



Rocky Hill Co-Housing Community, Northampton, MA

Making Choices Instead of Paying Premiums for Greener Buildings

BY BRUCE COLDHAM

It is often presumed that “green” resourceful building involves a cost premium. This is not a universal truth. Though it is reasonable to assume that a superior product should come at a premium, good performance-enhancing design is more a matter of examining design goals and objectives with a view to redirecting investment. On this basis, a performance enhancement can be seen as favoring one option over another—a choice rather than a cost premium. Unfortunately, due to the rather extreme conservatism in the building industry,

many choices are never made explicit. They are never discussed, never offered.

In this article I will address a particular residential opportunity for improving green resourceful building performance by means of conscious choice rather than cost premium. It involves improving the thermal envelope at the expense of committing to a central heating system. Let’s begin with three questions:

1. Can compact, open-planned houses with well designed, well constructed, thermally-efficient building envelopes achieve a reasonable standard of comfort by relying solely on the natural convection air circulation within the house to distri-

bute heat throughout the interior spaces?

2. Can a single space heater located in the first floor living space provide comfortable heating for the whole house?
3. Can the envelope upgrade cost be covered by savings generated by the elimination of the heating ducts/pipes and the associated fans/pumps?

The evidence of recent projects completed by our office is that we can confidently answer YES to each of these three questions.

With the savings from *not* investing in central heating, we are able to afford better windows (at least up to a U value

of 0.25), improved insulation (a strapped 2' x 6' framed wall with 7" of DensePak blown-in cellulose) and enhanced air tightness (2 ACH at 50 Pa). We modeled the annual heating fuel costs to be approximately 35% lower year-on-year. The cost of electricity to power the heating system (in the absence of the typical fans, pumps and burners) adds around \$60 to \$100 to those annual energy savings. To this we can add reduced annual maintenance costs: The space heater can be treated as an appliance whereas a central system really requires a technician to perform an annual service.

But the envelope-enhancement-with-space-heating (EESH) solution concept has certain lifestyle implications requiring explicit declaration and thorough consideration.

The space heater (usually gas, but always with a small electrically-powered fan) is located within the first floor living area and space will be required for this purpose. Whereas the rumble in the basement is gone, there is the fan in the living space. It is quiet, but some people may

still find it distracting—especially during late evenings when masking ambient noise levels are at a minimum. Basement spaces and first floor addition bedroom spaces, which are “outside” of the simple, connected interior volume require special consideration—usually some supplementary heating. This can be achieved inexpensively using baseboard or radiant electric devices if the use is infrequent, or using a second, smaller space heater if a constant occupancy is envisaged.

In order for the heat to distribute evenly through the upstairs, bedroom doors need to be left open or ajar throughout the bulk of the day. If they are left ajar, one can expect a temperature differential of no more than 5° F degrees during the coldest days. If upper floor doors are closed, a 10° F differential is to be expected. We used a single unit prototype constructed a year earlier for a separate client to determine this with some certainty. So we felt confident in our design counseling.

Note: The coldest days are an infrequent occurrence. For Westover, MA:

- **630** hours each year below 20° F

- **190** hours per year below 10° F
- **45** hours per year below 0° F

Again, electric resistance heating (strip baseboard or ceiling mounted radiant panels) can be added to spaces where there is any concern—or even just the electrical wiring capacity to install these if the need arises. It is usually necessary to think through just how frequently this supplementary heat might be needed because it may be less frequently than initially imagined. We remind our clients that they are in an “enhanced enclosure”—one that is not drafty, one with better insulation and therefore warmer interior surfaces, one that is inherently more comfortable, and one in which the annual cost of operating the electric resistance heating supplement in a couple of bedrooms under these conditions may be less than \$40. Because it is not a typical house, we assist our clients in making some assumptions and doing the calculation before abandoning the whole idea. (Also—increasingly, the cost of electric resistance heating is cheaper than propane, and the space heaters are typically fueled either by natural

