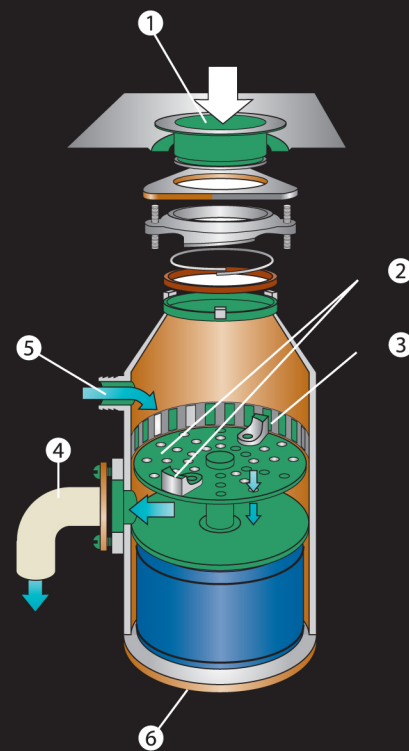
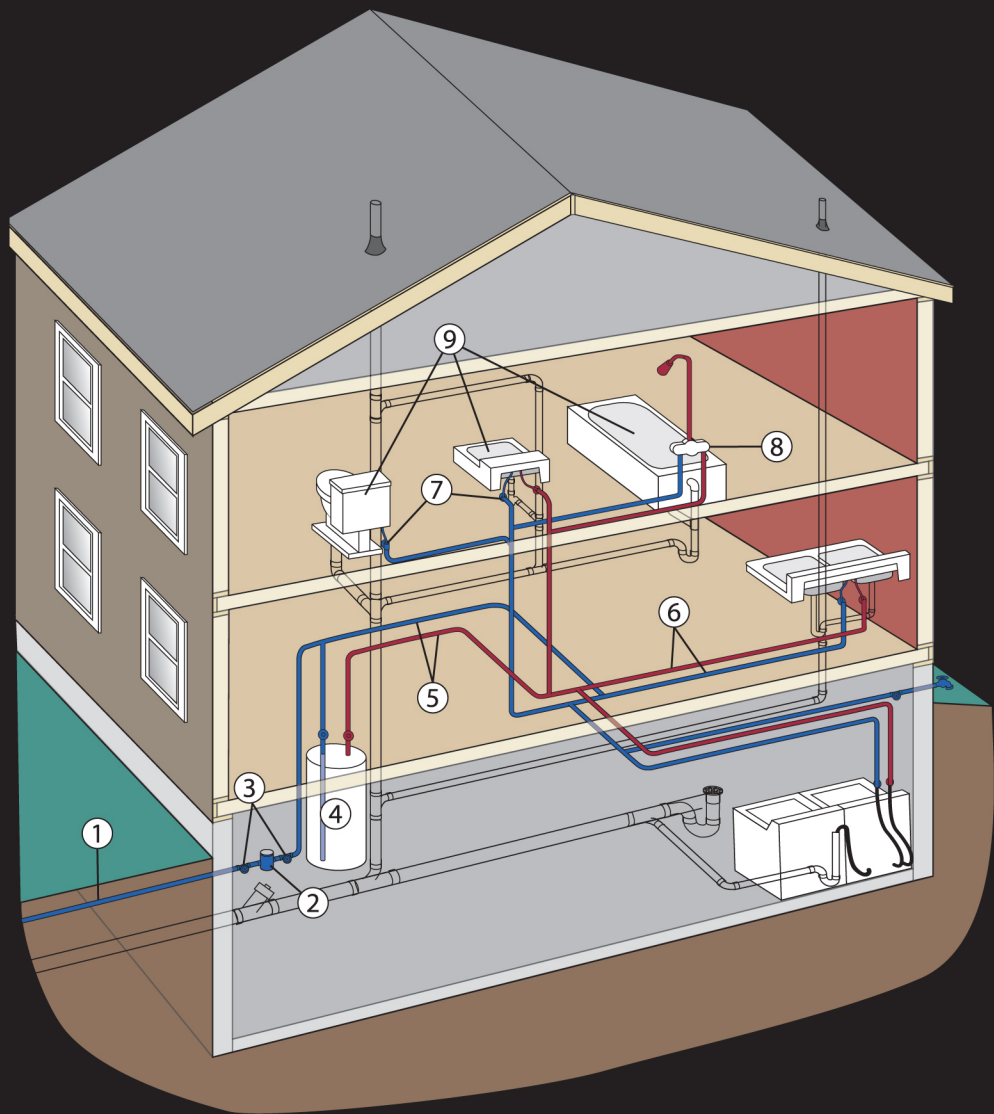
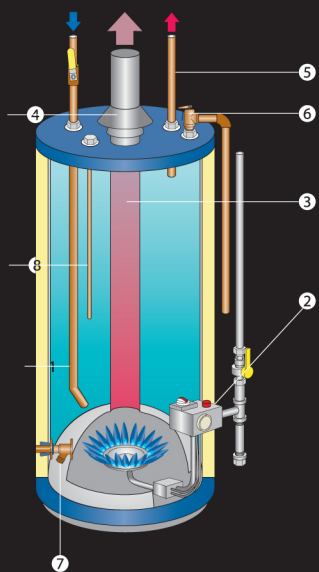


