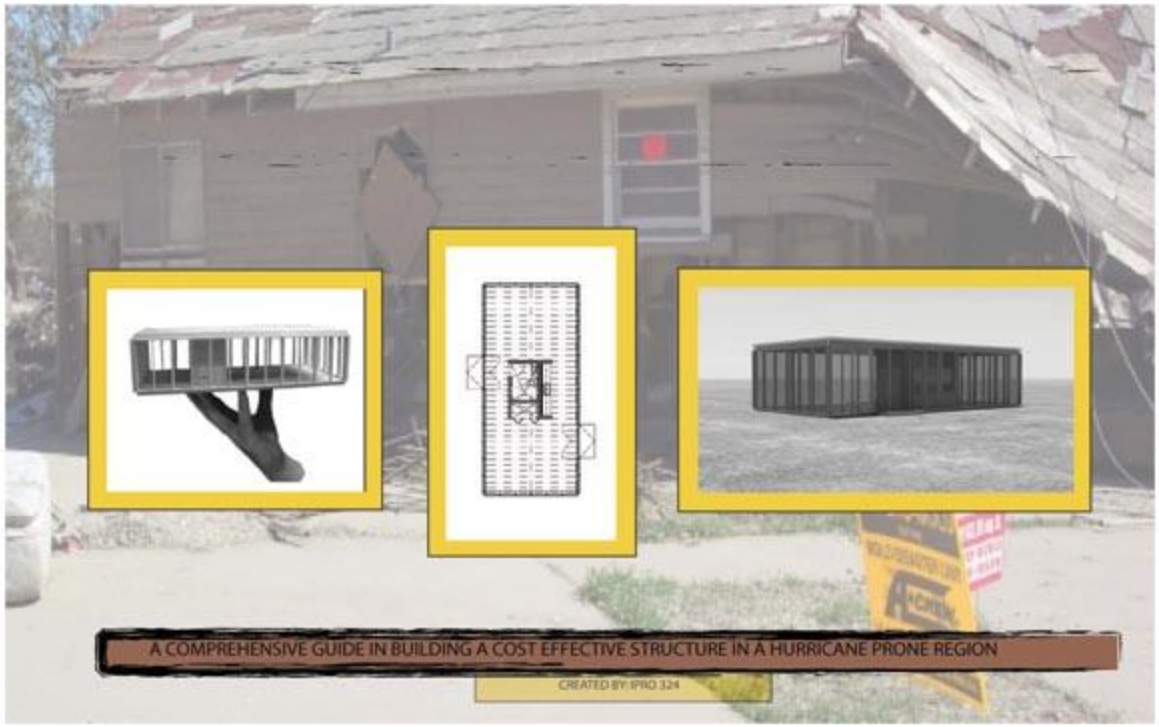
IPRO 324

Disaster Relief: Do-it-Yourself Home Building

Professor Frank Flury

Serena Chacko
Dukasz Dakowisz
Federico Diaz De Leon Orraca
Andrew Dilger
Martina Dolejs
Christopher Grosse
Jung-Jae Kim
Joe Kirsch
Jonathan Navarro
Edward Peck
Monmayuri Ray
Homero Rios
Eric Rogers
James Rotella
Sean T. Thompson



Problem

Problem:

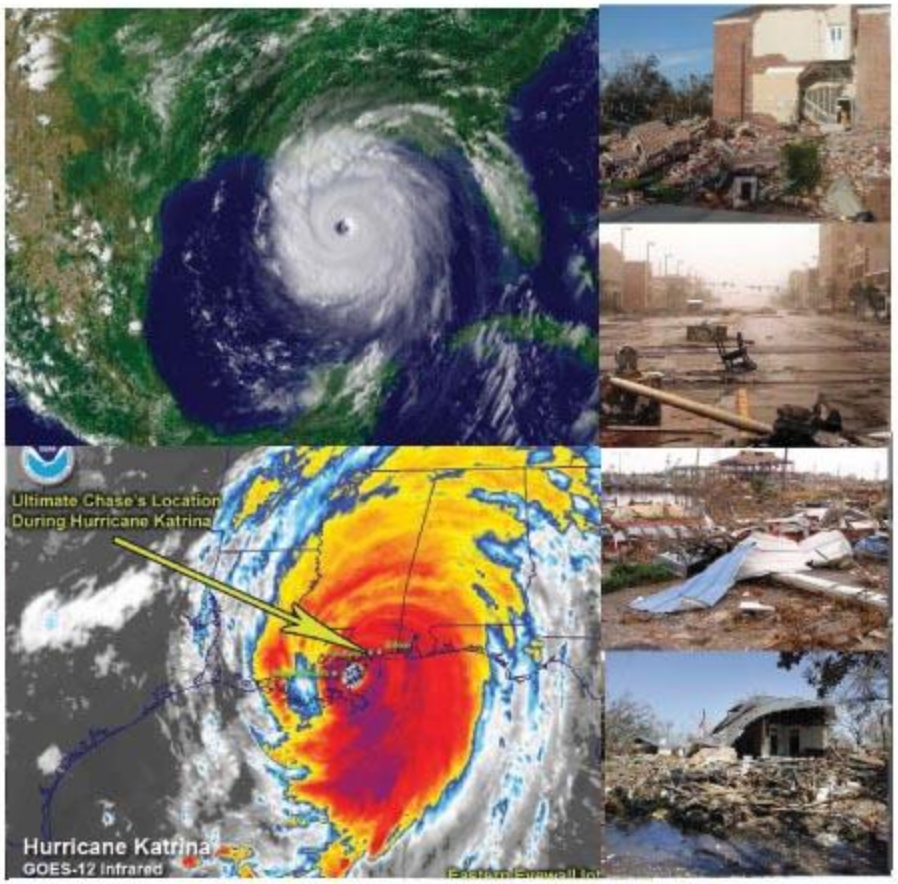
After Hurricane Katrina hit the Gulf Coast, the need for new housing was immediate. Not just families, but individuals and organizations were displaced from the hurricane that swept through.

Objectives:

- Design a simple structure that is economical.

- Provide a manual that would allow anyone with little to no building experience to construct a building for housing or community purposes within the disaster hit areas.

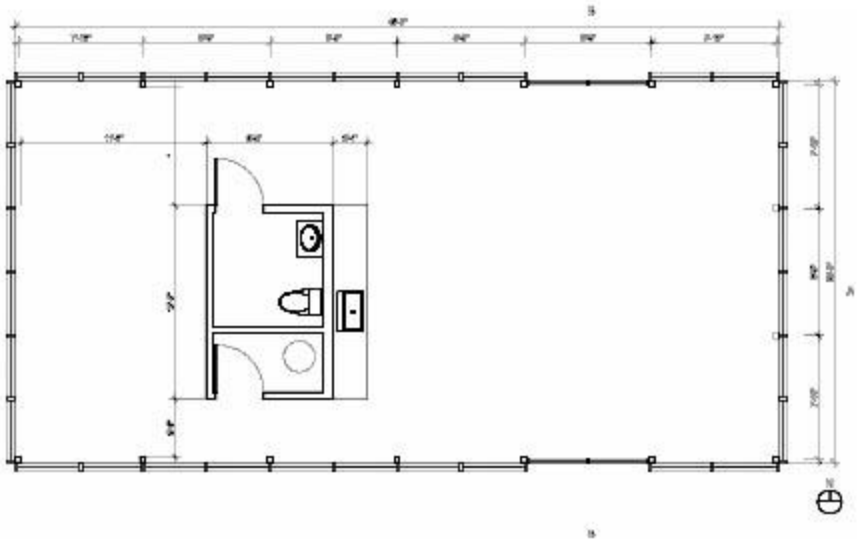
- Build



Fall 2006 Semester:

- Design created
  - 24'-0" x 48'-0" footprint
  - central core containing all plumbing and mechanical needs
  - open studio for kitchen, living and dining

- Potential client for construction
  - located in Gulfport area of Mississippi



Milestones

Phase 1
Identify Project Objectives and Goals
Set tasks for Group
Project Plan — January 29 - Febraury 12

Phase 2
Research codes and standards
Offer design solutions
Mid-Term Report — February 12 - March 18

Phase 3
Revise design
Create construction drawings — March 18 - April 2

Phase 4
Create Building Manual
Final Deliverables — April 2 - April 27

Goals

Goals for Spring 2007 Semester

- Revise design to fit basic standards and codes for the Gulfport Region
- Create a set of construction drawings
- Create a comprehensive building instruction manual
- Find a client
- Build project

