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CHAPTER 12. ENERGY CONSERVATION

SECTION 1: CHAPTER OVERVIEW

- 12-1. Introduction  
In the development of a National Energy Strategy, the Department of Energy launched a major endeavor to increase residential energy efficiency. Through a joint initiative, DOE and HUD have developed a set of guidelines, set forth in this chapter, that will seek to improve the quality of life for residents of HUD-subsidized housing, while at the same time, reduce the amount of energy consumption and the high energy costs owners and HUD must bear.
- 12-2. Purpose  
The purpose of this chapter is to assist owners and managers in meeting the Energy Efficiency Requirements set forth in Section 329C of the Housing and Community Development (HCD) Amendments of 1981. Through the use of an annual Multifamily Energy Survey (or other method of the owners choosing), management will identify steps which can be taken to improve energy efficiency. This survey will also serve as a method of documenting compliance with the law. This chapter also presents some practical ideas for involving tenants in the conservation efforts. For larger capital improvements, this chapter outlines the audit requirements for the Capital Improvement Loan Program (Flexible Subsidy) and discusses other funding opportunities. Finally, it will present the necessary steps for the conversion of Master Metered Utilities to Individually Metered (Tenant Paid) Utilities.
- 12-3. Applicability
- a. Section 329C of the Housing and Community Development Amendments of 1981 covers the programs set forth below. Projects which are subsidized under these programs and which have their rents adjusted through the Budgeted Rent Increase Method, are required to certify and document that they meet the requirements of the law.
    1. A project assisted under the Section 236 interest reduction program, including State Agency non-insured projects, 221(d)(3) Below-Market Interest Rate (BMIR) program, or the Rent Supplement program.

2. A project that was constructed with a direct loan more than 15 years ago under the Section 202 Program for Housing for the Elderly or Handicapped.
  3. A project assisted under the Section 8 Housing Assistance Payments program after conversion from assistance under the Section 236 Rental Assistance Payments Program or the Rent Supplement program.
  4. A program that met the criteria in item 1 or 2 above before acquisition by the Secretary of HUD, that has been sold by the Secretary subject to a mortgage insured or held by the Secretary and subject to an agreement which provides that the low- and moderate-income character of the project will be maintained. Projects in this category are only required to certify and document if their rent increases are granted through the Budgeted Rent Increase Method.
- b. Effective with the FY '93 funding year, when projects requesting Capital Improvement Loan (CILP) funds are required to submit the Comprehensive Technical Energy Audit the guidelines outlined in Section 3 should be utilized unless otherwise specified in the NOFA. This covers properties assisted under the following programs:
1. A project assisted under the Section 236 interest reduction program, including State Agency non-insured projects, 221(d)(3) Below-Market Interest Rate (BMIR) program, or the Rent Supplement program.
  2. A project that was constructed more than 15 years before assistance is to be provided under the Capital Improvement Loan Program, with a direct loan under the Section 202 Program for Housing for the Elderly or Handicapped.

3. A project assisted under Section 23 of the

United States Housing Act of 1937 as in effect immediately before January 1, 1975 that is ineligible for assistance under the modernization program operated under the 1937 Act.

4. A project assisted under the Section 8 Housing Assistance Payments program after conversion from assistance under the Section 236 Rental Assistance Payments Program or the Rent Supplement program.
5. A program that met the criteria in item 1 or 2 above before acquisition by the Secretary of HUD and that has been sold by the Secretary subject to a mortgage insured or held by the Secretary and subject to an agreement which provides that the low- and moderate-income character of the project will be maintained.

SECTION 2: MULTIFAMILY ENERGY SURVEY FOR HUD-INSURED PROPERTIES

12-4. Conducting the Survey

- a. Purpose and Use  
The survey (Appendix 1) is a sample survey, developed by the Department of Energy. It is designed to give a project manager or staff member the ability to assess the basic energy conservation needs of the complex. This survey is designed so that its completion will provide the supporting documentation necessary for the required certification. The owner may utilize outside survey forms or other methods if they feel that another method is adequate to fulfill the requirements of the law. Also contained in Appendix 1 is a list of Energy Conservation Measures (ECM) which indicate steps that can be taken to improve energy efficiency in a particular area. The survey will reference the ECM when a negative response is provided to a survey question, thus indicating possible corrective measures.

