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Information Sheet 3530
March, 2000

Life Cycle Energy Cost Analysis
Shows That SmartWall Systems® Provides
Significant Savings in All Climates

SmartWall Systems® is a

concrete masonry wall system
that outperforms other
masonry and non-masonry
wall systems. SmartWall
Systems® offers superior
performance, especially in
terms of energy efficiency,
maintenance, appearance, fire
resistance, durability, and
strength to weight ratio.

The built-in thermal resistance
and low thermal bridging of
SmartWall Systems® saves
energy in both warm and cold
climates.

The Life Cycle Cost analysis
illustrated in the graph uses
local climate data and energy
costs for heating and cooling,
and show the significant life

cycle energy cost savings achieved by SmartWall Systems®. In many cases the present value of these savings will pay for the SmartWall System® itself. For example, The analysis shows that a SmartWall building in Omaha saves \$1.15 per block over the first ten years of the building's life, and \$2.86 over a thirty-year period.

The analysis compares SmartWall Systems concrete masonry units at 90 lb/ft³ density to ordinary 135 lb/ft³ units. Units are standard 8" x 8" x 16" dimensions. The analysis uses steady-state heat flow calculations.

Detailed information on the thermal values, energy costs and the methodology of the

Life Cycle Costing analysis illustrated above is shown on the following pages. For more information about SmartWall Systems®, contact the Expanded Shale, Clay, and Slate Institute office or any ESCSI member.

Life Cycle Energy Cost Savings by City For Ten and Thirty Year Periods With Climate and Energy Costs

	Atlanta	Boston	Chicago	Cleveland	Dallas-Ft Worth	Denver	El Paso	Houston
Climate (WSO unless noted otherwise) (1)								
Heating degree Days HDD65	3025	5596	6459	6179	2420	6023	2672	1548
Cooling Degree Hours CDH74	16803	5358	6606	4772	36294	5908	22966	30474
Energy Costs Fall 1999 ⁽²⁾								
Natural Gas (for heating) \$/mcf	\$5.93	\$7.23	\$4.97	\$6.23	\$4.58	\$4.06	\$4.58	\$4.58
Electricity (for cooling) \$/kwh	\$0.070	\$0.100	\$0.081	\$0.095	\$0.064	\$0.055	\$0.094	\$0.068
Total LCC Savings @ 10 Years, \$ / block	\$0.82	\$1.59	\$1.28	\$1.51	\$0.71	\$0.96	\$0.73	\$0.53
Total LCC Savings @ 30 Years, \$ / block	\$2.05	\$3.96	\$3.18	\$3.76	\$1.76	\$2.40	\$1.82	\$1.31

	Indianapolis	Los Angeles	Memphis	Miami	Milwaukee	Minneapolis	New Orleans	New York JFK
Climate (WSO unless noted otherwise) ⁽¹⁾								
Heating degree Days HDD65	5653	1595	3214	198	7327	8010	1311	5171
Cooling Degree Hours CDH74	9082	4306	24504	39401	3313	6806	32758	7634
Energy Costs Fall 1999 ⁽²⁾								
Natural Gas (for heating) \$/mcf	\$5.44	\$6.26	\$6.11	\$6.59	\$4.89	\$4.40	\$5.65	\$6.49
Electricity (for cooling) \$/kwh	\$0.065	\$0.095	\$0.062	\$0.065	\$0.064	\$0.066	\$0.070	\$0.128
Total LCC Savings @ 10 Years, \$ / block	\$1.23	\$0.43	\$0.93	\$0.93	\$1.38	\$1.38	\$0.56	\$1.39
Total LCC Savings @ 30 Years, \$ / block	\$3.07	\$1.06	\$2.32	\$0.92	\$3.43	\$3.45	\$1.41	\$3.46

	Omaha	Phoenix	Raleigh	Sacramento	St. Louis	Salt Lake City	Seattle-Tacoma	Tulsa
Climate (WSO unless noted otherwise) ⁽¹⁾								
Heating degree Days HDD65	6201	1444	3538	2775	4948	5805	5122	3741
Cooling Degree Hours CDH74	13180	54404	11845	10464	17843	9898	1050	26468
Energy Costs Fall 1999 ⁽²⁾								
Natural Gas (for heating) \$/mcf	\$4.53	\$5.95	\$6.62	\$6.26	\$5.66	\$4.35	\$4.73	\$5.23
Electricity (for cooling) \$/kwh	\$0.054	\$0.080	\$0.064	\$0.083	\$0.061	\$0.056	\$0.062	\$0.046
Total LCC Savings @ 10 Years, \$ / block	\$1.15	\$0.87	\$0.98	\$0.76	\$1.19	\$1.02	\$0.92	\$0.89
Total LCC Savings @ 30 Years, \$ / block	\$2.86	\$2.17	\$2.43	\$1.90	\$2.97	\$2.54	\$2.29	\$2.22

LCC Savings Comparison between 90 pcf SmartWall units and ordinary 135 pcf masonry units. All units 8" x 8" x 16". This analysis uses steady-state heat flow calculations, and does not include the effects of thermal mass. An example of the calculation details is shown on the next page.