Set Tasks

Division of Team

Manual Group

Serena Chako
Jung-Jae Kim
Joseph Kirsch
Monmayuri Ray
Jonathan Navarro

Design/Construction Group

Lukasz Dakowisz
Homero Rios
Eric Rogers
James Rotella
Federico Diaz De Leon Orraca
Martina Dolejs
Christopher Grosse
Edward Peck

Subgroups

Client Research, *Martina Dolejs*
Construction Methods/Materials, *Lukasz Dakowisz, Homero Rios, James Rotella,*
Structure, *Eric Rogers, Federico Diaz De Leon Orraca*
Code Research, *Edward Peck, Joseph Kirsch, Monmayuri Ray*
Disaster Area Research, *Christopher Grosse, Serena Chako, Jung-Jae Kim, Jonathan Navarro*

Client

- Possible client associated with church group, “Back Bay Mission”

- The Back Bay Mission is withnthe United Church of Christ in Chicago.

- An outpost of the Back Bay Mission is in the Gulf region, near to Biloxi, Mississippi.

- Needs facility for outpost working in the Gulf region

ADA Requirements (Americans with Disabilities Act)

- Max. forward reach over an obstruction is 25”

- Need a min. of 60” (5ft) in a hallway for two wheelchairs to be able to pass each other.

- Need a 60” diameter for turning space (most applicable to bathrooms)

