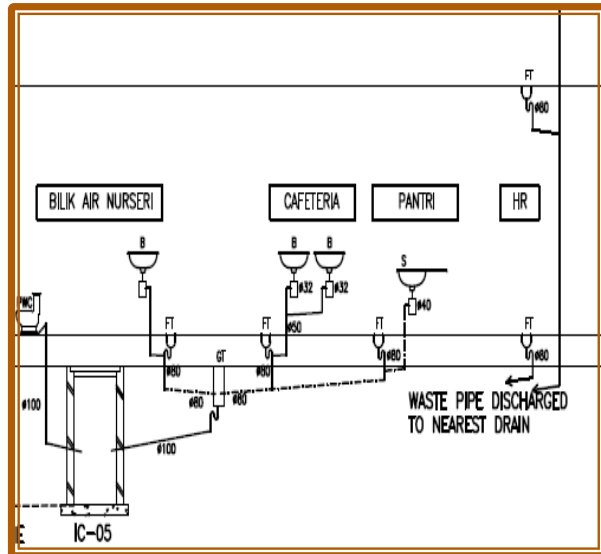


DESIGN OF INTERNAL SANITARY PLUMBING SYSTEM



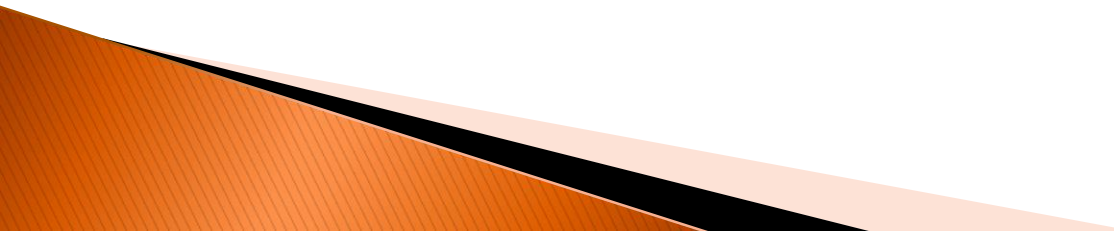
IR. MOHAMAD ZAINI BIN BAKAR

UNIT REKABENTUK BANGUNAN AM 1
CAWANGAN KEJURUTERAAN MEKANIKAL
IBU PEJABAT JKR MALAYSIA, KUALA LUMPUR

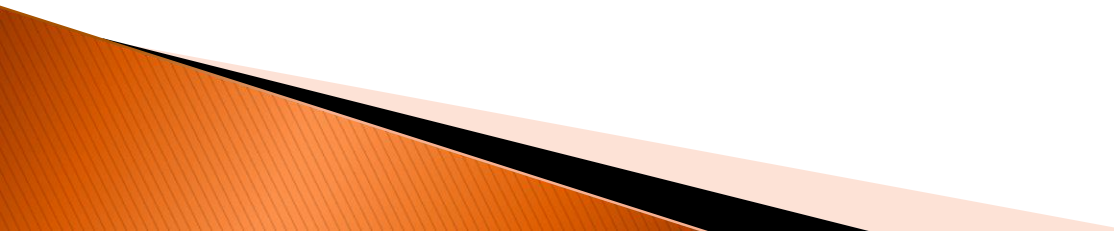
TARIKH : 15-16 APRIL 2014

TEMPAT : CAW.KEJ.MEKANIKAL,IBU PEJABAT KUALA LUMPUR

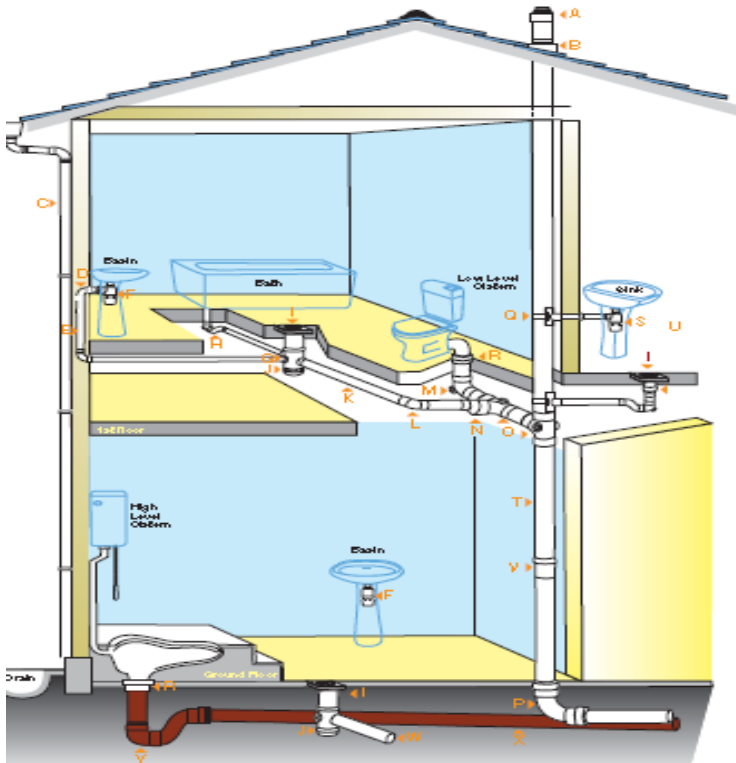
OBJEKTIF

- ▶ **MEMBERI KEFAHAMAN AKTA, STANDARD, CODE YANG BERKAITAN DIGUNAPAKAI**
 - ▶ **KEFAHAMAN KONSEP DAN REKABENTUK**
 - ▶ **KEFAHAMAN SKOP REKABENTUK ANTARA MEKANIKAL DAN CIVIL**
- 

JANGKAAN 'OUTCOME'

- ▶ **MENGETAHUI KEPERLUAN PIAWAIAN DAN PIHAK BERKUASA**
 - ▶ **MENGETAHUI KONSEP DAN PRINSIP REKABENTUK SISTEM SANITARI DALAMAN**
 - ▶ **BOLEH MEREKABENTUK SISTEM SANITARY DALAMAN...**
- 

INTERNAL SANITARY PLUMBING DESIGN



WASTE PIPE

DISCHARGE
STACK

VENT PIPE

PIPEWORK SHOULD BE DESIGNED TO
BE AS SIMPLE ARRANGEMENT AS POSSIBLE TO QUICKLY
AND QUIETLY CARRY AWAY THE DISCHARGE FROM ALL
CONNECTED SANITARY AND APPLIANCES

