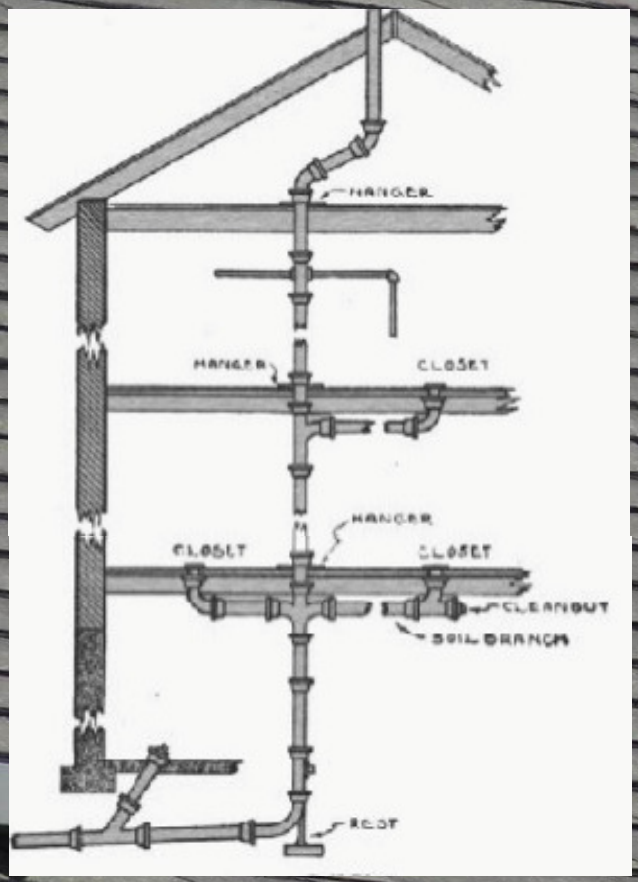
Chapter 15

Vents



Overview

- This topic covers need of vents, its sizing and proper placement in the drainage system. Source material for this course is Chapter 9 of the UIPC-I Code and NBC-2016 part-9 Section 2 .

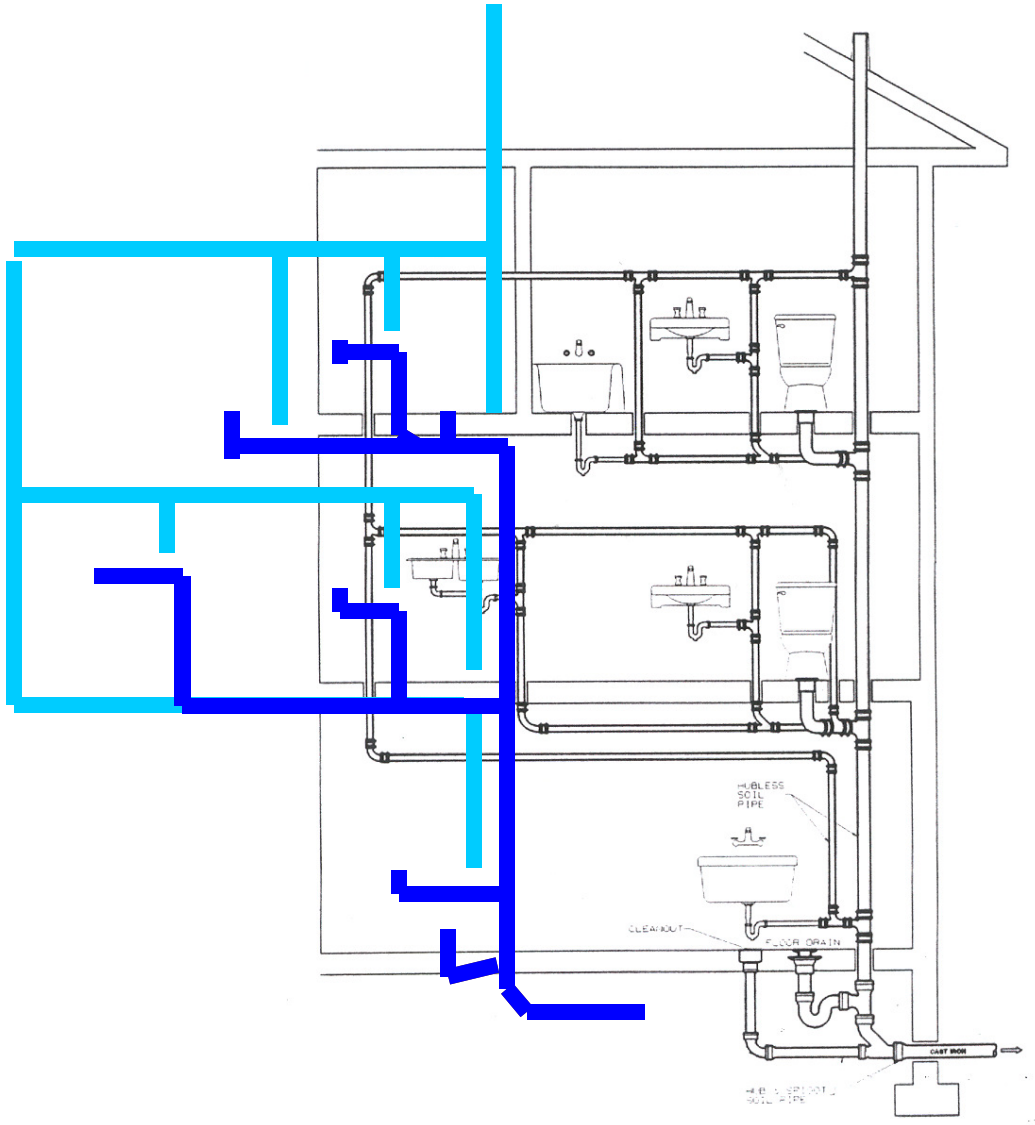
According to UIPC-I:

Each plumbing fixture needs a trap
Each trap needs a vent to protect trap seal

This is contrary to the practice in India:

- Most plumbing fixtures are connected to a floor trap.
- The plumbing fixtures may or may not have a dedicated fixture trap.
- Each plumbing fixture and also the floor trap do not have a dedicated vent.

How the Vent System Works



Why Venting Is Required

- Proper venting ensures trap seal integrity.
- Protection from the entry of sewer gases in to the habitable place is avoided by the 50 mm trap seal.
- The aim is to maintain a pressure differential of not more than 25mm of water column. This will prevent traps from blowing out.

Definition

Vent System –

A pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system to protect trap seals from siphonage and backpressure.

Definition

- **Vent** – Any pipe provided to ventilate a plumbing system, to prevent trap siphonage and backpressure, or to equalize the air pressure within the drainage system.

- **Main Vent** – The principal artery of the venting system to which vent branches may be connected.

Definition

- **Branch Vent** – A vent connecting one (1) or more individual vents with a vent stack or stack vent.

- **Relief Vent** – A vent, the primary function of which is to provide circulation of air between drainage and vent systems or to act as an auxiliary vent on a specially designed system.

Definition

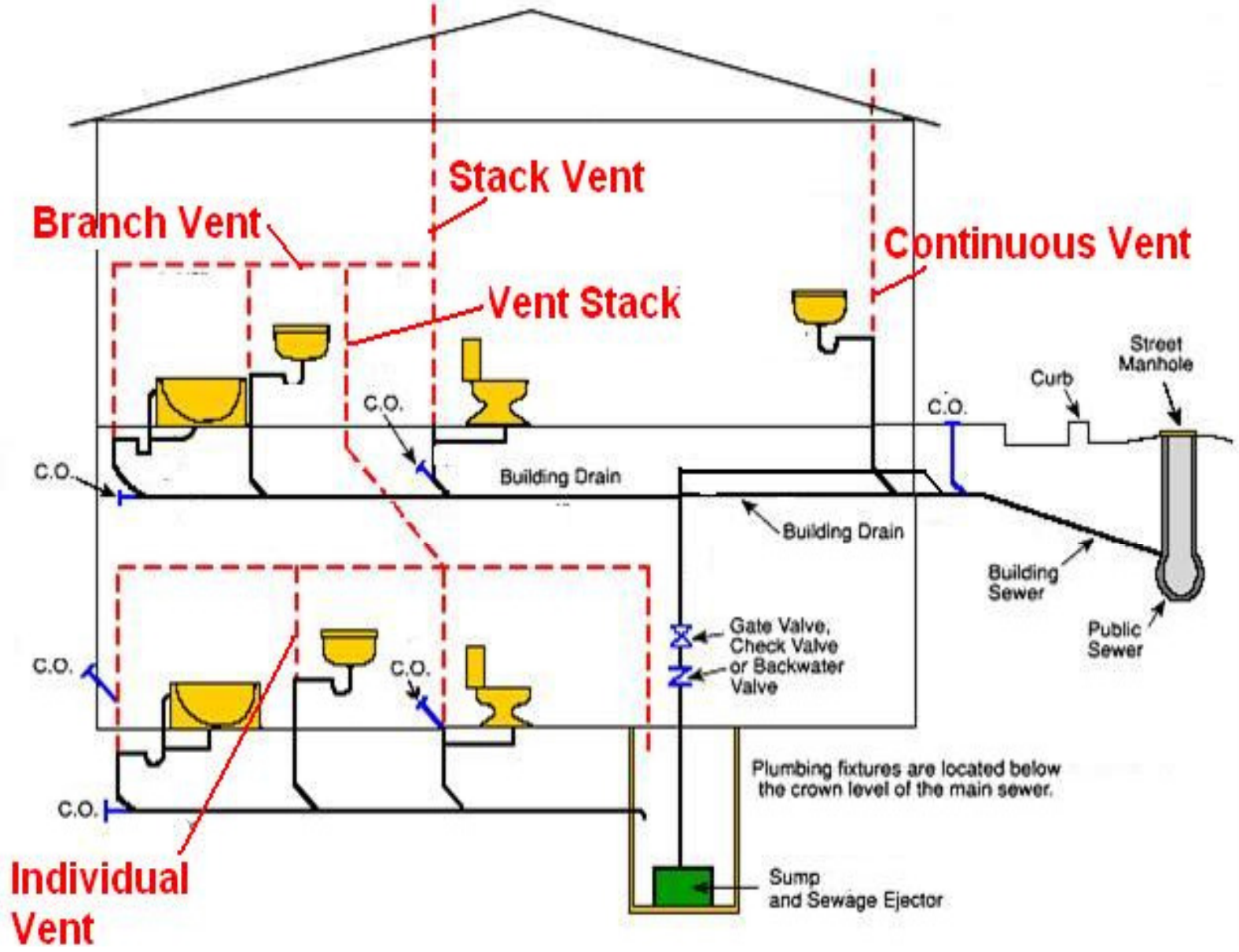
- **Individual Vent** – A pipe installed to vent a fixture trap and that connects with the vent system above the fixture served or terminates in the open air.

- **Continuous Vent** – A vertical vent that is a continuation of the drain to which it connects.

Definition

- **Stack Vent** – The extension of a soil or waste stack above the highest horizontal drain connected to the stack.

- **Vent Stack** – The vertical vent pipe installed primarily for the purpose of providing circulation of air to and from any part of the drainage system.

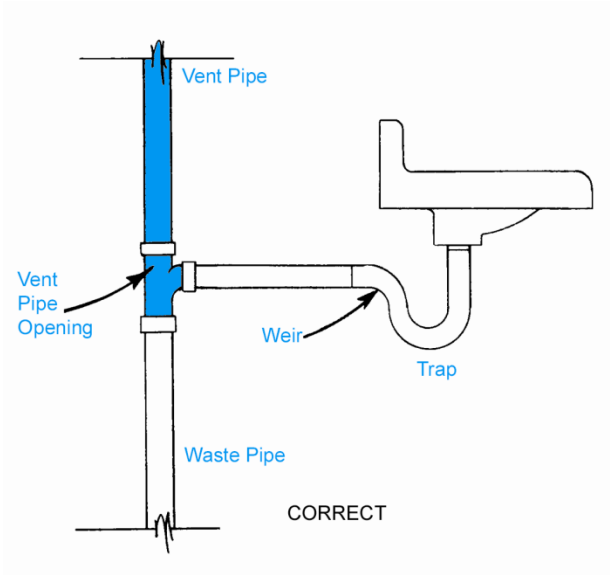

Stack Vent
Branch Vent
Continuous Vent
Vent Stack
Street Manhole
Curb
C.O.
C.O.
C.O.
Building Drain
Building Drain
Building Sewer
Public Sewer
Gate Valve, Check Valve or Backwater Valve
C.O.
C.O.
C.O.
Plumbing fixtures are located below the crown level of the main sewer.
Sump and Sewage Ejector
Individual Vent

Vents Required

Each plumbing fixture trap shall be protected against siphonage and back-pressure, and air circulation shall be assured throughout all parts of the drainage system by means of vent pipes.

