

Home Scale Resilient Flood Design



Inching Towards Resilience

Andrew Cobb - Director of Rebuilds

West Street Recovery

West Street Recovery

- Started the day of Hurricane Harvey - from rescues to rebuilds
 - Have worked with 220 families
 - Case Management, Rebuilding and Policy Advocacy
- Work with community residents rebuilding homes
- 5 houses rebuilt to completion
- 1 complete resilient home build out
- 3 more end to end home rebuilds in progress
- 60 small to medium home rebuilds
- Focus on Northeast Houston: 77078, 28, 26 and 16
- Andrew Cobb - Director of Rebuilds and a Founding Member



Why Resilience?

- MIT gives us 25 years before another Harvey sized storm
- Low income families home owners - homes under \$50,000
 - Market rate buyout wouldn't pay for relocation
 - Some not in a flood plain
 - Little money to elevate home
 - No money to tear down and rebuild
- But they are likely to flood again...so we need to be more prepared
- Landfills put under stress after disaster/flood events
- Landfills located near residential neighborhoods like Lakewood/Northeast Houston
- Shorten the time from disaster to recovery after storm



Resilience Strategies We Practice

- Rain Gardens
- Flood Resistant ----> Flood Proof Cabinets
- Muck ready walls ----> Cleanable/reusable walls
 - 2" built-in chair rail
- Fabric curtains instead of closet doors
- Electric outlets above 4 feet
- Ceramic tile floors
- Uponor expandable PEX plumbing
- Repair existing issues
 - Replace galvanized plumbing
 - Replace leaking roofs
 - Bring electric up to code



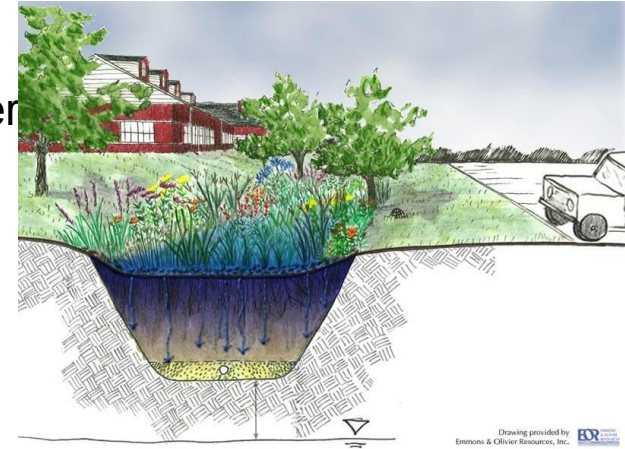
Rain Gardens - the issue

- Water from rain storms can pool near a house and damage siding or dampen sill plates
- French drains add to an overwhelmed sewer system
- Watering a yard can be expensive in the summer



Rain Gardens

- 5000 sqft lot with a 250 sqft rain garden in the back and drainage in the front allowed for a 3 inch rain without water pooling near the house
- About 1000 gallons stored in a 10 inch 150 sqft rain garden
- 10 inch temporary pond - basin
- 12 inch elevated berm
- Fill with basin with compost, mulch and native plants
- Water collects in basin instead of draining to street
- Plants drink the water and improved soil has more time to absorb the water
- Good project for unskilled volunteers
- 2 days to complete - 1 day digging, 1 day mulching and planting













Explore





Kitchen Cabinets - the problem

- Having a functional sink is important after a storm
- Kitchen cabinets are expensive and are often one of the last things to be replaced after a flood event
- Low cost pre-built cabinets from big box stores are made from composite materials that break down even without a flood
 - Not many sustainable or flood resilient options for low income families
 - The composite material is very susceptible to mold even from minor plumbing leaks
 - Not long lasting
- Mold around longer after storm in low income Black and Brown communities. Mold causes asthma and other respiratory issues.
- 18 ft of lower kitchen cabinets with countertops is around ***\$100/ linear foot***