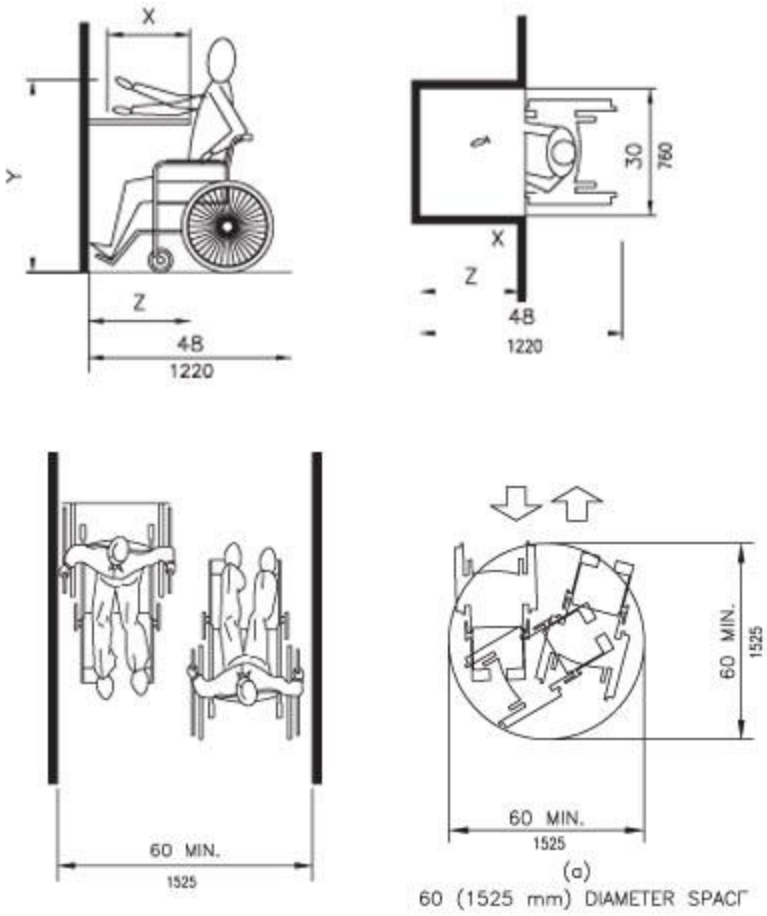


Fig. 2
Minimum Clear Width
For Two Wheelchairs

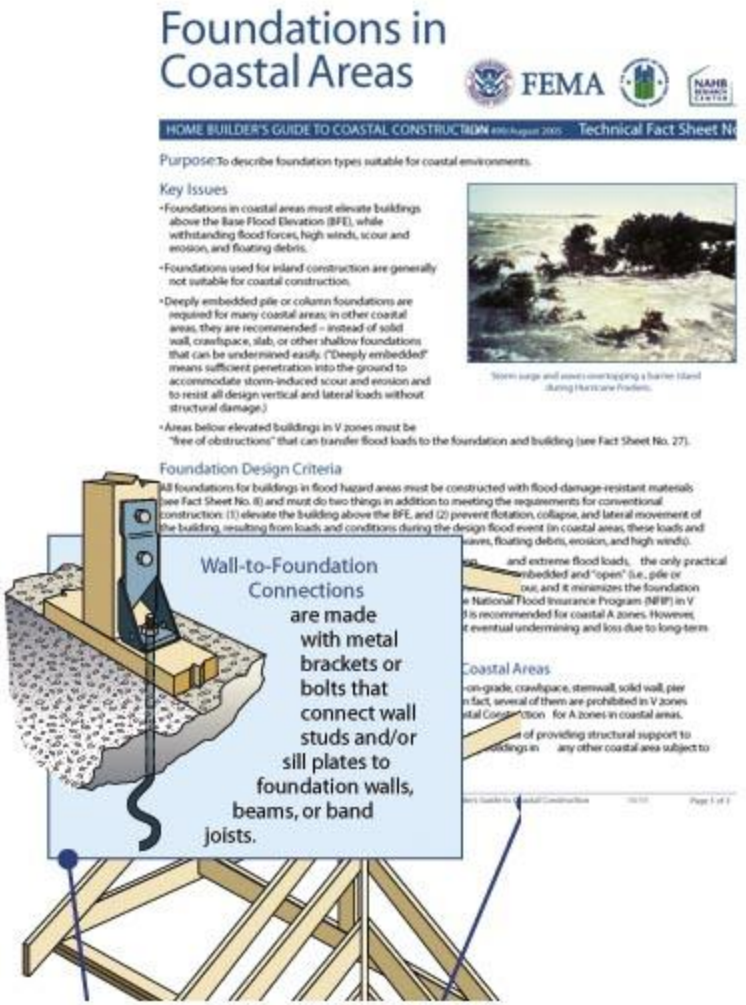
* From the Illinois Accessibility Code

FEMA Guidelines

- Gives standards of construction for coastal zones, V, Ao, and A

- Zone A (furthest from the coast, but may still be in a flood zone) gives least restrictions

- Sections: Roofing, Construction Materials, Methods of Construction, Connectors and Brackets



http://www.fema.gov/rebuild/mat/mat_fema499.shtm

Construction

Foundation

- place perimeter footings deeper than the expected scour depth

- needs to be at least 12" above grade in zone A

- elevated foundation wall, footings greater than 3 ft to resist hydrostatic forces, or to put in a crawl space, if located within a zone that has flooding over 5 ft.

Roofing

- it is best to have a lower profile house specifically in zone Ao.

- A roof with a slope of 35-40 degrees is best for wind forces

Overall hurricane/flood design

- to build burms around a building helps reduce wind pressure for flatter roofs.

- Buoyant slabs were also another interesting discovery and design solution.