- b. Survey Schedule  
Initially, a survey or alternative documentation should be performed at the end of the project's fiscal year. Some of the information will remain

the same from year to year and other information will change as the project becomes more energy efficient. The survey should be conducted by the on-site management staff and/or maintenance personnel, as they are the ones most familiar with project conditions. HUD does not expect that the owner/manager or contracted staff will conduct the survey for projects that have on site staff. The project owner is only expected to certify that they are in compliance with the law. A copy of the results of the survey or other documentation should be retained by management and made available upon request to the Field Office staff during the Management review or other on-site visits. It is expected that most of the needed improvements identified by the survey will be categorized as low cost, routine maintenance repair items that can be funded out of project income.

c. Other Acceptable Survey Formats

While the format in Appendix 1 is an acceptable form of documentation for compliance with the law, it is not mandatory that this form be used. Other acceptable formats include:

1. The Multifamily Energy Conservation Workbook, developed by the New York State Energy Office. It can be obtained from: New York State-Energy Office, Agency Building 2, Rockefeller Plaza, Albany, NY 12223.
2. The workbook, Energy Conservation for Housing, which was prepared under a HUD Policy Development and Research (PD&R) contract. It is available through HUD USER (PD&R's information service) for a nominal fee by contacting: HUD USER, P.O. Box 280, Germantown, MD 20874, 1-800-245-2691 or (301) 251-5154.
3. Any other method the owner or manager feels will place them in compliance with the HCD Amendments of 1981.

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- 12-5. Submission of the Certification and Supporting Documentation to the HUD Field Office. A certification of compliance with Section 329C of the HCD Amendments of 1981, will be required to be submitted to HUD with

the owner's request for a rent increase under the Budgeted Rent Increase method. Tenants will have the ability to provide comments concerning the certification, the documentation which supports the certification and the time frames in which the owner plans to take care of deferred maintenance items, as a part of the tenant review of the rent increase package (see Chapter 7, Handbook 4350.1, concerning the tenant review requirements).

- 12-6. Follow-up Study of Energy Conservation Efforts.  
The owner/manager should maintain monthly billings which show the levels of energy consumption and cost. This will serve as an indication of how effective energy conservation measures have been and will provide a useful source of information when calculating total energy consumption at the end of the year. When analyzing these records, it is important that changes in the consumption level rather than changes in cost be measured to accurately reflect the effectiveness of the conservation efforts.
- 12-7. Monitoring Requirements and Compliance.
- a. Monitoring - The HUD Field Office will, in the majority of cases, review supporting documentation as part of the on-site Management Review. In doing so it should review how the owner is adhering to the established time frames. This should be reflected in the rating of management's performance in Section A, Item 9 of the Management Review form (HUD 9834). As appropriate, the Loan Management Staff should make recommendations addressing slippage or noncompliance with the time frames.
  - b. Compliance - Cooperation on the part of owners/managers toward certifying and documenting compliance will serve as fulfillment of the requirements set forth in Section 329C of the HCD Amendments of 1981.

- 12-8. Tenant Involvement  
Tenant involvement is a vital part of an owner/manager's attempt to implement energy conservation measures in a project. Many steps can be taken to involve tenants in conservation efforts. Below is a brief list of some suggested ideas:
- a. Provide a brief energy conservation orientation to

new tenants.

- b. Provide specific suggestions for energy conservation to the tenants, seek their suggestions, and request their help in implementing the suggestions. Appendix 2 includes a list of tenant conservation measures that may be reproduced for tenant distribution.
- c. Explain to the tenants how a reduction in energy consumption can help offset future rent increases.
- d. Stress the need for tenants to immediately report to management any factors, either within their unit or in common areas, that contribute to energy losses.
- e. Inform the tenants of the project's present energy consumption level and provide periodic updates to show increases or decreases in energy consumption.
- f. Encourage tenants to contribute energy conservation ideas as an ongoing effort.
- g. Obtain speakers and/or printed materials that promote energy conservation.

SECTION 3: COMPREHENSIVE TECHNICAL ENERGY AUDIT

12-9.

