



## **Indiana Standards for Subsurface Drip Systems**

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# Indiana Standards for Subsurface Drip Systems

These standards apply to subsurface drip systems (SDS) [see list of Indiana approved SDS listed on Indiana State Department of Health (department) website, [insert HYPERLINK](#)]. Systems integrators (SI) of SDS not listed may submit a proposal for a STS for review by the department.

## I. Definitions

**Authorized Designer:** A person, often an installer, authorized by a system integrator (SI) in compliance with the requirements of the department, who incorporates a subsurface drip system from a SI into the design of an onsite system for a residential or commercial site.

**Authorized Installer:** A person, authorized by a system integrator (SI) in compliance with the requirements of the department, who installs an onsite system designed by an authorized designer.

**Authorized Representative:** An authorized representative is an authorized designer, authorized installer, or authorized service provider of a system integrator (SI).

**Authorized Service Provider:** A person, authorized by a SI in compliance with the requirements of the department, who services an onsite system installed by an authorized installer.

**Onsite System:** All equipment and devices necessary for proper onsite conduction, collection, storage, and treatment of sewage, and absorption of sewage in soil, from a residence or commercial facility.

**Subsurface Drip System (SDS):** Onsite sewage system described in this standard.

**Subsurface driplines:** Soil absorption field (SAF) component of a subsurface drip system (SDS). Subsurface driplines (installed below original grade) are flexible wastewater grade polyethylene tubing with pressure-compensating emitters, spaced regularly along the dripline, that operate over a wide range of pressure and allow for small and constant flow of effluent into soil.

**System Integrator (SI):** A company that combines several components and ensures that the components function together as a system. A SI looks at the whole picture (system), complies with regulatory requirements, incorporates industry best practices into component selection, and considers all details necessary to make the system work. A SI provides the following services:

1. Develops a system that complies with regulatory requirements;
2. Integrates components into a whole functioning system;
3. Provides drawings to scale of all components and the entire system;
4. Coordinates with equipment manufacturers;
5. Prepares and provides components list;
6. Prepares and provides purchase pricing for customers;
7. Authorizes designers, installers, and service providers;
8. In coordination with its authorized representatives, provides site visits to troubleshoot and diagnose system malfunctions and provide solutions; and
9. Maintains responsibility for management of all systems designed, installed, and serviced by its authorized representatives.

## II. Approval of subsurface drip systems (SDS)

- A. The department:
  - 1. Reviews, approves, and lists subsurface drip systems (SDS) when system integrators (SI) demonstrate they meet or exceed the requirements in the *standards* of the department; and
  - 2. Removes SDS from lists when performance is determined to be unacceptable. The department will inform a SI, in writing, prior to taking this action.
- B. The department lists approved SDS on its website, **insert HYPERLINK**.
  - 1. Any changes, modifications, or substitutions of components, materials, products, or specifications to a listed SDS must be submitted by the SI and approved by the department prior to the change, modification, or substitution.
  - 2. Products in a manufacturer's product line that are included in an approved SDS are approved for use only in the approved SDS.
- C. A SI must submit proposed changes to the design, installation, or operation and maintenance (O&M) procedures of an approved SDS, and a schedule for implementing recommended changes, for review and consideration for approval by the department.

## III. Requirements for system integrators (SI)

- A. Components and materials in an approved subsurface drip system (SDS) must perform according to manufacturers' performance requirements and the requirements of these *standards*.
- B. A SI must present and have a program plan reviewed and accepted by the department (see *Subsections C and D* for detailed requirements) for:
  - 1. The training and biennial authorizing of designers, installers, and service providers;
  - 2. The ongoing O&M of SDS;
  - 3. Investigating complaints; and
  - 4. Removing designers, installers, and service providers from authorized lists when performance is determined to be unacceptable.
- C. Requirements for a SI training and authorization program.
  - 1. Designers, installers and service providers must:
    - a. Be trained in accordance with the SI training program; and
    - b. Be authorized, and reauthorized biennially, in accordance with the SI authorizing program before they may design, install or service an approved SDS.
  - 2. A SI must:
    - a. Provide refresher training, as necessary, for authorized designers, installers, and service providers whose performance is below expectations;
    - b. Offer field demonstrations of approved SDS; and
    - c. Provide regulators and authorized designers, installers and service providers ongoing oversight and consultation, as needed.
  - 3. A SI must remove from its authorized list any designer, installer, or service provider who continues to perform below performance expectations after refresher training required in *Subdivision 2.a*.
  - 4. The department must be notified by a SI of any scheduled training event at least 10 working days prior to the event.
  - 5. Each SI must provide the department and LHDs with an up-to-date list quarterly, in a data format approved by the department, of:

