

Repiping an old house start to finish

YES Electric • a plain-language course for new plumbing apprentices

Draft 1 (October 2026). Code numbers follow the International Residential Code and International Plumbing Code as enforced in Alabama. The local inspector has the last word. Prices and hours are rough Birmingham-area numbers.

A repipe is the biggest job a residential plumber does. Every pipe in the house comes out and new pipe goes in. This chapter walks the job in order, from the first walk-through to the final inspection. It assumes a one or two story wood-frame house with a crawlspace or basement, interior walls open or about to be opened, and nobody living there during the work. The order does not change much if the drywall stays up. You just cut more holes.

Read it once straight through to see the shape of the job. Then use it as a checklist on site.

The big idea

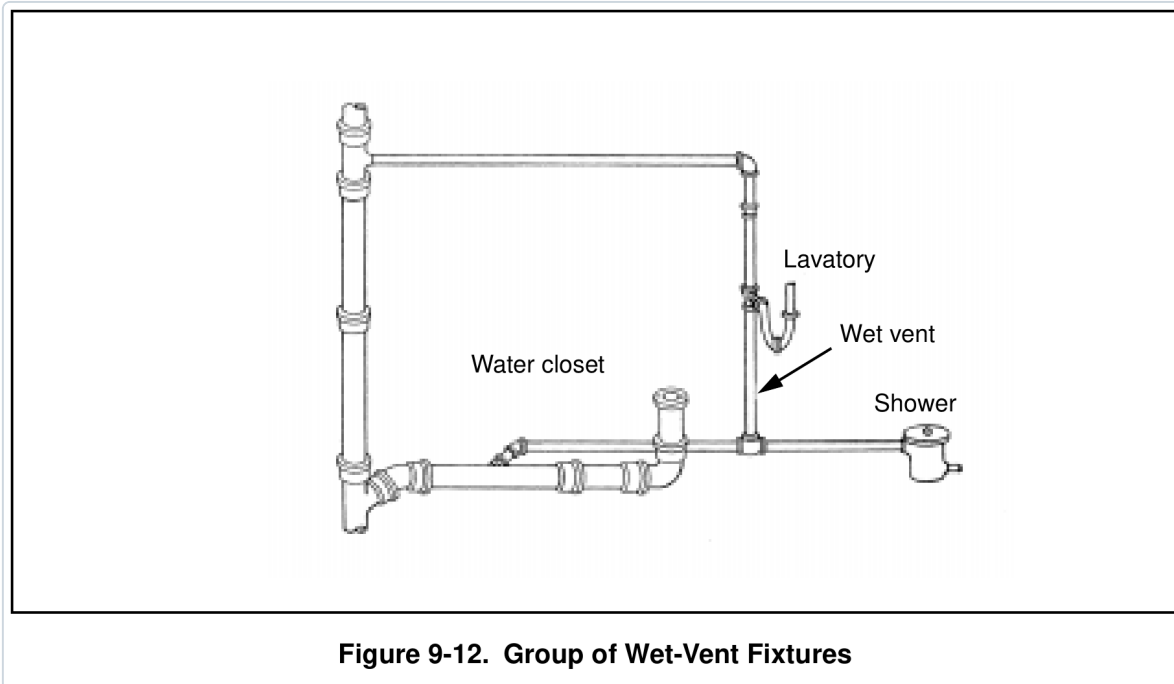
Two rules drive the whole sequence. First, the drain pipe is big and has to slope, so it goes in first and gets first claim on the space. The small supply pipe bends around it later. Second, nothing gets covered until it has been tested and an inspector has seen it. A failed rough-in inspection after drywall means tearing drywall back out.

Phase 0: Before anyone picks up a saw

1. **Walk the house and map the fixtures.** Count every sink, toilet, tub, shower, washer box, hose bib, ice maker, dishwasher, water heater, and gas appliance. Note which room each is in and which wall it sits on. This count drives the material list and the permit.
2. **Find the three connection points.** Where the water service enters (meter at the street, then the main shutoff). Where the sewer leaves (cleanout in the yard or at the foundation). Where the gas meter is, if gas is in scope.
3. **Decide what stays.** Fixture locations stay the same in most repipes. Moving a toilet or adding a bath changes the drain layout and is where the budget swings.
4. **Check the sewer line.** Camera it from the cleanout to the street or septic. If the yard line is clay or cast iron and broken, that is a separate dig job that should be priced now, not discovered after the new DWV is tied into it.
5. **Check incoming pressure.** Gauge on a hose bib. Over 80 psi means a PRV goes on the material list.
6. **Permit.** Plumbing permit with a fixture count. In Birmingham and Jefferson County that goes through the city or county building department, and the work has to be done under a

licensed master plumber. Inspections come in two rounds: rough-in and final. Schedule them in your plan now.

