WCI Wisconsin Contractors Institute

WISCONSIN PLUMBERS | CONTINUING EDUCATION

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Drain & Vent Systems (Course #961672) •

6 CE hours (Master Plumber, Master Plumber Restricted Appliance, Master Plumber Restricted Service, Journeyman Plumber, Journeyman Plumber Restricted Appliance, Journeyman Plumber Restricted Service, Commercial Plumbing Inspector, Utility Contractor, Cross Connection Control Tester)

4 CE hours (UDC Plumbing Inspector)

DISCLAIMER NOTE: This course is APPROVED by the Wisconsin Department of safety and professional services for continuing education to renew your plumbing license and is not intended to replace or supersede any state or local adopted codes.

Drain & Vent Systems

What is the purpose of this course?

The provisions of this course set forth the requirements for the design and installation of sanitary drain systems, including building drains and building sewers. The provisions of this course also set forth the requirements for the design and the installation of vents and venting systems.

Sanitary Drain Systems

MATERIALS.

All sanitary drain systems should be constructed of approved materials in accordance with chapter SPS 384.

LOAD ON DRAIN PIPING.

Intermittent flow.

'Fixture.' The load factor on drain piping should be computed in terms of drainage fixture unit values specified in Table 382.30–1 for the corresponding listed fixture.

'Devices.' Drainage fixture unit values for intermittent flow devices not listed in Table 382.30–1 should be computed on the basis of one fixture unit equaling one gallon per minute of flow.

Note: Equipment with a timed discharge cycle(s) of 2 minutes or less may be considered as an intermittent flow device.

Continuous flow devices.

Drainage fixtures unit values for continuous flow devices such as pumps, ejectors, air conditioning equipment or similar devices that discharge continuously should be computed on the basis of 2 fixture units for each one gallon per minute of flow.

Part 1 Exam Questions:

1. **What SPS chapter specifies approved materials for sanitary drain construction?**
   a. 364
   b. 374
   c. 384
   d. 394

2. **Drainage fixture unit values for intermittent flow devices not listed in Table 382.30–1 should be computed on the basis of one fixture unit equaling one gallon per how many minutes of flow?**
   a. One
   b. Two
   c. Three
   d. Four

3. **Equipment with a timed discharge cycle of 2 minutes or less may be considered as what type of flow device?**
   a. Unremitting
   b. Intermittent
   c. Continuous
   d. Unceasing

4. **True or false? Pumps, ejectors, and air conditioning equipment are examples of continuous flow devices.**
   a. True
   b. False

5. Drainage fixtures unit values for continuous flow devices should be computed on the basis of how many fixture units for each one gallon per minute of flow?

a. 1
b. 2
c. 3
d. 4

SIZE OF DRAIN PIPING.

Maximum loading.

The total drainage load in any portion of drain piping should not exceed the limits specified in Tables 382.30–2 and 382.30–3.

The drainage fixture unit values assigned to a receptor may be less than the limits specified in Tables 382.03-2 and 382-3 based on an approved alternate standard consistent with s. SPS 381.20 (2) or an analysis provided by a Wisconsin registered architect, registered professional engineer, or permitted designer of engineering systems -- plumbing.

Minimum size of building sewers.

'Gravity flow sewers.' The minimum size of a gravity flow sanitary building sewer should be 4" in diameter. A municipality or sanitary district by ordinance may require that portion of the building sewer between the lot line and the public sewer to be larger than 4" in diameter.

'Pressurized sewers.' Sewers pressurized through the use of sewage ejectors, sewage pumps or sewage grinder pumps should be sized to maintain a minimum flow velocity of 2 feet per second and should be in accordance with the ejector or pump manufacturer's recommendations.

Pressurized building sewers should be sized not less than 2" in diameter for sewage ejectors and sewage pumps, and 1¼" in diameter for all sewage grinder pumps.

Minimum size of private interceptor main sewers.

The minimum size of a gravity flow private interceptor main sewer should be 4" in diameter.

The minimum size of pressurized private interceptor main sewer should be such so as to maintain a minimum flow velocity of 2 feet per second.

A municipality or a sanitary district may by ordinance, require the minimum size of a private interceptor main sewer to be larger than 4" in diameter.

Private interceptor main sewers 6" or less in diameter may not exceed the drainage fixture limits in Table 382.30 –3.

Private interceptor main sewers 8" or larger in diameter should conform to the design criteria specified in NR 110.13.

Future fixtures.

Where provisions are made for the future installation of fixtures, the drainage fixture unit values of such fixtures should be considered in determining the required sizes of drain and vent pipes. Construction to provide for future installations should be terminated with a plugged fitting or fittings.

Part 1 Exam Questions:

6. The drainage fixture unit values assigned to a receptor may be less than the limits specified based on an approved alternate standard consistent with s. SPS 381.20 (2) or an analysis provided by a Wisconsin registered architect, registered professional _____, or permitted designer of engineering systems – plumbing.

a. Engineer
b. Contractor
c. Plumber
d. Inspector

7. What is the minimum size a gravity flow sanitary building sewer should be in diameter?

a. 1 inch
b. 2 inches
c. 3 inches
d. 4 inches

8. A municipality or sanitary district by ordinance may require that the portion of the building sewer between the _____ and the _____ is larger than 4" in diameter.

a. Drainage fixture, receptor
b. Domestic water heater, building drain
c. Lot line, public sewer
d. Waste discharge, plugged fittings

9. Sewers pressurized through the use of which of the following should be sized to maintain a minimum flow velocity of 2 feet per second?

a. Sewage ejectors
b. Sewage pumps
c. Sewage grinder pumps
d. All of the above

10. For sewage ejectors and sewage pumps, pressurized building sewers should not have a diameter less than how many inches?

a. 2
b. 3
c. 4
d. 5

11. For sewage grinder pumps, pressurized building sewers should not have a diameter less than how many inches?

a. 1¼
b. 1½
c. 1¾
d. 2

12. The minimum size of pressurized private interceptor main sewer should be such so as to maintain a minimum flow velocity of how many feet per second?

a. 2
b. 4
c. 6
d. 8

13. A municipality or a sanitary district by ordinance may require the minimum size of a private interceptor main sewer to be larger than ___ inches in diameter?

a. 2
b. 4
c. 6
d. 8

14. True or false? Private interceptor main sewers 8" or larger in diameter should conform to the design criteria specified in NR 681.10.

a. True
b. False

15. Where provisions are made for the future installation of fixtures, the drainage fixture unit values of said fixtures should be considered in determining the required sizes of which of the following?

a. Sewage pumps
b. Sewage ejectors
c. Drain and vent pipes
d. None of the above

PITCH OF HORIZONTAL DRAIN PIPING.

All horizontal drain piping 4" or larger in diameter should be installed at a pitch which produces a computed velocity of at least 2 feet per second when flowing half full.

Horizontal branch drains.

The minimum pitch of horizontal branch drains 2" or less in diameter should be ¼" per foot.

The minimum pitch of horizontal branch drains larger than 2" in diameter should be 1/8" per foot.

Building drains and building sewers.

The minimum pitch of building drains should be in accordance with Table 382.30–3.

The minimum pitch of building sewers 10" or less in diameter should be in accordance with Table 382.30–3.

The minimum pitch of building sewers 12" or larger in diameter should conform to the minimum pitch specified for municipal sewers in NR 110.13.

Private interceptor main sewers.

The minimum pitch of private interceptor main sewers 6" or less in diameter should be in accordance with Table 382.30–3.

The minimum pitch of private interceptor main sewers 8" or larger in diameter should conform with the minimum pitch specified for municipal sewers in NR 110.13

Part 1 Exam Questions:

16. True or false? All horizontal drain piping 4" or larger in diameter should be installed at a pitch which produces a computed velocity of at least 2 feet per second when flowing completely full.

a. True
b. False

17. The minimum pitch of horizontal branch drains 2" or less in diameter should be what per foot?

a. 1/8 inch
b. ¼ inch
c. ½ inch
d. 1 inch

18. The minimum pitch of horizontal branch drains larger than 2" in diameter should be what per foot?

a. 1/8 inch
b. ¼ inch
c. ½ inch
d. 1 inch

19. The minimum pitch of building sewers larger than what diameter should conform to the minimum pitch specified for municipal sewers in NR 110.13?

a. 6 inches
b. 8 inches
c. 10 inches
d. 12 inches

20. The minimum pitch of private interceptor main sewers of what diameter should conform to the minimum pitch specified for municipal sewers in NR 110.13?

a. 2 inches
b. 4 inches
c. 6 inches
d. 8 inches

TABLE 382.30–1
DRAINAGE FIXTURE UNIT VALUES BY FIXTURE TYPE

Type of Fixture	Drainage-Fixture Unit Value (dfu)	Trap Size Minimum Diameter (inches)
Automatic Clothes Washers:		
Commercial, individual	4	2
Commercial, large capacity	a	a
Self Service Laundry	4	2
Residential	4	2
Autopsy Table	h	h
Bathroom Group, includes: water closet,		
lavatory, bathtub or shower	6	
Bathtubs, all typesb	2	11/2
Bedpan Washer	6	2
Beer Tap	1/2	11/4
Bidet	2	11/2
Bottle Cooler	1/2	11/4
Campsite Receptor	6	4
Coffee Maker	1/2	11/4
Cuspidor, fountain or dental	1	11/4
Dipper Well	1	11/4
Dishwasher, commercial type	c	c
Dishwasher, residential type	2	11/2
Drinking Fountain	1/2	11/4
Exhaust Hood Washer	4	2
Floor Drain:		
2 inch	2	2
3 inch	3	3
4 inch	4	4
Larger than 4 inch	4	d
Glass Filler	1/2	11/4
Glass Washer	2	11/2
Health Care Fixtures:		
Clinic sink	6	NA
Exam/treatment sink	1	11/4
Sitz bath	2	11/2
Ice Chest	1/2	11/2
Laundry Tray, 1 or 2 compartment	2	11/2
Lavatory	1	11/4
Lavatory, combination per trap.	1	1½
Manufactured Home	11	NA
Refrigerated Food Display Case	1	1

Type of Fixture	Drainage-Fixture Unit Value (dfu)	Trap Size Minimum Diameter (inches)
Shower Stall:		
Residential	2	2
Public, individual	2	2
Public, group	2 per shower head	2
Sinks:		
Bar, residential	1	1¼
Breakroom (single compartment)	1	11/2
Cup	1/2	11/4
Factory, wash, per set of faucets	1	11/2
Fountain wash up	1	11/2
Fountain or Bar, 4 compartments or less	3	11/2
Food Waste Grinder, commercial 2 HP or less	2	f
Food Waste Grinder, commercial 3 HP or more	3	f
Laboratory	2	11/2
Laboratory, school	2	11/2
Classroom	1	11/4
Pack or plaster	3	2
Residential, with or without food waste grinder	2	11/2
Restaurant, Scullery, pots/pans < 4 compartments	3	f
Food, rinsing, cleaning or thawing	3	2
Service Sink, Flushing Rim	6	3
Service Sink, 2 inch diameter, wall outlet	2	2
Service Sink, 3 inch diameter, wall outlet	3	3
Service Sink, 2 inch diameter, floor outlet	2	2
Service Sink, 3 inch diameter, floor outlet	3	3
Shampoo Sink, barber or beauty parlor	2	11/2
Surgeons, wash up	3	11/2
Wash Fountain, circular and semi–circular	2	11/2
Receptors of Indirect Wastes, gravity flow discharge:		
11/4 inch receptor outlet diameter	1	11/4
11/2 inch receptor outlet diameter	2	11/2
2 inch receptor outlet diameter	3	2
3 inch receptor outlet diameter	4	3
4 inch receptor outlet diameter	6	4
Larger than 4 inch receptor outlet diameter	8	f
Soda Dispenser	1/2	11/4
Sterilizers:		
Bedpan	4	2
Garbage can washer	3	3
Instrument or water	1	
Urinal	2	g