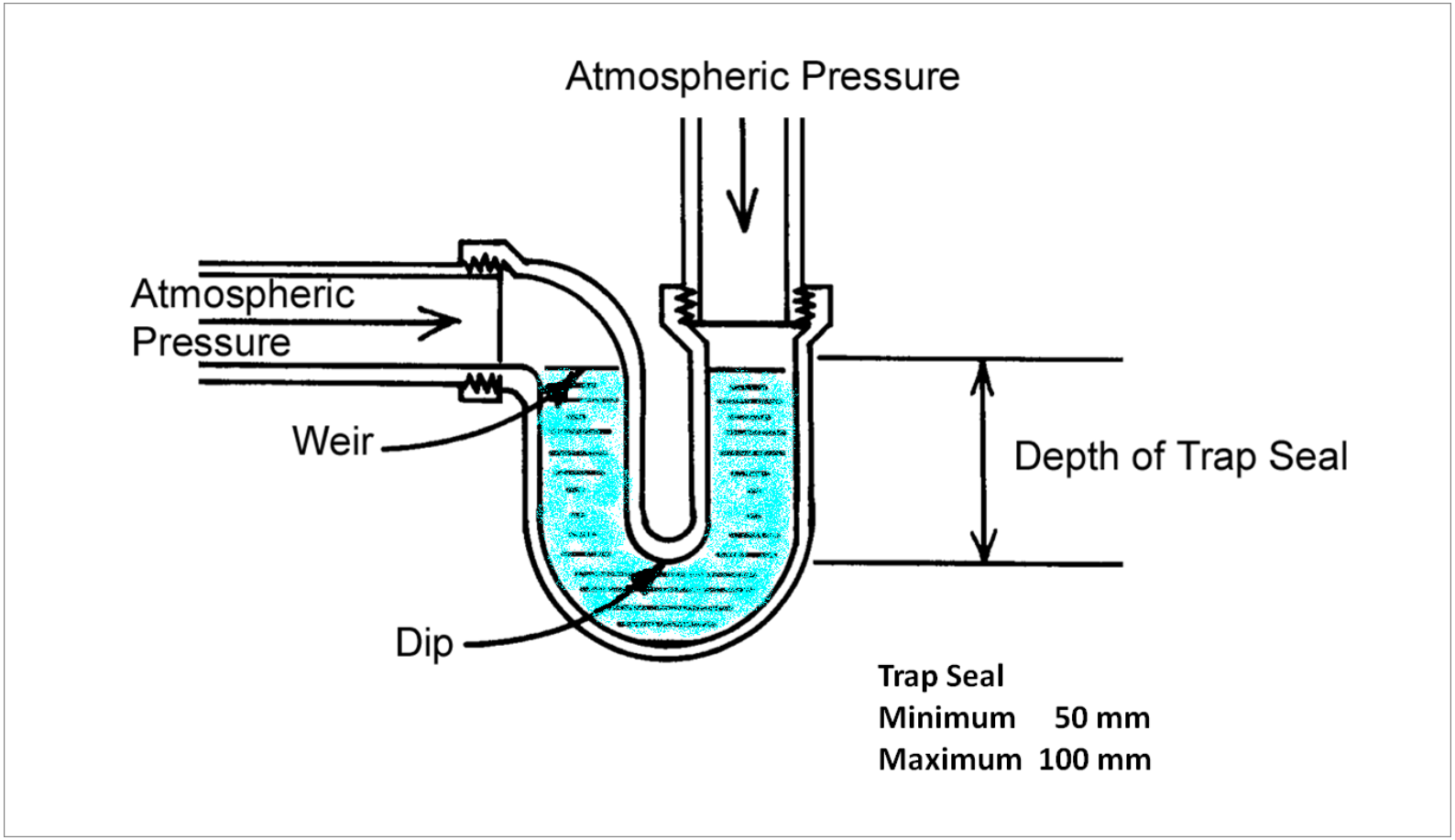
Traps Seal Protection

Vent system shall protect the trap seal from pressure differential that exceed 25 mm of water column on the outlet side of the trap.

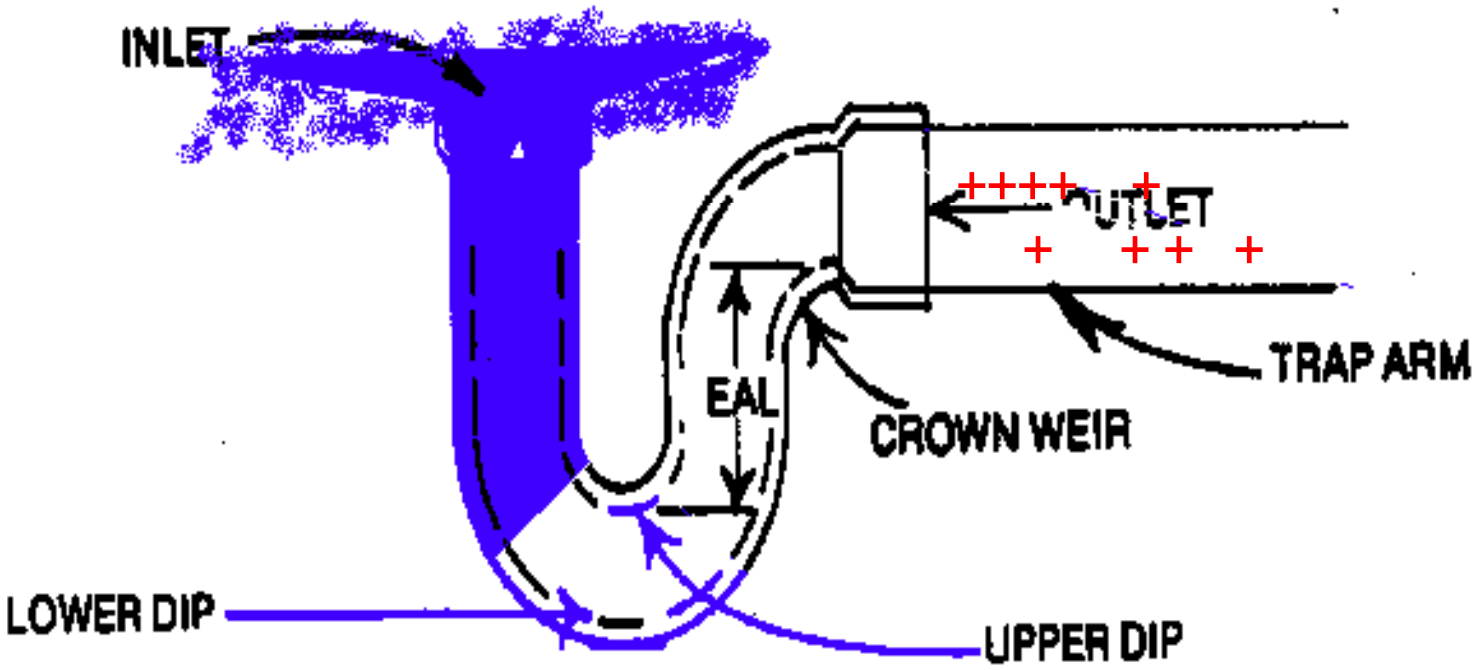


Every plumbing fixture (except those with integral traps) must have a trap.

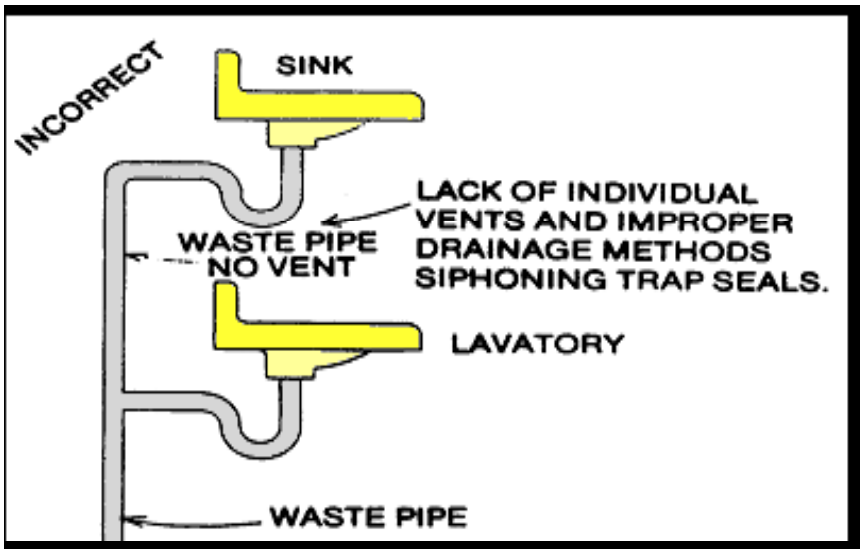
The Trap and Trap Seal

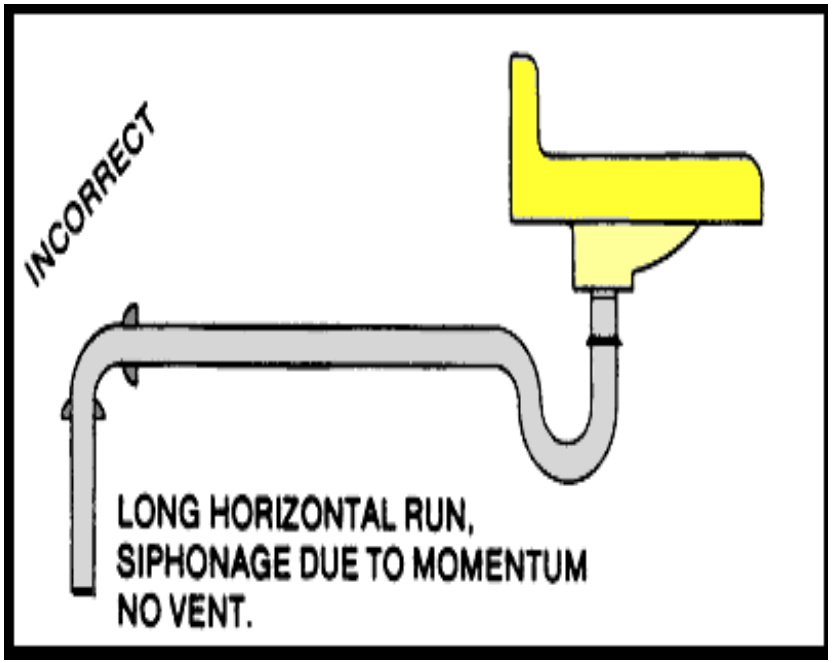


Trap Seal Blowout
Caused by Backpressure



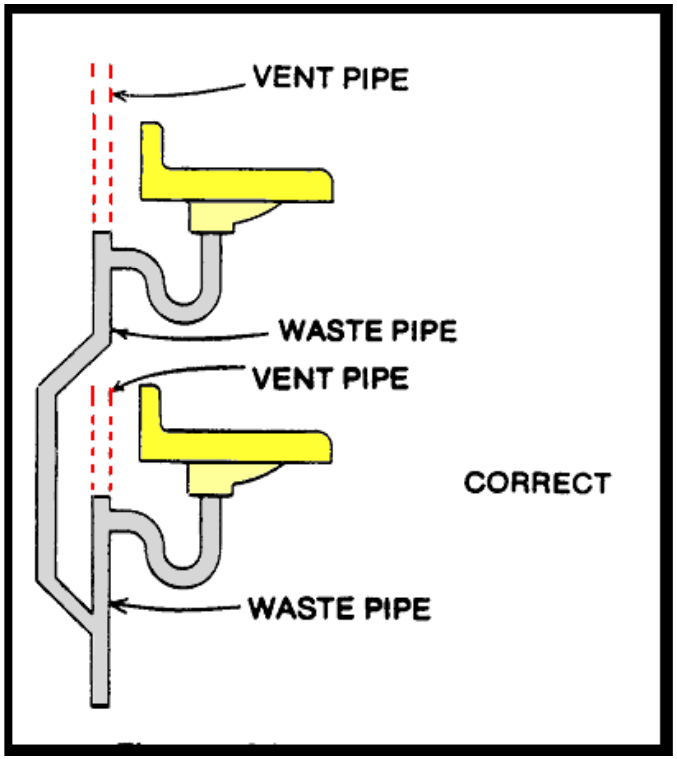
Incorrect Installation of Fixture Vents





Correct Installation of Fixture Vents

- Allows for equal pressure on both sides of the fixture trap
- Air circulation is assured throughout system



Vents Not Required

- Vent piping may be omitted on an interceptor when such interceptor acts as a primary settling tank and discharges through a horizontal indirect waste pipe into a secondary interceptor.
- The second interceptor shall be properly trapped and vented.