7. **Draw the isometric.** Even a napkin sketch of the DWV showing each stack, each branch, each vent, and each trap arm length. This is what the inspector will compare against. It also tells you how many fittings to buy.
8. **Order material.** Two piles. Supply: PEX in red and blue 3/4 and 1/2, manifold if you are using one, fittings, stops, stub-outs, PRV, hose bibs, water heater and its kit. DWV: PVC schedule 40 in 4, 3, 2, and 1 1/2, fittings per the isometric, primer and cement, no-hub or Fernco couplings, closet flanges, cleanouts, hangers and strap, roof flashings.



One bathroom group (water closet, lavatory, shower) draining to a stack. The lavatory drain doubles as the wet vent for the shower, and the vent rises and ties back into the stack above the fixtures. Isometric line drawing from the Army plumbing manual.

Photo: FM 3-34.471 Plumbing, Pipe Fitting, and Sewerage (2001), Figure 9-12 Group of Wet-Vent Fixtures by US Army (Headquarters, Department of the Army), Public domain (US federal government work).

Phase 1: Shut down and protect

1. **Shut the main at the meter and drain the house.** Open the lowest hose bib and the highest faucet so the lines empty.
2. **Shut gas at the meter** if any gas work is happening. Tag it.
3. **Pull the water heater.** Drain it through the drain valve to a hose outside. Disconnect water, gas or electric, and flue. Haul it out.
4. **Pull the fixtures you are replacing.** Toilets come out first. Stuff a rag in the flange hole so sewer gas stays down. Vanities, tubs, and sinks come out if they are being replaced. If a tub is staying, protect it with a drop cloth and cardboard.

5. **Open the walls and ceilings where the pipe runs.** Mark the studs you will be drilling. Keep demo narrow and in a straight line so the drywall patch is a strip, not a wall.

Phase 2: Demo the old pipe

1. **Supply side first.** It is small and easy. Cut galvanized or copper into carryable lengths with a reciprocating saw. Pull it out of the stud bays. Leave the service line from the meter to the house if it is in good shape and the right size. Otherwise it gets replaced in Phase 3.
2. **Drain side next.** Cast iron is heavy and brittle. Support each section before you cut it, because a stack can drop when the hub below it breaks. Cut with a snap cutter or a recip saw with a carbide blade. Work from the top down. Wear a face shield. Old cast iron stacks hold black sludge that comes out when they are cut.
3. **Leave a stub at the sewer connection.** Cut the building drain a few feet before it leaves the foundation, somewhere you can get a no-hub coupling or Fernco onto clean pipe. If the old pipe under the slab is bad, this is where the saw-cutting of the floor happens.
4. **Cap the sewer stub** with a test plug or a rubber cap so the house does not smell for the rest of the job.
5. **Haul out.** Cast iron goes to a scrap yard. Copper goes to a scrap yard and pays for lunch. Galvanized is nearly worthless.
6. **Fix the framing.** Old plumbers notched joists and hacked top plates. Sister any joist that was cut more than a third of its depth. Now is the time, because new pipe is about to go in the same spots.



Cast iron drain pipe under a floor, joined with rubber sleeve couplings held by stainless steel bands. A copper vent pipe ties in with the same kind of coupling.

Photo: Cast fe and cu dwv piping.jpg by Achim Hering, CC BY 3.0.

Phase 3: Rough-in the DWV

Drain pipe is big and has to slope, so it gets first claim on the space.

