BUILDING WATER SUPPLY & SANITARY INSTALLATION

CHAPTER 4

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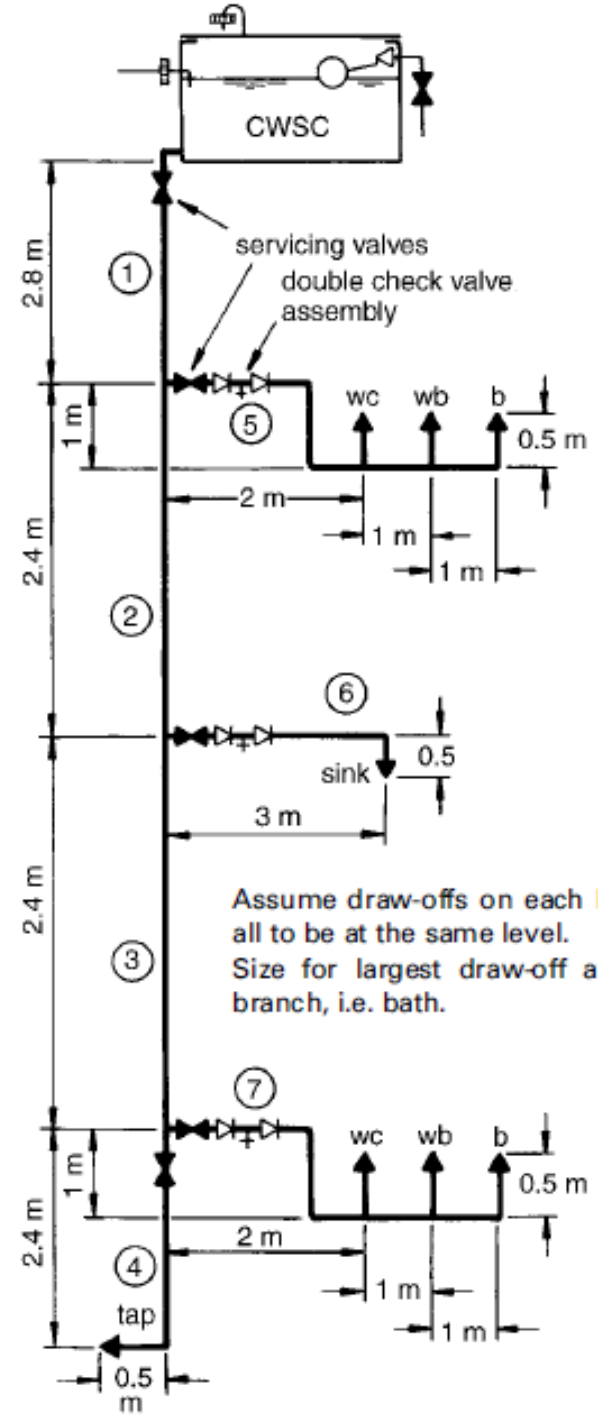
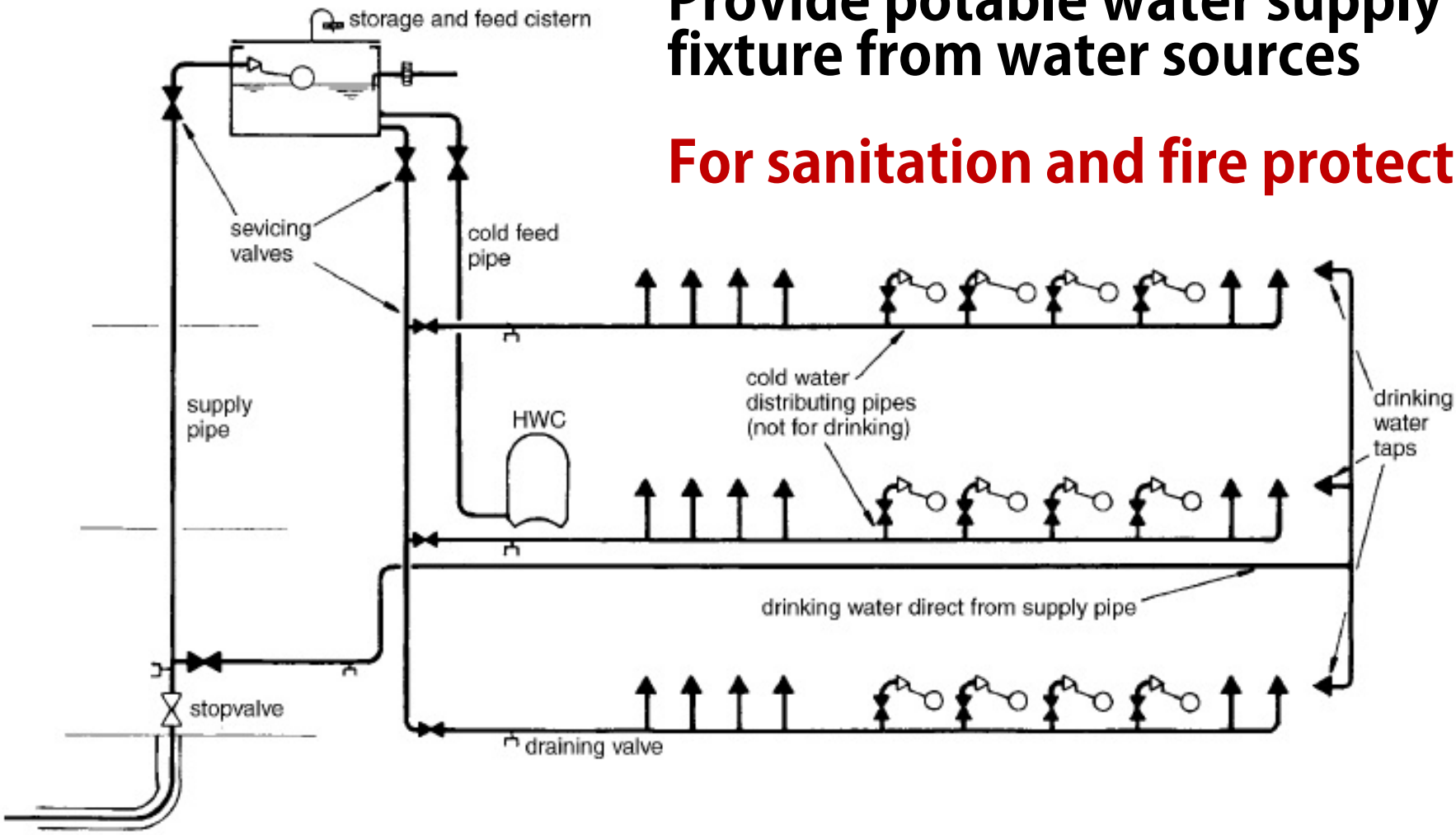
BUILDING
WATER SUPPLY