References for this page and the following page:

(1) Appendix A, Climatic Data for the US and Canada, ASHRAE 90.2, 1993.

(2) Natural Gas Costs: Natural Gas Monthly, US Department of Energy – Energy Information Administration, October, 1999. Table 22, page 57-59. Commercial gas costs by state were used for the most recent complete year available. Contact ESCSI for details.

Electricity Cost: *Electric Sales and Revenue 1998*, US Department of Energy – Energy Information Administration, October 1999, Table 15. Commercial Average Rates for the Utility serving the selected city.

(3) *R-values for Single Wythe Concrete Masonry Walls, TEK 6-2A*, National Concrete Masonry Association, 1996. The R-value is interpolated for 90 pcf. Values are for unreinforced walls. For walls with 32" o/c vertical grouting and reinforcing, the difference in U values between a 90 lb/ft³ wall and 135 lb/ft³ wall drops to 0.153, a 2.5% reduction. Life cycle savings will be reduced by a similar amount. Calculation procedures for grouted walls are shown in the referenced NCMA TEK.

(4) The 2% nominal discount rate was chosen as appropriate for this analysis because it represents the typical long-term two percent difference between short-term US T-bill rates and the CPI inflation rate. See Office of Management and Budget Circular A-94 *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*.

This analysis was developed by Buildex Inc. for use with permission by members of the Expanded Shale, Clay, and Slate Institute, Salt Lake City, Utah and is © 2000 ESCSI. This March 2000 edition replaces earlier versions of this publication, which used different furnace efficiencies and cooling SEER and a less comprehensive source of commercial electricity costs.

Life Cycle Energy Cost Analysis

Present Value of Annual Energy Cost Savings Using SmartWall Systems®

Over a Thirty Year Period

Wall construction:

Single wythe 8" w/foamed in place core insulation

Location:

Omaha, Nebraska

R Value Data	CMU Density		
	135 lb/ft ³	105 lb/ft ³	90 lb/ft ³
R value ⁽³⁾	3.40	5.60	7.30
Calc: U value	0.294	0.179	0.137
Calc: Difference in U values (vs 135 lb/ft ³)	---	0.116	0.157

R-value in (hr – ft² - °F) / BTU. U value in BTU / (hr – ft² - °F)

The following analysis makes two comparisons. The left column compares lightweight units meeting ASTM C90 at 105 lb/ft³ to ordinary 135 lb/ft³ units. The second comparison (in the right hand column) is between a SmartWall Systems® unit at 90 lb/ft³ and the same 135 lb/ft³ unit. All units are conventional 8" x 8" x 16" size. *The analysis Shows that SmartWall Systems® units save substantial energy costs when compared to both ordinary 135 lb/ft³ units and regular ASTM C 90 lightweight units.*

	ASTM Lightweight 105 lb / ft ³ CMU	SmartWall 90 lb / ft ³ CMU
Heating Cost Calculations		
U value difference vs. 135 lb / ft ³ cmu (from above)	0.116	0.157
Natural Gas Cost ⁽²⁾ per mcf	\$4.53	\$4.53
Furnace efficiency	0.80	0.80
Calc: \$ Cost per Btu output	5.66E – 06	5.66E – 06
Heating Degree Days for This Location ⁽¹⁾	6201	6201
Calc: Energy Savings: \$ / sq ft / yr	\$0.0974	\$0.1324
Calc: Energy Savings: \$ / block / yr	\$0.0866	\$0.1177
Present Worth of Heating Savings n (years)	30	30
i (nominal rate – energy and money) ⁽⁴⁾	2.00%	2.00%
Calc: Present Worth of Heating Energy Savings, \$ / block	\$1.94	\$2.64

Cooling Cost Calculations		
Electricity Cost ⁽²⁾ per kwh	\$0.0538	\$0.0538
SEER	10	10
Cooling Degree Hours for This Location ⁽¹⁾	13180	13180
Calc: Energy Savings: \$ / sq ft / yr	\$0.0082	\$0.0111
Calc: Energy Savings: \$ / block / yr	\$0.0073	\$0.0099
Present Worth of Cooling Savings		
n (years)	30	30
i (nominal rate – energy and money) ⁽⁴⁾	2.00%	2.00%
Calc: Present Worth of Cooling Energy Savings, \$ / block	\$0.16	\$0.22
Calc: Present Worth of Total Energy Savings, \$ / block	\$2.10	\$2.86

See previous page for Notes and References