

**SULIT**



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI  
KEMENTERIAN PENGAJIAN TINGGI**

**JABATAN KEJURUTERAAN AWAM**

**PENILAIAN ALTERNATIF**

**SESI 1: 2021/2022**

**DCB20053 : PLUMBING SERVICES**

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**NAMA PENYELARAS KURSUS: ZARINA BT MAT SAPRI**

**KAEDAH PENILAIAN : PEPERIKSAAN ATAS TALIAN**

**JENIS PENILAIAN : SOALAN BERSTUKTUR DAN ESEI  
(3 SOALAN)**

**TARIKH PENILAIAN : 27 JANUARI 2022**

**TEMPOH PENILAIAN : 1 JAM 30 MINIT**

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**LARANGAN TERHADAP PLAGIARISM (AKTA 174)**

**PELAJAR TIDAK BOLEH MEMPLAGIAT APA-APA IDEA, PENULISAN, DATA  
ATAU CIPTAAN ORANG LAIN. PLAGIAT ADALAH SALAH SATU  
PENYELEWENGAN AKADEMIK. SEKIRANYA PELAJAR DIBUKTIKAN  
MELAKUKAN PLAGIARISM, PENILAIAN BAGI KURSUS BERKENAAN AKAN  
DIMANSUHKAN DAN DIBERI GRED F DENGAN NILAI MATA 0.**

**(RUJUK BUKU ARAHAN-ARAHAN PEPERIKSAAN DAN KAEDAH PENILAIAN (Diploma) EDISI 6, JUN 2019,  
KLAUSA 17.3)**

**SECTION A : 50 MARKS**  
**BAHAGIAN A : 50 MARKAH**

**INSTRUCTION:**

This section consists of **TWO (2)** structured questions. Answer **ALL** questions.

**ARAHAN:**

*Bahagian ini mengandungi DUA (2) soalan berstruktur. Jawab SEMUA soalan.*

**QUESTION 1**

**SOALAN 1**

CLO1  
C2

- (a) Interpret the delivery system of water supply from the water mains to the control valve using grid method sketches.

*Tafsirkan sistem penghantaran bekalan air dari saluran air ke injap kawalan menggunakan lakaran kaedah grid*

[5 marks]  
[5 markah]

CLO1  
C2

- (b) Illustrate the layout of the direct and indirect pipe for 10 storey buildings.

*Ilustrasikan susun atur paip bagi sistem secara langsung dan tidak langsung bagi bangunan 10 tingkat.*

[10 marks]  
[10 markah]

CLO1  
C3

- (c)  
i. Explain the hot water supply design requirements for domestic building.

*Terangkan keperluan rekabentuk bekalan air panas bagi bangunan kediaman.*

[5 marks]  
[5 markah]

- ii. Sketch a direct system of hot water supply systems for a domestic building.

*Lakar kan sistem bekalan air panas secara langsung bagi bangunan kediaman*

[5 marks]  
[5 markah]

**QUESTION 2**  
**SOALAN 2**CLO1  
C2

(a) Explain the water test of the drainage system

*Terangkan ujian air sistem saliran*[5 marks]  
[5 markah]CLO1  
C2

(b) Sketch and label a diagram of the manhole section.

*Lakarkan dan labelkan gambarajah keratan sebuah lurang*[10 marks]  
[10 markah]CLO1  
C3

(c) Explain the factor of water losses seal in the following sanitary appliances:-

*Terangkan faktor-faktor kehilangan kedap air dalam peralatan kebersihan berikut:-*

- i. Self siphonage / *Persifonan Kendiri*
- ii. Induced siphonage / *Persifonan Teraruh*
- iii. Evaporation / *Penyejatan*
- iv. Capillary Attraction / *Tindakan Kapilari*
- v. Momentum / *Momentum*

[10 marks]  
[10 markah]

**SECTION B : 25 MARKS**  
**BAHAGIAN B : 25 MARKAH**

**INSTRUCTION:**

This section consists of **ONE (1)** essay questions. Answer **ALL** questions.

**ARAHAN:**

*Bahagian ini mengandungi SATU (1) soalan esei. Jawab SEMUA soalan*

CLO2  
C3

**QUESTION 1**  
**SOALAN 1**

- (a) By using the Thomas Box Formula method, calculate the diameter of the pipe in Figure 1 below.