1. **Set the building drain.** Start at the sewer stub and work upstream. If it runs under a slab, trench and bed it in gravel at 1/4 inch per foot. If it runs in a crawlspace, hang it from the joists with strap every 4 feet at the same slope. Put a cleanout at the point where it leaves the house and at the end of every long run.
2. **Stand the stacks.** Each bathroom group gets a 3 inch stack, or 4 inch if you have many fixtures on it. The stack runs vertical from the building drain up through the floor plates and out the roof. Drop a plumb line first so the hole in the floor and the hole in the top plate line up. A cleanout goes at the base of each stack.
3. **Set the toilet.** Closet flange at the finished floor height, center 12 inches from the finished wall. The closet bend turns down into the stack through a san tee or a wye. The toilet is the one fixture that drives where everything else goes.
4. **Run the branch drains.** Each fixture drain comes off the stack with a san tee at the right height. Lavatory drain stub is about 18 inches off the floor. Tub drain is a 1 1/2 inch trap set in the floor under the tub. Kitchen sink is 1 1/2 or 2 inch at about 18 inches. Washer box drain is 2 inch with its own trap and standpipe. Shower drain is 2 inch.
5. **Keep every trap arm short.** The code gives a maximum distance from each trap to its vent. For 1 1/2 inch pipe it is 6 feet, for 2 inch 8 feet. Past that the trap siphons. This is the rule beginners break most.
6. **Run the vents.** Every trap needs a vent that leaves the drain above the trap arm and rises at least 6 inches above the flood rim of the fixture before it turns horizontal. Vents tie together in the attic and go out the roof as one or two 3 inch stacks. Vent pipe can be 1 1/2 or 2 inch. Air admittance valves are allowed in some jurisdictions for an island sink. Check locally before relying on one.
7. **Flash the roof.** Cut the hole, run the stack up 12 inches above the roof, slide a neoprene or lead boot flashing over it and under the shingles above.
8. **Glue it.** Cut square, deburr, dry fit the whole assembly and mark alignment with a pencil. Purple primer on both pieces, then cement on both, shove it home with a quarter turn, hold it 30 seconds. Work fast. PVC cement sets in under a minute.
9. **Hang and protect.** Strap horizontal runs every 4 feet, vertical every floor. Nail plates on every stud where the pipe is within 1 1/4 inches of the face. Fire caulk where pipe passes through floors between units or into the garage.
10. **Test the DWV.** Plug the sewer stub and every open fixture stub with test caps or inflatable test balls. Fill the system with water from the roof vent until it comes out the top, or pump it to 5 psi of air and watch the gauge for 15 minutes. Fix every weep before you call for inspection. Most inspectors want to see the water standing in the stack when they walk in.



White Schedule 40 PVC pipe and fittings on a bench: a reducer, couplings, a union, and a can of all-purpose solvent cement.

Photo: Sticking the tees into the pvc.jpg by Asadabbas, CC BY-SA 4.0.