Primary Settling Tank

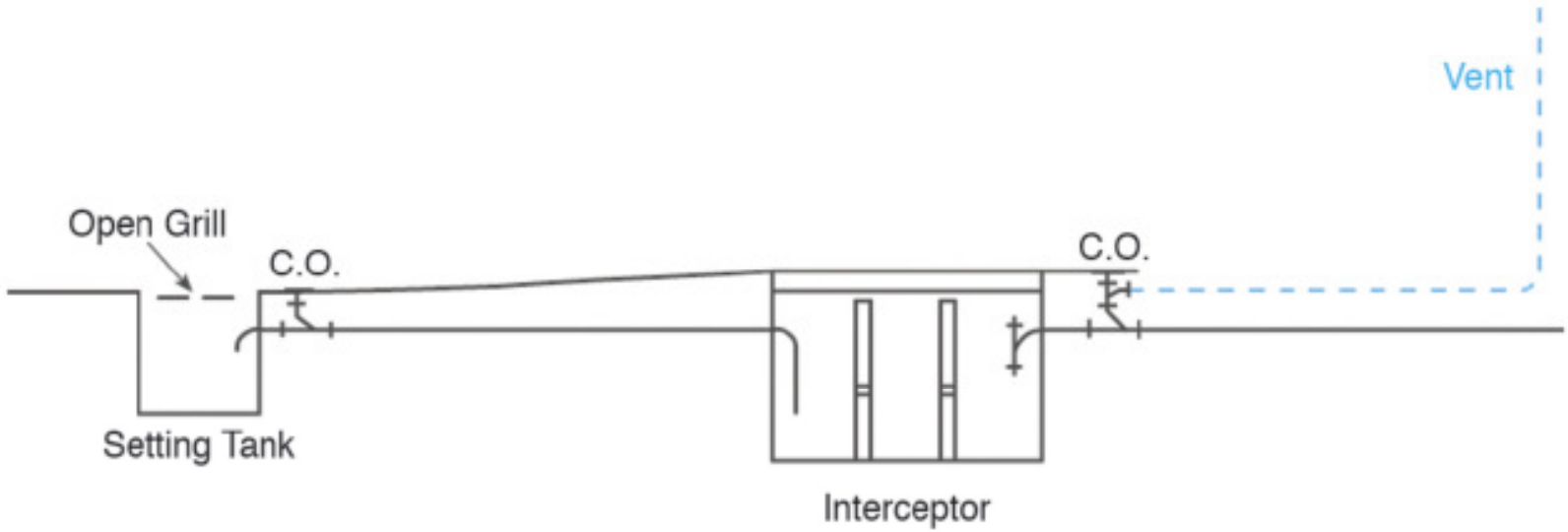
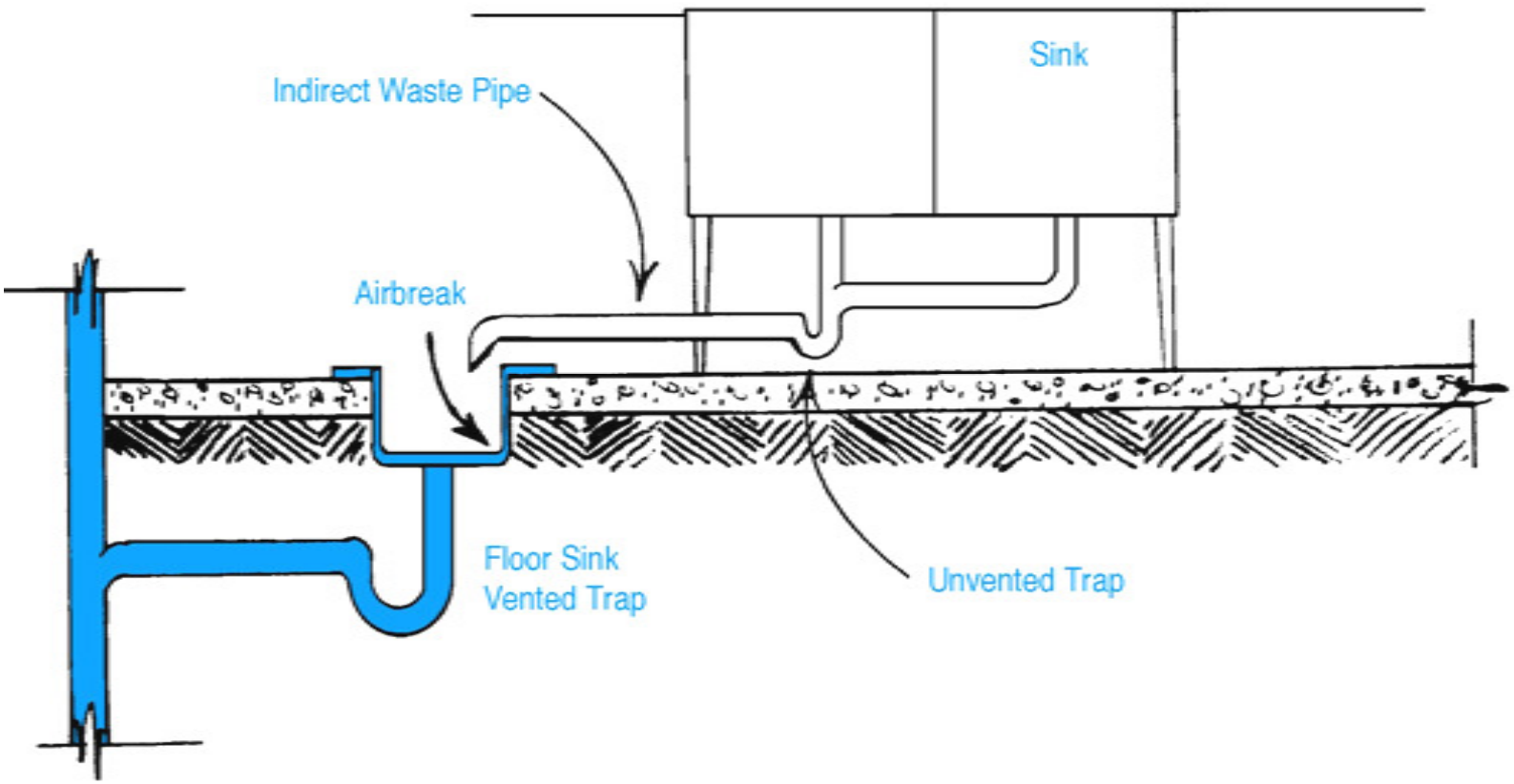


Figure 902.1
Vent Not Required on Secondary Interceptor

Industrial Interceptors (Clarifiers), Sand Interceptors etc.

Indirect Waste – Vent not Required



Materials For Vent Piping

Same as Table 7-1 with restrictions

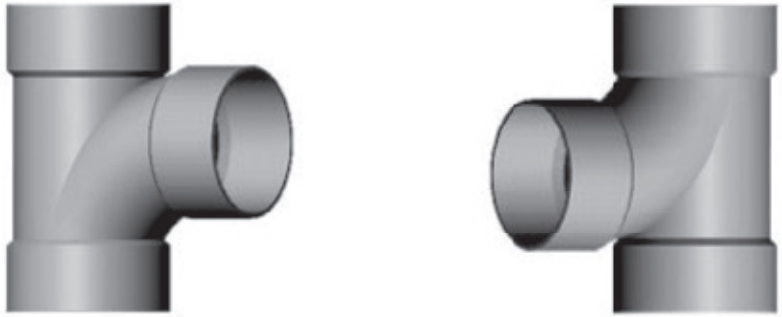
- SS 304 be kept min. 150 mm above ground.
- ABS, PVC installed using approved standards.
- Copper tube above and below ground of DWV grade
- Cast Iron



Changes in Direction of Vent Piping

- Changes in direction made with use of appropriate fittings
- Vent piping shall not be strained or bent
- Burred ends shall be reamed to full bore of the pipe

Vent Fittings



Sanitary (Swept)Tee for Drainage and Venting

¼ Bend and Vent 90

Size of Vent Piping

- Shall be determined from its length and the total number of fixture units connected thereto, as set forth by table 703.2

- An individual vent shall not be less than 32 mm nor less than ½ the diameter of the drain to which it is connected

Venting of WC with undersized 'corrugated' pipe

TABLE 703.2
Maximum Unit Loading and Maximum Length of Drainage and Vent Piping

Size of Pipe, mm	32	40	50	65	80	100	125	150	200	250	300
Maximum Units											
Drainage Piping[1]											
Vertical	1	2[2]	16[3]	32[3]	48[4]	256	600	1,380	3,600	5,600	8,400
Horizontal	1	1	8[3]	14[3]	35[4]	216[5]	428[5]	720[5]	2,640[5]	4,680[5]	8,200[5]
Maximum Length											
Drainage Piping											
Vertical, feet m	14	20	26	45	65	91	119	155	229		
Horizontal (unlimited)											
Vent Piping (See note)											
Horizontal and Vertical											
Maximum Units	1	8[3]	24	48	84	256	600	1380	3,600		
Maximum Lengths, m	14	18	37	55	65	91	119	155	229		

1 Excluding trap arm.
2 Except sinks, urinals, and dishwashers – exceeding 1 fixture unit.
3 Except six-unit traps or water closets.
4 Only four water closets or six-unit traps allowed on any vertical pipe or stack; and not to exceed three water closets or six-unit traps on a horizontal branch or drain.
5 Based on 1:50 (2 %) slope. For 1:100 (1 %) slope, multiply horizontal fixture units by a factor of 0.8.
6 The diameter of an individual vent shall be not less than 32 mm nor less than one-half the diameter of the drain to which it is connected. Fixture unit load values for drainage and vent piping shall be computed from Table 702.1 and Table 702.2(b). Not to exceed one-third of the total permitted length of a vent shall be permitted to be installed in a horizontal position. Where vents are increased one pipe size for their entire length, the maximum length limitations specified in this table do not apply. This table is in accordance with the requirements of Section 901.2.

Typical Design Of Vent Sizing
Refer Table 703.2

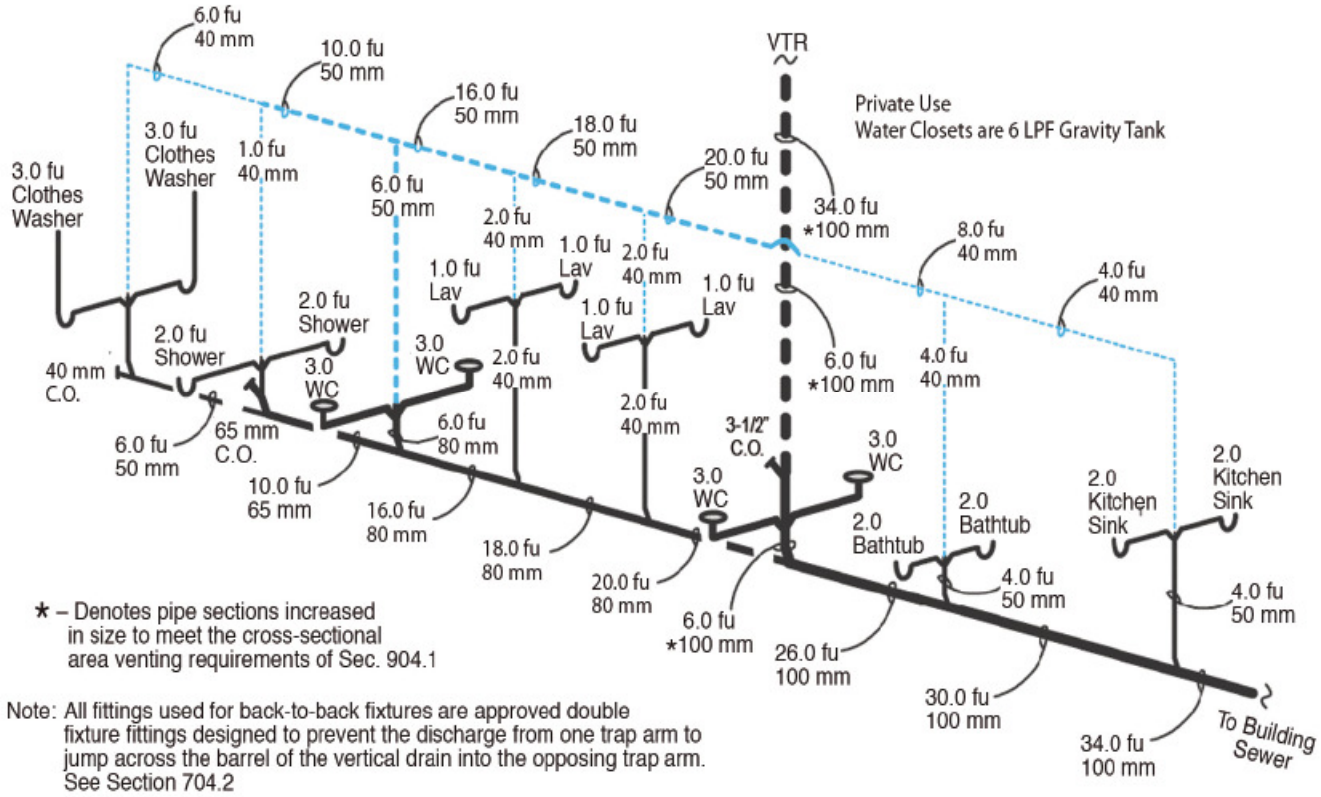


Figure 904.1a
Size Increase Due to Cross-sectional Area

Length of Vent Piping

Table 703.2

- Reason for length limits - friction loss in air movement.
- Lengths may be added in ascending order
  - 32 mm for 14 m
  - 40 mm for 18 m
  - 50 mm for 37 m

Size of Vents

- No more than 1/3rd of the total permitted length of any minimum sized vent shall be installed in the horizontal position.
  - Exception - When increased by one pipe size for its entire length, the length limitations do not apply.

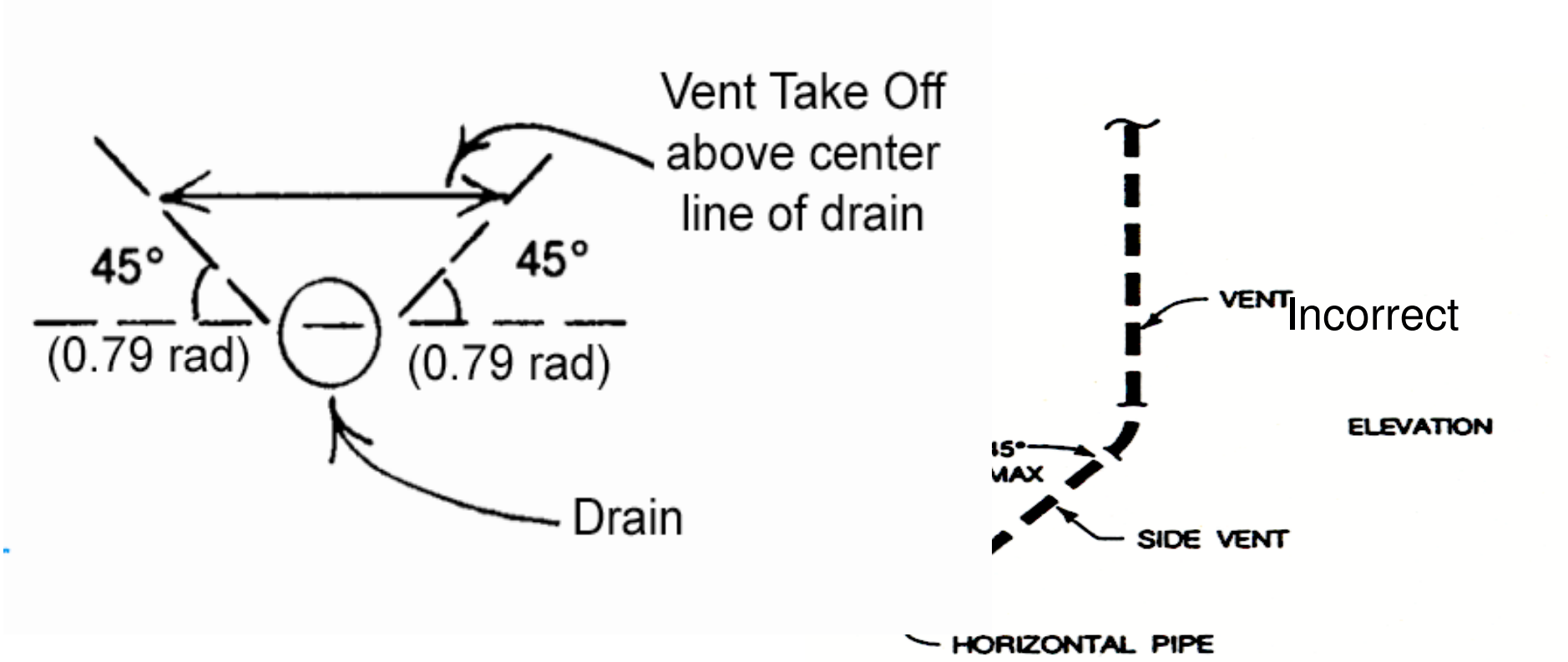
- Vents exceeding 12 m, the entire length shall be increased by one pipe size

Vent Pipe Grade

All vent pipes shall be free from drops and sags and shall be level or so graded and connected as to drip back by gravity to the drain it serves.

