plumbing for greywater

october 2015

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plumbing for greywater

- basic parts of a drainage system
- identifying the correct drain pipe
- where to cut in the three way valve
- how to cut the pipe to install the three way valve
- how to connect the three way valve
- new greywater piping from the three way valve to the garden
drainage system

- gathers together wastewater from all fixtures in the building

- a “fixture” is a toilet, sink, tub, shower, washing machine... where freshwater enters and wastewater flows away

- size of drain piping is determined by volume of wastewater flowing through it

- 1/4” per foot “slope” or “grade” for optimal gravity flow and removal of solids

- a single large drain carries wastewater out of the building to join the sewer and flow by gravity to the sewage treatment plant, or to a private septic system
basic parts of a drainage system

• fixture
• trap
• trap arm
• vent
• drain
• sewer
traps

- required at each fixture
- hold water creating a “water seal”
- prevent sewer gases and vermin from entering building
vents

• every trap must have a vent
• prevent siphoning of trap seal
• extend through roof to outside air
• allow air to equalize pressure in drain/sewer system
• prevent explosive build up of gases
drains: sized according to fixture/s they serve

- toilets: 3” or 4” drain pipe

- bathroom sinks: 1-1/4” or 1-1/2” trap and drain

- kitchen sinks/laundry sinks: by code 1-1/2” trap, 2” drain*

- bathtubs: 1-1/2” trap, 2” horizontal drain*

- showers: by code 2” trap and drain*

- washing machines: 2” trap and drain

* older buildings may have undersized drains for these fixtures
drain materials: in older buildings often main/toilet drain will be cast iron, smaller drains will be copper, galvanized steel, or ABS
drain materials
and method of connection

2” ABS plastic glued joints

2” no hub cast iron joined with no hub bands

1-1/2” copper DWV soldered joints

1-1/2” galvanized steel threaded joints with Durham fittings

(lead cast iron not shown)
DWV ("drain waste & vent") copper drain lines have yellow stripes. Copper water tubing has red, green, or blue stripes and thicker walls. Be careful not to cut a water line!
toilet drains

- convey fecal matter which creates blackwater, NOT greywater
- always minimum of 3” ID, minimum 2” vent
- typical materials: cast iron or ABS (rarely copper or galvanized)
- vent may be of different material than drain
- older buildings often have 4” cast iron stack continuing up through roof, with 4” closet bend to toilet
toilet drain: 4” cast iron

closet bend up to toilet

4” vent up

closet bend

4” vent up

up to toilet

toilet drains have no visible trap because trap is inside the toilet
toilet drain: 3” ABS

“lo heel 90” with 2” vent

3” up to toilet

3” ABS drain pipe
trap location:
sinks typically exposed above the floor
tub/showers below the floor
toilet trap is inside the toilet
washer trap is inside the wall
washing machine drain:
2” ABS trap in the wall above the floor

in older homes laundry tray may have been removed and a standpipe added to the 1-1/2” trap outside the wall
locating the shower drain

side view of typical shower pan

shower drain: 2” ABS, (1-1/2” in older homes)
trap is visible underfloor
locating the shower drain

shower drains from under the floor
locating the tub drain:
trap and waste and overflow are visible underfloor
locating the tub drain

1-1/2” Durham trap with galvanized steel trap arm

1-1/2” ABS trap and trap arm, 2” greywater drain
visible brass waste and overflow attached to tub, galvanized tailpiece, durham p-trap, galvanized trap arm
identifying the correct drain for greywater

- review location of fixtures upstairs so you can estimate which plumbing belongs to which fixture underneath floor

- by size: smaller than 3” (3”+ pipes will likely carry toilet waste)

- by visible trap underfloor: shower or tub

- by temperature: run hot water in the fixture whose drain you are trying to identify, feel whether that drain gets hot

- 2” toilet vent can be confused with 2” washer or sink drain
which pipe is the right pipe?

not sure? run hot water at the fixture you want to trace
where to cut in the three way valve

- greywater line only (less than 3”), not blackwater (3” or 4”)
- to code: diverter valve must be downstream from the vent
- in trap arm is not to code
- adequate space to fit 3-way? (greywater drain may join blackwater line too quickly
where to cut into it adequate space? or does greywater join blackwater too quickly
three way valve under sink

correctly installed in the greywater drain line "downstream" from the vent

not in the trap arm
valve correctly installed downstream from the vent
not in the trap arm
• **ABS/PVC**: tubing cutter (wheel for plastic), sawzall, handsaw

• **galvanized**: sawzall, hacksaw

• **copper DWV**: tubing cutter (wheel for copper), sawzall, hacksaw

• **cast iron**: snap cutter, sawzall (diamond blade), grinder with very thin wheel
connecting the three way valve

• ABS glue: 1-1/2” ABS pipe glues into valve hub; 2” ABS coupling glues over outside of valve hub

• transition couplings join dissimilar materials or sizes

• no-hub couplings join “like” materials to each other

• all rubber “slip” couplings slide up or down pipe for ease of installation—sometimes essential when old 2” cast iron is slightly different diameter than 2” valve hub