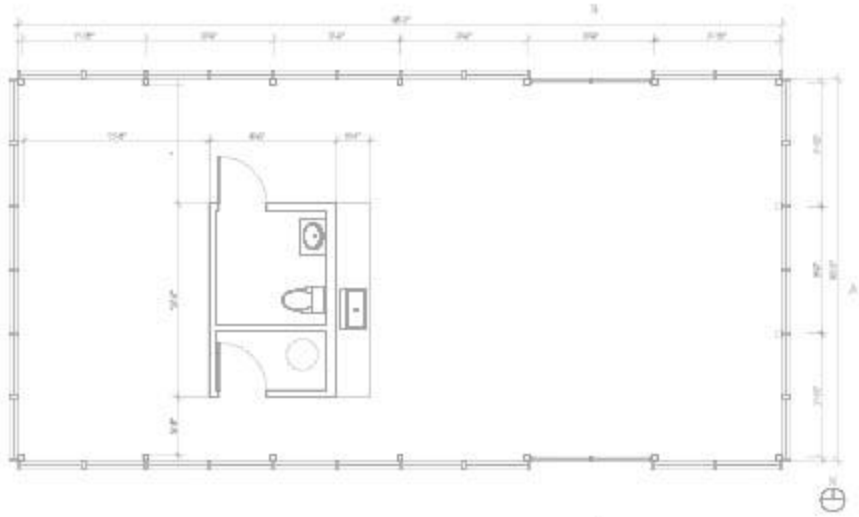
Design

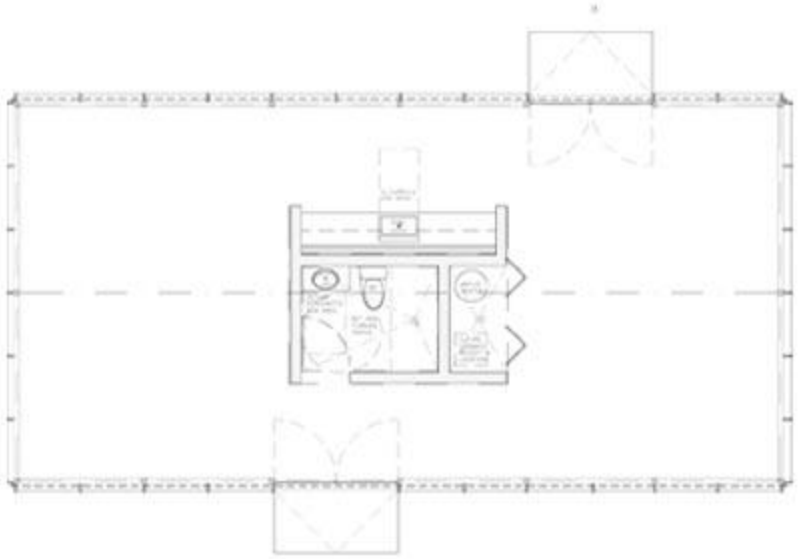
Design Changes

- Core Orientation is turned 90 degrees
-
Core is recentered

- ADA adjustments:
-
- larger bathroom allowing for turning radius
- floor drain included for possible shower,
- hallways are widened
- ramps included
- kitchen counter heights adjusted

- Options for plan added





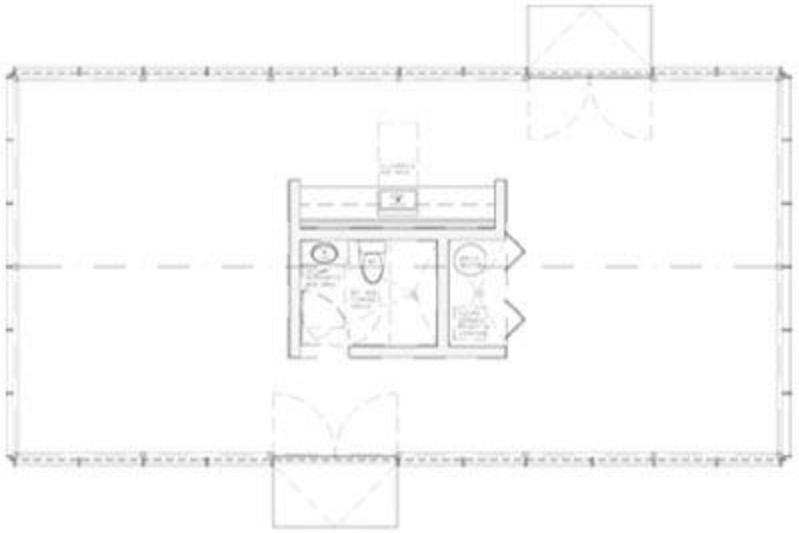
FIRST FLOOR PLAN

Design

Design Changes

-Options for plan:

- 2 kitchen options
- door location can move
- 2 core placement options
- screens can be removed and replaced with infill walls or windows
- rooms/walls can be added into the space



