

**PRE-COURSE TEST**

1. The word “plumbing” is defined in:
  - a) The Building Code
  - b) The Ontario Water Resources Act
  - c) The Building Code Act
  - d) The Environmental Protection Act

Code Ref: \_\_\_\_\_

2. A cross-connection is:
  - a) Caused by backflow
  - b) Contaminated water
  - c) A reversal of water in the water-distribution system
  - d) A potential source of contamination of potable water
3. Private water supply system means a system that supplies water from a private source to a:
  - a) Water service pipe
  - b) Potable water system
  - c) Distributing pipe
  - d) Fixture

Code Ref: \_\_\_\_\_

4. Which of the following pieces of legislation gives the inspector the authority to enter any premises?
  - a) The Building Code Act
  - b) The Ontario Building Code
  - c) Municipal by-laws
  - d) The Environmental Protection Act

Code Ref: \_\_\_\_\_

13. What minimum size for a vent pipe that penetrates the exterior wall or roof?
- a) 1 1/2 in.
  - b) 2 in.
  - c) 3 in.
  - d) 4 in.

Code Ref: \_\_\_\_\_

14. A foundation drain:
- a) Connects the storm building drain to the foundation of the house
  - b) Is part of the sanitary drainage system
  - c) Refers to the pipes under the basement slab
  - d) Collects water from around the foundation

15. Cleanouts are:
- a) Located at the base of every soil or waste stack
  - b) Part of the water-distribution system
  - c) Always found in traps
  - d) Necessary on all vertical piping

Code Ref: \_\_\_\_\_

16. A number such as 7.6.2.4. found in Part 7 of the Ontario Building Code is referred to as:
- a) A Subsection
  - b) An Article
  - c) A Sentence
  - d) A Clause

Code Ref: \_\_\_\_\_

17. Which of the following is *NOT* the responsibility of the plumbing inspector?
- a) Check compliance with the Code
  - b) Inspect the work of plumbing contractors
  - c) Issue stop work orders if the plumbing does not comply with the Code
  - d) Assist the municipality in maintaining a safe and healthy environment

Code Ref: \_\_\_\_\_

18. Which of the following fixtures does *NOT* require a 1 1/2 in. fixture outlet pipe and a 1/2 in. water supply pipe?
- a) Domestic lavatory
  - b) Bathtub
  - c) Laundry tub
  - d) Sink

Code Ref: \_\_\_\_\_

19. Acceptable materials for use in a sanitary building sewer include:
- a) Copper tube M hard and cast iron
  - b) PVC and galvanized steel
  - c) Copper tube L hard and concrete
  - d) Lead pipe and copper tube K soft

Code Ref: \_\_\_\_\_

20. A branch vent, stack vent, vent stack or header shall *NOT* be:
- a) Used in a single-family dwelling
  - b) Less than 1 1/2 in. in size
  - c) Less than the size of the vent pipe connected to it
  - d) Made out of PVC

Code Ref: \_\_\_\_\_

## LEARNING OBJECTIVES

Upon completion of this module, participants will be able to:

- Examine what plumbing is and is not
- Determine whether a permit is required
- Determine the kinds of information that you may require in examining a permit application
- Examine the submitted plans to see if they are correct and correspond to the practices in your jurisdiction
- Consult the Ontario Building Code Act to see where the authorities for permits and inspections are granted

## STOP

### INTRODUCTION TO PLUMBING

As defined under the Building Code Act (BCA), **plumbing** is a drainage system, a venting system, and a water system, or parts thereof.

A **drainage system** means an assembly of pipes, fittings, fixtures and appurtenances on the property that is used to convey sewage and clear water waste to a main sewer or private sewage disposal system, and includes a private sewer, but does not include subsoil drainage piping.

A **venting system** means an assembly of pipes and fittings that connects a drainage system with open air for circulation of air and the protection of trap seals in the drainage system.

A **water system** means a water service pipe, a private water supply, a water distribution system, a fire service main or part of any of them.

Understanding these definitions will help you understand what a plumbing system is and what it is not.

## STOP

### What is NOT considered plumbing?

Other piping systems listed below are excluded from the plumbing system. A plumbing system does **NOT** include a system of piping:

- For space heating in which water is used as a medium to transfer heat

- To maintain a high standard of installation  
As this course progresses, you will see that a proper plumbing system is not a collection of pipes thrown together to remove sewage or to provide potable water, but an engineered system requiring skill and knowledge to design, install and inspect. The regulations that will be discussed are important if we are to maintain a safe environment and safe drinking water.

### **OBJECTIVES AND FUNCTIONAL STATEMENTS**

The 2012 OBC links every technical requirement to at least one objective and one functional statement. Taking a look at some of the key objectives will help us understand the overall goals for plumbing regulations in the Ontario Building Code.

#### **EXERCISE 2-1**

Three key objectives that relate to plumbing requirements are: OH1, OH2, OP5.

Look up these objectives in Division A, Part 2, and write their title and definition in the space below.

Next, read through the objectives under OH1, OH2 and OP5. Discuss with your group examples of technical requirements that might be linked to these objectives. Class discussion begins in about 5 minutes.

Title: OH1 \_\_\_\_\_

Definition:

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Title: OH 2 \_\_\_\_\_

7. Revocation of permit \_\_\_\_\_
8. Inspection \_\_\_\_\_
9. Order not to cover \_\_\_\_\_
10. Inspection of unsafe building \_\_\_\_\_
11. Entry to dwellings \_\_\_\_\_
12. Powers of inspector \_\_\_\_\_
13. Warrant for entry and search \_\_\_\_\_
14. Disputes \_\_\_\_\_
15. Offences \_\_\_\_\_
16. This Act & municipal by-laws \_\_\_\_\_

**STOP**

**CHECKLISTS FOR INSPECTION**

The checklists on the following pages are for you to refer to as you go through this course. They don't include everything you should be looking at during inspections; you may therefore wish to expand on them to suit your own needs. As you develop your own inspection checklists during the course, compare them to what is included in your course package. Checklists are useful for ensuring that your inspections are consistent, and serve as a reminder of what you should be looking for.

**CHECKLIST FOR DRAINAGE & WATER SERVICE INSPECTION IN A  
NEW HOUSE**

	<b>No</b>	<b>Inspection Item</b>	<b>BCA or Code Reference</b>	<b>Acceptable</b>	<b>Not Acceptable</b>
<b>DRAINS</b>	1	Connection: Storm Sanitary	7.1.5. 7.1.5.2. 7.1.5.1.		
	2	Certification of pipe	7.2.1.3.		
	3	Support of pipes	7.3.4.6.(1)(2)		
	4	Slope of pipes: 3 inches or smaller, 1:50 4 inches or larger, sanitary 4 inches or larger, storm	7.4.8.1.(1) Table 7.4.10.8 Table 7.4.10.9		
	5	Testing of drains: Water Air Ball	7.3.6.2. 7.3.6.4. 7.3.6.5. 7.3.6.7		
	6	Cleanouts: Located where drain leaves building Size & spacing of cleanout	7.4.7.1.(6) 7.4.7.2.		
	7	Floor drain required Venting required Priming required	9.31.4.4.(1) 7.5.1.1. 7.4.5.5.		
	8	Extending full size(4 in. or 10 cm): Sanitary (min) Storm (min)	7.4.9.4.(1) 7.4.9.4.(2)		