LAWS
STANDARD ,
RULES,
GUIDELINES,
AUTHORITY

LAWS OF MALYSIA



LAWS OF MALAYSIA

REPRINT

Act 655

WATER SERVICES INDUSTRY ACT 2006

Incorporating all amendments up to 1 August 2006

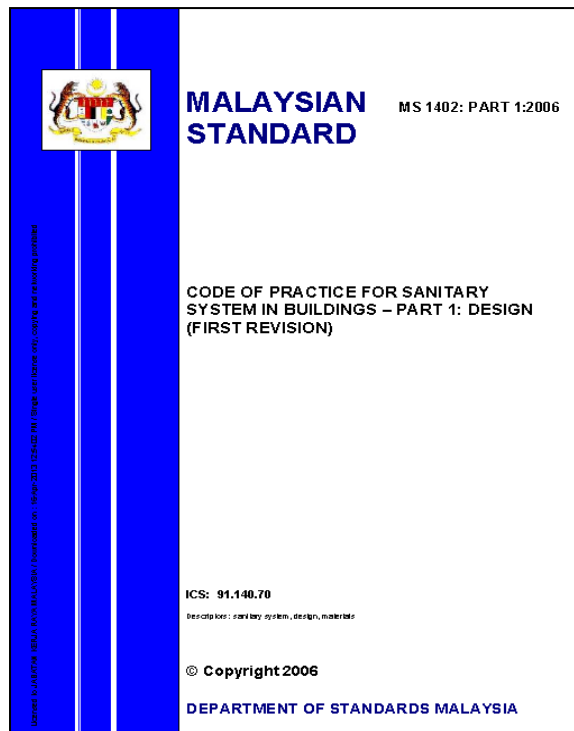
Chapter 3

Sewerage system and services

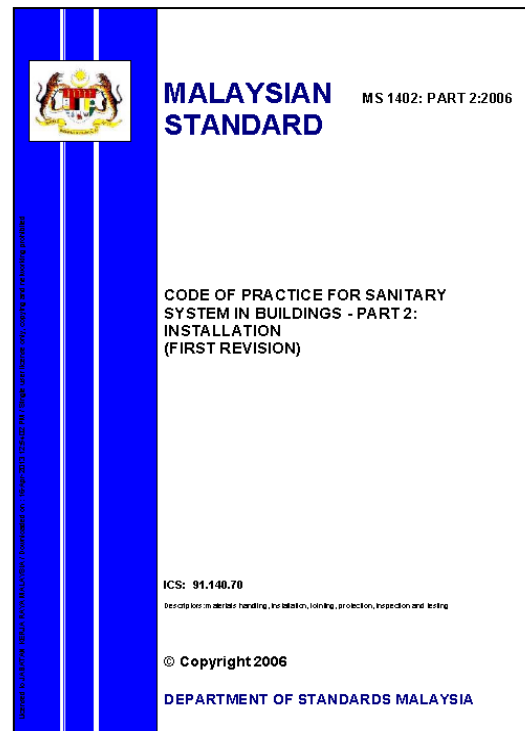
57. Power to require premises to be connected to public sewerage system
58. Power to require developer to connect development to public sewerage system
59. Requirement that proper drainage for sewage be made
60. Unauthorized connection to public sewer, *etc.*
61. Prohibited effluent or noxious matter not to be discharged into public sewer, *etc.*
62. Responsibilities for communal septic tank
63. Power to install or construct private sewerage system or septic tank
64. Power to require private sewerage system, *etc.*, to be put in proper order
65. Duty to operate and maintain private sewerage system, *etc.*
66. Penalty in respect of nuisance, *etc.*, caused by private sewerage system or septic tank
67. Contract for the provision of sewerage services