UPDATED & EXPANDED

HOW YOUR HOUSE WORKS

A Visual Guide to Understanding and Maintaining Your Home



CHARLIE WING

RSMeans

HOW YOUR HOUSE WORKS

Charlie Wing

RSMears



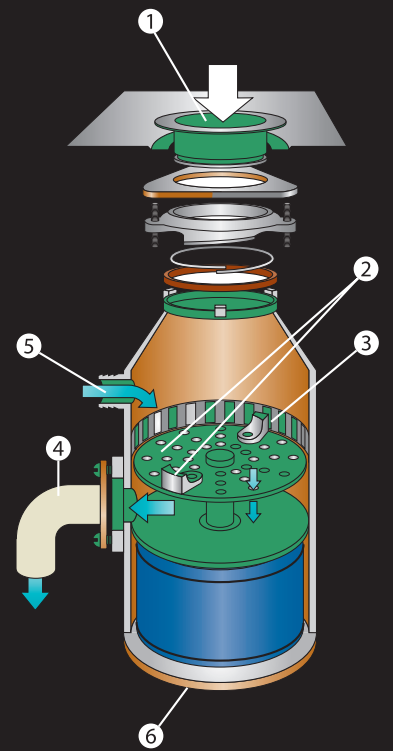
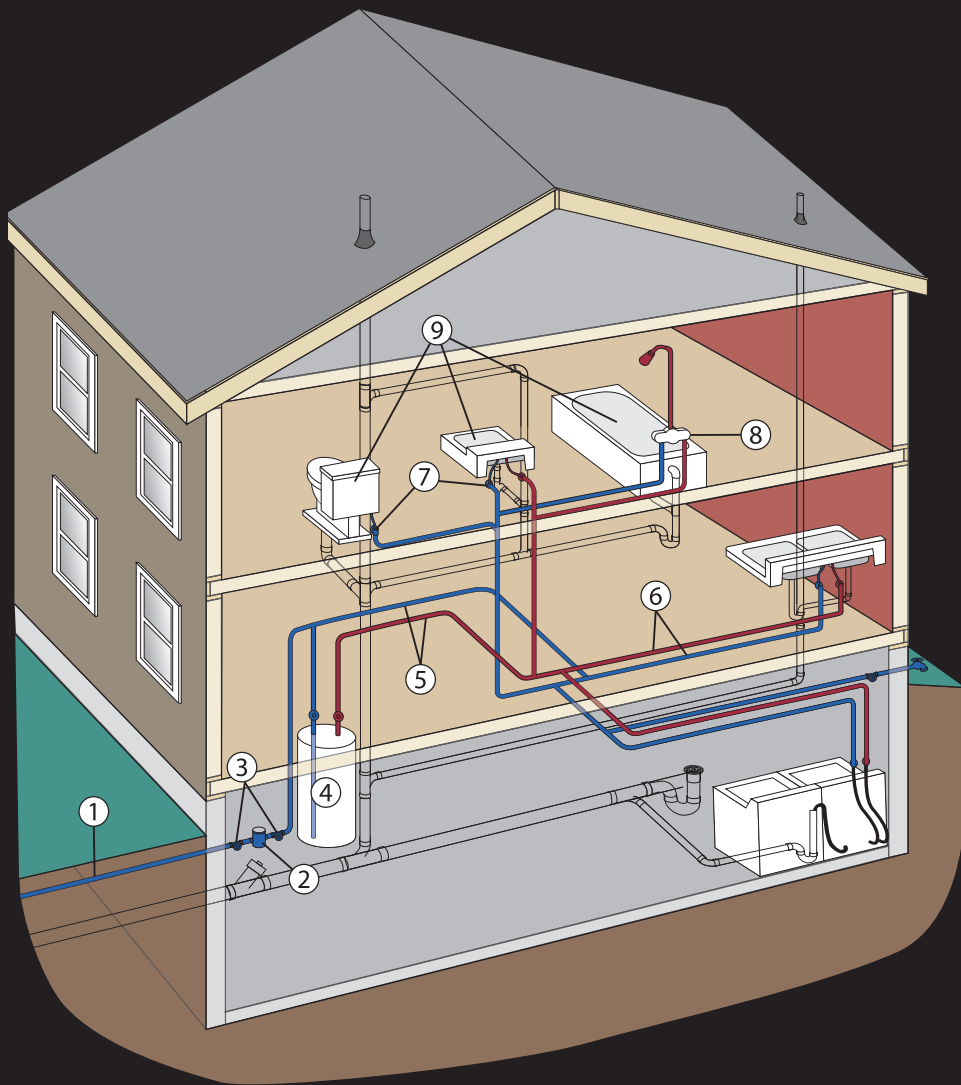
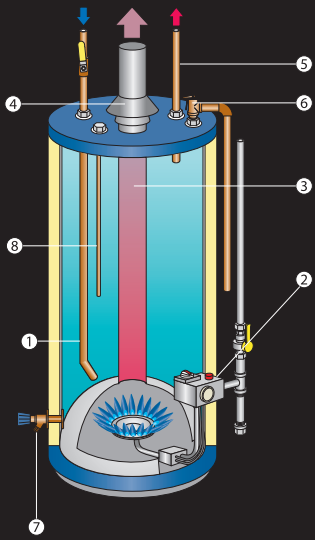
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CHARLIE WING

