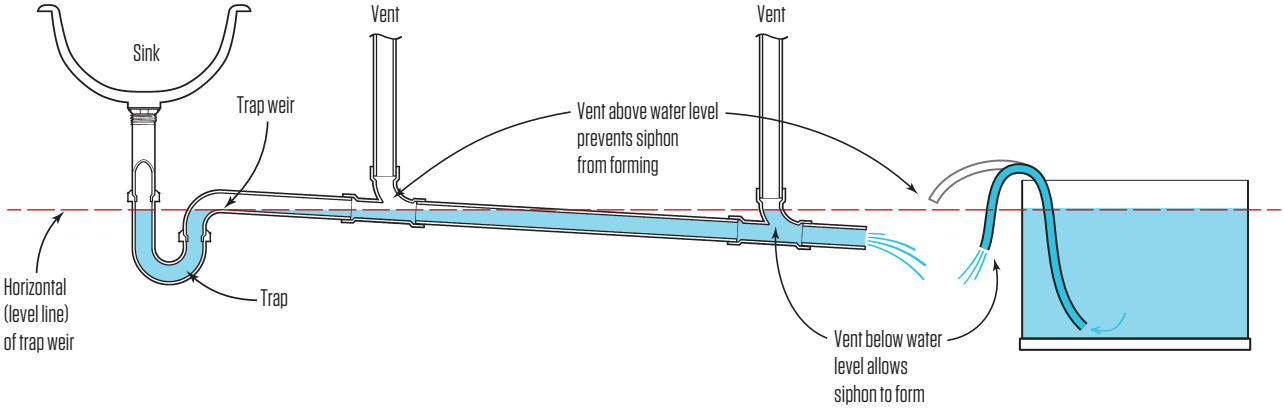
BY GLENN MATHEWSON

Maximum Length for Fixture Drains

How Siphons Are Created



The trap below a plumbing fixture is likely the most ancient plumbing feature that is still in use today. Basically, it's a simple cup of water that keeps sewer air from communicating with the air you breathe. The trap arm is the portion of a fixture drain between a trap weir and its protecting vent. The trap weir is the point at the bottom of the trap arm pipe where it connects to the trap. It's the height at which water will no longer flow from the trap via gravity—the rim of the cup, so to speak (see "How Siphons Are Created," above).

The flow of liquids has a lot of science to it, and anyone who has ever siphoned water from a fish tank or a swimming pool knows that a liquid can be drawn from a vessel without any power other than what appears to be magic. In a drain, one of the primary purposes of a fixture vent is to break the siphon. If the entire cross-section of a drain is able to fill with water downstream of the trap, a siphon can be created for a sufficient period of time to pull enough water out of the trap to render it ineffective. A vent is supposed to maintain air in the cross-section of the pipe to prevent a siphon from forming.