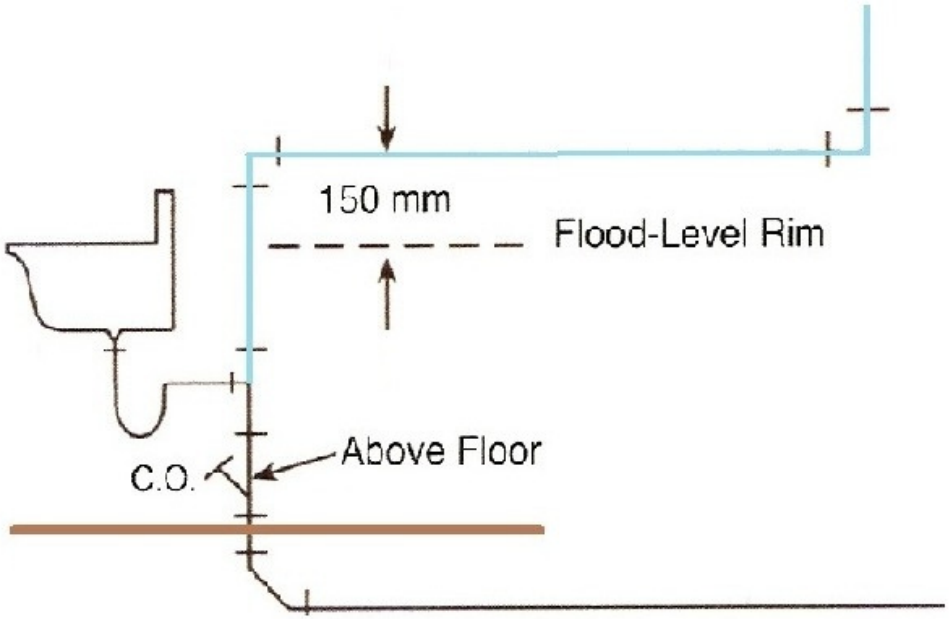
Remember, the humid space in vent pipe may result in condensation.

Vent Connection

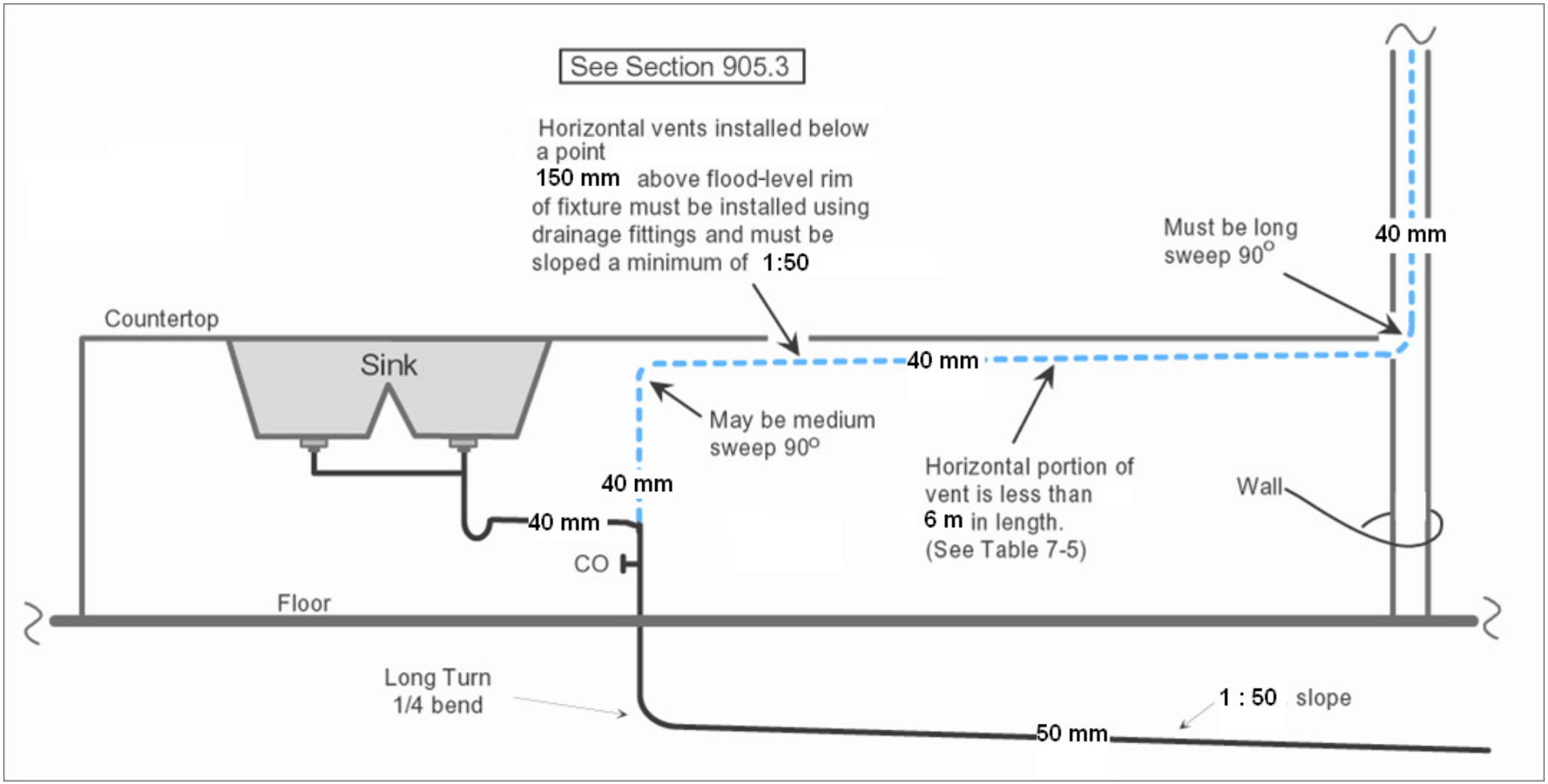


Vent Vertical Rise

- Unless structural condition exists, each vent shall rise vertically to a point not less than 150 mm above the flood level rim of the fixture served before offsetting horizontally



Peninsula Sink Vent



Connecting Vents Together

- Vents shall be 150 mm above flood rim of each fixture before connecting
- Vents less than 150 mm above the flood rim shall use drainage type fittings, material and grade

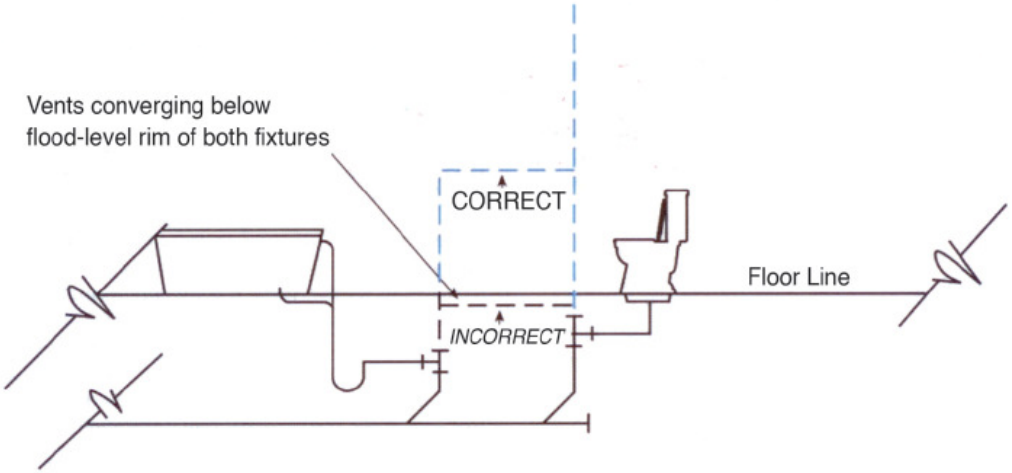
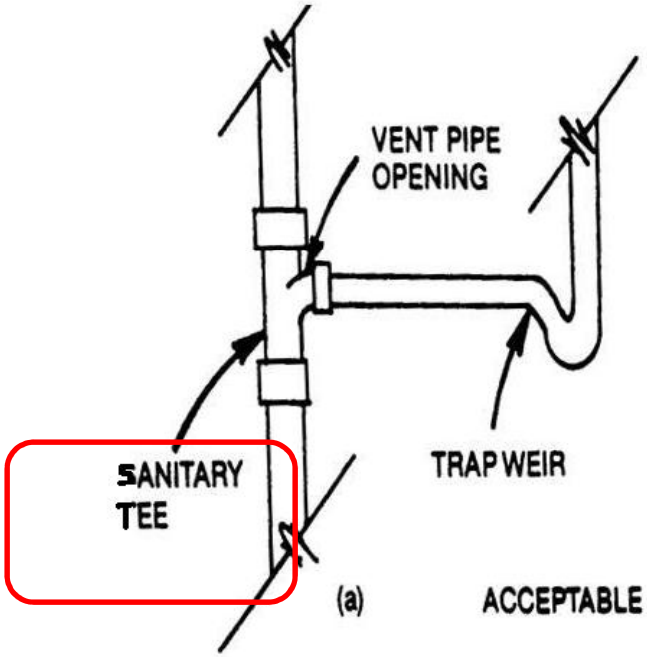
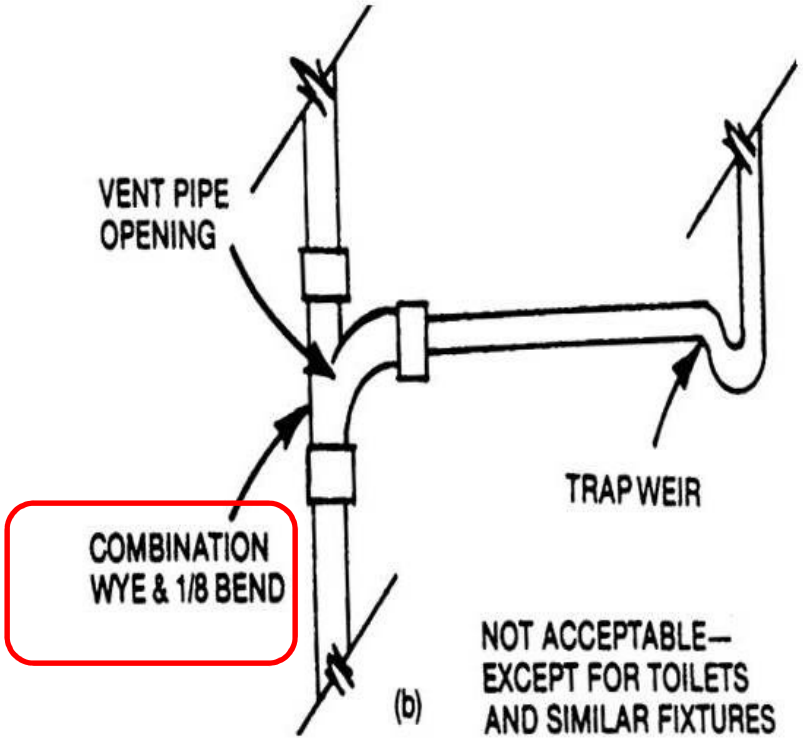


Figure 905.3a
Vents Must Rise 150 mm Above the Overflow Rim of the Fixture Before Connecting With Other Vents

