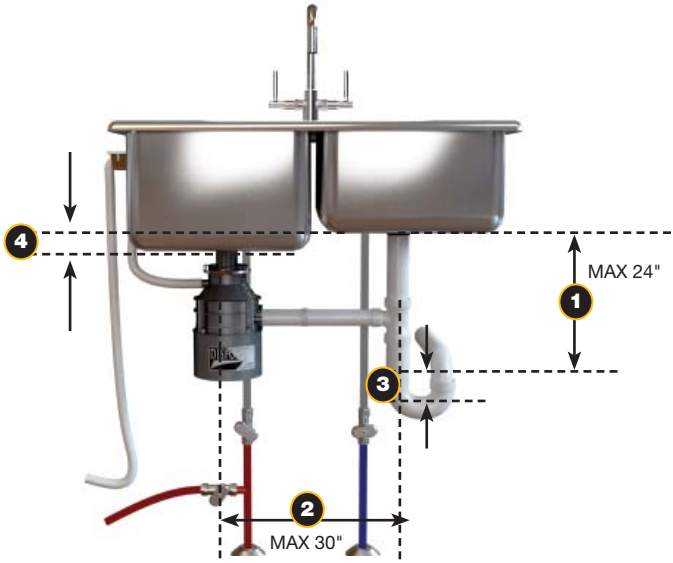
TRAPS



No.	IPC	IRC	Description
1	1002.1	P3201.6	Vertical distance from fixture to the trap weir can not exceed 24".
2	1002.1	P3201.6	Horizontal distance from the fixture outlet to the centerline of the trap inlet can not exceed 30".
3	1002.4	P3201.2	Each fixture trap must have a liquid seal of not less than 2" and not more than 4".
4	1002.1 (2)	P3201.6 Exc. 2	Combination plumbing fixture can share a trap as long as one compartment is not more than 6" deeper than the other compartment and compartment outlets are 30" or less apart.

YOU SHOULD KNOW: IPC 908.1, 1002.5 AND IRC P3201.7

- **IPC 908.1, IRC P3107.1:** An individual vent is permitted to vent two traps or trapped fixtures as a common vent.
- **IPC 1002.5, IRC P3201.7 & TABLE P3201.7:** Fixture trap size shall be sufficient to drain the fixture rapidly and not less than the size located in Table 709.1.

PERMITS (IRC R105 • IPC 106)

REQUIRED (IRC R 105.1 • IPC 106.1)

- Construction, alteration, removal, or repair of any plumbing system.

APPLICATION (IRC R105.3 • IPC 106.3)

- Submit application to local building department.
- Submit two or more sets of all supporting construction documents.
- Code official can waive the requirement for submitting supporting construction documents.

ISSUANCE (IRC R105.3.2, IRC 105.6 • IPC 106.5)

- Typically issued for a period of 180 days.
- Time extensions can be granted for up to 180 days.
- May be revoked or suspended if false information was provided on the application.

VALIDITY ENFORCEMENT (IRC R105.4 • IPC 106.5.2)

- Code official has the right to enter the premises to make inspections
- Code official is to enforce the code and act on any relative questions
- Code official must carry proper identification when performing his duty

NOT REQUIRED (IRC R105.2 • IPC 106.2)

- Maintenance such as repairing leaks to any plumbing system as long as a replacement is not necessary.
- Removal and reinstallation of water closets.

CODE COMPLIANCE FOR EXEMPT WORK (IRC R102.2 • IPC 106.2)

- Although an inspection will not be performed, you are required to follow codes.

INSPECTIONS (IRC R109.1 • IPC 107)

Underground (IRC R109.1.1 • IPC 107.1)

- Made after trenches or ditches are excavated and bedded, piping is installed, and before backfill is placed.

Rough-In (IRC R109.1.2 • IPC 107.1)

- Prior to installation of drywall but after the roof, framing, fire-blocking, fire-stopping, draft-stopping, and bracing is in place and all sanitary, storm, and water distribution piping is roughed-in.

Final (IRC R109.1.6 • IPC 107.1)

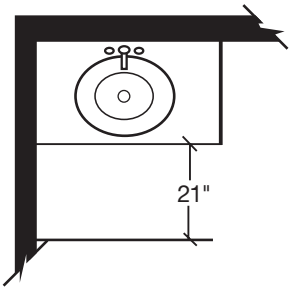
- After the building is complete and when all fixtures are in place and ready for use.

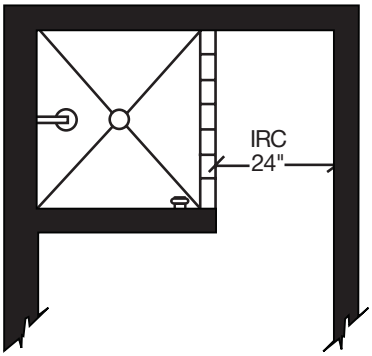
GAUGES

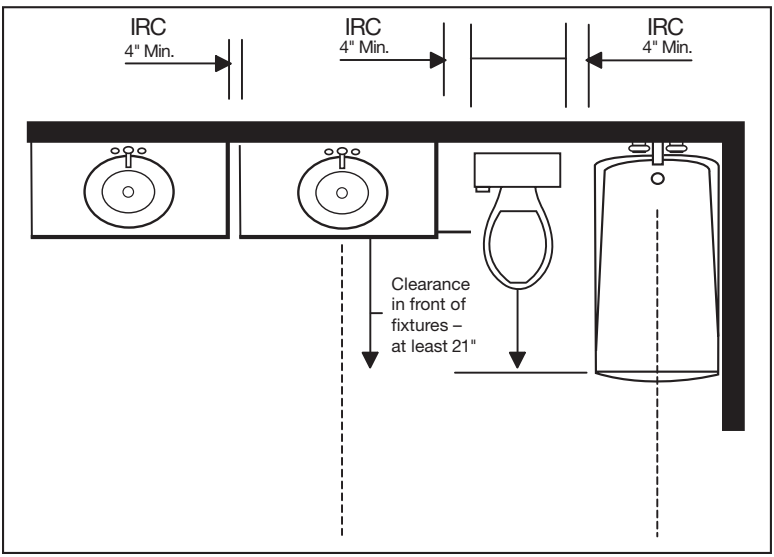
No.	IPC	IRC	Description
1	312.1(2)	P2503.8 #2	Use a gauge having increments of 1 psi or less for tests requiring a pressure greater than 10 psi but less than or equal to 100 psi.
2	312.1(3)	P2503.8 #3	Use a gauge having increments of 2 psi or less for tests requiring a pressure greater than 100 psi.
3	312.1(1)	P2503.8 #1	Use a gauge having increments of 0.10 psi or less for tests requiring a pressure of 10 lbs. per square inch or less.