Type of Fixture	Drainage-Fixture Unit Value (dfu)	Trap Size Minimum Diameter (inches)
Water Closet, nonpublic	4	g
Water Closet, public	6	g

TABLE 382.30–2
STACKS AND DRAIN PIPING

Pipe Diameter (inches)	Maximum Number of Drainage Fixture Units That May Drain Through Any Portion of Drain Piping[a]			
	Drain Piping Other Than Stacks[b]	Stacks[c]		
		Total Discharge from Side Connections into One Branch Interval[d,e]	Stacks of 3 Branch Intervals or Less	Stacks of More Than 3 Branch Intervals
1 ¼	1	1	2	2
1 ½	3	2	4	8
2	6	6	10	24
3	20	20	48	72
4	160	90	240	500
5	360	200	540	1,100
6	620	350	960	1,900
8	1,400	600	2,200	3,600
10	2,500	1,000	3,800	5,600
12	3,900	1,500	6,000	8,400
15	7,000	f	f	f

TABLE 382.30–3
BUILDING DRAINS, SUBDRAINS, BUILDING SEWERS AND PRIVATE INTERCEPTOR MAIN SEWERS

Pipe Diameter (inches)	Maximum Number of Drainage Fixture Units Which May Drain Through Any Portion of a Building Drain, Building Subdrain, Building Sewer or Private Interceptor Main Sewer			
	Pitch (inch per foot)			
	1/16	1/8	1/4	1/2
1 ¼	NP[b]	NP	1	1
1 ½	NP	NP	3	3
2	NP	NP	6	9
3	NP	36	42	50
4	NP	180	216	250
5	NP	390	480	575
6	NP	700	840	1,000
8	1,400	1,600	1,920	2,300
10	2,500	2,900	3,500	4,200
12	3,900	4,600	5,600	6,700
15	7,000	8,300	10,000	12,000

OFFSETS IN VERTICAL DRAINS.

Offsets in vertical drain piping should be in accordance with this section.

Offsets of 45° or less.

An offset in a vertical drain, with a change in direction of 45° or less from the vertical, should be sized as a vertical drain piping in accordance with this section.

Where a horizontal branch connects to a drain stack within 2 feet above or below an offset with a change of direction of 30° to 45° from the vertical and the offset is located 5 or more branch intervals below the top of the stack, the offset should be vented in accordance with chapter SPS 382.31 (5) (a).

Offsets of more than 45°.

A drain stack with an offset of more than 45° from the vertical should be installed in accordance with this section.

That portion of the drain stack above the highest offset should be sized as for vertical drain piping in accordance with this section.

That portion of the offset between and including the offset fittings should be sized as building drain piping in accordance with this section.

That portion of stack below the offset should be not less than the size of the offset.

Where an offset of more than 45o is located more than four branch intervals below the top of the drain stack, a horizontal branch may not connect within the offset or within 2 feet above or below such offset.

Where an offset in a drain stack with a change of more than 45° from vertical is located below 5 or more branch intervals, the offset should be vented in accordance with chapter SPS 382.31 (5) (b).

The vent required in chapter SPS 382.31 5. a. should not be required where the drain stack, including the offset, is sized one pipe size larger than required for a building drain designed to serve and the entire stack and offset are not less in cross sectional area than that required for a stack plus the area of a vent as required in chapter SPS 382.31 (5) (b).

Exception: Where an offset is located 2 or more feet below the lowest branch drain connection to the stack, the venting specified in this section and chapter SPS 382.31 (5) (b) is not required.

Part 1 Exam Questions:

21. What does the acronym DFU stand for?

a. Drain Faucet Unit
b. Data Fraction Unit
c. Drainage Fixture Unit
d. Draining Factor Unit

22. An offset in a vertical drain, with a change in direction of 45° or less from the vertical, should be sized as what type of drain piping in accordance with this section?

a. Horizontal
b. Vertical
c. Perpendicular
d. Parallel

23. Where a horizontal branch connects to a drain stack within 2 feet above or below an offset with a change of direction of ____ to ____ from the vertical, the offset should be vented in accordance with chapter SPS 382.31 (5) (a).

a. 10°, 15°
b. 20°, 35°
c. 30°, 45°
d. 40°, 55°

24. With regards to offsets greater than 45°, the portion of the drain stack above the _____ offset should be sized as for vertical drain piping in accordance with this section.

a. Lowest
b. Highest
c. Bottom
d. End

25. True or false? The portion of stack below the offset should not be greater than the size of the offset.

a. True
b. False

26. The offset should be vented in accordance with chapter SPS 382.31 (5) (b) when an offset in a drain stack with a change of more than 45° from vertical is located below how many branch intervals?

a. 2 or more
b. 3 or more
c. 4 or more
d. 5 or more

27. The vent required in chapter SPS 382.31 5. a. should not be required where the drain stack, including the offset, is sized how many pipe sizes larger than required for a building drain designed to serve and the entire stack?

a. 1
b. 2
c. 3
d. 4

HORIZONTAL BRANCH DRAIN CONNECTION AT BASE OF A STACK.

A horizontal branch drain may not connect downstream from the base fitting of a drain stack 2" or larger in diameter within the distance equal to 10 pipe diameters of the drain to which the horizontal branch drain connects.

A building drain branch or building subdrain branch may not connect to a building drain or building subdrain downstream from the base fitting of a drain stack 2" or larger in diameter within the distance equal to 20 pipe diameters of the building drain or building subdrain.

PIPING CHANGES IN DIRECTION.

Changes in the direction of drain piping should be accomplished in accordance with the requirements of this subsection.

Fittings.

All changes in direction of flow in drain piping should be made by the appropriate use of 45 degree wyes, long or short sweep quarter bends, sixth, eighth, or sixteenth bends, or by a combination of these or other equivalent fittings. Fittings which change the direction of flow for drain piping 8" or less in diameter should conform to the minimum radii specified in Table 382.30–4

The minimum radius for the first 90° fitting downstream from a trap serving a lavatory or sink should be 1–3/4" for drain piping 1–1/2" in diameter. The fitting should be a tee or quarter bend.

The minimum radius for the first 90° bend or elbow down- stream from a water closet should be 2–1/2" for drain piping 3" in diameter.

The minimum radius for the first 90° bend or elbow downstream from a water closet should be 3" for drain piping 4" in diameter.

TABLE 382.30–4 MINIMUM RADII OF FITTINGS (IN INCHES)		
Pipe Diameter (inches)	Changes in Directional Flow	
	Horizontal to Vertical	Vertical to Horizontal and Horizontal to
1–1/4	1–1/8	2–1/4
1–1/2	1–3/8	2–3/4
2	1–7/8	3–1/4
3	2–7/8	4–1/16
4	3–3/4	4–7/8
5	4–1/2	6–1/2
6	5	7
8	6	8

Blowout type fixtures.

Where blowout type fixtures are installed back to back, appropriate fittings should be installed to prevent the passage of wastes from one fixture to the other.

Part 1 Exam Questions:

28. A horizontal branch drain may not connect _____ from the base fitting of a drain stack 2" or larger in diameter within the distance equal to 10 pipe diameters of the drain to which the horizontal branch drain connects.

a. Upstream
b. Downstream
c. Within 5 feet
d. Within 10 feet

29. A building drain branch or building subdrain branch may not connect to a building drain or building subdrain downstream from the base fitting of a drain stack 2" or larger in diameter within the distance equal to _____ pipe diameters of the building drain or building subdrain.

a. 10
b. 15
c. 20
d. 25

30. All changes in direction of flow in drain piping should be made by the appropriate use of which of the following?

a. 45 degree wyes
b. Long or short sweep quarter bends
c. Sixth, eighth, or sixteenth bends
d. All of the above

31. Table 382.30–4 specifies conforming minimum radii diameters up to what diameter of drain piping?

a. 8 inches
b. 10 inches
c. 12 inches
d. 14 inches

32. According to Table 382.30–4, if the change in direction of flow from horizontal to vertical is 5 inches, what is the diameter of the pipe?

a. 2 inches
b. 4 inches
c. 6 inches
d. 8 inches

33. True or false? Where blowout type fixtures are installed back to back, appropriate fittings should be installed to encourage the passage of wastes from one fixture to the other.

a. True
b. False

DRAIN FITTINGS AND CONNECTIONS.

Drain fittings, connections, devices and methods of installation should not obstruct or retard the flow of water, wastes, sewage or air in the drain system or venting system in an amount greater than the normal frictional resistance to flow, unless as otherwise permitted in this chapter or unless approved by the department.

Closet bend.

The reduction of a 4 x 3 inch closet bend or collar fitting from 4" to 3" should not be considered an obstruction.

Side inlet tees or bends.

The side inlet of a low pattern or high pattern tee or bend should not be used as a vent connection when the side inlet is placed in a horizontal position or when any arrangement of piping or fittings produces a similar effect.

Prohibited fittings and connections.

The types of fittings and connections specified in this section should not be used for drain piping:

- A heel inlet bend when the heel inlet is in the horizontal position;
- A fitting or connection which has an enlargement chamber or recess with a ledge or shoulder, or reduction in pipe area in the direction of flow;
- A fitting which has running threads; and
- A connection by means of drilling and tapping of a drain or vent pipe, unless as otherwise approved by the department.

Saddles.

If a pipe saddle is used to connect drain piping together, the saddle should be installed in accordance with chapter SPS 384.30 (5) (d).

Part 1 Exam Questions:

34. True or false? The reduction of a 4 x 3 inch closet bend or collar fitting from 4" to 3" should not be considered an obstruction.

a. True
b. False

35. The side inlet of a low pattern or high pattern tee or bend should not be used as a vent connection when the side inlet is placed in a _____ position or when any arrangement of piping or fittings produces a similar effect.

a. Vertical
b. Horizontal
c. Perpendicular
d. Parallel

36. True or false? A fitting which has running heads should not be used drain piping.

a. True
b. False

37. If a pipe _____ is used to connect drain piping together, the saddle should be installed in accordance with chapter SPS 384.30 (5) (d).

a. Fitting
b. Drain
c. Saddle
d. Collar

SUMPS, EJECTORS AND PUMPS.

Sumps.

'General.' All sanitary building subdrains should discharge into an approved, vented sump with an airtight cover. The sump should be so located as to receive the wastewater by gravity flow, and should be located at least 25 feet from any water well or as otherwise approved by the department of natural resources.

'Capacity.' The minimum capacity of the sump should be determined in accordance with the provisions of this section.

The water supply fixture unit method should be used to determine peak input flow in gallons per minute; only the fixtures that drain to the sump should be included.

Note: When converting water fixture units to gallons per minute it is permissible to calculate the load as a supply system with predominantly flush tanks.

The capacity of the sump should be such that the pump when actuated by the lowest "pump on" switch runs at least 20 seconds.

Between the highest "pump on" switch level and the sump inlet, the sump should hold the amount of input that exceeds the discharge of the pumping equipment in a 5 minute peak input period, but in no case should the vertical distance between the switch and the inlet be less than 3".

The low water level should be maintained in accordance with the pump manufacturer's requirements, but should not be less than 4" above the sump bottom.

Sumps containing one pump should have an inside diameter of at least 24". Sumps containing 2 pumps should have an inside diameter of at least 30".

'Vents.' All sumps and all drains leading to a sump should be vented in accordance with chapter SPS 382.31.

'Materials.' All sumps should be constructed in a watertight manner of approved materials in accordance with chapter SPS 384.

'Removable covers.' Penetrations through the top of removable sump covers should be limited to those for the electrical supply, the vent piping and the discharge piping for the pump or pumps.