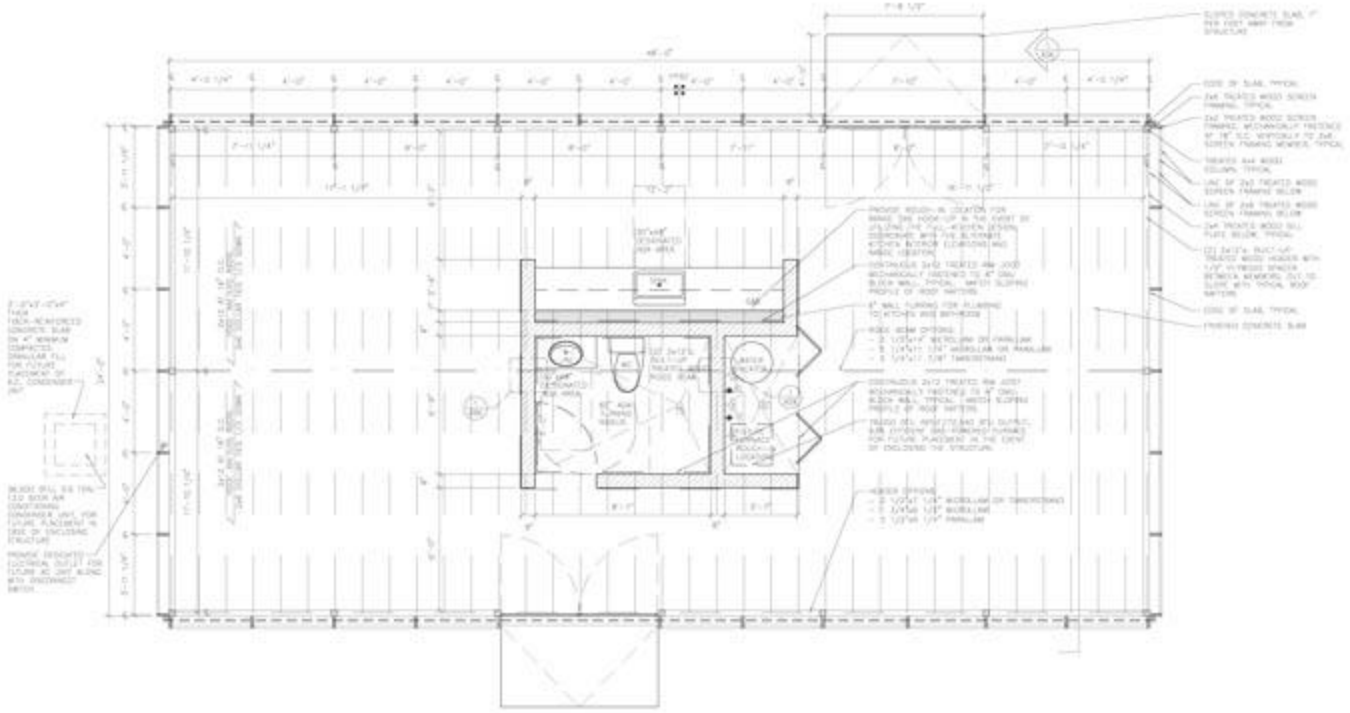
FIRST FLOOR PLAN

- Core Construction changed from a 2 x 4 framing wall to an 8" CMU block

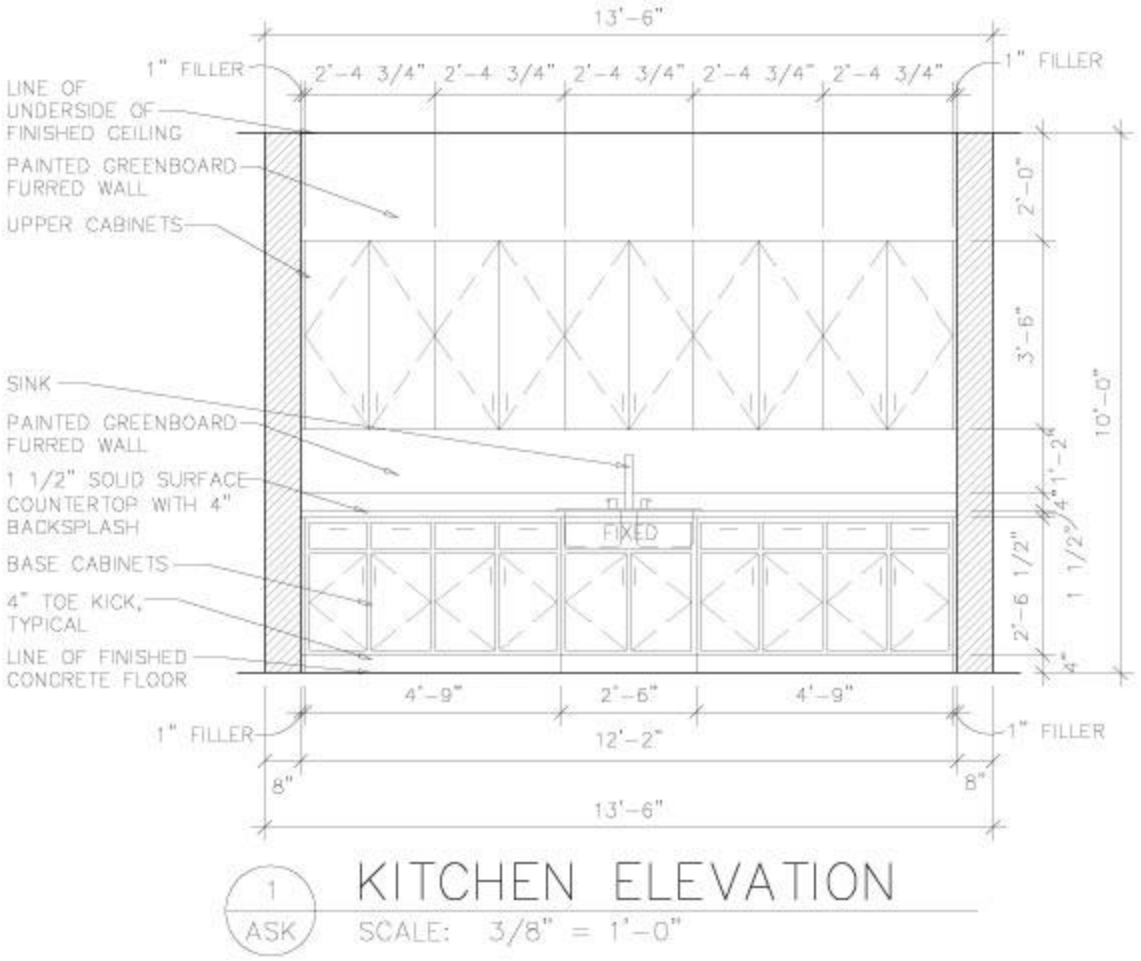
- Foundation walls 12" above grade