PLUMBING
VENTS

The purpose of a plumbing vent is to break the suction and allow water to drain quickly while preserving the trap seal that keep sewer gas from wafting into the house.

INDIVIDUAL VS. COMMON VENTS

The most foolproof venting strategy would be to provide a separate dry vent to every fixture, just behind the trap. Such an *individual* vent ensures that the trap seals will never be broken by a difference in air pressure. But this would require a lot of vent pipes traveling up into the walls and attic and penetrating the roof, which would not be practical.

Some codes allow for greater design flexibility by permitting the use of common, or wet, venting strategies. Many houses include some combination of individual and common venting strategies.

Individual Vents

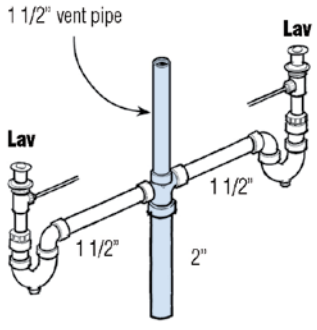
An individual vent must:

- be at least half the diameter of the drain served
- be a minimum 11/4 in. in diameter (bigger is usually better)
- slope like a drainpipe
- rise at least 6 in. vertically above the flood rim before turning horizontal or connecting to vertical vent pipe (**Figure A**)
- be increased by one size if its length exceeds 40 ft.

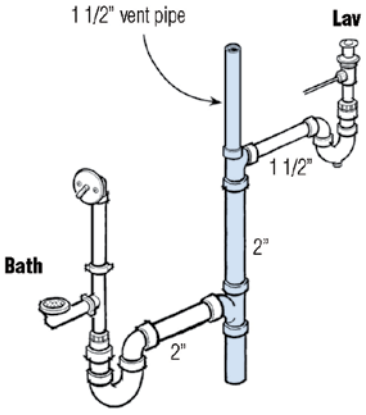
By some codes, two fixtures can share the same individual vent as long as they are on the same floor (**Figure A**). An exception allows three lavatory sinks to share a common vent, regardless of where they are. Such a *common vent* can be either dry or a combination of dry and wet.

FIGURE A: COMMON VENT CONFIGURATIONS

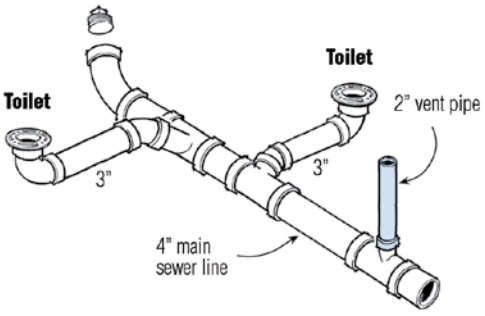
A. Back-to-Back Lavs



B. Lav Above, Bathtub Below



C. Back-to-Back Toilets



A common vent can handle two fixtures on the same floor level. In the case of a combo wet/dry vent (B), the vertical section of pipe above the bath trap is sized so that it can handle the discharge for the upper fixture (the lav), as well as provide air to the lower fixture. The sizes shown here are larger than required, but represent a safe margin. For minimum common vent sizes, see the table in **Figure B**.

Individual vs. Common Vents

Common Vents

A shared, or common, vent can exist when:

- Two fixtures (or three lavatory sinks) located on the same floor can share an individual vent.
- This vent pipe comes off at the interconnection of two fixtures or further downstream.
- Drains connect at the same level, or at different levels if sized according to the table in **Figure B**.

A common vent connection can be made either at the same level, as when you have two bathroom lavs back to back on a wall (a simple dry vent; Example A in **Figure A**); or at different levels, as you might have if a lav and a bath share the same vent (a combination wet and dry vent; Example B in **Figure A**).

Combination wet/dry vents (for example, the section between the lav and the bath drains in Example B in **Figure A**) must be sized to handle the discharge from the upper fixture and provide air to the lower fixture (see the table shown in **Figure B**).

Common Vents For Toilets. In the case of a combination wet/dry vent, a toilet cannot be the upstream fixture because the massive amount of water coming down the pipe might cut off the lower fixture's air and pull the trap dry. In this case, run an individual vent for the bottom fixture.

Double sinks. A double sink connected to a single trap — as is common in bathrooms and kitchens — is treated as one fixture, not two (see Traps for Double Sinks in Traps).

Back-to-back sinks. When putting two sinks back to back, be sure to use a special double side-outlet sanitary tee designed for such an installation. Commercial-style, pump-assisted lavs — known as "blowout" fixtures — are not allowed in a back-to-back configuration.

FIGURE B: MINIMUM COMMON VENT SIZES

Pipe Size (in.)	Maximum Discharge from Upper Fixture Drain (dfu)
1 ½	1
2	4
3	6

WET VENT VS. DRY VENT

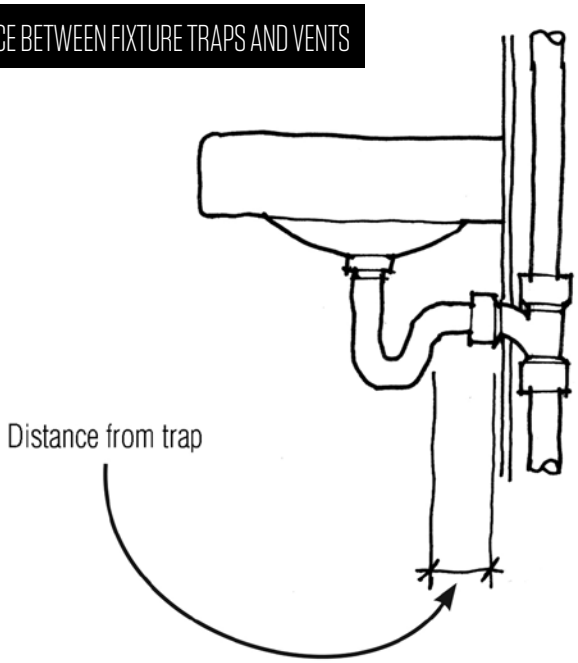
There are two basic ways to supply air to a drain line: through a *dry vent* or through a *wet vent* (if codes allow). A dry vent supplies only air to the drain line, whereas a wet vent functions as both a drain line and a vent.