Part 1 Exam Questions:

38. All sanitary building subdrains should discharge into an approved, vented sump with what type of cover?

a. Diaphanous
b. Airtight
c. Breathable
d. Translucent

39. The sump should be located in order to receive the wastewater by gravity flow and should be located at least ____ feet from any water well, or as otherwise approved by the department of natural resources.

a. 25
b. 30
c. 35
d. 40

40. True or false? Only the fixtures that drain to the sump should be included when determining peak input flow in gallons per minute.

a. True
b. False

41. The capacity of the sump should be such that the pump when actuated by the lowest "pump on" switch runs at least ____ seconds.

a. 20
b. 30
c. 40
d. 50

42. Between the highest "pump on" switch level and the sump inlet, the sump should hold the amount of input that exceeds the discharge of the pumping equipment in a 5 minute peak input period, but in no case should the vertical distance between the switch and the inlet be less than ___inches.

a. 3
b. 4
c. 5
d. 6

43. The _____ water level should be maintained in accordance with the pump manufacturer's requirements, but should not be less than 4" above the sump bottom.

a. High
b. Maximum
c. Low
d. Peak

44. Sumps containing one pump should have an inside diameter of at least ___inches.

a. 12
b. 16
c. 20
d. 24

45. Sumps containing 2 pumps should have an inside diameter of at least ___inches?

a. 24
b. 26
c. 28
d. 30

46. All sumps and drains leading to a sump should be vented in accordance with what SPS chapter?

a. 362.51
b. 372.98
c. 382.31
d. 392.47

47. True or false? All sumps should be constructed in a watertight manner of approved materials in accordance with chapter SPS 384.

a. True
b. False

48. Penetrations through the top of removable sump covers should be limited to which of the following?

a. Electrical supply
b. Vent piping
c. Discharge piping for the pump or pumps
d. All of the above

Ejectors and pumps.

'Where required.' The liquid from all sanitary building sumps should be lifted and discharged into the building sanitary drain system by automatic ejectors, pumps or any other equally efficient method approved by the department.

'Duplex equipment.' Duplex ejector or pumping equipment should be installed in a public building where 3 or more water closets or more than 20 drainage fixture units discharge into a sump.

Duplex ejector or pumping equipment should be installed where the sanitary wastes of 2 or more one–family or two–family dwellings discharge into a sump.

Where duplex ejector or pumping equipment is installed, appropriate devices should be installed to automatically alternate operation of the pumps or ejectors and to operate both pumps and/or ejectors when one unit cannot handle the load.

Where duplex pumping equipment is installed, an audible or visual alarm system with a manual control reset should be installed to indicate pump failure.

'Size.' The size and design of an ejector or pump should be determined by the capacity of the sump to be served, the discharge head and discharge frequency. All ejectors and pumps should provide a minimum flow velocity of 2 feet per second in the forced discharge piping.

All sewage grinder pumps should have a minimum 1¼" diameter discharge opening and discharge piping.

All nongrinder–type sewage pumps serving water closets should be capable of passing a 2" diameter solid ball and should have a minimum 2" diameter discharge opening and discharge piping. All other pumps handling

sanitary wastes should be rated by the manufacturer as an effluent pump, should be capable of passing a ½" diameter solid ball and should have a minimum 1¼" diameter discharge opening and discharge piping.

'Discharge connections.' The discharge pipe from the ejector or pump should be connected to the gravity drain by means of a wye pattern fitting. Where the fitting connects to a horizontal drain, the bottom of the wye branch of the fitting should be located above the horizontal center line.

With the exception of exterior sumps, a full flow check valve should be installed in the discharge piping from each ejector or pump.

Where duplicate ejector or pumping equipment is installed, each discharge pipe from an ejector or pump should be provided with a gate or ball type valve installed downstream of each full flow check valve.

'Discharge pipe air relief.' Air relief valves should be provided at all high points in the discharge piping of an ejector or pump where the piping arrangement creates an air trap.

'Prohibited connections.' No fixtures may be connected to the discharge pipe between the ejector or pump and the point where it enters the gravity drain.

'Maintenance.' All ejectors, pumps and like appliances should receive care as needed to keep them in a satisfactory operating condition.

Part 1 Exam Questions:

49. Duplex ejector or pumping equipment should be installed in a public building where _____ or more water closets or more than _____ drainage fixture units discharge into a sump.

a. 2, 15
b. 3, 20
c. 4, 22
d. 5, 25

50. True or false? Duplex ejector or pumping equipment does not need to be installed where the sanitary wastes of 2 or more one–family or two–family dwellings discharge into a sump.

a. True
b. False

51. True or false? Where duplex pumping equipment is installed, an audible or visual alarm system is acceptable.

a. True
b. False

52. The size and design of an ejector or pump should be determined by which of the following:

a. The capacity of the sump to be served
b. The discharge head
c. The discharge frequency
d. All of the above

53. All ejectors and pumps should provide a minimum flow velocity of how many feet per second in the forced discharge piping?

a. 2
b. 3
c. 4
d. 5

54. All sewage grinder pumps should have a minimum diameter discharge opening and discharge piping diameter of ___inches.

a. 1¼
b. 1½
c. 1¾
d. 2

55. All nongrinder–type sewage pumps serving water closets should be capable of passing a 2" diameter _____ and should have a minimum 2" diameter discharge opening and discharge piping.

a. Sewage clump
b. Solid ball
c. Globule of scraps
d. Malleable sphere

56. The discharge pipe from the ejector or pump should be connected to the gravity drain by means of what type of fitting?

a. Side inlet
b. Sanitary tee
c. Wye pattern
d. Vent draining

57. Where the fitting connects to a horizontal drain, the bottom of the wye branch of the fitting should be located above the horizontal _____ line.

a. Fixture
b. Center
c. Fill
d. Bottom

58. A full flow check valve should be installed in the discharge piping from each ejector or pump, unless it is a(n) _____sump.

a. Interior
b. Exterior
c. Submersible
d. Aboveground

59. Where duplicate ejector or pumping equipment is installed, each discharge pipe from an ejector or pump should be provided with a gate or ball type valve installed. Where should this be located, with respect to each full flow check valve?

a. Downstream
b. Upstream
c. Within 5 feet
d. Within 10 feet

60. Air relief valves should be provided at all high points in the discharge piping of an ejector or pump where the piping arrangement creates a what?

a. Gas vent
b. Drain connection
c. Air trap
d. Sewage cluster

61. True or false? No fixtures may be connected to the discharge pipe between the ejector or pump and the point where it enters the gravity drain.

a. True
b. False

62. How often should all ejectors, pumps and like appliances receive care?

a. Every other week
b. At the start of each month
c. Biannually
d. As needed to keep them in a satisfactory operating condition

Prefabricated pumps and sump systems.

The minimum capacity of a prefabricated pump and sump system should be determined in accordance with all of the following:

- The water supply fixture unit, wsfu, method should be used to determine peak input flow in gallons per minute. The peak input should include all the fixtures that drain to the sump.
- The capacity of the prefabricated pump and sump system should accommodate the peak input flow.

The low water level should be maintained in accordance with the pump manufacturer's requirements.

Exterior sumps.

The minimum capacity of exterior sumps should be determined in accordance with all of the following:

- Peak input flow in gallons per minute should be determined in accordance with either of the following:
- The water supply fixture unit, wsfu, method of all the fixtures that drain to the sump.
- The provisions as specified in chapters SPS 383.43 (2) through (6).

In lieu of providing the duplex pumping equipment as specified above, a one–day holding capacity may be provided above a high level alarm when installed on a simplex system.

Part 1 Exam Questions:

63. What does the acronym WSFU stand for?

a. Water Scale Fullness Unit
b. Water Sample Faculty Unit
c. Water Supply Fixture Unit
d. Water Safety Factor Unit

64. With regards to exterior sumps, what chapter of SPS specifies requirements?

a. 373
b. 383
c. 393
d. 403

65. In lieu of providing the duplex pumping equipment as specified above, how many days long can the holding capacity be provided for?

a. 1
b. 2
c. 3
d. 4

BUILDING DRAINS AND BUILDING SEWERS.

Limitations.

No building sewer may pass through or under a building to serve another building, unless:

- The building sewer serves farm buildings or farm houses, or both, which are all located on one property; or
- The building sewer or private interceptor main sewer serves buildings located on the same property and a document, which indicates the piping and distribution arrangement for the property and buildings, should be recorded with the register of deeds no later than 90 days after installation.

Building drains.

'Elevation.' All building drains should be installed below the lowest floor levels on which fixtures may be installed if the public sewer, POWTs or private interceptor main sewer elevation permits.

Where any portion of an above–ground building drain discharges to a vertical pipe, the building drain should connect to the building sewer at an elevation at least 30" above the basement floor.

'Backwater protection.' A building drain subject to backflow or backwater should be protected with a backwater valve or with a sump with pumping equipment in accordance with the following section.

Backwater valves, when fully open, should have a capacity not less than that of the pipes in which installed.

Backwater valves should be so located as to be readily accessible for cleaning.

'Floor drain required.' Where a plumbing fixture or appliance is located on a floor which is entirely below grade, a floor drain should be installed to serve that floor.

In any room containing the recessed or concealed portions of sterilizers located in health care or related facilities, at least one floor drain connecting to the drainage system should be installed in a manner to adequately drain the entire floor area.

Part 1 Exam Questions:

66. True or false? If a building sewer serves farm buildings or farm houses, a building sewer may pass through or under a building to serve another building.

a. True
b. False

67. All building drains should be installed below the _____ floor levels on which fixtures may be installed if the public sewer.

a. Highest
b. Lowest
c. Middle
d. Top

68. Where any portion of an aboveground building drain discharges to a vertical pipe, the building drain should connect to the building sewer at an elevation at least ___inches above the basement floor.

a. 30
b. 32
c. 34
d. 36

69. True or false? Backwater valves, when fully open, should have a capacity less than that of the pipes in which installed.

a. True
b. False

70. Where a plumbing fixture or appliance is located on a floor which is entirely _____ grade, a floor drain should be installed to serve that floor.

a. Beyond
b. Above
c. Below
d. Exceeding

71. In any room containing the recessed or concealed portions of sterilizers located in health care or related facilities, at least how many floor drains connecting to the drainage system should be installed in a manner to adequately drain the entire floor area?

a. 1
b. 2
c. 3
d. 4

Building sewers.

'Minimum depth.'

The top of a building sewer should be located at a depth of not less than 42" below finished grade, except as provided below.

The top of a building sewer which discharges to a septic tank, holding tank or grease interceptor should be located at a depth of not less than 18" below finished grade.

'Protection from frost.' A building sewer or private interceptor main sewer should be protected from frost in accordance this section in areas where the top of the building sewer or private interceptor main sewer is located less than 60" below a surface area from which snow will be cleared.

A building sewer or private interceptor main sewer should be protected from frost in accordance with this section in areas where the top of the building sewer or private interceptor main sewer is located less than 42" below a surface area which snow will not be cleared.

Where a building sewer or private interceptor main sewer discharges to a holding tank, POWTs treatment tank or grease interceptor, the portion of a building sewer or private interceptor main sewer which is within 30 feet from the connecting building drain and which is under a surface area from which snow will not be cleared should not be required to be protected from frost.

Frost protection for a building sewer should not be required where the predicted depth of frost as determined from Figure 382.30–1 and Table 382.30–6 does not extend below the top of the building sewer.

Where a building sewer or private interceptor main sewer is installed to serve summer use public facilities, frost protection requirements should not apply.

'Insulation for building sewers.' Building sewer or private interceptor main sewer insulation for frost protection should be provided in accordance with one of the methods specified below.

Extruded polystyrene foam insulation should be installed at a depth of at least 18" below finished grade and at least 6" above the top of the sewer pipe. The minimum thickness and width of the foam insulation should be determined from Figure 382.30–1 and Tables 382.30–5 to 382.30–7. If the insulation is to be installed more than 6" above the top of the sewer, the number of inches exceeding 6" should be added to the width of insulation determined from Table 382.30–7.