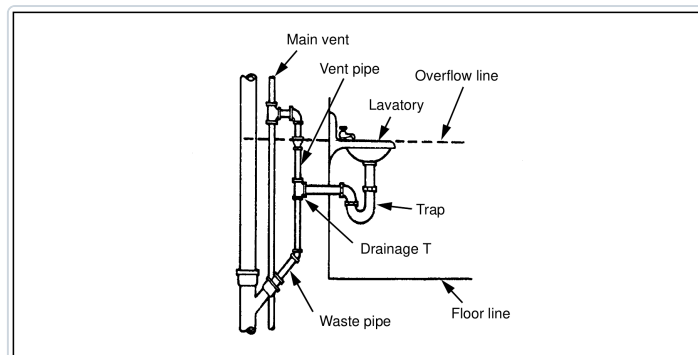


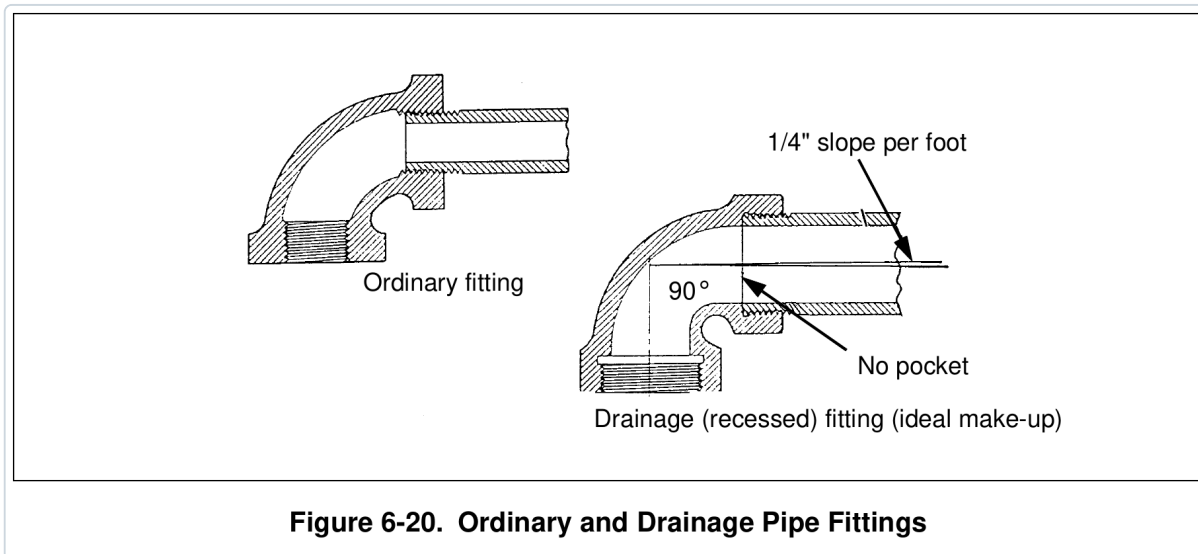
Figure 9-8. Single-Fixture Vent

Table 9-1. Determining the Pipe Size From the Fixture to the Vent

Maximum Distance From the Fixture Trap to the Vent	Size of the Fixture Drain (in Inches)
2' 6"	1 1/4
3' 6"	1 1/2
5'	2
6'	3
10'	4

Single-fixture vent: the trap arm runs from the lavatory P-trap to a drainage tee, the vent rises from the tee above the fixture overflow line before it turns to join the main vent. The table below gives maximum trap-arm length by drain size. The 6 inch rise above the flood rim is not dimensioned; the instructor adds it.

Photo: FM 3-34.471 Plumbing, Pipe Fitting, and Sewerage (2001), Figure 9-8 Single-Fixture Vent and Table 9-1 by US Army (Headquarters, Department of the Army), Public domain (US federal government work).



Section through a recessed drainage elbow showing the 1/4 inch per foot slope built into the fitting so the horizontal pipe falls toward the stack with no pocket at the joint. It is a fitting drawing, not a level on a pipe, but it states the slope number directly.

Photo: FM 3-34.471 Plumbing, Pipe Fitting, and Sewerage (2001), Figure 6-20 Ordinary and Drainage Pipe Fittings by US Army (Headquarters, Department of the Army), Public domain (US federal government work).

Phase 4: Rough-in the supply

Small pipe threads around the big pipe that is already in place.

1. **New service line if needed.** From the meter to the house in 3/4 or 1 inch PE or type K copper, buried below frost depth. In Alabama that is shallow. 12 to 18 inches is typical, check the local code. Tracer wire on plastic.
2. **Main shutoff and PRV** where it enters, in an accessible spot. Add a hose bib tee right after the main so there is water during the rest of the job and for testing.
3. **Choose trunk-and-branch or manifold.** Trunk-and-branch runs a 3/4 hot and 3/4 cold through the house and tees 1/2 branches off to each fixture. A manifold, also called home run, puts a plastic or copper box near the water heater with one 1/2 line to each fixture. Manifold uses more pipe but no fittings in the walls, and each fixture has its own shutoff at the box. For a repipe where walls are open either works. Manifold is faster for an apprentice because there is nothing to join inside the wall.
4. **Set the water heater location** and run 3/4 cold in and 3/4 hot out. Leave stubs for the T&P discharge, expansion tank, and a drain pan drain if it is in a finished space.
5. **Run the hot and cold to each fixture.** Hot on the left, cold on the right, every time. Drill holes at least 1 1/4 inches back from the stud face. Keep PEX away from the water heater flue and recessed lights. It cannot touch anything over about 200 degrees. Do not run it where sunlight will hit it.
6. **Stub out.** At each fixture, a copper or brass stub-out ear or a PEX stub-out bracket screwed to a block between the studs, so the pipe does not move when a stop valve is turned later. Lavatory stubs are about 20 inches off the floor, 8 inches apart. Toilet stub is

about 6 inches up, 6 inches left of center. Shower valve is set in a bracket at 48 inches, tub spout at 20 inches, shower head at 78 inches or where the owner wants it.