RSMeans

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Published by John Wiley & Sons, Inc., Hoboken, New Jersey

Published simultaneously in Canada

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Library of Congress Cataloging-in-Publication Data:

Wing, Charles, 1939-

How your house works : a visual guide to understanding & maintaining your home / Charlie

Wing. -- 2nd ed.

p. cm. -- (RSMMeans)

Includes index.

ISBN 978-1-118-09940-7 (pbk.); ISBN 978-1-118-28549-7 (ebk); ISBN 978-1-118-28580-0 (ebk); ISBN 978-1-118-28607-4 (ebk); ISBN 978-1-118-28616-6 (ebk); ISBN 978-1-118-28736-1 (ebk); ISBN 978-1-118-28737-8 (ebk)

1. Dwellings--Maintenance and repair. I. Title.

TH4817.W56 2012

643'.7--dc23

2011046745

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

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INTRODUCTION

This book offers a unique approach to home improvement, maintenance, and repair. It describes how virtually everything in a house is put together, and how each item functions – from plumbing to electrical, heating and air conditioning, appliances, doors and windows, and even the home’s foundation and wood framing.

The key to the book is the easy-to-understand, see-through drawings. Each one is backed up by clear, brief explanations from a nationally known home improvement expert. It’s a formula for a quick understanding of what you’re dealing with when troubleshooting a problem, talking to your repairman, or planning your new home, addition, or remodeling project, and selecting new fixtures, appliances, or materials.

The illustrations show how the components of a system fit together and how each item is intended to function – whether it’s an air conditioner, a hot water heater, the foundation, or a faucet. The author breaks down the workings of all of the plumbing, electrical, and heating/air conditioning systems, and other house parts, and shows not only what the parts look like and how they interact, but the sequence in which things work. Even complex systems are explained in simple terms and diagrams.