Introduction

Most HUD-insured and HUD-held multifamily properties were built using the minimum property standards developed by the Department to assure sound insurance underwriting. However, much of the housing stock was constructed during a period of low energy costs, before there was as critical a need to design housing for optimum energy efficiency. While those standards represented what was considered necessary for energy efficiency at the time of construction they may not necessarily reflect the most cost effective, energy efficient construction standards as the technology is

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known today. In consideration of these factors, it would be prudent to plan for the upgrading of the major capital components which were originally installed in projects, with cost effective, energy efficient replacements as they reach the end of their life expectancy. With respect to a project's major structural components and systems, a Comprehensive

Technical Energy Audit is necessary to determine the most cost effective, as well as practical energy efficient replacements that can be funded based on the available financing. The type of audit needed for this purpose requires a higher degree of technical expertise than that normally found on the immediate staff of the owner/manager, thus the services of a licensed professional engineer or certified energy auditor will be required. In cases where an identity of interest with the owner exists, three formal bids will be required prior to obtaining the services of a licensed professional engineer.

12-10.

Purpose

The purpose of this section is to address the audit process, present methods to evaluate the findings, and provide a range of what is expected to be cost effective improvements. This section will provide guidance on the technical aspects of a Comprehensive Technical Energy Audit (CTEA) for use in conjunction with the implementation of capital improvements. While it is not required that an owner perform an audit (unless an owner is applying for Capital Improvement Loan funds) this section establishes minimum audit guidelines necessary for meeting the requirements of the Comprehensive Technical Energy Audit to be submitted as a part of the Capital Improvement Loan application. The CTEA will also assist the owner in developing the Energy Conservation Plan (ECP) which will become part of the MIO Plan or Work Write-Up to address how the owner will upgrade the property to meet cost-effective energy efficiency standards.

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Conducting the Comprehensive Technical Energy Audit

- a. Purpose - This will establish the minimum audit guidelines and background research necessary to meet the definition of a Comprehensive Technical Energy Audit (CTEA). A CTEA must be performed by a licensed professional engineer or certified energy auditor.

- b. Funding - Funding of a Comprehensive Technical Energy Audit will be considered an allowable project expense. If an Identity of Interest firm is involved, then the owner must obtain three formal bids prior to funding the CTEA as a project expense.

- c. Audit Preparation - It is important that a proper emphasis be given in preparing the background material necessary for carrying out the audit specifications. Below is a recommended step-by-step process which discusses what materials need to be gathered, how audit guidelines should be established in contracting for an auditor, how retrofit recommendations should be analyzed, and how to carry out the recommended retrofits. The steps are as follows:

Step 1: Preparing preliminary material

The first step in preparing the audit specification is to bring together all the pertinent available documentation. Making this information available to the auditor(s) will help them prepare a better audit, and may reduce the cost by eliminating many of the time consuming steps of gathering the information.

1. Building Documentation.  
Building plans and specifications are the best source of information on building materials, dimensions and other physical characteristics. These will provide information on mechanical systems. In addition to the original building plans, specifications and other documentation may be available from subsequent renovation, remodeling or rehab work. Equipment maintenance records and documentation from previous audits should also be collected.
2. Energy Consumption Records.  
Historical billing records are an important source of information for the energy auditor, both for targeting areas for reduction, as well as providing a baseline from which to measure energy savings. Utility companies will release usually the last 12 months of gas and electricity consumption. Tracking

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fuel oil is more difficult, due to the large number of suppliers and the less regular delivery schedules. Energy consumption should be plotted and weather normalized, which can be done using a software program or manually using charts and tables. This will



provide a more accurate picture of conservation needs.

3. Occupancy Characteristics.  
Similar to the need for weather normalization, occupancy characteristics (all elderly, families with small children, etc.) can be important in specifying certain retrofits, and concerns for safety and security. The total number of occupants, the number of vacant units, and some feel for the change in vacancy are all important factors in making a building audit.
4. Building Maintenance Staff.  
Often the best source of information on the performance of the building will be the building manager or maintenance person. Interviewing the building manager prior to the audit can identify important areas for inclusion in the audit guidelines.