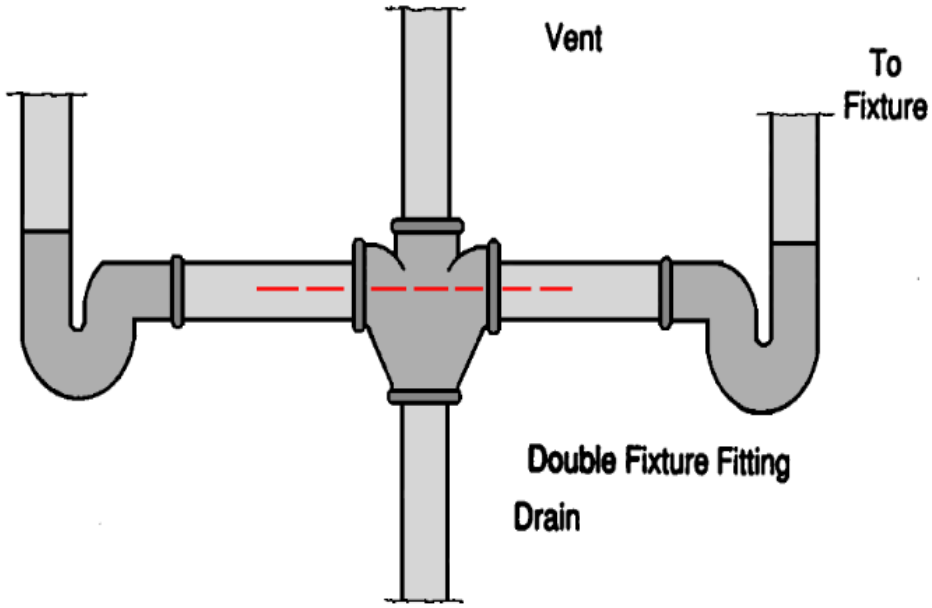
The Proper Fitting for Vertical Vent





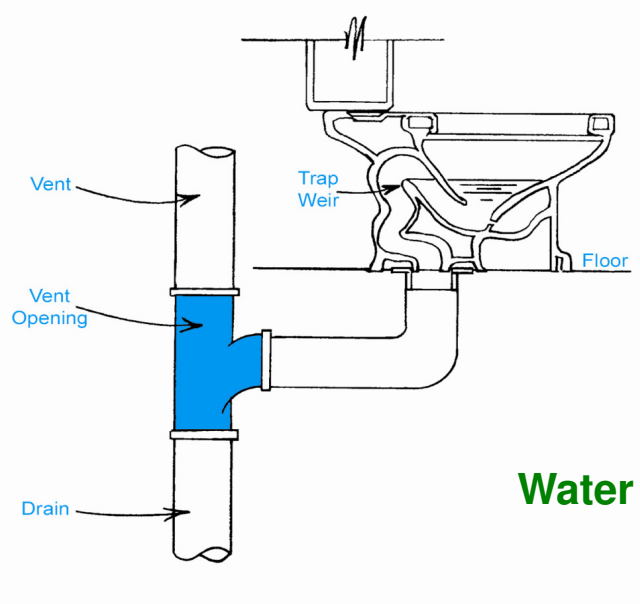
Common Vertical Vent Pipe

Back to back fixtures must waste into an approved double fixture fitting



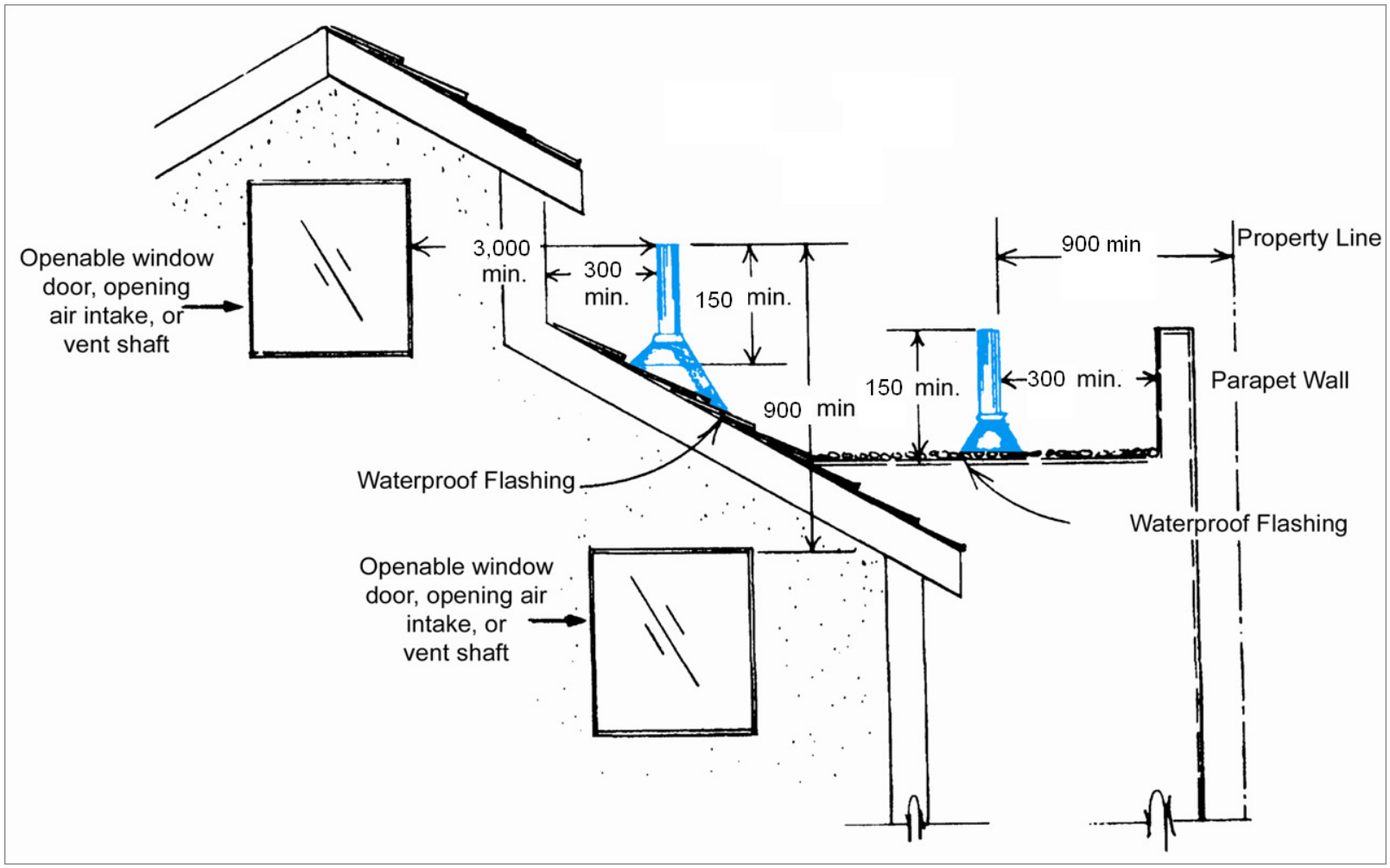
Proper Installation of WC Vent

The vent pipe opening from a soil or waste pipe, except for water closets and similar fixtures, shall not be below the weir of the trap.



Water Closet Vent

Vent Termination



Vent Termination

Each vent pipe or stack shall extend through its flashing and shall terminate vertically:

- Not less than 150 mm above the roof
- Not less than 300 mm from any vertical surface
- Not less than 900 mm above any openable window, door, opening, or air intake
- Not less than 2,100 mm above terrace
- Not less than 3,000 mm above the surrounding ground for outdoor installations

Vent Stack and Relief Vent

- Stack of building of 10 or more stories shall have parallel (relief) vent stack

- Yoke vent connection every 5 floors
- Yoke vent size not less than either the drainage or the vent stack diameter, whichever is smaller
- Yoke vent connection to the drainage stack by a wye branch fitting placed below the lowest branch connection serving that floor
- Yoke vent connection to the vent stack shall be not less than 1,000 mm above the floor level,

Yoke Vent Section

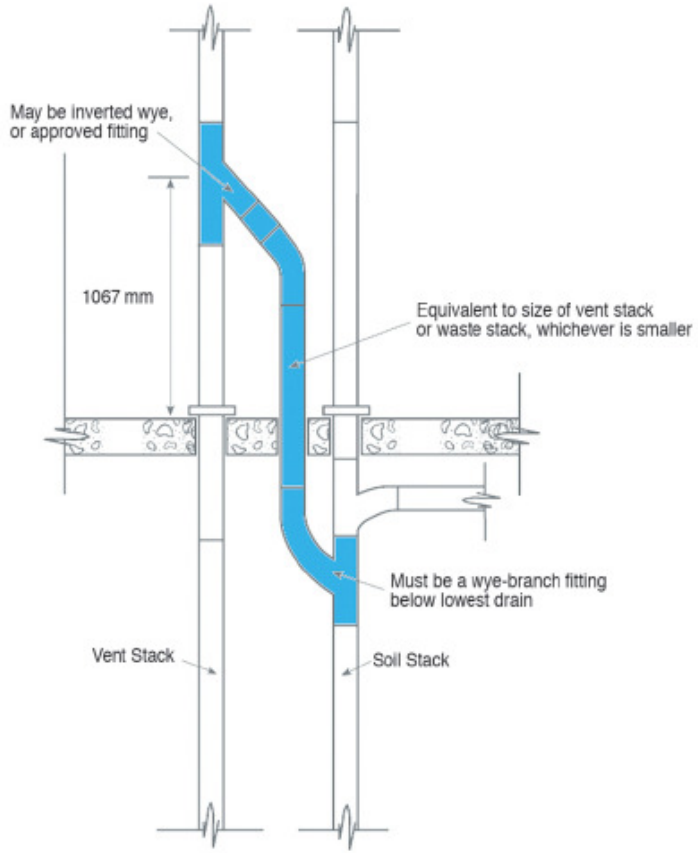


Figure 907.1j
Yoke Vent Installation

Parallel Vent Stack System

Note:
Counting down from top

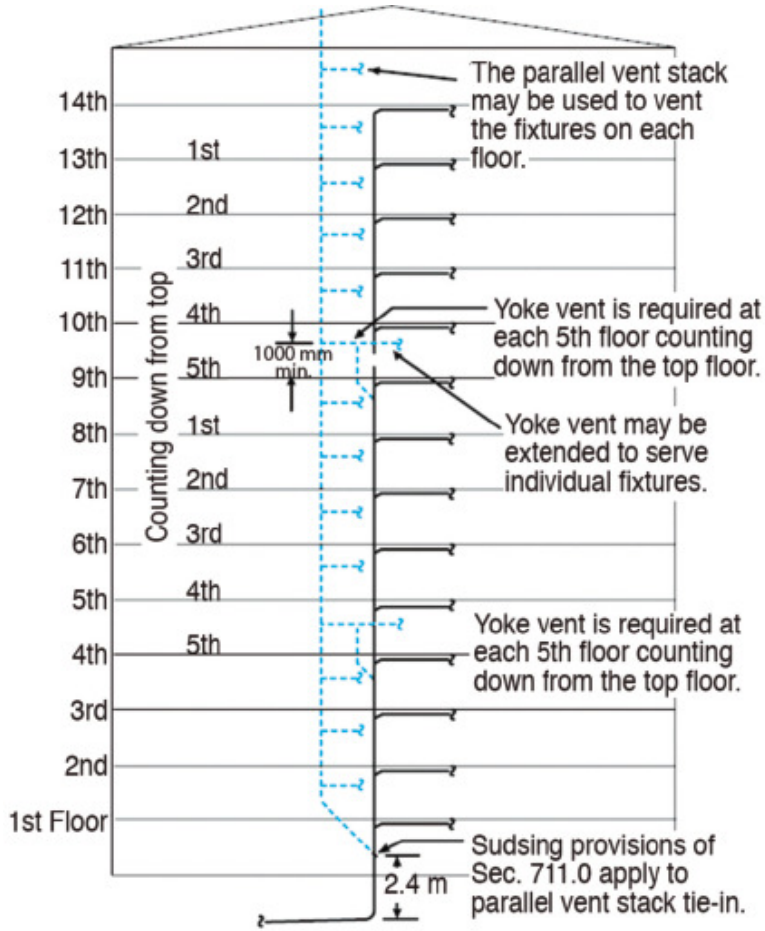
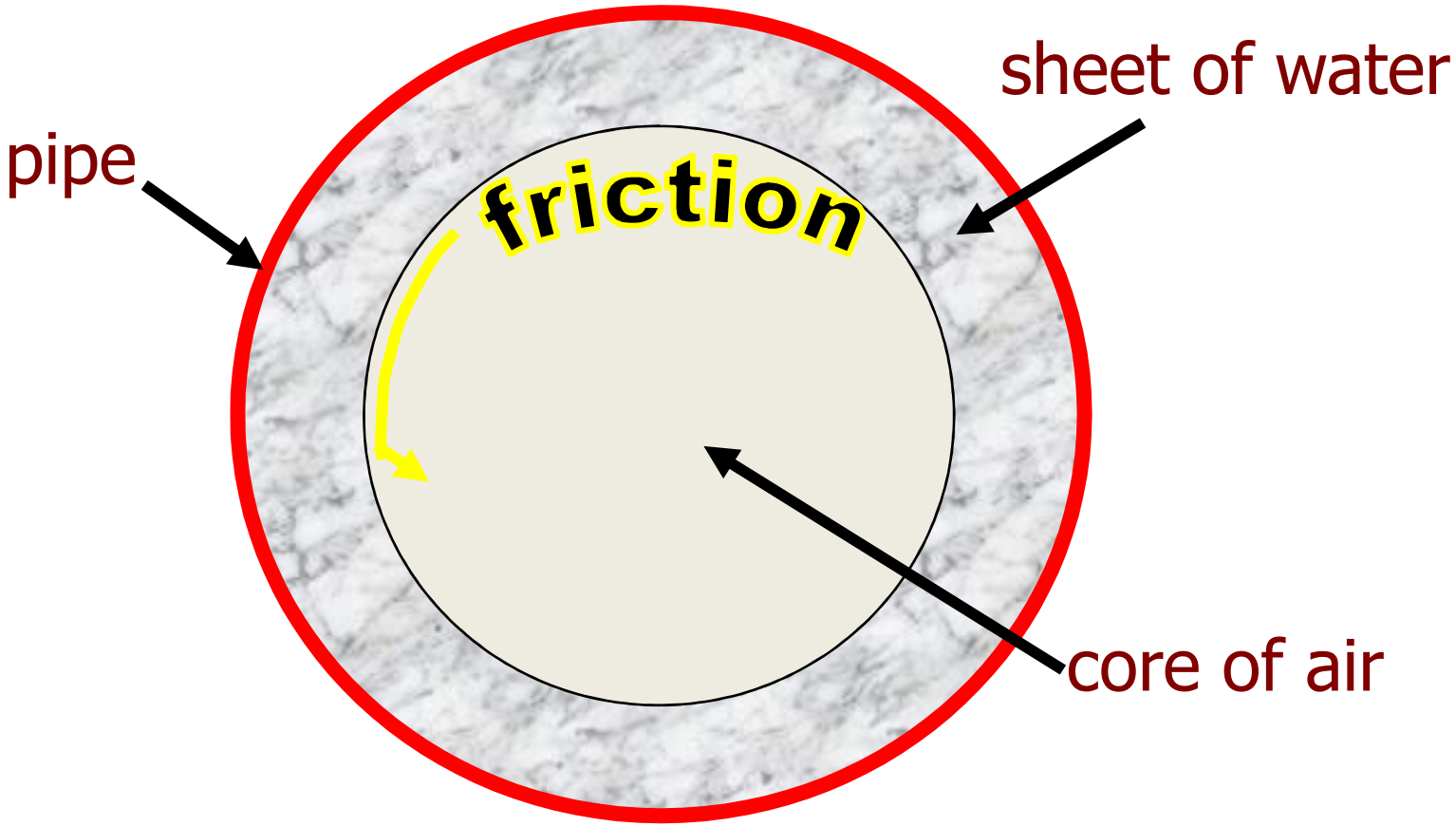