YOU SHOULD KNOW: IPC 312 AND IRC P2503.3

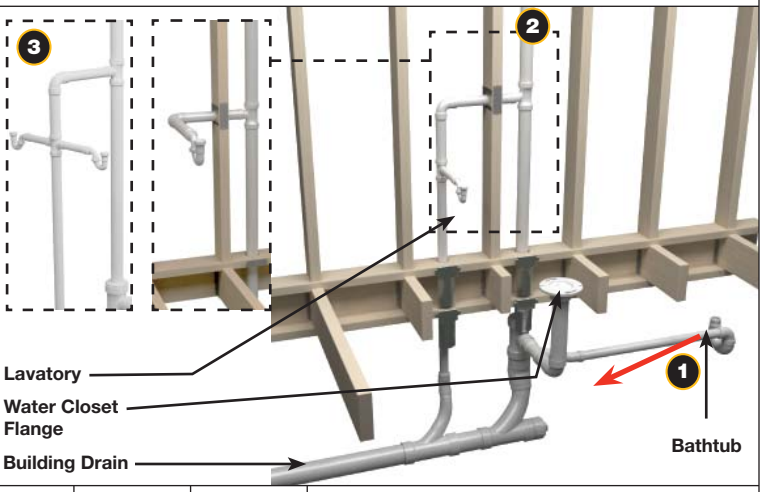
- The permit holder is responsible for required testing.


21"


IRC
24"


IRC
4" Min.
IRC
4" Min.
IRC
4" Min.
Clearance
in front of
fixtures –
at least 21"

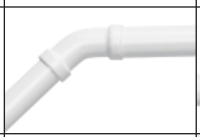
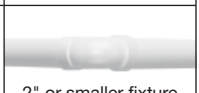
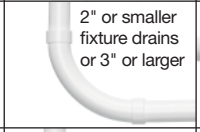
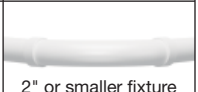
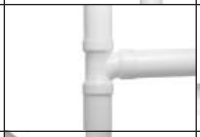
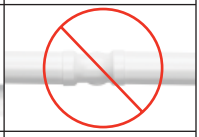
VENT AND DRAIN OPTIONS



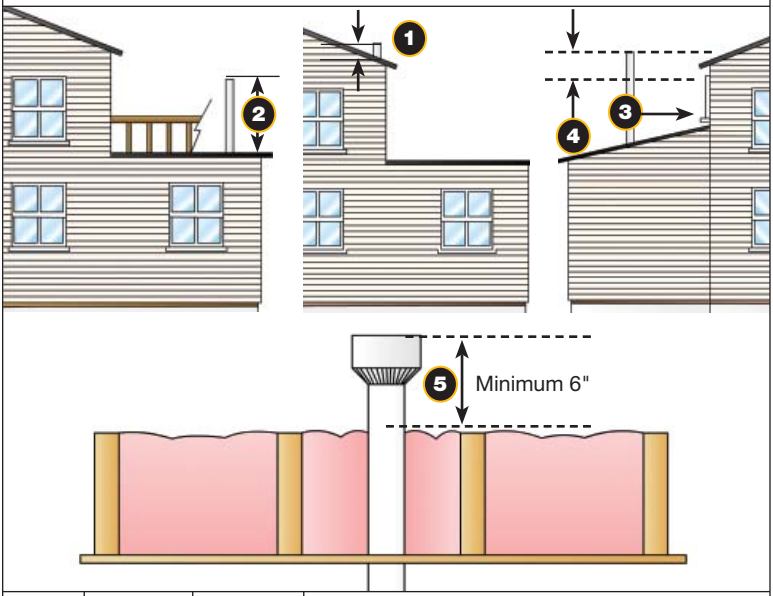
No.	IPC	IRC	Description
1	906.1	3105.1	Allowable distance of the trap from the vent is based on the pipe size. *(See Table on page 64)*
2	903.1	3107.1	A vent system serving each building drain must have at least one pipe that extends to the outdoors. *(See additional requirements on page 26)*
3	908.1	3107.1	An individual vent is allowed to vent two traps or trapped fixtures. *(See additional requirements in the IPC Section 908/909 and IRC 3107 and 3108)*

YOU SHOULD KNOW:

- **IPC 910.2 & IRC 3109.3:** Offsets are not allowed in waste stack vents between the lowest fixture drain and the highest fixture drain. NOTE: Waste stack vents shall not receive discharge from water closets or urinals.
- **IPC 909 & IRC 3108.1:** Horizontal wet vents, those drainage pipes that serve as both drain and vent purposes, are allowed for any combination of fixtures within two bathroom groups located on the same floor.

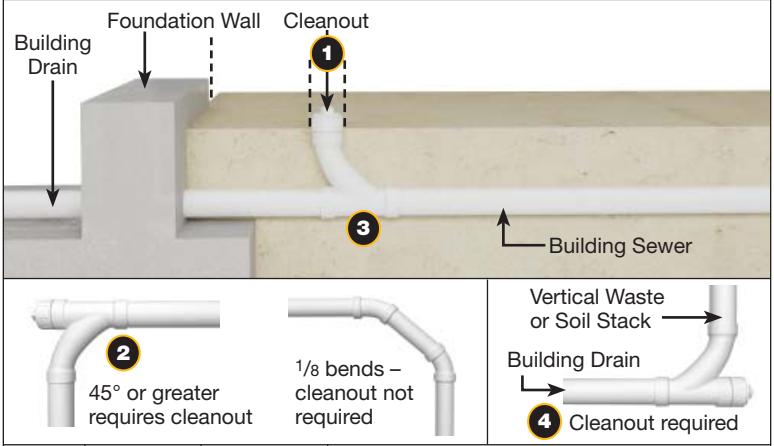
DRAIN PIPES – IPC 706.3 & IRC 3005.1			
Fitting Type	**Horizontal to Vertical**	**Vertical to Horizontal**	**Horizontal to Horizontal**
Sixteenth Bend (22.5°)			
Eighth Bend (45°)			
Sixth Bend (60°)			
Quarter Bend (90°)		 2" or smaller fixture drains only	 2" or smaller fixture drains only
Short Sweep		 2" or smaller fixture drains or 3" or larger	 2" or smaller fixture drains only
Long Sweep			
Sanitary Tee			
Wye			
Combo Wye and 1/8 Bend			
Fittings must be oriented to guide the flow of drainage.			

VENT TERMINATION



No.	IPC	IRC	Description
1	—	3103.1	Open vent pipes must extend at least 6" above the roof or anticipated snow accumulation level (whichever is greater).
2	904.1	3103.1	If a roof is used for any purpose other than weather protection (such as a deck), the vent must extend at least 7' above the roof.
3	904.5	3103.5	Vents can not terminate directly beneath doors, windows or other air intake openings of the building or adjacent buildings.
4	904.5	3103.5	Vents that terminate within 4' – 10' horizontally of a door or window must extend at least 2' above such opening.
5	—	3114.4	Air Admittance Valves that terminate in the attic must be extended at least 6" above the insulation level.