Dry Vent Rules

- Dry vents must run horizontally for at least two pipe diameters before you tee into the vertical pipe.
- The length of the trap arm must be limited to the distances shown in **Figure C**, below. If the trap arm is too long, the tee might end up below the level of the trap weir; eventually, negative pressure in the drain line would start a siphon, which would drain the trap.

Any back-vent must rise at least 6 in. vertically above the flood rim of the fixture before turning horizontally or connecting to a vertical vent pipe. The horizontal run must be sloped to allow any condensation that forms within the pipe to run back to the drain. No downward or upward U-bends are allowed — keep it straight. All fittings should be installed to provide smooth, unrestricted airflow: This is why a sanitary tee in a vent connection is installed upside down.

FIGURE C: MAX. DISTANCE BETWEEN FIXTURE TRAPS AND VENTS



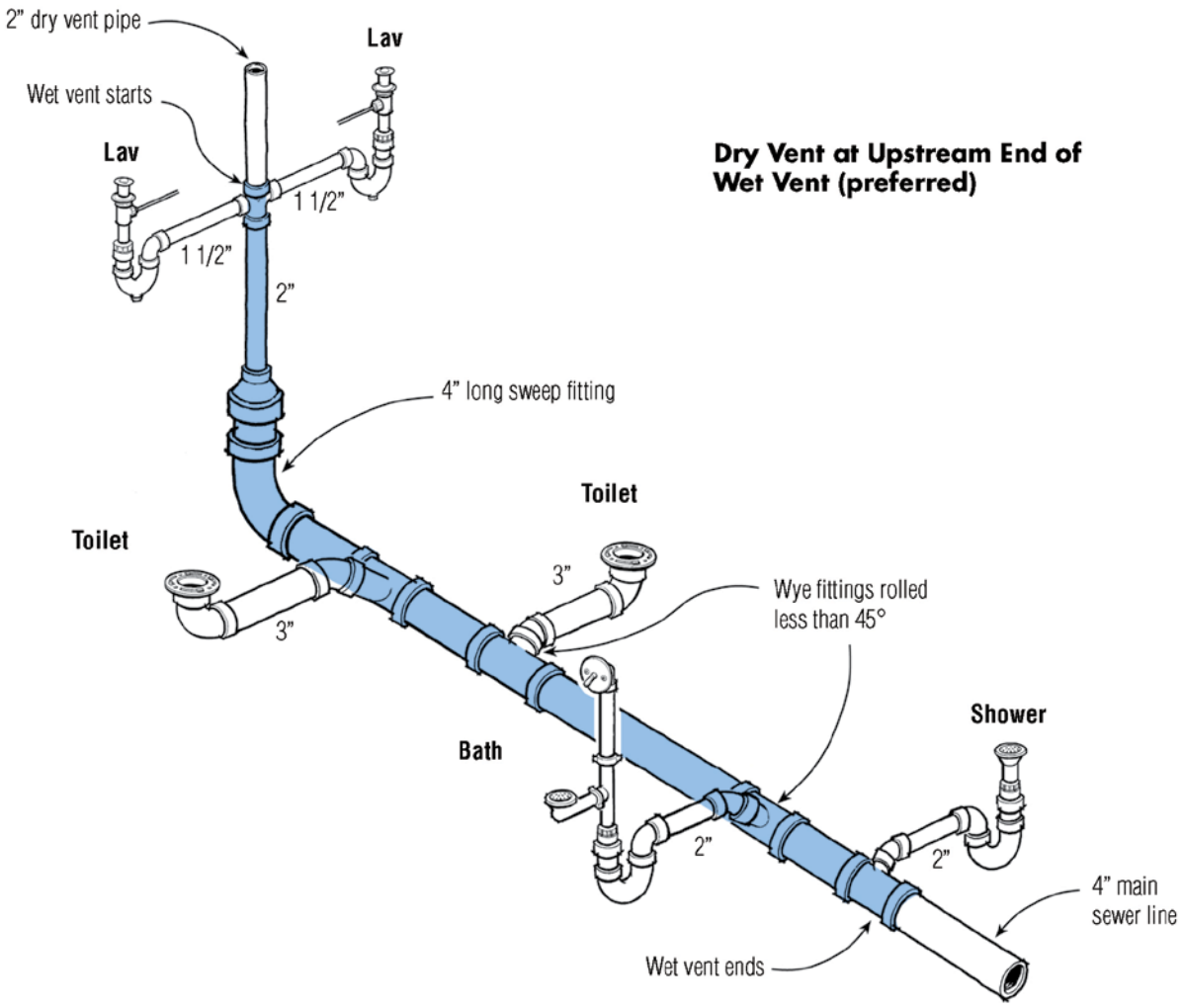
Size of Trap (in.)	Size of Fixture Drain (in.)	Slope (in. per ft.)	Distance from Trap (ft.)
1 ¼	1 ¼	¼	3 ½
1 ¼	1 ½	¼	5
1 ½	1 ½	¼	5
1 ½	2	¼	6
2	2	¼	6
3	3	⅛	10
4	4	⅛	12

Wet Vents

A wet vent can be used for a single branch of a bath group, or for the entire drainage system for up to two bath groups located on the same floor (**Figure D**). Vent air enters the system through one or more dry vents. Both horizontal and vertical pipes (limited to one-story height) can be wet vented, though some codes may not allow horizontal wet venting.

