



**Economic Evaluation of Six Insulation Systems
for Block-Wall Construction in Florida**

Prepared for

Mr. Bill Lippy
Fi-Foil Company, Inc.
P.O. Box 800
Auburndale, FL 33823

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A handwritten signature in black ink that reads 'David W. Yarbrough'.

David W. Yarbrough, PhD, PE
President

P.O. Box 2400
Cookeville, Tennessee 38502-2400
www.rdservices.com
Phone: 931-372-8871
Fax: 931-525-38

Wall Assemblies

Seven wall structures were included in this study. All seven structures involve masonry block construction with an interior finish provided by 1/2-inch thick gypsum attached to the block wall using nominal 1x2 inch furring strips. The furring strips were taken to be on 16-inch OC for the calculation of savings. The small changes in overall wall R-value for 24-in OC framing are shown in Table 2. Descriptions of the wall assemblies are given below.

Wall-1. Base Case:	1/4-inch stucco, 8-inch block, furring, 1/2-inch gypsum
Wall-2. Two Reflective Air Spaces:	1/4-inch stucco, 8-inch block, furring with R 4.1 reflective insulation between the furring, 1/2-inch gypsum
Wall-3. Foam Board:	Same as Wall 1 with R 3.75 foam board insulation between the furring
Wall-4. Three Reflective Air Spaces:	1/4-inch stucco, 8-inch block, two runs of 1x2 furring with R 7 reflective insulation; 1/2-inch gypsum
Wall-5. Foam Board on Block:	1/4-inch stucco, 8-inch block, 3/4-inch foam board, furring, 1/2-inch gypsum
Wall-6, Polyisocyanurate in cavity	1/4-inch stucco, 8-inch block, 3/4-inch polyisocyanurate foam board insulation between furring, 1/2-inch gypsum
Wall-7, Block with insulation in core	same as Wall 1 with R 20 insulation in the block cavity

The air-to-air thermal resistance for each of the seven wall structures described above were determined using a parallel-path calculation with 0.906 for the fraction cavity and 0.094 for the fraction framing in the case of 16-in. OC framing and 0.9375 for the cavity fraction in the case of 24-in. OC framing. Thermal resistances for the components in each structure were taken from the ASHRAE Handbook of Fundamentals. The apparent thermal conductivity for the furring lumber was taken to be 0.82 Btu•in./ft²•h•°F. Table 2 contains the component R-Values used in the calculation and the overall air-to-air thermal resistance for each of the seven structures. The thermal resistance of the filled block was calculated using the method described in the ASHRAE Handbook of Fundamentals for insulated concrete block walls.

