

## Section 8.6. LFH At-grade Treatment Systems

### 8.6.1. LFH At-grade Treatment Systems— Objectives and Design Standards

#### 8.6.1.1. General

- 1) An *LFH At-grade system* shall meet the following objectives:
  - a) break down the *organic loading* contained in the *effluent*,
  - b) provide an area of *soil* over which the *effluent* is spread to reduce the hydraulic and *organic loading* on each part of the *soil infiltration surface*,
  - c) spread the *effluent* over a suitably sized area to enable sufficient oxygen to be transferred through the *soil* in order to achieve treatment objectives and long-term utilization, and
  - d) introduce the *effluent* into the *soil* and be constructed in a manner that minimizes the risk of *effluent* breakout through the material covering the *soil infiltration surface* area that provides a barrier against direct contact with the *effluent*.
- 2) The design of an *LFH At-grade system* shall meet all requirements and objectives set out in Section 8.1.

#### 8.6.1.2. Effluent Treatment Objectives in Soil

- 1) An *LFH At-grade system* shall treat the applied *effluent* as it migrates through the *soil*, as measured at the *vertical separation treatment boundary limit* required for the design and *effluent* quality being applied, to the following quality:
  - a) fecal coliform < 10 cfu/100 mL above background levels, or
  - b) fecal coliform < 2 MPN/gram of dry *soil* above background levels.

#### 8.6.1.3. Applied Effluent Quality

- 1) The *effluent* applied to the *soil infiltration surface* of an *LFH At-grade system* shall meet a *secondary treatment* standard Level 2 as set out in Article 5.1.1.1. or better quality.

#### 8.6.1.4. Located in Forested Area

- 1) The *LFH At-grade system* shall be located in a forested area that
  - a) provides shelter from the cooling effect of winds and also maximizes snow cover over the system, and
  - b) has a minimum 50 mm (2 in) LFH layer that allows the relatively fast horizontal spread of the applied *effluent* over the *soil-based treatment area* that is under the *cover material* of the system.

#### 8.6.1.5. Cover Material and Stability

- 1) The material covering the *LFH At-grade system soil infiltration surface area* shall be consistent with the ecology of the forested area and be effective at minimizing the risk of direct contact with the *effluent* by humans and animals.<sup>1</sup>
- 2) The depth of the cover material shall be a minimum of 230 mm (9 in.) above the *infiltration* chambers after settlement of the cover material occurs.<sup>2</sup>
- 3) The slope of the cover material shall be minimized to prevent slumping and loss of cover depth, or be stabilized using acceptable methods.

- 4) The cover material shall extend a sufficient distance beyond the *infiltration* chambers to ensure that the *effluent* applied at the design *effluent* hydraulic loading rate infiltrates into the *soil* within the cover material to prevent risk of direct contact.

<sup>1</sup> Note: Sentence (1) — The cover material typically used is wood chips. Wood chips are suitable with the forest ecology where these systems are to be installed. The wood chips allow the forest undergrowth to grow through the cover material, consolidating the entire system into the forest floor over time. This is important to minimize the risk of direct contact with the effluent by people or animals.

<sup>2</sup> Note: Sentence (2) — The depth of the cover material at time of installation will need to be substantially more than 230 mm (9 in.) to allow for settling and still achieve a minimum 230 mm (9 in.) cover after settlement. Fresh wood chips will settle substantially while old weathered wood chips will not settle as much. Anticipating that fresh wood chips may settle by 50% is not unreasonable.

#### 8.6.1.6. Effluent Loading Rates

- 1) The *effluent hydraulic loading rate* on the *soil infiltration surface* directly under the *infiltration* chambers shall not exceed 40.7 litres per sq. metre per day (0.83 gal./sq. ft./d) or as limited by Sentences 8.1.2.2 (2) and 8.1.1.2 (3) to achieve effective treatment of the *effluent*.
- 2) Notwithstanding Sentence (1),
  - a) the area provided by the actual internal open area of the chamber needs to cover a minimum of 80% of the required *soil infiltration surface* area determined under Sentence (1), or
  - b) the *effluent hydraulic loading rate* can be increased by a factor as allowed by Article 8.3.1.5.
- 3) The design *effluent hydraulic loading rate* on the *soil infiltration surface* area under the *LFH At-grade system* cover material shall not exceed the values set out in Table 8.1.1.10.<sup>1</sup>
- 4) The *soil infiltration surface* area required by Sentence (3) shall include the area covered by the *infiltration* chambers and the cover material
  - a) on both sides of the *infiltration* chamber when the slope is less than 1%, or
  - b) only on the downslope side of the *infiltration* chamber when the system is on a slope greater than 1%.