	No	Inspection Item	BCA or Code Reference	Acceptable	Not Acceptable
WATER SERVICE	9	Water service: Material Tested Separation Frost protection Minimum 3/4 in. (1.9 cm) Sized for peak demand flow	Table 7.2.11.2. 7.3.7.2. 7.3.5.7. 7.3.5.4. 7.6.3.4. 7.6.3.4.(1)		
	10	Water pipes: Material Support Valve access Lead-free solder	7.2.5. to 7.2.7. 7.3.4. 7.1.6.2.(1) 7.2.9.2.(2)		

**MODULE 2 QUIZ**

1. As discussed in this module, a water system includes:
  - a) Only a water service pipe
  - b) Only a private water supply system
  - c) A water service pipe and a water distribution system
  - d) A water service pipe, a private water supply, a water distribution system, a fire service main or any part of them

Code Ref: \_\_\_\_\_

2. When a house is supplied with water from a well, but a well pump is not used, which of the following is considered to be included as plumbing:
  - a) Well
  - b) Water supply piping connected to a well for a distance of 3 feet from outside of the well
  - c) Water supply piping starting at a distance of three feet from the building
  - d) Water supply piping from the entry to the building

Code Ref: \_\_\_\_\_



**EXERCISE 5-5**

Discuss the following questions within your group.

1. Why have the requirements in 7.6.1.2. been included in the Code?

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2. Can you foresee any problems in gaining compliance with this? If so, what problems might occur? How could this be addressed?

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Code Ref: \_\_\_\_\_

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Code Ref: \_\_\_\_\_

**STOP**

**OTHER ISSUES**

Subsection 7.6.1. of the Ontario Building Code has not been covered under any of the checklist items, but you must be familiar with it to carry out your inspection.

Article 7.6.1.1. deals with the **positioning of hot and cold water pipes**, which must conform to the following Sentences:

- **Every fixture** supplied with separate hot and cold water controls shall have the **hot water control on the left** and the **cold on the right**. Sentence 7.6.1.1.(1)
- Where hot and cold water are mixed and the temperature is **regulated by a single, unmarked, manual control**, a movement to the **left shall increase the temperature**, and a movement to the **right shall decrease the temperature**. Sentence 7.6.1.1.(2)(See also requirements on shower valves – Article 7.6.5.2.)

When **sizing drain pipes**, the hydraulic load is the **total load** from every fixture that is (or may in the future be) connected to the system upstream of a pipe as per Article 7.4.10.1.

Note that Article 7.4.10.3. provides the conversion factors to convert from a flow in litres per second to a hydraulic load in fixture units. Table 7.4.10.3. also converts to fixture units from a semi-continuous flow from specific sizes of traps.

Fixture units do not need to be converted to gallons per minute for sizing of drainage piping in the 2012 OBC. However, **Table 7.4.10.5.** allows you to do this, which might be useful to find the total drainage rate from a building draining to a sewer.

**EXERCISE 6-6**

Using Tables 7.4.9.3. and 7.4.10.2., indicate the hydraulic load for the following fixtures and groups of fixtures served by the same drain pipe.

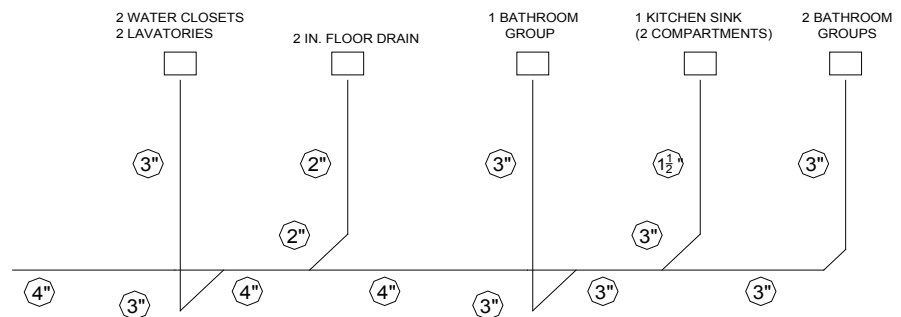
	<b>Fixture or Group of Fixtures Served by the Same Drain Pipe</b>	<b>Total Hydraulic Load (fixture units)</b>	<b>Code Reference</b>
1	Shower stall		
2	Water closet (tank type)		
3	Kitchen sink		
4	Floor drain with 3 in. trap		
5	Bathroom group (tank type WC)		
6	Kitchen sink and bathroom group		
7	4 lavatories (with 1 1/4 in. traps) and 2 tank type water closets		
8	Floor drain with a 4 in. trap		



**EXERCISE 6-9: Sizing Exercise**

Use Subsection 7.4.9. and the appropriate sizing tables in Subsection 7.4.10. to size the vertical and horizontal drainage pipes in the figure below. The figure shows 5 vertical drain pipes connecting to a horizontal sanitary drainage pipe. (Note that the fittings are schematic only.)

Work with your group. When completed, put answers on your flipchart.



**FIGURE 6:4 SIZING EXERCISE**

8. The total fall of a trap arm is required to be:
- a) 1.5 metres.
  - b) Not less than the inside diameter of the fixture drain.
  - c) Not greater than the inside diameter of the fixture drain.
  - d) Equal to the size of the fixture drain.

Code Ref: \_\_\_\_\_

**End of Module 6**

**EXERCISE 7-5**

The drain plan is shown in Figure 7:3. Working by yourself, answer the following questions. Class discussion begins in five minutes.

In each plan, drainage pipes have been identified as follows:

- a) The storm building drain
- b) The storm building sewer
- c) The sanitary building drain
- d) The sanitary building sewer

1. What is the difference between the two sewer systems shown?

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2. Are there any deficiencies in Figure 7:3?

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**EXERCISE 7-11**

Fill in the chart below for permitted pipe only. Refer to Subsections 7.2.5. Non-Metallic Pipe and Fittings, 7.2.6. Ferrous Pipe and Fittings and 7.2.7. Non-Ferrous Pipe and Fittings in the Code.

Review the acceptable materials for underground drains and sewers in the first column, and indicate with a “yes” or a “no” if they can be used. Include the relevant Code reference and CSA number. Work alone. Class discussion begins in 15 minutes.

**Underground Drain and Sewer Pipe Materials**

Reference Subsections 7.2.5., 7.2.6., and 7.2.7.