Purpose

Provide potable water supply to each fixture from water sources

For sanitation and fire protection



Types of System

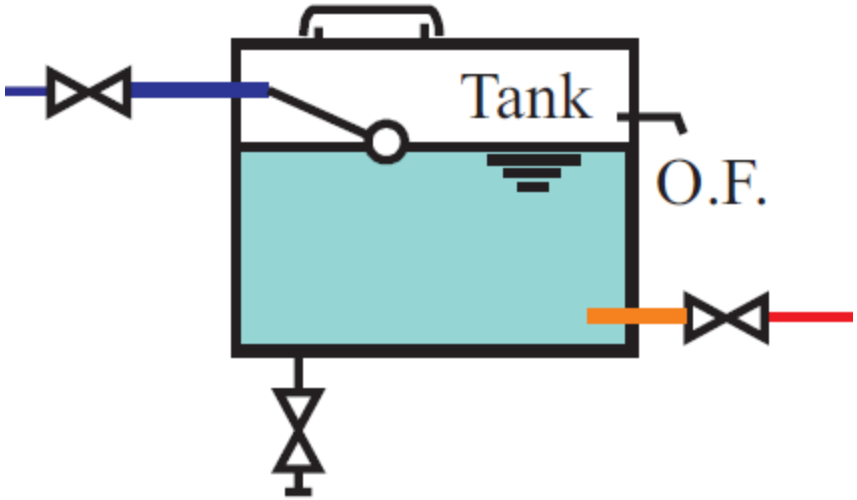
- Direct connection from the main
- Pumped system