Throughout the book, you’ll also see “Before Calling for Help” boxes – guidance on simple things to check, in many cases solving the problem quickly and inexpensively without having to hire a repairman. If you do find that you need a contractor or serviceman, the book will help you understand your options and be better informed about having the correct elements installed or replaced.

Maintenance tips and other helpful guidance throughout the book will help you keep your home running smoothly.

Not only homeowners, but handymen and contractors will benefit from the easy-to-interpret information presented here, especially for getting up to speed on items that are not their specialty.

If you would like the confidence of knowing more about how your house works and what to do if something breaks down, read this book. It just may change your life.

***Note:** This book is intended to provide useful information for understanding the systems, fixtures, and appliances in a house, but it is not a substitute for professional construction, engineering, or repair evaluations, recommendations, or services. Readers should obtain assistance from appropriate experts, as needed.*

ABOUT THE AUTHOR

Charlie Wing is a nationally recognized home improvement/repair expert. He has written or co-written more than 20 books on these topics, including Home Depot's *Decorative Painting, Tiling, and Plumbing 1-2-3* books, *Better Homes & Gardens' Complete Guide to Home Repair*, Taunton Press's *The Visual Handbook of Building and Remodeling*, Reader's Digest's *The Big Book of Small Household Repairs*, and many others, including *Ortho's Home Improvement Encyclopedia* and *How to Build Additions*.

An MIT PhD, Charlie has been a guest more than 400 times on home improvement radio and television shows, including on the Discovery Channel, PBS, and NBC's *Today Show*. He developed and hosted a national PBS series on home remodeling for energy efficiency. He was founding and technical editor for *Smart Homeowner* magazine from 2001 to 2004.

A NOTE FROM THE AUTHOR

After observing neighbors, friends, and family through decades of home ownership, I'm convinced that most of today's homeowners live in a perpetual state of anxiety. The log cabin with a privy, a fireplace, and a bucket for hauling water has been replaced by homes with sophisticated wiring, plumbing, and appliances. What happens if something goes wrong?

No wonder we live in fear. While school has taught us math, foreign languages, and computer sciences, most of us have no idea how our furnace, refrigerator, or even kitchen faucet works. This is an expensive omission in our educations. In metropolitan areas, the minimum charge for a plumber or appliance repairperson to come to your home is about \$150. In fact, repair services are now so expensive that the leading consumer magazine recommends replacing, rather than repairing, appliances over five years old.

Why don't more people attempt simple repairs themselves? Because they're convinced that only professional tradespeople have the required tools and special knowledge. The truth, however, is the opposite. Let me tell you my favorite home repair story.

A few years back, I was visiting a friend who happened to own a plumbing repair service. His considerable success was built on the promise that a repair would be accomplished the same day, or the repair would be free. He had built a fleet of 75 trucks and licensed plumbers on that simple promise. The promise also allowed him to charge a minimum of \$150 just for showing up.

During my visit, my friend's dishwasher began making a strange whirring sound. Convinced that the sound indicated an impending complete breakdown, he called the repair center listed for the brand.

A day later the doorbell rang, and there appeared an appliance repairman with an intimidating tool belt and service manual the size of the New York City phone book. Before starting repairs, he informed my friend he would have to sign a work order agreeing to a minimum charge of \$150, regardless of the problem or the success of the work.

That agreed to, my friend said, “The dishwasher makes a weird whizzing sound, like the motor bearings are gone.”

Without a word, the repairman plucked a simple Phillips screwdriver from his tool belt and unscrewed the perforated cover of the dishwasher’s drain. He reached in with two fingers and plucked out a pistachio shell. “Here is the culprit,” he beamed.

He replaced the drain cover and turned on the machine. The noise had disappeared. “That will be \$150,” the serviceman said.

Now what enabled the serviceman to go so directly to the problem? First, he understood how a dishwasher worked—that, for example, it had a drain and a pump impeller to circulate water. Second, he knew from experience that well over half of all appliance “repairs” involve tightening a loose connection, adjusting a screw or knob, or removing a foreign object.