according to FEMA guidelines

Documents

Creation of Construction Documents



Creation of Construction Documents

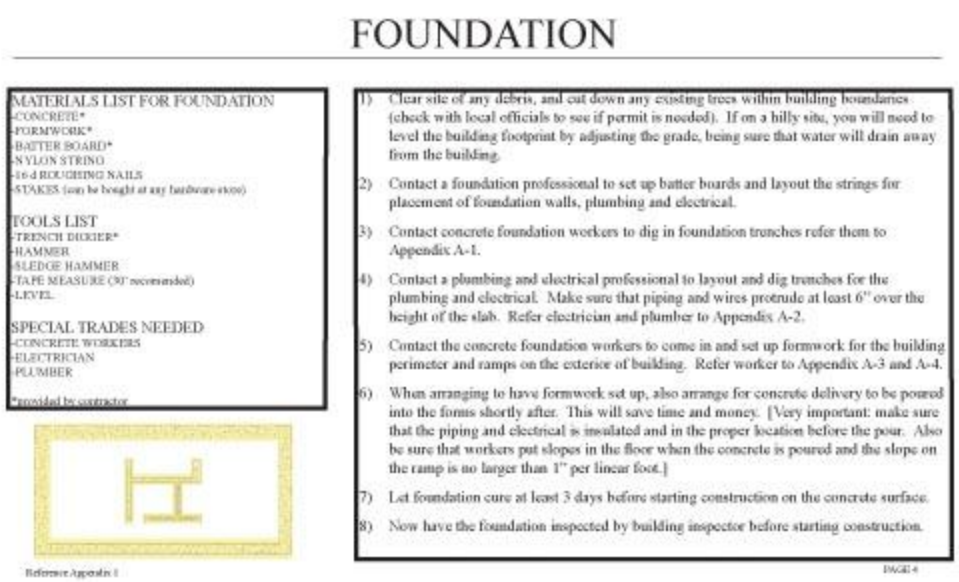


1 / ASK KITCHEN ELEVATION

SCALE: 3/8" = 1'-0"