CLEANOUTS



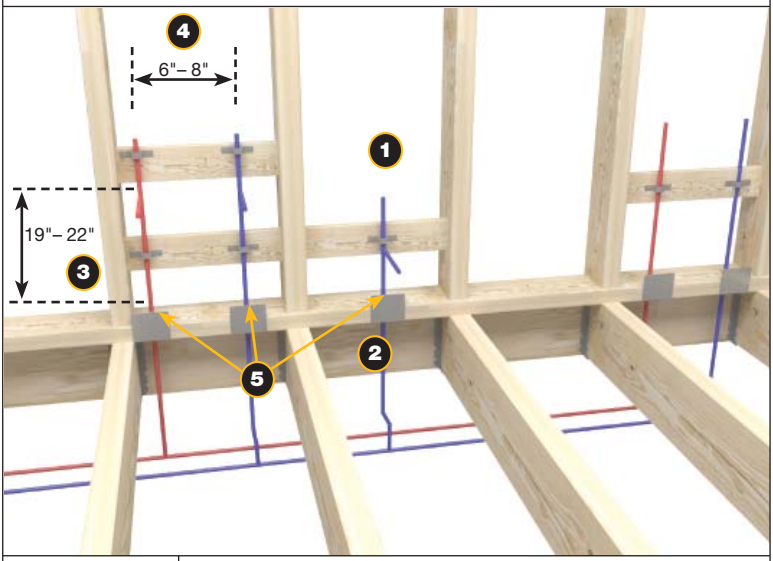
No.	IPC	IRC	Description
1	708.3.5	3005.2.3	Cleanouts must be extended vertically to or above grade when installed underground.
2	708.3.3	3005.2.4	Cleanouts must be installed for all changes in direction greater than 45°. (Where more than one change of direction occurs, only one cleanout is required for every 40'.)
3	708.3.5	3005.2.7	Cleanouts must be installed at the junction of the building drain and building sewer.
4	708.3.4	3005.2.6	Accessible cleanouts must be installed at the base of each vertical waste or soil stack.

YOU SHOULD KNOW:

IPC 708.3.1, 708.7, IRC 3005.2.9 AND 3005.2.2

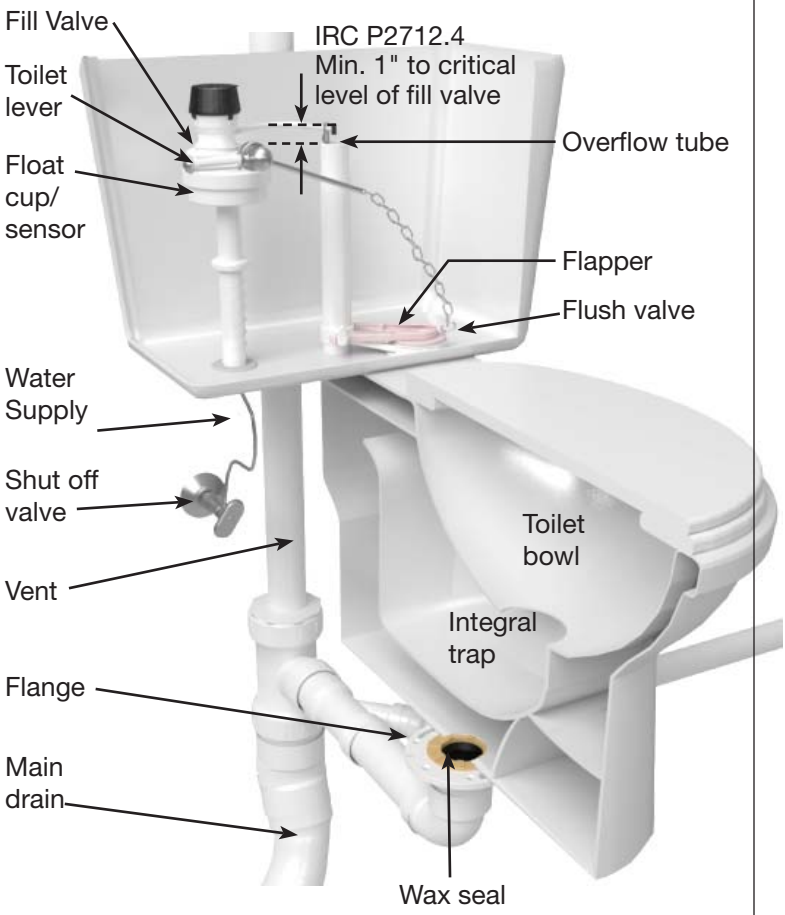
- **IPC 708.7 & IRC 3005.2.9:** Cleanouts must be the same size as the pipe served up to 4". For larger pipes, the cleanout only has to be at least 4".
- **IPC 708.3.1 & IRC 3005.2.2:** Cleanouts must be provided no more than 100' apart in horizontal drainage lines.

WATER PIPING – HOT AND COLD WATER LINES



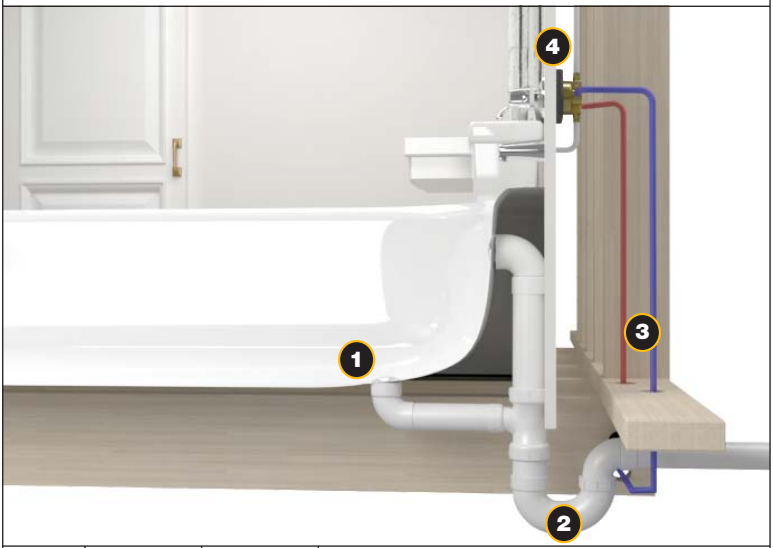
No.	IPC	IRC	Description
1	Table 604.5	Table 2904.5	Approved water distribution pipe includes CPVC, PEX, and copper. A complete list of approved material can be found as referenced.
2	Table 604.5	Table 2903.7	Water supply line size requirements vary based on the type of fixture. *(See Table on page 66)*
3	Typical Installation		Lavatory water stub-out should be between 19 and 22" from the floor.
4	Typical Installation		Space between hot and cold water stub-out for lavatory should be between 6 and 8".
5	305.8	2603.2.1	Shield plates must be installed to protect pipes if the whole bored for installation is closer than 1.5” from nearest edge.

WATER CLOSET



IPC	IRC	Description
425	2712	Water closets are manufactured per code standards and will be in compliance with sections 425 of the IPC and 2712 of the IRC.

BATHTUB



No.	IPC	IRC	Description
1	407.2	2713.1	Drain outlet of at least 1 1/2" is required with an approved waste stopper.
2	Table 709.1	Table 3201.7	Trap size must be at least 1 1/2". *(See Table on page 67)*
3	Table 604.5	Table 2903.7	Hot and cold water supply must be at least 1/2". *(See Table on page 66)*
4	Table 604.5	2708.2	1/2" riser to the shower head is required and must be attached to the structure.

YOU SHOULD KNOW: IPC 405.8 AND IRC 2704.1

- Slip joint type P-Traps can only be used if an access panel or utility space of at least a 12" dimension is provided.

