

INSPECTING AND TROUBLE SHOOTING WISCONSIN MOUNDS

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The Wisconsin mound system, developed in the 1970's to overcome some soil-site limitations for on-site disposal of septic tank effluent, has been widely accepted. A recent survey found the mound system to be performing very well (Converse and Tyler, 1986). However, the owner or the inspector must be able to identify potential problems early and diagnose the problem correctly with a minimum amount of time and expense. This publication outlines the potential problems, their symptoms, and some recommended solutions. A systematic method of inspecting and evaluating the system is presented.

Figure 1 shows a schematic view of the entire system. To analyze problems, the location of each portion of the system must be known. A scale drawing of the system, as installed, should be kept handy for reference.

The septic tank and dose chamber of the on-site system must be pumped periodically to remove any accumulated solids. The tank and chamber should be pumped at least every 3 years. Less frequent pumping is satisfactory if the system is used only seasonally and more frequent pumping will be needed if it is heavily used or if the system serves a commercial establishment such as a

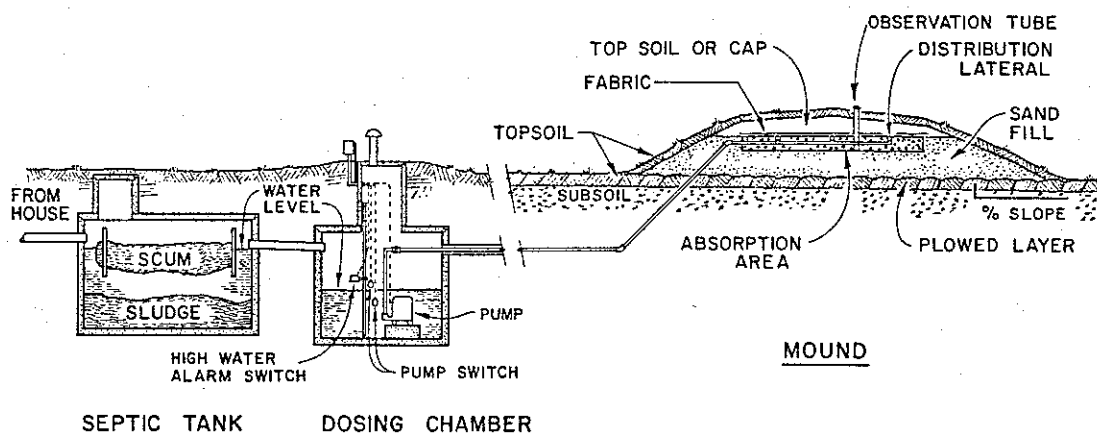


Fig. 1. Schematic of a Wisconsin Mound System

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restaurant. With more frequent pumping initially, a knowledgeable pumper can establish a long term pumping frequency which should help to minimize the carry over of solids to the soil absorption unit.

Whenever a soil absorption system is used, water conservation practices should be used. Such practices as low flow toilets, low volume shower heads, front loading washers, elimination of garbage grinders, and other techniques can significantly reduce the amount of wastewater generated in the house and do not appreciably reduce the desired standard of living.

WARNING: DO NOT ENTER THE TANKS OR CHAMBER!!!

NEVER ENTER A SEPTIC TANK OR DOSE CHAMBER WITHOUT SPECIAL EQUIPMENT. PEOPLE HAVE LOST THEIR LIVES UPON ENTERING THE SEPTIC TANK AND DOSE CHAMBER WHICH CONTAINS TOXIC GASES AND LITTLE OR NO OXYGEN. HOMEOWNERS DO NOT HAVE THE NECESSARY EQUIPMENT OR THE EXPERIENCE TO ENTER TANKS.

The following is a list of symptoms, followed by an explanation of the problem, probable causes, and some possible corrective actions. If a problem is recognized, be sure to look for other symptoms so that corrective actions can lead to the system functioning fully. Most corrective actions must be performed by a licensed plumber, installer, or electrician. Most homeowners do not have the expertise to correct the problems and their actions may cause additional damage and cost.

SYMPTOM 1: WASTEWATER BACKING UP AT THE HOUSE OR SOURCE

Explanation: Sometimes the toilets flush very slowly and/or wastewater is backing up in the floor drain.

Causes: If the toilet flushes slowly or sluggishly, the vent on the roof may be frosted over due to cold weather.

If wastewater backs up in the floor drain and slowly seeps away, the sewer line to the septic tank may be partially plugged due to tree roots or solids accumulation. Many times the restriction is at the inlet to the septic tank. After time, the blockage becomes so restrictive that the wastewater doesn't flow away from the house. It is possible that the outlet from the septic tank to the dose chamber is plugged or that the pump or controls have failed causing water to back up into the house.