- a. Individuals trained, authorized and reauthorized for the design, installation or service of SDS in Indiana as required in *Subsection F.1*; and
  - b. LHD staff trained on SDS.
- D. Requirements for a SI O&M program.
1. Authorized service providers must:
    - a. Have and know how to operate equipment necessary to assess and adjust the operation of all components as necessary to bring a SDS into compliance with the SI O&M program;
    - b. Check wastewater level in all tanks and verify proper operation of float and alarm functions;
    - c. Verify that all tank risers and lids are in good condition and risers are watertight;
    - d. Verify that all box risers and lids are present and in good condition;
    - e. Inspect all air/vacuum release valve boxes and verify that all air/vacuum release valve boxes and valves are clean, in good condition, and operating properly;
    - f. Visually inspect the SDS soil absorption field (SAF) at least once per year or at the time of maintenance, whichever is less, for signs of effluent on the ground surface, with the results documented in the O&M report; and
    - g. Notify the department and LHD if a SDS shows signs of failure as defined in *410 IAC 6-8.1-8* or *410 IAC 6-10-3*.
  2. Measurements of system performance must include, but not be limited to, the following operating parameters:
    - a. Pressure and flow rate while dosing each zone in the SDS SAF. Leaks detected or observed, and flow rates that differ substantially from design and start-up flow rates, must be corrected;
    - b. Pump cycle time between doses and pump run time during dosing for each zone in the SDS SAF. Values that deviate from design and start-up values must be corrected;
    - c. Differential pressure across the pressure filter or filter headworks during dosing. An excessive pressure across the pressure filter or filter headworks must be corrected;
    - d. Flow rate while flushing the driplines. An insufficient flow rate to maintain minimum required flush velocity at the distal ends of the laterals must be corrected.
    - e. Dose volume of each zone; and
    - f. Between scheduled and unscheduled O&M:
      - 1) Number of doses per zone;
      - 2) Number of zone flushing events; and
      - 3) Number of filter backwashing events.
  3. A SI may permit, if described in the SI O&M program, an authorized service provider to adjust the dose frequency on each service visit:
    - a. Based on the actual daily flows, provided actual daily flows are consistent;
    - b. Based on an adjusted daily flow equal to 1.2 times the actual daily flow; and
    - c. Provided data on the actual daily flows, consistency of flows, and adjustment of dose frequency are reported in the O&M report.
  4. Documentation of system performance and O&M of installed SDS must be in accordance with the SI O&M program by the authorized service provider for scheduled and unscheduled O&M.

- E. Each SI must submit a report to the department and to LHDs for the counties in which SDS are installed by March 31<sup>st</sup> of each year. The report must contain the following information for the previous calendar year:
1. Data recorded in an electronic format approved by the department:
    - a. On a one-time basis for each SDS installed:
      - 1) Information required in *Standards for Secondary Treatment Systems, Section III.E.1.a*; and
      - 2) Measurements of system performance at the start-up for the SDS, as required in *Subsection D.2*.
    - b. Annually for each SDS serviced, including:
      - 1) Scheduled and unscheduled O&M with reports;
      - 2) Identification of the authorized service provider; and
      - 3) Measurements of system performance for the SDS, as required in *Subsection D.2*, for each scheduled and unscheduled O&M.
  2. All known problems, shortcomings, or failures of SDS with a summary of the cause and remedial measures taken.
- F. The SI or authorized representative must provide the owner a copy of:
1. The department's information document on SDS;
  2. The O&M agreement;
  3. All manufacturer warranty information for each component of the SDS; and
  4. For SDS SAF sites on slopes  $> 15\%$  and  $\leq 25\%$ , the requirement of *Section VII.D.3.d*.
- G. Each SI or authorized representative must report to the department and LHD failure of an owner to renew an O&M agreement within 30 days of non-renewal.
- H. Requirements for design and specifications for SDS.
1. A SDS must include a secondary treatment system (STS) that complies with the *Indiana Standards for Secondary Treatment Systems*.
  2. A SDS must include a pressure filter or filter headworks. The pressure filter or filtration headworks must:
    - a. Be approved for use by the manufacturer of the pressure filter or filtration headworks for the requirements of the SDS SAF;
    - b. Meet the requirements of the dripline manufacturer for removal of suspended solids;
    - c. Be:
      - 1) Self cleansing; or
      - 2) Cleansed by backwashing at the beginning of each dose event, with:
        - a) The backwash effluent returned to the tank designated by the SI;
        - b) The pump selected for dosing the SDS SAF capable of achieving the backwashing volume and pressure requirements of the filter manufacturer;
    - d. Be selected to match or exceed the maintenance frequency of the remaining components of the onsite system; and
    - e. Be accessible according to the requirements of the SI.
  3. A SI must specify the limitations of its pressure filter or filtration headworks in design of a SDS SAF.