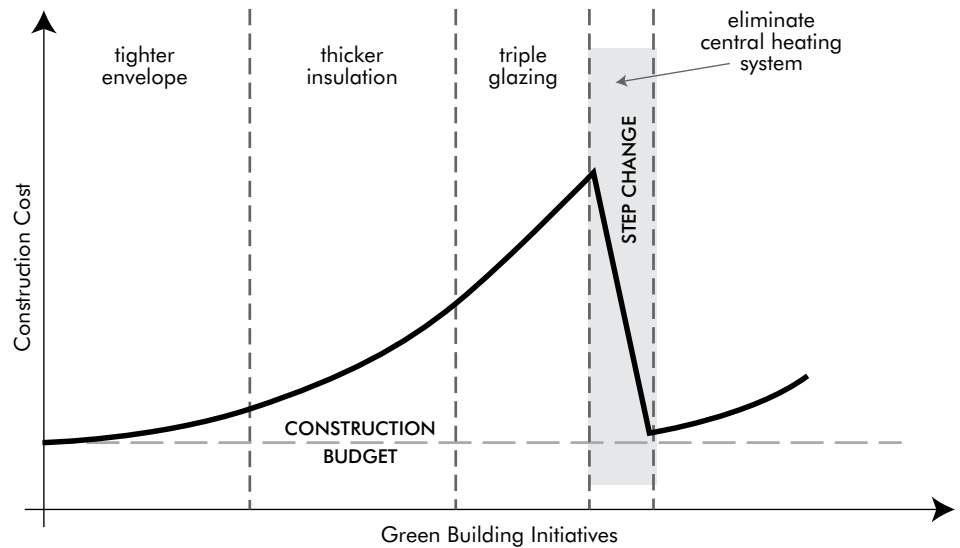


gas or propane so that \$40 may turn out to be a bargain.)

Our firm offered this choice to 28 residents at the Rocky Hill co-housing community in 2004. We spent considerable time explaining the proposition and evaluating the implications of the trade. We noted for example that families with infants or teenage children are more likely to have problems with the closed-bedroom-door condition than the empty nesters or young families. We developed options for supplementary heating. Eight of the 28—those with the smaller more compact units mostly—decided to take the space heating option. After two winters during which we installed basic temperature monitoring with assistance from Integrated Building and Construction Solutions (IBACOS) in Pittsburgh, Pennsylvania, and after which we had visited these early adopters, there appears to be complete satisfaction. People are comfortable, and they are saving fuel—and they did not pay any premium. They simply made a choice, and (it should be said) they stood their ground when, as usually happens, their friends and families and the mechanical sub-contractors (who are used to the inevitability of central heating and the guarantee of temperature uniformity under any condition) told them that they were nuts.

On the basis of these recent successes, other progressive housing projects are in construction that have a total commitment to this cost shifting that favors enhancing building envelopes at the expense of conventional central heating systems. These include the 30-unit Northeast Creek housing development in Bar Harbor, ME that our office is completing with Gordon Stanley Architecture, the Mosaic Commons co-housing now in construction in Berlin, MA (Kraus Fitch Architects and Marc Rosenbaum providing building performance consulting support), and the recently-completed Jenny Lane affordable housing development in Edgartown on Martha's Vineyard by South Mountain Company. This shift has widespread


Cost and Green Building Initiatives




applicability in this climate zone—especially if houses are simple, single-volume affairs.

The next step for us is to move to non-fossil fuel space heating. The Mosaic Commons is using electric radiant and baseboard heating which ultimately allows for a renewable power source. In Europe (but unfortunately not here yet) are micro-silo, auto-feed, wood pellet space heaters

that more or less duplicate the performance characteristics of the current crop of gas space heaters that the likes of Rinnai and Takagi are selling in the local market. One model produced by Wodke has a direct vent device that had the admirable quality of turning the now redundant flue into the pellet storage silo—the same formal components used differently. I hope that we can buy something like that here soon.





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