Solution: Check the water level in the septic tank and dose chamber. If the dose chamber is full, the problem is a faulty control unit or pump or a blockage in the force main or mound. The alarm should have sounded. If not, there is something wrong with the alarm system. Check the circuit breaker, as many times it is disconnected.

If the liquid level is normal in the dose chamber, but higher than normal in the septic tank, the pipe connecting the septic tank and the dose chamber is plugged. It needs to be unplugged in a safe manner so as not to endanger the life of the person doing it. The septic tank baffles should also be checked.

If the septic tank level is normal the inlet to the septic tank or the pipe between the house and the septic tank is plugged. Care must be taken when unplugging the inlet or the pipe. As stated earlier, DO NOT ENTER THE TANK WITH OUT PROPER SAFETY PRECAUTIONS.

SYMPTOM 2: ALARM IN HOUSE FROM DOSE CHAMBER IS ACTIVATED

Explanation: An audible alarm or a light will turn on when the liquid level in the dose chamber reaches a set height above the wastewater level normally needed to activate the pump.

Causes: Faulty pump or pump controls or a malfunctioning alarm may activate the alarm.

Blockage in the force main or distribution system of the mound keeps the pump from moving water to the mound.

Solutions: If the problem appears to be a faulty pump or controls, see Symptom 1 for causes and solutions.

If the pump runs but the water level doesn't drop, then the force main or distribution laterals are plugged. See Symptom 10 for correcting this problem.

SYMPTOM 3: EXCESS SOLIDS ACCUMULATING IN THE DOSE CHAMBER

Explanation: Settled solids should be removed in the septic tank. Solids carried to the dose chamber will be pumped to the mound and may plug the distribution system or the mound infiltrative surface.

Causes: Not pumping the septic tank on a frequent bases.

Broken baffles in septic tank.

High amount of solids introduced into the system.

Solutions: Pump the septic tank on a regular basis and have baffles checked after each pumping (see cautionary introductory remarks above). Wisconsin law requires that a liscensed hauler must pump, haul and dispose of the seeptage. Don't use garbage grinders as they add excessive solids to the septic tank.

SYMPTOM 4: PONDING IN THE ABSORPTION AREA OF THE MOUND

Explanation: If wastewater is visible in the observation tubes (Fig. 2), indicating ponding at the sand/aggregate interface, it can be 1) ponding during dosing, 2) seasonal ponding, or 3) permanent ponding. Ponding during dosing is very temporary and usually disappears shortly after the pump stops. Seasonal ponding occurs over the winter but usually disappears by early summer. It is the result of low bacterial activity causing a clogging layer to develop at the sand/aggregate interface, thus reducing the infiltration rate across the interface. During early summer as the temperature warms up, the bacterial activity increases, reducing the clogging mat and increasing the infiltration rate. Seasonal ponding is of minimum concern to the owner. Permanent ponding results when ponding is observed continuously in the observation tubes. Ponding does not constitute failure, but the results of excessive ponding may lead to failure.

Causes: Permanent ponding is the result of a clogging mat forming at the sand/aggregate interface and may be caused by excessive overloading of septic tank effluent and/or too fine a sand fill.

Solutions: Checking the observation tubes every 3 mo. will indicate if permanent ponding is occurring in the absorption area of the mound. If the ponding appears to be permanent, the homeowner will want to institute water conservation practices to reduce the load to the system. Permanent ponding can often be reduced by reducing the load to the mound.

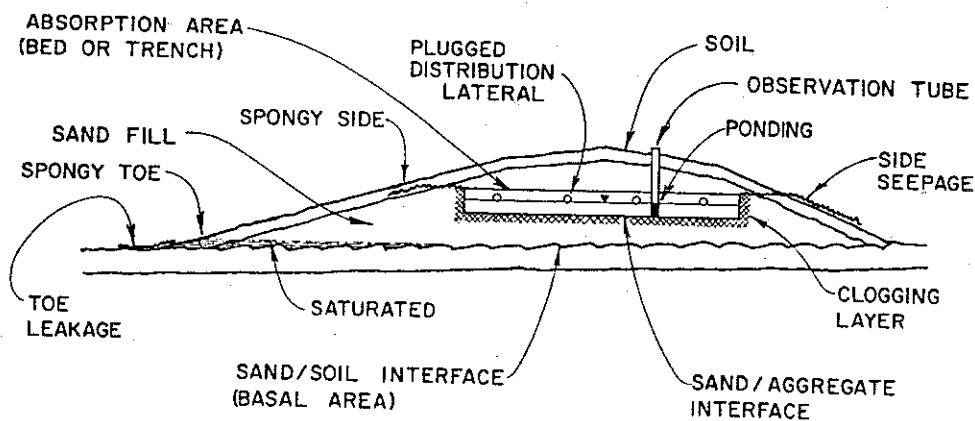


Fig. 2. Cross Section of a Wisconsin Mound Showing Potential Problems

SYMPTOM 5: SEEPAGE OUT THE SIDE OF THE MOUND

Explanation: Seepage out the side of the mound usually has an odor and is black. It is primarily septic tank effluent that has been pumped into the mound. The breakout normally occurs around an observation tube or at other locations near the top of the mound with the raw septic tank effluent flowing down the side of the mound (Fig. 2).