Kitchen Cabinets - steel tubing and wood

- Using materials that are flood resilient and attractive to the home kitchen
- 1.5" painted steel tubing
- Attractive and simple tile countertop
- Open frame design...doors for the sink plumbing, but not elsewhere
- Drawers across the top
- Adjustable legs for leveling
- Lasts a lifetime - clean after floods with microban or similar
- \$2700 for 18 linear feet = ***\$150/linear foot***

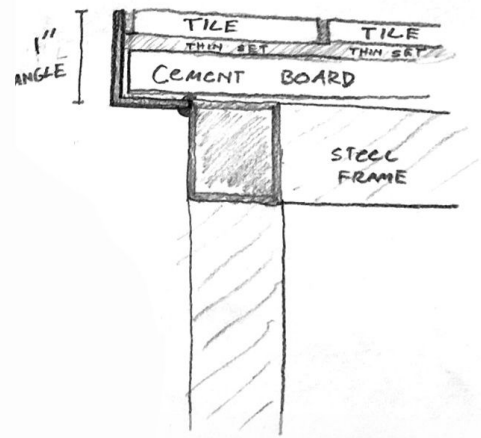
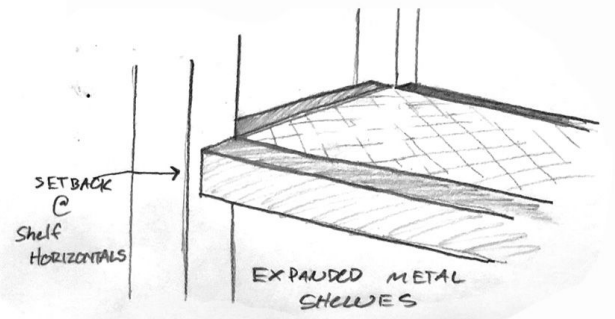
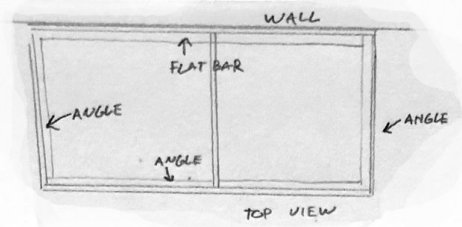
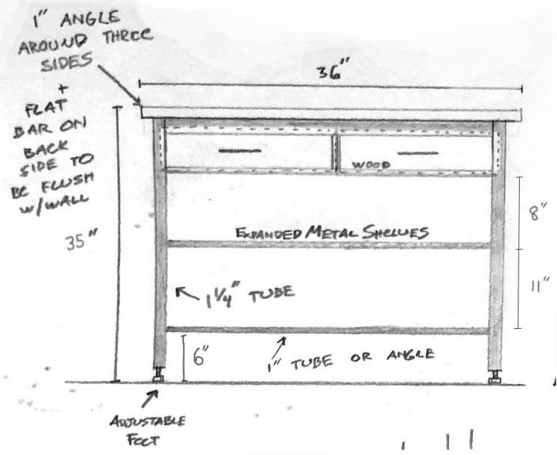






2nd Edition Cabinets

- Bottom two shelves are expanded metal
- Angle iron to cover the the edges of the counter
- New faces for drawers - poplar wood
- Smoother slides
- Cement board and tile countertop
- 1 ¼" vertical framing, 1" horizontal framing
- \$2600 for 13 linear feet = ***\$200/linear foot***











Kitchen cabinets - working out the kinks

- Flood proofing the wall behind the cabinets
 - Durablis - removable plastic walls
- Current models are heavy
- A reliable welding contractor
- Best types of material to use - cost vs resilience
- Material selections under review
 - Doors
 - Drawers
 - Countertop

Muck Ready Walls - The Problem

- Moisture travels up the walls of flooded homes
- Sheetrock wicks moisture up through it's paper face
- Insulation does not wick moisture, except for paper face
- More material removed than is actually damaged
- Many homes have repeatedly flooded
- Not enough buyout money for everyone
- Resilience needs to be addressed



Muck Ready Wall Experiment



Muck Ready Walls

- Add horizontal moisture barrier at 4 feet inside walls
 - Separate top insulation from bottom
 - Insulation easier to remove and replace
 - Water does not wick up pink insulation
- Use 1x6 common board for baseboard - connected directly to the studs
- Use 1x2 wood spacer between sheets of sheetrock
 - Break in the sheetrock paper (prevent moisture and mold climbing up to top sheet)
 - Full 48" of sheetrock below - for easy removal and replacement
- Goal
 - Reduce chance of moisture and mold spreading up the wall .
 - Reduce waste - keep top 4 feet of insulation and sheetrock
 - Reduce cost and time to repair

FEMA Spec - cost effective?