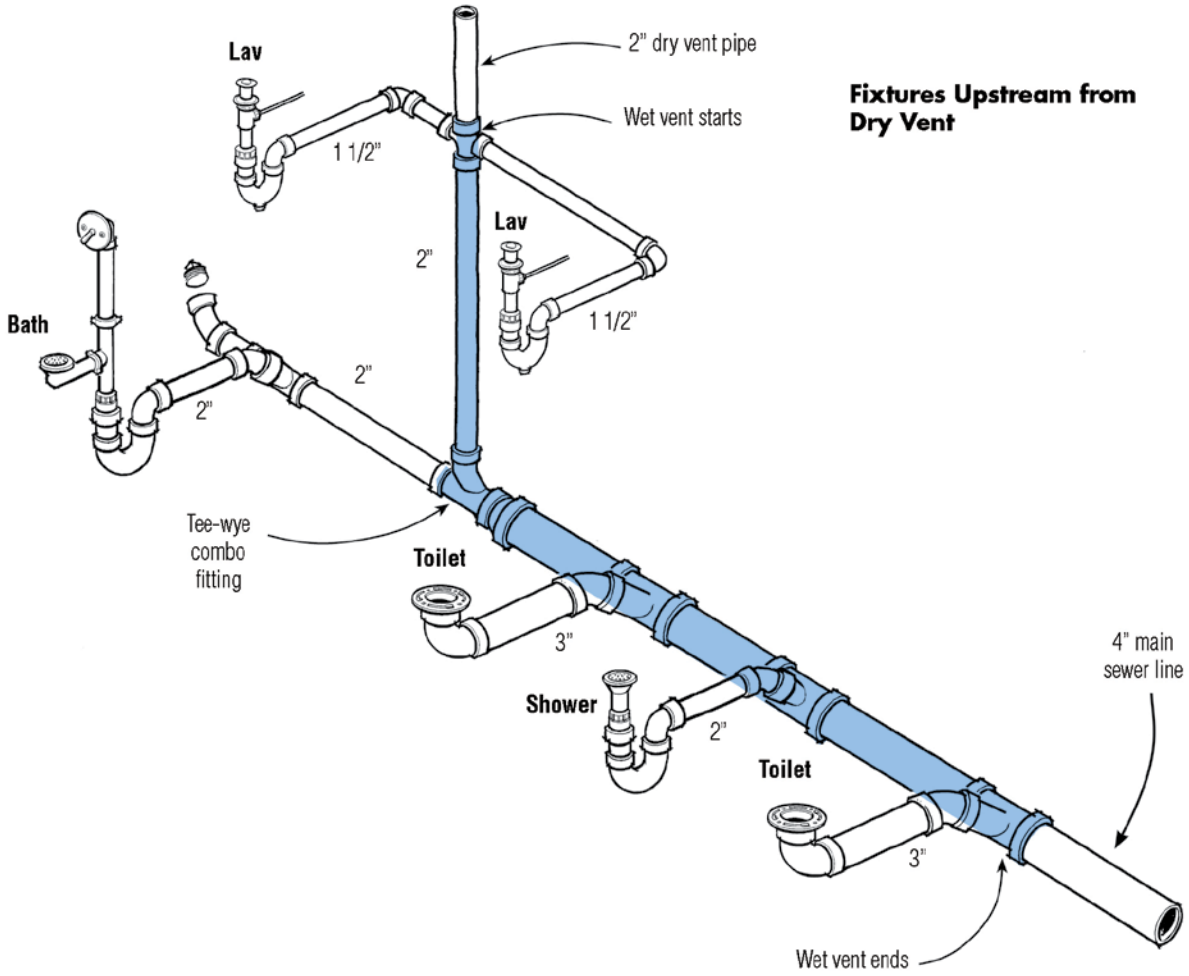
Wet Vent vs. Dry Vent

FIGURE D: WET VENT CONFIGURATIONS



Wet vents allow an oversized drainpipe to provide vent air to all the fixtures in up to two bathroom groups.