Creation of Manual

- Introduction with dedication to those affected by Hurricane Katrina.
- Instructions for 5 components:
  - Foundation
  - Core Construction
  - Exterior Wall Construction
  - Roofing
  - Screen Assembly



FOUNDATION

MATERIALS LIST FOR FOUNDATION
-CONCRETE*
-FORMWORK*
-BATTER BOARD*
-NYLON STRING
-16 d ROUGHING NAILS
-STAKES (can be bought at any hardware store)

TOOLS LIST
-TRENCH DIGGER*
-HAMMER
-SLEDGE HAMMER
-TAPE MEASURE (30' recommended)
-LEVEL

SPECIAL TRADES NEEDED
-CONCRETE WORKERS
-ELECTRICIAN
-PLUMBER

*provided by contractor

Reference Appendix 1

1) Clear site of any debris, and cut down any existing trees within building boundaries (check with local officials to see if permit is needed). If on a hilly site, you will need to level the building footprint by adjusting the grade, being sure that water will drain away from the building.
2) Contact a foundation professional to set up batter boards and layout the strings for placement of foundation walls, plumbing and electrical.
3) Contact concrete foundation workers to dig in foundation trenches refer them to Appendix A-1.
4) Contact a plumbing and electrical professional to layout and dig trenches for the plumbing and electrical. Make sure that piping and wires protrude at least 6" over the height of the slab. Refer electrician and plumber to Appendix A-2.
5) Contact the concrete foundation workers to come in and set up formwork for the building perimeter and ramps on the exterior of building. Refer worker to Appendix A-3 and A-4.
6) When arranging to have formwork set up, also arrange for concrete delivery to be poured into the forms shortly after. This will save time and money. [Very important: make sure that the piping and electrical is insulated and in the proper location before the pour. Also be sure that workers put slopes in the floor when the concrete is poured and the slope on the ramp is no larger than 1" per linear foot.]
7) Let foundation cure at least 3 days before starting construction on the concrete surface.
8) Now have the foundation inspected by building inspector before starting construction.

PAGE 4

Creation of Manual

- Reference Diagrams
- Glossary
- Appendix of Construction Documents including those for Foundation, Plumber, and Electrical Contractors needed for job

GLOSSARY

2x Framing – standard term which refers to the type of wall system for wood construction (typical use is 2x4 wood studs).

Batter board – one of a pair of horizontal boards nailed to posts set at the corners of an excavation, used to indicate the desired level, also as a fastening for stretched strings to indicate outlines of foundation walls.

Bow - Bow is a form or warp whereby lumber deviates from flatness lengthwise but not across the faces.

Brace - pieces fitted and firmly fastened to two others at any angle used to strengthen the angle

CMU Block – concrete masonry unit, material used for the foundation wall.

Collar Tie – member that unites two opposing roof rafters at a point below the ridge.

Concrete Footing - continuous form of concrete that is keyed into the foundation wall which helps spread the loads that are being placed on the wall.

Concrete Slab - placed at or near ground level which services as a floor and/or part of the foundation system

Curing - one of the most important steps in concrete construction, because proper curing greatly increases concrete strength and durability. Concrete hardens as a result of hydration: the chemical reaction between cement and water. However, hydration occurs only if water is available and if the concrete's temperature stays within a suitable range. During the curing period-from five to seven days after placement for conventional concrete-the concrete surface needs to be kept moist to permit the hydration process.

Drain Tile – footing drain of perforated pipe used for sewage and drainage

Flush - even adjacent structural surfaces or those in the same plane.

Footprint – the overall space/layout that the building is laid on

PAGE 23

Experience

Project Management

- Assign tasks
- Clearly explain tasks needed to be accomplished
- Establish exchange of information between groups
- Maintain progress and help with information to continue progress
- Evaulate information to make appropriate changes in evaluation

Experience

Communication

- Establish level of comfort for everyone to express themselves

- Speak with respect, and listen

- Allow each person to contribute their ideas

- Accept the roles of each person

Experience

Teamwork

- Make an effort to be a team member
- Accept each person's role
- Explain and work through problems that arise

Thank You