4. A SDS must include a programmable logic controller (PLC) to automatically backwash a pressure filter or filtration headworks required in *Subdivision 2.c.2*), and dose and flush the SDS SAF.
  - a. The PLC must automatically activate a flush cycle for a filter or filtration headworks at the beginning of each SDS SAF dose cycle.
  - b. The PLC must automatically activate a dose for a SDS SAF zone:
    - 1) Only when there is sufficient volume of effluent to provide a full dose of the zone; and
    - 2) With the following dose scheme:
      - a) A dose of  $\geq 4$  times and  $\leq 5$  times the volume of the driplines in a zone, except as recommended, in writing, by the dripline manufacturer and the SI, and approved by the department.
      - b) Doses evenly spaced throughout a 24 hour period assuming a daily volume of liquid equal to 60%  $\pm$ 5% of the DDF;
      - c) For peak flow conditions:
        - i) A dose equal to the volume of liquid described in *Subdivision 4.b.2).a)*; and
        - ii) A frequency up to 2 times the frequency described in *Subdivision 4.b.2).b)*.
    - c. The PLC must automatically activate a flush cycle for a SDS SAF zone:
      - 1) Only when there is sufficient volume of effluent to provide a full flush of the zone; and
      - 2) At least once every 84 doses.
  5. The PLC must have manual override switches for the purpose of O&M and troubleshooting the SDS and SDS SAF.
  6. A SDS must include a wastewater grade high pressure pump.
  7. A SI must specify the limitations of its high pressure pump in design of a SDS SAF, including:
    - a. The maximum number of lateral connections to a supply manifold while maintaining a flushing velocity at the distal ends of the dripline laterals of  $\geq 1$  fps, or the driplines manufacturer's recommended velocity, whichever is greater;
    - b. The maximum allowable lateral length of a dripline, measured from the supply to flush manifolds;
    - c. The maximum allowable linear feet of dripline in a zone; and
    - d. The maximum allowable static head loss and gain.
  8. The components of an SDS, including but not limited to valves, filters, pressure regulators, measuring devices, pipe, driplines with pressure-compensating emitters, and fittings, must be:
    - a. Integrated by a SI in a manner that:
      - 1) The components function together as a system; and
      - 2) Prevents freezing of system components;
    - b. Rated for wastewater application; and
    - c. Listed in a list of materials.
  9. The SI must specify, based on the determination of the dripline manufacturer, the separation distance of driplines (typically 2') in a SDS SAF:
    - a. On slopes  $> 15\%$  and  $\leq 25\%$ , laterals may be spaced  $> 2'$  apart; and

- b. For soils with a soil load rate of 0.10 gpd/ft<sup>2</sup> or 0.05 gpd/ft<sup>2</sup> (see *Figure 2, Soil Load Rates for Subsurface Drip Systems*), laterals or emitters (or both) may be spaced < 2' apart.
- 10. The SI must specify that a zone have  $\geq 2$  air/vacuum release valves at the highest elevation(s) of the zone able to supply sufficient volume of air necessary to prevent a vacuum from forming in the zone.
- 11. The SI must provide design charts, tables, formulas, or a spreadsheet to calculate system hydraulics for dosing and flushing SDS SAF driplines.

