SPM Version 3 Orientation Learning Exercise - Installer Answer Key

This exercise is intended to support your self-directed learning.

Start by reading SPM Section I- 4 of Volume 1 for an overview of the new layout.

You may wish to work with the digital version of the SPM, available at the following link: http://owrp.asttbc.org/p/documents.php

The 'paper' versions have a separate table of contents at the beginning of each of the four volumes. The digital version has those, plus a single table of contents covering all four volumes. The digital version table of contents have a 'click and go' feature, and it's helpful to use the 'Find' or 'Search' features.

To complete the exercise, first answer the questions, and then check the answer key - which is available at the SPM Learning Resources page: (http://owrp.asttbc.org/p/resources.php)

The correct answers are indicated in bold font.

1. Which volume of the SPM contains the glossary?
   - **a) I**
   - b) II
   - c) III
   - d) IV

2. Which volume of the SPM contains the guidelines?
   - a) I
   - b) II
   - **c) III**
   - d) IV

3. Which volume of the SPM contains the standards?
   - a) I
   - **b) II**
   - c) III
   - d) IV

4. Which volume of the SPM contains the rationale, references and a listing of design manuals?
   - a) I
   - b) II
   - c) III
   - **d) IV**

5. What is the section identifier for vertical separation standards?
   - a) 2 - 5
   - **b) II- 5.3**
   - c) IV- 5.8
   - d) 3.4.1.1
   - e) I- 4.4.1

6. What is the section identifier for vertical separation guidelines?
    a) I- 4.4.1
    b) IV- 5.8
    c) 2 - 5
    d) II- 5.3
    e) III- 5.3

7. Which pair of section identifiers correspond to standards and guidelines for specification and installation standards?
    a) I- 4.4.1 and III- 3.6.1
    b) II- 6 and III- 6
    c) IV- 6 and II- 5.5
    d) II- 3.6 and II- 4.2

8. Which section contains standards for tank installation?
    a) II- 6.4
    b) Table II- 35
    c) III- 6.4.1.1
    d) IV- 5.9.3 page IV- 22

9. Which section contains guidelines for watertight testing of tanks, including additional detail about procedures, alternative approaches and supporting information?
    a) II- 6.4
    b) Table II- 19
    c) III- 6.4.3.2
    d) IV- 5.9 page IV- 21

10. What is the section identifier for flow monitoring standards?
    a) I- 4.4.1
    b) 2 - 6
    c) 2.4.2
    d) II- 6.1

11. What is the section identifier for flow monitoring guidelines?
    a) I- 3.4
    b) IV- 6
    c) 4 - 6
    d) III- 6.1

12. What is the minimum required horizontal separation distance from a septic tank to a below ground water supply cistern?
    a) 3 m
    b) 7.5 m
    c) 15 m
    d) 30 m

13. What is the minimum required horizontal separation distance from a septic tank to a lake?
    a) 7.5 m
    b) 10 m
    c) 15 m
    d) 30 m

14. What is the minimum required horizontal separation distance from a BC zero discharge lagoon to an irrigation well?
    a) 3 m
    b) 7.5 m
    c) 15 m
    d) 30 m

15. From the Sewerage System Regulation, what is the required setback from a septic tank or pump chamber to a drinking water well?
    a) 3 m
    b) 7.5 m
    c) 15 m
    d) 30 m

16. For repair of an existing system, which of the following procedures requires a Filing submission to the Health Authority?
    a) replacement of transducer
    b) installation of new tank risers and lids
    c) extending trenches for additional area of infiltrative surface
    d) replacement of short sections of pipe when not functioning as intended

17. For repair of an existing system, which of the following procedures <u>does not</u> require a Filing submission to the Health Authority?
    a) replacement of D-box
    b) retrofitting treatment devices
    c) addition of grease interceptor
    d) upgrading trickle gravity to a pump to D-box configuration

18. Which section contains standards for the specification of trench infiltration systems?
    a) III- 6.4
    b) II- 6.6
    c) Table II- 36
    d) III- 6.4.3.2

19. What is the trench width specification standard for a dispersal system on slopes greater than 15%?
    a) 1.83 m (183 cm)
    b) less than 90 cm
    c) 30 to 60 cm
    d) 30 to 90 cm

20. Which table contains specification and installation standards for bed dispersal systems?
    a) Table II- 22
    b) Table II- 32
    c) Table II- 35
    d) **Table II- 38**