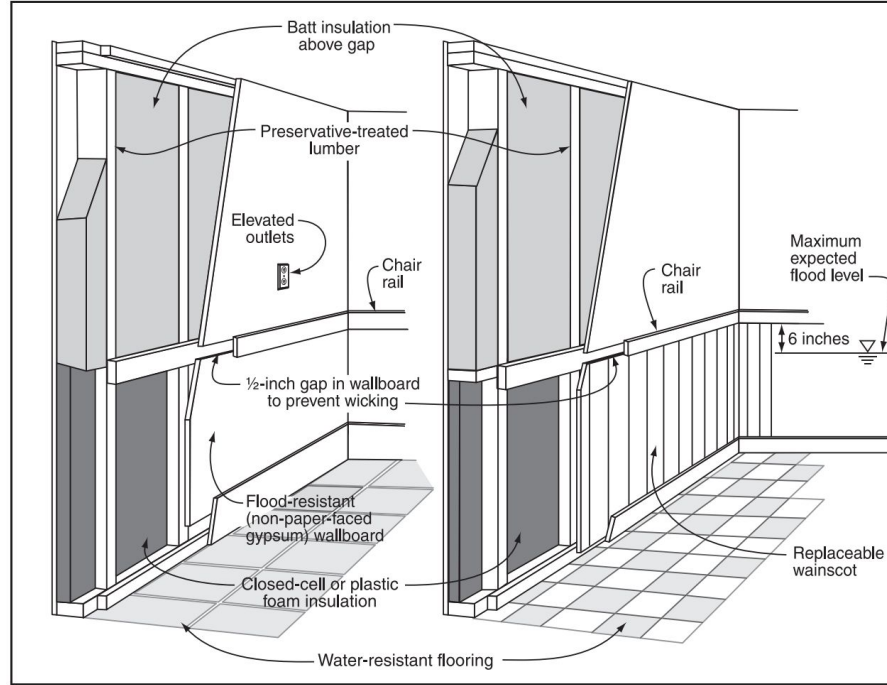