#### **IV. Requirements for plan submittal, review, and construction permit issuance**

- A. Overview of the plan submittal and review process for residential onsite systems with a subsurface drip system (SDS).
  - 1. The authorized designer submits to the LHD the soil evaluation report for the proposed SDS soil absorption field (SAF).
  - 2. The LHD:
    - a. Determines the minimum SDS SAF area (consulting with the department, if necessary); and
    - b. Forwards the minimum SDS SAF area to the authorized designer.
  - 3. The authorized designer:
    - a. Prepares plans and specifications (plan submittal) for the onsite system; and
    - b. Submits 2 sets of the plan submittal to the LHD.
  - 4. If the department has delegated responsibility for plan review and approval to the LHD according to *Subsections C and D*, the LHD proceeds with the plan review and approval process (consulting with the department, if necessary) and proceeds to *Subdivision 7*.
  - 5. If the department has not delegated responsibility for plan review and approval to the LHD according to *Subsections C and D*, the LHD:
    - a. Retains a copy of the plan submittal; and
    - b. Forwards to the department a copy of:
      - 1) The plan submittal;
      - 2) The LHD permit application; and
      - 3) The soil evaluation report.
  - 6. The department:
    - a. Conducts the plan review; or
    - b. Schedules to conduct the plan review with LHD staff for the purpose of training.
  - 7. During review of the plan submittal by the department or LHD, whichever has responsibility for plan review and approval according to *Subsections C and D*:
    - a. If errors or omissions are discovered:
      - 1) They are documented;
      - 2) Returned to the authorized designer:
        - a) To revise the plan submittal; and
        - b) Submit 2 sets of the revised plan submittal to the LHD.
      - 3) Proceed to *Subdivision 4*.
    - b. If no errors or omissions are discovered, proceed to *Subdivision 8*.
  - 8. When a plan submittal is complete and approvable:
    - a. If the department has delegated responsibility for plan review and approval to the LHD according to *Subsections C and D*, the LHD issues a construction permit.

- b. If the department has not delegated responsibility for plan review and approval to the LHD according to *Subsections C and D*:
        - 1) The department issues an approval letter to the owner; and
        - 2) The LHD issues a construction permit.
- B. A plan submittal for an individual site must comply with:
  1. These *standards*, and applicable sections of *410 IAC 6-8.1, Residential Sewage Disposal Systems, 410 IAC 6-10, Commercial Onsite Wastewater Disposal, Bulletin S.E. 13, Onsite Water Supply and Wastewater Disposal for Public and Commercial Establishments*, and applicable *standards* of the department;
  2. Local ordinances, requirements and procedures for onsite systems;
  3. Requirements of an approved and listed SDS;
  4. Current guidelines of the dripline manufacturer provided they do not conflict with the requirements of *Subdivisions 1, 2 and 3* and
  5. *IC 16-41-25-3*.
- C. A plan submittal must be reviewed and approved by:
  1. The department; or
  2. The LHD (except as described in *Subsection D*) when the department delegates authority, in writing, to LHD staff member(s) for plan review and approval:
    - a. Delegation is automatically rescinded if the staff member(s) to which delegation was granted leaves employment with the LHD onsite program and the LHD has no remaining onsite program staff delegated responsibility for plan review and approval;
    - b. Delegation may be revoked upon documentation that the LHD program is not operating in compliance with *410 IAC 6-8.1, 410 IAC 6-10* or *standards* set by the department, or provisions of the delegation.
    - c. If delegation is revoked, the department will notify the LHD, in writing, stating reason(s) for revocation and criteria for delegation to be reinstated.
- D. A plan submittal must be reviewed and approved by the department, unless authority for plan review and approval is specifically delegated by the department to the LHD, in writing, for a SDS SAF site with:
  1. A slope > 15% and ≤ 25%; and
  2. A soil load rate of 0.10 gpd/ft<sup>2</sup> or 0.05 gpd/ft<sup>2</sup> (see *Section VII.D* and *Figure 2, Soil Load Rates for Subsurface Drip Systems*).
- E. An approval or construction permit may not be issued by the department or LHD, whichever has authority as described in *Subsection C and D*, without training and authorization of authorized representatives as required in *Section III.C.1*.
- F. The department or LHD, whichever has authority as described in *Subsection C and D*, may suspend or revoke an approval or construction permit prior to or during installation of an onsite system due to violation of these *standards*.
- G. The following *5 sections* contain specific requirements in the plan submittal, review and construction permit issuance process for:
  1. Owners;
  2. Regulators;
  3. Authorized designers;
  4. Authorized installers; and
  5. Authorized service providers.