<sup>1</sup> Note: Sentence (3) — The total area covered by both the infiltration chambers and cover material, as set out in Sentence 4, is determined by dividing the peak daily wastewater flow by the allowed effluent hydraulic loading rate set out in Table 8.1.1.10. for the soil at the site.

#### 8.6.1.7. Time Controlled Pressure Distribution of Effluent Required

- 1) *Effluent* shall be distributed using an *effluent pressure distribution lateral pipe* system meeting the design requirements and objectives of Subsection 2.6.1.
- 2) Time controlled dosing of the individual doses of *effluent* applied to the *LFH At-grade system* shall be evenly spread over a 24-hr. period, and the volume of each *effluent* dose shall be minimized to achieve as many doses as possible in a 24-hr. period based on system design flows.

#### 8.6.1.8. System Geometry and Linear Loading Rate Design

- 1) The design and geometry of the *effluent soil-based treatment area* of the *LFH At-grade system* shall result in an *effluent hydraulic linear loading rate* that does not exceed the *soil profile's* capability to allow the horizontal movement of the *effluent* away from the treatment system when downward vertical *effluent* flow will be restricted and shall be designed to meet
  - a) the values set out in Table 8.1.1.10. that relate horizontal movement of *effluent* through the *soil* to the characteristics of the *soil* profile and the slope of the landscape, or

- b) a comprehensive and documented assessment and calculation of the *soil's* capacity to transmit the *effluent* horizontally, as set out in Article 8.1.1.9.

#### 8.6.1.9. Orientation on Slopes

- 1) The geometry of the *LFH At-grade system* shall conform to the surface slope contour of the site it is placed on such that
  - a) the long axis of the *LFH At-grade system*, including any 3 m (10 ft.) segment of the *LFH At-grade system*, shall be oriented at 90 degrees to the slope direction, and
  - b) the downslope edge of the *LFH At-grade system* where it makes contact with the in situ *soil* surface shall
    - i) be level along its length within 2% as measured from end to end or in any 3 m (10 ft.) segment of the *LFH At-grade system*,
    - ii) be level within 100 mm (4 in.) as measured within any 600 mm (2 ft.) segment of its length, and
    - iii) when placed on a convex slope, the deflection of curvature of the *LFH At-grade system* where it meets the in situ *soil* will not exceed 15%, as measured by the horizontal deflection from a plane drawn from each end of the *LFH At-grade system*.

### 8.6.2. LFH At-grade Treatment Systems – Prescriptive Requirements and Installation Standards

#### 8.6.2.1. Separation Distances

- 1) An *LFH At-grade system* shall not be located within
  - a) 15 m (50 ft.) of a *water source or water well*,
  - b) 100 m (330 ft.) of a municipal licensed water well,
  - c) 15 m (50 ft.) of a *water course*, except as restricted in Article 2.1.2.4.,
  - d) 3 m (10 ft.) of a *property* line where the ground is level or slope is less than 1%,
  - e) 6 m (20 ft.) of a *property* line that is located downslope of the *LFH At-grade system* where the slope is 1% or more,
  - f) 3 m (10 ft.) of a *septic tank, packaged sewage treatment plant, effluent tank, or other tank* in the system, and
  - g) 10 m (33 ft.) of a *building*.
- 2) For the purposes of Sentence (1), all measurements are to be taken from the point where the side slope of the *cover* material intersects with the natural *soil* contour.

#### 8.6.2.2. Infiltration Chambers Covering the Effluent Pressure Distribution Laterals

- 1) Each distinct row of *infiltration* chambers that provide the direct *soil infiltration surface* area required for the *LFH At-grade system* shall include at least one *effluent pressure distribution lateral pipe* that has orifices spaced at not more than 600 mm (2 ft.) apart and that meets the requirements of Section 2.6.
- 2) Chambers shall meet the requirements set out in Sub-section 8.6.3.

