The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance.

# HAVING A GOOD **HOT** **WATER** SYSTEM...

... and a few other thoughts on creating  
durable and efficient construction

# A bit about what I have to share

In 2006 I finished building my dream home. It gave me an opportunity to test some ideas on efficiency, saving money, and durability.

Also I've worked with hot water in different ways since 1978, so hope to have some useful info for you. Let's start with hot water...



# Delivering Hot Water

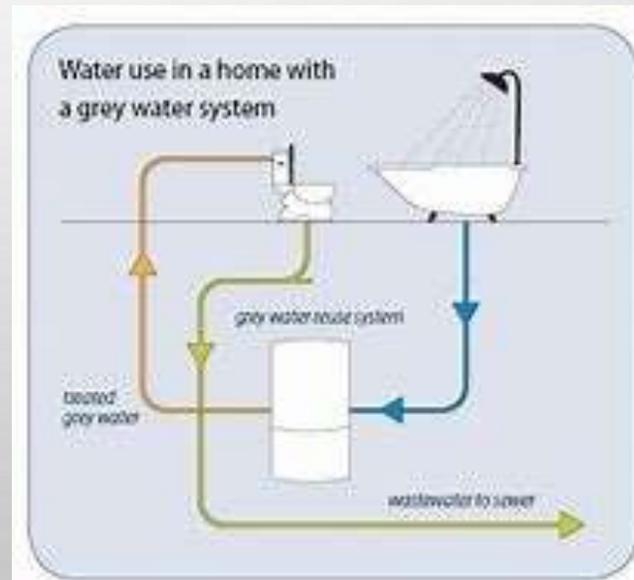
*How do you get the best service while saving time, money, energy, and water?*

1. Fixtures and Appliances – hot water really needed? What flow rate?
2. Plumbing Systems – conventional, home run, demand recirculation?
3. Preheating – using found or waste heat?
4. Preheating – solar thermal, or solar electric?
5. The Hot Water Maker – tank, tankless, hybrid?



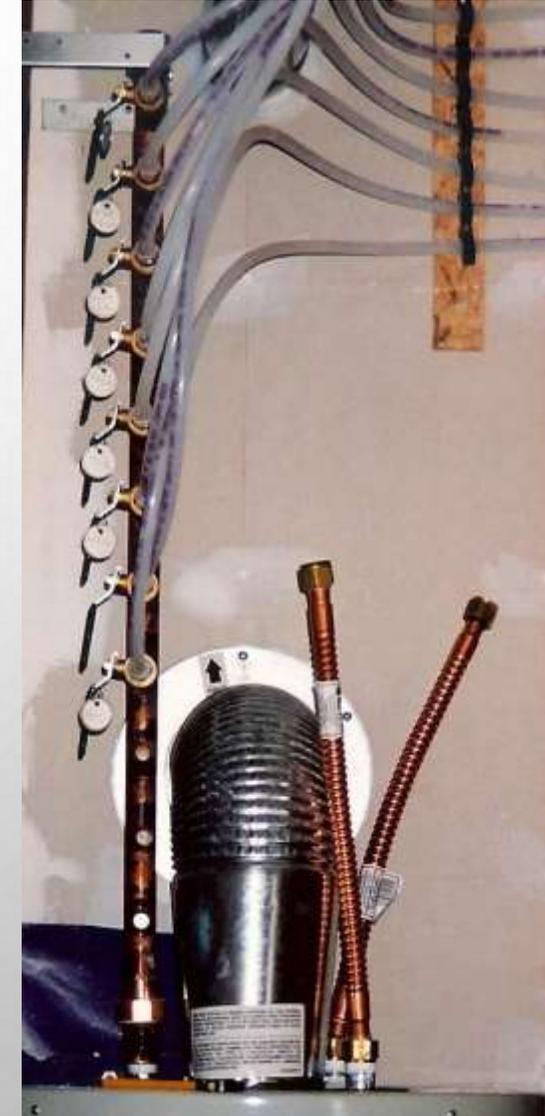
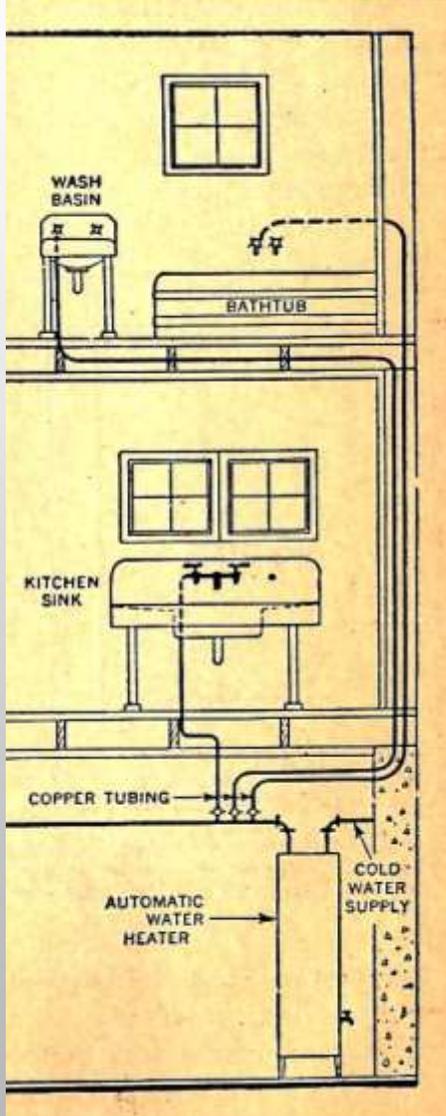
# 1. Fixtures and Appliances