• make certain the three way valve has inlet “set” to correct side

• provide instructions to homeowner re direction of flow
connecting the three way valve

2” ABS coupling
  glues ABS valve to 2” ABS pipe

2” no hub coupling
  (removable/adjustable) connects ABS to ABS

2” Fernco slip coupling (may not be approved)

2” transition coupling
  connects 2” ABS valve to dissimilar material/size

nut driver
torque wrench
“transition couplings”

transition from one pipe size or material to another by varying thickness of rubber band

CP 200: 2” cast iron plastic or steel to 2” plastic or steel

CP 215: 2” cast iron plastic or steel to 1-1/2” cast iron plastic or steel

CK 115: 1-1/2” cast iron plastic or steel to 1-1/2” copper
2” ABS coupling glues onto hub (hub “OD” is same as 2” pipe)

2” rubber slip coupling fits over hub

1-1/2” ABS pipe glues into hub (1-1/2” pipe “OD” is same as hub “ID”)
three way valve cut into 2” cast iron shower drainpipe transition couplings connect 2” cast iron to 2” ABS valve hubs
three way valve with electronic “actuator”: transition couplings connect 1-1/2” DWV copper shower drain to 1-1/2” ABS pipe stubs glued into valve hubs

or a 2” ABS x 1-1/2” copper transition coupling could have been used
backflow prevention protects diverter valve from potential blackwater backup (sometimes required)
a backwater valve with cleanout is the approved fitting
images of the valve handle in “to garden” or “to sewer” positions can be laminated and posted near the valve as required by code
~greywater piping to garden must have continuous 1/4” slope
~be able to pass over or go through perimeter foundation
piping from the three way valve to the garden

- ABS pipe: 1-1/2” (or 2” for shower if permit requires it)
- correct fittings
- proper support
- necessary slope
- cleanouts
- testing
correct ABS fittings : terminology

• OD (outside diameter) vs ID (inside diameter)

• male / female (anatomically correct)

• hub/spigot/street

• sweep/radius

• direction of flow

• elbows/bends

• tees/branched fittings
terminology:
- hub
- OD
- ID
- inside diameter
- outside diameter
terminology: hub/ spigot/ street

a hub can receive:
~the end of a pipe
~the “spigot” end of a “street” fitting
terminology: sweep / radius

- sweep determines allowed direction of flow

- vent 90 has no sweep used for air only in any position

- sanitary “short sweep” 90 used with flow horizontal to vertical only

- long sweep 90 (quarter bend) used in any position
terminology: direction of flow

vent fittings:
no sweep=not for liquids
used to convey air only

sanitary (“short sweep”) fittings:
used only where flow is horizontal to vertical

short sweep 90 / sanitary tee
vertical flow must enter horizontal flow on a 45 degree angle (horizontal to horizontal also)

wye + street 45 = “combination”

“combination”

sanitary tee not allowed

long sweep 90

short sweep 90 not allowed
ABS tees/ branched fittings/ elbows/ bends

wye combination long sweep sanitary tee bends: named by
(wye + 45) 90 (short sweep)

SS 90 60 45 22
degrees from straight or fraction of a circle--
quarter, sixth, eighth...
naming branched fittings

• name run size (larger end first if a reducing fitting) then branch size
• then type of material and name of fitting

• example:
• 2” x 1-1/2” x 1-1/2” sanitary tee ("two by inch and a half by inch and a half ABS sanitary tee")
“double ells” for branched drain systems:

- For permitted shower greywater, the main must be 2” ABS all the way to the first double ell (2” pipe in, 1-1/2” out both sides).
- Continuing from there, piping can be 1-1/2” ABS using 1-1/2” double ells (“twin ells”/“double 1/4 bends”).
- To create a “cleanout” to monitor flow, drill a hole in the top of the double ell ~tap (make threads) with a metal nipple ~thread in a PVC cap, or use a cork.
proper support for ABS pipe

- support every 4’
- ABS perforated plumbers tape (not for hanging pipe)
- official ABS rigid pipe hangers several styles
- plastic electrical two hole straps
- plastic pipe must be protected with 10 mil tape if metal strapping is used
proper support

rigid pipe straps hold pipe straight

maintain precise grade/slope

protect in earthquake from side to side movement and uplift

look professional

easy to set 1/4” per foot slope: 1” difference in length of rod every 4’
proper hangers prevent pipe from moving up or down when hanger rod isn’t long enough a 2x4 can be added
necessary slope

- 1/4” per foot

- types of levels: torpedo, 2’, 4’

- calibrate using block of wood

- some have lines indicating 1/4” per foot grade
cleanouts

• required every 100 ft.

• when aggregate number of bends adds to 135 degrees

• must be accessible

• use the plug in the double ell as a cleanout

use a sanitary tee and cleanout where greywater exits the building--this opening can be used to test and flush the system
testing

• at minimum do a running test

• check for leaks under the house

• defects in materials can leak

• bands not tight, cast iron too rough to seal?

• wait manufacturer’s recommended length of time for glue to set before testing
thank you for caring about our water