### 8.6.2.3. Individual Infiltration Chamber Laterals Level Throughout Length

- 1) Each lateral that consists of the *effluent pressure distribution lateral pipe* and covering *infiltration chamber* shall be level along the long axis within
  - a) 2% end to end,
  - b) 2% within any 3 m (10 ft.) segment of the lateral, and
  - c) 10 cm (4 in.) within any 600 mm (2 ft.) segment.

### 8.6.2.4. Design for 5 Individual Doses Per Day

- 1) The design of the *pressure distribution lateral pipe system*, the *effluent tank*, and pump control settings shall be based on achieving the ability to deliver individual doses of *effluent* that do not exceed 20% of the design average daily *effluent* volume over the entire *LFH At-grade system*.<sup>1</sup>

<sup>1</sup> *Intent: Sentence (1) — Smaller individual-dose volumes provide better treatment conditions and minimize the chance that the effluent will break out of the At-grade system due to a large individual-dose volume. Doses may be smaller than 20%. A 20% dose volume results in 5 doses per day. The entire At-grade systems does not have to be dosed during an individual dose event; however, the design must be based on each dosed area of the At-grade system receiving 5 doses of effluent per day based on average daily flow. For example, if a distribution system was designed with two alternating zones, the system needs to be designed on the basis of 10 doses per day in total — 5 doses for each zone.*

### 8.6.2.5. Cover Material Depth, Slope and Stabilization

- 1) The *cover material* shall be a minimum of 225 mm (9 in.) in thickness over all *infiltration chambers* in the *LFH At-grade system* when settled.<sup>1</sup>
- 2) The *cover material* shall consist of materials set out in Article 8.6.3.2.
- 3) The placed cover material shall have a maximum slope of
  - a) 2 horizontal to 1 vertical when no stabilization method is used, or
  - b) 1 horizontal to 1 vertical when acceptable geo-tech erosion control and slope stabilizing material is used to contain and stabilize the *cover material*.

<sup>1</sup> *Note: Sentence (1) — The depth of the cover material at time of installation will need to be substantially more than 230 mm (9 in.) to allow for settling and still achieve a minimum 230 mm (9 in.) cover after settlement. Fresh wood chips will settle substantially while old weathered wood chips will not settle as much. Anticipating that fresh wood chips may settle by 50% is not unreasonable.*

### 8.6.2.6. Minimize Impact on LFH Layer and Underlying Soil During Construction

- 1) The LFH layer of the *soil profile* shall not be removed in the area of the *LFH At-grade system*.
- 2) Brush and small trees shall be cut off at ground level, not pulled out of the ground.
- 3) The installation shall be carried out in a manner that minimizes compaction of the soil under the *LFH At-grade system* and the downslope side of the *LFH At-grade system*.

### 8.6.2.7. Effluent Monitoring Access Ports

- 1) The *LFH At-grade system* shall include access ports into the *infiltration chambers* that have a minimum dimension of 100 mm (4 in.) and that terminate at the surface of the *cover material* in order to enable monitoring the depth of *effluent ponding* and *soil moisture conditions* at the *soil infiltration surface*.
- 2) At a minimum, there shall be two access ports as required by Sentence (1), each one located not more than 4.5 m (15 ft.) from each end of a continuous row of *infiltration chambers* that cover an individual *effluent pressure distribution lateral pipe*.
- 3) The access ports required by Sentence (1) shall
  - a) be accessible from the surface of the *cover material* at finished elevation,
  - b) be fitted with a mechanically fastened top to prevent the entry of foreign material,

- c) allow viewing of both the *infiltration* chamber interior and *soil infiltration surface*, and
- d) provide access for sampling of the *soil infiltration surface*.

### 8.6.3. LFH At-grade Treatment System - Material Requirements

#### 8.6.3.1. Infiltration Chamber

- 1) All chambers shall meet or exceed the requirements of the American Association of State Highway and Transportation Officials H -10 or H -20 ratings.

#### 8.6.3.2. Cover Material

- 1) The *cover material* used shall be
  - a) wood chips of a size that easily allows the grain of the wood to be seen (sawdust is not acceptable), or
  - b) peat moss that is seeded with a vegetative selection that is free of invasive species and suitable to the forest ecology in order to establish a vegetative cover that will stabilize the peat moss.
- 2) Material used to stabilize *cover material* shall be a geo-tech erosion control and stabilizing material that
  - a) will hold the *LFH At-grade system cover material* in place to prevent slumping from mechanical or natural forces, and
  - b) is made of a decomposable material.