FIGURE D: WET VENT CONFIGURATIONS, CONTINUED



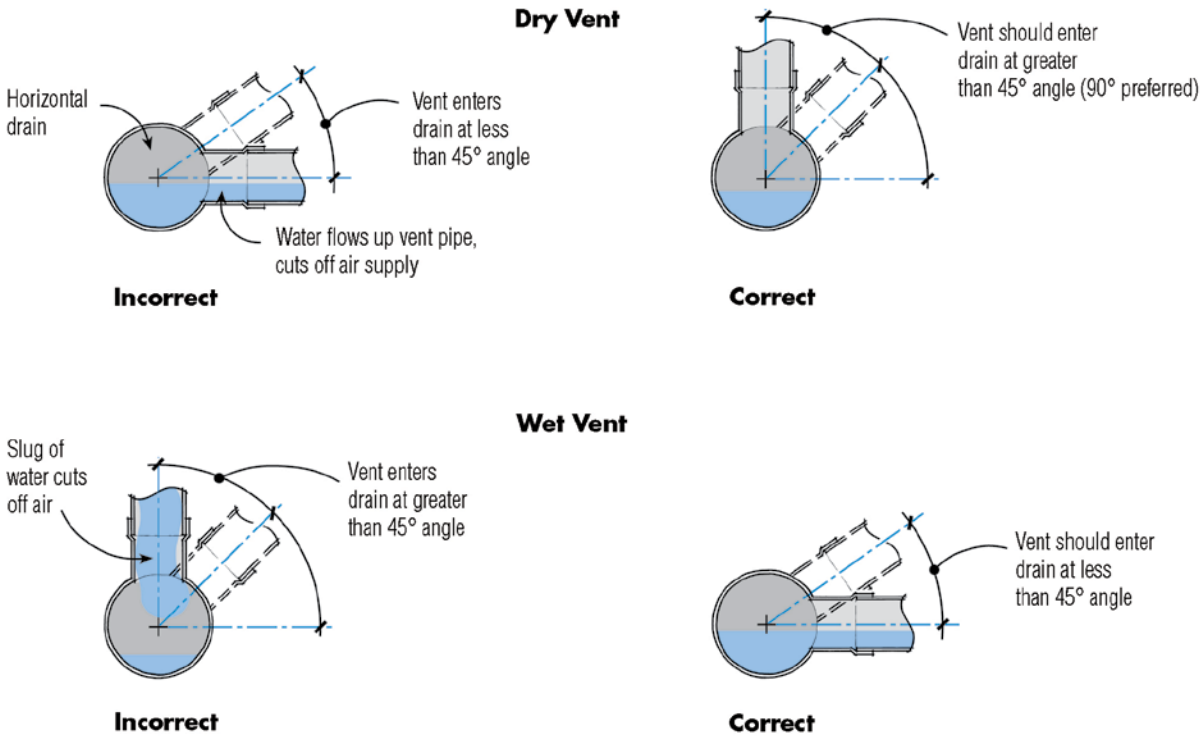
Wet Vent Rules

- A wet vent can handle all the fixtures in two bathroom groups (a bathroom group is a lav, toilet, bidet, and tub or shower).
- To stay out of trouble with wet vents, go beyond code and use a 4-in. main horizontal waste line where possible.
- Any wet vents must be 2 in. minimum in diameter.

Wet Vent to Main Drain

Code is very specific about the angle at which a wet or dry vent may enter a horizontal drain line. Make sure you have enough room for wet vents to enter drain lines so that your drain configuration will function as a true vent (**Figure E**).

FIGURE E: ORIENTATION OF WASTE AND VENT CONNECTIONS



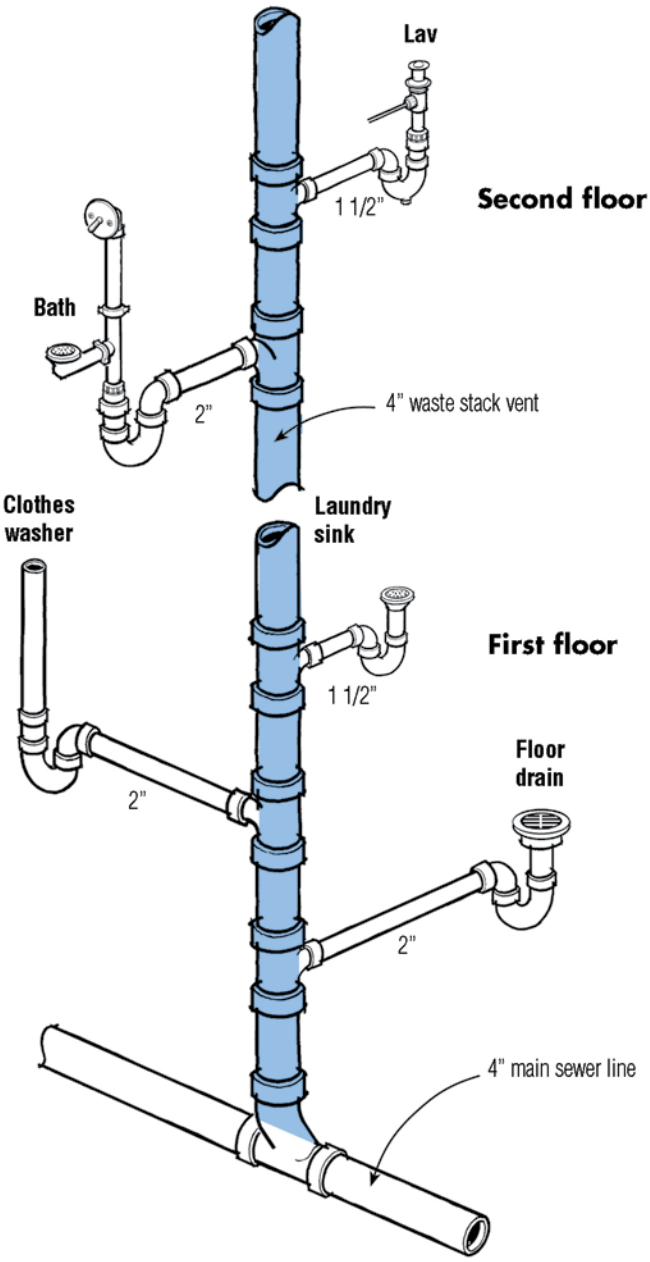
Dry vent and wet vent connections to main drain lines are made differently. A dry vent must connect at an angle of 45 degrees or greater, measured from a line cut horizontally midway through the pipe. Because it carries water and air, a wet vent must connect at an angle less than 45 degrees to this line.

WASTE STACKS

These days, a waste stack is not a soil stack — it's a graywater stack (**Figure F**). A stack system may be used, but not with a toilet. Although individual fixtures can still drain separately into the stack, a horizontal drain containing any number of fixtures is not permitted on the stack.

The more common alternative, particularly for a two-story house, is to use a stack with all the fixtures discharging into it, but to vent every fixture individually.

FIGURE F: WASTE STACK VENT



A waste stack vent can handle all fixtures except toilets and urinals, as long as each fixture connects individually.

Waste Stack Vent Rules

- A vertical waste stack can handle the discharge of all fixtures except toilets and urinals.
- The fixtures must connect individually to the waste stack.
- No horizontal offsets of any kind are allowed.
- The vent for a waste stack, which continues as an extension at the top, must be the same size as the waste stack.
- See **Figure G** for sizing.