- Some appliances may not need piped hot water
- Low-flow showerhead and aerators have gotten better
- Consider separate grey water piping
- “Water recycling shower” saves 70% water and energy



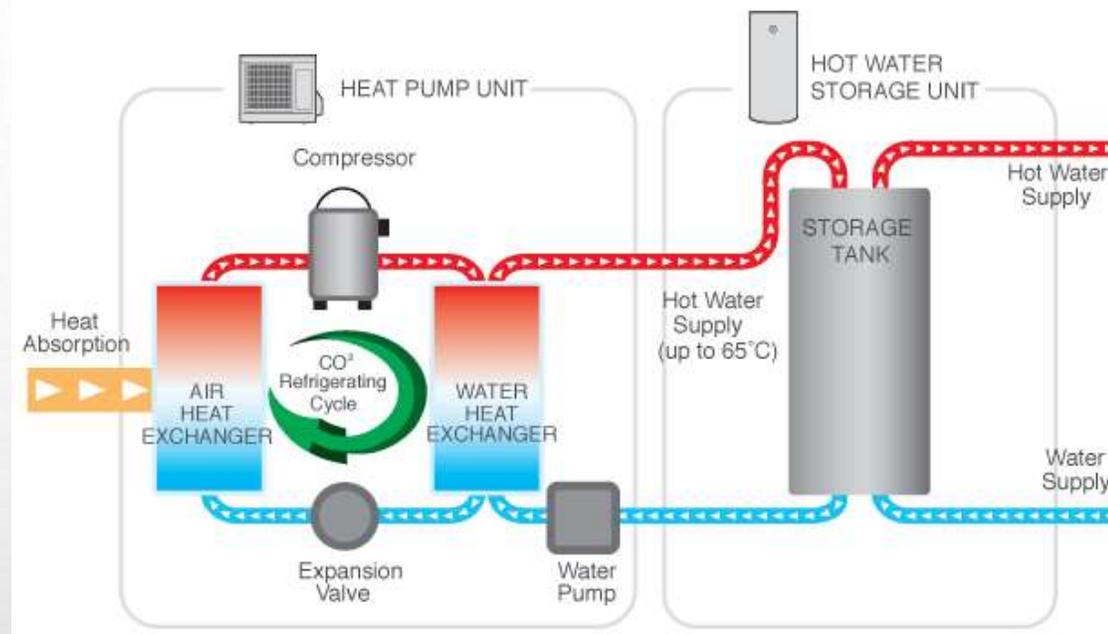
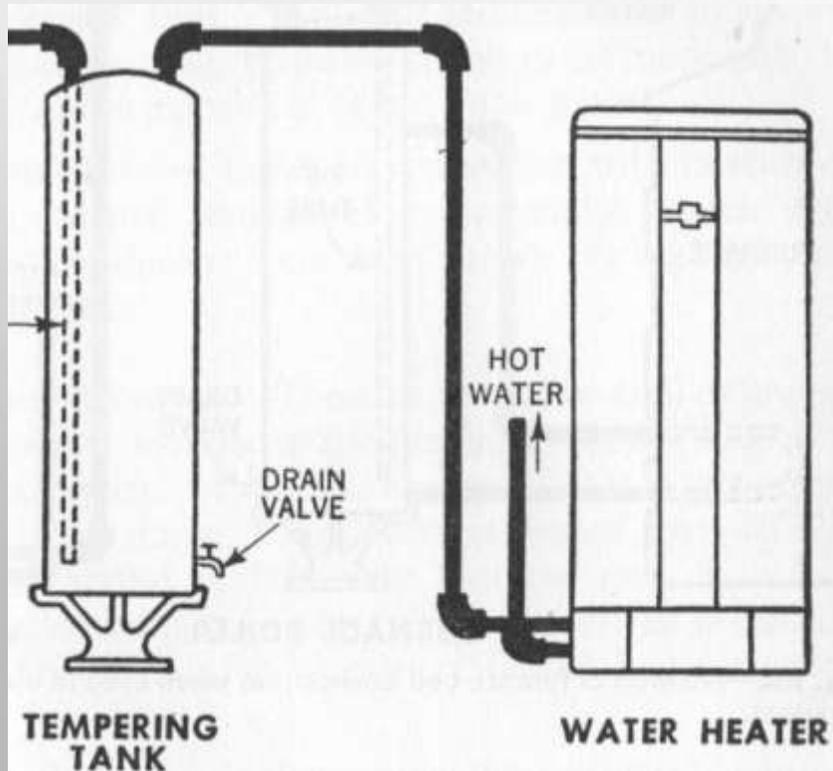
# 2. Plumbing Systems