Materials	Building Drain	Building Sewer	Con-ditions	Code Reference	Standard
Asbestos-Cement			-		CAN/CGSB-34.9 CAN/CGSB-34.23
Concrete			-		CAN/CSA A257
Vitrified Clay			-		CSA A60.3-M
Polyethylene			Note 1		ASTM F714
ABS			-		ASTM F628 and CAN/CSA B181.1
PVC			-		CSA-B181.2
Cast Iron			-		CSA B70
Galvanized Steel			Note 2		ASTM A53/A53M
Corrugated Steel			Note 3		CAN/CSA-G401
Copper			-		ASTM B42
Brass			-		ASTM B43
Copper Tube – Type K & L hard			-		ASTM B306
Lead			-		-

Note 1 – Underground rehab only  
 Note 2 – Above ground use only  
 Note 3 – Storm drainage only

**STOP**



Location	Fixture Units/Sizing Considerations	Pipe Size
A	22 fu, 2 WCs	
B	10.5 fu, no WCs, Table 7.4.10.6.	
C	22.5 fu, 3 WCs	
D	21 fu, no WCs, but 3 in. floor drains require 3 in. drain 7.4.9.1.(1)	
E	45 fu, 6 WCs, 7.4.9.2.(3) not yet applicable, max 2 WC per floor so 3 in. horizontal branches, Table 7.4.10.6. requires 3 in.	
1	22 fu, 2 WCs, building drain min 4 in. 7.4.9.4.(1)	
2	B+C = 33 fu, 3 WCs, downstream of 3rd WC fixture drain, 7.4.9.2.(2)	
3	A+B+C = 55 fu, 5 WCs, building drain min 4 in. 7.4.9.4.(1), also not lesser than upstream drainage pipes 7.4.9.1.(1)	
4	D+E = 66 fu, 6 WCs, 3 in. pipes upstream, Table 7.4.10.8.	
5	A+B+C+D+E or 3 + 4 = 111 fu, 11 WCs, building drain min 4 in. 7.4.9.4.(1), 4 in. ok Table 7.4.10.8.	

**END OF MODULE 7**



**PLAN REVIEW****EXERCISE 9-3**

The plans for the MITEC house are in Appendix A. Review them for information about its stacks and waste pipes.

Within your groups, see what you can tell about the system of stacks and wastes in the MITEC house. Answer the questions following. Note your conclusions on the flipchart and be prepared to justify your answers.

1. Each fixture must be serviced by a waste or soil pipe. How many waste pipes must there be in the MITEC house? How many soil pipes?

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2. What type of drainage stacks would you expect to find in the MITEC house?

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**STOP****DEFINITIONS**

The Ontario Building Code defines the following terms, which are specific to stack and waste pipes in the sanitary drainage system. You should make sure you understand each of them.

**MATERIALS**

In older homes, cast iron, galvanized steel and lead are the materials most commonly found in stacks and wastes. Today it is more common to find plastic piping in this part of the drainage system.

The regulations regarding the use of plastic piping in the drainage system are found in Subsection 7.2.5., Non-Metallic Pipes and Fittings.

**EXERCISE 9-8**

Read Subsection 7.2.5., paying particular attention to the specifications for the drainage system. Then take a few minutes to answer the following questions on your own.

1. Under what circumstances can you use CAN/CSA-B181.2 PVC piping?

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2. When using asbestos-cement piping in the drainage system, what minimum standards must you observe?

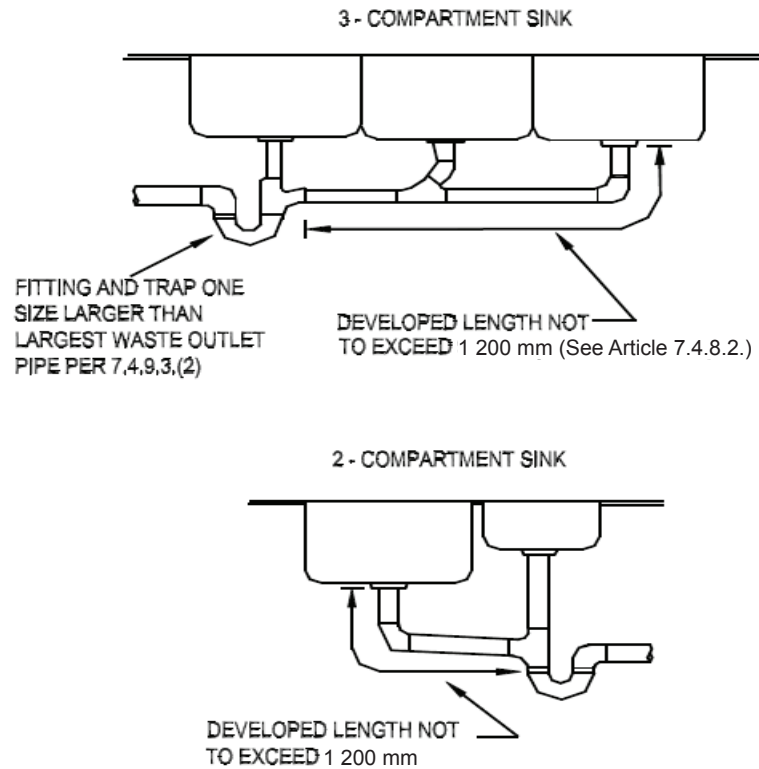
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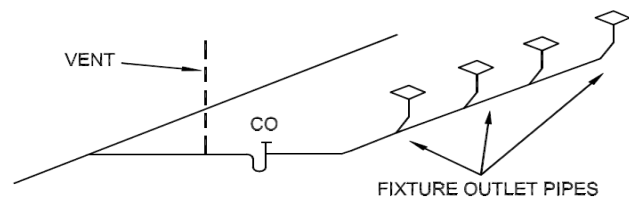
### TRAPS PROTECTING MULTIPLE FIXTURE OUTLET PIPES

1. A single trap protecting a two- or three-compartment sink



**FIGURE 9:9 COMPARTMENT SINKS**

2. Gang-trapping floor drains located in the same room



**FIGURE 9:10 GANG-TRAPPED FLOOR DRAINS**

## CLEANOUTS

A **cleanout** is a fitting installed in the drainage or venting system that **provides access to the system for inspection and cleaning** (Drawing 9:12).

According to Sentence 7.2.3.1.(3) of the Code, except for a floor-mounted service sink, every trap serving a lavatory, sink or laundry tray must:

- be provided with a cleanout plug 3/4 in. or more in diameter, located at the lowest point of the trap,
- made of the same material as the trap (except that a cast iron trap requires a brass cleanout plug),
- be designed so that part of the trap dip can be completely removed for cleaning purposes, or
- be provided with a cleanout above the floor when the trap is under the floor and not readily accessible for cleaning.

In addition, Article 7.2.10.3. states that:

- Every cleanout plug, cap, nut or bolt that is intended to be removable from a ferrous fitting must be made of a non-ferrous material.
- A cleanout fitting must be able to withstand the physical stresses of removal and reinstallation as a result of normal maintenance operations and also ensure a gas-tight seal.
- A screw cap or test cap may not be used as a cleanout plug or cover.

Besides the above requirements, there is also an entire Subsection dedicated to cleanouts. – Subsection 7.4.7. This Subsection states where cleanouts are required for drainage systems.

## SITE CONDITIONS

The house should still be at the rough framing stage of construction when you inspect the venting system. All the venting pipes should be exposed, so that you can check:

- Materials
- Location of vent pipes
- Size and loading
- Slope
- Connections
- Support

and so that water or air test can be performed.