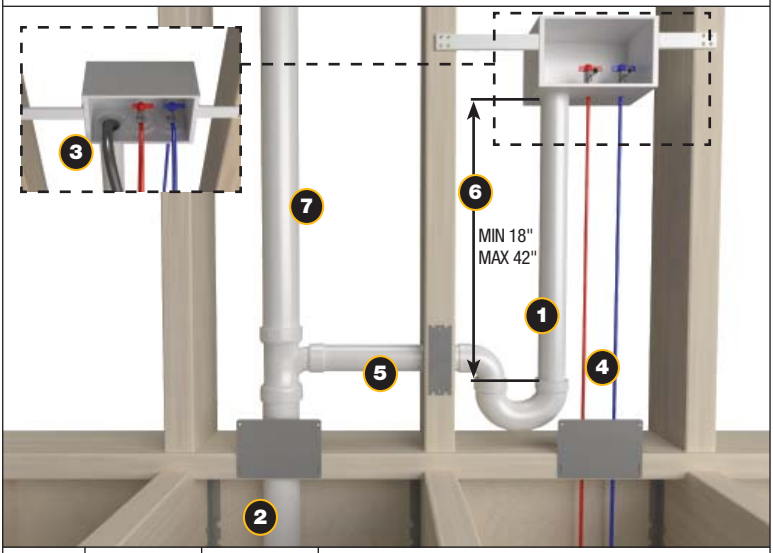
HYDROMASSAGE BATHTUB

No.	IPC	IRC	Description
1	407.2	2713.1	Minimum outlet must be at least 1 1/2" diameter.
2	Table 709.1	Table 3201.7	P-Trap must be at least 1 1/2". *(See Table on page 67)*
3	405.7.1	—	Overflow must discharge into the drainage system.
4	421.5	P2720.1	Access door must be provided for pump maintenance and must be of adequate size to allow removal. Access door must be at least 12" × 12". In cases where the pump is more than 2' from the opening, the access must be 18" × 18".

YOU SHOULD KNOW: IPC 421.2

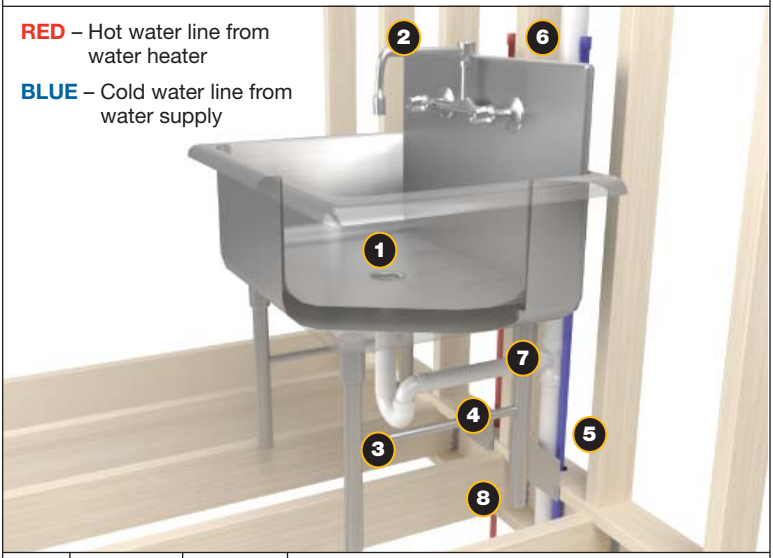
- Hydromassage bathtubs must be installed with the manufacturer's instructions and tested in accordance to the manufacturer.

AUTOMATIC WASHING MACHINE



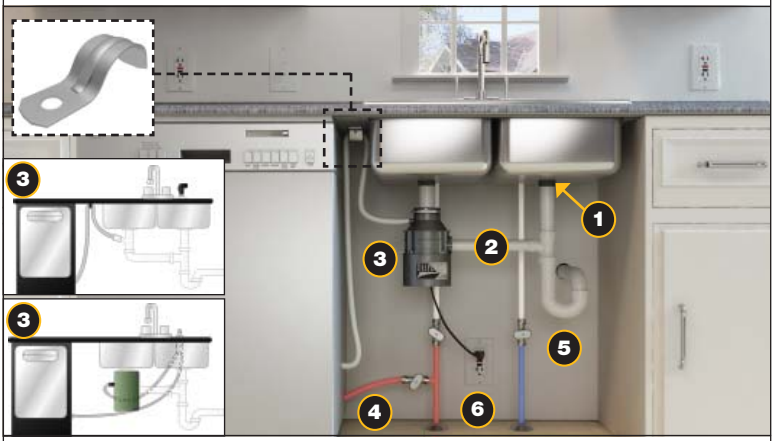
No.	IPC	IRC	Description
1	406.3	Table 3201.7	Trap and fixture drains must be at least 2".
2	406.3	3005.4	Fixture drain must connect to a horizontal drain or drainage stack that is at least 3" diameter.
3	406.3	2718.1	Waste water must be discharged through an air break into a standpipe.
4	Table 604.5	Table 2903.7	Water supply must be at least 1/2".
5	802.4	3201.6	Each standpipe must have an individual trap.
6	802.4	2706.2	Standpipes must be at least 18" above the crown weir but no more than 42". *(IRC specifies at least 30" from standpipe outlet to weir.)*
7	916.1	Table 3113	Vent must be at least 1 1/4"

UTILITY SINK



No.	IPC	IRC	Description
1	415.2 418.2	P2715.1	Each compartment of a laundry or utility sink shall have a minimum 1½" drain outlet.
2	608.15.4.2	Table P2902.3	If faucet to be used has hose threads on the spout, it must have either a built-in vacuum breaker or one has to be installed on faucet spout.
3	709.1	Table P2715.1	Minimum 1½" P-Trap.
4	Table 604.5	Table P2903.7	Hot water line must be a minimum of ½".
5	Table 604.5	Table P2903.7	Cold water line must be a minimum of ½".
6	916.1	P3113.1	Vent must be a minimum of 1¼".
7	415.2	P2714.1	Sanitary tee must be a minimum of 1½".
8	415.2	P2714.1	Drain pipe must be a minimum of 1½".