STANDARD

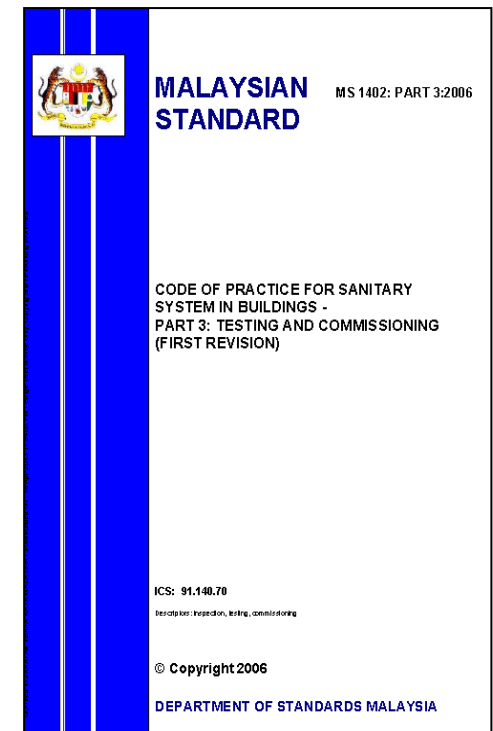
- ▶ MS 1402–2006
- ▶ BS 5572–1994



MS1402: PART 1:2006



MS1402:PART 2:2006



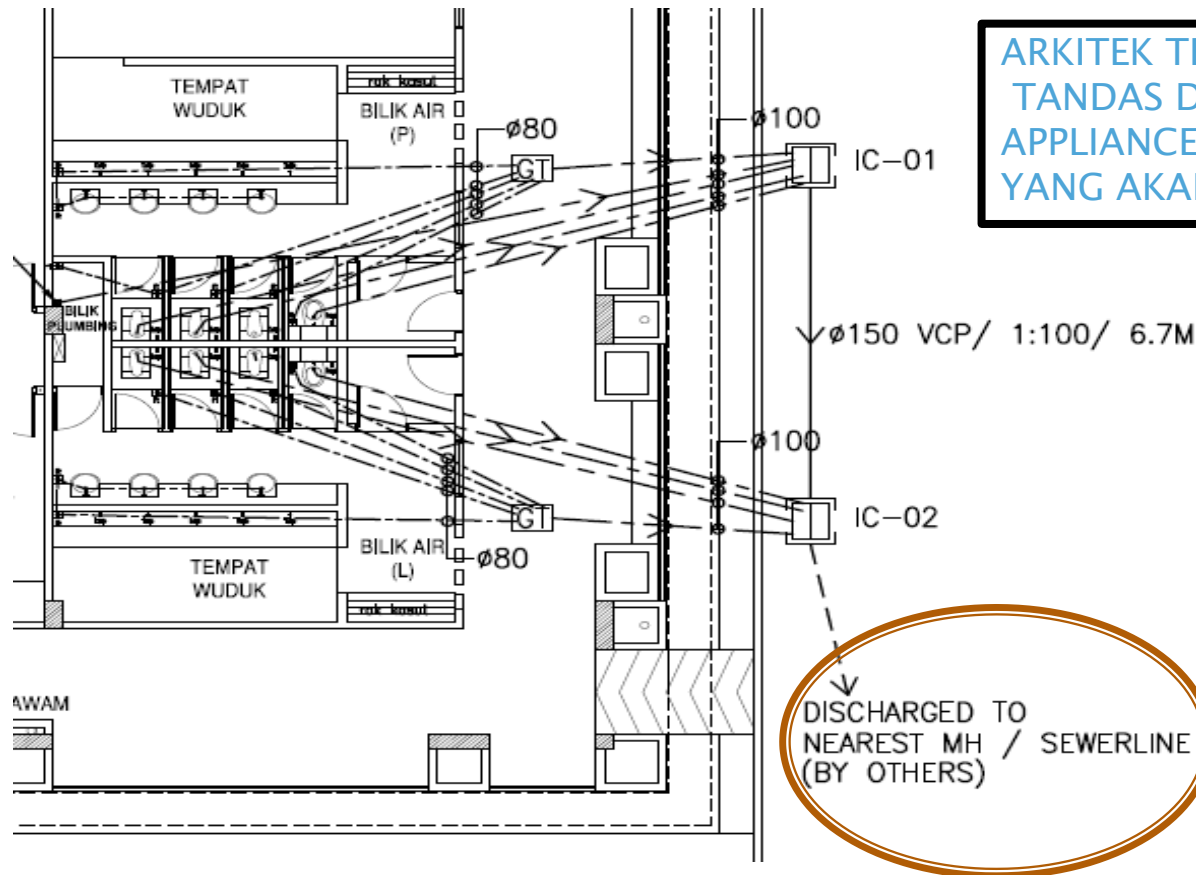
MS1402:PART 3:2006

TANGGUNGJAWAB SKOP REKABENTUK

(HODT MEKANIKAL-SPK JKR-ISO-9001)

- ▶ SEDIAKAN LUKISAN TENDER CWS UNTUK DITENDER BERSAMA DENGAN KONTRAKTOR UTAMA
- ▶ BQ TIDAK DISEDIAKAN KECUALI ADA SKOP PENTING HENDAK DIMASUKKAN
- ▶ LULUS LUKISAN PEMBINAAN/KERJA YANG DISEDIAKAN OLEH KONTRAKTOR UTAMA