Causes: A clogging mat has reduced the volume of septic tank effluent infiltrating into the sand below that being pumped into the mound. Thus, septic tank effluent is being forced to the surface of the ground. The clogging mat appears as a black layer at the sand /aggregate interface. The sand, several inches below the interface, is usually dry and clean.

Temporary or continuous overloading also causes seepage out the side of the mound, even though a clogging mat may not have developed to cause permanent ponding.

Solutions: Estimate the effluent loading into the system. Look for 1) excessive amount of water being used in the home, and 2) ground water entering the pump chamber. Reduce the loading to the mound by reducing water usage in the home and/or eliminating infiltration into the dose chamber.

Determine the quality of fill by sampling the sand at several locations and have a particle size sand analysis performed. Also, some experienced persons can estimate the sand texture in the field. If the sand fill is fine sand, medium sand or coarse sand containing a lot of fine, very fine sand, and silt and clay, the mound may have to be partially rebuilt. Rebuilding involves replacing the sand beneath the absorption area only. This is done by 1) removing the soil above the absorption area, 2) removing the distribution system and aggregate, 3) removing the sand beneath the absorption area down to the natural soil, 4) replacing with an approved sand fill, 5) replacing the distribution system, 6) covering with a synthetic fabric, and 7) replacing the top soil, seeding, and mulching.

SYMPTOM 6: SPONGY AREA ON THE SIDE OR TOP OF MOUND

Explanation: A small amount of effluent seepage from the absorption area may cause soft spongy areas on the side or top of the mound.

Causes: Spongy areas are evidence of ponding in the absorption area and the result of nearly saturated soil materials.

Solutions: Refer to Symptom 5 "Seepage out the side of the mound" as spongy areas normally proceed seepage.

SYMPTOM 7: LEAKAGE AT THE TOE OF THE MOUND

Explanation: Leakage of effluent at the toe of the mound (Fig. 2) may be seasonal or permanent. During extremely wet weather, the toe area of the mound may become saturated which may result in some leakage. In most cases, within a few days after the wet period, leakage stops. In extreme cases, continuous leakage may occur even during periods of dry weather. Research has shown that the water is of high quality with no odor and contain very few or no fecal bacteria. Often leakage is very difficult or impossible to distinguish from natural surface water.

Causes: Leakage at the toe may be caused by 1) overloading of the mound due to excessive water usage or infiltration of ground water into the system, 2) overestimating the infiltration rate and hydraulic conductivity of the natural soil during design, 3) hydrophobic soils that do not readily accept water, and 4) compaction of the soil during construction.

Solutions: Reducing the volume of wastewater generated at the source with conservation practices may eliminate the leakage.

If the wastewater is being accepted by the soil, but slower than anticipated, extending the toe may be sufficient to eliminate the leakage. Extending the toe is done by removing the existing toe, allowing the soil to dry, tilling the adjacent soil area, placing sand on the tilled area, and placing topsoil over the sand followed by seeding and mulching.

If the natural soil beneath the mound is dry even though the sand fill above is saturated, the natural soil is hydrophobic, compacted or accepts the wastewater very slowly. The wastewater is moving horizontally at the sand/soil interface with very little moving vertically downward. Extending the basal area downslope may help to overcome leakage. It may be necessary to increase the length of the mound which reduces the linear loading rate and thus reduces the loading at the toe. A combination of both may be required. If the situation is extreme, a interceptor drain at the downslope toe should move the leakage away from the toe of the mound. However, surface disposal of this water may be prohibited.

On a sloping site, if it can be shown that the ground water is moving laterally downslope, then an interceptor drain on the upslope edge of the mound can intercept the ground water allowing the effluent to infiltrate into the soil and replace the intercepted groundwater.

SYMPTOM 8: SPONGY AREA AT THE TOE OF THE MOUND

Explanation: Saturated conditions in the sand fill and near saturation of the cover soil at the toe results in a soft, spongy toe.

Causes: Spongy areas are evidence of saturated conditions at the toe of the mound and the causes are similar to those give under Symptom 7 entitled "Leakage at the Toe of the Mound" but of a slightly lesser degree.

Solutions: Same as Symptom 7 entitled "Leakage at the Toe of the Mound".

SYMPTOM 9: EXCESSIVE AMOUNT OF EFFLUENT FLOWS BACK INTO THE DOSE CHAMBER AFTER THE PUMP SHUTS OFF.