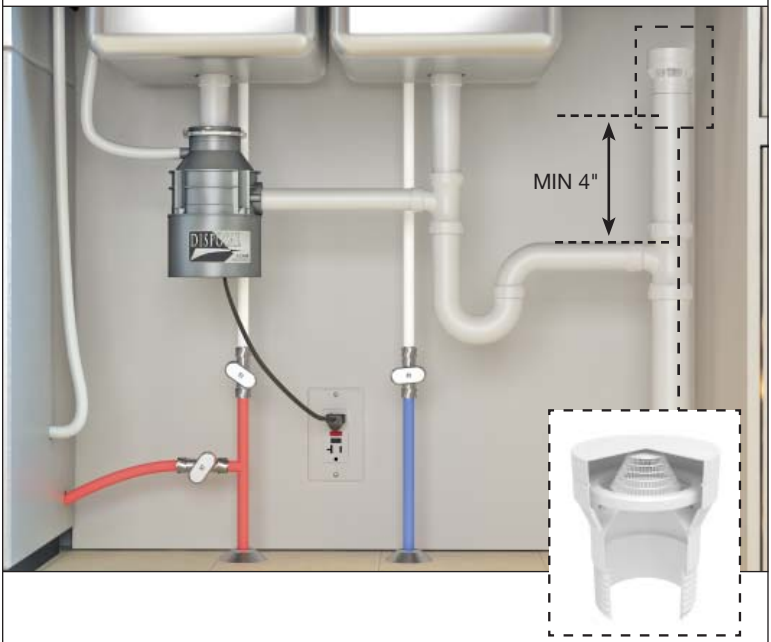
SINKS



RED – Hot water line from water heater
BLUE – Cold water line from water supply

No.	IPC	IRC	Description
1	418.2	P2714.1	Waste outlets for sinks must be at least 1 1/2" and feature a strainer or crossbar to restrict the clear opening of the waste outlet.
2	413.2	P2716.1	Drain for the garbage disposal must be at least a 1 1/2" drain outlet.
3	409.3 802.1.6 802.1.7	P2717.1 P2717.2 P2717.3	The waste water from a dishwasher must discharge in one of the following manners: (a) directly through an air gap or air break. (b) discharge into a wye branch fitting on the tail piece of a kitchen sink drain or food grinder.
4	604.5	P2903.7	Hot water inlet to the dishwasher must be at least 1/2"
5	Table 709.1	P2717.3	Dishwasher, disposal, and kitchen sink can share the 1 1/2" waste drain pipe. *(See Table on page 67)*
6	604.5	P2903.7	Branch lines for hot and cold water must be at least 1/2".

HOW IT WORKS – AIR ADMITTANCE VALVE

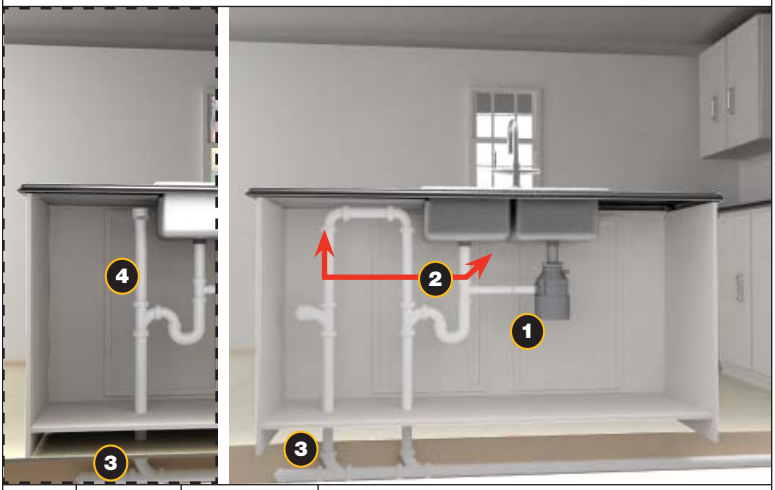


Air admittance valves are pressure-activated, one-way vents used where outdoor venting is not desired. (Commonly used for island kitchen sinks.) When wastewater discharges, it causes the valve to open, releasing the vacuum and allows the air to enter the vent for proper drainage. Otherwise, the valve remains closed and prohibits the sewer gases to escape to the room.

YOU SHOULD KNOW: IPC 917 AND IRC P3114

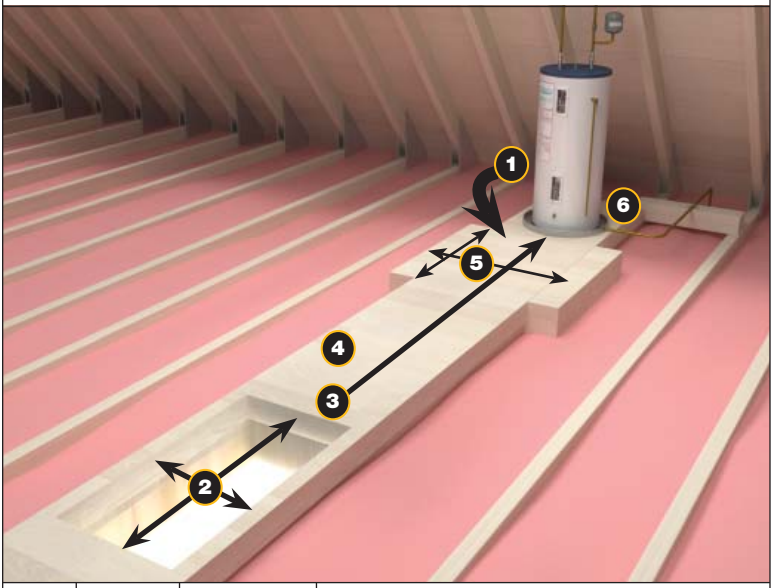
- **IPC 917.2 & IRC 3114.2:** Air admittance valves must be installed after the DWV pressure testing.
- **IPC 917.8: Prohibited Installations** – Air admittance valves can not be located within spaces utilized for return air or for air supply.
- **IPC 917.3.3:** If vent stacks or stack vents exceed six branch intervals, the stack shall not serve as a drainage vent terminal.
- **IPC 917.4:** Air admittance valves must be located at least 4" above the fixture drain.

ISLAND FIXTURE VENTING



No.	IPC	IRC	Description
1	913.1	3112.1	Island fixture venting is not allowed for fixtures other than sinks and lavatories. Such fixtures are permitted with a dishwasher waste connection, a food waste grinder or both.
2	913.2	3112.2	Island vents must extend vertically above the drainage outlet of the fixture being vented before offsetting (vertically or horizontally)
3	913.3	3112.3	Cleanouts must be provided in the island fixture vent to permit rodding of all vent piping located below the flood level rim of the fixtures.
4	917.3	3114.4	Air admittance valves are allowed for the purpose of venting island fixtures.

ATTIC INSTALLATION

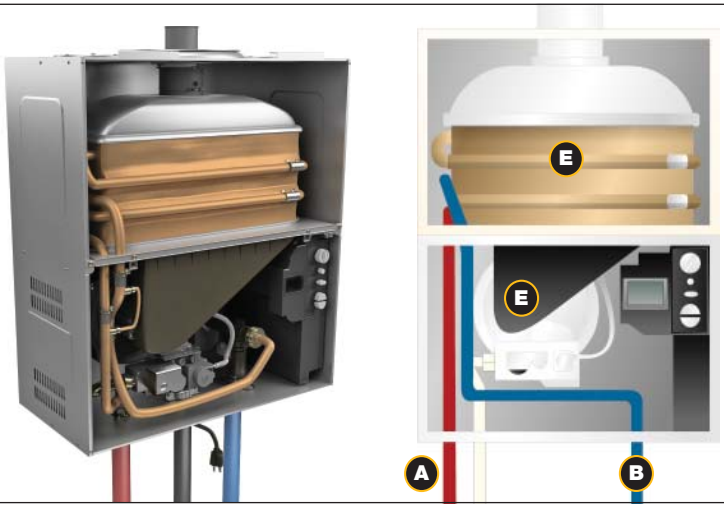


No.	IPC	IRC	Description
1	501.4	M1305.1.3	Water heaters must always be installed in locations feasible for observation, maintenance, and replacement.
2	502.3	M1305.1.3	Access must be at least 20" × 30" or large enough for removal of water heater.
3	502.3	M1305.1.3	Access can be no more than 20' from the water heater.
4	502.3	M1305.1.3	The path to the water heater must be solid flooring no less than 24" wide.
5	502.3	M1305.1.3	A level work area (service space) at least 30" × 30" must be provided in front of the water heater.
6	504.6	P2801.5.2	**Required:** Pan with drain that runs to the exterior of the building terminating no less than 6" and not more than 24" from the ground.