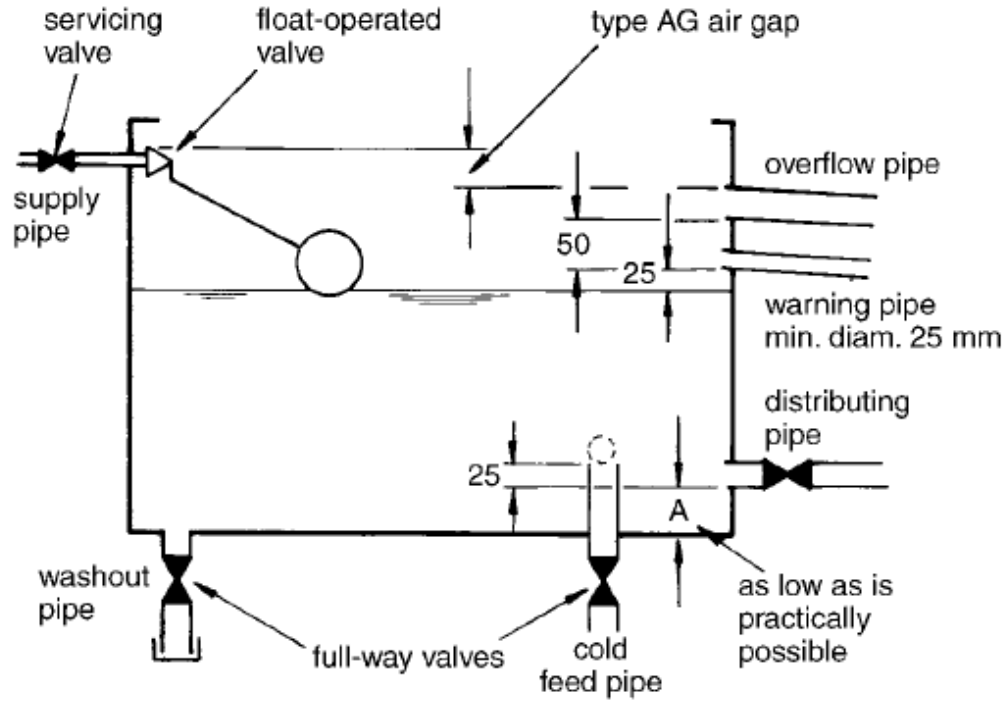
System Selection

- Demand (pressure and flow)
- Type of building occupancy
- Aesthetics
- Economy
- Use
- Maintainability
- Flexibility to failure

Storage Cisterns

- Capacity
  - Type and use of buildings
  - Likelihood and frequency of supply breakdown
  - Number of occupants
  - Pattern of use





Pipe sizing

- Layout to each fixtures
- Assume a pipe diameter
- Determine the flow rate
- Determine the effective pipe length
- Calculate the permissible loss of head
- Determine the pipe diameter

Fixtures flow rate

Loading units- a factor or number given to an appliance relating flow rate to the duration and frequency of use (probable usage).