7. **Set the valves in the wall.** Shower mixing valve, washer box, ice maker box, and hose bibs all go in now, since they are part of the pressure test.
8. **Crimp or expand.** With crimp rings, slide the ring on, insert the fitting, center the ring 1/8 to 1/4 inch from the end, and squeeze with the correct size jaw until it stops. Check every ring with the go/no-go gauge. With expansion fittings, expand the pipe and ring, slide the fitting in, and hold while it shrinks back. Never heat PEX to make it bend.
9. **Support.** PEX gets a hanger every 32 inches horizontal. Leave a little slack for expansion. Isolate copper from steel with plastic clips.
10. **Test the supply.** Cap every stub with a test cap. Pressurize with water to 100 psi, or air if freezing is a risk, and hold for 15 minutes with no drop on the gauge. Every crimp gets a look.



A right-angle drill boring through a stud with a self-feed bit. The short head lets the drill fit between studs and joists where a normal drill will not go.

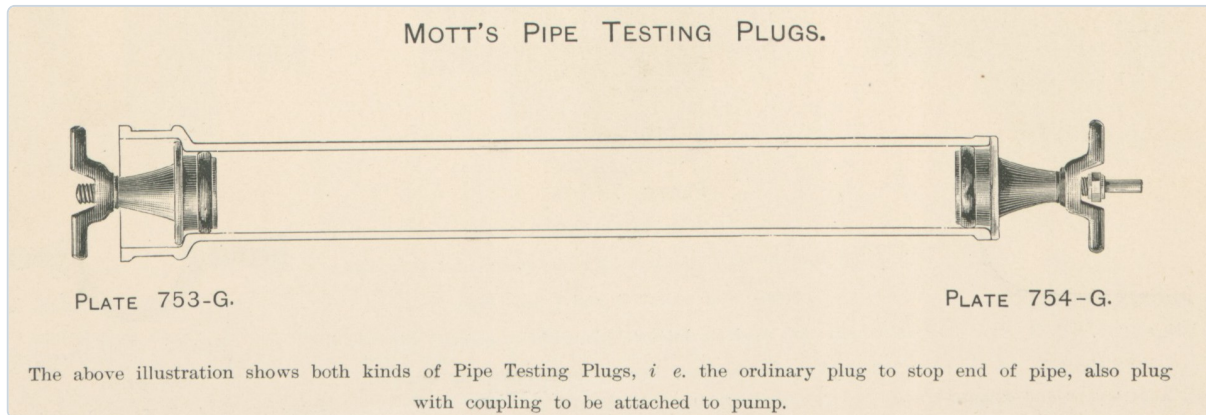
Photo: File:Makita Angle Drill (4887101433).jpg by Mark Hunter, CC BY 2.0.

Phase 5: Gas, if it is in scope

1. Run black iron or CSST from the meter to each appliance with a drip leg and a shutoff at each. Size by BTU load and length.
2. Pressure test at 15 psi for 15 minutes or whatever the local code says, with the gauge left on for the inspector.
3. Bond the CSST to the electrical grounding system. That is an electrician's tie-in and gets coordinated with the electrical crew.

Phase 6: Rough-in inspection

The inspector sees three things standing at once: DWV under water or air test, supply under pressure with a gauge, and gas under pressure with a gauge. Nothing is covered. Nail plates are on. Hangers are on. Trap arm lengths and vent heights are visible. Pass this before a single sheet of drywall goes up. Failing means pulling drywall later.



Nineteenth-century catalog cut of two pipe testing plugs. Turning the wing nut squeezes a rubber ring outward so the plug seals the pipe end; one plug simply stops the pipe, the other has a coupling for the pump or gauge used to pressure test the line.

Photo: File:Leader Pipes; Mott's Pipe Testing Plugs (NYPL b15260162-487565).jpg by Scan by NYPL, Public domain.

Phase 7: Insulate and close

1. Insulate hot lines in unconditioned space with foam sleeves. Insulate every pipe in an exterior wall or crawlspace.
2. Drywall, tape, and paint happen here. Plumbing stops until finish surfaces are done.
3. Tile and flooring go in. The toilet flange was set to finished floor height in Phase 3, so the tile setter works around it.