## MATERIALS

The regulations for materials are covered in Section 7.2. of the Ontario Building Code. Subsection 7.2.5. covers **non-metallic materials** and stipulates the following requirements **for vent pipes**:

According to Sentence 7.2.5.12.(1), plastic pipe, fittings and solvent cement used inside or under a building in a sanitary drainage system or venting system must be certified to:

- CAN/CSA-B181.1, "ABS Drain, Waste, and Vent Pipe and Pipe Fittings"
- CAN/CSA-B181.2, "PVC and CPVC Drain, Waste, and Vent Pipe and Pipe Fittings"
- ASTM F628, "ABC Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core"

In addition, plastic pipe, fittings and solvent cement used inside a building in a storm drainage system must be certified to:

- CAN/CSA-B181.1, "ABS Drain, Waste, and Vent Pipe and Pipe Fittings"
- CAN/CSA-B181.2, "PVC and CPVC Drain, Waste, and Vent Pipe and Pipe Fittings"
- CAN/CSA-B182.1, "Plastic Drain and Sewer Pipe and Pipe Fittings"
- CAN/CSA-B182.2, "PSM Type PVC Sewer Pipe and Fittings"
- ASTM F628, "ABC Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core"

**Note: plastic pipe used as described above requires stiffness equal or greater than 320 kPa as per Sentence 7.2.5.12.(3).**

Sentence 7.2.7.5.(1) sets out the standards for solder-joint fittings. They must be certified to Standard ASME B16.23 “Cast Copper Alloy Solder Joint Drainage Fittings: DWV”, or ASME B16.29, “Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV”.

**EXERCISE 10-4: Materials Permitted in the Venting System**

You have just read about all the different types of materials that are acceptable for use in the venting system, but the information is spread out over several pages.

Put all this information into one chart. Use the following chart, or adapt your own version.

Do this exercise with your group and develop your answer on the flipchart. Be sure to make a copy in your book for future reference.

**Materials Permitted in the Venting System  
(See Subsections 7.2.5., 7.2.6., 7.2.7.)**

Type of Pipe Material	Applicable Standard	OBC Reference	Application in Venting Systems

**STOP**

## LOCATION OF VENT PIPES

As you have already learned, each waste pipe is connected to a trap that serves the fixture. The waste pipe must be installed properly to ensure the waste flows away smoothly, quietly and does not siphon the trap. The pipe that connects a trap serving a fixture to another part of the drainage system is called a fixture drain.

The OBC defines the term **trap arm**, which means that portion of a fixture drain between the trap weir and the vent pipe fitting. **Trap arm requirements are in Article 7.5.6.3.**

Five factors must be considered when inspecting a trap arm and the location of the vent pipes serving the trap:

1. Minimum length
2. Minimum slope
3. Maximum length
4. Total fall maximum change in direction

A crown vent is a vent connected to a fixture waste pipe on top of the crown of the trap. This is not acceptable in a plumbing system because of the close proximity of the trap. Experience has shown that grease, hair and other clogging materials splash into the vent pipe to accumulate there and finally close the vent. Also there is some evidence that because the vent is so close to the water that surface evaporation is increased. **This is why the Code requires the minimum length of the trap arm to be not less than twice the size of the fixture drain – Clause 7.5.6.3.(1)(a).**

In order to promote self-cleansing flow, the **minimum slope** in the direction of flow is 1 in 50 for all drainage pipes – Table 7.5.6.3.

There are two reasons for establishing **maximum distance** between a trap and its vent as shown in Table 7.5.6.3. Remember that one end of the waste pipe is blocked with the trap, and it is also desirable to have fresh air circulating through the drainage piping to carry away gases. Therefore the farther away the vent, the more piping that is not ventilated.

**Example:** 135 degrees can be reached by many combinations of bends, including:

- Three 1/8 bends
- One 1/8 bend and one 1/4 bend

Where a drainage pipe of a WC discharges through a floor assembly, it must be installed in accordance with Sentence 7.5.6.3.(3) which states that the vent pipe be located not more than 1 m vertically and 3 m horizontally from the connection of the fixture drain to the fixture.

**EXERCISE 10-5**

For each requirement below, put down the Code reference and describe in your own words why the requirement is important.

1. The **minimum developed length** of a trap arm.

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Code Ref: \_\_\_\_\_

2. The **minimum slope** of all trap arms under 5 m in length.

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3. The **maximum range of length** of a trap arm. Explain why the permitted length increases as the trap size increases.

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4. The **total fall** in the trap arm.

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5. The **change in direction** permitted in a trap arm.

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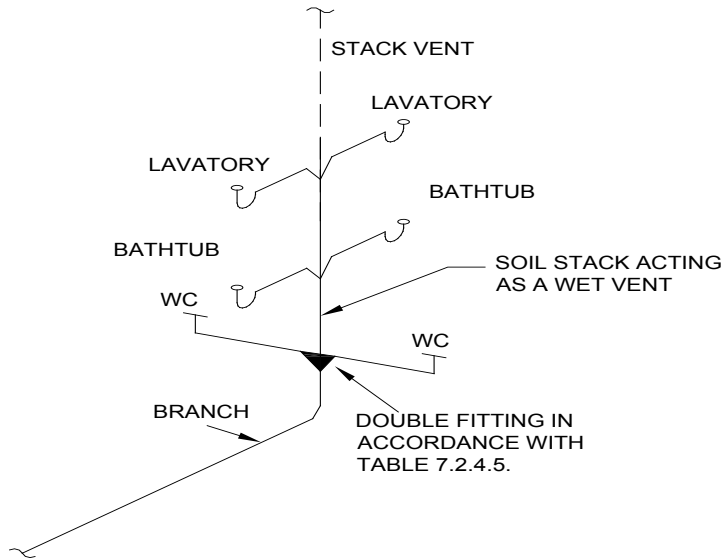
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## STOP

### TYPES OF VENTS

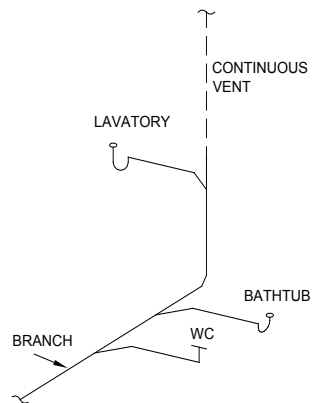
It is very important to understand what each venting term means and to be able to visualize each type of vent. Although you will typically not see the more complex types of vents in houses, you should be familiar with all venting terms.

At the beginning of the module we reviewed some definitions of the most common types of vents. We will review these and more venting terms now before learning how to size vent pipes.



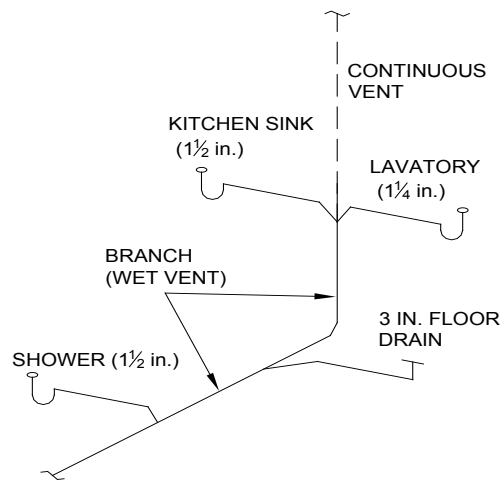
**FIGURE 10:6 WET VENTED WATER CLOSETS CONNECTED WITH A DOUBLE FITTING**

If **2 water closets** are wet vented they must be **connected** at the same level to a vertical part of the stack with a **double fitting**. – Clause 7.5.2.1.(1)(c)