## V. Requirements for owners

- A. The owner must:
  - 1. Have a signed O&M agreement with an authorized service provider, prior to construction permit issuance, that commences at the time the subsurface drip system (SDS) is placed into operation; and
  - 2. Maintain an O&M agreement with an authorized service provider during the life of the SDS.
- B. Prior to the start of construction, the owner, or authorized representative of the owner, must:
  - 1. Obtain a written approval from the department, unless plan review and approval has been delegated to the LHD, as described in *Section IV.C and D*; and
  - 2. Obtain a written permit from the LHD.
- C. After installation:
  - 1. Staff of the department and LHD may make observations of the onsite system at reasonable times; and
  - 2. The owner must notify the department and LHD if the onsite system shows signs of failure as defined in *410 IAC 6-8.1-8* or *410 IAC 6-10-3*.

## VI. Requirements for regulators

### **LHDs are strongly encouraged to have in-place local ordinances, policies and procedures for enforcement of O&M requirements.**

- A. Before a regulator may issue a construction permit for an onsite system incorporating an subsurface drip system (SDS), the SDS must be approved by the department.
- B. For a residential onsite system having a SDS, a LHD may not use the provision for best judgment in *410 IAC 6-8.1-33(a)* for onsite system alterations due to system defect, failure, or malfunction without the written approval of the department.
- C. For a plan submittal with a proposal to replace a soil absorption field (SAF) with a SDS SAF, a regulator must:
  - 1. Require all new components; or
  - 2. Require that, for onsite system components proposed for reuse, the owner, or authorized representative of the owner, document that each component:
    - a. Is watertight and in good condition, using test procedures that comply with requirements of the department; and
    - b. Complies with size and product requirements in applicable sections of *410 IAC 6-8.1*, *410 IAC 6-10*, *Bulletin S.E. 13*, and *standards* of the department.
- D. A LHD may require an owner to record a deed restriction or notice with the deed that identifies the SDS and the requirement for an O&M agreement (see *Section V.A*);
- E. A regulator may:
  - 1. Prior to issuing a permit for construction, require the design be reviewed by the SI for compliance with the requirements in *Sections IV.B*; and
  - 2. Require an SI or authorized designer to inspect an installed SDS to:
    - a. Certify that as-built conditions conform with the approved plan; or
    - b. Submit “as-built” plans.
- F. Prior to construction, and after the SDS SAF has been laid out on the site by the authorized installer as required in *Section VIII.A*, the department or LHD, whichever has authority for plan review and approval as described in *Section IV.C and D*, must:
  - 1. Visit the site to verify that the layout of the SDS SAF complies with the approved plan; and

2. If the layout of the SDS SAF does not comply with the approved plan, inform the authorized designer and authorized installer, in writing, that installation of the SDS may not commence until revised plans have been reviewed and approved.
- G. After installation:
1. The department or LHD, whichever has authority for plan review and approval as described in *Section IV.C and D*, must conduct a final inspection.
  2. A final inspection may not be based on a statement by an authorized installer that the SDS was installed as designed.
  3. The department and LHD must maintain documentation on the final inspections their staff conducts.

**VII. Requirements for authorized designers**

- A. Given that driplines are installed at a shallow depth in the soil (typically 6” – 12”), and that the site of the subsurface drip system (SDS) soil absorption field (SAF) is not plowed prior to installation of the driplines:
1. The soil scientist evaluating a site must evaluate the upper horizons of the soil for signs of disturbance, compaction and platy structure; and
  2. The authorized designer must confirm that the upper horizons of the soil for a site are reported on in the evaluation report.
- B. Plans for an onsite system with a SDS SAF must:
1. Be designed by an authorized designer;
  2. Be drawn to scale; and
  3. Include an approved SDS as listed on the department website, **insert HYPERLINK**.
- C. Vertical separation distances below subsurface driplines must comply with *Figure 1, Vertical Separation Distances for Subsurface Drip Systems*.

<b>Figure 1 Vertical Separation Distances for Subsurface Drip Systems</b>		
<b>Slope (%)</b>	<b>Limiting Condition</b>	<b>VSD<sup>1</sup></b>
≤ 15%	SLR <sup>2</sup> < 0.05 gpd/ft <sup>2</sup> SLR <sup>2</sup> > 0.80 gpd/ft <sup>2</sup> SH <sub>2</sub> O <sup>3</sup>	≥ 20”
>15% to ≤ 25% <sup>4</sup>	SLR <sup>2</sup> < 0.05 gpd/ft <sup>2</sup> SLR <sup>2</sup> > 0.80 gpd/ft <sup>2</sup> SH <sub>2</sub> O <sup>3</sup>	≥ 24”
<sup>1</sup> Vertical separation distance from bottom of dripline to a limiting condition. <sup>2</sup> Soil load rate. <sup>3</sup> Seasonal high water table or seasonal high water table as amended with a subsurface drainage system. <sup>4</sup> See <i>Section IV.D.2</i> .		