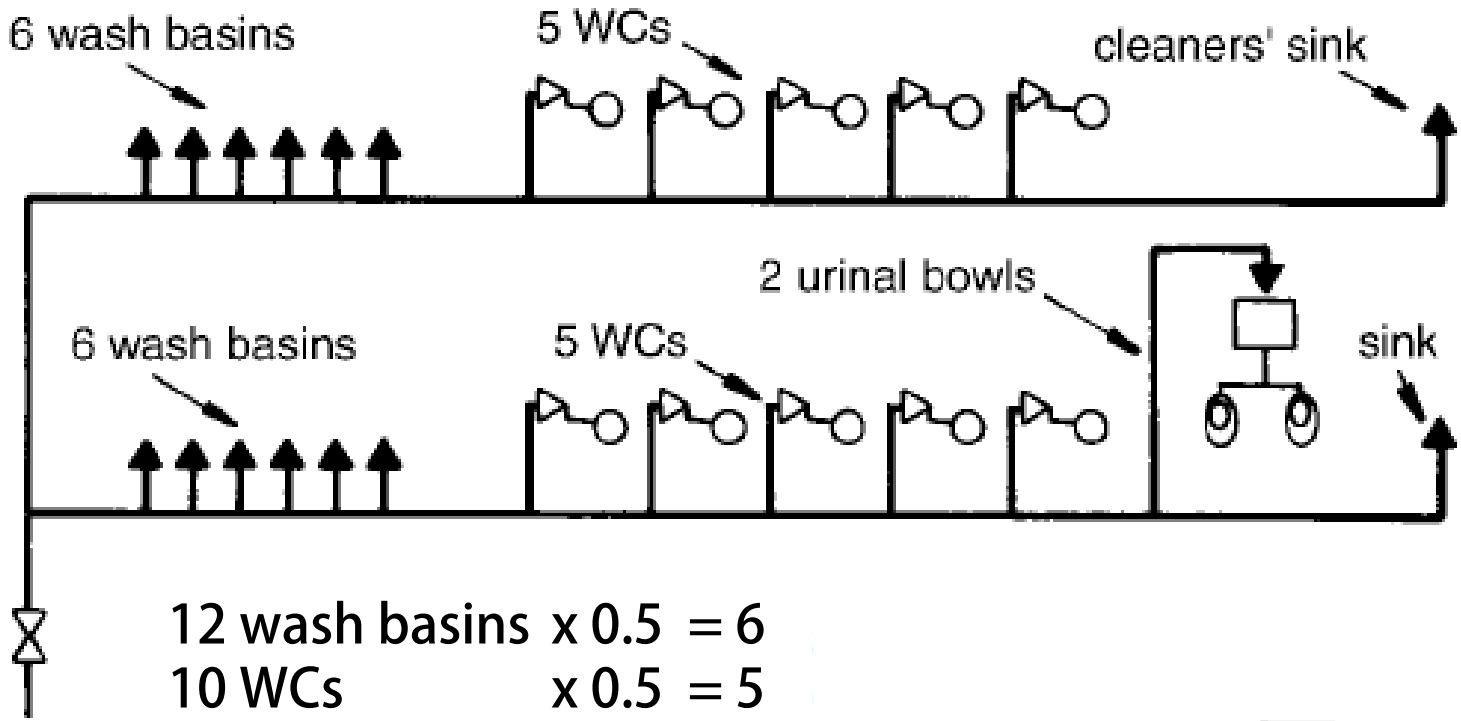
Appliance	Flow rate [l/s]	Loading units Z
(a) WC cistern / bidet / wash basin	0.125	0.50
(b) Flush valve (urinal)	0.125	0.50
(c) Sink	0. 25	1.00
(d) Shower	0. 25	1.00
(e) Bath	0. 35	1.96
(f) Flush valve (WC)	0. 52	4.32
(g) Laundry tub	0. 25	1.00
(h) Washing machines (dish washer)	0. 25	1.00
(i) Hose tap (20 nom-size)	0. 30	1.44
(j) Hose tap (15 nom-size)	0. 20	0.64
(k) Cistern for urinal	0.004	*
(l) Spray tap (Drinking fountain)	0. 04	*

$$Z = \left(\frac{q}{0.25}\right)^2$$

For simultaneous flow

$$Q = 0.25\sqrt{Z_1 + Z_2 + \cdots + Z_n}$$

Fixtures flow rate



12 wash basins	x 0.5	= 6
10 WCs	x 0.5	= 5
2 urinals	x 0.5	= 1
2 sinks	x 1	= 2
Total loading units		= 14