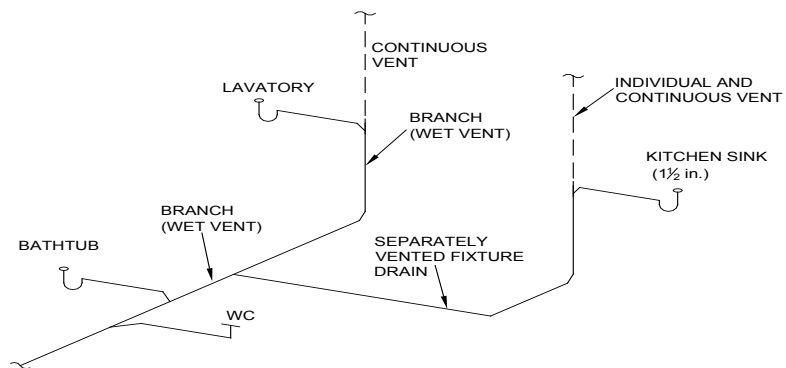
**FIGURE 10:7 WET VENTED WATER CLOSET LOCATION**

**Water closets must be downstream** of all other fixtures. – Clause 7.5.2.1.(1)(d)



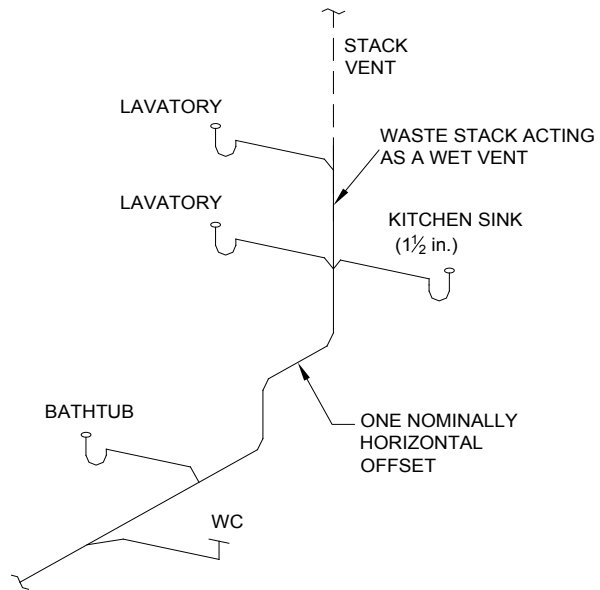
**FIGURE 10:8 MAXIMUM SIZE OF WET VENTED DRAIN PIPES**

**Maximum 2 in. size trap arms** and fixture drains (except floor drains not less than 3 in. are permitted if installed as per 7.5.1.1.(3))(a) to (c).  
 – Clause 7.5.2.1.(1)(e)



**FIGURE 10:9 SEPARATELY VENTED FIXTURES DRAINING TO A WET VENT**

Other **separately vented fixtures** on the same storey with a **total hydraulic load up to 2 fixture units** can drain to the wet vent. –  
 Clause 7.5.2.1.(1)(f)



**FIGURE 10:11 HORIZONTAL OFFSET OF A WET VENT**

Where a wet vent extends through more than 1 storey, only **one nominally horizontal offset** of a restricted length is permitted. Maximum length of offset is 1 200 mm for pipes 2 in. or less in size, and 2 500 mm for pipes larger than 2 in. in size. – Clause 7.5.2.1.(1)(i)

One other condition that is not illustrated above is that the hydraulic load of separately vented fixtures that drain into the wet vent is not included when sizing the continuous vent that serves the wet vent. – Clause 7.5.2.1.(1)(g)

New for the 2012 Code, a soil or waste pipe may serve as a wet vent provided, the highest fixture is connected to a vertical portion of the wet vent, upstream of any other fixtures, in the form of a continuous vent. – Clause 7.5.2.1.(k)

**EXERCISE 10-9**

List the advantages and disadvantages of wet venting below:

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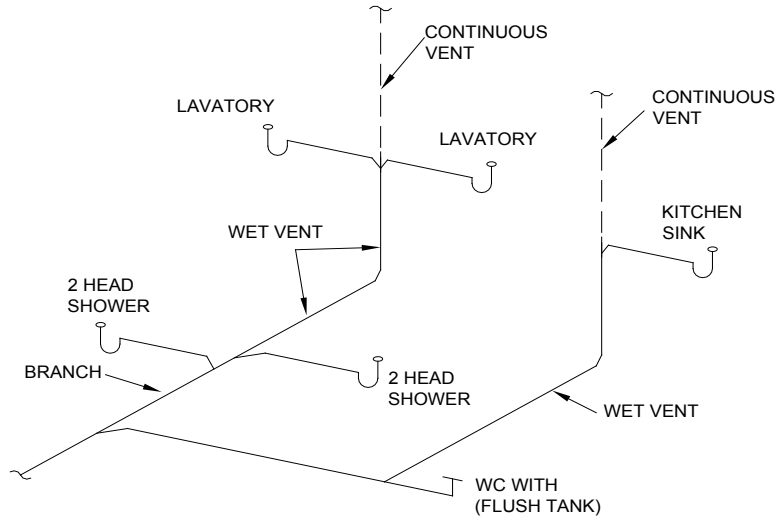
**STOP**

**STACK VENTING**

One of the most common venting arrangements in a single family dwelling is stack venting the fixtures located in a washroom on the top floor. Stack venting is defined in Division A as “when used with reference to fixtures, an arrangement such that the connections of the drainage piping from the stack vented fixtures to the stack provide venting to the fixture traps so that no additional vent pipe is required.”

**EXERCISE 10-14**

Calculate the size of the wet vent and the continuous vent serving the wet vent in the Figure 10:19. The continuous vent is 4 metres long. The lavatories have 1 1/4 in. traps.



**FIGURE 10:19 SIZING A WET VENT AND CONTINUOUS VENT (EX.10-14)**

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Code Ref: \_\_\_\_\_

**STOP**

### **SLOPE**

Sentence 7.5.6.1.(1) of the OBC states that, “every vent pipe shall be installed without depression in which moisture can collect”. It is important that the grading of vent pipes can allow any accumulation of water to be drained, otherwise airflow through vent pipes would be restricted and the effectiveness of a venting system will then be reduced.

### **CONNECTIONS**

The Ontario Building Code sets out specific requirements for the connection of sanitary drainage pipes to vent pipes. You will find these in Sentences 7.4.2.1.(1) to (5).

### **JOINTS**

In Subsection 7.3.3., “Joints and Connections,” one Sentence specifically regulates the joints that connect vent piping.

Sentence 7.3.3.4.(2) states that a **slip joint** cannot be used in a venting system or drainage system, except to connect a fixture trap to a fixture drain in an accessible location.

### **EXERCISE 10-16**

Think about why the Code has included this regulation and note your reason below. Discuss the problem with your group and write an answer on the flipchart.

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Code Ref: \_\_\_\_\_

### **STOP**

2. How many shower heads may be served by a single drain?

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Code Ref: \_\_\_\_\_

3. Where is a concealed overflow not permitted in a fixture?

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Code Ref: \_\_\_\_\_

4. What kind of urinal is not permitted to be installed in a plumbing system?

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Code Ref: \_\_\_\_\_

### **STOP**

### **WATER SUPPLY IN A PLUMBING SYSTEM**

Article 7.2.10.6. of the Ontario Building Code is relevant to supply and waste fittings in a plumbing system. This Article states that supply and waste fittings shall be certified to Standard CAN/CSA B125.3, "Plumbing Fittings".

Furthermore, Subsection 7.6.4. of the Code regulates water efficiency of supply fittings and the amount of water required to flush per cycle for fixtures.