Extruded polystyrene foam insulation should be installed using a box method. The 3–sided box should be formed with 3 lengths of polystyrene foam insulation where the top of the box extends horizontally to the farthest edge of both vertical sides. The insulation should be installed at or below a depth of at least 12" below finished grade and 6" above the top and 6" from each side of the building sewer or private interceptor main sewer. The minimum thickness of the foam insulation should be determined from Figure 382.30–1 and Table 382.30–5.

Lightweight insulating concrete should be installed to the depth of the spring line of the sewer and should extend laterally at least 6" on both sides of the sewer. The minimum thickness of the insulating concrete should be determined from Figure 382.30–1 and Table 382.30–5. The thickness should be measured from the top of the sewer. The top of the insulation should be installed at least 12" below finished grade.

Alternative methods of frost protection should be approved by the department.

FIGURE 382.30–1. FROST PROTECTION ZONES.

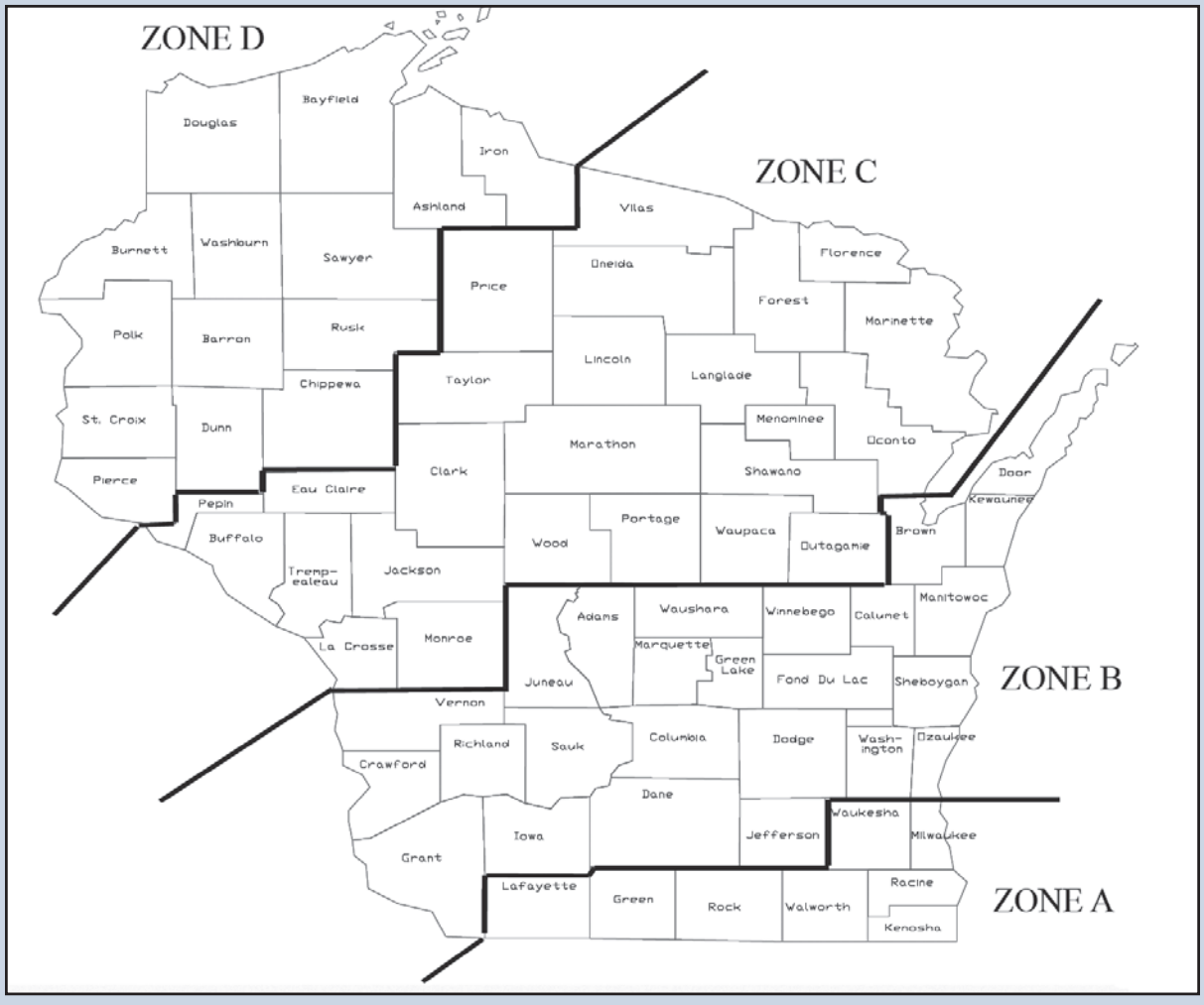

TABLE 382.30–5 MINIMUM THICKNESS OF INSULATION		
Frost Protection Zone	**Extruded Polystyrene Foam (in inches)**	**Insulating Concrete (in inches)**
A	1.0	6
B	1.5	9
C	2.0	12
D	2.5	15

TABLE 382.30–6 PREDICTED DEPTH OF FROST IN VARIOUS TYPES OF BACKFILL SOIL (IN FEET)				
Soil Type	**Frost Protection Zone**			
	A	**B**	**C**	**D**
Clay, Clay Loam	2.5	3.0	3.5	4.0
Silt Loam, Silty Clay Loam	3.5	4.0	4.5	5.5
Sandy Clay Loam	4.0	4.5	5.5	6.0
Sandy Loam, Loamy Sand	4.5	5.0	6.0	6.5
Sand	5.0	5.5	6.5	7.5
Gravelly Sand	6.0	7.5	9.0	10.0

TABLE 382.30–7 MINIMUM WIDTH OF EXTRUDED POLYSTYRENE FOAM INSULATION (IN FEET)						
Predicted Depth of Frost (feet)	**Depth of Sewer (in feet)**					
	2.0	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
2.5	2	NR	NR	NR	NR	NR
3.0	3	2				
3.5	4	3	2			
4.0	5	4	3	2		
4.5	6	5	4	3	2	
5.0	7	6	5	4	3	2
5.5	8	7	6	5	4	3
6.0	9	8	7	6	5	4
6.5	10	9	8	7	6	5
7.0	10	10	9	8	7	6
7.5	10	10	10	9	8	7
8.0	10	10	10	10	9	8
8.5	10	10	10	10	10	9
9.0	10	10	10	10	10	10
10.0	10	10	10	10	10	10

Part 1 Exam Questions:

72. The top of a building sewer should be located at a depth of not less than how many inches below finished grade?

a. 42
b. 44
c. 46
d. 48

73. The top of a building sewer which discharges to a septic tank, holding tank or grease interceptor should be located at a depth of not less than ___ inches below finished grade.

a. 18
b. 20
c. 22
d. 24

74. According to Figure 382.30–1, how many frost protection zones are there?

a. 2
b. 3
c. 4
d. 5

75. True or false? The frost protection zones are categorized by numbers.

a. True
b. False

76. According to Table 382.30–6, if the predicted depth of frost in Frost Protection Zone A is 4.0 feet, what soil type is it?

a. Clay, clay loam
b. Sandy clay loam
c. Gravelly sand
d. Silt loam, silty clay loam

77. According to Table 382.30–6, sand has a predicted depth of frost of ____feet in Frost Protection Zone B.

a. 4.0
b. 4.5
c. 5.0
d. 5.5

78. Frost protection for a building sewer should not be required where the predicted depth of frost as determined from Figure 382.30–1 and Table 382.30–6 does not extend below the _____ of the building sewer.

a. Base
b. End
c. Bottom
d. Top

79. Where a building sewer or private interceptor main sewer is installed to serve _____ use public facilities, frost protection requirements should not apply.

a. Winter
b. Spring
c. Summer
d. Autumn

80. Extruded polystyrene foam insulation should be installed at a depth of at least ___inches below finished grade and at least ___inches above the top of the sewer pipe.

a. 9, 3
b. 12, 4
c. 16, 5
d. 18, 6

81. According to Table 382.30–7, if the predicted depth of frost is 3 feet and the depth of the sewer is 3 feet, at what depth should the extruded polystyrene foam insulation be installed at?

a. 2 feet
b. 3 feet
c. 4 feet
d. No requirement

82. According to Table 382.30–7, if the depth of the sewer is 3.5 feet and the polystyrene foam is installed at 7 feet, what is the predicted depth of frost?

a. 6 feet
b. 6.5 feet
c. 7 feet
d. 7.5 feet

83. When using the box method to install extruded polystyrene foam insulation, how many sides should the box have?

a. 1
b. 2
c. 3
d. 4

84. _____ insulating concrete should be installed to the depth of the spring line of the sewer and should extend laterally at least 6" on both sides of the sewer.

a. Lightweight
b. Medium weight
c. Heavyweight
d. Strong weight

Location limitations.

Building drains, building sewers or private interceptor main sewers should be separated from water wells by the applicable separation distances contained in chapters. NR 811 and 812 or as otherwise approved by the department of natural resources.

Installation of building drains and building sewers.

'Trenching.' All excavations for building drains and building sewers should be open trench work, unless otherwise permitted by local ordinance or accepted by the local inspector.

'Stable bottom.' Where the bottom of the trench can be maintained in a stable condition and free of water during the time of installation the building drain and the building sewer should be bedded and initially backfilled to comply with all the following requirements:

- Where the trench bottom does not contain stone larger than one inch in size or where bedrock is not encountered, the trench may be excavated to grade.
- Where stone larger than one inch size or when bedrock is encountered, the trench should be excavated to a depth at least 3 inches below the grade elevation and should be brought back to grade with a bedding of sand, gravel or crushed stone that should be of a size that all the material should pass a ¾–inch sieve.
- Bedding should be sufficiently dry and hand or mechanically compacted to a minimum of 90 percent standard proctor density.
- Initial backfill to a depth of 12 inches over the pipe should be sand, crushed stone or excavated material which is neither corrosive nor organic in nature.
- Initial backfill should be of a size that passes a one–inch sieve.
- A concrete floor may be placed over a building drain having less than 12 inches of initial backfill.
- Initial backfill should be placed in increments not to exceed 6 inches in depth.
- Initial backfill should be well tamped for the full width of the trench and length of the sewer.

'Unstable bottom.' Where a mucky or unstable bottom is encountered in the trench, the required dry and stable foundation conditions should be provided by providing one of the following options:

- Sheathing should be driven and left in place to a depth of 48 inches below the trench bottom or to solid foundation to a lesser depth.
- Removal of wet and yielding material to a depth of 24 inches or to solid material and replacement of the unstable material with limestone screenings, pea gravel or equivalent material.
- Install a longitudinally reinforced concrete cradle the width of the trench and at least 3 inches thick.
- Install a longitudinally reinforced concrete slab the width of the trench and at least 3 inches thick.

'Backfill completion.' Care should be exercised in placing the balance of the backfill to prevent breakage of the pipe. Large boulders or rock, concrete slabs, or frozen masses should not be used in the backfill. At least 36" of backfill cover should be provided over the top of the pipe before the pipe trench is wheel–loaded.

'Pipe openings protected.' The ends of all pipes not immediately connected should be closed so as to prevent the introduction of earth or drainage from an excavation.

