

# Why build an alternative house?

- Energy savings
- Building cost savings
- New innovative design

# Alternative Types

- Earth Sheltered Dwellings
  - Geodesic Domes
  - Insulating Concrete Forms (ICF)
- Structurally Insulated Panels (SIP)

# Earth Sheltered Dwellings

Considerations

- Orientation to sun and wind
- Topography
- Soil type
- Groundwater level





# Domes

- Structural Superiority Unobstructed floor space Low cost
- Reduced energy needs









## **Insulating Concrete Forms**

- Foundations
- House walls
- Benefits:
  - High R-values (R-17 to R-26)
  - Reduced air infiltration
  - Reduced noise infiltration
  - Structurally sound (wind, seismic)
  - Fast and straightforward assembly
- More information: www.forms.org/index.php?act=projectfiles

## Insulating Concrete Forms

- Costs run up to 10% more than frame construction (\$1.75 to \$3.50 per ft<sup>2</sup>) with skilled labor and special equipment being factors
- Design covered by a prescriptive code in most
- ICFA sells Prescriptive Method for Insulating Concrete Forms in Residential Construction (2nd Edition)



	ATTRIBUTE	MAXIMUM LIMITATION	
General	Number of Stories	2 stories above grade plus a basement	Detect for block wind an ex-
	Design Wind Speed	150 mph (241 km/hr) 3-second gust (130 mph (209 km/hr) fastest mile)	and seismic loads
	Ground Snow Load	70 psf (3.4 kPa)	
	Seismic Design Category	A, B, C, D1, and D2 (Seismic Zones 0, 1, 2, 3, and 4)	
Foundations	Unbalanced Backfill Height	9 feet (2.7 m)	
	Equivalent Fluid Density of Soil	60 pcf (960 kg/m3)	- HE - I
	Presumptive Soil Dearing Value	2,000 psf (96 kPa)	
Walls	Wall Height (unsupported)	10 feet (3 m)	
Floors	Floor Dead Load	15 psf (0.72 kPa)	
	First-Floor Live Load	40 psf (1.9 kPa)	
	Second-Floor Live Load (sleeping rooms)	30 ptf (1.4 kPa)	
	Floor Clear Span (unsupported)	32 feet (9.8 m)	
Roofs	Maximum Roof Slope	12:12	enter ( a second
	Roof and Ceiling Dead Load	15 ptf (0.72 kPa)	
	Roof Live Load (ground snow load)	70 psf (3.4 kPa)	Coursos
	Attic Live Load	20 psf (0.96 kPa)	bttp://www.toolbass.org/Toobpology
	Roof Clear Span (unsupported)	40 feet (12 m)	Inventory/walls/Insulating-Concrete-Fo















# Structurally Insulated Panels

- New churches
- Offices
- Homes











### WHAT ARE SIPS ?

SIPS ARE A COMPOSITE STRESSED-SKIN PANEL WITH AN INSULATING CORE OF RIGID FOAM -USUALLY EPS OR POLYURETHANE - AND "WORKING" SKINS MOST COMMONLY OF 7/16" THICK ORIENTED STRAND BOARD (OSB).







#### RIGID FOAM CORE MATERIALS MAY BE:

- 1. EXPANDED POLYSTYRENE (EPS) 2. EXTRUDED POLYSTYRENE (XPS) 3. POLYURETHANE 4. POLYISOCYANURATE



## Manufacturing Process

1. Design AutoCAD

- Shop Drawings 2. Fabrication CNC
- Hand Cutting
- Cut to specific design of structure 3. Shipped to jobsite ready to install
- omplete packages available with dditional components installed



## CAD/CAM

SIP Software converts SIP CAD drawings into Machine instructional code.



















# SIP APPLICATIONS

WALLS -- ROOFS -- FLOORS

Thicknesses: walls 4" 6" roofs 8" 10" 12" and 14" floors 10"-12" Custom

Sizes 4'x8,' 8'x24,' and 9'x24' Custom

SIPS . OR





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SIP R - VALUES												
EPS Core Thickness	3 5/8"	5 5/8"	7 3/8"	9 3/8"	12 3/8"							
R-Value @ 75° F	15.34	23.04	29.77	40.36	49.02							
@ 40° F	16.57	26.26	32.28	43.80	53.23							
@ 25° F	17.15	27.16	33.46	45.42	55.21							

# Applicability Limits

- Wall Panels Only
  4-1/2" and 5-1/2" Thick Panels (Nominal)
  40 Foot x 60 Foot Building Size
  Up to Two Stories Above a Basement
  10 Feet Max. Wall Height
  130 mph Wind Speed
  70 psf Ground Snow Load
  Seismic Design Category A, B, and C

