TECHNICAL STANDARDS FOR EXPERIMENTAL SYSTEMS

These standards were implemented in 2002 for ODH review of experimental concurrence requests and were derived from a draft rule package that was not adopted at that time. These technical standards are used in addition to other design resources as applicable. Refer to the ODH Experimental Guidance document for additional information. PLEASE NOTE that these standards are not part of the rule development process related to passage of HB 231.

I. Septic tanks, dosing tanks, pumps, siphons, and controls.

(A) Septic tanks and dosing tanks shall be designed and manufactured in accordance with the following: ***There are no tanks, septic or dosing, so I.(A)(1)-(4) is vacuously satisfied. No tanks are needed for a household with no washer (spinner only), no garbage-grinder, and no dishwasher. And NO TOILETS, only bidets, so no solids to be settled out. The primary treatment process is automatically and naturally done in the household 'at the bio-bucket point of use.' Hence all fluids leaving the household plumbing are ready for secondary treatment and no tanks are needed to control the flow either.***

(1) Tanks shall be watertight and be designed to withstand anticipated internal and external loads.

(2) Tanks shall be easily accessible and have secured covers. All riser connections, joints, seals, and pipe connections shall be watertight.

(3) Dosing tanks shall accommodate the volume below maximum drawdown, the maximum design dose including any drainback, the volume to high water alarm, and the design shall provide a reserve capacity for high water alarm events that is not less than the daily design flow. If time dosed, the combined reserve and surge capacities shall not be less than one hundred and fifty per cent of the daily design flow.

(4) A septic tank second compartment or a second septic tank in series may be used for low volume dosing if all conditions under paragraph (A)(3) are met, the pump flow rate is less than thirty GPM, and a filtered step system or screened vault is used.

(B) Pumps shall meet the following specifications:

(1) A pump shall be rated for effluent service by the manufacturer and be a UL or CSA listed product. ***Definitely UL. The water quality is body-contact clean, so sump pump is appropriate. TS4 or TS5 is the quality of the water.***

(2) A pump shall meet the minimum design flow rate and total dynamic head requirements specified in the HSTS design. *Our design requires dewatering performance at 5'-10' height which is satisfied as built.*

(3) A quick disconnect shall be accessible in the pump discharge piping, with adequate lift attachments provided for removal and replacement of the pump and switch assembly without having to either enter the dosing tank or pump the tank to lower the liquid level. *The sump well is easily accessible, the pump is hoistable with the adjustable strapping attached, the power is quickly shut off/on right at hand.*

(C) A dosing siphon may only be used if the HSTS design requirements, including the minimum design flow rate and minimum dose capacity, can be met and maintained. *No dosing siphon is in use.*

(D) Switches, controls, alarms, and electrical components shall be installed in a manner easily

accessible for routine monitoring and maintenance and shall comply with the following:

(1) Switches and controls shall accommodate the minimum and maximum dose capacities of the distribution network design. *Control of high and low water levels for the wetlands is easily adjustable, and accessible for monitoring and maintenance. No alarms at this point. Will consider alarm technology, once we have more event history. We have been fairly lucky so far.*

(2) Controls shall be field-tested to assure compliance with the HSTS design specifications. Counters or flow meters shall be included in those HSTS designs having critical control functions, such as timed dosing. *No timed dosing is involved or needed.*

(3) Control panels and alarms shall be mounted in an easily accessible exterior location, provide manual test features, and include written instructions related to standard operation and alarm events. *Controls are easily accessible outside.*

(4) All critical control functions shall have both audible and visual alarms. Alarms, test features, and controls shall be on a separate circuit from the dedicated circuit for the pump or motor. *There currently are no alarms, and the circuit for the pump was noted in the circuit box. Nor has any been needed for two years od extreme events as dicumented in the weather data.*

(5) All electrical wiring shall meet the National Electric Code. Connections shall be made in UL listed NEMA 4X junction boxes. All controls shall be in NEMA 3R, 4, or 4X enclosures for outdoor use. *All wiring meets amp and distance codes. Connections are UL and are sheltered at the moment in a container-under-cover.*

(E) Dosing specifications, including pump curves and float switch settings, and any related critical control function instructions shall be provided by the installer to both the homeowner and the department as a condition of final installation approval. *Dosing specifications, pump curves and float switch level can be included in the operations manual to be available to homeowner/operator as well as the Health Department when the Department is ready for approval and is no longer malfeasantly concealing the mistakes and abusiveness of their lead sanitarian Steve Dick.*

(F) Monitoring should include assessment and documentation of the following:

(1) scum and sludge levels in the tanks; *Not applicable.*

(2) visual evidence of infiltration or leakage; *Not applicable.*

(3) condition of electrical and mechanical components; and *Doable and done.*

(4) critical control functions' compliance with HSTS design specifications, including tests of the following as applicable:

(a) alarms, test features, and controls *Doable*

(b) float switch level settings *Appropriate*

(c) dose rate, volume, and frequency *Not applicable, float control.*

(d) distal pressure or operating head. *Not applicable, gravity-only 'head' required at observation pond.*

II. Pretreatment effluent quality standards.

BOD_5/TSS effluent quality standard: effluent meeting the BOD_5/TSS standard should not exceed the thirty-day average of less than thirty milligrams per liter (30 mg/l) for five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS), when applying HSTS sizing reductions as addressed in the soil absorption component section III in paragraph (F)(2)(b).

BOD.5 and TSS levels met standards in preliminary test sampling by Clermont WaterWorks

EPA Quality Lab, complete with chain of custody. Quotes for complete testing have been requested, two labs in hand (including TestAmerica), one not yet received (MASI used by Georgetown).

Parameter	Standard	Application
BOD_5/TSS (30 day average)	< 30 mg/l	soil absorption area sizing

Fecal effluent quality standards listed below shall apply to HSTS designs, as indicated.
Fecal quality standard in preliminary test sample (as well as logically) qualifies 'effluent' for TS4 or TS5 so UNRESTRICTED LAND APPLICATION should be appropriate once the plants are installed and thriving. Currently, we have more wildlife 'input' when flow is low and only the microbes are in service. Planting is on the agenda for this summer.

Parameter	Standard	Application
Fecal coliform (30 day geometric mean)	< 10,000 col./100 ml	1 foot soil depth credit
	< 1000 col./100 ml	2 foot soil depth credit
	< 200 col./100 ml	surface spray (restricted area)
	< 20 col./100 ml	(unrestricted access)

Nutrient contamination related to risk factors identified in the site evaluation or risk due to proximity to local, state, or federally recognized nutrient sensitive environments *[none such noted on conservation maps or surveys]* should be addressed through pretreatment reductions in nitrogen, phosphorus, and other nutrients as applicable, unless the HSTS siting and design eliminates the risk of nutrient contamination.

III. Soil absorption component. ***Since 'effluent' is ultimately eligible for UNRESTRICTED APPLICATION, these rules are not applicable, any more than they would be required of the homeowner running his/her garden hose at their own discretion. Omit III.(A)-(I)***

(A) Except as provided in paragraph (C) of this section, soil absorption components shall comply with the following vertical separation distances within suitable in situ soil:

(1) at least three feet if the limiting condition is bedrock, the normal ground water table, or a restrictive soil layer. *Not applicable BUT for the record, bedrock is >60in down and for Avonburg soils, the seasonal high watertable is possibly 3 ft down since the front slope to the stormditch at the road is roughly 25 ft away.*

(2) at least two feet if the limiting condition is a seasonal or perched water table. *Not applicable BUT for the record, the watertable is seasonal and perched and likely beyond this limit according to the maps of the Soil & Water Conservation Dept.*

(B)N/AFor soils such as coarse sands known to provide inadequate treatment within the vertical separation distances specified in paragraph (A), as determined through the site evaluation, one or more of the following design options shall be used: *[Not applicable either]*

(1) increased vertical separation distance; *[N/A etc]*

(2) pretreatment for pathogen reduction, and nutrient reduction as needed;

(3) designation of the underlying soil that is unable to provide adequate treatment as a restrictive soil layer under paragraph (A)(1) and for the purpose of applying soil

depth credits under paragraph (D).

(C) *N/A* An exemption to paragraph (A) shall allow for reduced vertical separation distances through the use of soil depth credits as specified in paragraph (D), provided:

(1) a vertical separation distance of at least one foot is maintained within suitable in situ soil, or

(2) if the limiting condition is a seasonal or perched water table, a vertical separation distance of at least one foot is maintained within elevated sand fill and suitable in situ soil, or

(3) if the limiting condition is a seasonal or perched water table and the effluent from the pretreatment unit does not exceed the fecal standard of one thousand colonies per one hundred milliliters *[definitely NOT exceeded]*, elevated sand fill may be reduced to a minimum of four **inches** of sand.

(D) *N/A* In addition to the requirements of paragraph (C), soil depth credits shall be available as follows:

(1) a one-to-one (1:1) equivalency soil depth credit, up to a maximum of two feet, shall apply to soil absorption components that elevate the infiltrative surface of the distribution system to achieve vertical separation distance. Sand fill material in an elevated soil absorption component shall comply with applicable design specifications under paragraph (G)(6) including sand media, sand soil interface, and sand placement requirements.

