Home Components

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Concepts

- Foundations and Earthquake Retrofitting
- Roofs and Roof Maintenance
- Plumbing Concepts
- Water Heaters and Water Heater Safety
- Handrails and Guardrails
- Heating and Heating Maintenance
- Electrical and Electrical Safety
- Siding and Siding Maintenance
- Tying it all together.
Foundations

There are two basic types of foundations

- Slab Foundations
- Raised Foundations
Slab Foundations

Though slab foundations are basically concrete pads that support a building...
Raised Foundation

Raised foundations are the kind one can crawl in.

- Anchor bolts embedded in the concrete
- Concrete footing and stem wall
- Concrete footings to support the center of the floor
Raised Foundation – Cont.

Once the concrete dries, the foundation gets a sill plate and anchor bolts.
Raised Foundation – Cont.

Next, the cripple wall is built.
Anchor Bolt

This graphic is offered for a better look at a stem wall, footing, sill plate, and anchor bolt.
Cripple wall

Some raised foundations have floors right on top of the sill plate. Some have cripple walls.

![Diagram of a cripple wall with labeled parts: The Floor Goes Here, Anchor Bolt, Sill Plate, Stem Wall, Footing, Cripple Wall, Reinforcement Bar.]
Where the cripple wall lives
Earthquake Retrofit

Basic earthquake retrofit measures strengthen the cripple wall.

- Plywood aka Shear Wall
- Blocking
- Connectors at the floor joist
- Lots of nails
The Hardware
Alternative to an anchor bolt
Monitor Foundation Cracks

Typical foundation cracks on older homes

Sub area view

Exterior view
Roofs

There are two main types of roofs
1. Flat Roofs = a slope less than 2/12
2. Pitched Roof = a slope more than 2/12

What is slope?

Pitch or slope is the Rise over Run. Take the picture on the right. If for every 12 feet of “run” the roof “rises” 4 feet, we have a 4/12 roof.
Pitched Roof

Pitch roofs typically consists of shingles. Shingles are like little umbrellas passing the drip onto the next umbrella until the drip falls off the roof.

Overlapping shingles keeps the water moving off the building.
Shingled roofs are like umbrellas
There are wood shingles, tile shingles and composition shingles. The latter is most common.

- **Wood Shingles**

- **Tile Shingles**

- **Composition Shingles – Most Common**
The Composition Roof

- Shingles
- Roof Deck
- Roofing/Building Paper
Roof Flashing

Roof flashing are often metal pieces that help water flash off the roof around penetrations or roof shape changes.
Flashing

Flashing around a skylight

Step Flashing
Flashing

Step flashing and kick-outs

Kickout Flashing

Step flashing

Kickout flashing

Underlayment

Drip flashing

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Edge Flashing

Flashing is used to prevent damage to the edges of the roof deck.
Flat Roofs Are Like Pond Liners

Flat roofs are designed for water to pool on it like a pond.
Flat Roofs

Because flat roofs can pool water, they have to be as water proof as a pond liner. A common flat roof is a Built-Up Roof.

3-Ply Built-Up Roof (BUR)

Inter-ply bitumen must be installed in a continuous firmly bonded film with no voids between the plies of material. Approximately 25 lb. of asphalt per square is req’d. The temperature must be maintained at the proper range for the specific type of asphalt.
Common BUR = Tar and Gravel

- **Roof Deck**
- **Three layers of paper and asphalt**
- **Gravel protects the asphalt from sun damage**
Modified Bitumen

Modified bitumen consists of rubberized asphalt sheets.
Roof Maintenance

Keep debris off roof, gutters, scuppers.
Roof maintenance

In addition to keeping off debris, cut back vegetation.
Seal Flashing

Sometimes caulks and mastics are used to seal roof components. They dry out and need touch up.
Roof to wall sealant

Open roof to wall joint
Keep gutters clear of debris

Clogged gutter soaking the edge of the roof
Keep gutters clear of debris
Keep downspout drainage clear
Brake for Downspouts
How does plumbing work?

1. Cold water comes in and serves the cold water supply.
2. Some of the cold water goes to the water heater and that supplies the hot water.
3. Waste water goes to the sewer.
4. Sewer gases are vented to the atmosphere.
**Water Trap**

Traps keep the smell and combustibles away

The sewer gases go through the roof

Water is trapped here to keep sewer gases out of the house
Water Traps

Water traps have to be put in just right.

Water filling the downstream vertical portion of the “S” trap will cause siphoning and loss of trap seals. Trap seals must be maintained to prevent sewer gases and vermin from entering the dwelling.
Incorrect Traps

Improper “S” Trap
Improper Trap

Flexible pipes clog and become unsanitary
Improper Traps

Low water traps are prone to clogging
Proper Water Trap

Weir

Dip

Trap Seal

2 in. min.
4 in. max.

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Water Heater

There are two kinds of water heaters.