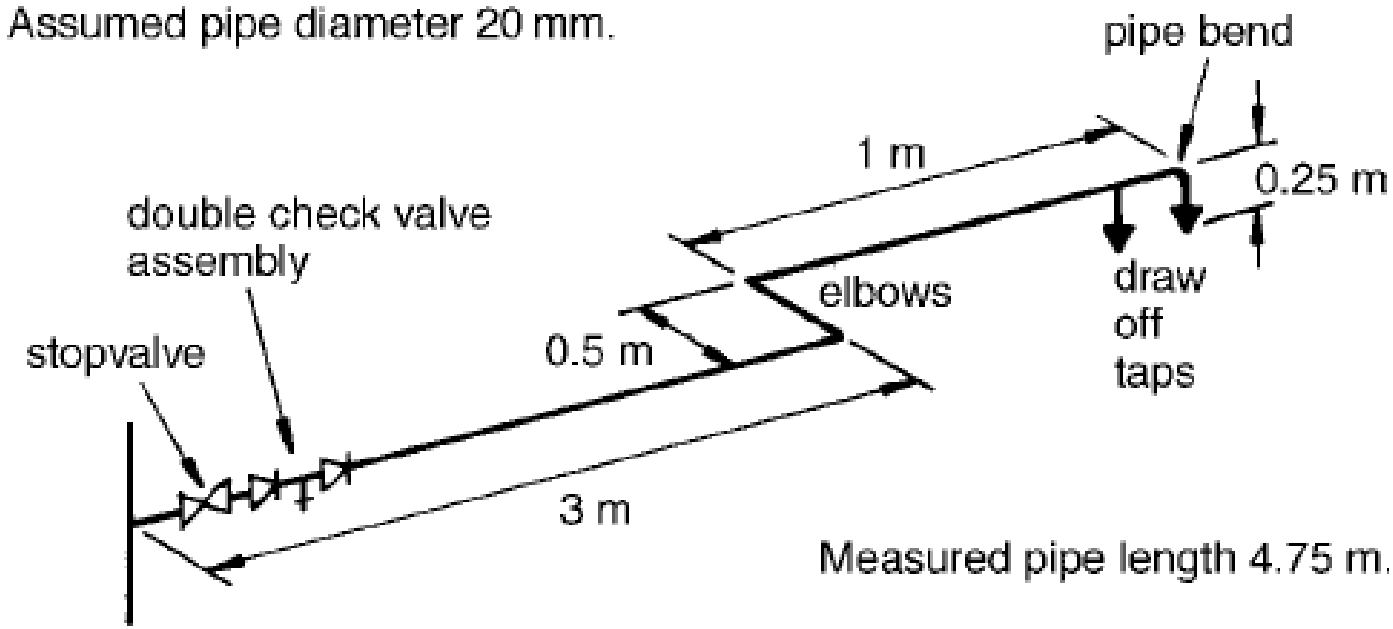
$$Q = 0.25\sqrt{14} = 0.935\ l/sec$$

Effective pipe length

= **Measure pipe length + equivalent pipe length**

Bore of pipe mm	Equivalent pipe length			
	Elbow m	Tee m	Stopvalve m	Check valve m
12	0.5	0.6	4.0	2.5
20	0.8	1.0	7.0	4.3
25	1.0	1.5	10.0	5.6
32	1.4	2.0	13.0	6.0
40	1.7	2.5	16.0	7.9
50	2.3	3.5	22.0	11.5
65	3.0	4.5	—	—
73	3.4	5.8	34.0	—