(2) a one foot soil depth credit shall apply when soil absorption components utilize drip distribution in compliance with applicable design specifications under paragraph (G)(6), provided the HSTS design complies with manufacturer's specifications and the drip tubing has pressure compensating emitters and is maintained through an automated scouring flush of at least two feet per second.

(3) soil depth credits as specified for effluent meeting the fecal effluent quality standards shall apply to soil absorption components that are preceded by pretreatment components reviewed and approved by ODH for the specified credit.

(E) *N/A* The following requirements for effluent distribution to the soil absorption component shall be met, as indicated:

(1) septic tank effluent may be distributed by gravity to an in situ soil absorption component meeting the vertical separation distances described in paragraph (A).

(2) designs with pretreatment component effluent quality meeting the BOD_5/TSS or fecal standards shall utilize pressurized distribution except in those cases where a two foot vertical separation distance to any limiting condition can be maintained within suitable in situ soil.

(3) except as specified under paragraph (E)(4), designs on sites having less than eighteen inches from the surface of the ground to the limiting condition shall utilize equalized distribution that provides timed dosing and minimized dose volumes. Dosing intervals shall attenuate peak flows and allow for reaeration of the soil absorption area between doses. The design of the distribution network shall provide an instantaneous loading rate as follows:

(a) the daily dose volume is distributed proportionally over a sixteen to twenty-four hour period per day,

(b) each dose volume is no greater than one eighth of the daily design flow,

(c) and flow is distributed to infiltrative surface areas of no greater than six square feet per orifice or point of dispersal.

(4) surface spray application of effluent meeting fecal effluent quality standards in section II shall comply with applicable design specifications.

(F) *N/A* The soil absorption component area shall be of adequate size to disperse the effluent and prevent ponding on the surface of the ground. *[Overflow is avoidable with this design]* When sizing the soil absorption area the following requirements shall be met:

(1) soil loading rates shall be based on effluent quality and on soil structure, texture, and consistence and shall be selected from loading rate tables or calculated from formulas provided or referenced in approved design resources.

(2) the selection of soil loading rates based on effluent quality shall be limited to one of the following:

(a) a rate for septic tank effluent, or

(b) a rate for effluent meeting the BOD_5/TSS standard under section II. Any further increases in soil loading rates based on reductions in BOD_5 or TSS below thirty milligrams per liter shall not be permitted.

(3) the structure, texture, and consistence of the soil at the infiltrative surface of the in situ soil shall be used to determine a soil loading rate. If a lower soil layer within the vertical separation distance would reduce treatment or dispersal, selected loading rates shall consider that lower soil layer, or the lower soil layer shall be treated as a restrictive soil layer for the purposes of establishing the vertical separation distance. *[less permeable soil is 30" down, just for the record]*

(4) in addition to sizing based on soil loading rates, linear loading rate (LLR) estimates shall be used to determine the required length of the infiltrative surface of the distribution system parallel to surface contours. LLR estimates shall be selected from loading rate tables or calculated from formulas in approved design resources.

(5) if site and soil conditions indicate significant horizontal subsurface flow of effluent, minimum horizontal isolation distances shall be increased around the perimeter or downslope as an extension of the soil absorption area.

(G) *N/A* General requirements for designing a soil absorption component are as follows:

(1) effluent dispersal components shall be oriented parallel to natural surface contours and shall not be sited on slopes exceeding design limitations. *[flat]*

(2) observation ports that allow for monitoring of the infiltrative surface shall be provided. *[frog 'vernal' pond serves the need for observation]*

(3) designs shall prevent damage to components or operational failures due to freezing temperatures. *[N/A at pond but of course, see weather data with observations recorded, pump end is still under construction for insulation process.]*

(4) for management of short term repairs and long term resting, easily accessible shut-off mechanisms shall be provided to allow for segregation of flows to portions of the soil absorption component.

(5) pressure distribution networks shall have a means of measuring design pressure or operating head for both initial baseline measurement and future monitoring of orifice clogging and other network operations and shall include a means of scouring or flushing distribution laterals.

(6) in addition to the requirements of these technical standards, the design of a soil absorption component shall comply with the specifications found in any design resource approved by ODH as a generally accepted standard design reference applicable to the type of soil absorption component proposed for use.