Minimum thickness for SIP wall supporting light-frame roof only																	
Wet:	lipsed								813	122	in fit						
13-040	0060	Snew		28			25			- 32			- 34			- 428	
84.	89.	Loss	_ <b>%</b> e	( falo)	:03	325	A Heler	ciii)	- We	tha gr	2000 - E	- 324	Halen	100	Vial Height (2)		
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		201	44	- 445	- 64	4.0	- 64	4.5	- 44	- 64	44	<u>88</u>	-64	4.6	-84	- 66	- 80
35		- 10	-66	- 46	- 46	- 66	- 46	4.6	- 6.6	- 46	- 65	- 46	46	- 44	-4.6	- 44	- 46
			- 24		- 645	- 6.9		444	- 6.6				- 646	4.0	-646	- 10	2.1
					0.0	4.2		4.2		0.2		100	444	4.4	1.0		160
		303	1.0					4.4	- 14					4.4			A.C.
100	85		7.5	3.5	2.4	4.5	24	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2.6	34	3.5
		10	- 27	- 21	24	16	- 34	- 34	34	34	11	11	24	11	14	- 24	14
	109	20	4.5	48	44	4.5	45	4.5	4.4	44	45	8.8	44	4.5	44	44	4.6
		30	6.5	4.5	4.5	4.5	- 6.6	4.5	4.5	4.5	4.5	8.5	4.5	4.5	4.6	4.5	3.5
ma		- 60	4.5	4.6	45	4.5	- 25	4.5	4.5	45	4.5	45	44	4.6	44	45	3.5
		- 10	4.5	- 65	-8.5	4.5	- 65	4.5	-445	-85	45	- 65	-8.5	4.5	-4.5	-85	- 8,6
		- 20	45	45	45	-4.5	- 45	44	44	45	45	- 45	45	44	4.5	- 44	- 4.5
000		- 30	4.5	- 4.8	- 4 <u>18</u> -	4.5	- A& -	4.5	- 4.5	48	45	- <b>25</b>	1.5	4.5	4.6	- 455	- 8.6
		- 99	-6.5	- 65	- 4.5	- 6.5	- 6.5	4.5	- 4.5	-45	- 645	- 65	-85	- 6,6	4.5	- 65	- 86
		- 40	4.3	- 45	45	- 4.0	- 62	4.5	- 44	- 45	- 44	- 65	-43	- 6.5	-4.6	- 65	- 4.9
		- 20	4.5	-4.5	- 4.6	4.5	- 64	4.5	- 4.6	- 15	- 44	- 4.6	- 44	4.6	4.6	- 4.6	1.5
120	120	- 20	-4-	- 48	- 44	- 42	- 44				-11-	- 62-		- 11	- 44	- 11	- 10
				- 62	- 62	-42		- 14	- 42	44	-	- 62	-64	- 41		- 52	12
						4.9		8.5			14.0	- 14.0	- 112	1009		2.5	1000
			20	- 22	84.0	4.0	32	503	12		824	3.5	34	1669 8974	34	8.0	1000
	139		10	- 22	834	4.6	26	N/6	3.6	594	M74		344	50A	36	875	845
		10	4.5	105	198A	3.8	N/A	MA	8.8	105	1025	1245	NKA	110	100	105	1.6
SIPS.	ORG																

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	Minimum thickness for SIP wall																
S	supporting light-frame one story and roof																
Wind	Wind Speed Building Width (ft)																
(3-sec	(3-sec. gust) Snow 24 28 32 36 40																
Exp.	Exp.	Load	Wa	ll Heigh	it (ft)	Wa	ll Heigh	t (ft)	Wa	ll Heigh	ıt (ft)	Wal	l Heigh	rt (ft)	Wa	ll Heigh	t (ft)
A/B	С	(psf)	8	9	10	8	9	10	8	9	10	8	9	10	8	9	10
		20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
85		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
-		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	6.5	6.5	6.5
		20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
100	85	50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	65	6.5	6.5	6.5	6.5	N/A	N/A
	100	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	45	65
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	6.5	6.5
110		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	6.5	6.5	6.5	6.5	N/A
		70	4.5	4.5	4.5	4.5	4.5	6.5	6.5	6.5	N/A	6.5	N/A	N/A	N/A	N/A	N/A
	140	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A
120		30	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A	6.5	6.5	N/A
120	110	50	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A	6.5	N/A	N/A	N/A	N/A	N/A
		70	4.5	4.5	6.5	4.5	6.5	N/A	6.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		20	4.5	4.5	6.5	4.5	4.5	6.5	4.5	6.5	N/A	4.5	6.5	N/A	6.5	N/A	N/A
130	120	30	4.5	4.5	6.5	4.5	4.5	N/A	4.5	6.5	N/A	6.5	N/A	N/A	6.5	N/A	N/A
		50	4.5	6.5	N/A	4.5	6.5	N/A	6.5 N//A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		20	4.5	0.5	TN/A	0.5	N/A	N/A	NVA	N/A	N/A	N/A	N/A	TN/A	N/A	N/A	N/A
		20	6.5	N/A	N/A	0.5 N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	130	50	0.5 N/4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		70	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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