Appendix D
Sources for Cost Estimates and Formulas for Estimating Savings

This appendix shows for each retrofit, the sources used by Energyworks in estimating the costs and savings for that retrofit.

Sources for Costs and Savings Calculations

Envelope retrofits	*Retrofit costs*	*Retrofit savings**
El. Roof insulation	R. S. Means, *Building Construction Cost* Data, 1980	Carrier System *Design* Manual–Load estimating (ref. 8)
E2. Wall insulation	Same source as El	Same source as El
E3. Storm windows	Same source as El	Same source as El
E4. Double glazing	Same source as El	Same source as El
E5. weatherstripping	Zero Weatherstripping Co., Bronx, N.Y.	Same source as El
E6. Window insulation	Appropriate Technology Corp., Brattleboro, Vt. (Window Quilt)	Same source as El and manufacturers' information
E7. Reflective films	3M Energy Control Products Division, St. Paul, Minn.	Manufacturers' information
E8. Shading devices	Literature from several different products	Same source as El
E9. Roof sprays	R, S. Means, Buildings Construction Data, sprinkler costs	Same source as El
HVAC ***retrofits***		
H1. Replace burner	ABC Sunray Corp., Plainview, N.J.	Brookhaven, Efficiency of Residential Oil-*Fired Boilers* (ref. 7)
H2. Replace boiler	Hydrotherm, Inc., Northvale, N.J.	Same source as H1
H3. Vent damper	Flair Manufacturing Corp., Hauppage, N.Y.	Same source as H1
H4. Stack heat reclaimer	Condensing Heat Exchanger Corp., Latham, N.Y.	Same source as H1 plus Bookhaven reports on boiler stack economizers (refs. *9* and 10)
H5. Heat pumps	R. S. Means, *Mechanical and Electrical Cost Data, 1980*	Residential Conservation Service, Mode/ Audit Manual (ref. 18)
H6 Boiler turbolators	Fuel Efficiency, Inc. (Brock *Turbolator)* Newark, N.J.	Same source as H1
H7 Modulating aquastat	American Stabilis, Inc. *(Enertrol)* Lewiston, Maine	Hydronics Institute–Controls for Hydronic *Systems* (ref. 14)
H8 Setback thermostats	R. S. Means, *Mechanical* **Data**	Carrier, Systems Design Manual (ref. 8)
H9 Economizer	Honeywell enthalpy control package	Honeywell, *Energy Conservation* With Comfort (source for algorithm)
H1O. Room air-conditioners	R. S. Means, *Mechanical* **Data**	RCS, Manual (ref. 18)
H11. Central air-conditioners	**R. S. Means,** *Mechanical Data*	RCS, *Manual* (ref. 18)
H12. Vary chilled water	Controlled Energy Systems Co., Seattle, Wash.	FEA, ECM-2 (ref. 12)
H13. Reheat to VAV	R. S. Means, *Mechanical Data*	Honeywell (ref. 13), Hydronics Institute (ref. 14)
H14. Reduce ventilation	Honeywell, Minneapolis, Minn. *(Tradeline, low* leakage damper)	Weather service climate data
HIS. Evaporative cooling	R. S. Means	ASHRAE **Handbook 1976 (ref. 5)**
H16. Water-cooled condenser	R. S. Means	FEA, ECM-2 (ref. 12)
H17. Fog cooling	Carrier Corp. (Rota Spray) sprayed coil system	ASHRAE Handbook 1976, 1977 (refs. 4 and 5
H18. Insulate ducts	R. S. Means	FEA, ECM-2 (ref. 12)

HVAC retrofits	***Retrofit costs***	***Retrofit savings****
H19. **Insulate** pipes	R. S. Means	FEA, ECM-2 (ref. 12)
H20. Two-speed fans	Carrier Corp. (Mocludrive)	FEA, ECM-2 (ref. 12)
Hot water retrofits		
D1. Summer hot water heater	R. S. Means	Brookhaven boiler analysis (ref. 7)
D2. Flow controls	Omni Products, Inc., Yucca Valley, Calif.	ASHRAE Handbook (refs. *4* and *5)*
D3. Insulate storage	R. S. Means	Carrier Corp., System *Design* Manual (ref. 8)
D4. Vent damper	Same **source as** H3	Brookhaven (ref. *7),* NBS energy conservation modifications for water heaters
D5. Heat pump water heater	E-Tech., Inc., Atlanta, Ga.	Department of Energy, research and development of heat pump water heater (ref. 11)
Lighting retrofits		
L1. Fluorescent for incandescent	R. S. Means	McGuiness and Stein (ref. 15)
L2. Hybrid fluorescent	GE, Circlight, Los Angeles, Calif.	McGuiness and Stein (ref. 15)
L3. Task lighting	Dayton Co., commercial work fixtures	McGuiness and Stein (ref. 15)
L4. High-efficiency flourescent	GE *(Watt Mizer //),* Sylvania (Superstar)	McGuiness and Stein (ref. 15)
Solar retrofits		
	References for Costs, local contractors in Massachusetts cross-checked with R. S. Means, Cost-Study *Report to Mass-Save,* Inc., 1981	*References for* Savings, 1) Solar Heating Design by the F-Chart Method, Beckman, Klein, Duffie, 1977, and 2) *Passive Solar Design* Handbook, vols. 1 and 2

● Most of the algorithms used to estimate **energy savings were developed by Energyworks, Inc. of West Newton, Mass., using parameters to be found in the sources cited. In a few cases, indicated here, the algorithm came from the source**

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