



**Clarification for Use of Tables 10-1, 10-2 and 10-3 of Regulation 43
 When Designing an Unlined (Open Bottom) Sand Filter System**

The Water Quality Control Division (Division) has received inquiries regarding the use of size adjustment factors in Tables 10-1, 10-2 and 10-3 when an unlined sand filter (Section 43.11(C)(2)(c)) is proposed. The following examples are used to provide a clarification of the requirements of Regulation 43.

Example 1: A 3-bedroom home is proposed in a soil type “0”. The existing material is removed and 3 feet of C-33 sand is placed in the excavation. Pressure distribution is required to be used to distribute TL1 effluent into rock media through perforated distribution laterals. The following calculations show how the Soil Treatment Area (STA) must be sized:

Flows: 450 gpd = Three-bedroom home at 150 gal./bedroom

Table 10-1:

- Soil Type “0”
- TL1 = *Minimum 3’ deep unlined sand filter required*²
- *Footnote 2: Design shall conform to section 43.11(C)(2)(c), Unlined Sand Filters*

Application Rate: 1.0 gpd/ft² based on the following:

Section 43.11(C)(2)(c)(3) states: “An unlined sand filter is to be sized based on section 11.C.2.a.(4)(i) or the long-term acceptance rate of the receiving soil for TL3, whichever results in the larger area.”

Section 43.11(C)(2)(a)(4)(i) states: “When receiving wastewater that meets TL1 treatment level, a maximum sand filter application rate of 1.0 gpd/ft² must be used.”

Since the receiving soil is Soil Type “0”, the application rate (LTAR) would revert to 1.0 gpd/ft²

STA Size: GPD/LTAR = 450/1.0 = 450 ft²

Table 10-2: *Method of Application, Size Adjustment Factor, for All Treatment Levels.* The adjustment factor for a pressure dosed bed is “1.0”, thus 450 x 1.0 = 450 ft².

Table 10-3: *Types of Distribution Media, Size Adjustment Factor, Only for TL1 Effluent.* Relative to this example, the adjustment factors found in this table may not be used due to the following reason:

- Footnote 2 in Table 10-1, “*Design shall conform to section 11.C.2.c, Unlined Sand Filter.*” The requirements for unlined sand filters are found within section 43.11 of Regulation 43 titled, “*Design Criteria - Higher Level Treatment Systems*”. As an unlined sand filter provides a treated effluent to the native soil, it is considered a HLT system. Therefore, the reductions provided in Table 10-3 may not be used. However, the “*minimum 3 foot deep unlined sand filter*” requirement in Table 10-1 for soil type “0” creates a unique situation. As this requirement is found under the “*Treatment Level 1*” category of Table 10-1, local public health agencies that do not have an inspection and oversight program may still allow unlined sand filters for soil type “0” designed under the requirements noted above. Note that the bottom of the 3 feet deep sand filter must be at least 2 feet above the high ground water or bedrock (43.11(C)(2)(c)(1)).



Example 2: If an unlined sand filter receives TL1 quality effluent and was installed above a Soil Type “2”, the following section of Regulation 43 would apply:

Section 43.11(C)(2)(c)(3) states: “An unlined sand filter is to be sized based on section 11.C.2.a.(4)(i) or the long-term acceptance rate of the receiving soil for TL3, whichever results in the larger area.”

The size of the soil treatment area would be calculated as follows: $450 / 1.0$ (43.11(C)(2)(c)(3)) = 450 ft^2 . $\times 1.0$ (for a pressure distributed bed; Table 10-2) = 450 ft^2 . As this design includes a higher level treatment component, Table 10-3 may not be used. Thus the size requirement for the STA would be 450 ft^2 .

Note that the required depth for the C-33 sand in this example is only 2 feet, but must be installed so the bottom of the sand filter is at least 2 feet above the high ground water or bedrock (43.11(C)(2)(c)(1)). Further, the local public health agency must have a program for inspection and oversight of higher level treatment systems in order to receive the reductions provided to this system.

Example 3 (REVISED SECTION): If an unlined sand filter receives TL2 quality effluent or better, and was installed above a soil type “2”, the initial October 2014 clarification document indicated that the following section of Regulation 43 would apply:

Section 43.11(C)(2)(a)(4)(ii) states: “When receiving wastewater that meets TL2, TL2N, TL3, or TL3N treatment levels, the sand filter must be sized based on the long-term acceptance rate for Soil Type 1.” Thus the size of the STA would be $450 / 1.25 = 360 \text{ ft}^2$.

However, additional review of Regulation 43 suggests that there is an additional section that modifies the sizing and would actually be more appropriate. Section 43.11(C)(2)(c)(3) states: “An unlined sand filter is to be sized based on section 11.C.2.a.(4)(i) or the long-term acceptance rate of the receiving soil for TL3, whichever results in the larger area.” Note that the LTAR of the receiving soil as defined in Table 10-1 for soil type 2 is 1.40 gal./sq.ft.day, yet section 43.11(C)(2)(c)(3) states that a 1.0 gal./sq.ft. application rate must be used as it results in the larger area. Thus the size of the STA would be $450 / 1.0 = 450 \text{ ft}^2$.

In a different scenario, if the receiving soil were a soil type 3, the LTAR for sizing of the system would be 0.6 gal./sq.ft./day based on the LTAR of the receiving soil for TL3, which results in a STA that is greater than a STA based on a LTAR of 1.0 gal./sq.ft.day. Therefore in this instance the size of the STA would be $450 / 0.6 = 750 \text{ ft}^2$.

The reason behind the use of 43.11(C)(2)(c)(3) is that receiving soils do have a maximum loading rate, even for highly treated effluent. You cannot apply wastewater at a 1.25 gal./sq.ft. application rate when the soil will only accept it at a rate that is significantly less. Application rates must be based on both the strength of the wastewater and the permeability of the receiving soil.

As in the prior clarification document, the required depth for the C-33 sand in this example is also 2 feet, however the bottom of the sand filter may be at or above the high ground water or bedrock (43.11(C)(2)(c)(2)). Further, the local public health agency must have a program for inspection and oversight of higher level treatment systems in order to receive the reductions provided to this system.

As shown in Example 3 above, the STA size reductions with the use of Higher Level Treatment systems are provided for through increased application rates found in Table 10-1 under the appropriate treatment level column, and under the criteria found within section 43.11(C)(2). It should also be noted that section 43.11(C)(2)(a)(3)(i) states, “Dispersal of effluent to the surface of the sand filter must be by a pressurized distribution system for equal distribution.” Therefore, all calculations shown in the examples above have used the “pressure dosed” adjustment factor from Table 10-2.

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