Similarly, the size of the supply pipes is regulated by the type of fixture they service. This is covered in Table 7.6.3.2.A., which you should also look at to refresh your memory.

From the information in those two Tables, complete the following chart for the minimum required pipe sizing for the fixtures in a single family dwelling.

**Size of Fixture Outlet Pipe and Supply Pipe  
(Refer to Table 7.4.9.3 and Table 7.6.3.2.A)**

<b>Fixtures</b>	<b>Size of Fixture Outlet Pipe</b>	<b>Size of Supply pipe</b>
Water Closet with Flush Tank		
Lavatory		
Bathtub		
Domestic Sink		
Laundry Tray		

**STOP**

**LOADING**

You do not have to worry about loading on fixtures and plumbing appliances, but you do have to be concerned with the loading of the waste pipes the fixtures and plumbing appliances empty into. This material was covered in module 2 and in the "Water Supply and Waste Disposal" course.

**SLOPE AND LENGTH**

For obvious reasons, slope and length are not relevant to fixtures and plumbing appliances. However, the fixture drains and vents must be checked for compliance to the Code.

**CONNECTIONS**

Fixtures are connected to both the drainage system and the supply system. These connections have already been covered in modules 2 and 4.

- Every floor or wall mounted water closet bowl shall be securely attached to the floor or wall by means of a flange and shall be stable.
- Every wall mounted fixture shall be supported so that no strain is transmitted to the piping.

**EXERCISE 11-9**

What might happen if the requirements for support of piping or fixtures were not met? Take a few minutes to answer this question within your groups.

Why it is necessary to support a fixture with something other than the piping:

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**STOP**

**OTHER ISSUES**

There are several important parts of the Code related to fixtures and plumbing appliances that have not been covered in any of the other checklist items. For examples, Subsections 7.1.6. and 7.4.3. of the Code regulate the location of fixtures, stipulating the following requirements:

- Plumbing fixtures **shall not be installed in a room** that is not lighted and ventilated—Article 7.1.6.1.
- Every fixture, plumbing appliance, interceptor, cleanout, valve, device or piece of equipment shall be so located that it is **readily accessible for use, cleaning and maintenance**—Sentence 7.1.6.2.

## FINAL ADMINISTRATIVE PROCEDURE

The objective of all of these inspections is to get to a stage where the plumbing has been installed in compliance with the Code. Signing off the plumbing permit takes place after the final inspection and is the final administrative task.

The following references are relevant to the administrative procedures contained in the Ontario Building Code Act.

Section 8. (12) states that **no person shall make a material change** or cause a material change to be made to a plan, specification, document or other information on the basis of which a permit was issued without notifying, filing details with and obtaining the authorization of the chief building official.

Section 11 requires that no person shall **occupy or use** (or permit to be occupied or used) any building or part thereof newly erected or installed unless any order made by an inspector under Section 12 has been complied with.

An **emergency order** may be issued under Section 15.10 if it is deemed to be necessary.

### Limitation period

Section 36. (8) indicates that no proceeding under this section (the section of offence) may be commenced more than **one year after** the facts on which the proceeding is based first came to the knowledge of the chief building official.

## INSPECTIONS FOR CONTAMINATION OF POTABLE WATER SUPPLY

Section 15.9 (1) and (2) of the Ontario Building Code Act gives the municipality the power to make an order if the installation of plumbing may endanger the health or safety of any person.

5. All fixtures must be:
- a) Certified to a standard.
  - b) Corrosion-resistant surface free from flaws.
  - c) Not made of concrete.
  - d) Made of stainless steel, porcelain, vitreous china or plastic.

Code Ref: \_\_\_\_\_

6. All supply and waste fittings must be certified to the standard of:
- a) CAN/CSA-B45
  - b) CAN/CSA-B64
  - c) CAN/CSA-B125
  - d) CAN/CSA-B272

Code Ref: \_\_\_\_\_

7. Which of the following do not require a 1 1/2 in. fixture outlet pipe and a 1/2 in. supply pipe?
- a) c & d
  - b) Bathtub
  - c) Laundry tub
  - d) Sink

Code Ref: \_\_\_\_\_

8. A backflow preventer is required on which of the following?
- a) A laundry tub
  - b) An outside hose bibb
  - c) A hot water tank
  - d) A water closet

Code Ref: \_\_\_\_\_

**MODULE 1**  
**PRE-COURSE TEST**

1. c) Building Code Act 1. (1)
2. d) 7.2.6.1.
3. b) Div. A, 1.4.1.2.
4. a) Building Code Act Section 16
5. b) 7.2.3.1.(1) & (3)
6. b) 7.6.3.4.(1)
7. c) 7.2.7.8.(1)
8. b) 7.3.4.4.(2)
9. b) 7.5.6.2.(1)
10. c) 7.4.9.2.(1)
11. d) 7.2.5.8.(2)
12. d) 7.5.1.1.(4)
13. c) 7.5.6.5.(6)
14. d) Course material
15. a) 7.4.7.1.(7)
16. b) See "Numbering System" in Preface to the OBC
17. c) BCA 14. (1)
18. a) Tables 7.4.9.3. and 7.6.3.2.A.

**Exercise 2-5: The Ontario Building Code Act**

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| 1. Inspector appointment          | Section 3. (2), 3. (3) or 6.1. (4) |
| 2. Enforcement                    | Section 3 and 6.1                  |
| 3. Certificate                    | Section 3. (8)                     |
| 4. By-Laws & regulations          | Section 7                          |
| 5. Issue of permit                | Section 8. (2)                     |
| 6. Conditional permit             | Section 8. (3)                     |
| 7. Revocation of permit           | Section 8. (10)                    |
| 8. Inspection                     | Section 12. (1)                    |
| 9. Order not to cover             | Section 13                         |
| 10. Inspection of unsafe building | Section 15.9                       |
| 11. Entry to dwellings            | Section 16                         |
| 12. Powers of inspector           | Section 18                         |
| 13. Warrant for entry and search  | Section 21                         |
| 14. Disputes                      | Section 24                         |
| 15. Offences                      | Section 36                         |
| 16. This Act & municipal by-laws  | Section 35                         |

**ANS**

**Module 2 QUIZ**

1. d) Div A, 1.4.1.2.
2. c) Definitions
3. b) Building Code Act Section 14.-(1)
4. a) Division C Subsection 1.3.5.
5. b) BCA 7.(2)
6. a) 7.6.2.1.(2)
7. b) 7.6.2.6.(1)
8. d) All of the above
9. a)
10. c) Div A, 1.4.1.2.

**Exercise 4-3**

Possible discussion points:

- some municipalities do not permit service and sanitary piping in the same trench
- some permit storm and sanitary piping together, but require service piping to be separate
- some permit service and sanitary piping together if it meets the OBC

**Exercise 4-4****Acceptable and Unacceptable Piping Materials for Water Service Piping (Section 7.2.)**

<b>Materials</b>	<b>Acceptable (yes/no)</b>	<b>Standard</b>	<b>Code Reference</b>
Polyethylene	Yes – only for water service pipe	CAN/CSA B137.1	7.2.5.5.(2)
PEX	Yes	CAN/CSA B137.5	7.2.5.7.(1)
PVC	Yes	CAN/CSA B137.2 or CAN/CSA B137.3	7.2.5.8.(1)
PE /AL/PE	Yes	CAN/CSA B137.9	7.2.5.13.(1)
Cast-iron soil pipe	No	-	7.2.6.1.(2)
Galvanized steel	Yes – only in industrial occupancy	ASTM A53/A53M	7.2.6.7.(3).
Copper— K soft	Yes	ASTM B88	7.2.7.4.(1)(a) Table 7.2.7.4.
Copper— L soft	Yes	ASTM B88	7.2.7.4.(1)(a) Table 7.2.7.4.
Lead	No	-	7.2.7.8.
Materials previously used for a purpose other than distribution of potable water	No	-	7.2.1.2.(2).