Explanation: The pump surcharges (pressurizes) the absorption area by forcing effluent into the aggregate and soil above the distribution laterals. When the pump shuts off the effluent flows back into the dose chamber until the effluent level in the absorption area is below the distribution laterals. Side seepage may or may not occur.

Causes: Permanent ponding fills the storage volume of the aggregate below the laterals. Ponding can be verified by checking for effluent in the observation wells. Overloading of the system rapidly may also cause excessive flowback.

Solutions: Refer to the solution under Symptom 5 entitled "Seepage out the side of the mound".

SYMPTOM 10: THE PUMP RUNS CONTINUOUSLY WITH NO DROP IN THE LIQUID LEVEL IN THE DOSE TANK.

Explanation: Inspection of the observation tubes indicate that the absorption area is not ponded but the mound does not accept the wastewater.

Causes: The small diameter holes in the distribution system are plugged. The effluent can not flow into the absorption area. Plugging is caused by the carry over of solids from the septic tank into the pump chamber and then to the mound. Items such as disposable wash towelettes or sanitary napkins will not settle out in the septic tank and are carried over into the pump chamber and forced into the distribution pipes.

Solutions: Pump septic tanks and pump chambers every 2-3 years

Do not flush towelettes and similar materials down the toilets.

If system is plugged, remove the end caps to the distribution laterals, and flush out the solids using a high volume-high pressure pump. Recap the laterals and force water or air into the distribution system to unplug the holes. Septic tank pumpers, when pressurized, works well in forcing water into the laterals for removing the accumulated solids and forcing water out the holes to unplug them.

Consider installing a screen (with 1/8 in. opening) around the pump or siphon to keep the larger solids out of the system. Other types of filters may also minimize the solids carry over to the dose tank.

SYMPTOM 11: SEPTIC ODORS ARE PRESENT OCCASIONALLY

Explanation: The biological activity occurring in the septic tank and dose chamber produces gases such as ammonia and hydrogen sulfide which are very odorous. These gasses escape from the dose tank via the vent.

Causes: Odors generated in the septic tank and dose chamber in combination with atmospheric conditions such as humidity and wind velocity.

Solution: There is no easy solution to this problem. Extending the dose chamber vent to roof level may minimize these unpleasant odors.

REFERENCES

Converse, J. C. and E. J. Tyler. 1986. Wisconsin Mound Performance. Small Scale Waste Management Project. College of Agriculture and Life Sciences, 240 Agricultural Hall, University of Wisc. - Madison. 53706.

Table 1. Questions To Be Answered When Inspecting A Mound System

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	YES	NO
1. Is the alarm system operating properly?	_____	_____
2. Does wastewater back up into the house occasionally?	_____	_____
3. Do the toilets ever flush slowly?	_____	_____
5. Does the liquid level in the septic tank appear to be normal?	_____	_____
6. Is there a thick scum mat on the surface in the septic tank?	_____	_____
7. Is the liquid level in the dose chamber within operating range?	_____	_____
8. Are there a lot of solids in the bottom of the dose chamber?	_____	_____
9. Is there water standing in the observation tubes in the mound?	_____	_____
10. Are there soggy spots on the top or side areas of the mound?	_____	_____
11. Is there seepage on the side slopes of the mound?	_____	_____
12. Are there soggy spots in the toe area of the mound?	_____	_____
13. Is there leakage at the toe of the mound?	_____	_____
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If you answered no to all of the questions, then the mound system should be operating properly. If you answered yes to any of the questions, please refer to the text of this publication for explanations, causes, and solutions.

Table 2. Summary Of The Symptoms And Probable Causes For Inspecting and Trouble Shooting a Wisconsin Mound System*

INSPECTION POINT	SYMPTOM	PROBABLE CAUSE
1. Alarm	sounding	pump failure alarm switch failure
	non-functioning	circuit breaker thrown faulty alarm
2. Floor drain	waste on floor	house sewer plugged septic tank inlet plugged septic tank outlet plugged pump failed distribution laterals plugged
3. Septic tank	liquid waste level above normal	outlet plugged pump failed distribution laterals plugged
	excess solids	excess solids added garbage disposal
4. Dose chamber	liquid level above high water pump switch	pump failure control failure plugged laterals
	excess solids	solids carryover septic tank baffle baffle missing
	groundwater inflow	high ground water leaky joints
5. Mound	water in observ. tubes	soil absorption area plugged excessive water use
	seepage of raw sewage on side or top of mound	soil absorption area plugged system overloaded sand fill too fine
	spongy on side and top of mound	same as for seepage of raw sewage (above)
	leakage at toe	slowly permeable soil compaction during construction soil damaged during construction overloading of system
	spongy at toe	same as leakage at toe (above)

*Please refer to appropriate section of the text for solution to the symptom.