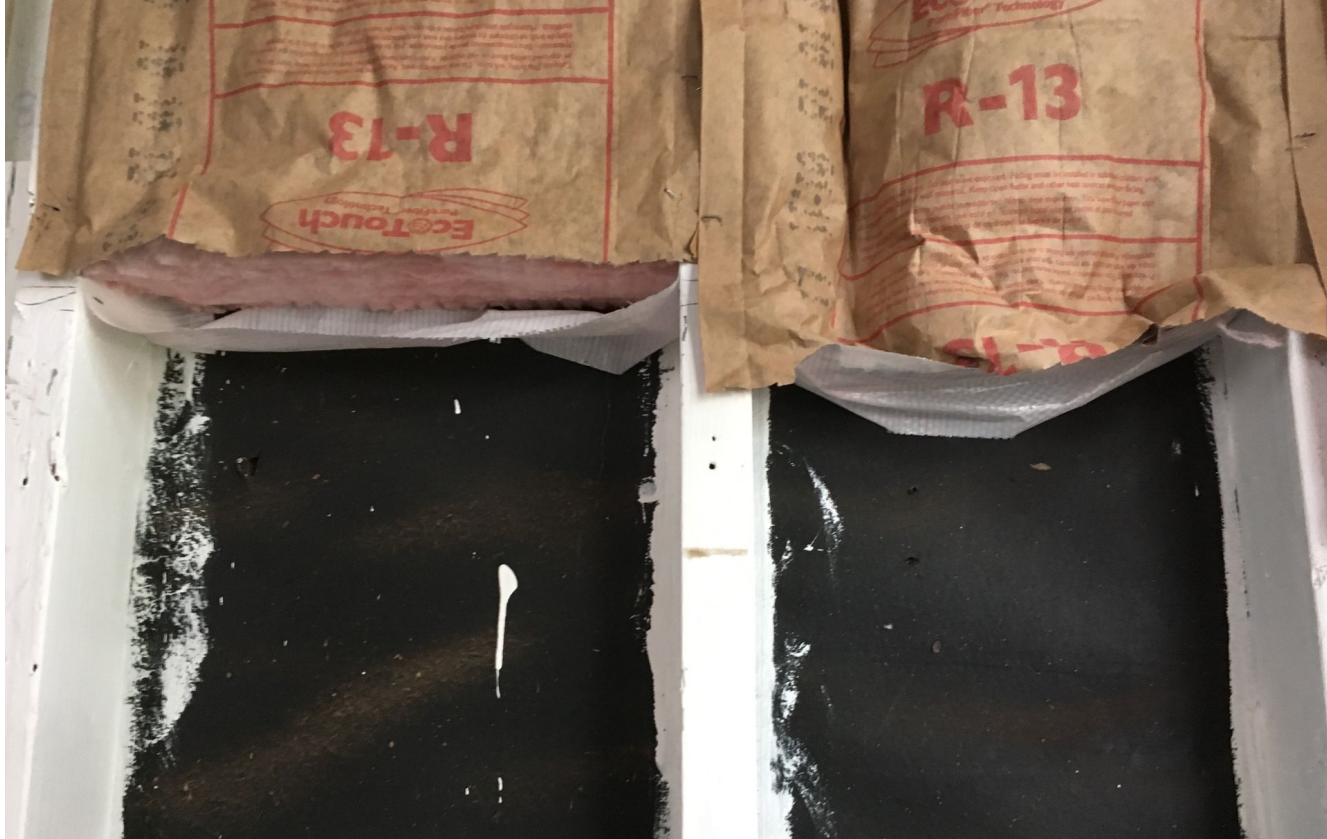


