THERMAL AND COST COMPARISON OF SIX SUPERINSULATED HOUSES AND ONE PASSIVE SOLAR HOUSE IN THE IDAHO RESIDENTIAL DEMONSTRATION PROGRAM

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SUMMARY

Figure 1 cost data is compared as an incremental cost from current practice defined in Idaho as FHA/VA Standards. Total incremental costs reflect supervision, design, construction loan interest, commission and tax, but not lot and builder markups. Vapor barrier costs are for ceiling, floor, and wall areas. All other costs are for single component-named areas. The total incremental costs are for dollars per square foot of floor area. Air-to-air (AAHX) costs are total installed costs for the unit and ductwork. AAHX average costs are high because of house #3, which has 492 linear feet of duct work. The AAHX has a 10 KW strip heater in it, which supplies all of the heat for this 3965 SF house. Total incremental costs for a 2145 SF house (average) are $7272, while average annual fuel bill savings are projected to be $488.85 per year at $.043/Kwh.

Predicted energy budgets (Kwh/SF/yr.) were determined using the WATTSUN computer program or hand-calculated, using ASHRAE standard heat loss methodology. Actual energy budgets are based on the space heating Kwh for that monitoring period. The normalized energy budget is calculated from the site heating degree days and Kwh comsumption to the normal (20-year average) heating degree days.

The number 7 house, passive solar, had a high energy budget because the available sunshine was 33% below normal. The numbers 1, 3, 4, 5, and 6 houses had above-normal sunshine, while the number 2 house had approximately normal sunshine.

House No.	1	2	3	4	5	6	7 *	AVG.
Floor Area (Sq. Ft.)	2400	1176	3965	2124	1920	1423	1996	2145
Type	B	A	C	E	B	A	A	
Air-to-air Heat Exchanger ($)	1718	1179	4150	2139	1424	1507	1200	1902
Vapor Barrier ($ Sq. Ft.)	0.07	0.02	0.20	0.48	0.16	0.06	0.03	0.17
Glass (% Floor Area)	6	9	13.6	16	12	10	15	11.7
Door ($ Sq. Ft.)	16.40	0.00	0.00	0.00	16.00	1.00	0.00	4.77
Floor ($ Sq. Ft.)	----	0.38	----	----	****	0.17	****	0.27
Ceiling ($ Sq. Ft.)	0.79	0.26	1.22	0.75	0.40	0.27	0.66	0.62
Walls ($ Sq. Ft.)	1.66	0.41	0.69	0.38	0.20	0.86	0.09	0.61
Basement Walls ($ Sq. Ft.)	0.70	----	0.74	----	0.12	----	----	0.52
Windows ($ Sq. Ft.)	7.12 (3G)	3.06 (3G)	0.00 (2G)	0.00 (2G)	2.84 (3G)	3.63 (3G)	0.00 (2G)	2.38
TOTAL INCREMENTAL COST ($ Sq. Ft.)	3.47	2.96	1.50	3.46	5.17	3.65	3.51	3.39

Type
A = 1 Story, No Bsmt.
B = 1 Story, Bsmt.
C = 2 Story, With Bsmt.
E = 2 Story, No Bsmt.

* Passive Solar
---- No Entry
**** Heated Crawl Space

Figure 1. RSDP incremental costs.

House No.	1	2	3	4	5	6	7
Site HDD	10115	7606	9922	10493	10547	8253	7731
Normal HDD	8184	7250	8184	8184	9077	6324	5833
Space Heating	3984	5372	18972	6520	7644	1624	8336
Water Heating	4656	1864	6064	4560	5440	2928	4448
Other Kwh	4196	3901	7103	4966	5060	11053	7703
Predicted Energy Budget Kwh/SF/Yr	2.27	1.63	3.73	3.53	3.91	1.15	1.37
Actual Energy Budget	1.66	4.57	4.80	3.05	3.98	1.14	4.18
Normalized Energy Budget	1.27	4.34	3.76	2.19	3.34	0.79	2.82
Solar Glazing ± 30° SF	40	12	214.5	168	101	70.5	180
%	27%	11%	40%	49%	47%	51%	67%
MACH *	0.35	0.22	0.27	.49	.22	.5	.33
NACH **	0.2	0.1	0.21	0.12	0.13	0.22	0.1
AAHX Flow Cfm	111	34	178.5	140	55	94	88
Temp. °F in	66.7	70.36	67.8	69.9	69.1	71.6	69.9
Temp. °F out	38.9	44.6	37.8	36.3	36.1	42.2	44
Monitoring Period	5-6-85 5-7-86	3-26-85 4-3-86	5-6-85 5-5-86	4-29-85 4-28-86	4-17-85 4-17-86	5-10-85 5-7-86	5-4-85 5-4-86

* Mechanical air changes per hour
** Natural air changes per hour.

Figure 2. RSDP house thermal and ventilation data.

House No.	1	2	3	4	5	6	7
Size SF	2400	1176	3965	2124	1920	1423	1996
R-Values							
Ceiling ***	60	60	60 38	60	60	49	38
Walls	38*	36*	30*	40*	38*	44*	27**
Floors	10	30	--	30	30	30	25
Basement Walls	19	--	11	--	19	--	--
Doors	10	8.0	8.0	3.0	3.0	10	10
Windows (Glazings)	3.2(3G)	2.6(3G)	2.0(2G)	2.0(2G)	2.6(3G) 4.0(4G)	2.6(3G)	2.0(2G)
Glazing Area	146	106	538	346	215	136	270
Location	Hailey	Sandpoint	Hailey	Hailey	McCall	T.Falls	Boise

* Double stud walls.
** Single stud wall with 1" iso.
*** Advanced framed.

Figure 3. RSDP house characteristics.