Calculated Annual Energy Savings

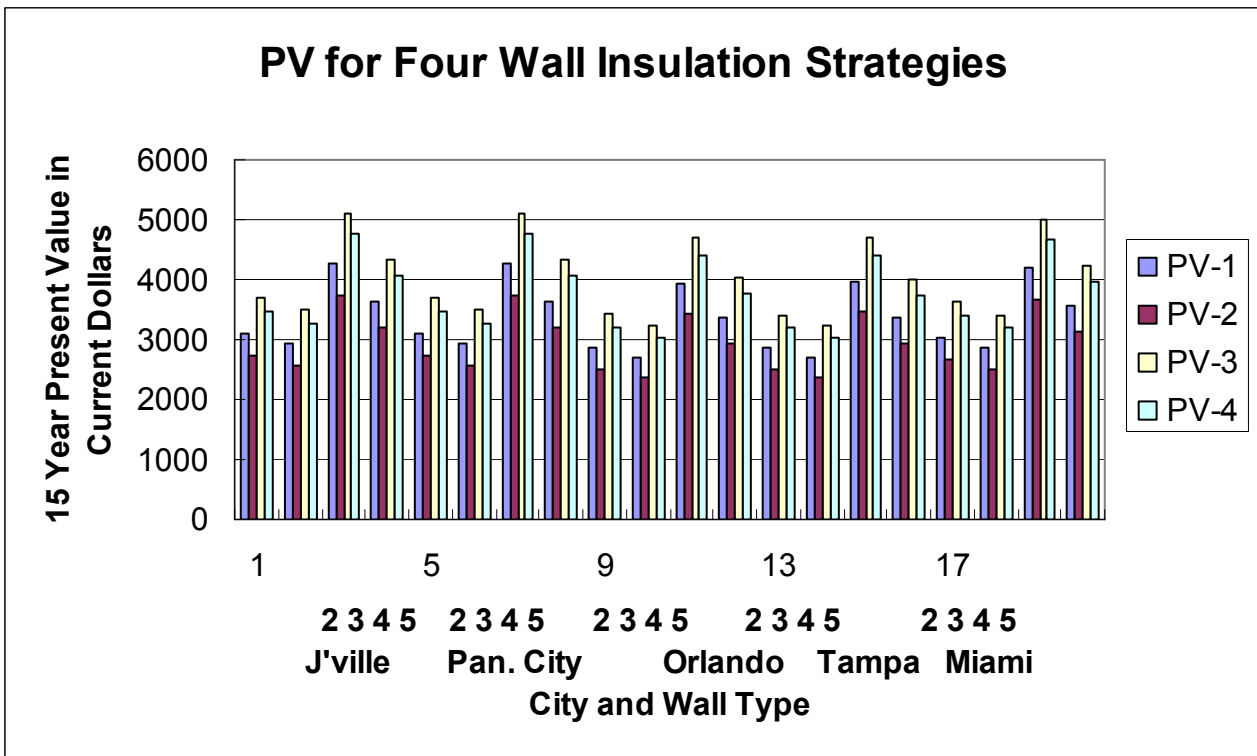
The calculated annual reductions in heating loads in therms and the reductions in cooling loads in kwh are listed in Table 3. The load reductions are based on a heating efficiency of 90% and a COP of two for cooling. The load reductions are expressed in terms of annual dollar savings using \$1.58 per therm (\$15.80 per million Btu) and \$0.0885 kWh for electricity. In each case, the savings shown are relatively to the un-insulated wall (wall 1).

Table 3. Calculated Savings

<u>City</u>	<u>Wall Structures</u>	<u>Heating (therms)</u>	<u>Cooling (kWh)</u>	<u>\$/year</u>
Jacksonville	2	62.5	1599	240
	3	59.0	1509	227
	4	84.2	2155	324
	5	73.4	1880	282
	6	69.2	1771	266
	7	45.5	1163	175
	Panama City	2	83.5	1323
3		78.8	1248	235
4		112.6	1734	336
5		98.2	1555	293
6		92.5	1465	276
7		60.8	962	181
Orlando		2	26.8	2119
	3	25.3	2000	217
	4	36.1	2857	310
	5	31.5	2491	270
	6	29.6	2347	255
	7	19.5	1542	167
	Tampa	2	27.3	2119
3		25.7	2000	218
4		36.8	2857	311
5		32.1	2491	271
6		30.2	2347	255
7		19.8	1542	168
Miami		2	6.9	2654
	3	6.5	2504	232
	4	9.3	3578	331
	5	8.1	3120	289
	6	7.6	2939	272
	7	5.0	1931	179

The present value (PV) of an investment includes factors such as the rate of inflation, the time value of money (interest rate), and the rate of increase in the cost of energy. Present values for 15 years of savings are listed in Table 5 for the calculated first-year savings in Table 3. Four combinations of the three rates mentioned above have been included in the analysis which results in a present value (current dollars) of the investment to provide block-wall insulation. The present values represent the accumulated savings over the 15- year period following the installation of insulation.

	<u>Interest Rate</u>	<u>Inflation Rate</u>	<u>Energy Rate</u>
PV 1	4%	3%	5%
PV 2	4%	5%	5%
PV 3	4%	5%	10%
PV 4	5%	5%	10%



I suggest showing results in a form like that shown above. The horizontal label needs work to identify the bars. There are five cities and four categories in each city.

A figure like this can also be constructed to show savings and /or simple pay back.