Effective pipe length

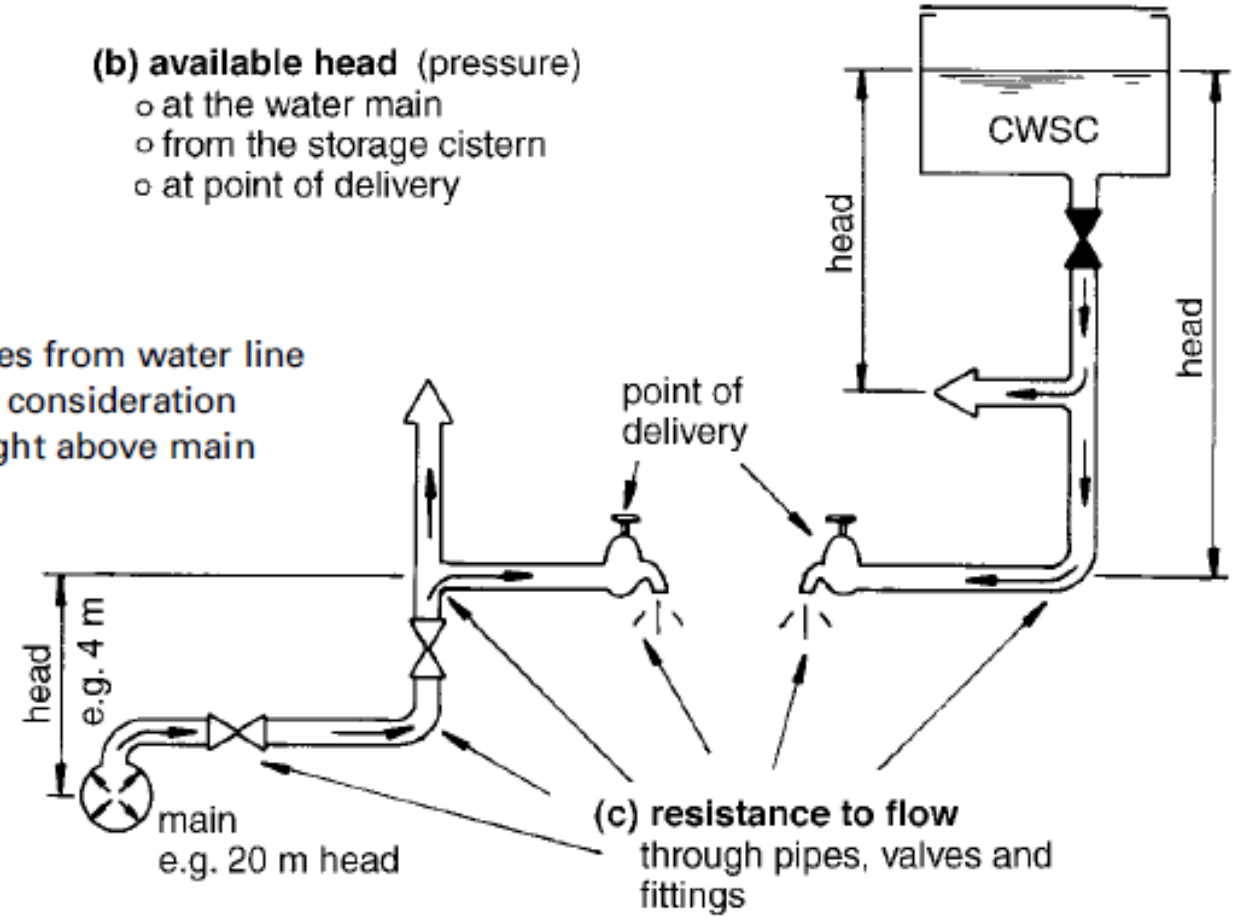


Measured pipe length		4.75 m
Equivalent pipe lengths		
elbows	2 × 0.8 =	1.6 m
tee	1 × 1.0 =	1.0 m
stopvalve	1 × 7.0 =	7.0 m
taps	2 × 3.7 =	7.4 m
check valves	2 × 4.3 =	8.6 m
Effective pipe length	=	30.35 m

Head loss calculation

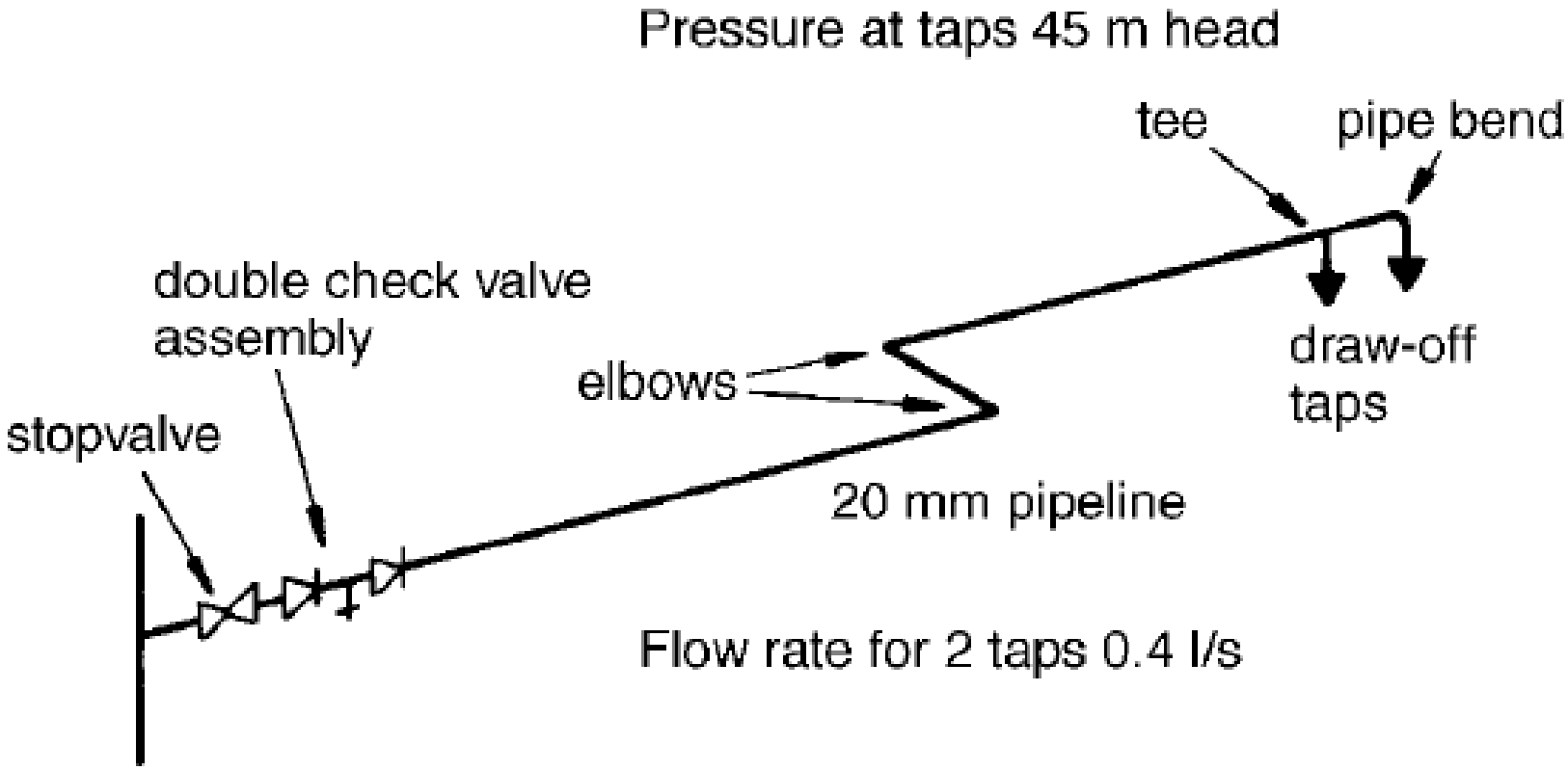
(b) available head (pressure)
- at the water main
- from the storage cistern
- at point of delivery