FIGURE G: MINIMUM WASTE STACK VENT SIZES

Stack Size (in.)	Maximum Number of Fixture Units (dfu)	
	Total Discharge from One Floor	Total Discharge for Stack
1 ½	1	2
2	2	4
3	No limit	24
4	No limit	50

CIRCUIT VENTS

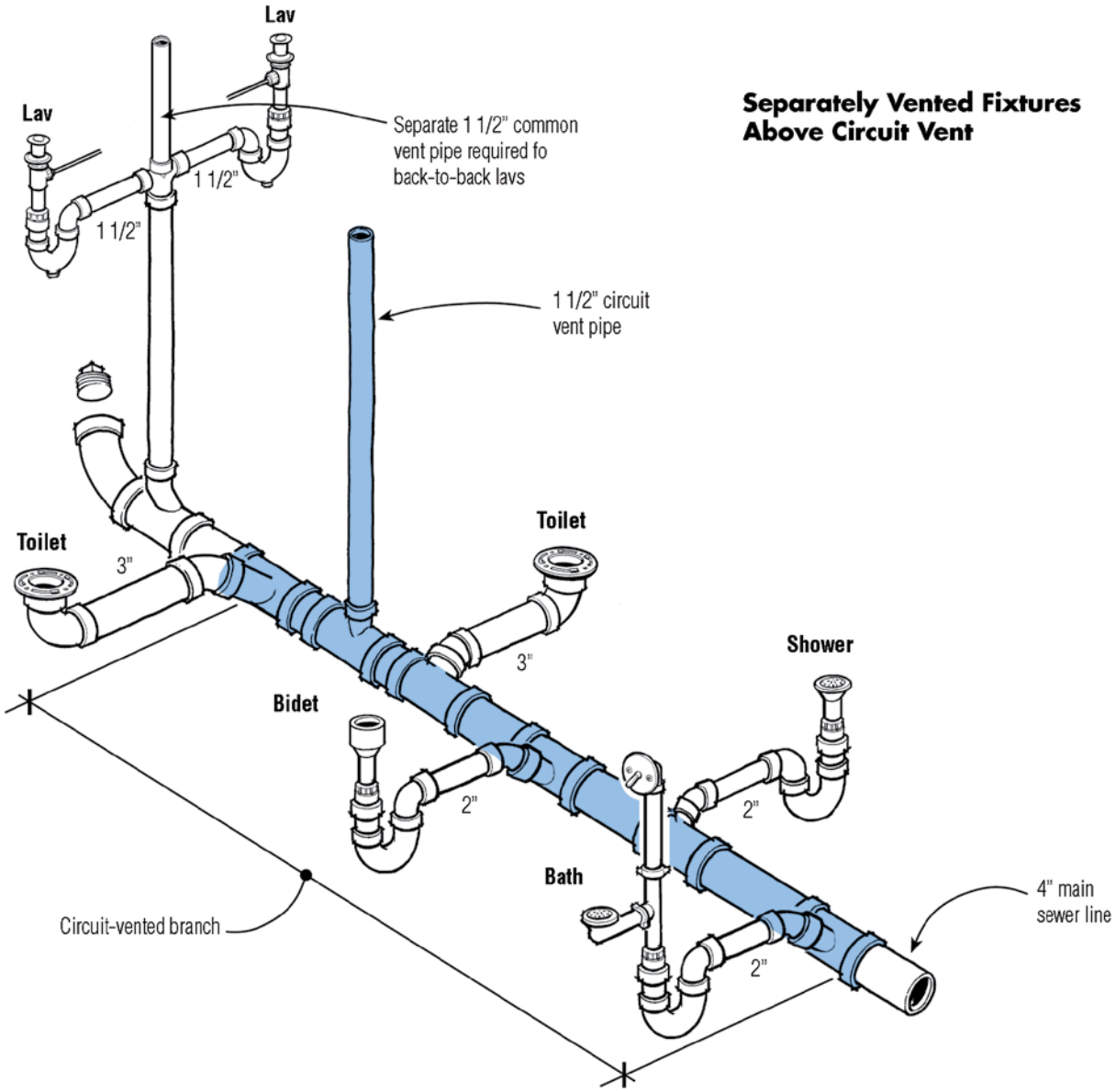
Similar to wet venting, a circuit vent can accommodate eight fixtures on a drain line (**Figure H**). The basic rules are that the vent pipe — sized to at least half the size of the drain line — must be installed between the two most upstream fixtures, and all the fixture trap arms must be within the code length limits (**Figure C**). If an individual fixture is beyond the code-allowed distance, it can still discharge into the pipe, but that fixture must be individually vented.

Sizing a circuit vent. For a circuit vent to work, the drains must be large enough for air to circulate above the wastewater. To stay out of trouble using a circuit vent system, use 4-in. pipe as the main drain, even if 3-in. is allowed, or use 2-in. pipe to individual fixtures, even if 11/2-in. is allowed. Typically, this means that the dry vent to the roof will be 2 to 3 in.