**Exercise 5-2: A Case of Out-of-Site**

Possible Answers:

- Inspector should comply with Div. C 1.3.5.3.(1) which requires inspection within 2 days . If not:
- He could inspect 2nd and 3rd floor and record any findings before a final decision is made
- How familiar is he with the contractor's work? If familiar may be confident in installation.
- He could request a air or water test.

**Exercise 5-3: Nonmetallic Pipe Materials****Acceptable and Unacceptable Piping Materials for Water Distribution (Subsection 7.2.5.)**

<b>Materials</b>	<b>Cold</b>	<b>Hot</b>	<b>Code Reference</b>
Polyethylene (PE)	Y	N	7.2.5.5.(1)
Chlorinated Poly Vinyl Chloride (CPVC)	Y	Y	7.2.5.9.(1)
Cross-linked polyethylene (PEX)	Y	Y	7.2.5.7.(1)
Polypropylene (PP-R)	Y	Y	7.2.5.15.
Acrylonitrile-Butadiene-Styrene (ABS)	N	N	7.2.5.12.
Polybutylene	N	N	No longer permitted in 7.2.5.

### **MODULE 5 Quiz**

1. c) Div A, 1.4.1.2.
2. d) Div A, 1.4.1.2.
3. a) 7.6.2.9.
4. c) 7.2.7.4.(2), Table 7.2.7.4.
5. a) 7.6.1.4.
6. c) 7.6.3.1.(4)
7. b) 7.6.1.2.(1)
8. d) 7.7.3.1.(1), 7.7.3.2.(1)
9. b) Div A, 1.4.1.2.
10. a) 7.6.1.1.(2)

### **MODULE 6**

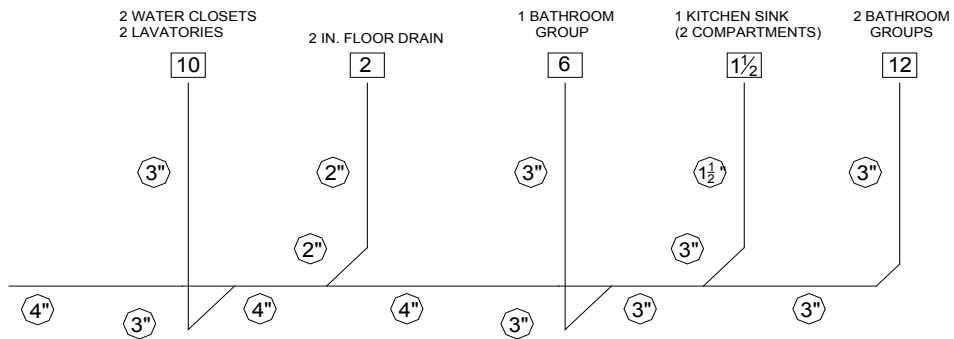
#### **Exercise 6-1**

Answers in Division A.

**Exercise 6-8**

	Fixtures Served by the Horizontal Drainage Pipe	Hydraulic Load (Fixture units)	Minimum Size of Horizontal Pipe (in)	Code Reference
1	2 lavatories (1 1/4 in. traps)	2	1 1/4	Table 7.4.10.7.
2	One water closet (flush tank)	4	3	7.4.9.2.(1)
3	4 water closets (flush tank)	24	4	7.4.9.2.(2)
4	Two bathroom groups (flush tank)	12	3	7.4.9.2.(1) and Table 7.4.10.8.
5	Building drain with 30 fixture units	30	4	7.4.9.4.(1)

**Exercise 6-9**



Steps 1 and 2: Determine the fixture units and cumulative fixture units. Table 7.4.9.3.

Step 3: Size vertical pipes. Table 7.4.10.6.

Step 4: Size horizontal pipes. Table 7.4.10.8.

Remember to check minimum sizes, Subsection 7.4.9.

**Exercise 6-10**

Class discussion.

**Exercise 6-11**

Class experiences.

**Exercise 7-11****Underground Drain and Sewer Pipe Materials  
Reference Subsections 7.2.5., 7.2.6., and 7.2.7.**

Materials	Building Drain	Building Sewer	Conditions	Code Reference	Standard
Asbestos-Cement	Yes	Yes	-	7.2.5.1.(2)	CSA/CGSB-34.9 CSA/CGSB-34.23
Concrete	Yes	Yes	-	7.2.5.3.	CAN/CSA A257
Vitrified Clay	Yes	Yes	-	7.2.5.4.(3)	CSA A60.3-M
Polyethylene	Yes	Yes	Note 1	7.2.5.6.(1)	ASTM F714
ABS	Yes	Yes	-	7.2.5.10.(1)	ASTM F628 and CAN/CSA B181.1
PVC	Yes	Yes	-	7.2.5.10.(1)	CSA-B181.2
Cast Iron	Yes	Yes	-	7.2.6.1.	CSA B70
Galvanized Steel	No	No	Note 2	7.2.6.7.(2)	ASTM A53/A53M
Corrugated Steel	No	Yes	Note 3	7.2.6.8.(2)	CAN/CSA-G401
Copper	Yes	Yes	-	7.2.7.1.	ASTM B42
Brass	Yes	Yes	-	7.2.7.1.	ASTM B43
Copper Tube – Type K & L hard	Yes	Yes	-	Table 7.2.7.4.	ASTM B306
Lead	Yes	No	-	7.2.7.8.(1)	-

Note 1 – Underground Rehab only

Note 2 – Above Ground use only

Note 3 – Storm Drainage only

**Exercise 7-12**

1. a) 4 inches (7.4.9.4.(1))  
b) 4 inches (7.4.9.4.(2))
2. a) 3 inches (7.4.9.2.(1))  
b) 4 inches (7.4.9.2.(2))

Location	Fixture Units/Sizing Considerations	Pipe Size
A	22 fu, 2 WCs	3 in.
B	10.5 fu, no WCs, Table 7.4.10.6.	3 in.
C	22.5 fu, 3 WCs	3 in.
D	21 fu, no WCs, but 3 in. floor drains require 3 in. drain 7.4.9.1.(1)	3 in.
E	45 fu, 6 WCs, 7.4.9.2.(3) not yet applicable, max 2 WC per floor so 3 in. horizontal branches, Table 7.4.10.6. requires 3 in.	3 in.
1	22 fu, 2 WCs, building drain min 4 in. 7.4.9.4.(1)	4 in.
2	B+C = 33 fu, 3 WCs, downstream of 3rd WC fixture drain, 7.4.9.2.(2)	4 in.
3	A+B+C = 55 fu, 5 WCs, building drain min 4 in. 7.4.9.4.(1), also not lesser than upstream drainage pipes 7.4.9.1.(1)	4 in.
4	D+E = 66 fu, 6 WCs, 3 in. pipes upstream, Table 7.4.10.8.	4 in.
5	A+B+C+D+E or 3 + 4 = 111 fu, 11 WCs, building drain min 4 in. 7.4.9.4.(1), 4 in. ok Table 7.4.10.8.	4 in.