Available head (from cistern) = vertical distance in metres from water line in cistern to point under consideration
= head at main minus height above main
Available head (mains supply) = 20 m − 4 m
= 16 m head



$$\text{Permissible head loss (m/m run)} = \frac{\text{Available head (m)}}{\text{Effective pipe length (m)}}$$

Head loss calculation



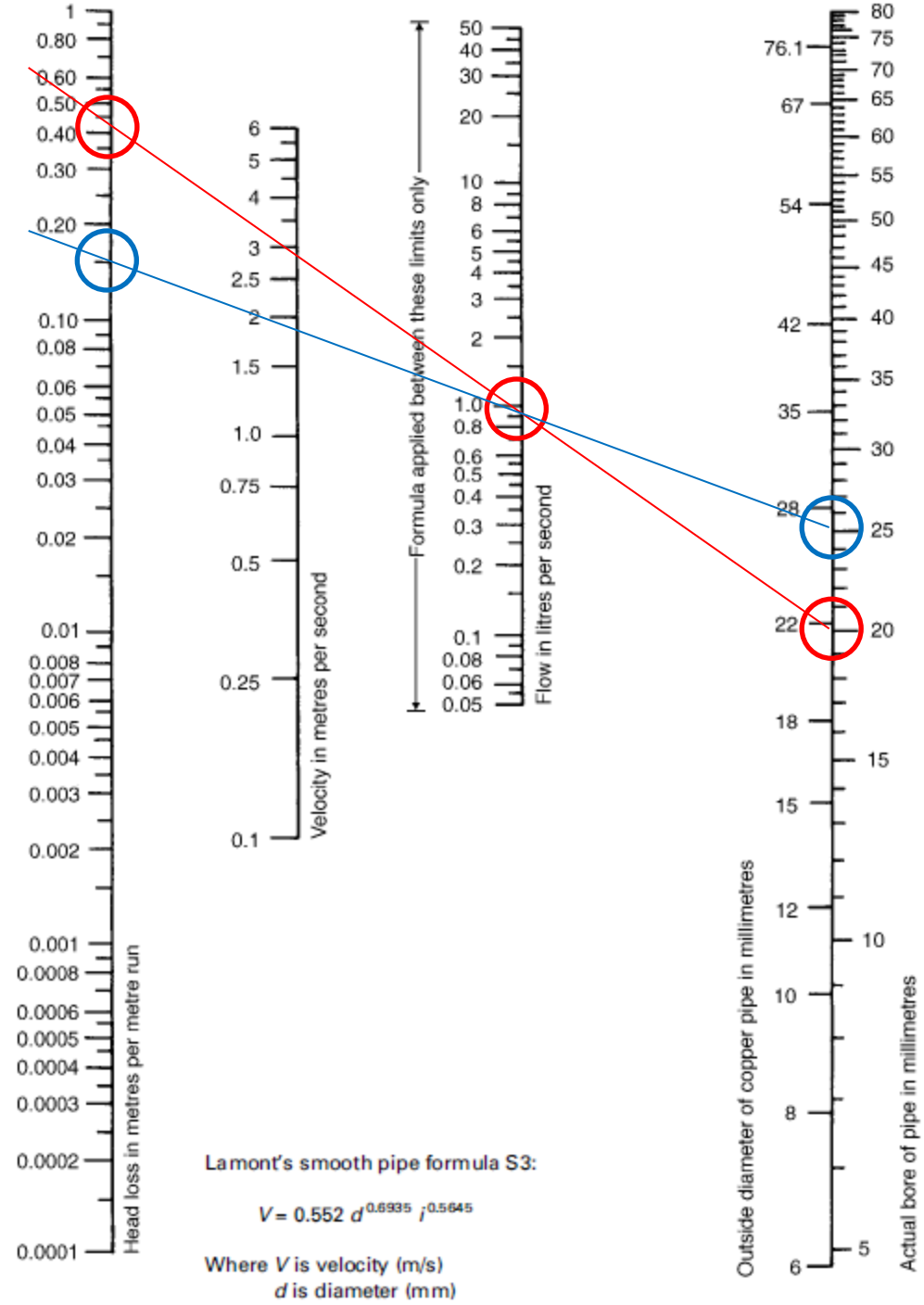
$$\text{Permissible head loss} = \frac{\text{available head (45 m)}}{\text{effective pipe length (30.55 m)}}$$

