Home Scale Resilient Flood Design

Inching Towards Resilience

Andrew Cobb - Director of Rebuilds
Andrew Barley - Rebuild Manager

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 Barley - Rebuild Manager and a Founding Member
- 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
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 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 needed 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
In Progress: Exterior Rigid Foam Insulation

Wall Assembly | Interior to Exterior

1. 1x6 Pine
2. 1/2" OSB
3. Carlisle CCW 705 40 mil Peel & Stick Air/Water/Vapor Barrier
4. Two 1.5" layers of Carlisle R2+ Silver Foil Faced Polyiso R-6.7 per inch (R-20.1 total)
5. 1x4 Pressure Treated lath rainscreen
6. corrugated metal siding 24ga white Kynar painted finish

The Perfect Wall
Concept by Building Science Corp
Executed by Risinger Homes & Rauser Design
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.
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
Open to feedback and ideas

Andrew Cobb
West Street Recovery

andrew@weststreetrecovery.org

713-401-4785
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

Excavation depth: 24-42 inches

Ponding area

Soil/compost mix

Zone 1

Side slopes

Zone 2

Existing substrate

Plants shown
1. Paper birch
2. Evergreen huckleberry
3. Western columbine
4. Pacific aster
5. Lupine
6. Wild ginger
7. Slough sedge
8. Red twig dogwood
9. Deer fern

Zone 3

Inflow

Source: WSU Extension

Monica Nguon and Vanessa McVay / The Herald