*Dengan menggunakan kaedah Thomas Box Formula, hitungkan diameter paip dari Rajah 1 di bawah.*

[5 marks]  
[5 markah]

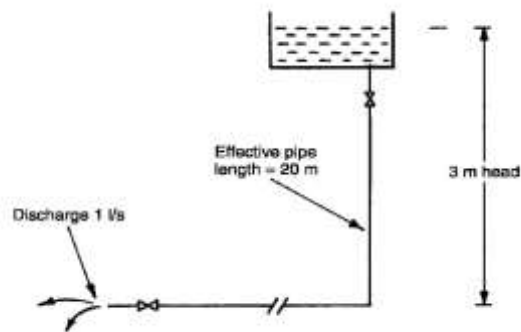


Figure 1  
Rajah 1

CLO2  
C3

- (b) Using the office building diagram in Figure 2, determine:  
*Menggunakan diagram bangunan pejabat pada Rajah 2, tentukan*
- Total DU value for branch discharge pipe.  
*Jumlah nilai (DU) bagi paip cabang luahan*
  - Diameter discharge for soil pipe  
*Diameter paip najis*
  - Diameter discharge for waste pipe.  
*Diameter paip air sisa*
  - Diameter discharge for stack A  
*Diameter paip tumpu A*

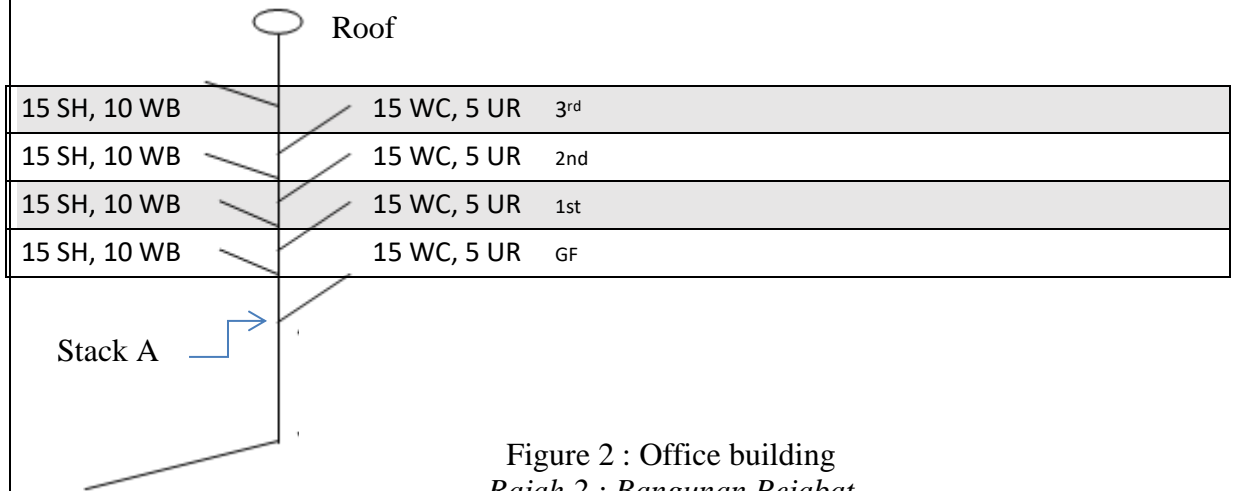


Figure 2 : Office building  
Rajah 2 : Bangunan Pejabat

[10 marks]  
[10 markah]

CLO2  
C3

(c) Based on figure 3, calculate the size of the manhole by referring to the table given.

Berdasarkan Rajah 3 di bawah, kirakan saiz lurang dengan merujuk jadual yang diberi dalam lampiran.

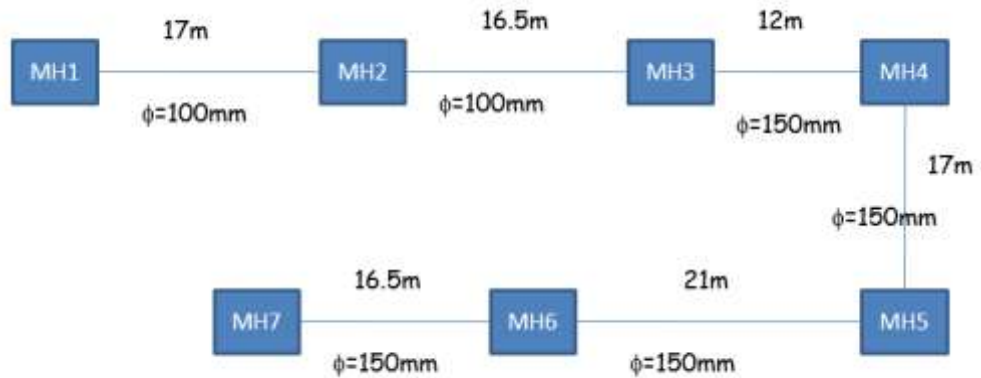


Figure 3  
Rajah 3

[10 marks]  
[10 markah]