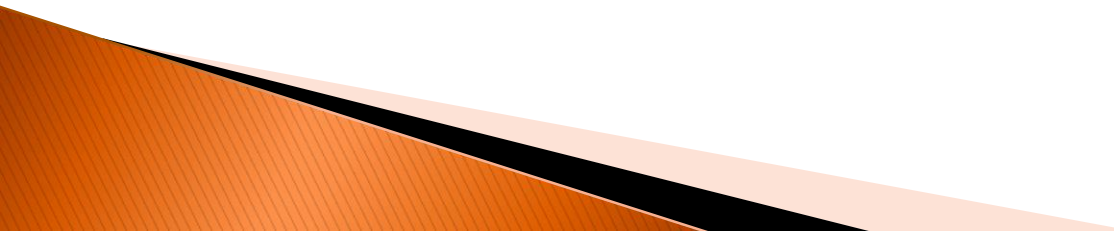
SEMPADAN SKOP MEKANIKAL DENGAN CIVIL DAN ARKITEK



ARKITEK TENTUKAN BILANGAN
TANDAS DAN JENIS
APPLIANCES/FIXURES
YANG AKAN DIGUNAPAKAI

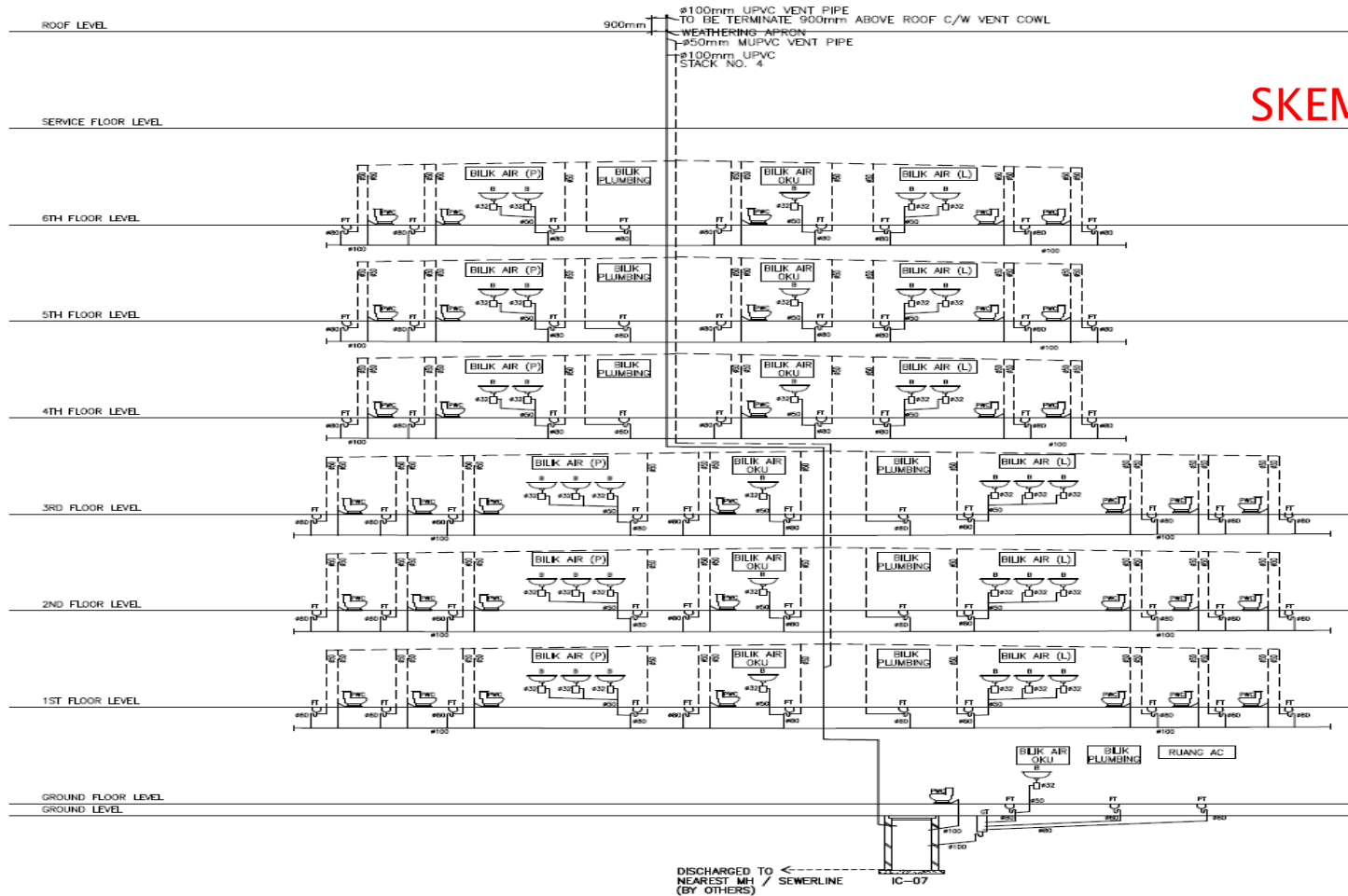
DESIGN BY
CIVIL ENGINEER

ANTARA ISU REKABENTUK DAN PEMANTAUAN

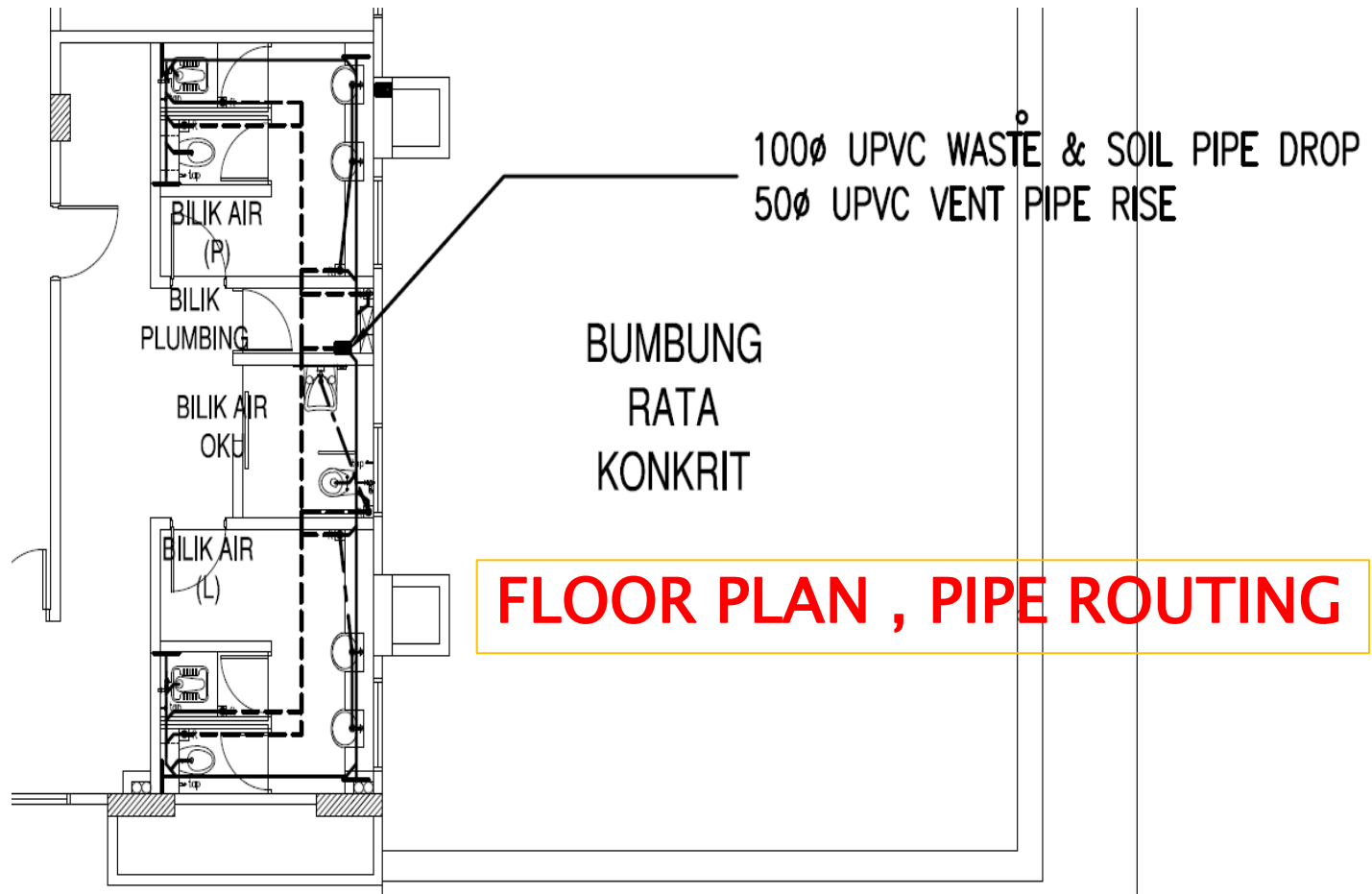
- ▶ LUKISAN PEMBINAAN/SHOP DRAWING/LUKISAN KERJA MASIH KURANG JELAS
 - ▶ SIAPA BUAT LUKISAN PEMBINAAN/KERJA/SHOP
 - ▶ SIAPA YANG PERLU LULUS LUKISAN SIAPA AKAN BUAT PENYELIAAN DITAPAK DAN BAYARAN INTERIM
 - ▶ PERLU KELULUSAN PIHAK BERKUASA
- 

CONTOH JANGKAAN DESIGN OUTPUT

SKEMATIK



JANGKAAN 'DESIGN OUTPUT'