Figure 907.1a
Parallel Vent Stack System

Vertical Drainage

- Effluent flows spirally down the walls of the drainage piping
- At maximum flow, the effluent displaces 1/4 to 1/3 of the cross-sectional area of the pipe
- Frictional drag occurs along the walls of the pipe and on the core of air in the center of the pipe

Flow in Drainage Stacks

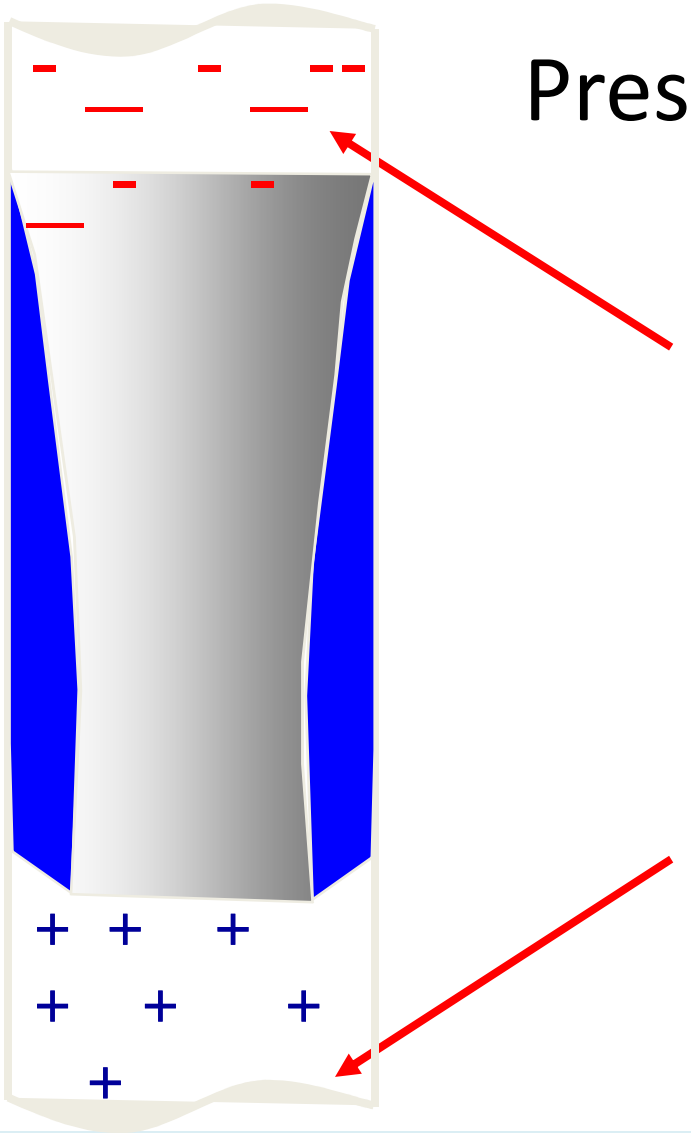


Pressures in Drainage Stacks

- Pressures above atmospheric are created below the flow:

- Pressures below atmospheric are created above the flow:

Pressures in Drainage Stacks

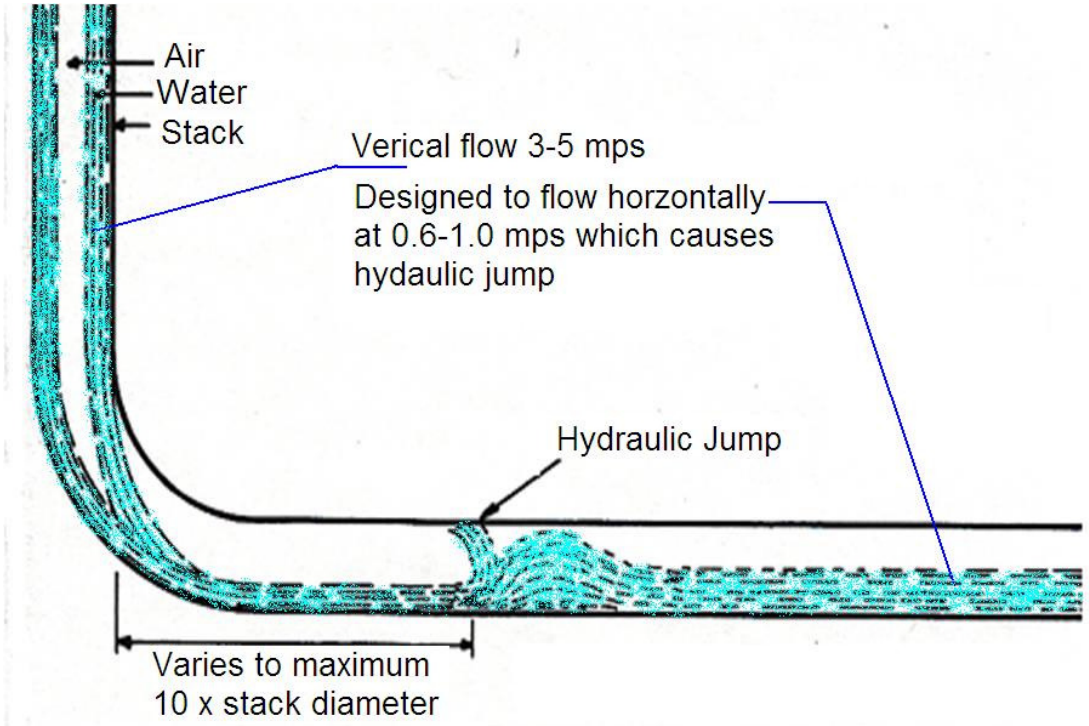


- Pressures begin to drop below atmospheric pressure

- Pressures begin to rise above atmospheric pressure

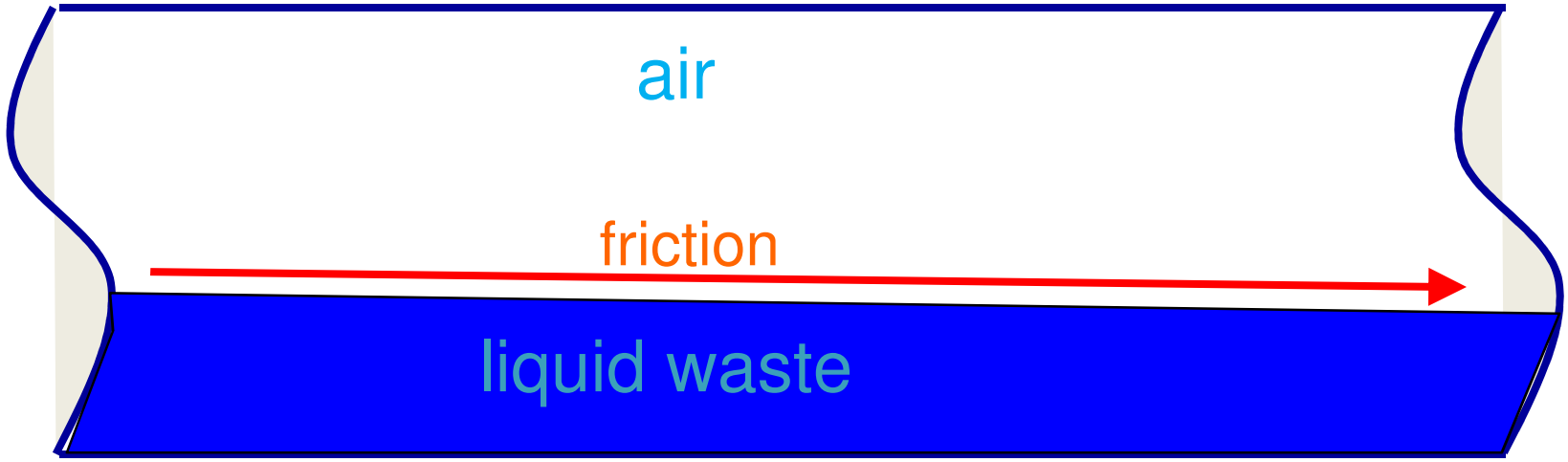
Hydraulic Jump

Hydraulic jump and water curtain at the base of vertical drainage piping will cause positive pressures in the stack:



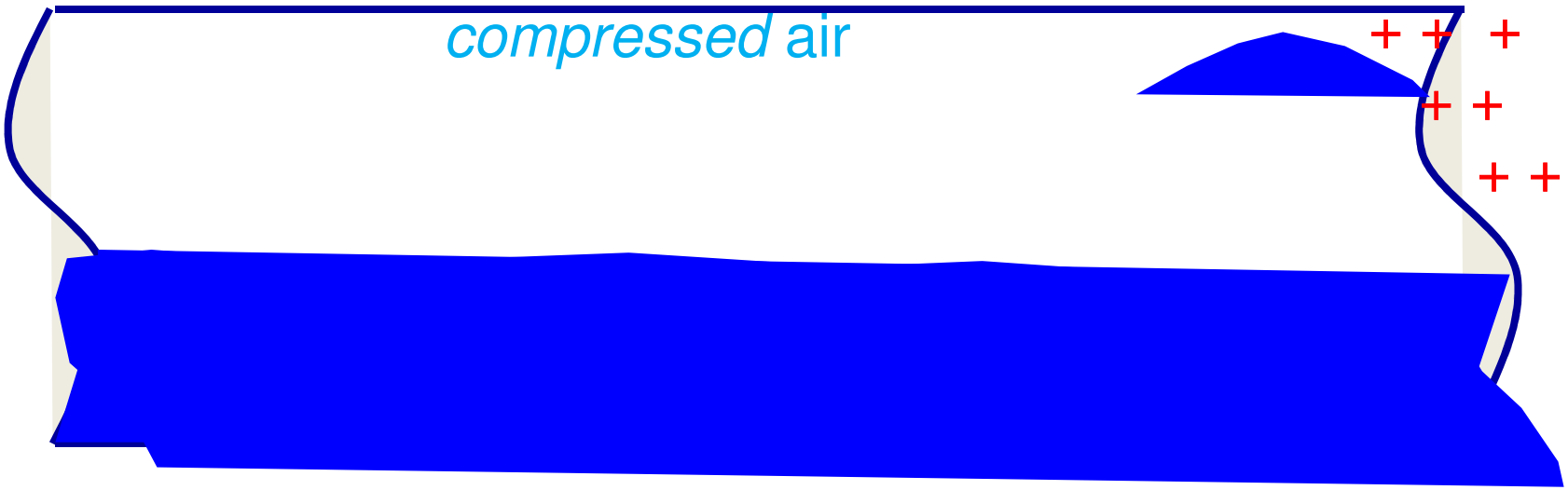

Viega Eco Plus
GEBERIT

Horizontal Drainage



- The flow of effluent in horizontal drainage piping causes a frictional effect in which air is dragged along with the water
- Horizontal drainage designed to be 1/4 to 1/3 full

Pressures in Horizontal Drainage

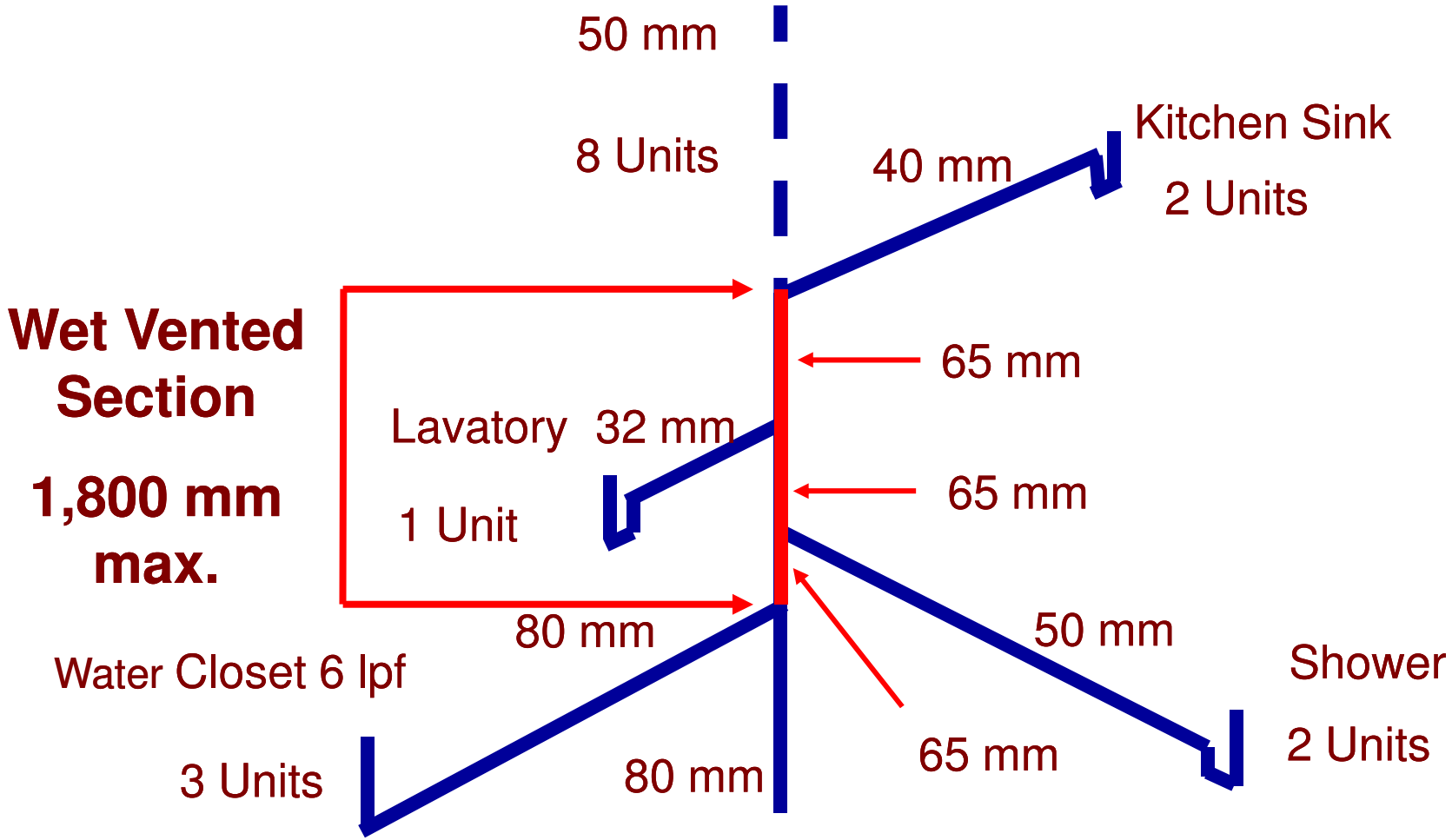


Flooding or hydraulic jump constricts air flow resulting in a buildup of pressure:

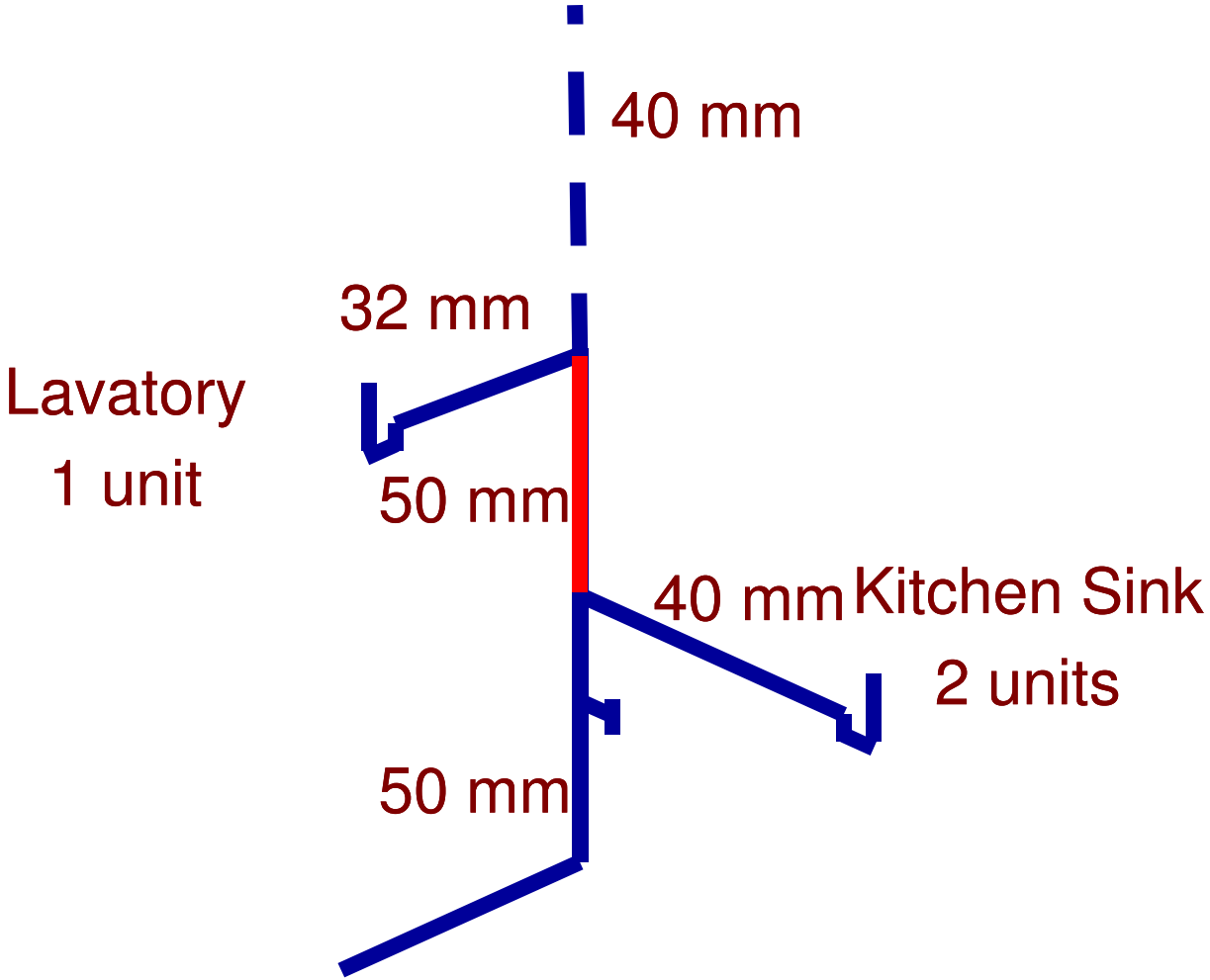
Vertical Wet Venting

- Limited to vertical drainage piping receiving discharge from 1 & 2 FU fixtures
- May serve as a vent for not more than 4 fixtures
- Fixtures must be on same floor level
- No wet vent section shall exceed 1,800 mm in length

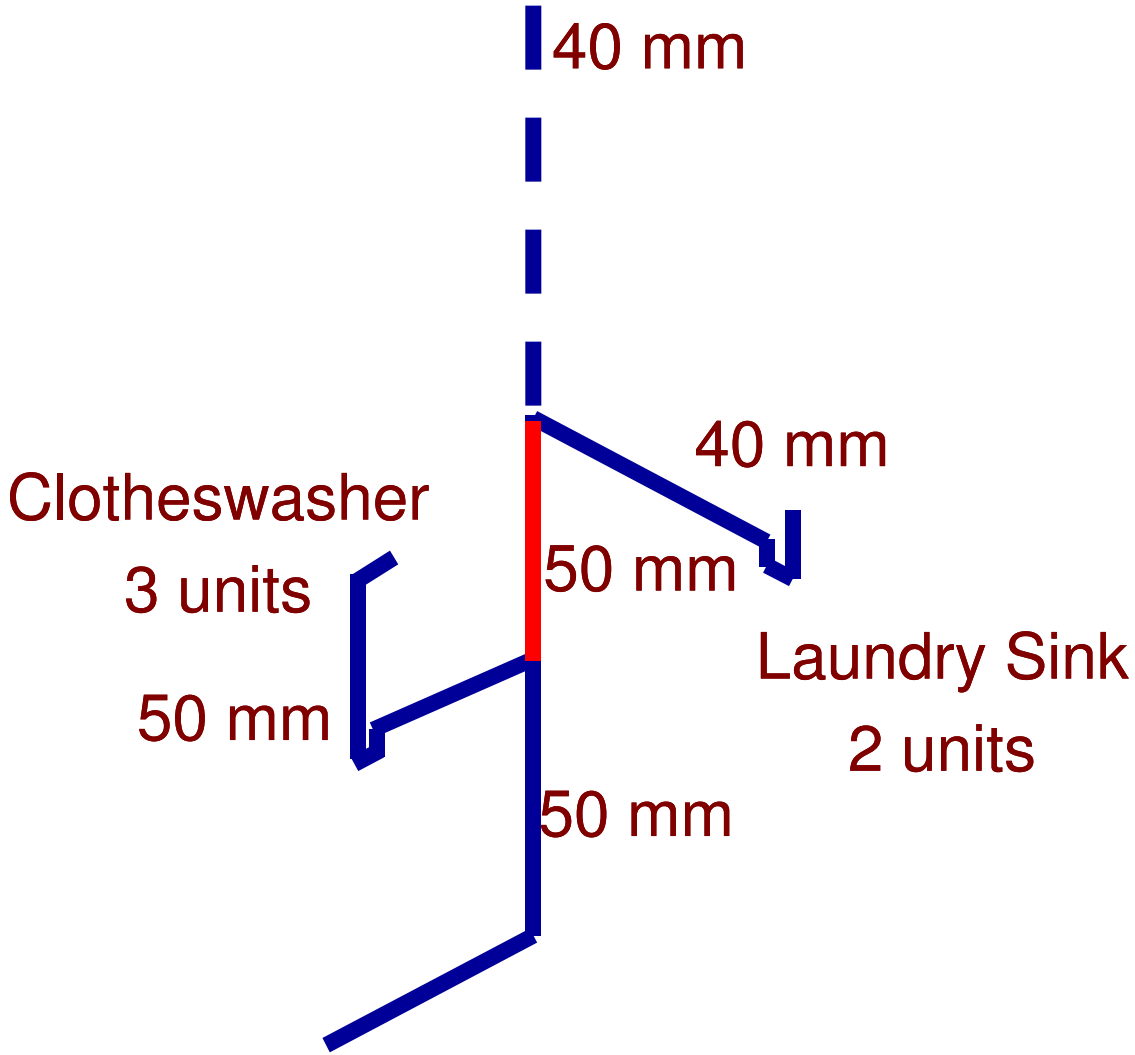
Sizing Wet Vented Section



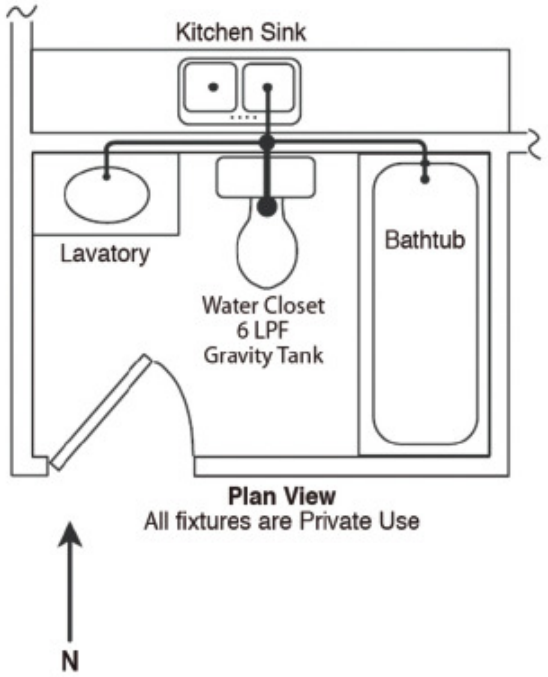
Sizing Wet Vented Section

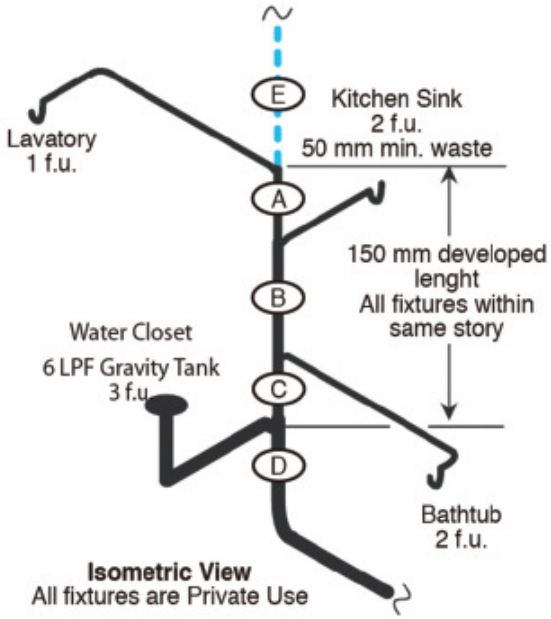


Sizing Wet Vented Section

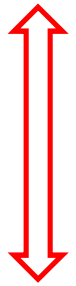


Wet Vent

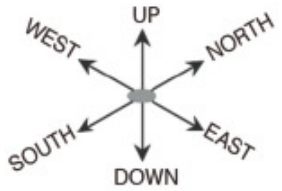




Wet vent section?



Pipe Section	Fixture Units	Pipe Size
A	1	50 mm
B	3	65 mm
C	5	65 mm
D	8	80 mm
E	8	50 mm



Isometric Compass

Figure 908.1a
Wet Vent Sizing Example 1

Horizontal Wet Venting for Bathroom

The intent of this code change is to provide an alternative venting method for bathrooms.

- This method permits wet venting any combination of fixtures within a single or double bathroom and provides adequate volume within the wet vent pipe to permit the required airflow.

- This method relies on two factors:
  - Low probability of simultaneous fixture discharge and
  - Low-flow velocity.

Horizontal Wet Venting for Bathroom

Where permitted.

- Any combination of fixtures within one (1) or two (2) bathrooms located on the same floor
- The wet vent shall be considered the vent for the fixtures and shall extend from the connection of the dry vent along the direction of the flow in the drain pipe to the most downstream fixture drain connection to the horizontal branch drain.
- Only the fixtures within the bathroom(s) shall connect to the wet-vented horizontal branch drain.

Horizontal Wet Venting for Bathroom

- The dry vent connection to the wet vent shall be an individual vent or common vent for the lavatory, bidet, shower or bathtub

- The wet vent shall be sized based on the fixture unit discharge into the wet vent. The wet vent shall be a minimum size of 50 mm for 4 DFU's or less, and 80 mm for 5 DFU's or more.