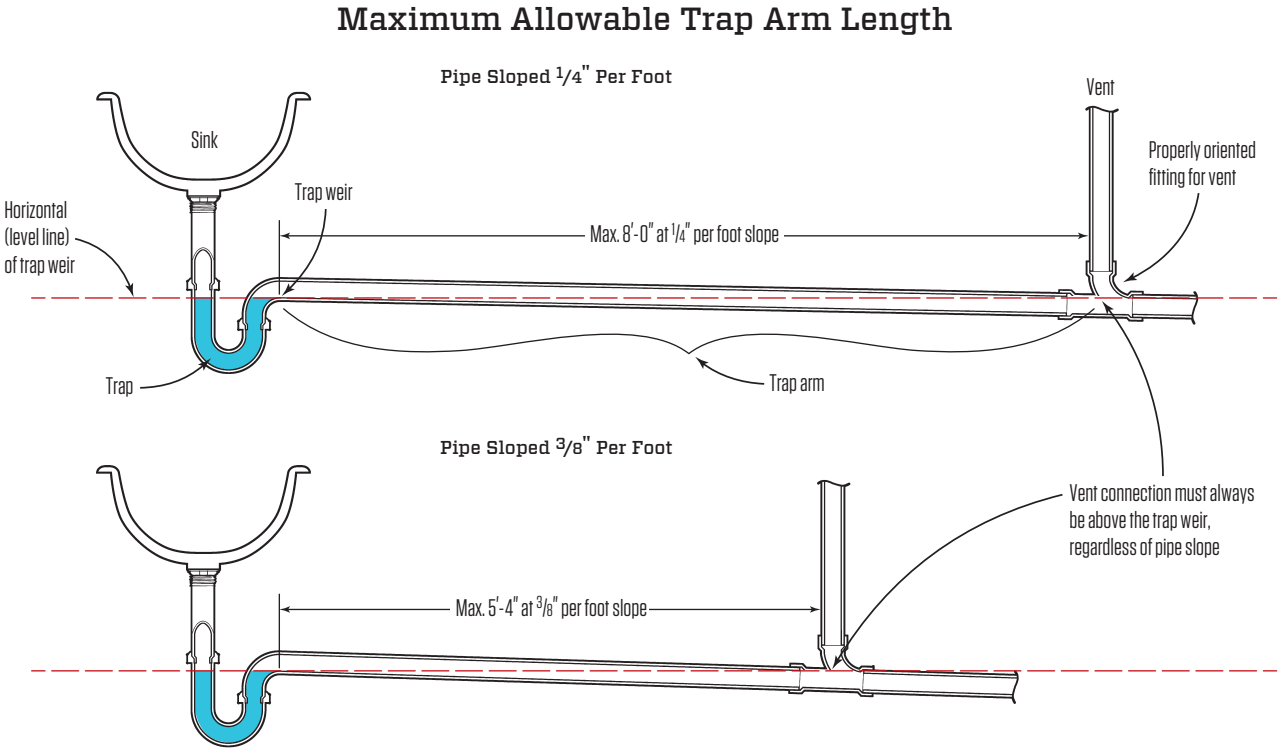
TROUBLE WITH TABLES

The section of the code that pertains to the maximum trap-arm (also called a "dirty arm") length has strict provisions designed to prevent a siphon from forming in a drain. For simplicity, the maximum distance between a trap and its protecting vent has been presented in the form of a table for decades.

However, this table was—and still is—accompanied by a very important statement: "The vent connection shall not be below the trap weir." Unfortunately, that statement is now much easier to overlook.

This basic scientific statement always trumps the simple length taken from a table and is the real key to preventing a situation where a siphon could form.

Illustrations by Tim Healey



When builders look only at the table without reading the text, they find that a 2-inch-diameter drain can run a maximum distance of 8 feet to the vent. They may also see that the slope column references ¼ inch per foot, but they are likely to assume that it's just reiterating the minimum allowable slope for a 2-inch drain.

MORE THAN THE MINIMUM SLOPE

But the slope column is saying much more than that. It's stating that you can only use *up to* an 8-foot length if the pipe is run at the minimum allowable slope of ¼ inch per foot. But often, installers don't install pipe at the minimum slope, just as they wouldn't stand at the very edge of a cliff to enjoy the vista. (For many code applications, I use that analogy to encourage people to build beyond the minimum level that is allowed.)

The lengths in the table are just the result of simple math. A 2-inch-diameter pipe sloped at ¼ inch per foot results in a drop equal to the pipe's internal diameter over a distance of 8 feet: ¼ inch x 8 = 2 inches (see "Maximum Allowable Trap Arm Length," above).

But if the drain is sloped at ⅜ inch per foot, the maximum length is less than what someone might assume with just a quick glance at the table—it is actually 5.33 feet: ⅜ inch x 5.33 = 2 inches. So the additional slope of just ⅛ inch per foot reduces the allowable drain length between the trap and vent by a whopping 2.66 feet, or 33%.

KEEP THE VENT CONNECTION ABOVE THE TRAP WEIR

When I'm performing a plumbing inspection, I don't often bother with measuring the exact drain length, unless it seems to be unusually long or is clearly at a shallow slope.

With the siphon principle in mind, I first make sure that any drain less than 3 inches in diameter has at least a ¼-inch slope (⅛-inch slope for 3-inch diameter and greater), and then I simply measure from the floor (assuming that it is level) to the bottom of the drain at the trap connection (where the trap weir is located).

Next I measure to the top of the pipe at the vent connection, roughly accounting for the thickness of the pipe wall. If the difference is less than the diameter of the pipe, a siphon will not be able to form and the connection is approved—simple and effective with no code book table needed for reference.

Just make sure that the top of the drain where it connects to the vent is at or above the bottom of the drain at the trap connection, and you're golden.

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