21. What is the sand media specification standard for mound sand effective particle size (D_{10})?
    a) < 4% passing the No. 100 sieve
    b) 1/16 mm to 2 mm
    c) >0.25 mm
    d) <0.3 mm

22. What is the minimum required residual pressure (squirt height) when using 3.2 mm (1/8 inch) orifices
    a) 60 cm
    b) 90 cm
    c) 150 cm
    d) 180 cm

23. What is the minimum required depth of drain rock under the distribution piping for a sand mound?
    a) 2.5 cm
    b) 10 cm
    c) 15 cm
    d) 23 cm

24. What is the required soil texture classification for cover soil of sand lined trenches?
    a) loam or sandy loam
    b) permeable native soil
    c) loamy sand, loamy fine sand or sandy loam
    d) clean course sand, mound sand or sand filter coarse sand

25. For gravelless infiltration systems what is the requirement for observation ports?
    a) one on each lateral
    b) at least two per drainfield
    c) two on each lateral, distal and proximal
    d) ports are not required for gravelless systems

26. What is the maximum allowable width of a seepage bed?
    a) 0.9 m
    b) 1.8 m
    c) 3.0 m
    d) 3.6 m

27. What is the minimum vertical separation in native soil for gravity distribution when the percolation rate is 0.5 minutes per inch?
    a) 60 cm
    b) 90 cm
    c) 150 cm
    d) 183 cm

28. For sandy loam, what is the minimum required Vertical Separation (VS) in native soil for uniform distribution of type 1 effluent with low frequency demand dosing?
    a) 45 cm
    b) 60 cm
    c) 70 cm
    d) 75 cm

29. 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).

Notes:

- *Refer to Table II- 10, and Table II- 15.*
- *To determine VS, there are different tables for different types of distribution and different rows for type of dosing and type of effluent HLR. Determination of the minimum VS depth standard requires a 'two pronged approach.' In general, it requires first looking at the dosing frequency tables (Table II - 10, 11 and 12) and then looking at the distribution type tables (Table II- 14, 15, 16, 17, and 18).*
- *In this example, Table II- 10 determines that the proposed dosing is within the 'low' dosing category. Table II- 15 lists the VS standard of 90 cm.*

Answer: ***90 cm***

30. 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).

Notes:

- *Refer to Table II- 11, and Table II- 16.*

Answer: The minimum required VS in native soil is ***45 cm*** and the minimum as constructed VS is ***60 cm.***

31. 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 _____.

Notes:

- *Refer to Table II- 10, Table II- 15 and the notes to Table II- 15 and 16 on page II- 28.*
- *"Confirm that the vertical separation, as planned, meets both the minimum depth of native soil specified (in column 4)* ***and*** *the minimum required total depth of soil plus sand (as constructed VS, column 5)."*
- *Table II- 15 indicates 60 cm VS in native soil, and 85 cm as constructed VS, but since adding sand media to increase the total depth will not be an option, VS in native soil must be equal to or greater than the as constructed VS standard.*

Answer: ***85 cm****.*

32. 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?

Notes:

- *Refer to Table II- 14 and section III- 5.3.2.1.*
- *SPM page III- 64 says: "If soil depth is limited, the infiltrative surface can be placed higher in the soil ("shallow placement"), at the surface ("at grade") or elevated above the surface on a layer of sand media fill ("above grade" or "raised").*
- *180 cm depth of suitable native soil - 150 cm VS standard = 30 cm maximum depth of infiltrative surface/bottom of trench.*

Answer: ***30 cm***

33. 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?

Notes:

- *Refer to Table II- 10 and Table II- 15, and section III- 5.3.2.1.*
- *90 cm depth of suitable native soil - 70 cm VS standard = 20 cm maximum depth of infiltrative surface (depth of trench or bed).*

Answer: ***20 cm***

34. 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?