1. Tankless aka On-Demand Water Heaters
2. Storage Water Heaters
Storage Water Heaters

Water Heater in Garage

- Heat loop
- Vent
- Fullway (gate) valve
- Cold water
- Temperature & pressure-relief valve (TPRV)
- Strapping & flex connectors in seismic areas
- TPRV drain
- No threads in ends
- Protective bollards
- Terminate to approved location max ≤ 6 in. IRC
- 6-24 in. UPC above floor or ground
Gas supply is brought in to fuel a flame under the tank.

Cold Water Enters the tank

Hot water goes to the fixtures
Water Heater Safety

- Vent
- Seismic Straps
- TPR Valve
- Discharge Pipe
FVIR Water Heater

From gas supply

Air enters through the vents & passes through the flame-arrestor plate into the sealed combustion chamber.
TPR Valves

Temperature & Pressure-Relief Valve

When the WH is in a basement or below grade, it may not be possible to arrange for a gravity drain of the TPRV valve. A Watts 210 valve (F57) might be an allowable option. The temperature-sensing bulb of the valve goes in the upper portion of the tank & the gas piping runs through the valve. The Watts 210 shuts off the gas if the temperature is excessive. In addition, a separate water pressure-relief valve (F58) must be installed in the piping & must drain by gravity to an approved location. Check with the local AHJ to see if this method is accepted in your area.

Exploding heaters have been known to reach heights of 500 ft. & lift houses off their foundations.
The TPR discharges outside

TPRV Drains

Full size & slope to drain

IRC within 6 in.

No threads

UPC 6 - 24 in.

No valves between drain & offset
Discharge Pipe Defects

Higher than the TPR valve
Higher than TPR valve
Discharge Pipe Defects

Improper material and does not extend to the exterior of the building.
Watts 210 Alternative
Tanks but no Tanks!!!

Tankless water heaters heat as the water passes through its heat exchanger.

1. Hot water tap is turned on.
2. Water enters the heater.
3. The water-flow sensor detects the entry of water into the unit, switching on computer.
4. The computer ignites the burner.
5. Water circulates through the heat exchanger.
6. The heat exchanger heats water.
7. When the tap is shut off, the unit shuts down.

Gas line must be sized to max. Btu rating to deliver max. hot water.
Handrails

- Handrails are the grips. One is less likely to fall when using steps if there is a grippable handrail.

[Diagram of Handrail Profiles]

- **Type I**
- **Type II**
- **Prohibited**

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Handrail on Guardrail

**Handrail & Landing Guard Heights**

- 34 in. – 38 in.
- $4^{3/8}$ in. max.
- 4 in. max.

**Guard min. 42 in.; unless also handrail**

- $\geq 36$ in.
  measured from nosing to nosing

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Handrail on a Wall

Stair Width & Height

Min. 1½ in. between wall & handrail, max. 4½ in. projection from wall

Min. 36 in.

Min. 6 ft. 8 in. headroom clearance

Switch req’d at each floor level if 6 or more risers (303.6.1).

Return to wall

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Guardrails

Guard req’d when walking surface or fixed seating > 30 in. above any point within 36 in.

Guards

Must restrict the passage of a 4 in. sphere

36 in.

30 in.

Guard min. 42 in.; unless also handrail

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How Does a Heater Work

Cold air enters through the biggest vent in your house. This is called the cold air return.

A fire is maintained in a box inside the heater and the unsafe air of that box goes out the vent. That is the heat exchanger.

The cold air is heated by passing by that hot box where heat it exchanged. It comes out at registers.

Filter
Consider High Efficiency

High-Efficiency Furnace

- Combustion air
- Flue pipe
- Gas burners
- Inducer motor & fan
- Condensate
- Return air
- Plenum
- Serpentine heat exchanger
- Recuperative heat exchanger
- Blower
Insulated and Tight Ducts

**Step 1.**
Peel jacket & insulation from core & butt cores together over collar.

**Step 2.**
Apply approved tape & secure with band clamps.

**Step 3.**
Pull jacket & insulation back together & apply 2 wraps of UL181 tape.
Heating Maintenance

- Check filter for excessive build up and change regularly.
- Consider annual service by a qualified HVAC contractor.
- Be sure that carbon monoxide detectors are placed in the building.
How Electricity Works in a House

Power comes into the building through hot conductors.

When used power returns to the transformer through the neutral.

The meter tracks your usage.

Power is distributed through breakers.
How Electricity Works in a House

The breaker box distributes the right amount of power to the right circuit.
How Electricity Works in a House
Get GFCI Receptacles

3 GFCIs

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Consider Tamper Resistant Receptacles
Siding and Siding Maintenance

2 layers paper

Weep screed

Wire

Stucco coats

Scratch

Brown

Finish

Water exits from edge, not through holes

4 in. min. to soil
2 in. min. to paving

Weep Screed

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Siding and Siding Maintenance

Window Flashing

Follow the numbers for the order of flashing and caulking
Caulking
Caulking

- Caulk chimney and siding joints
- Caulk siding trim
- Caulk window trim
Tying It All In