

On-Site Rule Revision Issue –Proprietary Product Field Testing Table VI and Table IX WAC 246-272A-0230, WAC 246-272A-0280 (revisited)

Problem Statement

Proposed changes to Table III (WAC 246-272A-0110) require changes to Table VI (WAC 246-272A-0230) and Table IX (WAC 246-272A-0280). After review, ORRC members expressed concern that the appropriate Treatment Levels (TL) were provided in Table IX. The proposed changes to WAC 246-272A-0230 reflect an update to match the language and requirements of the proposed Table III. This update ensures that these different sections of the rule function together. The proposed revision to Table IX includes the results of a review of its appropriateness. This included a literature review and a review for compatibility with the rest of the rule, particularly Table VI. The review lead to proposed changes to bring Table IX into agreement with Table IV. These changes are meant to ensure adequate protection of public health by ensuring that appropriate treatment is provided in repairs that do not meet the required setbacks.

The proposed changes to Table IX are presented followed by a discussion and a summary of literature.

WAC 246-272A-0230

RED - deleted

BLUE - added

Design requirements—General *(excerpt)*

TABLE VI
Treatment Component Performance Levels and Method of Distribution¹

Vertical Separation in inches	Soil Type		
	1	2	3-6
12 < 18	A + DL1 pressure with timed dosing	B + DL2 pressure with timed dosing	B + DL2 pressure with timed dosing
≥18 < 24	B + DL2 pressure with timed dosing	B C + DL3 pressure with timed dosing	B C + DL3 pressure with timed dosing
≥24 < 36	B + DL2 pressure with timed dosing	C + DL3 pressure with timed dosing	E – pressure with timed dosing
≥36 < 60	B + DL2 pressure with timed dosing	E - pressure	E - gravity
≥60	C + DL2	E - gravity	E - gravity

	pressure		
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WAC 246-272A-0280

RED - deleted

BLUE - added

Repair of Failures (*excerpt*)

Proposed changes due to changes to Table III and Conformance with Table VI:

Vertical Separation (in inches)	Horizontal Separations ²											
	< 30			≥ 30 < 50			≥ 50 < 100			≥ 100		
	Soil Type			Soil Type			Soil Type			Soil Type		
	1	2	3-6	1	2	3-6	1	2	3-6	1	2	3-6
< 12	A + DL1	A + DL1	A + DL1	A + DL1	A + DL1	A + DL1	A + DL1	A + DL1	B + DL2	B + DL2	B + DL2	B + DL2
≥ 12 < 18	A + DL1	A + DL1	A + DL1	A + DL1	B + DL2	B + DL2	A + DL1	B + DL2	B + DL2			
≥ 18 < 24	A + DL1	A + DL1	A + DL1	A + DL1	B + DL2	B + DL2	A + DL1	B + DL2	B + DL2			
≥ 24 < 36	A + DL1	B + DL2	B + DL2	B + DL2	B + DL2	B + DL2	B + DL2	B + DL2	C + DL3			
≥ 36	A + DL1	B + DL2	B + DL2	B + DL2	C + DL3	C + DL3	B + DL2	C + DL3	C + DL3	Conforming OSS		

Current:

**TABLE IX
Treatment Component Performance Levels for Repair of OSS Not Meeting
Vertical and Horizontal Separations¹**

Vertical Separation (in inches)	Horizontal Separation ²											
	< 25 feet			25 < 50 feet			50 < 100 feet ³			≥100 feet		
	Soil Type			Soil Type			Soil Type			Soil Type		
	1	2	3-6	1	2	3-6	1	2	3-6	1	2	3-6
< 12	A	A	A	A	A	A	A	A	B	B	B	B
≥ 12 < 18	A	A	A	A	B	B	A	B	B	Conforming Systems		
≥ 18 < 24	A	A	A	A	B	B	A	B	C			
≥ 24 < 36	A	B	B	B	C	C	B	C	C			
≥ 36	A	B	B	B	C	C	B	C	E			



¹The treatment component performance levels correspond with those established for treatment components under the product performance testing requirements in Table III of WAC 246-272A-0110.

²The horizontal separation indicated in Table IX is the distance between the soil dispersal component and the surface water, well, or spring. If the soil dispersal component is up-gradient of a surface water, well, or spring to be used as a potable water source, or beach where shellfish are harvested, the next higher treatment level shall apply unless treatment level A is already required.

³On a site where there is a horizontal setback of 75 - 100 feet between an OSS dispersal component and an individual water well, individual spring, nonmarine surface water or surface water that is not a public water source and a vertical separation of greater than twelve inches, a conforming system that complies with WAC 246-272A-0210(4) shall be installed if feasible.

Cells identified for possible changing of treatment level:

Vertical Separation (in inches)	Horizontal Separations ²											
	<25			25 < 50			50 < 100			≥ 100		
	Soil Type			Soil Type			Soil Type			Soil Type		
	1	2	3-6	1	2	3-6	1	2	3-6	1	2	3-6
< 12	A	A	A	A	A	A	A	A	B	B	B	B
≥ 12 < 18	A	A	A	A	B	B	A	B	B			
≥ 18 < 24	A	A	A	A	B	B	A	B	C B			
≥ 24 < 36	A	B	B	B	C B	C	B	C B	C			
≥ 36	A	B	B	B	C	C	B	C	C			

 Changed due to not being more stringent than Table VI
 Concern that fecal coliform reductions are adequate

Discussion

ORRC members expressed concern that the appropriate Treatment Levels (TL) were provided in Table IX. DOH committed to the goal of the table requiring treatment to <200 FC before effluent mixes with surface water. 200 FC represents the bodily contact threshold as recommended by EPA and Department of Ecology. DOH staff conducted literature review to determine appropriate treatment levels (summarized in the following table). The concern focused on TLB applications at 24 inches or less of vertical separation, especially with less than 50 feet of horizontal separation (yellow highlighted cells above). After review of the literature it was determined that the current treatment levels are appropriately protective. The literature indicates that gravity distribution of effluent treated to TLB through all soil types (except type 1) reaches <200 FC, except in a few instances (highlighted in yellow in table below). These data points are notably inconsistent with others and may be outliers.