YOU SHOULD KNOW:

- When pipes are exposed in an unheated space, insulation and heat source is required to prevent freezing.

TANKLESS WATER HEATER



HOW IT WORKS

Ltr.	Step
A	**Step 1:** Fixture hot water valve is turned on.
B	**Step 2:** Water flows through the heater.
C	**Step 3:** Water flow activates burner control.
D	**Step 4:** Burner is ignited.
E	**Step 5:** Heat exchanger heats the water as water flows through.
F	**Step 6:** Burner adjusts to heat the water to the specified temperature.
G	**Step 7:** When the fixture burner shuts down, water flow is turned off.

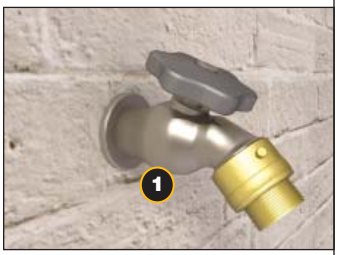
YOU SHOULD KNOW

- Water heaters must be installed in compliance with Chapter 28 of the IRC and Chapter 5 of the IPC. NOTE: All water heaters must be installed in accordance with the manufacturer's installation instructions.

SILL COCKS

Hose Connection Vacuum Breaker

Sill Cock



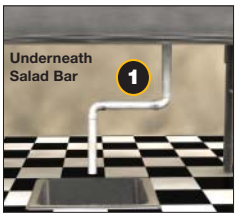
Hose Bibb

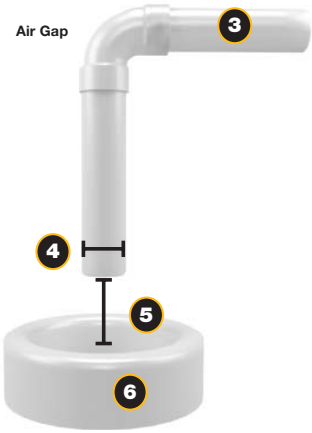
No.	IPC	IRC	Description
1	608.15.4.2	P2902.4.3	All sill cocks, hose bibbs, wall hydrants, and other openings with a hose connection must be protected by an atmospheric-type vacuum breaker, pressure-type vacuum breaker, or a permanently attached hose connection vacuum breaker. **Exceptions:** water heater boiler drain and hose bibbs for washing machines.
2	202	R202	**Vacuum Breaker** – An anti-siphon device that prevents waste water from being drawn back into supply lines, potentially contaminating the water supply.

YOU SHOULD KNOW

- The shank of the sill cock faucet extends into the wall or crawl space 6" – 14". This makes the faucet “freeze-proof”. If a garden hose is left connected to the faucet in the winter, the faucet may freeze.
- Garden hoses are the number one cause for cross connection backflows; causing contamination of our drinking water.

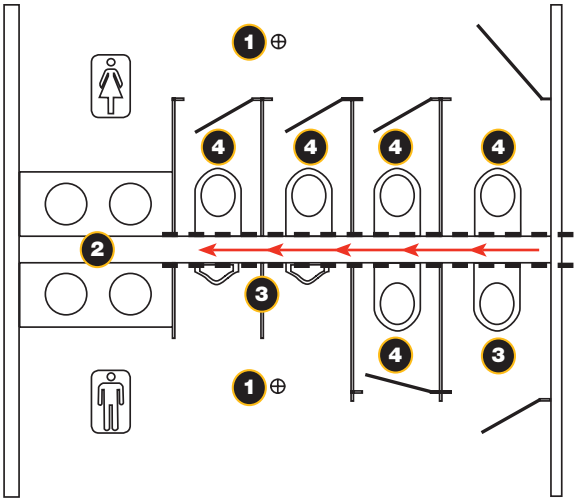
AIR GAP





Air gap is a means of preventing backflow.

No.	IPC	IRC	Description
1	202	R202	**Air Gap (Drainage System)** – The unobstructed vertical distance through the free atmosphere between the outlet of the waste pipe and the flood rim of the receptacle into which the waste pipe is discharged.
2	202	R202	**Air Gap (Water Distribution System)**– The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle.
3	202	R202	Indirect/Waste pipe.
4	202	—	Diameter of the pipe.
5	802.2.1	P2902.3.1	Distance of the air gap is determined by multiplying the diameter of the pipe times two. Minimum 1". *(i.e.: A pipe with a 2" diameter would need a minimum of a 4" air gap)*
6	—	—	Waste receptor such as a floor sink.



To size the Horizontal Branch Drain Sizing, calculate the total DFUs first.

TABLE 709.1: DRAINAGE FIXTURE UNITS FOR FIXTURES AND GROUPS

Fixture Type	DFU Value As Load Factors	Minimum Size of Trap
Automatic clothes washers, commercial[a,g]	3	2
Automatic clothes washers, residential[g]	2	2
Bathroom group as defined in Section 202 (1.6 gpf water closet)[f]	5	
Bathroom group as defined in section 202 (water closet flushing greater than 1.6 gpf)[f]	6	
Bathtub[b] (with or without overhead shower or whirlpool attachments)	2	
Bidet	1	
Combination sink and tray	2	
Dental lavatory	1	
Dental unit or cuspidor	1	
Dishwashing machine[c], domestic	2	
Drinking fountain	1/2	
Emergency floor drain	0	
Floor drains	2	
Kitchen sink, domestic	2	
Kitchen sink, domestic with food waste grinder and/or dishwasher	2	
Laundry Tray (1 or 2 compartments)	2	
Lavatory	1	1 1/4
Shower	2	1 1/2
Service sink	2	1 1/2
Sink	2	1 1/2
Urinal	4	Noted
Urinal, 1 gallon per flush or less	2[e]	Noted
Urinal, nonwater supplied	0.5	Noted
Wash sink (circular or multiple) each set of faucets	2	1 1/2
Water closet, flushommeter tank, public or private	4[e]	Noted
Water closet, private (1.6 gpf)	3[e]	Noted
Water closet, private (flushing greater than 1.6 gpf)	4[e]	Noted
Water closet, public (1.6 gpf)	4[e]	Noted
Water closet, public (flushing greater than 1.6 gpf)	6[e]	Noted

Multiply the quantity by the DFU value to determine the total.

DFU CALCULATIONS

No.	Fixture	Qty.	DFU	Total
1	Floor Drain	2	0	0
2	Lavatories	4	1	4
3	Urinals	2	4	8
4	Water Closet	6	4	24

Add together = 36 DFUs

See full Table on page 67.

- A ***horizontal branch*** is a drainage branch pipe extending laterally from a soil or waste stack or building drain that receives the discharge from two or more fixture drains or branches and conducts the discharge to the soil or waste stack or to the building drain.

- A ***branch interval*** is a vertical measurement of distance, 8 feet or more in developed length between the connections of horizontal branches to a drainage stack.

- A ***stack*** is a general term for any vertical line of soil, waste, vent or inside conductor piping that extends through at least one story with or without offsets.