#### Step 2: Providing audit guidelines

If staffing permits, an in-house review of the preparatory audit materials can lead to a more direct audit. If not, this review can be performed by the auditor. The audit guidelines which will be presented in the next section state the minimum standards HUD will accept in auditing capital improvements. If a certain guideline does not pertain to a certain building, then it should be noted in the narrative as opposed to being simply omitted. The preparatory material provided to the auditor will assist in determining what guidelines apply to the project and which do not.

#### Step 3: Preselecting retrofit recommendations

The auditor may benefit from the list of ECMS in Appendix 1. By management's indication of which measures they would like to see implemented in the project the auditor should be able to develop a range of recommendations, based on possible

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funding levels, as to their possible energy savings. By providing a "floor" level recommendation as well as an ideal level of energy efficiency, the owner will be able to work within

the restraints of available funding to implement energy conservation measures. The owner's input will also provide the auditor with the direction management feels should be taken in regards to energy conservation.

Step 4: Writing the audit specifications

It will be useful in soliciting bids from potential auditors to cover: the collection of information during the audit, the analysis of energy savings, computation of ECM costs and the presentation of findings. The specifications should also address concerns for safety, security and reliability as well as energy conservation goals the owner/manager wishes to achieve.

Step 5: Selecting candidate auditors

There are several strategies for locating energy auditors. Local phone directories may have companies under the following listings: Energy Management and Conservation Consultants, Engineers, Energy Service Companies, Energy Auditors. Magazines such as the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Journal, Home Energy and the Journal of Real Estate Management, among others, will often have advertisements for energy auditors. Once potential auditors are identified, set a schedule for the work to be carried out and make arrangements for the building to be accessible through the building manager.

Step 6: Evaluating the auditors proposals

After the audit has been completed, the manager/owner will have to select which ECMs should be undertaken. In addition to reviewing projected costs and savings, the following points should be kept in mind:

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- o Is the work necessary for this measure due to deferred maintenance? If so, time frames for correction should be submitted with the plan if capital improvements are to be requested under the Capital Improvement Loan program. Deferred maintenance items should be funded from project income.

- o What type of performance guarantees are included?
  - o What will the contractor have to do to comply with any Federal, State or local environmental requirements.
- d. Audit Guidelines - This section presents guidelines for performing the audit by identifying which areas need to be addressed. These guidelines are the minimum acceptable standards for HUD's definition of a Comprehensive Technical Energy Audit. All numbered and lettered areas listed below should be addressed in narrative form including: (1) the condition of the item, (2) recommended retrofits to make the item more energy efficient including adjustments to the current systems or replacement with new systems, (3) the impact each item has on the energy efficiency of the project, (4) estimated energy savings of each recommended change and; (5) for major capital improvements, payback time (estimated in years) to determine cost effectiveness. More specific inspection items are listed under each lettered area to direct the audit and provide a thorough assessment.

1. Building Data

A. General Data

- o Number of floors in the building
- o Number of each type of unit
- o Orientation of the building

B. Walls

- o Construction type
- o Insulation characteristics

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C. Roof

- o Construction type
- o Insulation characteristics

D. Basement (if applicable)

- o Construction type
- o Insulation characteristics

2. Apartment

Not all units in a complex are required to be inspected during the CTEA. It is assumed that several apartments (preferably at least one from each building) will be representative of the energy consumption of all the apartments in the entire complex. If this assumption is incorrect the inspection areas listed below should be addressed for each type of apartment. The typical apartment selected for the audit should be the one farthest from the heating plant.

A. Inspect Apartment Doors

- o Check weatherstripping if door opens to outdoors
- o Check tightness of door closure
- o Does the door close automatically?

B. Inspect Apartment Windows

- o Type, number and size of windows
- o Check Weatherstripping
- o Check tightness
- o Check caulking
- o Are there window-mounted air conditioners?
- o Are there any removable panels or through-the-wall sleeves for air conditioners?

C. Inspect Apartment Heating and Cooling

- o Type of heating units
- o Condition of valves
- o Condition of air vents
- o Condition of thermostats

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- o Is air conditioner supplied by tenant?

D. Inspect Apartment Hot Water

- o Check for leaky hot water taps
- o Measure hot water at the tap in a sample of apartments.
- o Measure flow rates (gallons per

minute) of showers and faucets.