Phase 8: Trim out

Set the fixtures. Work from the heaviest and most buried to the lightest and most visible.

1. **Water heater.** Set on a stand or pan, connect water with flex connectors and dielectric unions if mixing copper and steel, install the expansion tank, run the T&P discharge to within 6 inches of the floor or outside, hook up gas with a flex connector and drip leg or electric with the whip. Fill it completely before power goes on, or the elements burn out in seconds.
2. **Tub and shower.** Set the tub in mortar if it is a one-piece. Hook the waste and overflow to the trap below. Install the trim on the mixing valve, the spout, and the arm and head.
3. **Toilets.** Wax ring or waxless seal, set, bolt, caulk the base leaving the back open, new supply tube from the stop.

4. **Vanities and kitchen sink.** Set the cabinet, drop in the sink, mount the faucet and the basket strainer or pop-up, hang the P-trap and tailpiece, stop valves on the stubs, supply tubes to the faucet.
5. **Disposal and dishwasher.** Disposal on the strainer flange, dishwasher drain into the disposal with a high loop or air gap, dishwasher supply from a dedicated stop.
6. **Washer box, ice maker box, hose bibs.** Handles on, caps off.
7. **Escutcheons** on every pipe that comes through a wall or floor.

Phase 9: Turn it on and test it like a customer would

1. Open the main slowly with every stop valve shut. Check the PRV reading.
2. Open stops one at a time and run each fixture hot and cold. Look under every sink with a flashlight and a dry paper towel while it runs.
3. Flush every toilet several times, run the tub to full and drain it, run the washer box drain with a hose to check the standpipe does not back up.
4. Fire the water heater and confirm hot at the farthest fixture within a few minutes.
5. Check that the main cleanout cap and all stack cleanouts are tight.
6. Pull the test plug on the sewer stub if you have not already, and make sure the tie-in coupling is dry.

Phase 10: Final inspection and hand-off

The inspector checks fixture setting, trap and tailpiece connections, T&P discharge, expansion tank, backflow protection on hose bibs, dishwasher air gap or high loop, and that the water heater is strapped or panned as required. Once signed off, leave the owner a drawing of where the main shutoff, PRV, cleanouts, and manifold are, and label the manifold valves if there is one.

How long and how much

Item	Typical number
House size	2 bath, 1 kitchen, about 1,500 square feet, walls open
Rough-in time	3 to 5 days, one plumber and one helper
Trim-out time	1 day, after finishes are done
Supply material	A few hundred dollars in PEX and fittings
DWV material	\$800 to \$1,500 in PVC and fittings
Water heater and fixtures	Whatever grade the owner picks
Plumber labor, Birmingham market	\$8,000 to \$15,000 before fixtures and before any sewer dig in the yard

Demo days and inspection waits add to the calendar but not much to the labor.

The phases at a glance

Phase	What happens	What must be true before the next phase
0 Plan	Count fixtures, camera sewer, check pressure, permit, isometric, order material	Permit in hand, material on site
1 Shut down	Main off, gas off, heater and fixtures out, walls open	House drained
2 Demo	Old supply out, old drain out, sewer stub capped, framing fixed	Clean stud bays
3 DWV rough	Building drain, stacks, toilet, branches, vents, roof, glue, hang, test	DWV holding water or 5 psi
4 Supply rough	Service, main and PRV, trunk or manifold, heater stubs, fixtures, valves, crimp, test	Supply holding 100 psi
5 Gas	Black iron or CSST, drip legs, test, bond	Gas holding test pressure
6 Rough inspection	Inspector sees all three tests standing	Green tag
7 Close	Insulate, drywall, tile, floors	Finished surfaces
8 Trim	Heater, tub, toilets, sinks, disposal, boxes, escutcheons	Every fixture connected
9 Test	Run everything, look under everything	No drips
10 Final	Inspector signs off, owner gets a drawing	Job closed

Check yourself

1. Why does the drain pipe go in before the supply pipe?
2. What do you camera before the job starts, and why does it matter for the price?
3. Why do you support a cast iron stack before cutting it?
4. What is the first fixture located in a bathroom rough-in, and what number sets its position?
5. What does the inspector want to see standing at the rough-in inspection?
6. What is the difference between trunk-and-branch and manifold supply?
7. What has to happen to a water heater before the power goes on?
8. Name four things the final inspector checks.

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