TABLE 710.1(2): HORIZONTAL FIXTURE BRANCHES AND STACKS[a]

	Max. Number of Drainage Fixture Units (DFUs)			
		Stacks[b]		
Diameter of Pipe (inches)	Total for horizontal branch	Total discharge into one branch interval	Total for stack of three branch intervals or less	Total for stack greater than three branch intervals
1½	3	2	4	8
2	6	6	10	24
2½	12	9	20	42
3	20	20	48	72
4	160	90	240	500
5	360	200	540	1,100

See full Table on page 68.

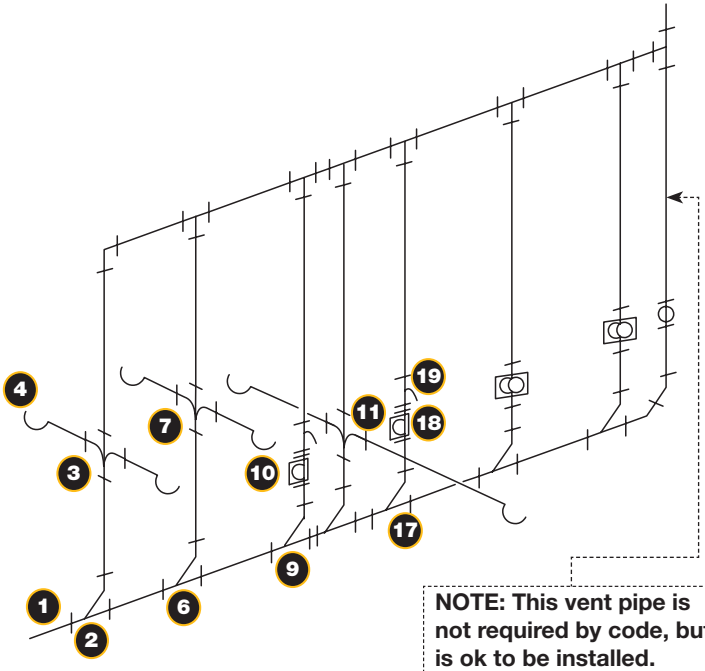
- Size the horizontal branch drain based on the information from page 54.

- Total DFUs from men's and women's restrooms is 36. The correct column to use is "Total for horizontal branch." The diagram is a single story and horizontal branch is not connected to a stack.

- Find the number in column B that will accommodate 36 DFUs. In this case, the 160 DFU value would have to be used.

- Follow that row to the left column: "Diameter of Pipe" which indicate the size of horizontal branch needed.

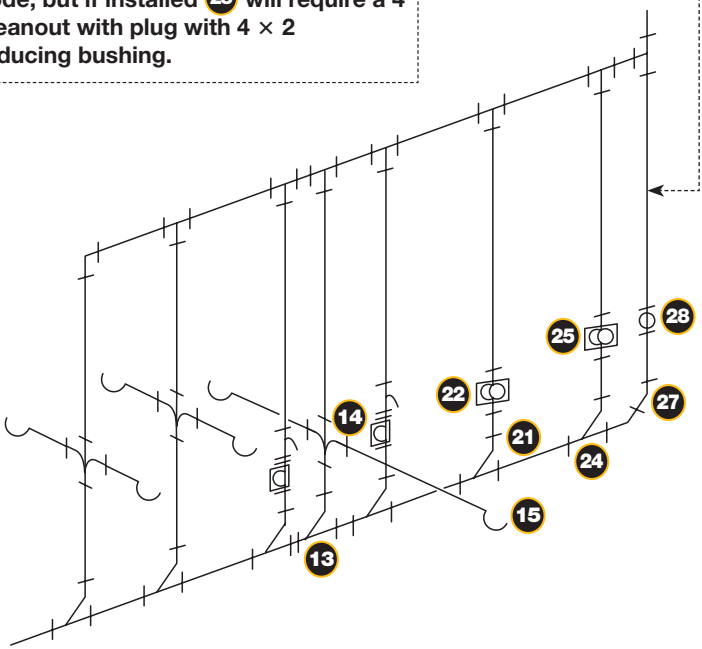
COMMERCIAL RESTROOM ISOMETRICS



No.	Description
1	The branch drain line having a slope of 1/8" shall be 4" in diameter. A 4" can convey a maximum of 160 DFUs. A total of 36 DFUs were calculated on the previous page.
2 6	4" × 1½" fixture fittings are required for lavatory drainage.
3 7	1½" double fixture fittings are required to convey drainage from back-to-back lavs.
4	1¼" P-Traps for lavs.
9 17	4" × 3" fixture fittings are required for all hung closet and urinal drainage.
10 18	3" single water closet carrier is required for wall hung water closets.
11 19	3" × 2" sanitary tees are required for urinal drain connections.

COMMERCIAL RESTROOM ISOMETRICS (*cont.*)

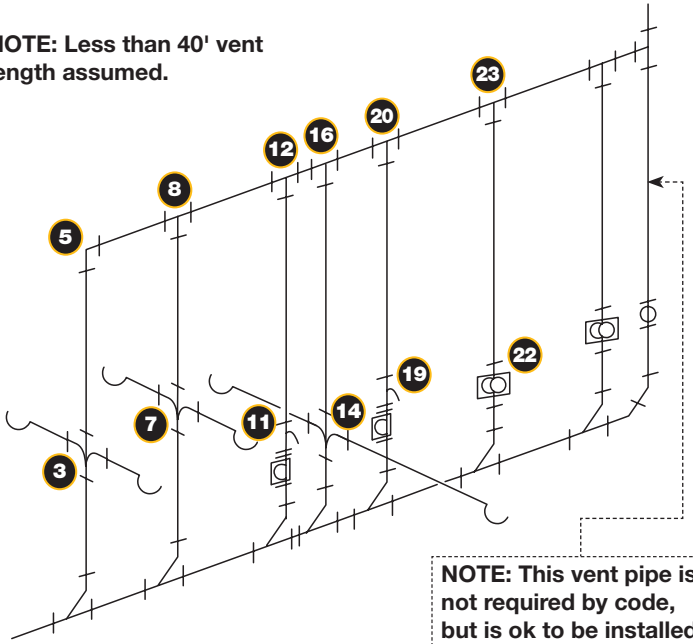
NOTE: This vent pipe is not required by code, but if installed (28) will require a 4" cleanout with plug with 4 × 2 reducing bushing.



No.	Description
13	4" × 2" fixture fittings is required for drain connection of floor drain.
14	2" double fixture fittings or 2" double sanitary tee is required for both floor drains.
15	2" floor drains shall have trap primers to prevent sewer gases from entering restrooms.
21 24	4" × 3" fixture fittings are required for wall hung water closet drain connection.
22 25	3" double water closet carrier is required for back-to-back wall hung water closets.
27	Two 1/8" bends or one longsweep 1/4" bend is required.
28	4" cleanout w/plug.