E. Inspect Apartment Exhaust Ventilation

- o Is there a kitchen exhaust ventilation?
- o Is air exhausted continuously?
- o Is there bathroom exhaust ventilation?
- o Is air exhausted continuously?

F. Inspect Apartment Lighting

- o Check type and power of kitchen lighting
- o Check type and power of bathroom lighting

3. Lobby and Corridor

NOTE: Concerning common area and exterior lighting, tenant safety must remain the primary concern when analyzing whether or not lighting should be reduced in common areas for energy efficiency.

A. Inspect Corridor and Stairwell Windows

- o Check condition

B. Inspect Interior Doors

- o Check condition and insulation

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C. Inspect Corridor and Stairwell Lighting

Note type, condition and number of fixtures. Measure illumination levels to determine if spaces are over or under-lit. Note if wall painting or carpet replacement is needed, and recommend lighter colors (NOTE: Avoid carpet colors which are easily soiled).

D. Inspect Lobby Lighting

Note type, condition and number of fixtures. Measure illumination levels to determine if spaces are over or under-lit. Note if wall painting or

carpet replacement is needed and recommend lighter colors (NOTE: Avoid carpet colors which are easily soiled).

4. Central Plants

A. Domestic Hot Water (DHW)

- o Inspect the boiler and distribution system for the domestic hot water system.
- o Assess potential for heat pumps or solar-assisted systems.

B. Heating System

C. Cooling System

5. Roof

Check for missing material, curled shingles or patching, gaps in flashing, ventpipes and caulking on the roofs in general.

6. Exterior Building

Lighting

- o Survey exterior lighting, noting type, condition and number of fixtures. Assess illumination levels (at night), and note schedule of automatic controls, if any.

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7. Outdoor Parking Areas

Lighting

- o Survey exterior lighting, noting type, condition and number of fixtures. Assess illumination levels (at night), and note schedule of automatic controls, if any.

8. Laundry Room

Note type, condition and number of fixtures. Measure illumination levels to determine if spaces are over or under-lit. Note condition of windows and doors. Section 504

requirements should be referenced prior to developing retrofit recommendations to assure the requirements are taken under consideration.

9. Special Facilities

Note type, condition and number of fixtures. Measure illumination levels to determine if spaces are over or under-lit. It is important that tenant safety outweigh the need for energy conservation when recommending lighting reduction. If wall painting or carpet replacement is needed, recommend lighter colors (NOTE: Avoid carpet colors which are easily soiled). Note condition of windows and doors.

12-12. Requirements for the Capital Improvement Loan Program. When requesting funds under the Capital Improvement Loan Program, a CTEA must be submitted addressing the cost effectiveness of each proposed capital improvement. In determining cost effectiveness the owner should at least utilize the payback formula in Section F(1). This will satisfy the need for proof of whether a measure is cost effective. A more accurate means of determining cost effectiveness is through the software programs addressed later in this chapter. If necessary capital improvements are related to deferred maintenance, then an application must be made simultaneously for Operating Assistance. This should be addressed in the audit findings.

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12-13. The Energy Conservation Plan (ECP). When a CTEA is required by the Capital Improvement Loan Program, the implementation of the findings should be addressed in the Work Write-Up or MIO Plan. The ECP will focus on planning major capital improvements relating to energy efficiency (including those which are identified in the Comprehensive Technical Energy Audit) and should include:

- a. Long range energy conservation goals;
- b. Description of work for each proposed improvement;
- c. Funding sources/mechanisms to be utilized; and
- d. The estimated payback time (in years) of each long range capital improvement.

12-14. Evaluating Audit Results

a. Technical Aspects of the Audit

The following are several areas that should be taken into consideration when evaluating audit results. HUD does not require that each of these items be addressed when submitting the results of an audit; they are simply tools provided to assist the owner/manager in choosing which energy conservation measures to implement. Utilization of these tools will provide a more accurate assessment of the cost effectiveness of each ECM.