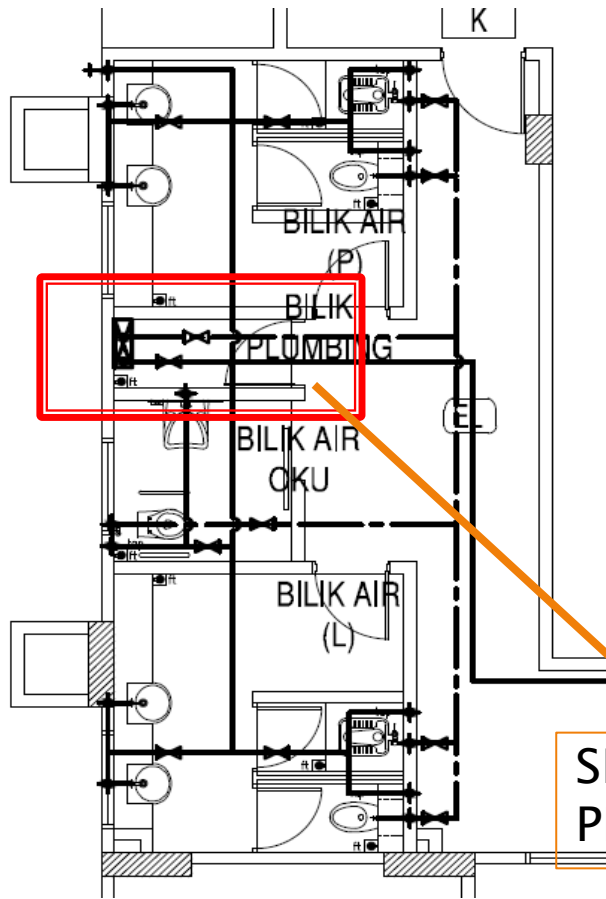


Q & A

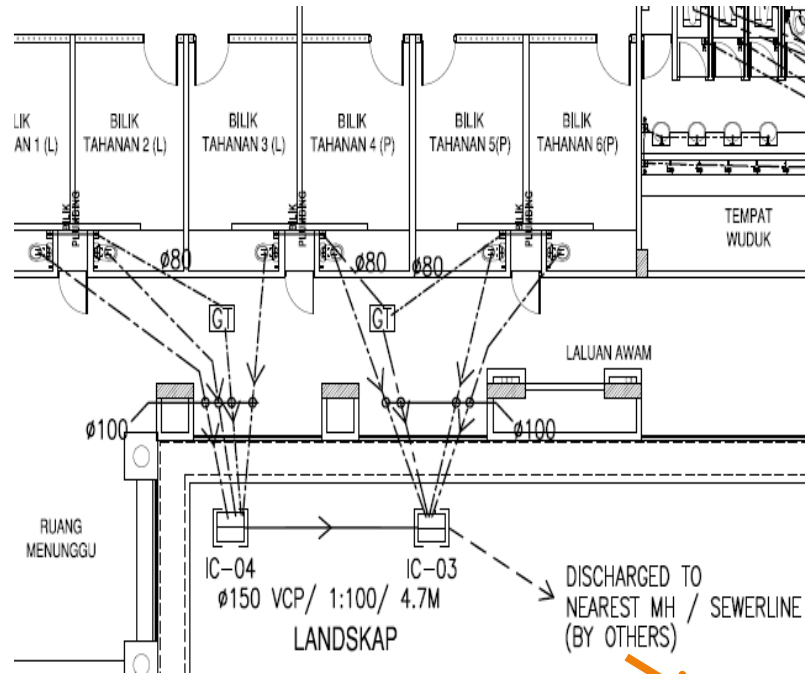
BASIC APPROACH TO COLD WATER SUPPLY DESIGN

Step 1	Location and sizing of main DISCHARGE STACK dropper
Step 2	Detail piping layout and schematic drafting
Step 3	Pipe sizing
Step 4	Size of service shaft (normally 1000mm x 400mm)

PENTING KOORDINASI DENGAN ARKITEK DAN CIVIL



**SERVIS SHAFT UNTUK
PIPE/DROPPER**



**LOKASI MAIN
HOLE BY CIVIL**

CONTOH PEMASANGAN



Contoh ;
KERJA-KERJA
internal sanitary
plumbing SEBAIK
SAHAJA GROUND
FLOOR BERMULA

Q & A

DISCHARGE UNIT ..MS 1402

Table 1. Flow and usage data of sanitary appliances

Sanitary appliances	Capacity	Discharge data		Frequency of use (T) s	Individual probability (p) of discharge $\frac{p \cdot t}{T}$
		Maximum flow rate $l s^{-1}$	Duration (t) s		
Washdown Water Closet (WC)	9	2.3	5	1 200 600 300	0.004 1 0.008 3 0.016 7
Urinal (per person unit)	2.5	0.15	30	1 200 900	0.0167 0.033 3
Wash basin (32 mm branch)	6	0.6	10	1 200 600 300	0.008 3 0.016 7 0.008 3
Sink (40 mm branch)	23	0.9	25	1 200 600 300	0.020 8 0.041 7 0.083 4
Bath (40 mm branch)	80	1.1	75	4 500 1 800	0.016 7 0.041 7
Automatic washing machine	4 kg to 5 kg dry load	0.6	30	15 000	0.020 0
Shower	-	0.1	-	-	-
Spray tap basin	-	0.06	-	-	-

MAX LOADING ON STACKS

Table 4. Maximum loading on stacks in fixture units

a) Four or more floor levels

Size of stack	Maximum loading per floor level	Maximum loading per stack
DN 40	4	16
DN 50	9	36
DN 65	14	56
DN 80	20	80
DN 100	125	500
DN 125	250	1 000
DN 150	600	2 400
DN 225	1750	7 000

b) Three or fewer floor levels

Size of stack	Maximum loading per floor level	Maximum loading per stack
DN 40	2	6
DN 50	5	15
DN 65	6	18
DN 80	13	40
DN100	65	195
DN 125	150	450
DN 150	250	750
DN 225	950	2 850

DISCHARGE UNIT : BS 5572

Type of appliance	Minimum interval of discharge min	Discharge units
Washdown WC with 9 l high or low level cistern ¹⁾	20 10 5	7 14 27
Washdown WC with 7.5 l high or low level cistern ¹⁾	20 10 5	6 12 24
Washdown WC with 6 l high or low level cistern	20 10 5	6 11 23
Washdown WC with 9 l close coupled cistern ¹⁾	20 10 5	4 8 16
Washdown WC with 7.5 l close coupled cistern ¹⁾	20 10 5	4 7 14
Washdown WC with 6 l close coupled cistern	20 10 5	3 6 11
Washdown WC fitted with a macerator	Add 0.4 ls ⁻¹ per unit	< 1 See note
Urinal (per person unit)	Add 0.15 ls ⁻¹ per unit	< 1 See note
Wash basin (32 mm branch)	20 10 5	1 3 5
Sink (40 mm branch)	20 10 5	7 13 26
Bath (40 mm branch)	75 (domestic) 30 (congested)	7 17
Spray tap basin	Add 0.06 ls ⁻¹ per tap	< 1 See note
Electric shower	Add 0.07 ls ⁻¹ per unit	< 1 See note
Low pressure shower (per spray head)	Add 0.15 ls ⁻¹ per spray head	< 1 See note
High pressure shower (per spray head)	Add 0.15 - 0.35 ls ⁻¹ per spray head	< 1 See note
Automatic washing machine	250 (domestic) 4 (commercial/congested)	3 18
Dishwashing machine	Add 0.25 ls ⁻¹ per unit	< 1 See note
One group consisting of: one WC (7.5 l), one bath, one or two basins, one sink and a washing machine		14

¹⁾ British Standard WC cistern capacities have the following tolerances:
9 ± 0.5 l (BS 1125), 7.5 ± 0 - 0.5 l (BS 7357).