COMMERCIAL RESTROOM ISOMETRICS (*cont.*)

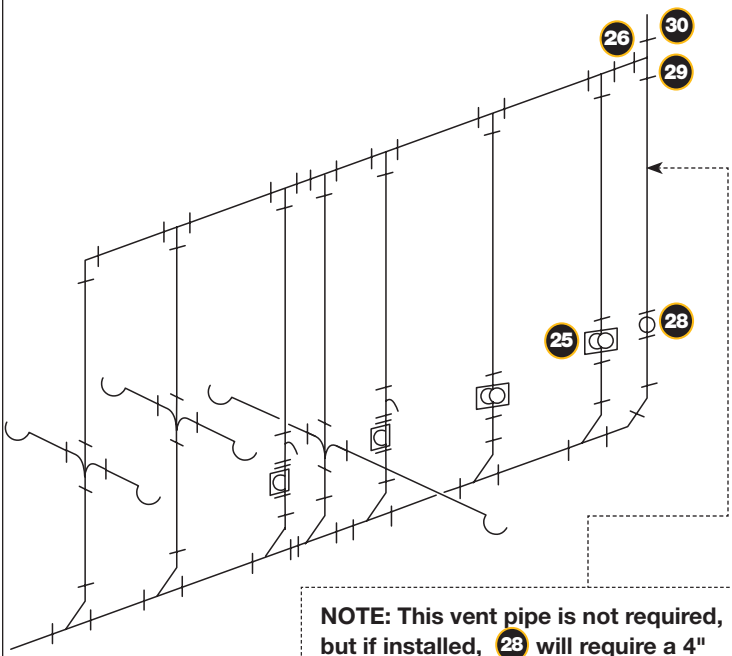
NOTE: Less than 40' vent length assumed.



NOTE: This vent pipe is not required by code, but is ok to be installed.

No.	Description
5	A 1¼" 90° elbow is required to be installed for vent connection. A 1½" × 1¼" bushing or reducer shall be installed on top of fitting at #3.
8	A 1¼" × 1¼" × 1¼" tee is required to be installed for vent connection. A 1½" × 1¼" shall be installed on top of fitting at #7.
12	A 1½" × 1½" × 1¼" tee is required to be installed for vent connection. A 2" × 1¼" bushing or reducer shall be installed on top of the fitting at #14.
16	A 1½" × 1¼" × 1½" tee is required to be installed for vent connection. A 2" × 1¼" bushing or reducer shall be installed on top of the fitting at #14.
20	A 2" × 1½" × 1½" tee is required to be installed for vent connection. A 3" × 1½" bushing or reducer shall be installed on top of the fitting at #19.
23	A 2" × 1½" × 1½" tee is required to be installed for vent connection. A 3" × 1½" bushing or reducer shall be installed on top of fitting at #22.

COMMERCIAL RESTROOM ISOMETRICS (*cont.*)



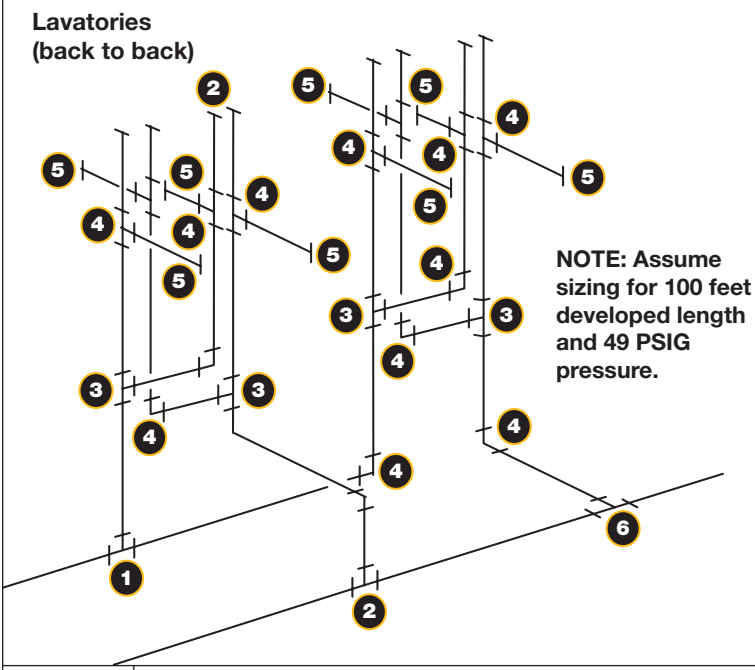
NOTE: This vent pipe is not required, but if installed, 28 will require a 4" cleanout with plug with reducing bushing, 29 a 2" tee, and 30 a 2" vent.

No.	Description
26	A 2" × 2" × 2" tee is required for vent connection. A 3" × 2" bushing or reducer is necessary on top of the fitting at #25.
29	A 90° EL is required for vent connection.
30	A 2" vent shall be installed to vent all fixtures through the roof. *(Assuming 40 feet or less vent length.)*

YOU SHOULD KNOW

- This is not by scale. Always check with local codes that may apply. The above would be the same if the water closet were floor mounted. There would be a difference if the water closets were tank type instead of flush valve. Check tables in code book.

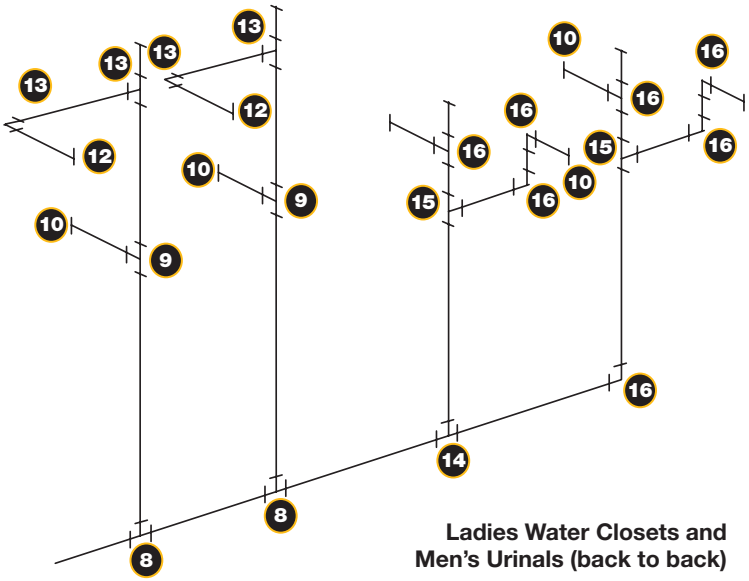
COMMERCIAL RESTROOM ISOMETRICS – LAVATORIES



No.	Description
1	**3/4" × 1/2" × 1/2" Tee** – Upstream there are 6 WSFUs (cold). Using the table, count the value (WSFU) of the different fixtures that will have hot water.
2	**2" × 1 1/4" × 1/2" Tee** – Upstream there are 76 WSFUs. Using the table, count the value of the different fixtures that will have cold water.
3	1/2" Tee
4	1/2" 90° Ell
5	1/2" Caps
6	1 1/4" × 1 1/4" × 1/2" Tee

COMMERCIAL RESTROOM ISOMETRICS – WATER CLOSETS

Water Closets (back to back)



Ladies Water Closets and Men's Urinals (back to back)

No.	Description
8	1 1/4" × 1 1/4" × 1" Tee
9	1" × 3/4" × 1" Tee
10	1" Cap
11	3/4" Tee
12	3/4" Cap
13	3/4" 90° Ell
14	1 1/4" × 1" × 1" Tee
15	1" Tee
16	1" 90° Ell