1. Cost and Savings Analysis.

When deciding on which measures to implement it is important to evaluate the payback period to the project. Improvements having a payback period of 5 years or less may be recommended for inclusion in the project. To compute a simple payback of the project in years, the following formula should be used:

$$\text{Payback} = \frac{\text{Cost of ECM}}{\text{Annual Energy Savings (\$ per year)}}$$

Another way of analyzing the long term cost and savings of a particular ECM is through computer programs. Two programs are particularly helpful in this area. They are:

- o "The Right-J," a computer program and "Manual J," a technical manual, which are distributed by the Air Conditioning Contractors of America. This program

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and the technical manual follows the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) methods and principles and are especially useful in calculating residential heating and cooling loads. Both resources may be obtained from the Air Conditioning Contractors of America (ACCA), 1513 16th St., N.W., Washington, D.C. 20036 or (202)483-9370.

- o The second program is the DOE-2 program designed by the University of Wisconsin



for DOE and represents the state of the art in building simulation software. This program is complex and provides a detailed report of annual energy consumption. There are currently only two software vendors who provide the microcomputer version of DOE-2.

- o ADM Associates Inc., 3299 Ramos Circle, Sacramento, CA 95827 or (916)363-8383; and
- o Acrosoft International, 9747 East Hampden Ave., Denver, CO 80231 or (303)368-9225.

2. Geographic Location.  
Determination of the cost effectiveness of various ECMs requires adjustments pertaining to the climate at the building location. The National Oceanic and Atmospheric Administration (NOAA) maintains highly specific weather data for every major city and region in the U.S. This information can be used to model the local climate for use in calculation and in sophisticated computer programs.
3. The Building Envelope, Infiltration and Air Exchange Rates.
  - A. The building envelope. This term refers to the building shell including all exterior walls, floors, roofs, doors and windows. Energy Conservation Measures involving the building envelope focus on

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reducing both the heat conducted to the outdoors through these building elements and the heat load due to infiltration of outside air.

- B. Air infiltration can account for as much as 50% of the total heat consumption in older buildings. Air leaks in apartments most commonly result from broken and poorly constructed windows, degraded caulking, open exhaust stacks, and inadequate walls and ceilings.

Drywall holes located at plumbing and electrical service entrances, such as drain pipes and electrical receptacles are sources of air infiltration and detectable drafts frequently come from these areas.

Air infiltration tests have been designed to locate and measure air leaks in the building envelope. They should be conducted before and after the retrofit to assist in energy savings calculations. Outside air infiltration can be measured using methods such as the blower door testing and tracer gas detectors. These tests utilize air changes per hour (ACH) as their unit of measurement. Another beneficial test for measuring air infiltration is the Air Infiltration Measurement Service. This test distributes an inert gas into the building at a constant rate, which is measured as its concentration drops due to infiltration.

Some deferred maintenance energy conservation measures in the area of reducing air infiltration include:

- i. Caulking all openings of the building envelope, including all window frames, electrical and plumbing penetrations.
- ii. Replacing broken and cracked window panes.

- iii. Repairing or replacing weatherstripping around the perimeter of all doors and providing door sweeps at the bottoms of all exterior doors or doors that adjoin unheated spaces.
- iv. Sealing all floor or ceiling penetrations.
- v. Installing interior polyethylene vapor barriers behind new sheetrock

on major structural rehabilitations  
(except in warmer climates).

The above measures should be funded out  
of project income.

- C. Additional measures are recommended for  
the control of conductive heat losses.  
These are more extensive and likely to  
be funded under a mechanism such as the  
Capital Improvement Loan Program.
  - i. Additional insulation in major  
structural rehabilitation.  
(Recommended R-values: a minimum  
of R-13 in walls and up to R-38 in  
ceilings depending on local  
climatological conditions. Local  
or state code, if more stringent,  
shall apply.)
  - ii. Storm windows for colder areas.
  - iii. Double-pane windows with thermal  
breaks.
  - iv. Double-pane storm windows with  
thermal breaks in northern  
projects.
- V. For air conditioned southern  
projects:
  - o radiant barriers in projects  
with attics or roof  
replacements; and

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- o solar screens on windows with  
western and southern exposure.
- 4. Heating, Ventilating and Air Conditioning  
(HVAC) and Domestic Hot Water Equipment (DHW)
    - A. Several criteria are important to  
consider in the selection of HVAC and  
DHW for multifamily complexes. These  
include:
      - i. Initial and Life Cycle Costs - The

life cycle cost of mechanical equipment is dependent on its initial installed cost as well as costs to operate and maintain the equipment throughout its usable life. Thus, the design of the appropriate systems and selection of equipment and proper maintenance to retain efficiency play important roles in reducing life cycle costs.

ii. Fuel Availability; and

iii. Occupant Comfort.