Part 1 Exam Questions:

85. Which of the following should be separated from water wells by the applicable separation distances contained in chapters?

a. Building drains
b. Building sewers
c. Private interceptor main sewers
d. All of the above

86. All excavations for building drains and building sewers should be _____ trench work, unless otherwise permitted by local ordinance or accepted by the local inspector.

a. Closed
b. Open
c. Wet
d. Secure

87. With regards to the bottom of a trench that can be maintained in a water-free, stable condition during the time of installation, no stones larger than ___inch(es) should be contained.

a. 1
b. 2
c. 3
d. 4

88. With regards to the bottom of a trench that can be maintained in a water-free, stable condition during the time of installation, bedding should be sufficiently dry and compacted to a minimum of ____percent standard proctor density.

a. 70
b. 80
c. 90
d. 100

89. True or false? Hand compacting and mechanically compacting bedding are both approved methods.

a. True
b. False

90. With regards to the bottom of a trench that can be maintained in a water-free, stable condition during the time of installation, a concrete floor may be placed over a building drain having less than __ inches of initial backfill.

a. 6
b. 8
c. 10
d. 12

91. With regards to the bottom of a trench that can be maintained in a water-free, stable condition during the time of installation, initial backfill should be placed in increments not to exceed ___inches in depth.

a. 2
b. 4
c. 5
d. 6

92. With regards to the bottom of a trench where a mucky or unstable bottom is encountered, sheathing should be driven and left in place to a depth of ___ inches below the trench bottom or to solid foundation of a lesser depth.

a. 48
b. 50
c. 52
d. 54

93. With regards to the bottom of a trench where a mucky or unstable bottom is encountered, if a longitudinally reinforced concrete slab is installed, it should be the width of the trench and at least ___ inches thick.

a. 3
b. 4
c. 5
d. 6

94. Care should be exercised in placing the balance of the _____ to prevent breakage of the pipe.

a. Concrete cradle
b. Limestone screenings
c. Pea gravel
d. Backfill

95. Which of the following should not be used in backfill?

a. Large boulders or rock
b. Concrete slabs
c. Frozen masses
d. All of the above

96. At least ___inches of backfill cover should be provided over the top of the pipe before the pipe trench is wheel–loaded.

a. 36
b. 42
c. 56
d. 68

97. True or false? The ends of all pipes immediately connected should be closed so as to prevent the introduction of earth or drainage from an excavation.

a. True
b. False

Connection to public sewer.

The connections of building sewers to public sewers should be in accordance with conditions of approval for the public sewer granted by the department of natural resources under chapter 281.41, Stats.

'Gravity public sewer.' When a building sewer connection to the public sewer is not found within 3 feet of the point designated by the local governing body or its authorized representative, the connection should be made in accordance with one of the provisions specified below.

A saddle fitting approved by the department and acceptable to the municipality or sanitary district should be installed.

Where acceptable to the municipality or sanitary district a portion of the main sewer may be removed and a tee or wye fitting approved by the department may be inserted with compression joints in the public sewer acceptable to the municipality or the sanitary district. The insertion should be made under the supervision of the authorized representative of the municipality or the sanitary district.

When the public sewer is concrete or clay, the end of the connecting sewer may be set upon or in an opening cut into the top half of the public sewer, but should not protrude into the public sewer. The connection should be secured by encasing the main sewer pipe and the connection in concrete at least 3" thick so as to assure permanency of the connection and adequate backing of the public sewer pipe.

In lieu of the use of a fitting and in the event that an opening cannot be located in the top half of the public sewer, a length of concrete or clay public sewer pipe may be removed and a section with a wye fitting should be inserted in its place. The joints at the ends of the section should be encased in concrete at least 3" thick. The connection or insertion should be made under the supervision of the authorized representative of the municipality or the sanitary district.

'Pressurized public sewer.' Where a forced building sewer discharges to a pressurized public sewer all of the following requirements should apply:

- A curb stop should be installed on the same property as close as possible to the connection to the common forced main sewer.
- A check valve should be installed in the pressurized building drain or building sewer.
- An accessible quick disconnect should be installed upstream of the check valve.

Part 1 Exam Questions:

98. The connections of building sewers to public sewers should be in accordance with conditions of approval for the public sewer granted by the department of natural resources under chapter _____, Stats.

a. 346.87
b. 654.21
c. 281.41
d. 734.79

99. When the public sewer is _____ or _____, the end of the connecting sewer may be set upon or in an opening cut into the top half of the public sewer, but should not protrude into the public sewer.

a. Concrete, clay
b. Sand, concrete
c. Clay, sand
d. Stone, clay

100. The connection should be secured by encasing the main sewer pipe and the connection in concrete at least ___inches thick so as to assure permanency of the connection and adequate backing of the public sewer pipe.

a. 3
b. 4
c. 5
d. 6

101. In lieu of the use of a fitting and in the event that an opening cannot be located in the top half of the public sewer, a length of concrete or clay public sewer pipe may be removed and a section with a ____ fitting should be inserted in its place.

a. Tee
b. Wye
c. Netted
d. Concrete

102. Where a forced building sewer discharges to a pressurized public sewer, a _____ should be installed on the same property as close as possible to the connection to the common forced main sewer.

a. Concrete cradle
b. Concrete slab
c. Curb stop
d. Metered valve

103. True or false? A check valve should be installed in the pressurized building drain or building sewer.

a. True
b. False

104. An accessible quick disconnect should be installed _____ of the check valve.

a. Within 5 feet
b. Within 10 feet
c. Downstream
d. Upstream

Prohibited installations.

'Harmful discharge.' No person may connect to a public sewer any building drain or building sewer through which is discharged any substance likely to cause undue corrosion, obstruction, nuisance, explosion or interference with sewage treatment processes.

'Storm water and clear water connections.' Storm drain piping and clear water drain piping may not discharge to a sanitary building drain which connects to a publicly–owned treatment works.

Locating requirements.

A means to locate buried non–metallic sewers and private interceptor main sewers discharging to municipal mains should be accomplished in accordance with one of the following options:

- A tracer wire should be installed in accordance with all of the following:
  - Tracer wire should be installed along the length of the non– metallic pipe.
  - Tracer wire should be a minimum of 18 gauge, insulated, single–conductor copper wire or equivalent.
  - Tracer wire should be located directly above and within 6 inches of the non–metallic pipe.
  - Tracer wire should be accessible and locatable within the owner's property at 400–foot intervals or increments thereof.
  - Exterior access locations should include a means of protecting the tracer wire.
  - In–ground sleeves should be installed as provided in chapters SPS 382.35 (5) (a) 2. c. and d.
  - Where tracer wire is more than 6 inches from the pipe, tracer wire insulation color should comply with the following
  - Tracer wire insulation color for non–metallic sewer pipe should be green.
  - Tracer wire conductivity should be tested prior to use.
  - Conductive warning tape may not be utilized in lieu of tracer wire.
- Global positioning system data should be recorded with the municipality where the non–metallic pipe is installed.
- Another equally–effective means acceptable to the department should be employed to mark the location of the non–metallic pipe.

Part 1 Exam Questions:

105. No person may connect to a public sewer any building drain or building sewer through which any substance discharged is likely to cause which of the following?

a. Undue corrosion
b. Obstruction or nuisance
c. Explosion or interference with sewage treatment processes
d. All of the above

106. Storm drain piping and clear water drain piping may not discharge to a _____ building drain which connects to a publicly–owned treatment works.

a. Sanitary
b. Trench
c. Soiled
d. Sewage

107. With regards to locating buried non–metallic sewers and private interceptor main sewers discharging to municipal mains, be accomplished in accordance with which of the following:

a. A tracer wire should be installed in accordance with certain specifications
b. Global positioning system data should be recorded with the municipality where the non–metallic pipe is installed
c. A detailed map should be included in the dwelling's blueprints
d. A and B

PRIVATE INTERCEPTOR MAIN SEWERS.

The connection of a private interceptor main sewer to a public sewer should be in accordance with the conditions of approval for the public sewer granted by the department of natural resources under chapter 281.41, Stats.

Private interceptor main sewers which discharge to a municipal treatment facility should be designed in accordance with the appropriate water quality management plan.

All private interceptor main sewers should be tested in accordance with chapter SPS 382.21.

Private interceptor main sewers 6" or less in diameter should be installed in accordance with the criteria for building sewers specified below.

Private interceptor main sewers 8" or larger in diameter should be:

- Provided with frost protection and
- Installed in accordance with the municipal sewer criteria specified in NR 110.13.

No private interceptor main sewer may pass through or under a building to serve another building, unless one of the following conditions are met:

- The private interceptor main sewer serves farm buildings, farm houses, or both which are located on one property.
- The private interceptor main sewer serves buildings that are located on one property and a document, which indicates the piping and distribution arrangement for the property and buildings, should be recorded with the register of deeds no later than 90 days after installation.

LOCATION OF DRAIN PIPING.

Drain piping located below the ceilings of areas where food, ice or potable liquids are prepared, handled, stored or displayed should be installed with the least number of joints and should be installed in accordance with the following.

All pipe openings through floors should be provided with sleeves bonded to the floor construction and protruding not less than one inch above the top of the finish floor with the space between sleeve and the piping sealed.

Plumbing fixtures, except bathtubs and showers, should be of the wall mounted type. Bathtubs should have waste and overflow connections made above the floor and piped to a trap below the floor.

Floor and shower drains installed should be equipped with integral seepage pans.

Cleanouts for piping should be extended through the floor construction above.

Piping subject to operation at temperatures that will form condensation on the exterior of the pipe should be thermally insulated.

Where drain piping is located in ceilings of areas where food, ice or potable liquids are prepared, handled stored or displayed, the ceilings should be of the removable type, or should be provided with access panels in order to provide an access for inspection of the piping.

Exposed drain piping should not be located over a pool, surge tank or an open filter for a pool.

Part 1 Exam Questions:

108. The connection of a private interceptor main sewer to a public sewer should be in accordance with the conditions of approval for the public sewer granted by the department of natural resources under chapter 281.41, _____.

a. Stats
b. Tables
c. Figures
d. Data

109. All private interceptor main sewers should be tested in accordance with chapter SPS _____.

a. 382.21
b. 416.13
c. 734.78
d. 863.46

110. Private interceptor main sewers ___inches or larger in diameter should be provided with frost protection and installed in accordance with the municipal sewer criteria specified in NR 110.13.

a. 5
b. 6
c. 7
d. 8

111. Drain piping located below the ceilings of areas where food, ice or potable liquids are prepared, handled, stored or displayed should be installed with the maximum number of joints and should be installed in accordance with specific requirements.

a. True
b. False

112. All pipe openings through floors should be provided with sleeves bonded to the floor construction and protruding not less than ____ inch(es) above the top of the finish floor with the space between sleeve and the piping sealed.

a. 1
b. 2
c. 3
d. 4

113. With the exception of _____and_____, plumbing fixtures should be of the wall mounted type.

a. Toilets, sinks
b. Showers, toilets
c. Bathtubs, showers
d. Sinks, bathtubs

114. _____ should have waste and overflow connections made above the floor and piped to a trap below the floor.

a. Toilets
b. Sinks
c. Showers
d. Bathtubs

115. Floor and _____ drains installed should be equipped with integral seepage pans.

a. Toilet
b. Sink
c. Shower
d. Bathtub

116. Cleanouts for piping should be extended through the _____ construction above.

a. Ceiling
b. Floor
c. Wall
d. Plumbing

117. Piping subject to operation at temperatures that will form condensation on the exterior of the pipe should be _____ insulated.

a. Thermally
b. Mechanically
c. Doubly
d. Extrinsically

118. Exposed drain piping should not be located over which of the following?

a. A pool
b. A surge tank
c. An open filter for a pool
d. All of the above

Vents and Venting Systems

MATERIALS.

All vents and venting systems should be constructed of approved materials in accordance with chapter SPS 384.

GENERAL.

Vents.

Every trap and trapped plumbing fixture should be provided with an individual vent, except as otherwise permitted in this chapter. Vents and venting systems should be designed and installed so that the water seal of a trap should be subject to a maximum pneumatic pressure differential equal to one inch of water column.

Main stack.

Each gravity–flow sanitary building sewer should be served by at least one stack which extends from a building drain to a vent terminal or vent header. The stack should be not less than 3" in diameter from the building drain to the vent terminal or vent header.

VENT STACKS AND STACK VENTS.

Where required.

A vent stack and a stack vent should be installed to serve any drain stacks of 5 or more branch intervals.

Installation.