The two yellow highlighted cells (TLBs) in the <25 ft tier in the table above are perhaps the most concerning because of the potential to contaminate surface waters, wells, and springs. The literature supports that type 2 soils (sands) can achieve adequate FC reductions at 24 inches. This is the prescribed depth for sand filter beds, which are recognized as achieving 3 logs of FC reduction. The literature is not as conclusive for soil types 3-6 for gravity distribution. However, these examples do not account for the added treatment provided by pressure distribution. All TLA and TLB effluent is required to be applied by pressure distribution. Numerous studies (listed at end of this paper) confirm that pressure distribution provides significantly enhanced FC reduction. This enhanced treatment can be considered approximately .5 - 1.0 of FC log removal. The examples of pressure distribution in the table below (red text) demonstrate that at as low as 18 inches of vertical separation pressure distribution reduces TLB effluent to <200 FC.

Literature indicate that lateral (horizontal) movement through groundwater reduce FC concentrations. This may be through dilution on some sites but is also a result of adsorption onto soil particles and predation by soil microbes. This is relevant for applications in horizontal setbacks ≥ 25 ft. A limited literature review on this topic found that 30 feet horizontal movement can be expected to provide approximately .5 log reduction. Applying this reduction to the final FC concentrations in the yellow cells in horizontal setbacks ≥ 25 ft in the table below (without considering pressure distribution) brings all of these levels to <200 FC. DOH recommends adjusting the initial horizontal setback tier from <25 ft to <30 ft to ensure that this level of treatment is provided for all OSS that can meet this setback.

Summary of soil FC removal efficiency by type found in literature.

	FC CFU /100ml of test influent	Soil Type	Inches of Vertical Separation	% Removal Efficiency	TLC	TLB
					FC: 50000	1000
					Final FC Concentration	Final FC Concentration
Karathanasis et al. (2006)						
Loamy Sand (Soil Type 3) 18" vertical separation	940,000	3	18	99.90%	50	1
Loamy Sand (Soil Type 3) 24" vertical separation	940,000	3	24	99.98%	10	0.2
Loamy Sand (Soil Type 3) 18" vertical separation	330,000	3	18	93.80%	3100	62
Loamy Sand (Soil Type 3) 24" vertical separation	330,000	3	24	77.90%	11050	221
Anderson et al. (1994) 24" vertical separation						
Fine Sand (Soil Type 4) Pressure Dosed	370,000	3	24	99.90%	50	1
Ausland et al. (2002) 48" vertical separation						
Fine Sand (Soil Type 4) Pressure Dosed	2,000,000	4	48	99.90%	50	1
Fine Sand (Soil Type 4) Gravity Dosed	2,000,000	4	48	99.90%	50	1
Cogger et al. (1988) Pressure Distribution Drainfield						
Fine Sand (Soil Type 4) 12"-18" vertical separation (50% of the time)	2,500,000	4	12 thru 18	99.70%	150	3

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24"-36" vertical separation (72% of the time)	2,500,000	4	24 thru 36	99.90%	50	1
Alhajjar et al. (1988)						
36" vertical separation						
Sandy Loam (Soil Type 4) Gravity Flow Drainfield	63,000	4	36	99.90%	50	1
Karathanasis et al. (2006)						
Sandy Loam (Soil Type 4) 18" vertical separation	647,000	4	18	98.90%	550	11
Sandy Loam (Soil Type 4) 24" vertical separation	647,000	4	24	99.60%	200	4
Loam (Soil Type 4) 18" vertical separation	633,000	4	18	99.38%	310	6.2
Loam (Soil Type 4) 24" vertical separation	633,000	4	24	99.80%	100	2
Sandy Loam (Soil Type 4) 18" vertical separation	758,000	4	18	70.80%	14600	292
Sandy Loam (Soil Type 4) 24" vertical separation	758,000	4	24	98.20%	900	18
Hepner et al. (2007)						
12" - 24" vertical separation						
Silty clay loam (Soil Type 5) Drip Dispersal	2,700,000	5	12 thru 24	99.99%	5	0.1
Cooper et al. (2014)						
Silt Loam (Soil Type 5) 12" vertical separation Pressurized shallow Drainfield and GeoMat	30000 (sand filter effluent)	5	12	99.90%	50	1
Karathanasis et al. (2006)						
Silt Loam (Soil Type 5) 18" vertical separation	235,000	5	18	94.40%	2800	56
Silt Loam (Soil Type 5) 24" vertical separation	235,000	5	24	98.90%	550	11

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Silt Loam (Soil Type 5) 18" vertical separation	98,000	5	18	99.90%	50	1
Silt Loam (Soil Type 5) 24" vertical separation	886,000	5	24	99.90%	50	1
Clay Loam (Soil Type 6) 18" vertical separation	886,000	6	18	87.40%	6300	126
Clay Loam (Soil Type 6) 24" vertical separation	886,000	6	24	63.70%	18150	363
EPA ISF Fact Sheet						
Sand Filter Sand (Type 2) 24" vertical separation	typical	2	24	99.90%	50	1

References

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