- D. The minimum size of the SDS SAF and minimum total length of dripline must be determined using the soil load rates listed in *Figure 2, Soil Load Rates for Subsurface Drip Systems*, as follows:
1. The area of the SDS SAF must be ≥ the DDF divided by the soil load rate (Area<sub>SDS SAF</sub> ≥ DDF / SLR);

2. The total length of dripline must be  $\geq$  the area of the SDS SAF divided by 2 (Total Length<sub>dripline</sub>  $\geq$  Area<sub>SDS SAF</sub> / 2); and

**Figure 2**  
**Soil Load Rates (gpd/ft<sup>2</sup>)<sup>1,2</sup> for Subsurface Drip Systems**

Texture	Structure/Consistence						
	without densic material or fragic soil properties						pl, densic material or fragic soil properties
	sg	gr	strong abk sbk	moderate abk sbk	weak abk sbk	structureless massive (friable and very friable)	
all pr							
Gravel (GR) Loamy Very Coarse Sand (LVCOS) Coarse Sand (COS)							
Loamy Coarse Sand (LCOS)	0.80	0.80			0.60		
Medium Sand <sup>3</sup> (S) Fine Sand (FS) Very Fine Sand (VFS) Loamy Sand (LS) Loamy Fine Sand (LFS) Loamy Very Fine Sand (LVFS)	0.60	0.60		0.60	0.50	0.50	
Coarse Sandy Loam (COSL) Sandy Loam (SL) Fine Sandy Loam (FSL) Very Fine Sandy Loam (VFSL)		0.50		0.40	0.30	0.30	
Loam (L)		0.40	0.30	0.30	0.20	0.20	
Silt Loam (SIL) Silt (SI)		0.30	0.25	0.25	0.20	0.20	
Sandy Clay Loam (SCL)		0.25	0.20	0.20	0.15	0.10 <sup>4</sup>	
Clay Loam (CL) Silty Clay Loam (SICL)		0.25	0.20	0.20	0.15	0.10 <sup>4</sup>	
Sandy Clay (SC)		0.15	0.10 <sup>4</sup>	0.10 <sup>4</sup>	0.05 <sup>4</sup>		
Silty Clay (SIC) Clay (C)		0.10 <sup>4</sup>	0.05 <sup>4</sup>	0.05 <sup>4</sup>	0.05 <sup>4</sup>		
Bedrock, Marl, Muck, Ortstein, and Peat							



**Soil absorption fields for subsurface drip systems are not allowed in these soils.**

**Shape of Structure:**

sg: single grained

gr: granular

pl: platy

abk: angular blocky

sbk: subangular blocky

pr: prismatic

## Footnotes for Soil Load Rates (gpd/ft<sup>2</sup>)<sup>1,2</sup> for Subsurface Drip Systems

- <sup>1</sup> Mine spoils and fill are excluded from this table.
- <sup>2</sup> The following are assigned a soil load rate (SLR) of < 0.05 gpd/ft<sup>2</sup> or a SLR > 1.2 gpd/ft<sup>2</sup>, whichever is applicable:
- compact glacial till (see densic material, special note B.);
  - coprogenous earth;
  - fragipan;
  - soils that have fragic soil properties (see special note C.);
  - massive structure with firm and very firm consistence and a texture that contains seventy (70) percent or less sand; and
  - soils with more than thirty-five (35) percent [weighted average volume within upper forty (40) inches of soil profile] of rock fragments greater than three (3) inches in diameter.
- <sup>3</sup> Has a particle size of 0.25 to 0.50 millimeters (mm).
- <sup>4</sup> See *Section IV.D.2*.