(H) *N/A* Installation shall be conducted in a manner consistent with design specifications to assure proper operation, maintenance, and monitoring of the soil absorption component. *[of course]*

(1) soil moisture conditions shall be evaluated at the time of installation, and the installation shall not proceed when there is a risk of smearing or compaction as evidenced by a deformability test, commonly referred to as ribboning.

(2) testing of any pressure distribution components shall be conducted prior to approval of the installation. *[none required]* Flow rate and distal pressure or operating head shall meet design specifications and a baseline shall be recorded for future performance monitoring.

(3) baseline records and any soil absorption component operation and maintenance instructions shall be provided by the installer to both the homeowner and the department as a condition of installation approval. *[doable]*

(I) Soil absorption components monitoring shall include an assessment and documentation of the following: *[unrestricted application appropriate for fine quality water]*

(1) any effluent ponding at infiltrative surfaces or at the surface of the ground;

(2) evidence of leaks or accumulation of residuals in the distribution system or other components;

(3) test of flow rate and distal pressure or operating head (or dispersal coverage in the case of surface spray application), with comparison to baseline and previous monitoring records; and

(4) any need for resting a portion of the soil absorption component.

IV. Site modifications.

(A) An existing drain tile, drainage system, or other artificial subsurface drainage shall be avoided whenever possible in siting HSTS. *[avoided]* If siting a HSTS in the area of existing artificial subsurface drainage cannot be avoided, the redoximorphic features in the soil above the depth of the drain shall be considered a limiting condition under paragraph (A)(2) of the soil absorption section.

(B) Site modification involving the use of fill materials *[no fill used below infiltrative surface]* shall comply with the following:

(1) no fill material shall be present in the vertical separation distance below the infiltrative surface of the distribution system, other than sand fill material specified for a soil absorption component.

(2) a settled non-compacted fill material, that has over time developed the characteristics of soil, shall be thoroughly evaluated as to its treatment and dispersal capacity prior to any consideration for the siting of a soil absorption component.

(C) HSTS components shall not be sited in depressions *[a depression is part of a constructed wetland's control design]* where surface water runoff cannot be properly managed through diversion. *[runoff is managed]* When surface water runoff will infiltrate or cause ponding on or around HSTS components, diversion swales shall be designed to intercept and divert surface water. *[diversion swales are used to control the surface runoff from adjacent house and sunshed roof 10' or so away and from the woodland's watershed]*

(D) any artificial subsurface drain designed to influence a HSTS shall comply with the following as applicable:

(1) interceptor drains sited upslope of soil absorption components to intercept laterally

moving water shall be designed such that the effluent plume moves downslope and away from the drain. *[done]*

(2) gradient drains intended to enhance the subsurface flow of a seasonal or perched water table shall not be used to avoid maximizing the length of the soil absorption component parallel to surface contours. *[none needed]* Soil absorption components utilizing gradient drains shall use equalized distribution as specified in paragraph (E)(3) under the soil absorption section.

(3) the isolation distance between a drain and a soil absorption component shall be adequate to prevent effluent from entering the drain based on site and soil conditions. A gradient drain shall be no closer than a horizontal distance of eight feet *[at least]* from the closest edge of the infiltrative surface area of the distribution network, and have a horizontal separation from any sand fill material of at least one foot of undisturbed in situ soil. *[at least]*

(4) the receiving area for the drain outfall shall not pond and shall allow free flow away from the outlet. Except as provided in this paragraph, a gravity flow outlet shall have at least six inches of freeboard. If at least six inches of freeboard is unavailable an eight inch minimum diameter monitoring well with cover shall be extended to grade to provide access and a sufficient reservoir for sampling.
[Either a creeklet or corrugated piping is used with expansion pond at the 'receiving' end of the flow, with a safety overflow to the road stormditch, in order to safely retain nearly all rainwater for return to groundwater.]

(5) if a gravity flow outlet cannot be achieved, the drain shall include an easily accessible pump vault of sufficient size and dose volume to maximize pump life, *[done]* shall have a freeze-protected discharge line,*[planned]* and shall meet electrical wiring requirements under paragraph (D)(5) of section I. If a pumped drain is used in the design of a gradient drain, the pump is a critical control function requiring an alarm. *[still under research]*

(E) Monitoring diversion swales and interceptor or gradient drains shall include an assessment and documentation of the following: *[doable]*

(1) evidence of the swale or drain not performing as designed, or surface or subsurface water infiltrating or ponding in, on, or around the system;

(2) condition and proper operation of electrical and mechanical components in pumped drains, including float switch level settings and dose volume; and

(3) test of all critical control functions for pumped gradient drains including alarms, test features, and controls, as applicable.