The connection of the vent stack to a drain stack should be at or below the lowest branch drain connection to the drain stack. The connection to the drain stack should be by means of a wye pattern fitting installed in a vertical portion of the stack.

A vent stack and a stack vent should:

- Connect to a vent stack which extends to a vent terminal; or
- Connect to a stack vent at least 6" above the flood level rim of the highest fixture discharging into a drain stack.

Vent stacks and stack vents may connect into a common vent header and then should extend to a vent terminal.

The connection of a vent stack with another vent may not be less than 38" above the next higher floor level where the plumbing fixtures are vented, but in no case lower than 2" above the elevation of the highest flood level rim of any fixture served by the vent.

Part 1 Exam Questions:

119. All vents and venting systems should be constructed of approved materials in accordance with chapter SPS____.

a. 321
b. 354
c. 369
d. 384

120. Vents and venting systems should be designed and installed so that the water seal of a trap should be subject to a _____ pneumatic pressure differential equal to one inch of water column.

a. Minimum
b. Average
c. Sustained
d. Maximum

121. Each gravity–flow sanitary building sewer should be served by at least ___ stack(s) which extends from a building drain to a vent terminal or vent header.

a. 1
b. 2
c. 3
d. 4

122. The stack that serves a gravity–flow sanitary building sewer should be not less than ___ in diameter from the building drain to the vent terminal or vent header.

a. 3
b. 4
c. 5
d. 6

123. A vent stack and a stack vent should be installed to serve any drain stacks of ___or more branch intervals.

a. 5
b. 6
c. 7
d. 8

124. True or false? The connection of the vent stack to a drain stack should be at or above the lowest branch drain connection to the drain stack.

a. True
b. False

125. The connection to the drain stack should be by means of a wye pattern fitting installed in a _____ portion of the stack.

a. Horizontal
b. Vertical
c. Pressured
d. Loose

126. The connection of a vent stack with another vent may not be less than ___inches above the next higher floor level where the plumbing fixtures are vented, but in no case lower than ___inch(es) above the elevation of the highest flood level rim of any fixture served by the vent.

a. 28, 1
b. 30, 2
c. 36, 1
d. 38, 2

RELIEF AND YOKE VENTS FOR STACK OFFSETS.

Vents serving offsets of 30 to 45° in drain stacks.

Where a horizontal branch connects to a drain stack within 2 feet above or below an offset with a change of direction of 30 to 45° from the vertical and the offset is located below 5 or more branch intervals, the offset should be vented in accordance with the following sections.

Where the drain stack and offset are sized as building drain as per Table 382.30–3, the vents serving the offset of 30 to 45° in a drain stack are not required.

Vents serving offsets of more than 45° in drain stacks.

Offsets of more than 45° in drain stacks should be vented where 5 or more branch intervals are located above the offset. The offset should be vented by venting the upper and lower section of the stack.

'Upper section.' The upper section of the stack should be vented as a separate stack with a vent stack connection installed in accordance with the following sections. The offset should be considered the base of the stack.

'Vent connection above offset.' The vent stack should connect with a wye pattern fitting above the stack offset and at or below the lowest drain branch above the offset.

'Lower section.' The lower section of the stack should be vented by a yoke vent connecting below the offset above or at the next lower horizontal branch.

The connection of the yoke vent to the drain stack should be by means of a wye pattern fitting.

The yoke vent connection may be a vertical extension of the stack

The connection of the yoke vent to another vent should not be less than 38 inches above the next higher floor level where plumbing fixtures are installed that discharge into the drain stack.

RELIEF VENTS FOR STACKS OF MORE THAN 10 BRANCH INTERVALS.

Drain stacks of more than 10 branch intervals should be provided with a relief vent at each tenth interval installed.

The lower end of the relief vent required should connect to the stack by use of a wye pattern fitting below the horizontal branch serving that floor.

The upper end of the relief vent required should connect to the vent stack not less than 38 inches above the next higher floor level where plumbing fixtures are installed that discharge into the drain stack.

Part 1 Exam Questions:

127. Where the drain stack and offset are sized as building drain as per Table 382.30–3, the vents serving the offset of ___to___ degrees in a drain stack are not required.

a. 15, 30
b. 30, 45
c. 45, 60
d. 60, 90

128. Offsets of more than ___ degrees in drain stacks should be vented where 5 or more branch intervals are located above the offset.

a. 30
b. 35
c. 40
d. 45

129. True or false? The offset should be vented by venting solely the lower section of the stack.

a. True
b. False

130. The offset should be considered the _____ of the stack.

a. Base
b. Middle
c. Top
d. Heart

131. The vent stack should connect with a wye pattern fitting above the stack offset and at or _____ the lowest drain branch _____ the offset.

a. Below, below
b. Below, above
c. Above, below
d. Above, above

132. The lower section of the stack should be vented by a yoke vent connecting below the offset above or at the next lower _____ branch.

a. Horizontal
b. Vertical
c. Proximal
d. Distal

133. True or false? The connection of the yoke vent to the drain stack should be by means of a tee pattern fitting.

a. True
b. False

134. The yoke vent connection may be a vertical extension of the _____.

a. Drain
b. Vent
c. Offset
d. Stack

135. The connection of the yoke vent to another vent should not be less than ___ inches above the next higher floor level where plumbing fixtures are installed that discharge into the drain stack.

a. 34
b. 36
c. 38
d. 40

136. Drain stacks of more than ___ branch intervals should be provided with a relief vent at each tenth interval installed.

a. 3
b. 6
c. 8
d. 10

137. The _____ end of the relief vent required should connect to the stack by use of a wye pattern fitting below the horizontal branch serving that floor.

a. Lower
b. Upper
c. Top
d. Extended

138. The upper end of the relief vent required should connect to the vent stack not less than ___ inches above the next higher floor level where plumbing fixtures are installed that discharge into the drain stack.

a. 34
b. 38
c. 44
d. 48

RELIEF VENTS FOR BUILDING DRAINS.

A building drain with a change in elevation of 12 feet or more and at an angle of 45° or more from the horizontal should be provided with a relief vent.

The connection of the relief vent to the building drain should be by means of a wye pattern fitting installed within 2 feet upstream of the top of the change in elevation.

The connection of the relief vent to another vent should be not less than 38" above the next higher floor level where plumbing fixtures are installed that discharge through the building drain.

VENTS FOR SANITARY SUMPS.

Interior sanitary sumps.

Sanitary sumps should be provided with a vent connecting either to the sump above the drain inlet or to the drain inlet within 12" of the sump.

Exterior sanitary sumps.

Sanitary sumps should be provided with a vent that terminates in accordance with the following sections.

FIXTURE VENTS.

Developed length between vent and trap.

Each fixture trap should be protected with a vent located in accordance with the provisions of the following sections.

Each fixture trap which is not an integral part of the fixture should be protected with a vent so located that the developed length of the fixture drain piping from the trap weir to the vent connection is within the limits set forth in Table 382.31–1.

Each fixture trap which is an integral part of the fixture should be protected with a vent so located that the developed length of the fixture drain piping from fixture outlet to the vent connection is within the limits set

forth in Table 382.31–1. For a floor outlet water closet or similar fixture, the point where the fixture drain piping turns horizontal should be considered as the fixture outlet.

Minimum distance.

A vent should not connect to a fixture drain within the distance equal to 2 diameters of the drain piping from the weir of a trap.

TABLE 382.31–1
MAXIMUM DEVELOPED LENGTH BETWEEN VENT AND TRAP (IN FEET)

Diameter of Fixture Drain (inches)	Vent Connecting to Horizontal Drain Piping			Vent Connecting to Vertical Drain Piping					
				by means of a Sanitary Tee Fitting			by means of a Wye Pattern Fitting		
	Pitch of Fixture Drain (inch per foot)			Pitch of Fixture Drain (inch per foot)			Pitch of Fixture Drain (inch per foot)		
	1/8	1/4	1/2	1/8	1/4	1/2	1/8	1/4	1/2
1 ¼	NP[C] NP	5.0	2.5	NP NP	3.5	2.0	NP NP	1.5	1.0
1 ½	NP 24	6.0	3.0	NP 10.0	5.0	3.0	NP 8.0	4.0	2.0
2	32	8.0	4.0	12.0	6.0	4.0	10.0	4.5	4.0

Part 1 Exam Questions:

139. A building drain with a change in elevation of ___ feet or more and at an angle of 45° or more from the horizontal should be provided with a relief vent.

a. 6
b. 8
c. 10
d. 12

140. The connection of the relief vent to the building drain should be by means of a wye pattern fitting installed within ___ feet upstream of the top of the change in elevation.

a. 2
b. 3
c. 4
d. 5

141. The connection of the relief vent to another vent should be not less than ___inches above the next higher floor level where plumbing fixtures are installed that discharge through the building drain.

a. 38
b. 40
c. 42
d. 44

142. Sanitary sumps should be provided with a vent connecting either to the sump above the drain inlet or to the drain inlet within ___inches of the sump.

a. 6
b. 8
c. 10
d. 12

143. True or false? For a floor outlet water closet or similar fixture, the point where the fixture drain piping turns horizontal should be considered the fixture outlet.

a. True
b. False

144. A vent should not connect to a fixture drain within the distance equal to ___diameter(s) of the drain piping from the weir of a trap.

a. 1
b. 2
c. 3
d. 4

CIRCUIT VENTING.

In lieu of providing individual vents, a horizontal drain to which at least 2 but not more than 8 wall outlet fixtures or at least 2 but not more than 8 floor outlet fixtures, other than blowout type fixtures and wall–outlet carrier type water closets, are connected to the same horizontal branch drain, may be vented by a circuit vent in accordance with the following sections.

The circuit vent should connect to the horizontal drain at a point between the 2 most upstream fixtures.

A circuit vented horizontal drain into which 4 or more fixtures discharge should be provided with a relief vent. The relief vent should connect to the circuit vented horizontal drain downstream of the most downstream fixture drain which is vented by the circuit vent and upstream of any other drain connections.

Two circuit vented horizontal drains serving a total of 8 fixtures, 4 on each branch, should be provided with at least one relief vent, unless the horizontal drains connect to a drain stack with no other drain connections located above the circuit vented horizontal drains. One relief vent may serve both horizontal drains, if installed downstream of the point where the 2 horizontal drains are joined.

A horizontal drain served by a circuit vent may not diminish in size from the most downstream fixture drain connection vented by the circuit vented drain to the circuit vent connection. Where a relief vent is installed, the horizontal drain served by the circuit vent should not diminish in size from the relief vent connection to the circuit vent connection.

Fixture drains served by a circuit vent should conform to the provisions of the following sections. The connection of the fixture drain to the branch drain served by the circuit vent should be considered as the vent connection.

Additional wall outlet fixtures with a drainage fixture unit value of one or less which are served by individual vents or common vents may discharge into a horizontal drain served by a circuit vent.

Part 1 Exam Questions:

145. The circuit vent should connect to the _____ drain at a point between the 2 most upstream fixtures.

a. Horizontal
b. Vertical
c. Vent
d. Circuit

146. A circuit vented horizontal drain into which ___ or more fixtures discharge should be provided with a relief vent.

a. 1
b. 2
c. 3
d. 4

147. Two circuit vented horizontal drains serving a total of ___ fixtures, ___ on each branch, should be provided with at least one relief vent, unless the horizontal drains connect to a drain stack with no other drain connections located above the circuit vented horizontal drains.

a. 4, 8
b. 6, 8
c. 8, 4
d. 8, 6

148. True or false? One relief vent may serve both horizontal drains, if installed downstream of the point where the 2 horizontal drains are joined.

a. True
b. False

COMMON VENTS.

In lieu of providing individual vents, fixtures may be common vented in accordance with the following sections.

Vertical drains.

A common vent may serve a maximum of 2 fixtures where both fixture drains connect to a vertical drain at the same elevation. Where this connection is by means of a sanitary tee fitting with a side inlet, the centerline of the

side inlet opening may not be below the centerline of the larger opening. The drain connection of a blowout type fixture or a kitchen sink served by a common vent may not be by means of a double sanitary tee fitting.

