

SPM Version 3 Orientation Learning Exercise - Daily Design Flow Answer Key

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 daily design flow (DDF) and the limited information provided within each question. Assume that the sewage is characterized as 'typical residential' with no unusual circumstances that affect DDF. Then check the answer key - which includes some helpful SPM references and notes.

The correct answers are indicated in bold font.

1. What is the minimum DDF for a 3 bedroom residence with 280 m² 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 m² per maximum from Table II- 8.
- Therefore, there are no extra allowances required.

Answer: **1300 L/day**

2. What is the minimum DDF for a 3 bedroom residence with 230 m² of living area?

Notes:

- Refer to Table II- 8.
- The question does not indicate occupancy so assume less than 3.75 occupants per Table II- 9.
- Table II- 8 is based on number of bedrooms AND floor area ... there is no intended reduction to DDF when the floor area is relatively small ... so although the floor area is less than the maximum for the 2 bedroom category, the correct DDF remains 1300 L/day as per the 3 bedroom row.

Answer: **1300 L/day**

3. What is the minimum DDF for a 3 bedroom residence with 300 m² of living area?

Notes:

- Refer to Table II- 8.
- The question does not indicate occupancy so assume less than 3.75 occupants per Table II- 9.
- The area exceeds the 280 m² maximum area for the 3 bedroom category. So additional DDF is required ... an allowance for area exceeding the maximum floor area ... an additional 3 L/d for each m² of area in excess of 280 m².

Answer: $1300 \text{ L/day} + 3 \text{ L/m}^2 \times (300 \text{ m}^2 - 280 \text{ m}^2) = \mathbf{1360 \text{ L/day}}$

4. What is the minimum DDF for a 5 bedroom residence with 400 m² 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**

5. What is the minimum DDF for a sewerage system that will serve a 2 bedroom residence with 200 m² of living area and a secondary suite within a detached garage that has 1 bedroom and 55 m² 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**

6. What is the minimum DDF for a two story residence, where the upper floor has 3 bedrooms and 200 m² of living area, and a full basement (200 m²) that is currently unfinished? The owner plans to finish the basement as a games room, exercise area, bar and a bathroom. Projected occupancy is no more than 3 persons.

Notes:

- Refer to Table II- 8, Table II- 9 and section III- 5.1.2.1.
- Since the owner plans to finish the basement, it is clear that DDF should include an allowance for that use. However, it will not be a suite, rather just additional living area.

Answer: 1300 L/day + 3 L/m² X (400 m² - 280 m²) = **1660 L/day**

7. What is the minimum DDF for a two story residence, where the upper floor has 4 bedrooms and 300 m² of living area, and a full basement that is currently unfinished? When asked by the Planner, the owner indicates that he hopes to finish the basement in a few years, with a 150 m² hobby room and a 150 m², 2 bedroom rental unit.

Notes:

- Refer to Table II- 8 and section III- 5.1.2.1.
- Since the owner plans to finish the basement, it is in his best interest to construct the current system to accommodate those long term plans. It is clear that DDF should include an allowance for those uses.
- Total DDF will include 1600 L/day for the primary residence (4 bedrooms) PLUS an allowance for the planned 'extra' floor area (the finished hobby room) PLUS an allowance for the planned secondary suite.

Answer: 1600 L/day + 3 L/m² X (450 m² - 330 m²) = 1960 L/day for the primary residence
Plus 1000 L/day for the rental unit, resulting in a total DDF of **2960 L/day**.

8. What is the minimum DDF for a 5 bedroom residence with 450 m² of living area? The kitchen sink is equipped with a garburator. Projected occupancy is generally less than 5 persons.

Notes:

- Refer to Table II- 8, Table II - 9 and sections II- 5.1.3.2 and III- 5.1.3.2.
- Garburators cause a significant increase in suspended solids in effluent. Therefore, tanks and treatment units, and the dispersal system are sized based on an increased DDF (at least by a factor of 1.5).
- So for purposes of sizing components, DDF from Table II- 8 or Table II- 9 is multiplied by 1.5.
- However, for flow monitoring purposes (and others) the relevant quantity is DDF before the increase.
- Therefore, the DDF reported on Health forms and other documented entries related to flow monitoring (maintenance plan) will be the DDF "before this increase."
- In this question, the living area exceeds the Table II- 8 maximum floor area, so an allowance is needed for that, as well as the 1.5 factor for the garburator.

Answer: 1900 L/day + 3 L/m² X (450 m² - 420 m²) = **1990 L/day** for the 'basic' DDF
But for sizing components the DDF is increased by 50%, a 1.5 multiplier, 1990 L/day x 1.5 = **2985 L/day**.

9. What is the minimum DDF for a 90 m² 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, AND consider the severity of site and soil constraints such as proximity to freshwater bodies, etc., AND research any local bylaws or other regulatory requirements. Often, it is NOT appropriate to use the minimum DDF.
- Being 'willing' to increase DDF is especially important when high occupancy/peak flows are likely, and/or when performance boundaries are significant (for example, a lake located downslope with sandy soils over a shallow restrictive horizon). Increasing DDF will generally provide greater assurance of adequate treatment performance. Also, increasing DDF and the corresponding size of the dispersal system is the cheapest way to increase system longevity.

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

10. What is the minimum DDF for a 2 bedroom mobile home with 67 m² floor area and projected occupancy of 3 persons?

Notes:

- Refer to Table II- 8, Table II- 9 and sections III- 5.1.2.5., III-3.1.1, III- 3.1.2, and III- 3.1.5.
- Consider the likelihood of future additional floor area and/or occupancy exceeding 3 persons. Note from III- 5.1.2.5.(a), "increase the number of occupants if there is doubt."

Answer: 3 persons X 300 l/day = **900 L/day minimum DDF.**