NOTE. Where such appliances are used the total flow, from those that are likely to discharge at the same time (as determined by suitable probability calculations), should be calculated and added to the flow equivalent to the total discharge units of the other appliances (obtained from figure 27) producing the design flow rate, or design loading, that can be used in tables 7 and 8.

MAX DISCAHRGE UNIT FOR VERTICAL STACKS

Table 7. Maximum capacity and number of discharge units for vertical stacks

Size mm	Approximate capacity of stack l/s	Approximate number of discharge units
50	1.2	10 ¹⁾
65	2.1	60 ¹⁾
75	3.4	200
90	5.3	350
100	7.2	750 ✓
125	13.3	2500
150	21.7	5500

¹⁾ No WCs.

NOTE. Ventilating stacks may be required and sizes are shown in table 9.

MAX OF DU ALLOWED ON BRANCH DISCHARGES PIPES-BS 5572

Table 8. Maximum number of discharge units allowed on branch discharge pipes			
Size mm	Discharge units		
	Gradient $\frac{1}{2}^\circ$ (9 mm/m)	Gradient $1\frac{1}{4}^\circ$ (22 mm/m)	Gradient $2\frac{1}{2}^\circ$ (45 mm/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
NOTE 1. Maximum number of discharge units permitted for a 150 mm vertical stack is 5500.			
NOTE 2. Discharge pipes sized in this way give the minimum size necessary to carry the expected flow load.			
NOTE 3. Ventilating pipes may be required and sizes are shown in table 9.			

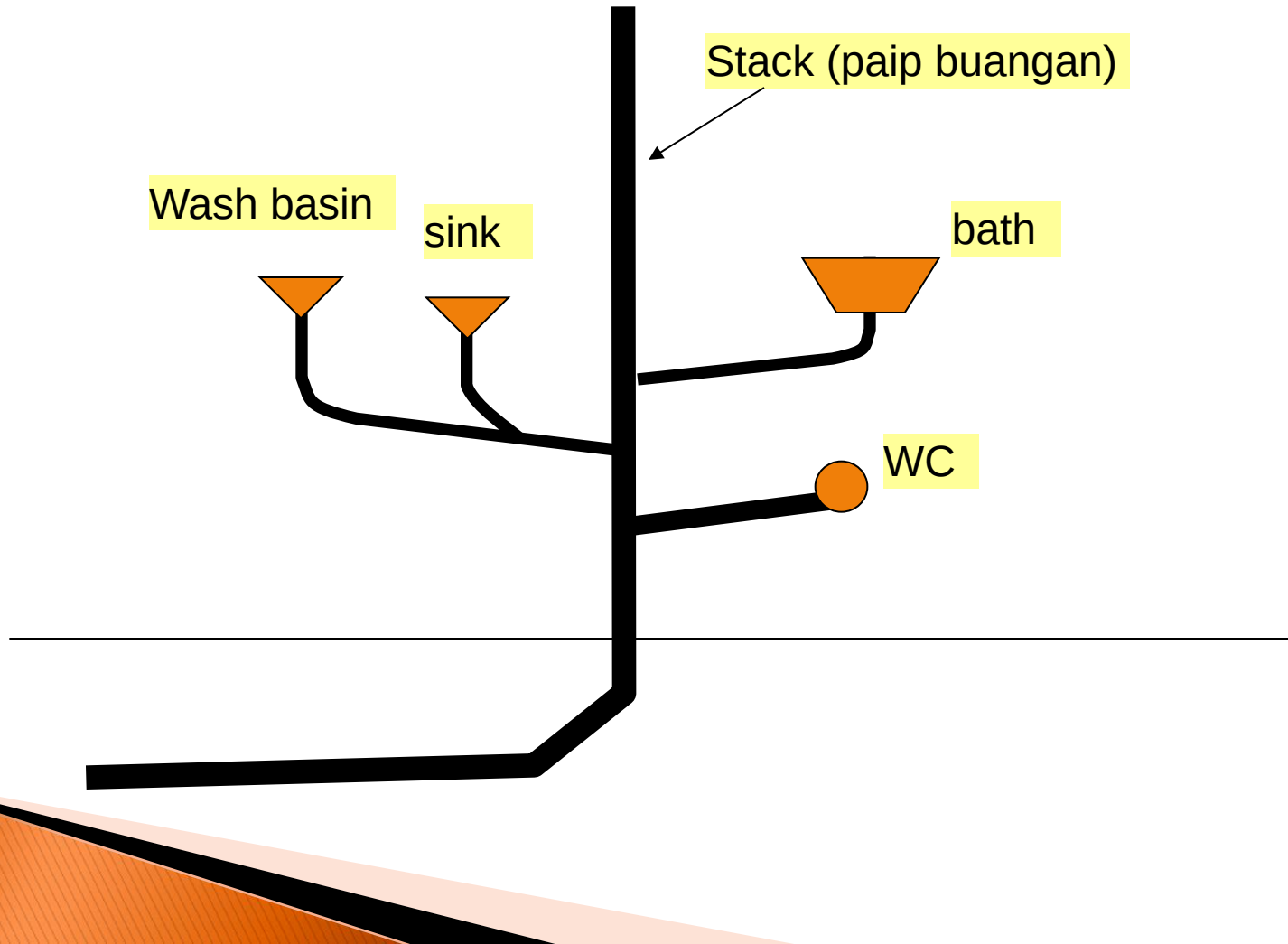
SIZES OF VENTILATING PIPES – BS 5572

Table 9. General guide for the sizes of ventilating pipes and stacks

Size of branch discharge pipe or discharge stack, D	Size of branch ventilating pipe or stack
Less than 75 mm	$\frac{2}{3} D$ (25 mm min.)
75 mm and above	$\frac{1}{2} D$