Horizontal branches.

The fixture drains from 2 wall–outlet fixtures, each with a drainage fixture unit value of one or less, or the fixture drains from 2 traps serving a kitchen sink with or with- out a dishwasher may connect to a horizontal branch without individual vents provided a common vent connects to the branch drain downstream of both fixture drains. Both fixture drains should be of the same diameter. The developed length of the drain from the vent to the farthest trap should conform to the following sections.

RETURN VENTS.

Plumbing fixtures may be vented in accordance with the following sections.

Wall outlet fixtures may be vented by extending an individual vent, vertical wet vent or a common vent as high as possible under the fixture enclosure and returning the vent vertically downward and connecting the vent to the fixture drain or branch drain by means of a wye pattern fitting.

Horizontal vent piping should connect to the vertical section of the fixture vent and extend to a point where it can extend vertically to a vent terminal in accordance with the following sections or connect to another vent in accordance with those sections.

Drainage fittings should be used on all sections of the vent pipe below the floor level and a minimum slope of ¼" per foot to the drainage point should be provided.

Cleanouts should be provided on the vent piping in accordance with s. SPS 382.35.

Part 1 Exam Questions:

149. A common vent may serve a maximum of ___ fixtures where both fixture drains connect to a vertical drain at the same elevation.

a. 2
b. 3
c. 4
d. 5

150. The drain connection of a blowout type fixture or a _____ served by a common vent may not be by means of a double sanitary tee fitting.

a. Bathtub
b. Bathroom sink
c. Kitchen sink
d. Dishwasher

151. _____ outlet fixtures may be vented by extending an individual vent, vertical wet vent or a common vent as high as possible under the fixture enclosure and returning the vent vertically downward and connecting the vent to the fixture drain or branch drain by means of a wye pattern fitting.

a. Wall
b. Floor
c. Ceiling
d. Garage

152. Drainage fittings should be used on all sections of the vent pipe below the floor level and a minimum slope of ___inch(es) per foot to the drainage point should be provided.

a. ¼
b. ½
c. 1
d. 2

153. Cleanouts should be provided on the vent piping in accordance with s. SPS _____.

a. 197.54
b. 236.78
c. 382.35
d. 434.54

WET VENTING.

In lieu of providing individual vents, fixtures may be wet vented in accordance with the following sections.

Vertical wet vents.

Where 2 wall outlet fixtures are located on the same floor level with their fixture drains connecting to the same vertical drain pipe at different elevations, the lower fixture drain may be wet vented in accordance with the following sections.

No other fixtures may discharge into the vertical drain pipe above or between the 2 wall outlet fixtures. Additional fixtures may discharge into the vertical drain pipe below the 2 wall outlet fixtures.

A branch vent should connect to the vertical drain pipe immediately above the higher fixture drain connection.

The drain between the 2 fixtures should be at least one pipe size larger than the upper fixture drain, but not smaller than 2" in diameter.

Both fixture drains should conform to the following sections. The connection of the lower fixture drain to the vertical drain should be considered as the vent connection.

The higher fixture drain may not serve a water closet.

Horizontal wet vents.

A drain from a lavatory or lavatories which are either provided with individual vents or a common vent may serve as the wet vent for not more than 2 bathtubs or showers and not more than 2 water closets in accordance with the following sections. No other fixtures may discharge into or be served by the wet vent.

All of the fixtures should be located in nonpublic bathroom groups.

The lavatories and bathtubs or showers should have a common horizontal drain with the drain for the lavatories serving as a wet vent for the bathtubs or showers.

Where 2 bathtubs or showers are served by the same wet vent, their fixture drains should connect independently to the com- mon horizontal drain downstream of the vertical drain serving the lavatory or lavatories.

Where 2 bathtubs or showers and 2 water closets are served by the same wet vent a relief vent should be provided, unless the wet vented horizontal drain connects to a drain stack with no other drain connections located above the wet–vented horizontal drain. The relief vent should connect to the horizontal drain at a point downstream of the fixture drains for the water closets and upstream of any other fixture drain connections.

One or 2 water closets may connect to the common horizontal drain with the drain from the lavatories and bathtubs or showers also serving as a wet vent for the water closets. Where 2 water closets are served by the same wet vent, their fixture drains should connect independently to the common horizontal drain at the same point.

The wet vent should be at least 2" in diameter. No more than 4 drainage fixture units may discharge into a 2" diameter wet vent.

A branch vent should connect immediately above the highest fixture drain connection and should be sized in accordance with the following sections.

Other types of wet vents.

An individual vent serving a floor outlet fixture, a common vent serving floor outlet fixtures, a circuit vent, a relief vent serving a circuit vented drain or a relief vent serving a wet vented horizontal drain may serve as a wet vent in accordance with the following sections.

No more than 2 wall outlet fixtures, each fixture with a drainage fixture unit value of one or less, may have their fixture drains connected into the individual vent, common vent, circuit vent or relief vent.

The wet vent should be at least 2" in diameter.

The branch vent to which the wet vent connects should be sized in accordance with the following sections. The branch vent may serve the wall outlet fixtures in lieu of individual vents or a common vent.

The fixtures discharging into the wet vent should be located on the same floor level as the fixtures served by the wet vent.

Part 1 Exam Questions:

154. True or false? Other fixtures may discharge into the vertical drain pipe above or between the 2 wall outlet fixtures.

a. True
b. False

155. True or false? Additional fixtures may not discharge into the vertical drain pipe below the 2 wall outlet fixtures.

a. True
b. False

156. A branch vent should connect to the vertical drain pipe _____ above the higher fixture drain connection.

a. 1 inch
b. 2 inches
c. 4 inches
d. Immediately

157. The drain between the 2 fixtures should be at least one pipe size larger than the upper fixture drain, but not smaller than ___inches in diameter.

a. 2
b. 3
c. 4
d. 5

158. The higher fixture drain may not serve a _____.

a. Vent connection
b. Vertical drain
c. Water closet
d. Branch vent

159. A drain from a lavatory or lavatories which are either provided with individual vents or a common vent may serve as the wet vent for not more than ___ bathtubs or showers and not more than ___ water closets in accordance with specifications.

a. 2, 2
b. 2, 3
c. 3, 2
d. 3, 3

160. The lavatories and bathtubs or showers should have a common horizontal drain with the drain for the lavatories serving as a _____ vent for the bathtubs or showers.

a. Dry
b. Wet
c. Drain
d. Vertical

161. Where __ bathtubs or showers are served by the same wet vent, their fixture drains should connect independently to the common horizontal drain downstream of the vertical drain serving the lavatory or lavatories.

a. 2
b. 3
c. 4
d. 5

162. The relief vent should connect to the horizontal drain at a point downstream of the fixture drains for the water closets and _____ of any other fixture drain connections.

a. Downstream
b. Upstream
c. Within 6 inches
d. Within 18 inches

163. True or false? Where 2 water closets are served by the same wet vent, their fixture drains should connect together to the common horizontal drain at the same point.

a. True
b. False

164. No more than ___ drainage fixture units may discharge into a 2" diameter wet vent.

a. 4
b. 5
c. 6
d. 7

165. No more than ___ wall outlet fixtures, each fixture with a drainage fixture unit value of one or less, may have their fixture drains connected into the individual vent, common vent, circuit vent or relief vent.

a. 2
b. 3
c. 4
d. 5

166. True or false? The fixtures discharging into the wet vent should be located on the same floor level as the fixtures served by the wet vent.

a. True
b. False

VENT SIZE.

Stack vents and vent stacks.

Stack vent and vent stack pipe sizes should be determined in accordance with Table 382.31–2 on the basis of developed length and the diameter of the drain stack at its base.

The developed length of the stack vent should be measured along the vent pipe, from the highest drain branch connection to the vent terminal or to the connection to a vent header.

The developed length of the vent stack should be measured along the vent pipe from the vent stack base connection to the vent terminal or to the connection to a vent header.

Vent headers.

Vent header pipe sizes should be determined in accordance with Table 382.31–3 with the number of drainage fixture units being the sum of the fixture unit loads of the stacks vented through that portion of the header. The diameter of a vent header should not be less than any vent connecting to it.

The developed length of the vent header should be measured along the pipe from the most distant vent stack or stack vent base connection to the vent terminal.

Branch vents.

Branch vent pipe sizes should be determined in accordance with Table 382.31–3. The developed length of the branch vent should be measured along the pipe from the furthest fixture drain served by the branch vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

Individual vents.

Individual vent pipe sizes should be determined in accordance with Table 382.31–3. The developed length of an individual vent should be measured along the vent pipe from the fixture drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal

Common vents.

Common vent pipe sizes should be determined in accordance with Table 382.31–3. The developed length of a common vent should be measured along the vent pipe from the drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to the vent terminal.

TABLE 382.31–2
SIZE AND LENGTH OF VENT STACKS AND STACK VENTS

Diameter of Drain Stack at Base (inches)	Maximum Developed Length of Vent (feet)									
	Diameter of Vent (inches)									
	1¹/4	1¹/2[a]	2	3	4	5	6	8	10	12
1¹/2	50	150	NL[b]	NL	NL					
2	NP[C]	50	150							
3		NP	50	400						
4		NP	20	180	700					
5			NP	50	200	700				
6			NP	20	70	200	700			
8				NP	25	60	250	800		
10					NP	25	60	250	800	
12						NP	25	100	300	900

TABLE 382.31–3
MINIMUM DIAMETERS AND MAXIMUM LENGTH OF INDIVIDUAL, COMMON, BRANCH AND CIRCUIT VENTS AND VENT HEADERS

Drainage Fixture Units (dfu)	Maximum Developed Length of Vent (feet)								
	Diameter of Vent (inches)								
	1¹/4[a]	1¹/2[b]	2	3	4	5	6	8	10
2	50	NL[C]							
4	40	200	NL						
8	NP[d]	150	250	NL					
10	NP	100	200	NL					
24	NP	50	150	NL					
42	NP	30	100	500					
72		NP	50	400	NL				
240		NP	40	250	NL				
500		NP	20	180	700				
1100			NP	50	200	700			
1900			NP	20	70	200	700		
3600				NP	25	60	250	800	
5600					NP	25	60	250	800

Circuit vents.
Circuit vent pipe sizes should be determined in accordance with Table 382.31–3. The developed length of the circuit vent should be measured along the vent from the connection with the branch drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

Relief vents.
Relief vents should be sized in accordance with the provisions of the following sections. The developed length of a relief vent should be measured along the vent from the connection with the branch drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

'Circuit vented branch drain.' The diameter of a relief vent for a branch drain served by a circuit vent should be at least one half the diameter of the branch drain. The maximum developed length should be determined from Table 382.31–3 based on the number of drainage fixture units served by the vent.

'Building drain.' The diameter of a relief vent serving a building drain, as required in the following sections, should be at least one half the diameter of the building drain. The maximum developed length should be determined from Table 382.31–3 based on the number of drainage fixture units served by the vent.

'Horizontal wet vent.' The diameter of a relief vent serving a horizontal wet vent should be at least 11/2". The maximum developed length should be determined from Table 382.31–3 based on the number of drainage fixture units served by the vent.

