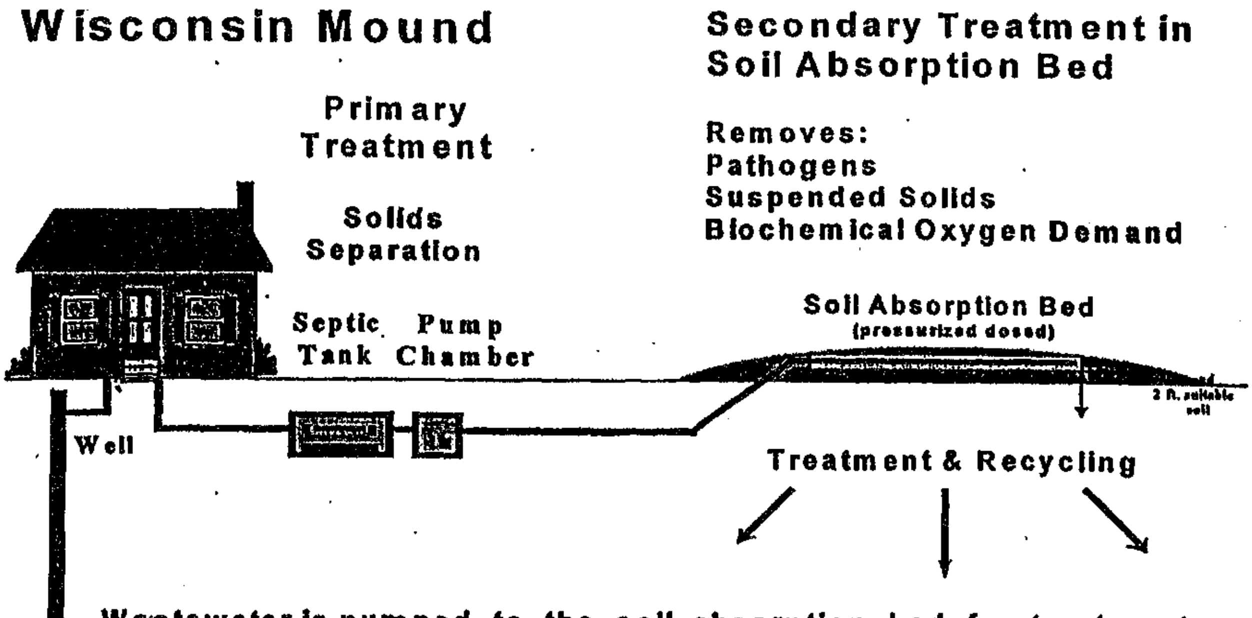
Wastewater is pumped to the soil absorption bed for treatment by physical filtration, biological reduction by aerobic bacteria, and ion bonding to clay particles.

An at-grade system consists of a septic tank, pump chamber, pressure distribution system and a soil absorption bed. In the septic tank, solids settle out of the waste stream and anaerobic bacteria facilitate the partial breakdown of organic matter (primary treatment). Clarified effluent from the septic tank is typically discharged via gravity to a pump chamber from which it is pumped, in controlled pressurized doses, up to the soil absorption bed. At-grades are unique in that the distribution piping is placed on a prepared gravel bed at the ground surface, literally "at-grade". The distribution piping is covered with sand and soil to protect it from freezing.

Because the effluent is pumped upward to be dispersed just below the ground surface, the at-grade can be used on sites with as little as 36 inches of suitable native soil, rather than the 56 inches required for conventional systems (which disperse effluent approximately 20 inches below the surface). And, since the amount of above-ground sand fill needed is less, these systems tend to be less expensive than a traditional mound.

Solids must be periodically pumped from the septic tank, as well as from the pump chamber to insure proper functioning of the pump mechanism. Proper site preparation protocols must be taken to prevent the leakage of effluent at the base.

The at-grade design was developed in Wisconsin about 10 years ago, however, most components from which it is assembled, septic tank, pump and 36" soil absorption bed, have a long history in the state. Under the current code, at-grades are approved as experimental systems. The proposed code will approve them for general use. At-grade systems are estimated to constitute approximately 5% of new systems and 5% of replacements in Wisconsin.



Wastewater is pumped to the soil absorption bed for treatment by physical filtration, biological reduction by aerobic bacteria, and ion bonding to clay particles.

A mound system, like a conventional system, consists of a septic tank and a soil absorption bed. In the mound system, however, sand is added where suitable native soil is insufficient. Clarified effluent from the septic tank is pumped, in controlled pressurized doses, to an aboveground, free-standing sand layer. The sand layer, placed upon a specially prepared area of native soil, serves as the medium on which aerobic bacteria facilitate much of the secondary treatment.
In a mound, the sand layer and native soil combined provide 36 inches of soil depth for treatment. Thus treatment is at least as effective as a conventional system. Delivering effluent to the soil absorption bed in controlled pressurized doses has some additional advantages. Wastewater is equally distributed, which reduces the chances for localized clogging. And the absorption bed has a "rest period" between doses that can result in superior pathogen and nutrient removal. Additional research over the past 20 years has provided increasingly effective specifications for mound geometry, sand characteristics, dosing frequencies, and loading rates.

Solids must be periodically pumped from the septic tank, as well as from the pump chamber to insure proper functioning of the pump mechanism. Proper site preparation protocols must be taken to prevent the leakage of effluent at the base of the mound.

The use of sand as a medium for wastewater treatment, rather than native soil, is more than 100 years old. In Wisconsin, beginning in 1971, the legislature funded research intended to provide effective systems for sites where a lack of native soil prohibited a conventional system. The mound system using sand as a medium became available for general use in 1980, but new construction was restricted to sites with 24 inches of native soil. This increased the suitable land area by only 10 percentage points. There are no technical or public health reasons for this restriction. The proposed code will allow mound systems on sites with 6 inches of native soil, which will increase the suitable land area by another 25 percentage points. Currently, in Wisconsin, mound systems constitute approximately 20% of all new systems installed and 23% of replacements. These systems are also used in many other states.

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