Circuit Vent Rules

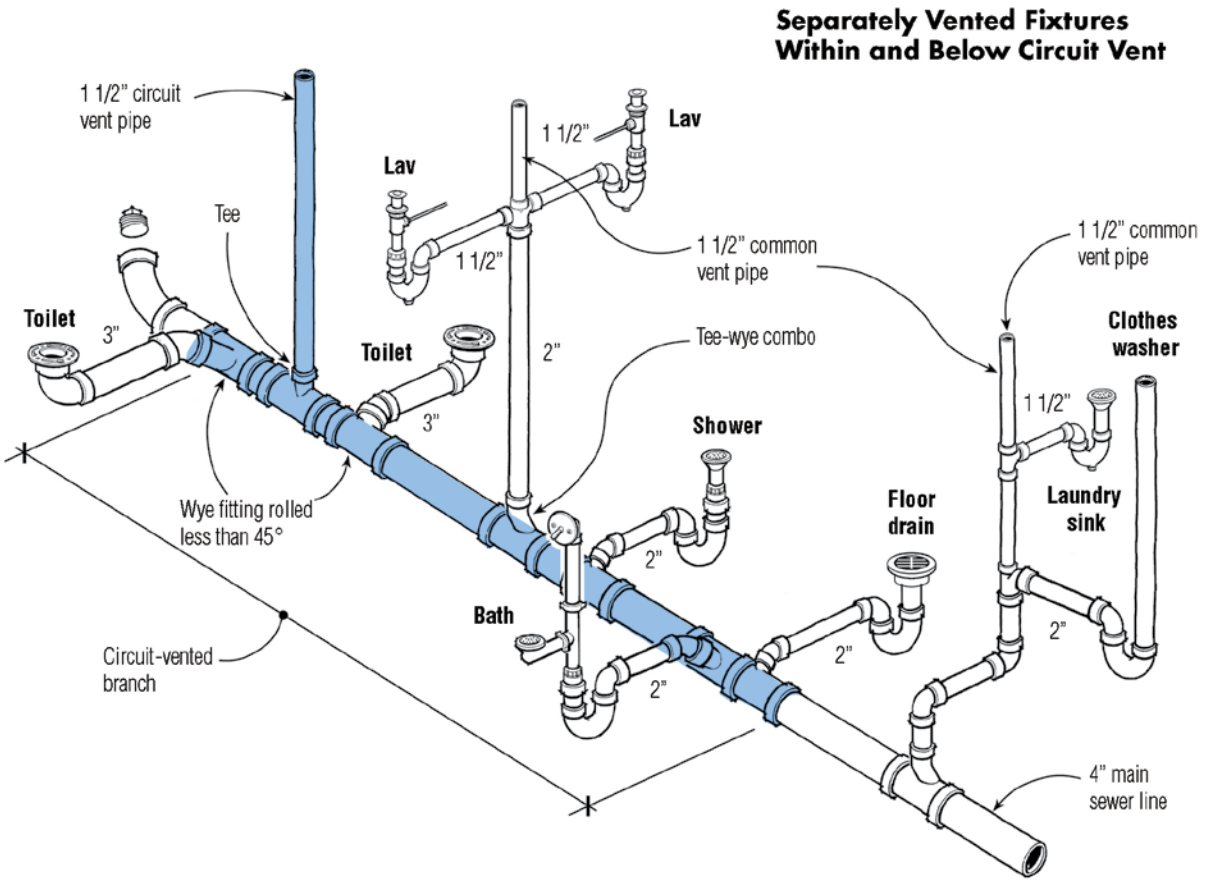
- A circuit vent can drain up to eight individual fixtures into a main horizontal waste line.
- The dry vent connection must be made between the two most upstream fixtures in the group.
- Multiple circuit-vented branches can be connected together, as long as the most downstream branch is sized to handle its fixtures plus all upstream fixtures and branches.
- Each fixture must connect individually (back-to-back lavs need their own individual dry vent).
- If there are more than eight fixtures on the line, group the upper eight and individually vent the lower fixtures.
- If the uppermost fixture is beyond the trap arm limit, run an individual vent for that fixture and move the
- circuit-vent system down to the next eight.
- An upstream fixture refers to fixtures that are frequently used under normal conditions — a floor drain would not be counted.

FIGURE H: CIRCUIT VENT CONFIGURATIONS



A circuit vent can handle up to eight individual fixtures draining it to a main horizontal waste line. Each fixture must connect individually. Back-to-back lavs need their own individual dry vent.