Part 1 Exam Questions:

167. The developed length should be measured along the vent pipe from the vent stack base connection to the vent terminal or to the connection to a vent header.

a. Stack vent
b. Vent stack
c. Vent header
d. None of the above

168. The developed length should be measured along the vent pipe, from the highest drain branch connection to the vent terminal or to the connection to a vent header.

a. Stack vent
b. Vent stack
c. Vent header
d. None of the above

169. The developed length of the vent header should be measured along the pipe from the most distant vent stack or stack vent base connection to the vent terminal.

a. Stack vent
b. Vent stack
c. Vent header
d. None of the above

170. The developed length should be measured along the vent from the connection with the branch drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

a. Branch vent
b. Individual vent
c. Common vent
d. Circuit vent

171. The developed length should be measured along the pipe from the furthest fixture drain served by the branch vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal.

a. Branch vent
b. Individual vent
c. Common vent
d. Circuit vent

172. The developed length should be measured along the vent pipe from the drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to the vent terminal.

a. Branch vent
b. Individual vent
c. Common vent
d. Circuit vent

173. The developed length should be measured along the vent pipe from the fixture drain served by the vent to the point where it connects to a vent pipe of a larger diameter or to a vent terminal

a. Branch vent
b. Individual vent
c. Common vent
d. Circuit vent

174. The diameter of a relief vent serving a building drain, as required in the following sections, should be at least _____ the diameter of the building drain.

a. One half
b. Equal to
c. Double
d. Four times

Yoke vents.

A yoke vent serving a drain stack should be sized as a vent stack in accordance the following sections.

Vents for sumps.

The size of a vent for a sanitary pump with other than a pneumatic ejector, should be determined in accordance with Table 382.31–4

The size of a vent for a sanitary sump located outside with other than a pneumatic ejector should be determined in accordance with Table 382.31–4, but should not be less than 2" in diameter.

The air pressure relief pipe from a pneumatic ejector should not be connected to vent or vent system serving a sanitary drain system, storm drain system or chemical waste system.

The relief pipe should be of a size to relieve the air pressure inside the ejector to atmospheric pressure, but should not be less than 2" in diameter where the ejector is located outside and 11/4" in diameter for all other ejector locations.

The vent should terminate in accordance with the provisions of the following sections.

TABLE 382.31–4
SIZE AND LENGTH OF VENTS FOR SANITARY SUMPS

Discharge Capacity of Ejector	Maximum Developed Length of Vent[a] (feet)				
	Diameter of Vent (inches)				
	1 1/4[d]	1 1/2[d]	2	3	4
10	NL[b]				
20	270	NL			
40	72	160			
60	31	75	270		
80	16	41	150	NL	
100	10	25	97	NL	
150	NP[c]	10	44	370	
200		NP	20	210	NL
250		NP	10	132	NL
300		NP	10	88	380
400			NP	44	210
500			NP	24	130

Vents for chemical basins.

The size of vents serving chemical dilution or neutralizing basins should be determined in accordance with Table 382.31–3 and based upon the number of drainage fixture units discharging into the basins.

VENT GRADES AND CONNECTIONS.

Vent grade.

All vent and branch vent pipes should be graded and connected so as to drain back to a drain pipe by means of gravity.

Installation.

Vents should be installed in accordance with the following sections.

Except for wet vent piping, the connection of a vent to horizontal drain piping should be at a point above the horizontal center line of the drain piping.

Except as provided in subs. (12) and (17), vent piping serving a wall–outlet fixture may not offset horizontally less than 36" above the floor, but in no case lower than the elevation of the highest flood level rim of any fixture served by the vent.

Vent piping may not connect to a branch vent less than 38" above the floor, but in no case lower than 2" above the elevation of the highest flood level rim of any fixture served by the vent.

VENT TERMINALS.

All vents and vent systems should terminate in the open air in accordance with this subsection.

Extension above roofs.

Extensions of vents through a roof should terminate at least 8" above the roof. Where the roof is to be used for any purpose other than weather protection, the vents should extend at least 7 feet above the roof.

Waterproof flashings.

The penetration of a roof system by a vent should be made watertight with an approved flashing

Prohibited uses.

Vent terminals should not be used as flag poles, support for antennas or other similar purposes.

Location of vent terminals.

A vent should not terminate under the overhang of a building.

All vent terminals should be located:

- At least 10 feet from an air intake;
- At least 5 feet from a power exhaust vent;
- At least 10 feet horizontally from or 2 feet above roof scuttles, doors and openable windows; and
- At least 5 feet from or 2 inches above parapet walls.

Where a structure has an earth covered roof extending from surrounding grade, the vent extension should run at least 7 feet above grade and terminate with an approved vent cap. The portion of vent pipe outside the structure should be without joints, except one fitting may be installed where the pipe leaves the top or side of the structure.

Extension through wall.

Where approved by the department, a vent may terminate through an exterior wall. Such a vent should terminate at least 10 feet horizontally from any lot line and should terminate downward. The vent should be screened and should comply with the following sections.

Extensions outside buildings.

Drain or vent pipe extensions should not be located or placed on the outside of an exterior wall of any new building, but should be located inside the building.

Frost closure.

For protection against frost closure, each vent terminal should be at least 2" in diameter. Where it is necessary to increase the diameter of the vent, the change in diameter should be made at least 6" inside the building.

Penetrations through grade.

Penetrations through grade should terminate at least 12" above finished grade and terminate with a vent cap or return bend.

Part 1 Exam Questions:

175. What type of vent piping is the exception to this rule: The connection of a vent to horizontal drain piping should be at a point above the horizontal center line of the drain piping?

a. Dry
b. Wet
c. Drain
d. Circuit

176. Extensions of vents through a roof should terminate at least ___inches above the roof.

a. 8
b. 10
c. 12
d. 14

177. True or false? A vent should not terminate under the overhang of a building.

a. True
b. False

COMBINATION DRAIN AND VENT SYSTEMS.

In lieu of providing individual vents, fixtures may be vented in accordance with the following sections.

Stacks.

A drain stack may serve as a combination drain and vent system for fixtures in accordance with the following:

The drain stack should not serve more than 3 fixtures. Each fixture should be located on a separate floor level.

The drain stack should be limited to serving fixtures with a drainage fixture unit value of no greater than 2.0. A urinal may not discharge into the combination drain and vent portion of the stack. The largest drainage fixture unit value served by the stack should determine the stack size as specified in Table 382.31–5.

The drain stack should not be offset horizontally above the lowest fixture drain connection.

The developed length of any fixture drain from the trap weir to the drain stack should not exceed the limits specified in Table 382.31–1.

The drain stack and its attendant vent should be sized in accordance with Table 382.31–5

TABLE 382.31–5
STACK SIZING BY DFU VALUE

Drainage Fixture Unit (dfu) Value	Size of Stack (inches)
0.5	1 1/2
1.0	2
2.0	3

A drain stack may serve as a combination drain and vent system for a kitchen sink and a wall outlet fixture with a drainage fixture unit value of 2 or less in accordance with the following:

One kitchen sink within a dwelling unit, with or without a food waste grinder or dishwasher connection, should connect to the drain stack above the wall outlet fixture with a drainage fixture unit value of 2 or less. No other fixtures may connect to the drain stack.

The drain stack should be at least 2 inches in diameter below the kitchen sink connection and it should be at least 4 inches in diameter below the connection to the lower fixture.

In lieu of the minimum sizes as required in the above section, the entire stack below the kitchen sink connection may be 3 inches in diameter.

The drain stack should not offset horizontally above the fixture drain connection for the lower fixture.

Building drains.

A building drain or a building subdrain may serve as a combination drain and vent system for floor drains and floor outlet fixtures in accordance with the following sections.

A vent or drain at least 2 inches in diameter should be connected upstream of any building drain branch or building subdrain branch.

No more than 2 water closets may connect to the building drain or building subdrain by means of building drain branches or building subdrain branches.

That portion of the building drain or building subdrain between the connection of the building drain branch or building subdrain branch and the vent or drain required should be at least one pipe size larger than the minimum size permitted in Table 382.30–3 based on the total drainage fixture unit load, but not less than 3 inches.

The vent or drain required should be at least one–half the diameter of that portion of the building drain or building subdrain which is vented by the vent or drain, but may not be less than 2 inches in diameter.

A vent serving a drain as required, should be at least one half the diameter of that portion of the building drain or building subdrain which is vented by the system, but may not be less than 2 inches in diameter.

The trap of a floor drain or a floor outlet fixture, except a water closet, connected to a building drain branch or building sub- drain branch should be at least 3″ in diameter.

A building drain branch or building subdrain branch may not connect to a building drain or building subdrain downstream from the base fitting of a drain stack 2″ or larger in diameter within the distance equal to 20 pipe diameters of the building drain or building subdrain.

The pitch and the developed length of the building drain branch or building subdrain branch may not exceed the limits specified in Table 382.31–1.

Laboratory sink venting.

A horizontal drain may serve as a combination drain and vent system for island laboratory sinks in accordance with the following sections.

A vent stack or a drain stack at least 2″ in diameter should be connected upstream of any fixture drain vented by the combination drain and vent system.

That portion of the horizontal drain between the connection of fixture drain and the vent stack or drain stack required should be at least one pipe size larger than the minimum size permitted in Table 382.30–2 based on total drainage fixture unit load.

The vent stack or drain stack required should be at least one–half the diameter of that portion of the horizontal drain which is vented by the stack, but may not be less than 2″ in diameter.

A stack vent serving a drain stack required should be at least one half the diameter of that portion of the horizontal drain which is vented by the stack, but may not be less than 2″ in diameter.

All fixture drains vented by the horizontal drain should be at least 3″ in diameter

Fixture drains to be vented by the horizontal drain should connect individually to the horizontal drain.

An individual vent or common vent should be extended as high as possible under the sink enclosure and then returned vertically downward and connected to the horizontal drain. A cleanout should be provided on the vent piping.

In lieu of connecting the vent to the horizontal drain which forms the combination drain and vent system, the vent may connect to a horizontal fixture drain vented by the combination drain and vent system. The pitch and developed length of the horizontal fixture drain should not exceed the limits specified in Table 382.31–1.

Fixture drains to be vented by the horizontal drain should not connect to a horizontal drain downstream from the base fitting of a drain stack 2″ or larger in diameter within the distance equal to 20 pipe diameters of the horizontal drain serving the stack.

PROHIBITED USES.

A vent or vent system should not be used for purposes other than the venting of the plumbing system.

Boiler blowoff basin vents.

Vent piping from boiler blowoff basins should not be connected to a vent or vent system serving a sanitary drain system, storm drain system or chemical waste system.

Chemical waste vents.

Vent piping for chemical waste systems should not be connected to a vent system serving a sanitary drain system or storm drain system.

Steam vents.

Vents serving steam operated sterilizers, cleansing or degreasing equipment, pressing machines or any other apparatus which normally discharges steam into the vent should not be connected to a vent or a vent system serving a sanitary drain system, storm drain system or chemical waste system.

Part 1 Exam Questions:

178. The drain stack should not serve more than ___ fixtures.

a. 1
b. 2
c. 3
d. No such requirement

179. The vent or drain required should be at least one–half the diameter of that portion of the building drain or building subdrain which is vented by the vent or drain, but may not be less than ___ inch(es) in diameter.

a. 1
b. 2
c. 3
d. 4

180. True or false? A vent or vent system can be used for purposes other than the venting of the plumbing system.

a. True
b. False

ANSWER SHEET: PART 1 • Drain & Vent Systems (Course #961672)

First Name: _____ Last Name: _____ Date: _____

Address: _____ City: _____ State: _____ ZIP: _____

License #: _____ Phone: _____ Email: _____

** See instructions on the inside of the cover to submit your exam.

1.	A B C D	28.	A B C D	55.	A B C D	82.	A B C D
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16.	A B C D	43.	A B C D	70.	A B C D	97.	A B C D
17.	A B C D	44.	A B C D	71.	A B C D	98.	A B C D
18.	A B C D	45.	A B C D	72.	A B C D	99.	A B C D
19.	A B C D	46.	A B C D	73.	A B C D	100.	A B C D
20.	A B C D	47.	A B C D	74.	A B C D	101.	A B C D
21.	A B C D	48.	A B C D	75.	A B C D	102.	A B C D
22.	A B C D	49.	A B C D	76.	A B C D	103.	A B C D
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27.	A B C D	54.	A B C D	81.	A B C D	108.	A B C D

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