

***These exercises are intended to support your self-directed learning. Answer the questions based on the SPM Version 3 standards and guidelines for determination of vertical separation (VS) and the limited information provided within each question. Assume that there are no further site/soil constraints or other unusual circumstances that affect VS. Then check the answer key - which includes some helpful SPM references and notes.***

1. What is the minimum required VS for gravity distribution of type 1 effluent to coarse sand?
  
2. Determine the minimum required VS, given the following conditions:
  - uniform distribution
  - demand dosing
  - dose frequency of 6 times per day based on DDF
  - type 2 effluent, type 2 HLR
  - soil texture is loamy sand at the infiltrative surface and at least 30 cm below

The minimum required VS in native soil is \_\_\_\_\_ (fill in the blank).

3. Determine the minimum required VS, given the following conditions:
  - uniform distribution
  - timed dosing
  - dose frequency of 10 times per day based on DDF
  - type 1 effluent, type 1 HLR
  - soil texture is loamy sand at the infiltrative surface and at least 30 cm below

The minimum required VS in native soil is \_\_\_\_\_  
and the minimum as constructed VS is \_\_\_\_\_ (fill in the blanks).

4. Determine the minimum required VS, given the following conditions:
  - uniform distribution
  - demand dosing
  - dose frequency of 14 times per day based on DDF
  - type 2 HLR
  - soil texture is loamy sand at the infiltrative surface and at least 30 cm below
  - sand media will not be used ... is not a practical option due to high transport costs

The minimum required VS is \_\_\_\_\_.

5. Determine the minimum required VS and sand media thickness, given the following conditions:
- sand mound dispersal system (must be uniform distribution, gravity dispersal not allowed)
  - the depth of unsaturated and permeable native soil above seasonal high water table is 30 cm
  - demand dosing
  - dose frequency of 11 times per day based on DDF
  - type 1 HLR is used for sizing the mound sand infiltrative surface (a type 2 HLR is used for the basal loading area check)

The standard for minimum required as constructed VS is \_\_\_\_\_ and ...

the minimum sand media thickness is \_\_\_\_\_ ...

the depth of suitable soil above a limiting condition is \_\_\_\_\_ ...

therefore, the as constructed VS will have to be at least \_\_\_\_\_.

6. Determine the minimum required VS and sand media thickness, given the following conditions:
- sand mound dispersal system (must be uniform distribution, gravity dispersal not allowed)
  - the depth of unsaturated and permeable native soil above seasonal high water table is 30 cm
  - timed dosing
  - dose frequency of 14 times per day based on DDF
  - type 1 HLR is used for sizing the mound sand infiltrative surface (a type 2 HLR is used for the basal loading area check)

The standard for minimum as constructed VS is \_\_\_\_\_ and ...

the standard for minimum sand media thickness is \_\_\_\_\_ ...

the standard for minimum native soil VS is \_\_\_\_\_ ...

the actual depth of native soil above a limiting condition is \_\_\_\_\_ ...

therefore, the constructed mound must have at least \_\_\_\_\_ depth of mound sand

under the infiltrative surface.

7. The depth of permeable, unsaturated soil within a proposed dispersal area is 180 cm. Soil texture is loamy sand. What is the maximum depth from surface to trench bottom (i.e. how deep can the trench be) that will achieve VS standards for gravity dispersal trenches?

8. The native soil has a texture of loam, with 90 cm depth to a restrictive layer of clay loam. A type 1 pressure dispersal system is proposed, with demand dosing at 4 doses per day. What is the required elevation relative to original grade of the infiltrative surface (i.e. how deep?), to meet the minimum VS standards?
9. The depth of suitable soil is 35 cm. A type 1 sand mound with timed dosing is proposed. Dose volume will be 1/12 th of DDF. What is the required elevation relative to original grade of the infiltrative surface, to meet the minimum VS standards?
10. Answer the questions that follow, given the following conditions:
- the configuration of the dispersal system will achieve better than 10% variation in effluent volume applied to each 0.5 sq m portion of the dispersal trenches
  - DDF is 2500 L/day
  - the dosing system will achieve consistent flow equalization throughout the day
  - the volume of each dose will be 155 L per dose
  - a type 2 HLR will be used to determine the area of infiltrative surface
  - soil texture is sandy loam to a depth of 120 cm, with wet clay under that
  - a 10 cm deep blinding layer of mound sand will be used to prevent crusting or “capping”.

Questions:

- a) Is the dosing characterized as ‘normal’ or ‘low’?
- b) Which VS Table applies (Table II- 14, 15, 16, 17 or 18)?
- c) What is the minimum VS in native soil?
- d) What is the minimum as constructed VS?
- e) What is the maximum depth of the dispersal trench that will achieve VS standards?

