TECH TIP # 4

HARDI
HEATING, AIRCONDITIONING & REFRIGERATION DISTRIBUTORS INTERNATIONAL

One of a series of dealer contractor technical advisories prepared by HARDI wholesalers as a customer service.

Insulation -- A NEW LOOK AT AN OLD FRIEND

Insulation is an important element in modern house construction. As we know it, insulation has been necessary primarily because of the advent and acceptance of expensive domestic heating fuels -- first natural gas in the 1930's; then electricity in the 1960's. Now *energy conservation* of all fuels in the 90's is adding new emphasis to the value of a well insulated house.

Generally, dealer-contractors have not taken the time of late in the highly competitive residential business to analyze in detail the effect of insulation on specific house models. This can be unfortunate. Sometimes a detailed analysis can show up important savings for the builder, the dealer, the prospective homeowner, and our nation's resources.

As an example of the type of analysis involved, Table 1 lists the effect of insulation, storm windows and doors on the heat loss, seasonal heating cost, heat gain and summer cooling cost for a typical split entry (raised ranch) style home.

The actual house considered has an upper level floor area of about 1275 sq. ft. and a lower level area of 990 sq. ft. -- excluding the unheated garage. Window area is a modest 182 sq. ft. of glass -- fairly typical of a Midwestern home.

To compute the heat loss and heat gain, reference was made to Manual J -- published by ACCA for the assumed design conditions of 70º F indoors, minus 5º F outside in winter and 95º F in summer.

Heating costs were computed assuming a 6000 degree day heating season, and that natural gas at 63¢ a therm was the fuel.

The cost of cooling was based on an electric rate of 7.7¢ per kilowatt hour and that the unit would run 500 hours per season.

It was further assumed that combination storm windows and screens cost about $50.00 per window (17 needed) and that a storm door cost $130.00 (two needed): to purchase and install batt-type insulation would cost 25¢ per sq. ft. for 3 inch batts in ceiling -- 33¢ using 6 inch batts: and 20¢ per sq. ft. for 1½ inch batts in sidewalls -- 23¢ using 3 inch batts.

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ALL WORTHWHILE

Besides the apparent comparisons to be made -- e.g., the uninsulated house costs $2344 to heat, whereas the well insulated house costs $529, or 3 inches of ceiling insulation is more effective than storm windows -- the longer the amortization period, the less desirable -- in the economic sense -- the addition.

First, let's assume that *no savings* in equipment is realized as a result of reduced loads. Adding storm windows and doors (item 4) to the uninsulated version of this house (item 1) reduces the heat loss from 143,000 down to 130,600 Btu\h, and cuts the cooling load from 52,000 to 50,200 Btu/h. The savings in fuel amounts to $208 for heating ($2344 - $2136); $16 on cooling ($290 - $274); for a saving total of $224 or 5 years to "pay" for the storm windows in savings from fuel cost in this house.

When a *savings* in the first cost of conditioning equipment is realized, its value should be deducted from the cost of the added insulation *before* determining the amortization period.

Suppose we wish to compare the effect of adding 3 inches of wall insulation plus storm windows to the house with an existing 6 inches of insulation in the ceiling (item 2b vs. combination 2b + 3b + 4).

The savings in fuel cost is $794 ($1323 - $529) for heating; $80 ($227 - $147) for cooling (total savings $874). At the same time it costs $1566 ($1988 - $422) to add the wall insulation and storm windows.

Because the heat loss is reduced by 38,500 Btu\h (84,500 - 46,000), let's say a $92 savings in the cost of the furnace can be realized, and with the cooling load cut 12,700 Btu\h (42,700 - 30,000), an additional $304 savings in cooling equipment cost is possible. Total equipment savings: $396.

Effectively then, when we consider the savings in equipment first cost, the cost of adding the insulation is only $1170 ($1566 - $396). Thus, it would take $1170/$874 or only 1.3 years to amortize the added insulation and storm combination in this instance.

These figures are obviously not valid for *every* house type, in *all* areas, etc., but they do indicate general trends for today's marketed homes. Also, we've considered tax breaks or the "cost" of money. And, of course, lest we forget, insulation improves *comfort* too.

So all things considered -- comfort, economy, energy conservation -- on future jobs, the dealer-contractor is likely to find himself *more involved in insulation/equipment analyses, certainly more involved than in the recent past.*

Table 1 -- Effect of Insulation on Split Entry Houses					
Construction	Heat Loss (Btu\h)	Seasonal[1] Cost of Heating	Cost of Insulation and /or Storm Windows	Heat Gain	Seasonal[2] Cost of Cooling
1. Uninsulated	143,000	$2344	$000	52,900	$290
2. Ceiling Insulation: a) R-11 (nominal 3 inches) b) R-19 (nominal 6 inches)	 84,500 81,900	 $1367 $1323	 $306 $422	 42,700 41,800	 $231 $227
3. Wall Insulation: a) R-5.6 (nominal 1½ inches) b) R-11 (nominal 3 inches)	117,000 111,000	$1909 $1802	$398 $456	42,400 39,800	$231 $216
4. Storm Windows & Doors	130,600	$2136	$1110	50,200	$274
Combinations:					
(2a + 3a) -- 3 inches in ceiling + 1½ inches in walls	58,500	$914	$704	32,900	$181
(2a + 3a = 4) -- 3 inches in ceiling + 1½ inches in walls + storm windows & doors	46,000	$687	$1814	30,000	$167
(2b + 3b) -- 6 inches in ceiling + 3 inches in walls	49,900	$762	$878	29,000	$158
(2b + 3b + 4) -- 6 inches in ceiling + 3 inches in walls + storm windows & doors	37,500	$529	$1988	26,700	$147

[1] 6000 degree days
[2] 500 hours