MEBS6000 Utility Services

http://ibse.hk/MEBS6000/

Assignment 01 – Water Supply Systems, Drainage and Sewage Disposal (2023-2024)

1. Cold and Hot Water Supply Systems

1.1 Describe the different types of utilities buried underground in Hong Kong. Discuss the important factors to be considered for planning and designing the utility services infrastructure.

(10 marks)

1.2 Draw a simplified schematic diagram to show the typical arrangement and key components of a cold water supply system for a multi-storey building in Hong Kong, starting from the government water mains. Explain the maintenance responsibility for different parts of the water supply system.

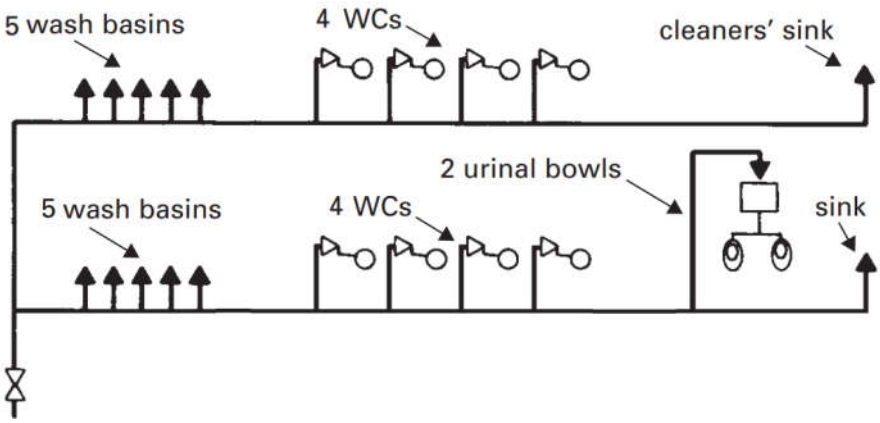
(10 marks)

1.3 Briefly describe the five categories of water resources in Hong Kong. Discuss the important areas of Total Water Management (TWM) strategy in our society and the implications to plumbing engineering design.

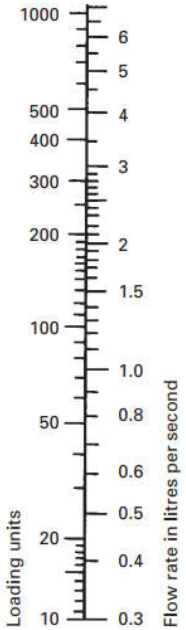
(10 marks)

1.4 A water supply piping system is shown on the following figure. Determine the total loading units and required flow rate for the system. Assume each of the two urinals has a continuous flow of 0.004 litre/s, calculate the design flow rate of the whole system. Explain the principle and key factors of simultaneous demand used for the water supply piping system.

(10 marks)



Type of appliance	Loading unit
WC flushing cistern	2
Wash basin 1⁄2 – DN 15	1.5 to 3
Bath tap 1 – DN 25	22
Sink tap 1⁄2 – DN 15	3



1.5 Discuss the important factors to consider when determining acceptable locations for the gas water heaters in high-rise residential buildings. Explain why a flueless gas water heater is considered dangerous and should be avoided. What type of gas water heater should be used instead? Illustrate with diagram(s).

(10 marks)

1.6 Briefly explain the design requirements in Hong Kong for centralised hot water systems. Discuss the major considerations when designing hot water systems for high-rise buildings.

(10 marks)

2. Sanitation and Drainage

2.1 A uPVC stormwater drainage pipe of 225 mm diameter is flowing half full bore (0.5 proportional depth of flow). Calculate the minimum gradient for a flow velocity of 1.6 m/s. Discuss how the flow velocity will affect the drain pipe gradient and suggest suitable limits for the flow velocity.

Given:

Chezy's formula:	Manning's formula:
$V = C\sqrt{m \times i}$	$C = \frac{m^{1/6}}{n}$

where
V = velocity of flow (m/s)
C = Chezy coefficient
m = hydraulic mean depth (HMD) (m) = pipe diameter x 0.25 [for half full bore]
i = inclination or gradient as 1/X
n = coefficient of pipe roughness (= 0.01 for uPVC pipe)

(10 marks)

2.2 The sanitary drainage system could be a risk for the spread of COVID-19 and SARS disease in high-rise residential buildings. Briefly explain the possible disease transmission paths and discuss the possible methods to prevent this.

(10 marks)

3. Sewage Disposal

3.1 If connection to public sewers is not feasible for a building project, briefly describe the sewage disposal methods which can be considered.

(10 marks)

3.2 Explain the three common acceptance tests of drainage systems. Illustrate with diagram(s). Discuss the safety precautions for doing testing and maintenance in underground manholes.

(10 marks)