Example: Bathroom Wet Venting

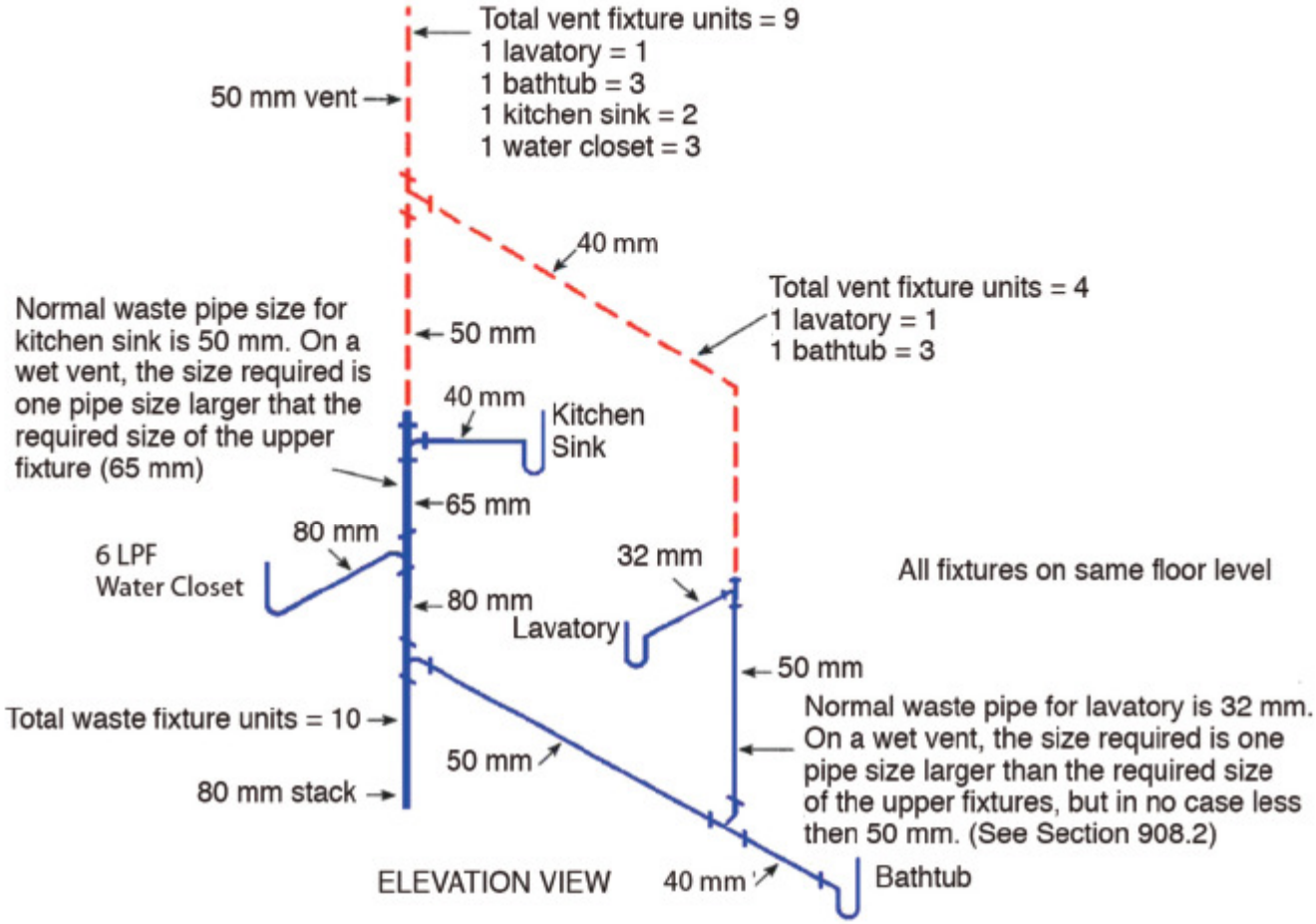
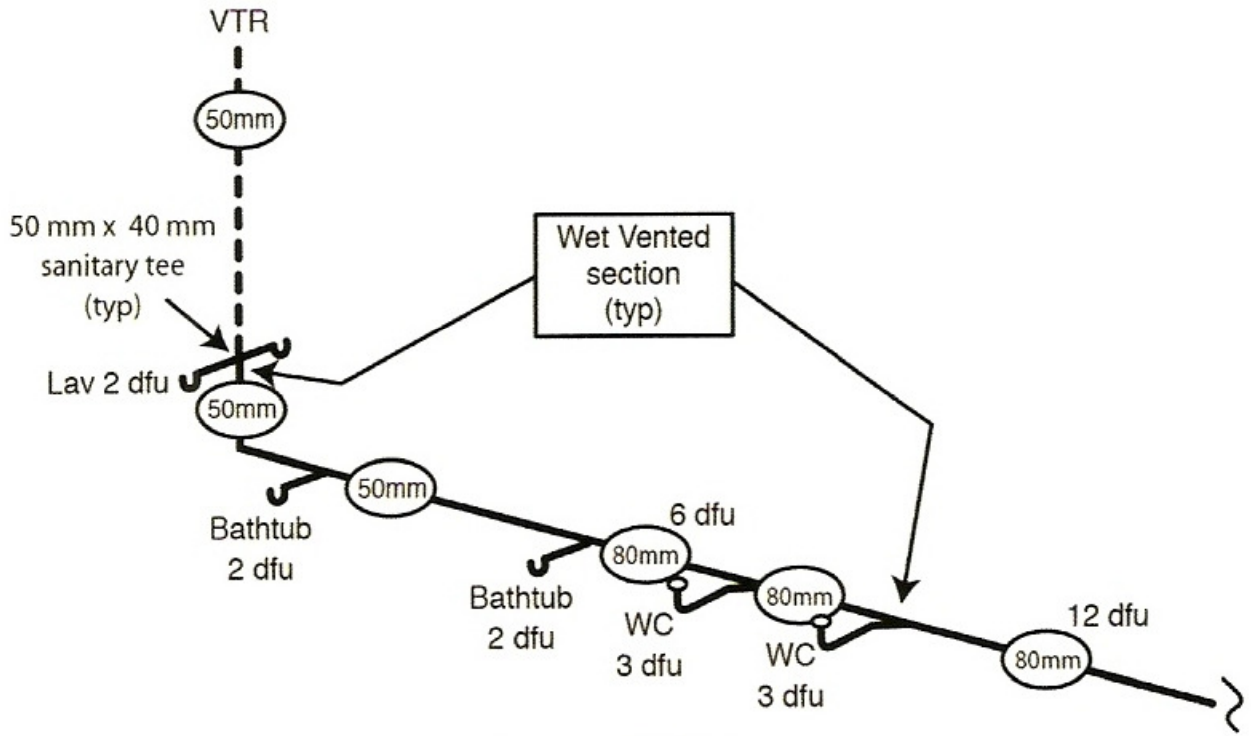
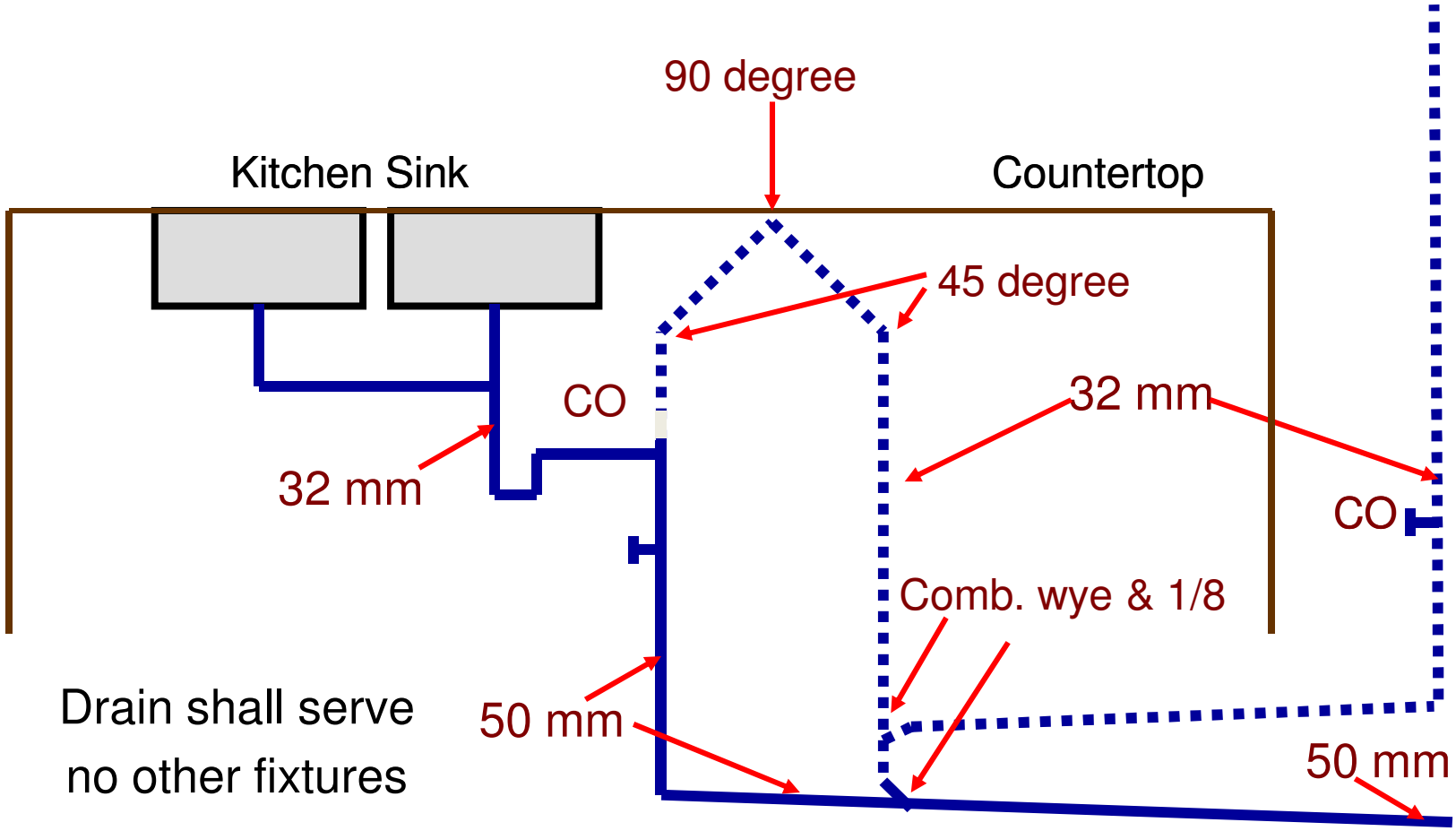


Figure 908.1.2b
Wet Vent Sizing Example 4

Example: Bathroom Wet Venting



Island Sink Venting



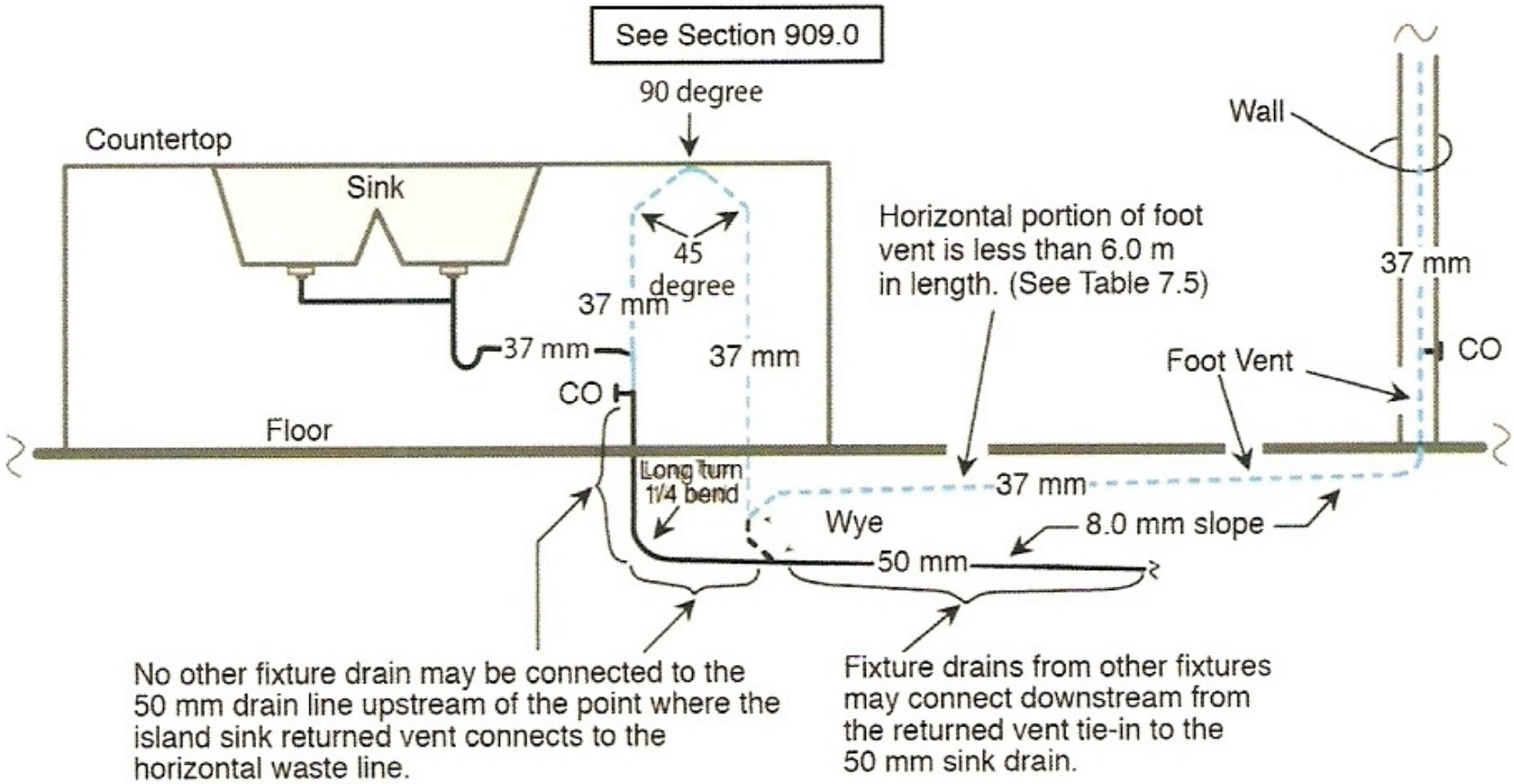


Figure 9-34
Island Sink Installation

Thank you

Any Questions?

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