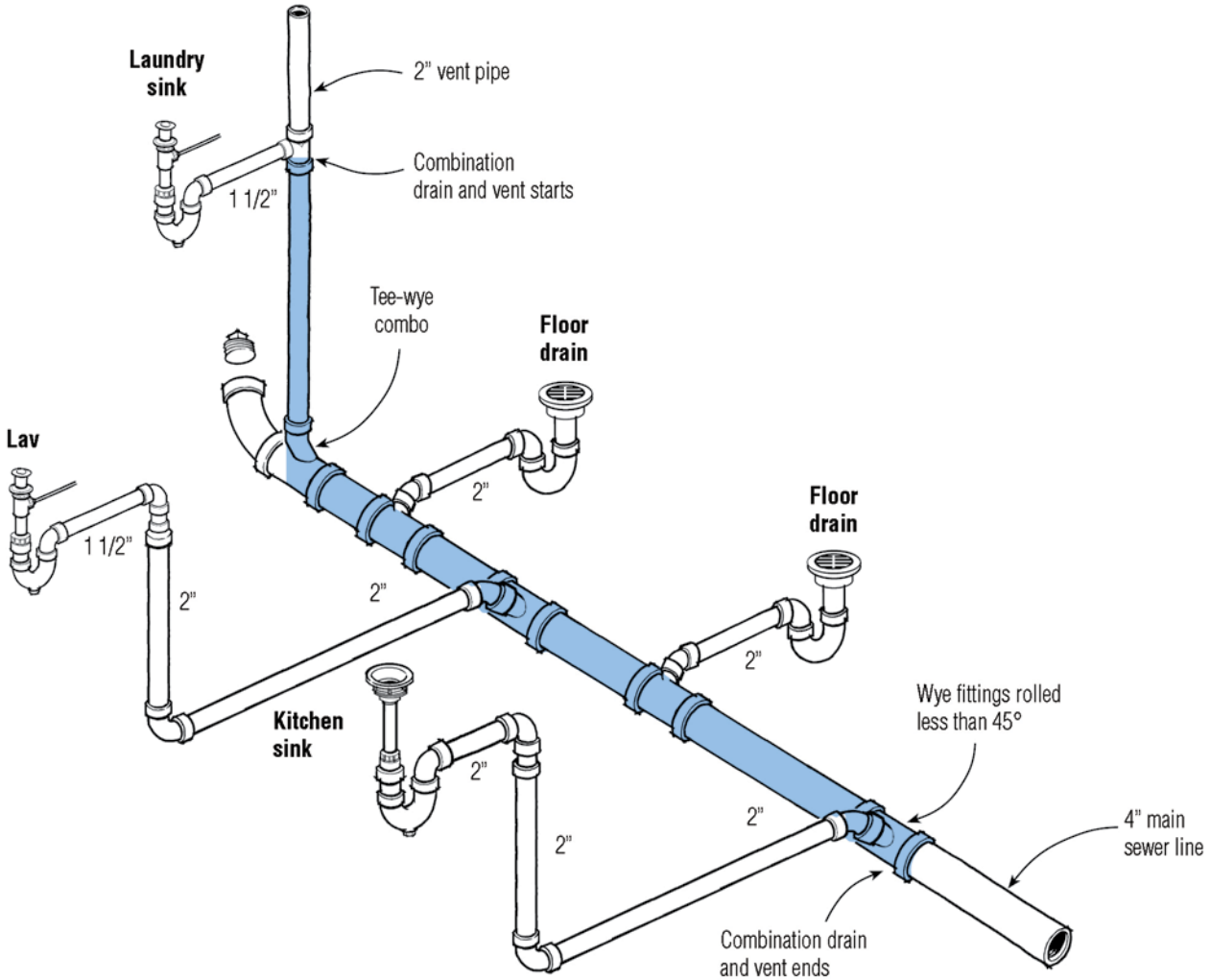
FIGURE H: CIRCUIT VENT CONFIGURATIONS, CONTINUED



COMBINATION WASTE AND VENT

For laundry rooms, an oversized horizontal drain system off the main drain is typical (**Figure I**). This line can serve sinks, lavs, washing machine standpipes, and floor drains. The only vertical pipes allowed are the drain lines from individual fixtures, and they must be limited to a total rise of 8 ft. This system allows only graywater — no toilets.

FIGURE I: COMBINATION DRAIN AND VENT



A combination drain and vent can serve floor drains, sinks, lavs, even a washer. However, any kitchen sink on this venting configuration cannot have a garbage disposal.

Combination Waste and Vent Rules

- A combination drain and vent can serve floor drains, clothes washer standpipes, and sinks and lavs.
- A kitchen sink on a combination drain and vent cannot have a garbage disposal.
- Toilets are not allowed on a combination drain and vent.
- Minimum size is 2 in.
- As long as the drain is sized according to the table shown in **Figure J**, trap-to-vent maximum distances do not apply.

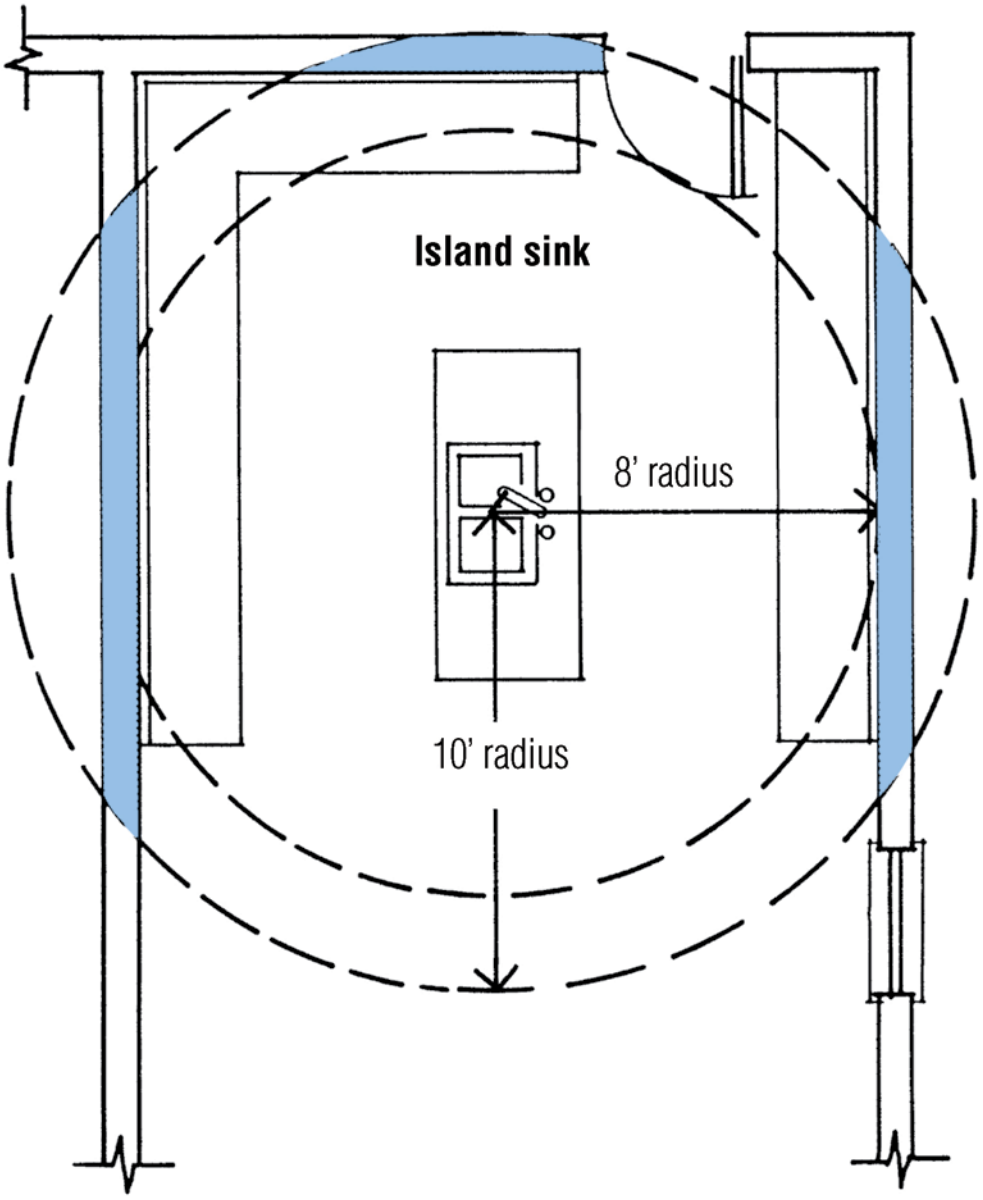
FIGURE J: SIZE OF COMBINATION DRAIN AND VENT PIPE

Pipe Diameter (in.)	Maximum Number of Fixture Units (dfu)	
	Connecting to a horiz. branch or stack	Connecting to a building drain or building subdrain
2	3	4
3	12	31
4	20	50

ISLAND VENTS

Most plumbing codes require that an island sink be no farther than 8 to 10 ft. from the nearest plumbing vent (**Figure K**). This may limit the location of the vent pipe to a small wall area, if it's possible to get the vent into the wall at all. There are a number of possible approaches to draining and venting an island sink:

FIGURE K: ISLAND SINK VENTING DISTANCE



Most plumbing codes require that an island sink be no farther than 8 to 10 ft. from the nearest plumbing vent. This may limit the location of the vent pipe to a small wall area.