### **SPECIAL NOTES:**

- A. The transitional BC, Bk and CB horizons, that developed in glacial till and have soil properties that are similar to densic material (see special note B.), are assigned the same SLR as the underlying C horizons.
- B. Densic materials (USDA, NRCS) are relatively unaltered materials (do not meet requirements for any other named diagnostic horizons nor any other diagnostic soil characteristic) that have a noncemented rupture-resistance class. The bulk density or the organization is such that roots cannot enter, except in cracks. These are mostly earthy materials, such as till, volcanic mudflows, and some mechanically compacted materials, for example, mine spoils. Some noncemented rocks can be densic materials if they are dense or resistant enough to keep roots from entering, except in cracks.  
Densic materials are noncemented and thus differ from paralithic materials and the material below a lithic contact, both of which are cemented.  
Densic materials have, at their upper boundary, a densic contact if they have no cracks or if the spacing of cracks that roots can enter is ten (10) centimeters (cm) or more. These materials can be used to differentiate soil series if the materials are within the series control section.
- C. Fragic soil properties (USDA, NRCS) are the essential properties of a fragipan. They have neither the layer thickness nor volume requirements for the fragipan. Fragic soil properties are in subsurface horizons, although they can be at or near the surface in truncated soils. Aggregates with fragic soil properties have a firm or firmer rupture-resistance class and a brittle manner of failure when soil water is at or near field capacity. Air-dry fragments of the natural fabric, five (5) to ten (10) centimeters (cm) in diameter, slake when they are submerged in water. Aggregates with fragic soil properties show evidence of pedogenesis, including one or more of the following: oriented clay within the matrix or on faces of peds, redoximorphic features within the matrix or on faces of peds, strong or moderate soil structure, and coatings of albic materials or uncoated silt and sand grains on faces of peds or in seams. Peds with these properties are considered to have fragic soil properties regardless of whether or not the density and brittleness are pedogenic.

3. On a SDS SAF site with a slope of  $> 15\%$  and  $\leq 25\%$ , a 100% separate area set aside for possible expansion of the SDS SAF, must be:
    - a. Evaluated on a slope of  $\leq 25\%$ ;
    - b. Sized according to *Subdivision 1*;
    - c. Identified on the plan submittal; and
    - d. Protected from disturbance for a period of  $\geq 5$  years.
- E. Each zone of an SDS SAF must:
1. Be located on linear or convex topography (i.e., not on concave topography);
  2. Be designed and laid out:
    - a. As long and narrow as the site will allow, but no longer than the maximum allowable length of dripline lateral specified by the SI;
    - b. With no more than the maximum allowable total length of dripline in a zone specified by the SI; and
    - c. With the driplines following the contours of the site; and
  3. Not exceed 45' in width.
- F. Zones may be located along the slope of a site provided:
1. For sites that require drainage, a segment drain is specified between zones, and the separation distance between drains (including segment drains) does not exceed 65'; and
  2. For sites that do not require drainage, a separation distance of  $\geq 20'$  is specified between zones.
- G. Design requirements for SDS.
1. The pressure filter or filtration headworks must be accessible according to the requirements of the SI. If the pressure filter or headworks is not located in a dose tank, the pressure filter must be enclosed in an access box having:
    - a. Protection from freezing by heating or insulation of at least 2" of extruded polystyrene (XPS, or foam board) permanently attached to the underside of the access box lid;
    - b. An air gap of at least 2" between the lid or XPS insulation, whichever is applicable, and the top of the each component in the pressure filter;
    - c. Bedding that stabilizes the access box; and
    - d. Grading around the access box that promotes drainage of surface water away from the access box and minimizes the possibility of damage during lawn mowing and maintenance operations.
  2. If site conditions permit, the force main must drain to the dose tank after dosing.
  3. Driplines must be designed to be installed below original grade at a depth recommended by the dripline manufacturer (typically 6" to 12").
  4. Each air/vacuum release valve must be enclosed in an access box having:
    - a. An access opening of at least 113 in<sup>2</sup> (approximately 12" diameter);
    - b. Insulation of at least 2" of extruded polystyrene (XPS, or foam board) permanently attached to the underside of the access box lid;
    - c. An air gap of at least 2" between the XPS insulation and the top of the air/vacuum release valve;
    - d. Bedding that stabilizes the access box; and
    - e. Grading around the access box that promotes drainage of surface water away from the access box and minimizes the possibility of damage during lawn mowing and maintenance operations.

5. The hydraulic design and operation of each zone in the SDS SAF must:
    - a. Operate within the pressure range of the pressure-compensating emitters, as specified by the dripline manufacturer; and
    - b. Manage redistribution of effluent at the completion of a dose cycle (drain-down) to prevent localized overloading to the lower portions of each zone by incorporating:
      - 1) Devices (e.g., check valves, air relief valves, etc.); or
      - 2) Methods (e.g., manifolds, elevated loops, etc.).
  6. The authorized designer must mathematically support the design for equal distribution of effluent in each zone using the design charts, tables, formulas, or spreadsheet of the SI:
    - a. With respect to the specific components selected by the authorized designer; and
    - b. Including head loss during dosing and flushing with respect to the overall size of each zone and number of lateral connections in each zone.
- H. Specifications for SDS must:
1. Specify that soil plasticity tests be conducted by the authorized installer prior to installation of the SDS SAF, and include the wording in *Section VIII.C*; and
  2. List all components of the SDS.