When you go to a doctor with a complaint, the result is most often the same. The doctor has studied anatomy. He or she knows what is inside you and how your different parts relate. Most often the prescription is, “Go to bed, stay warm, and drink lots of water,” not, “I think we’d better replace your heart.”

These two principles: that repair requires understanding how things work, and that many repairs are surprisingly simple, are what led me to create this book. I hope that it saves you many times \$150 and relieves some of your homeowner anxiety.

1

PLUMBING

If you are like most homeowners, the maze of hot and cold supply pipes and waste pipes in your basement resembles nothing more meaningful than a plate of spaghetti. This chapter will show you that, in fact, your house contains three separate systems of pipes, all making perfect sense.

Understanding their purpose and how each one works will enable you to decide which projects are in the realm of a homeowner, and which ones require a plumber. If you're planning to build a new home or do major remodeling, this chapter will also help you to visualize the plumbing requirements, and how they'll fit into your space.

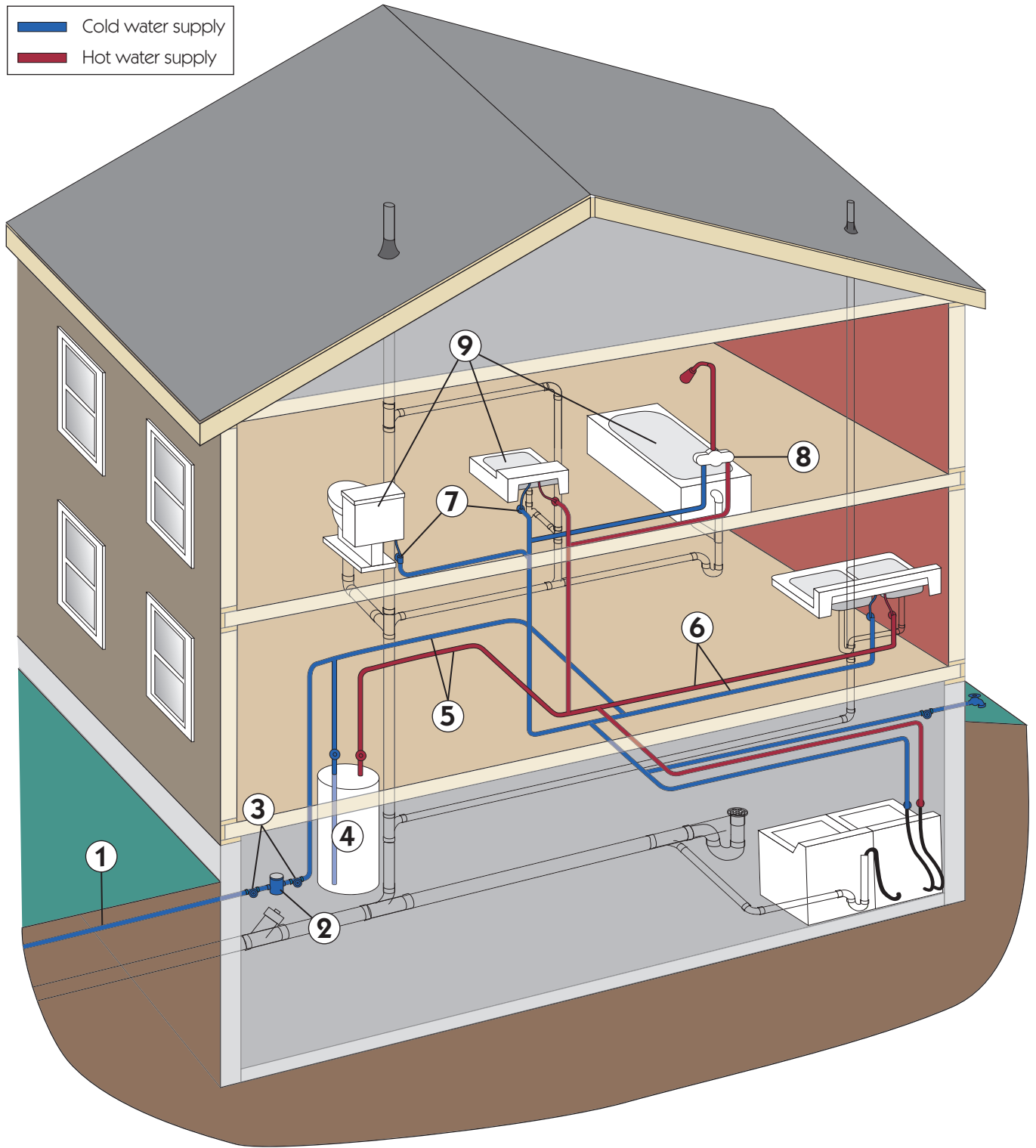
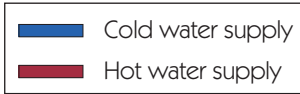
A visit to the plumbing aisle of your local home center will show you that do-it-yourself plumbing repair has never been easier. There you will find kits, including illustrated instructions, for just about every common repair project.