**-SOALAN TAMAT-**

## LAMPIRAN

Thomas Box Formula

$$d = \sqrt[5]{\frac{q^2 \times 25 \times L \times 10^5}{H}}$$

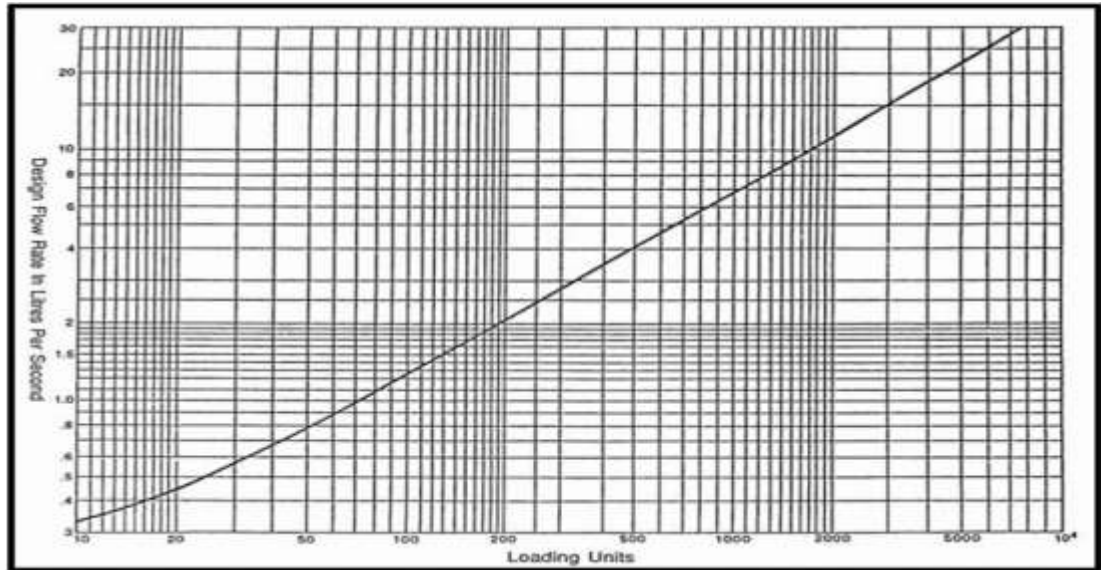


Table 1.1 gives the 'loading unit' rating for various appliances.

Table 1.1

	Loading unit rating
Dwellings and flats	
W.C. flushing cistern	2
Wash basin	1½
Bath	10
Sink	3–5
Offices	
W.C. flushing cistern	2
Wash basin (distributed use)	1½
Wash basin (concentrated use)	3
Schools and industrial buildings	
W.C. flushing cistern	2
Wash basin	3
Shower (with nozzle)	3
Public bath	22

*Note:* Certain sanitary appliances require a continuous flow of water throughout the whole of the time that they are being used. These include: ablution appliances fitted with spray taps, umbrella sprays, shower nozzles or similar fittings.

In buildings where high peak demands occur, a loading unit rating for such appliances is not applicable and 100 per cent of the flow rate for these appliances is required as shown in Table 1.2. The same applies to automatic flushing cisterns and for urinals.

Table 1.2 Recommended minimum rate of flow at various appliances

Type of appliance	Rate of flow (litre/s)
W.C. flushing cistern	0.12
Wash basin	0.15
Wash basin with spray taps	0.04
Bath (private)	0.30
Bath (public)	0.60
Shower (with nozzle)	0.12
Sink with 13 mm taps	0.20
Sink with 19 mm taps	0.30
Sink with 25 mm taps	0.60

Table 1.3 Frictional resistances of fittings expressed in equivalent pipe lengths

Copper			Galvanised steel			
Nominal outside diameter (mm)	Metre run of pipe		Nominal outside diameter (mm)	Metre run of pipe		
	Elbow	Tee		Elbow	Bend	Tee
15	0.5	0.6	15	0.5	0.4	1.2
22	0.8	1.0	20	0.6	0.5	1.4
28	1.0	1.5	25	0.7	0.6	1.8
35	1.4	2.0	32	1.0	0.7	2.3
42	1.7	2.5	40	1.2	1.0	2.7
54	2.3	3.5	50	1.4	1.2	3.4
62	3.0	4.5	65	1.7	1.3	4.2
76	3.4	5.8	80	2.0	1.6	5.3
108	4.5	8.0	100	2.7	2.0	6.8

In calculating the diameter of a pipe to supply individual fittings, the loss of head through the draw-off tap should also be taken into account. Table 1.4 gives the allowances for draw-off taps expressed in equivalent pipe lengths.