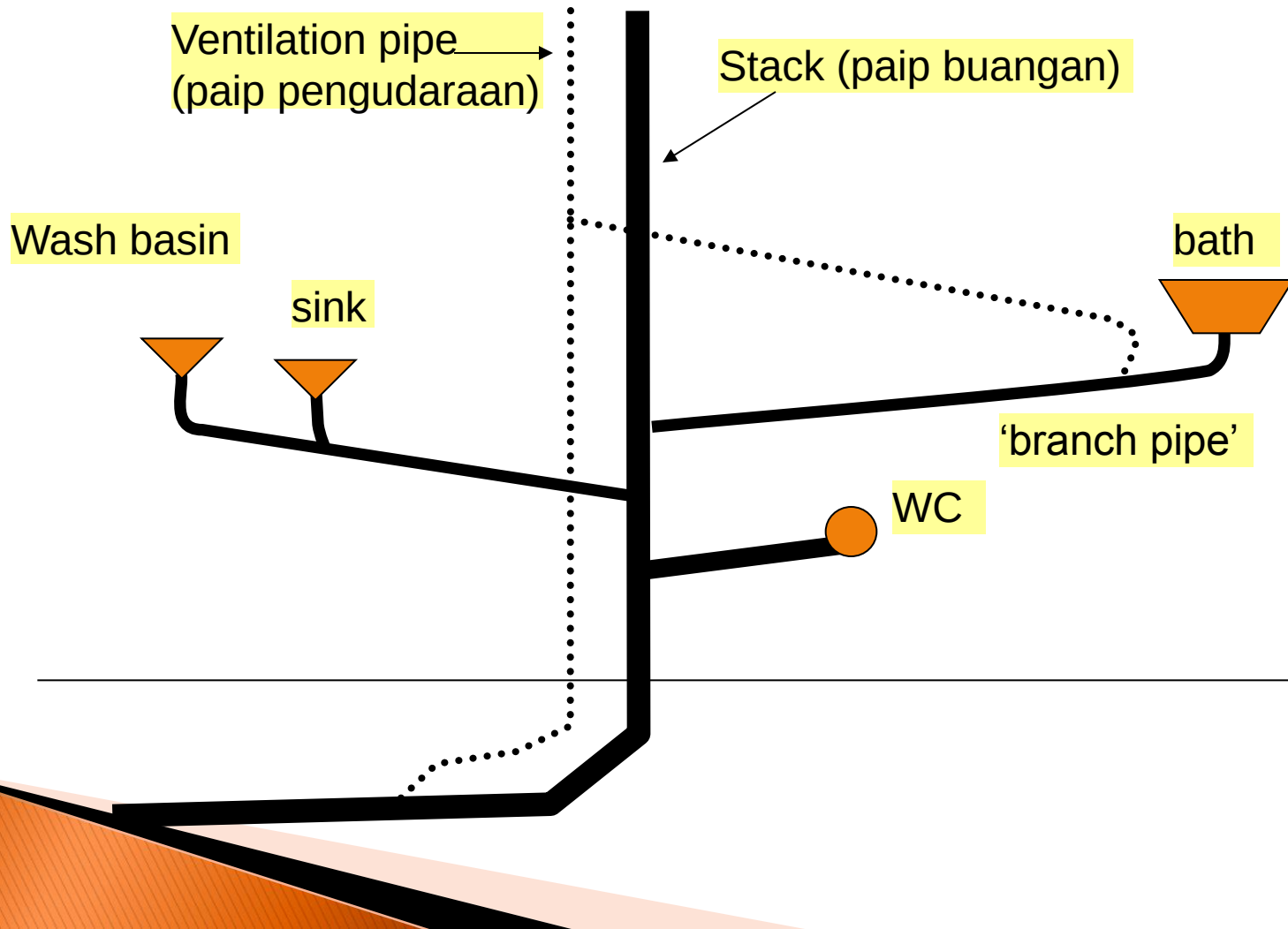
TYPE OF STACK SYSTEM

▶ Single stack system



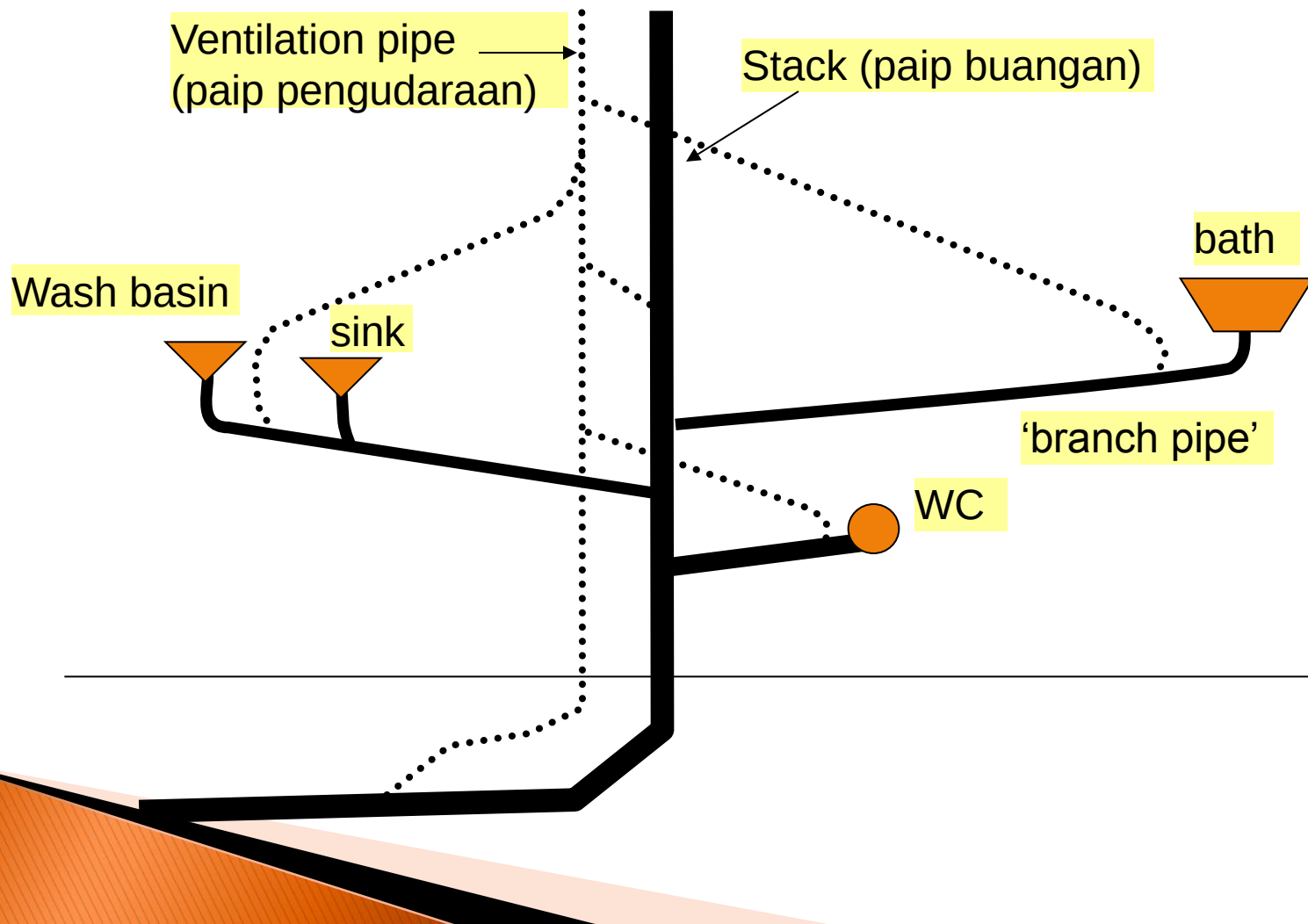
STACK SYSTEM

► Modified single stack system



STACK SYSTEM

▶ Ventilated system



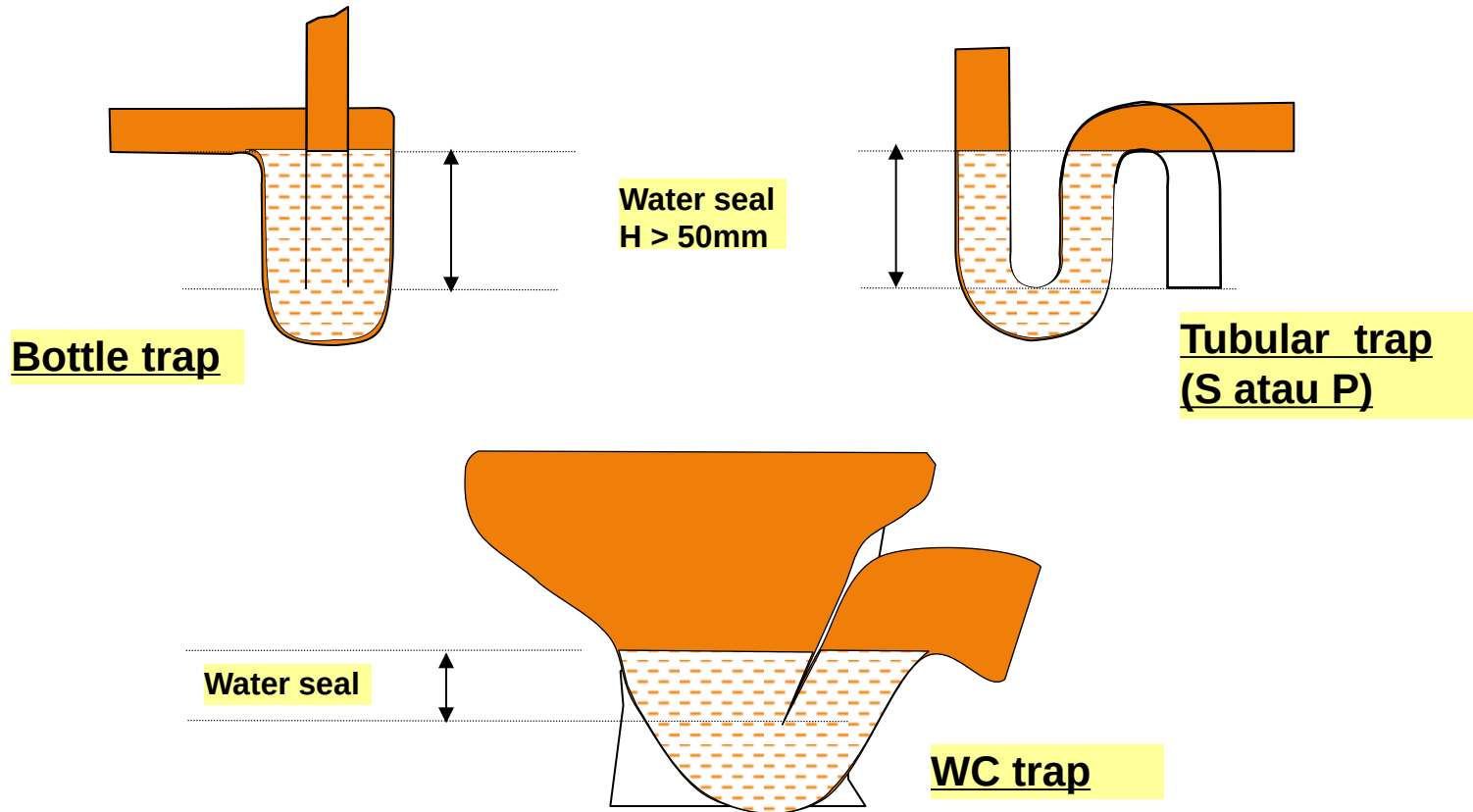
INSTALLATION

Panduan Pemasangan (Susunatur):

- ▶ Sambungan tandas ke paip buangan mestilah menggunakan saiz 100mm minima
- ▶ Saiz paip buangan (stack) juga bergantung kepada saiz terbesar perangkap dan 100mm minima
- ▶ **Perangkap** hendaklah dipasang pada **setiap** alat sanitari untuk mengelakkan pelepasan bau ke dalam bangunan
- ▶ Kedalaman 'perangkap air' mestilah tidak kurang daripada 50mm.

Sistem Paip Sanitari

► Kedalaman Perangkat Air



CONTOH PENGIRAAN BS5572

Example 1 : REFER BS 5772

Determine the diameter of the main water soil stack for a five storey office, having **6 WCs, 8 Wash Basin , 3 Urinal and 2 sink of each floor.**

CONTOH PENGIRAAN BS5572

From TABLE 6:

- 6x5 W.C.s x 14 = 420 d.u
- 8x5 wash basinx3 = 120 d.u
