Yule Development

P R O J E C T S

- **Energy Analysis and Improvements, Easton Crossing**

Property information:

Multifamily Townhouse Apartment Complex built circa 1975
Located at Easton Crossing, Route 138, South Easton, MA
188 apartments; 20 Buildings, 20 acres of land; 180,000 gross square feet

Program Description:

The property was purchased in September, 1996. It was run-down, and suffered from poor demographics and high turnover. Tenants paid for their own use of electricity, and the heat was from electric baseboard radiation – paid by the tenants. Typical electric bills, including lighting, cooking, hot water, and heat, averaged $125 to $150 per month. That means that tenants were paying $1,500 to $1,800 per year for electric costs.

The goal of the energy conservation program at Easton Crossing was to cut those amounts by two thirds. This was an aggressive objective, and would require a thorough analysis, followed by extensive, careful work.

Diagnostics:

The first task was to understand the reasons for the high electric bills. There was nothing immediately apparent to indicate dramatic problems. All 19 residential buildings were built the same: slab on grade; exterior wood frame 2x4 walls with _" homosote sheathing, T-111 plywood siding, fiberglass insulation, and _" sheetrock inside. There was plywood roof sheathing on trusses with 6' fiberglass and 12" cellulose attic insulation. Between the units were masonry CMU firewalls, and there were aluminum double glazed windows and patio doors with thermal breaks. The entry doors were weatherstripped.

A sample unit was blower door tested, and leakage was measured at about 2,200 cubic feet per minute (CFM). Exterior wall details, such as windows, outlet boxes, etc. did not appear to be unusually leaky. However, three areas were discovered to present serious problems: 1) exterior stud bays at the sill plate; 2) the pediments over the kitchen windows; and 3) the masonry firewalls. These problems would have to be solved before adding sidewall insulation or replacing windows and doors.

How to solve these problems?

Easiest first: leaky stud bays were sealed by reattaching the plywood siding to the sills with 2 _" screws, and injecting foam in stud bay bottoms where necessary. Along with this work, we also tightened attic access hatches, closed ceiling penetrations, and foamed slab / foundation joints.

Second: exterior pediments. These had been framed with cantilevered floor joists with wood blocking, and trimmed out conventionally. The joist blocking was not sealed, which allowed substantial air flows into the floor joist bays, and from there via strapping cavities virtually throughout the structure (one of the warmest surfaces in the unit was the second floor ceiling!). The solution was to provide both air sealing and insulation by removing the soffit and spraying the blocking with two-part foam.

Hardest last: Firewalls. There were many avenues for leakage through and around the masonry: 1) a 1" to 2" gap at the vertical wall ends behind the sheathing left pathways from the stud bays to all parts of the structure. These were sealed from the outside with hi-density cellulose. 2) The strapping gaps behind the sheetrock wall / ceiling joint allowed air flows directly to the attic. These were foamed. 3) The cavity holes in the masonry blocks themselves overlapped, creating a network of approximately 75 small chimneys in each firewall, direct to the attic. Since the blocks are porous, this created a substantial amount of leakage area. This was addressed by punching a 1" diameter hole into each block cavity at the attic floor level and blowing in a plug of cellulose, approximately 12" in diameter. The holes were punched with a specially designed hammer, roughly 75 holes per wall, **12,500 in all**. The 4" in 12" pitched roof blocked access to the last three blocks on each end, so these were sealed from the outside by drilling in with a 51" masonry bit and injecting from the inside out.

After this work was completed, the units were re-tested with the blower, and airflows had been reduced by approximately 50%, to 1,100 CFM.

The remaining work was on the exterior: first, removal of the original T-111 plywood siding. Then installation of 1" high R-value rigid insulation over the exterior, with all joints taped. All the doors and windows were replaced with high quality, energy efficient windows and doors (some of the window replacement was for aesthetic purposes – the old windows worked satisfactorily, but they did not give the appearance desired for the finished buildings). New siding (Cemplank clapboards) and trim (Permatrim) was installed over the rigid insulation.

After this work each of the 188 apartments was retested with the blower. One bedroom units varied from 326 to 1,034 CFM (0.2 to 0.6 ACH), and two bedroom units from 751 to 1,485 CFM (0.5 to 0.8 ACH). It is interesting to note that the end units often had significantly lower rates than interior units.

The overall results: two bedroom units have winter electric bills of $60 to $80 – one third of the former costs.

The goal of reducing energy consumption by two thirds was accomplished.

Why do all this if the Tenant pays the Utilities?

a) The goal of Yule Development Company is to provide a quality living environment. Inefficient and costly heating systems are both uncomfortable and wasteful;

b) Building Maintenance is substantially reduced.

c) The housing budget of every tenant includes both rent and the cost of utilities. That total of these is the cost in the mind of the tenant when making the decision to move to the property, or to stay at the property. To the extent that utility costs are reduced, the amount of rent can be increased, with no net increase in the out-of-pocket cost to the tenant. Therefore, if utility costs are reduced by $100 per month, as was accomplished with the program described above, rent can be increased by $100 per month.

   The additional rent means that the net operating income would increase by $100 x 12 months x 188 apartments = $225,000 per year. This represents a capitalized value of $2,225,000 (using a 10% capitalization rate). The cost of the work was $1,630,000 (see below). The investment made sense.

Easton Crossing:

Summary of Costs for Energy Improvements

	Task	Cost, Total	Cost per Apartment
	Airsealing and Interstitial Insulation	$ 85,194	$ 453
	Doors & Windows	$ 646,805	$3,440
	Roof and Trim	$ 380,327	$2,023
	Siding and Insulation	$523,643	$2,785
	Total	$1,635,969	$8,701