Building on Strong and Safe Foundations

C. Assumptions Used in Design

Coastal Areas Foundation Designs

The foundation designs proposed in Appendix A are based on the following standards and codes:

ASCE 7-05

Minimum Design Loads for Buildings and Other Structures
American Society of Civil Engineers (ASCE)

ASCE 24

Flood Resistant Design and Construction
American Society of Civil Engineers (ASCE)

ACI 318-02

Building Code Requirements for Structural Concrete
American Concrete Institute (ACI)

ACI 530-02/ASCE 5-02/TMS 402-02

Building Code Requirements for Masonry Structures
American Concrete Institute (ACI)
American Society of Civil Engineers (ASCE)
The Masonry Society (TMS)

ANSI/AF&PA NDS-2005

National Design Specifications for Wood Construction
American Forest & Paper Association (AF&PA)
American National Standards Institute
American National Standards Institute (ANSI)
American Wood Council (AWC)

IRC-2003

2003 International Residential Code for One- and Two-Family Dwellings
International Code Council (ICC)

FEMA 550 has been checked and found to be consistent with both the 2006 and the 2009 IRC.

To provide flexibility for the builder, a range of dead loads and building dimensions was used for calculating reactions on the foundation elements. For uplift and overturning analyses, the structure was assumed to be relatively light and narrow, and constructed with a relatively low-sloped roof. For sliding analyses, the home was considered relatively deep and constructed with a steeper roof slope. For the gravity loading analysis, a heavier structure was assumed.

Dead Loads

For Use in ASCE 7-05 ASD Uplift/Overturning Load Combination #7 (0.6D + W +H)

First Floor	8 psf	Vinyl flooring, 5/8-inch plywood sub-floor and 2 by 8 joists 16 inches on centers
Second Floor	10 psf	First floor components plus 1 layer of ½-inch gypsum drywall
Wall	9 psf	Wood siding, 2 by 4 studs 16 inches on centers, ½-inch plywood wall sheathing, and one layer of ½-inch gypsum drywall
Roof	12 psf	200 lb/sq asphalt roofing, 15 lb/sq felt, ½-inch plywood decking, 2 by 4 top and bottom truss chords 24 inches on centers, ½-inch gypsum drywall ceiling finish

Dead Loads

For Use in ASCE 7-05 ASD Gravity Load Combination #2 (D + H + F + L + T)

First Floor	16 psf	Dead loads increased 8 lb/sf to account for additional finishes like hardwood flooring (4 lb/sf), ½-inch slate (7 lb/sf), or thin set tile (5 lb/sf)
Second Floor	18 psf	
Wall	10 psf	Wall weight increased to account for cement composite siding
Roof	12 psf	
Concrete	150 psf	Normal weight concrete. Footings for continuous perimeter walls were also sized to support full height brick veneer at 40 psf.
Masonry	115 psf	Medium weight block
Grout	105 psf	
Brick Veneer	40 psf	

Wind Loads

Designs provided for 120-mph, 130-mph, 140-mph, and 150-mph zones (3-second gust wind speeds per ASCE 7-05). Wind analysis used Method 2 for buildings of all heights.

Exposure

Category C	Open terrain with scattered obstructions generally less than 30 feet in height; shorelines in hurricane-prone areas
$K_{zt} = 1$	No topographic effects (i.e., no wind speedup effects from hills, ridges, or escarpments)
$K_d = 0.85$	Wind directionality factor (for use with ASCE 7-02 load combinations)
K_z, K_h	Velocity pressure coefficients for Exposure Category C

Flood Loads

V zone	Breaking wave load from a wave with height 78 percent of still-water depth (d_s) Flood velocity (fps) equal to $(gd_s)^{1/2}$ up to a maximum of 10 fps (FEMA 55 Upper Bound)
Coastal A zone	Breaking wave load from 1½ foot up to a 3-foot high wave Flood velocity (fps) equal to $(gd_s)^{1/2}$ up to a maximum of 5 fps (FEMA 55 Upper Bound)

Non-Coastal A zone	Breaking wave load up to a 1½-foot high wave Flood velocity (fps) equal to stillwater flood depth (d_s) (in feet) (FEMA 55 Lower Bound)

Lateral Loads (on stem walls)

Lateral earth pressures from saturated soils	100 pounds per cubic foot (pcf)
Surcharge for slab weight and first floor live load	65 pounds per square foot (psf)

Live Loads

First Floor	40 psf
Second Floor	30 psf
Roof	20 psf

Soil Bearing Capacity

1,500 psf presumptive value for clay, sandy clay, silty clay, clayey silt, and sandy silt (CL, ML, MH, and CH soils) (2009 IRC)

Building Dimensions

Building Width	14 ft (per module)	
Building Depth	max 42 ft min 24 ft	
Shear Wall Spacing	max 42 ft	
Floor Height	10 ft (floor to floor dimension)	
Roof Pitch Ratio	min 3:12 max 12:12	Uplift and overturning calculation Sliding calculation
Roof Overhang	2 ft	