Figure 4. Partial wet floodproofing technique using flood damage-resistant materials for finished wall construction.

Moisture barrier - Tyvek paper



1x6 Baseboard installed level





Muck ready wall installed



Simplify window and door trim









Alternative Walls - Durablis Walls

- Pros
 - Removable/cleanable/reusable
 - Finished - chair-rail/baseboard/wallpaper
- Cons
 - Less forgiving than wood
 - Skills hands to install
 - Joints are loose
 - Wall is loose





Composite Closet Doors

Problem:

- Mold Easily
- Break easily

Solution:

- Curtains
 - Upcycled galvanized pipe
 - Upcycled wood
 - Sturdy anchors
 - Sturdy fabric









Inhabitat

The Perfect Wall house in Texas is insulated on the outside

Images may be subject to copyright. [Learn More](#)

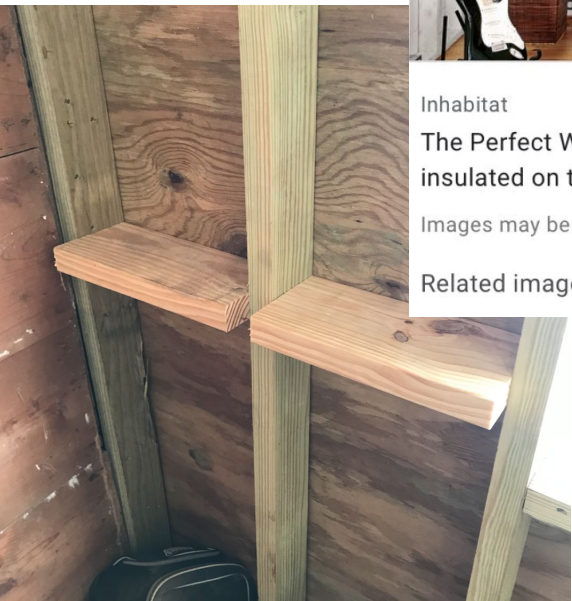
Related images



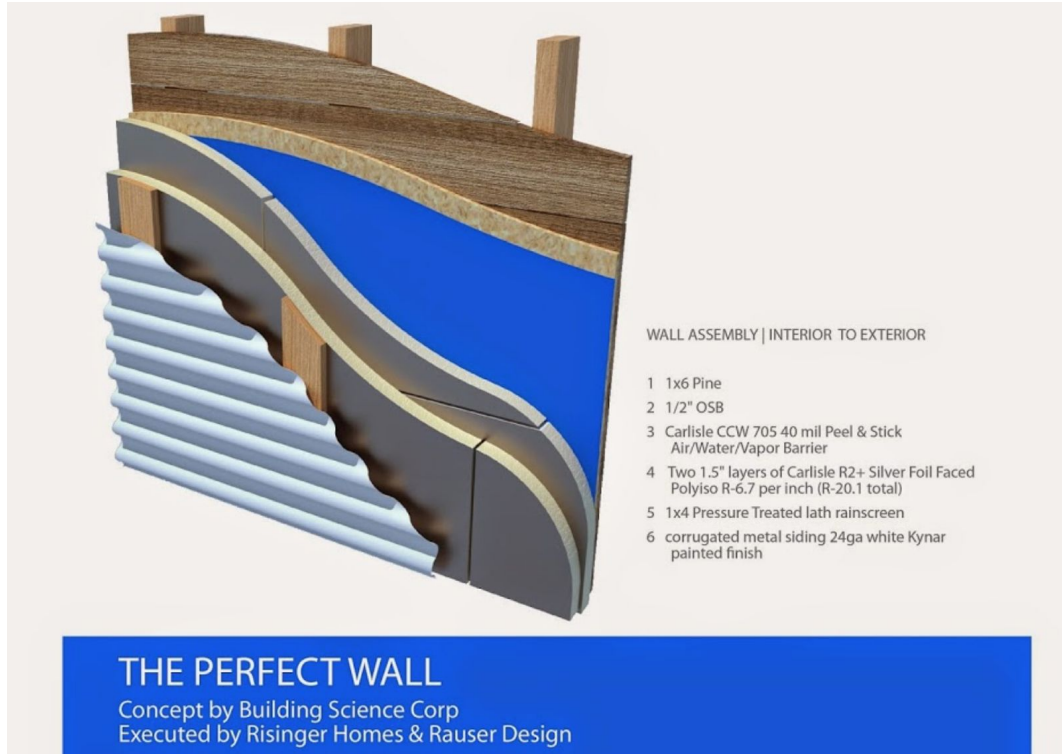
In-use lifestyle image; accessories not included

48-in x 8-ft Smooth Weathered Barnboard
MDF Wall Panel

Item # 794603 Model # Z71LY1394809600



In Progress: Exterior Rigid Foam Insulation



The issue: Drywall

- In our warm humid climate, there are many chances for drywall to mold
- AC duct leak
- Plumbing pipe leak
- Roof Leak
- Kitchen area leaks
- With little money for maintenance, families often live with mold instead of removing walls

The proposed solution: No Drywall

- Move the insulation to the outside of the house so that interior insulation and drywall are no longer required
- The inside of Exterior walls can be open studs that can be painted and have shelves added
- Interior walls can be built with recycled wood, wood paneling, 1x6 pine, and more









Review: Low-cost strategies for residential home flooding

❖ **0"-6" inches of in-house flooding**

- Rain garden
- Kitchen cabinets on metal legs
- Tall baseboards (1x8 wood) attached directly to studs

❖ **6"-2.5' of in-house flooding**

- Metal kitchen cabinets
- "Muck Ready Wall"