### VIII. Requirements for authorized installers

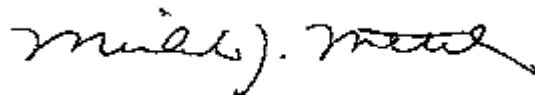
- A. Prior to construction, the subsurface drip system (SDS) soil absorption field (SAF) must be laid out on the site by the authorized installer. The authorized installer must:
  1. Schedule a visit to the site with the department or LHD, whichever has authority for plan review and approval as described in *Section IV.C and D*, to verify that the layout of the SDS SAF complies with the approved plan; and
  2. If the layout of the SDS SAF does not comply with the approved plan, inform the authorized designer that revised plans must be prepared and submitted for review and approval prior to commencing construction.
- B. Prior to construction, the installer must notify the following as to the start date of construction and anticipated date of the installation of driplines:
  1. If plan review and approval has not been delegated to the LHD as provided for in *Section IV.C and D*, the department at least 15 days prior to construction and the LHD according to its written procedures; or
  2. If plan review and approval has been delegated to the LHD as provided for in *Section IV.C and D*, the LHD according to its written procedures.
- C. A SDS SAF must not be constructed during periods when the soil is sufficiently wet to exceed its plastic limit. **Before installation of the SDS SAF, the authorized installer must perform, and the soils must pass, soil plasticity tests.** Soil plasticity tests include the evaluation of soil samples throughout the SDS SAF site, from the surface to the depth of installation, to assure that the plastic limit of the soil is not exceeded. The plastic limit of a soil is exceeded when the soil can be rolled between the palms of the hands to produce threads one-eighth (1/8) inch in diameter that do not easily break apart or crumble.
- D. The SDS and SDS SAF, when installed, must comply with the requirements of the construction permit and approval letter (if applicable), and the approved plans. Any changes, alterations, or additions that deviate from the construction permit or approved plan must be approved by the following prior to construction:
  1. If plan review and approval has not been delegated to the LHD as provided for in *Section IV.C and D*, the department and the LHD; or

2. If plan review and approval has been delegated to the LHD as provided for in *Section IV.C and D*, the LHD.
- E. Prior to construction, the authorized installer must:
  1. Protect the SDS SAF site from construction traffic (that may cause soil compaction); and
  2. Protect the dripline from ultraviolet radiation according to the manufacturer's requirements.
- F. During installation, an authorized installer must:
  1. Be present at all times; and
  2. Directly supervise all work.
- G. During installation, the authorized installer must:
  1. Insure that all connections and tank risers are watertight;
  2. If an onsite system for a replacement SAF utilizes existing components, document that each component is watertight, in good condition, and complies with size and product requirements as required in *Section VI.C.2*;
  3. Protect the force main, manifold, driplines, connections, and system components against the entry of construction debris and soil materials during installation of the SDS;
  4. Install the driplines at the same depth and along the contour of the site using a method recommended by the dripline manufacturer and SI that will minimize:
    - a. Pulling, stretching, or crimping of the dripline; and
    - b. Smearing, compaction, or altering of the soil structure; and
  5. Through final grading, insure that surface water flows away from access lids and the SDS SAF.
- H. For SDS SAF sites with a slope of  $> 15\%$  and  $\leq 25\%$ , the authorized installer must take measures to protect the expansion area required in *Section VI.C.3*.
- I. After installation the authorized installer must notify the department or LHD, whichever has authority for plan review and approval as described in *Section IV.C and D* to schedule a final inspection.

#### **IX. Requirements for authorized service providers**

- A. Operation and maintenance (O&M) of a subsurface drip system (SDS) must be performed by an authorized service provider according to the requirements in the SI O&M program.
- B. Performance and O&M of a SDS must be documented in accordance with the SI O&M program by an authorized service provider:
  1. At SDS start-up; and
  2. For scheduled and unscheduled O&M.
- C. Authorized service providers must have and know how to operate equipment necessary to assess and adjust the operation of all components as necessary to bring a SDS into compliance with the SI O&M program.

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