$$= 1.48 \text{ m/m run}$$

Determine pipe diameter

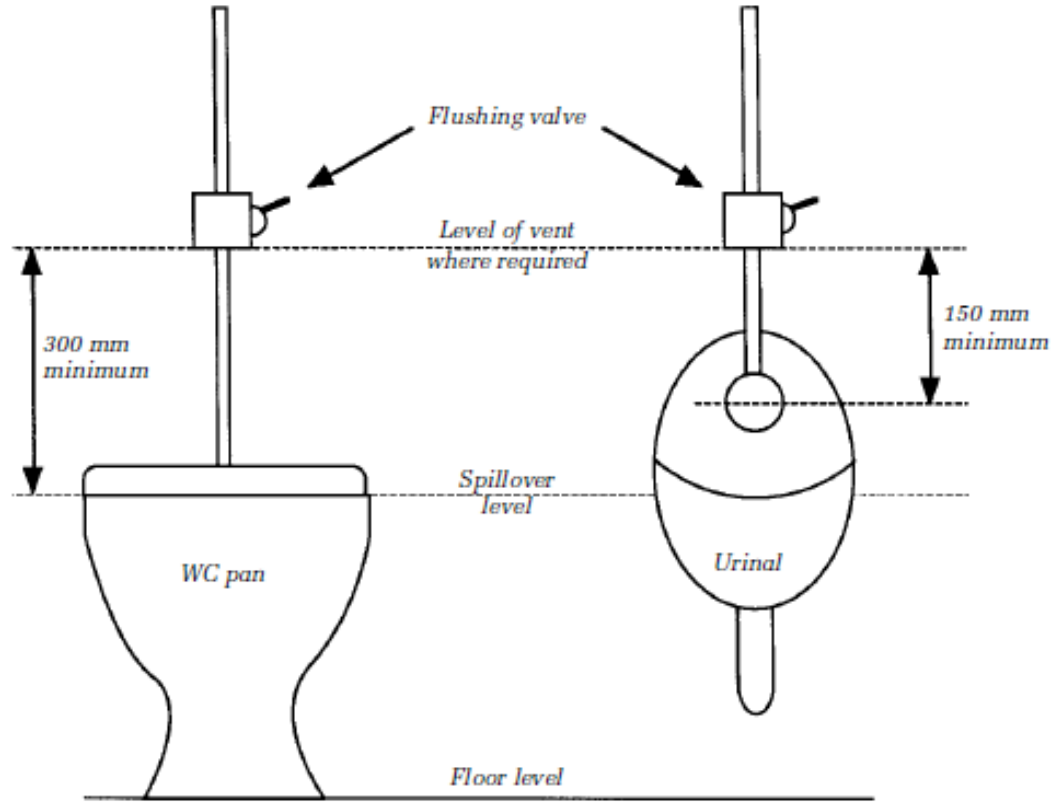
For diameter of 20 mm
With Q = 0.93 l/sec
From the graph we've:
Head loss = 0.42 m/m Ok!
V = 2.8 m/s hmmmm!

For diameter of 25 mm
With Q = 0.93 l/sec
From the graph we've:
Head loss = 0.15 m/m ok!
V = 1.8 m/s ok!



BUILDING

SANITARY INSTALLATION



PLEASE READ!