Notes:

- *Refer to Table II- 11 and Table II- 17.*
- *12 doses per day 'qualifies' as normal timed dosing per Table II- 10, so relevant VS standards are 75 cm minimum as constructed VS, 45 cm min sand depth, 25 cm min native soil VS. There is 35 cm of suitable soil which suggests we need 40 cm of sand media to achieve 75 cm as constructed VS, but the minimum sand media depth is 45 cm, so we need to place the infiltrative surface at least 45 cm above grade.*

Answer: ***45 cm above original grade***

35. What is the minimum DDF for a 3 bedroom residence with 280 m^2 of living area?

Notes:

- *Refer to Table II- 8.*
- *The question does not indicate any information about projected occupancy so we will assume there will be less than 3.75 occupants per Table II- 9.*
- *The area does not exceed 280 m^2 per maximum from Table II- 8.*
- *Therefore, there are no extra allowances required.*

Answer: ***1300 L/day***

36. What is the minimum DDF for a 5 bedroom residence with 400 m^2 and with anticipated occupancy of 8 persons?

Notes:

- *Refer to Table II- 8 and Table II-9.*
- *The question does indicate occupancy, which we should be checking in all cases and confirming with a signed owner's declaration.*
- *Table II- 9 lists a minimum number of occupants of 5.5 persons for a 5 bedroom residence. Don't be distracted by the 'partial person,' by the 0.5 issue. That approach simply allows us to use either Table II- 8 or Table II- 9 when occupancy is not unusually high, and arrive at a similar DDF. For example, if projected occupancy was 4 persons in a 5 bedroom house, we could use Table II- 9 to determine DDF as 5.5 persons x 350 L/day per person flow = 1925 L DDF, which is essentially the same as the 1900 L from Table II- 8. Or to look at it another way, it essentially means that if projected occupancy is greater than 5, then DDF will be calculated based on per person flow rates from Table II- 9, resulting in a higher DDF than the Table II- 8 allowance.*

Answer: 8 persons X 350 L/day = ***2800 L/day***

37. What is the minimum DDF for a sewerage system that will serve a 2 bedroom residence with 200 m^2 of living area and a secondary suite within a detached garage that has 1 bedroom and 55 m^2 of living area? Projected occupancy is 3 persons in the 2 bedroom primary residence and 2 persons in the 1 bedroom secondary residence.

Notes:

- *Refer to Table II- 8, Table II- 9 and section III- 5.1.2.4.*
- *When there are secondary residences of any type, whether detached or part of the primary structure, then the overall DDF must be the sum of DDFs for two distinct residences. For example, in this case the DDF is not 1300 L as per Table II- 8 for a 3 bedroom home, rather is the sum of DDFs for a 2 bedroom home and a 1 bedroom home. This would also be the case if the secondary suite was in the basement or above an attached garage.*

Answer: 1000 L/day + 700 L/day = ***1700 L/day***

38. What is the minimum DDF for a 90 m^2 cabin with an open floor plan (no bedrooms) used for approximately 60 days per year by 5 persons?

Notes:

- *Refer to Table II- 9 and sections III- 3.1.1, III- 3.1.2, III- 3.1.5 and III- 5.1.2.3.*
- *Base your assessment on consultations with the owner and a signed owner's declaration.*
- *If you determine that the structure and use is within the guidance and definition of "seasonal cottage" then use the Table II- 9 DDF per person flow allowance for the seasonal cottage category (250 L/day/person), AND inform the owner of their responsibilities under the SSR.*

Answer: 5 persons X 250 l/day = ***1250 L/day minimum DDF***

39. Is gravity dispersal allowed when the soil percolation rate is 20 seconds per inch?
    a) YES
    b) NO
    c) OK if dosed gravity is used (pump to D-box)
    d) OK only if land slope is less than 15% in the dispersal area

40. Is gravity dispersal allowed when the system has more than 10 cm of sand media under the infiltrative surface?
    a) YES
    b) NO
    c) OK if dosed gravity is used (pump to D-box)
    d) OK only if land slope is less than 15% in the dispersal area

41. Is gravity dispersal allowed when the system has more than 100 m^2 of infiltrative surface?
    a) YES
    b) NO
    c) OK if dosed gravity is used (pump to D-box)
    d) OK only if land slope is less than 15% in the dispersal area

42. Is an Alberta At Grade System allowed if the site is not forested?
    a) YES
    b) NO
    c) OK if type 2 effluent is used
    d) OK if land slope is less than 15% in the dispersal area

43. Which requirements are applicable (in addition to other standards) for dispersal to gravelly sand with perc rate faster than 0.5 minutes per inch?
    a) VS at least 183 cm
    b) gravity dispersal must use pump to D-box
    c) demand dosing with at least 8 doses per day
    d) uniform distribution with timed or micro dosing

For questions 44 to 47, refer to III- 3.6 Installation. The 'questions' are direct quotes from the SPM. Fill in the blanks with the SPM text.