## MODULE 8

### Exercise 8-1

1. See sewer use by-laws
2. By running water in the drainage piping and checking the manholes on the street side, or by using fluorescent dyes

### Exercise 8-2

From SA-1, [F81 - OH2.1], [F81-OP5]

**Exercise 10-3: Definitions**

1. Acrylonitrile butadiene styrene, 7.2.5.10.(1)(a)
2. Polyvinyl chloride, 7.2.5.8.(1)

**Exercise 10-4**

**Materials Permitted in the Venting System**  
(See Subsections 7.2.5., 7.2.6., 7.2.7.)

Type of Pipe Material	Applicable Standard	OBC Reference	Application in Venting Systems
ABS	ASTM F628 CAN/CSA B181.1	7.2.5.12.(1)(a) 7.2.5.12.(1)(b)	Inside or under a building
PVC	CAN/CSA B181.2	7.2.5.12.(1)(c)	Inside or under a building
Cast iron	CSA B70	7.2.6.1.(1)	Anywhere
Galvanized steel	ASTM A53	7.2.6.7.(2) & (4)	Above ground
Copper tube	ASTM B306	7.2.7.4. (1)(b)	Only K & L hard permitted under ground, only hard types and DWV permitted above ground, see Table 7.2.7.4.
Brass	ASTM B43	7.2.7.1.(2)	No restrictions

**Exercise 10 – 5**

1. Not less than twice the size of the fixture drain. If closer, it could promote evaporation of the trap or waste could splash up into the vent eventually causing it to clog. Also prevents siphonage. Clause 7.5.6.3.(1)(a)
2. 1 in 50. Helps to promote self-cleansing. Table 7.5.6.3.
3. Not more than 1.5 metres for 1 1/4 in. trap. Maximum length is up to 9.8 m for a 4 in. trap. If too long, the total amount of fall could exceed the diameter of the drain pipe causing self-induced siphonage Permitted length increases as trap size increases because the diameter of the pipe allows a greater fall before self-induced siphonage would occur. Table 7.5.6.3.

**Exercise 10-12**

Use Table 7.5.7.1. and refer to 7.4.9.3. for trap sizes

1. An individual vent serving a domestic clothes washer.  
Assume 2 in. trap, 1 1/2 in. vent pipe
2. A dual vent serving two water closets.  
Equivalent to 3 in. trap, 1 1/2 in. vent pipe
3. A dual vent serving a 2 inl. Trap and a 1 1/2 in. trap.  
Based on largest trap served, 1 1/2 in. vent pipe.

**Exercise 10-13****Step 1. Determine the hydraulic loads of each fixture.**

Find these from Table 7.4.9.3.

Lavatory	1 fixture unit
Kitchen Sink	1.5 fixture units
2-head shower	3 fixture units
WC (flush tank)	4 fixture units

**ANS****Step 2. Determine the hydraulic load carried by the wet vent.**

The wet vent does not drain the water closet, so this is not included in the calculation, as per Sentence 7.5.8.1.(2). But the wet vent must consider the hydraulic load of the kitchen sink as per 7.5.2.1.(f).

Wet vent hydraulic load = lavatory + lavatory + 2-head shower +  
2-head shower + kitchen sink = 9.5 fixture units

**Step 3. Size the wet vent.**

From Table 7.5.8.1., the wet vent is serving a water closet, so Column 3 is used. Since the hydraulic load is 9.5 fixture units, the wet vent pipe size is 4 in.

**Exercise 10-22**

Checklist developed by class.

**MODULE 10 QUIZ**

1. c) 7.5.1.1.(1)
2. c) Div.A 1.4.1.2.
3. c) Table 7.2.7.4.
4. d) 7.5.8.4.(5)
5. b) Table 7.5.8.3.
6. c) 7.5.8.3.
7. a) 7.5.5.5.(2)
8. a) 7.5.6.3.(1)
9. a) 7.3.4.5.(2)(e)
10. c) 7.5.6.2.(2)
11. a) 7.3.6.3.(1)
12. d) 7.5.4.2.(1)
13. b) 7.5.6.2.(1)
14. c) 7.2.5.10.(1)
15. d) 7.5.5.4.(1)
16. b) Div. A 1.4.1.2.
17. d) 7.5.2.1.(1)(I)



**Exercise 11-5**

1. Water cannot leak through the walls or floor. – Sentence 7.2.2.3.(1)
2. Not more than six. – Sentence 7.2.2.3.(2)
3. A dishwashing sink and a food-preparation sink. – Article 7.2.2.4.
4. A trough urinal. – Article 7.2.2.7.

**Exercise 11-6**

1. 8.35 L/min @ 413 kPa 60 psi – Table 7.6.4.1.
2. a) CAN/CSA-B45.0, General Requirements for Plumbing Fixtures. – Sentence 7.6.4.2.(1)  
b) No, does not exempt Sentence (1), but in practice would be required to meet 7.2.1.2.(1)

**Exercise 11-7****Size of Fixture Outlet Pipe and Distributing Pipe**

(Refer to Table 7.4.9.3 and Table 7.6.3.2.A.)

<b>Fixtures</b>	<b>Size of Fixture Outlet Pipe</b>	<b>Size of Supply pipe</b>
Water Closet with Flush Tank	3 in.	3/8 in.
Lavatory	1 1/4 in.	3/8 in.
Bathtub	1 1/2 in.	1/2 in.
Domestic Sink	1 1/2 in.	3/8 in.
Laundry Tray	1 1/2 in.	3/8 in.

**Exercise 11-8**

1. Plumbing appliance
2. To prevent contaminated water from the boiler from flowing back into the potable water supply.
3. This a pressure cross-connection.

**Exercise 11-9**

- Pipes may break
- Other piping may become misaligned
- May cause damage to wall
- Flow of fluids into or from fixture might be impeded

**Exercise 11-10**

1. Temperature and pressure relief valves are necessary to reduce the pressure inside hot water tanks in the event that pressure increases above normal.
2. These valves have sensing devices that are activated when the pressure inside the hot water tank reaches a critical level.
3. A sensing device is activated when the temperature inside the hot water tank reaches a critical level.

**Exercise 11-11**

1. a) Loading from a group of floor drains is expected to be handled by one trap.  
b) Gang-trapped floor drains must be in the same room and are not located where they can receive food or other organic matter. – Sentence 7.4.5.1.(3)
2. Must not be installed upstream from an interceptor, because food or waste could get caught in the interceptor. – Article 7.4.3.3.
3. The inlet side of the trap, with a Y fitting, as high as possible under the counter. – Sentence 7.4.5.1.(6)

**MODULE 11 QUIZ**

1. d) Div. A 1.4.1.2.
2. c) 9.31.4.1., 9.31.4.2., and 9.31.4.4.
3. b) Div. A, 1.4.1.2.
4. d) Div. A, 1.4.1.2.
5. b) 7.2.2.1.(1)
6. c) 7.2.10.6.(1)
7. a) Table 7.4.9.3. and Table 7.6.3.2.A.
8. b) 7.6.2.2.
9. c) 7.3.4.2.(1)
10. c) 7.3.6.6.(1)

**ANS**