- 3x5 Urinals x 0.3 = 4.5 d.u
- 2x 5sink x14 = 140 d.u

TOTAL = 684.5 Discharge units

CONTOH PENGIRAAN

BS5572

Next From Table 8 :

- ▶ 684.5 discharge units
- ▶ (size stack between 100 mm –125 mm)
- ▶ Take 125 mm stack

Next From Table 9: vent pipe size

- ▶ Stack > 100mm , vent dia=1 / 2Dia Stack
- ▶ Dia Vent =62.5mm
- ▶ Take = 50mm

CONTOH PENGIRAAN

MS 1402

Example 1 : REFER MS 1402

Determine the **diameter** of the main water soil stack for a five storey office, having **6 WCs, 8 Wash Basin , 3 Urinal and 2 sink** of each floor.

CONTOH PENGIRAAN MS1402

From TABLE 1 m/s 5:

- 6x5 W.C.s x 9 = 270 d.u
- 8x5 wash basin x 6 = 240 d.u
- 3x5 Urinals x 2.5 = 37.5 d.u
- 2x 5 sink x 23 = 230 d.u

TOTAL = 777.5 Discharge units

CONTOH PENGIRAAN MS1402

Next From Table 4 m/s 19 :

- ▶ 777.5 discharge units
- ▶ (size stack between 100 mm –125 mm)
- ▶ Take 125 mm stack

Next From Table 5 m/s 33: vent pipe size

- ▶ Stack > 100mm ,
- ▶ Take = DN 65mm?

Q & A

**SEKIAN
TERIMA KASIH**