44. Prior to or during installation, the SSR requires that if any **material changes** are made to the information filed, the AP must **file an amendment** with the Health Authority to update the filing.

45. Changes significant enough to require filing an amendment include … **relocation** of the dispersal system to a different area … changes to the system design that result in **departures from SPM** standards (e.g. a **vertical separation** that does not meet the minimum standard).

46. At system commissioning, it is critical to **record key system operational parameters**.

47. After installation, the installer should provide the filing AP with … record of the installation including **photos** … an Installers **Letter of Certification** … a **record drawing** showing all measurements and locations for system components (**if this is not prepared** by the filing AP). These should be provided within **15 days** of completion of the installation.

For the remaining portion of the exercise (question 48 to 65), refer to III- 6 Specification and Installation Guidelines. The 'questions' are direct quotes from the SPM. Fill in the blanks with the SPM text.

48. Suitable access provisions will include risers or access boxes with **lids exposed flush or above finished grade**, and with adjacent ground sloped to **direct surface water away**.

49. Pump control panels should be located in **external locations** or in a service building that will be accessible to the maintenance provider, and preferably within a **line of sight** of the pump chamber.

50. Any components that need to be accessed or removed from tanks will need to have **handles** or disconnect fittings located within **15 cm** of the riser or access lid.

51. Sewerage systems should include access pipes **(cleanouts)** for access to **flush** the system.

52. The house to tank sewer is a common cause of system **malfunction**, due to **pipe settling** or breakage. **Water** can also leak into defective collection sewers, overloading the system.

53. Effluent filters should be used in septic (trash) tanks **before treatment plants**, unless the manufacturer **specifically recommends** they not be used.

54. Ideally, drain the tank area if there is a risk of **high water table** conditions.

55. All tanks **need to be** vented. If the tank cannot vent back to the **building sewer**, then **provide a vent** that meets Volume II standards.

56. Do not increase the cover depth **except for frost protection** in very cold climate conditions. Limit the depth of cover to **60 cm or less** even in very cold climate conditions.

57. Check the soil moisture at the surface, and at 20 cm depth. Postpone the installation if a soil grab sample can be **rolled into a wire** … also, postpone work if squeezing a grab sample of soil **causes water to escape**. Both of these tests indicate that the soil is **too wet**.

58. In a Seepage Bed, the distribution laterals should be **evenly spaced** across the width of the bed.

59. The standards also provide two specific technologies for at grade systems which are placed directly on native soil and which **follow the slope of the land**: The **At-grade bed** and the Alberta At Grade system.

60. An at-grade bed is **a type of at grade system**. An aggregate bed placed on contour on the scarified **native grade**. Effluent is distributed to this bed by pressure. The technique is intended for use with pressure distribution only. On a sloping site the bed is **not installed level across its width**, the bed follows the ground slope. See Figure III- 20 and Figure III- 21. If the bed is levelled on a sloping site by excavation or adding sand media, then follow the **Seepage Bed standards**.

61. Narrow at-grade beds may be used with a single lateral, with 60 cm orifice spacing along the lateral. For wider beds, use a **maximum lateral spacing of 90 cm on flat** and low slope sites, and maximum **60 cm on sloping** sites.

62. These valves *(hydraulic distributing valves)* should be installed at the **high point** of the distribution network, or check valves should be used to prevent **back pressure** on the valve. Ensure the force main to the valve remains **full to prevent air slugs** causing erratic operation of the valve. An **air vacuum valve** may be used to improve drainage of the valve and filling of the force main.

63. For work on the sand mound, use only **tracked vehicles** with maximum 7 psi ground pressure. Keep a minimum of **15 cm of sand under the machine tracks**.

64. If an aggregate bed or other gravity distribution system is used to distribute treated effluent from the CTDS to native soil (or native soil with a blinding layer), the bed is considered as a seepage bed or trench (depending on width) and **standards for gravity distribution apply**, including site capability and **VS**, aggregate specifications and a maximum trench or bed length of 15 m (measured from the centerline of the CTDS unit along the bed or trench). **Linear Loading Rate** is calculated based on the **contour length of the bed** as for Seepage Beds.

65. When constructing the lagoon it is important to observe soil and groundwater conditions. If a **sand lens** or other **high permeability layer** is seen, investigate and consider relocating the lagoon. This is to avoid risk of the **lagoon draining** to the layer and also to avoid risk of groundwater entering the lagoon and over filling it.