❖ **2.5-8' of flooding**

- Metal kitchen cabinets
- External insulation
- Shiplap on internal walls

Open to feedback and ideas

Andrew Cobb

West Street Recovery

andrew@weststreetrecovery.org

713-401-4785

Appendix

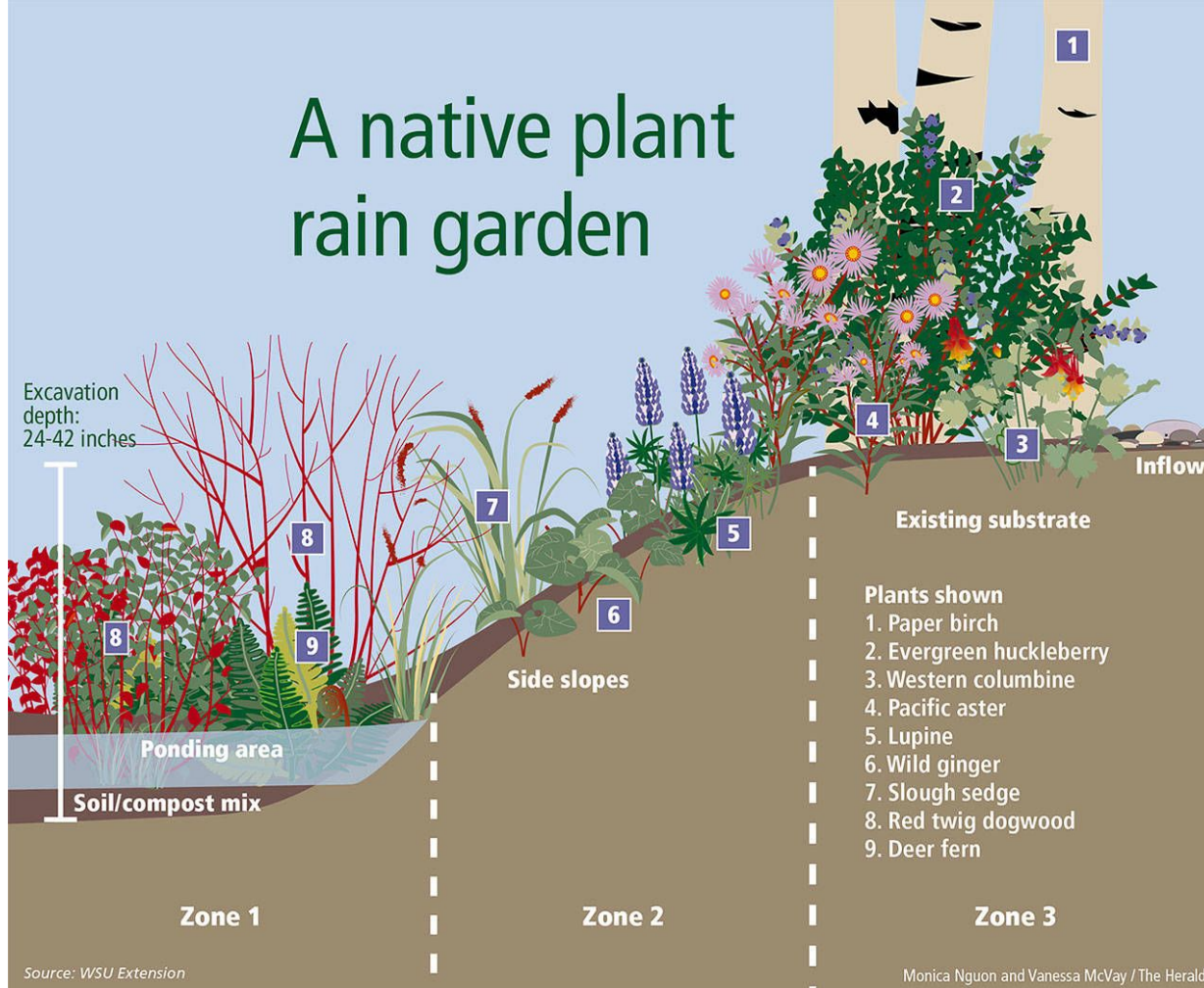
Plumbing options

- **PEX - *Uponor - Expander (recommended)***
 - Very unlikely to leak
 - No mess with glue
 - Easy to work with
 - Does require a \$300 tool
- **CPVC**
 - Easy to work with
 - No expensive tools
 - Up to code
- **Galvanized**
 - Can corrode over time
 - Specialized tools





A native plant rain garden



Source: <http://www.bothell-reporter.com/life/rain-gardens-natures-sponge/>