Plumbing is not dangerous, unless you're dealing with gas pipes. In fact, call a licensed professional if your repair or installation involves any change to existing gas piping. But plumbing mistakes can be damaging to the finishes and contents of your home, just by getting them wet. The force and weight of water are also something to be reckoned with, if many gallons flow where they should not. Before starting a project involving the supply system, locate the shut-off valve for the fixture you're working on. If you can't find one, shut off the main valve where the supply enters the house.

1

PLUMBING

The Supply System



How It Works

The supply system is the network of pipes that delivers hot and cold potable water under pressure throughout the house.

1. Water enters underground from the street through a $\frac{3}{4}$ " or 1" metal pipe. In houses built prior to 1950, the metal is usually galvanized steel; after 1950, copper. In the case of a private water supply, the pipe is usually polyethylene.

2. If you pay for water and sewage, your home's usage is measured and recorded as the water passes through a water meter. If you find no meter inside the house, one is probably located in a pit between the house and the street. You can monitor your consumption, measured in cubic feet, by lifting the cap and reading the meter.

3. Next to the water meter (before, after, or both), you will find a valve, which allows shutting off the water supply, both cold and hot, to the entire house. If you have never noted this valve, do so now. When a pipe or fixture springs a leak, you don't want to waste time searching for it.

4. Water heaters are most often large, insulated, vertical tanks containing from 40 to 120 gallons. Cold water enters the tank from a pipe extending nearly to the tank bottom. Electric elements, a gas burner, or an oil burner heat the water to a pre-set temperature. When hot water is drawn from the top, cold water flows in at the bottom to replace it.

If the home is heated hydronically (with circulating water), the water heater may consist of a heat-exchange coil inside the boiler, or it may be a separate tank (BoilerMate™) heated with water from the boiler through a heat exchange coil.

Wall-mounted tankless water heaters provide a limited, but continuous, supply of hot water through a coil heated directly by gas or electricity.

5. Supply pipes—both cold and hot—that serve many fixtures are called "trunk lines," and are usually $\frac{3}{4}$ " in diameter. Pipes serving hose bibbs and other fixtures with high demands may be $\frac{3}{4}$ " as well.

6. Pipes serving only one or two fixtures are called "branch lines." Because they carry less water, they are often reduced in size to $\frac{1}{2}$ " and, in the case of toilets, $\frac{3}{8}$ ". Exceptions are pipes serving both a shower and another fixture.

7. Every fixture should have shutoff valves on both hot and cold incoming supplies. This is so that repairing the single fixture doesn't require shutting off the entire house supply at the meter valve.

8. A pressure-balanced anti-scald valve or thermostatic temperature control valve prevents the hot and cold temperature shocks we have all experienced when someone suddenly draws water from a nearby fixture. They are not inexpensive, but they provide insurance against scalds and cold-water shocks, which may trigger a fall in the elderly.

9. "Fixture" is the generic plumbing term for any fixed device that uses water.

Drain pipes are sized according to the rate of flow they may have to carry. One fixture unit (FU) is defined as a discharge rate of one cubic foot of water per minute. Plumbing codes assign bathroom sinks (lavatories) 1 FU, kitchen sinks 2 FU, and toilets (water closets) 4 FU.