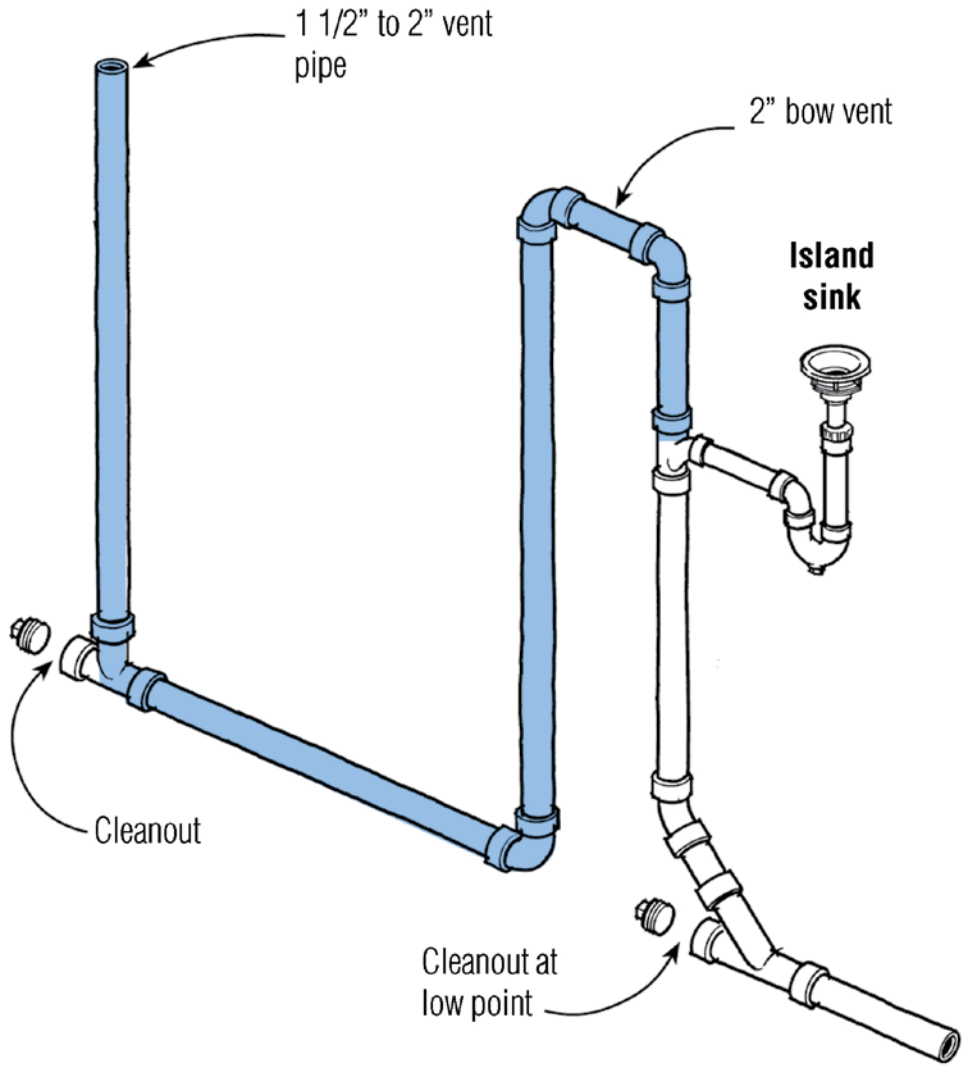
Automatic Vents

The easiest solution is to install an automatic vent — a little unit about the size of a tin can that screws into the drain line several inches above the trap weir. These devices sense any negative pressure and allow air to come into the lines when needed. However, code inspectors may not always approve them, possibly because they sense only negative pressure and do not relieve positive pressure.

Oversized Vent

Another solution that an inspector may allow is to increase the size of the pipe into which the trap dumps by one or two sizes, and run a dry vent to the drain line as close by as possible (**Figure L**). Essentially, this treats the island drain like a combination drain and vent. It's a good idea to oversize a kitchen sink drain anyway because a standard 11/2-inch drain frequently clogs up.

FIGURE L: KITCHEN ISLAND BOW VENT



Another option for an island vent is called a bow vent. While code inspectors are likely to approve this solution, it gobbles up cabinet space.

Island Vent Rules

- Island venting is permitted only for lavs and sinks (including connected dishwashers and food grinders).
- The island vent pipe must rise to a level above the sink drain before turning horizontally.
- Cleanouts must be provided for island vents.

VENT TERMINATION

- The distance the vent extends above the roof varies by locale, depending on local snowfall. The minimum is 6 in., while 1 to 3 ft. is the norm.
- In cold regions, where the vent is prone to frost up, the termination must be at least 3 in. in diameter.
- Vent terminations must be 10 ft. away from any windows, skylights, or doors.
- The end of the vent often looks better if it's cut at the same pitch as the roof and painted to match the color of the roof.

Side-Wall Terminations

Some codes permit the vent to exit the side of the house as opposed to the roof. This is sometimes done to keep the cost down during a renovation. If this is done, use a fitting at the end of the pipe to point it downward. If allowed, it's also a good idea to increase the size of the fitting by one size and put a screen over it to keep birds out. A problem with going through the wall as opposed to the roof is that the gas will have less chance to disperse, and any window under the pipe, even if it is 10 ft. away, is likely to pick up the odor.