- Trunk and branch is the norm, but...
- Manifold system, done well or not
- Central core, a variation of manifold
- Recirculation, good and bad – demand vs 24-hour

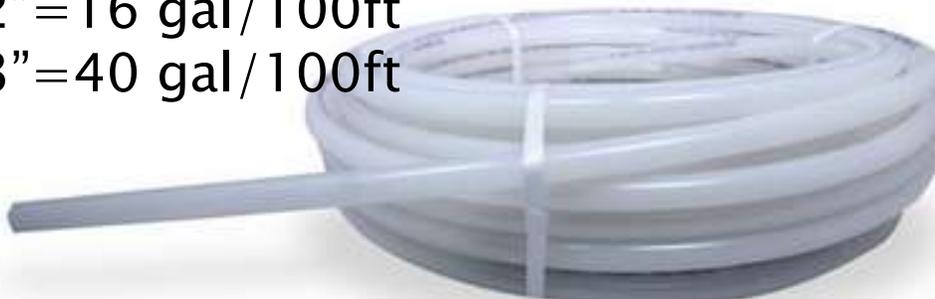


# 3. Preheating, Using Found Heat

- Equipment room, warm attic
- Tempering tank
- Shower heat exchanger
- Waste heat from AC

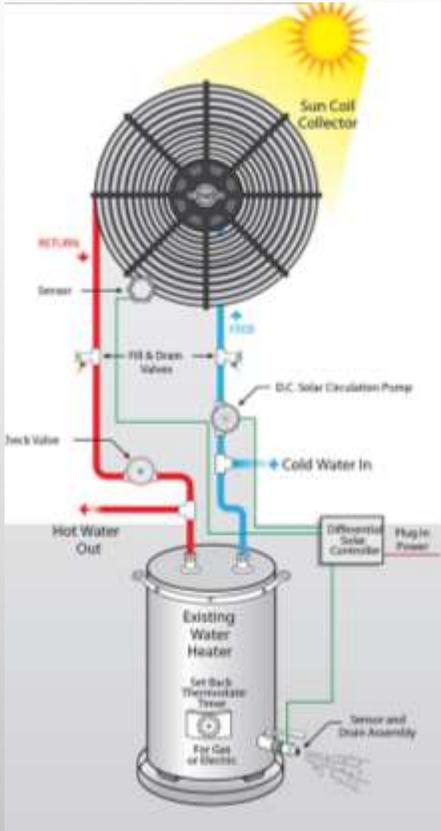


2" = 16 gal / 100ft  
3" = 40 gal / 100ft



# 4. Preheating, Solar Thermal & Electric

- You have choices! Thermal with backup, one or two tanks, PV with heat pump or direct electrical resistance.



# 5. The Hot Water Maker



- This is the first thing people look at, but should be last when making things efficient.
- I'm a fan of simplicity. Complex tech sadly, isn't durable.
- If loads are reduced and you have solar assist, even direct electric resistance heating is OK.
- Hybrid water heaters=small tank+big heat source.
- Then there are heat pump water heaters... and they are still improving.



# Other Useful Tidbits on Construction and Stress Reduction



*From this...*



*...to this!*

- Construction can (will) be stressful... design your project so everyone has the same incentives and goals. We don't want finger-pointing!
- Only work with people who are flexible and know how to listen.
- Make sure everyone you hire has a good relationship with the building dept.
- Don't leave the job for long periods. Better work and fewer surprises happen.
- The more you know about the work, the better. Just-in-time learning.
- The more planning and attention to detail up front, the smoother the job.
- Seldom look at the entire job. Focus on the task at hand. Helps with sanity.

# For More Information...

... I have a website,  
[larryweingarten.com](http://larryweingarten.com)  
that offers up lots of  
ideas and resources,  
*along with the odd cat.*



A resource for becoming self-sufficient by making homes work better.