Table 1.4 Frictional resistances of draw-off taps expressed as equivalent pipe lengths

Fitting (BS 1010)	Discharge rate tap fully open (litre/s)	Equivalent length of pipe of same diameter as tap (m)	
		Copper	Galvanised steel
15 mm diameter bib-tap or pillar tap	0.20	2.70	4.00
20 mm diameter bib-tap or pillar tap	0.30	8.50	5.75
25 mm diameter bib-tap or pillar tap	0.60	20.00	13.00

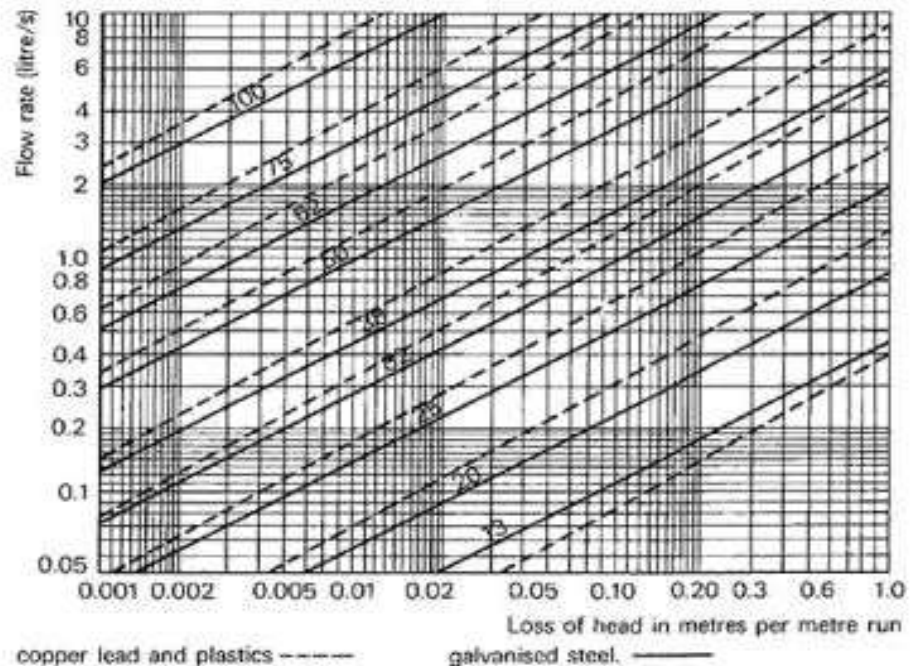


Fig. 1.2 Pipe-sizing chart

**Table 1: Discharge unit values**

Appliance	Application	Discharge unit value
WC	Domestic	7
	Commercial	14
	Congested/public	28
Basin	Domestic	1
	Commercial	3
	Congested/public	6
Bath	Domestic	7
	Commercial	18
Sink	Domestic	6
	Commercial	14
	Congested/public	27
Shower	Domestic	1
	Commercial	2
Urinal	-	0.3
Washing machine	-	4
1 group of WC, bath and basin	-	14

**Table 2: Discharge unit and stack diameter**

Nominal bore (mm)	Approximate no. of DUs.
50	10
65	60
75	200
100	750
125	2500
150	5500

**Table 3: Discharge unit and branch discharge pipe**

Nominal bore (mm)	Approximate no. of DUs.		
	Gradient		
	1/2° (9mm/m)	11/4° (22mm/m)	21/2° (45mm/m)
32	-	1	1
40	-	2	8
50	-	10	26
65	-	35	95
75	-	100	230
90	120	230	460
100	230	430	1050
125	780	1500	3000
150	2000	3500	7500



**Table 4 : General guide for sizes of ventilating pipes**

Branch or stack diameter (D)	Ventilating pipe min. diameter
Up to 75 mm bore	$\frac{2}{3}$ D (min. 25mm)
Over 75 mm bore	$\frac{1}{2}$ D

**Table 5 : Discharge Flow Rate**

Fitment	Capacity (l)	Discharge flow rate (l/s)
Basin	6	0.6
Basin – spray tap	-	0.06
Bath	80	1.1
Shower	-	0.1
Sink	23	0.9
Urinal	4.5	0.15
Washing machine	180	0.7
Water closet	6	2.3

**Table 6**

Manhole pipe size (mm) / saiz paip lurang	Slope / kecerunan	Manhole depth / kedalaman lurang
100	1:40	250
150	1:60	300
225	1:90	450
300	1:100	600

**Table 7**

Manhole depth (mm) / Kedalaman lurang	Manhole size / saiz lurang	
	Length (mm) / Panjang	Width (mm) / Lebar
<600mm	600	450
600 – 900mm	750	600
900 – 1500mm	750	750
1500 – 2400mm	900	1125