B. In the rehabilitation of the project, system design is limited by existing site conditions. Another limitation in planning for HVAC and DHW equipment is the trade off between system efficiency and net installed costs.

C. Some Energy Conservation Measures that can be utilized in this area include:

i. The use of high efficiency equipment in the normal replacement cycle of appliances, with consideration of the Section 504 requirements;

ii. For units with internal individual gas furnaces and electric air conditioning, install automatic vent dampers in flue stack;

iii. Careful consideration should be given to the type of fuel used for heating and cooling. The most efficient from a life-cycle cost standpoint will depend on the relative cost of gas, electricity and oil, as well as the first cost of equipment.

iv. Insulation of hot water pipes and heaters is recommended.

v. Central system operating efficiency

can be improved by system timing and control improvements.

- vi. Night set-back, timed thermostats and low-flow showerheads.

5. Lighting and Appliances

Lighting and appliance upgrades sometimes offer the best opportunities for short term paybacks. Replacement of incandescent lighting with fluorescent lamps in kitchens and common areas can be particularly cost effective, as can installation of new high efficiency appliances for existing, less efficient ones (both because of age and original construction). When replacing appliances in the normal course of replacement, owners should consider replacing deteriorated appliances with cost effective energy efficient ones.

- b. Renewable Energy and Energy Management Systems  
Two areas to consider before deciding on final energy conservation measures to implement, are the areas of Renewable Energy and Energy Management Systems.
  - o Solar energy hot water heaters and ground source thermal heat pumps are some of the recent developments in heating and cooling systems.
  - o Energy management systems (frequently computerized) are another consideration especially in larger multifamily structures. If used only for monitoring energy

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consumption, then HUD imposes no standards on their usage. If these systems are used as a check metering system to determine tenant paid utilities, then the system must meet the standards of Check Metering Systems as defined in paragraph 12-19.)

A licensed professional engineer should be consulted as to whether or not these types of energy conservation methods would be feasible for a particular project and to what extent they should

be developed. A valuable source of information for these types of energy conservation measures is the National Appropriate Technology Assistance Service (NATAS). This service, funded by the Department of Energy, provides technical information and assistance on energy conservation and renewable technologies. NATAS can be reached at 1-800-428-2525 (in Montana 1-800-428-1718) or by writing to: NATAS, U.S. Department of Energy, P.O. Box 2525, Butte, MT 59702-2525.

c. Financial, Technical and Informational Assistance  
In addition to NATAS, many sources are available which may provide assistance in deciding how to implement Audit recommendations. These include:

- o States maintain energy efficiency programs which can provide technical information, audit resources, financial assistance and related program assistance to the owners of multifamily housing.
- o Local government and non-profit programs.
- o Gas and electric utilities provide audit assistance, finance conservation improvements and are an important resource for multifamily owners/managers in some service areas.
- o In some states, the Weatherization Assistance Program (WAP) is available for low-income multifamily housing. This program provides assistance in controlling heating and cooling problems and for HVAC maintenance

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improvements. For more information on this project contact: U. S. Department of Energy, Weatherization Assistance Program, CE-232, 1000 Independence Ave. SW, Washington, DC 20585, (202)586-2207.

#### SECTION 4: FUNDING MECHANISMS AVAILABLE TO IMPLEMENT ENERGY CONSERVATION MEASURES

12-15. Use of Project Funds  
When possible, the project owner should utilize project funds to cover energy conservation measures. Deferred maintenance repairs should be funded out of project income and whenever possible the replacement of

appliances, heating equipment, etc. should be funded out of the Reserve for Replacement fund or Residual Receipts.

12-16. Alternative Funding Sources

If project funds are not sufficient to implement the necessary Energy Conservation Measures and the owner/manager is unable to identify other funding resources to implement the actions, the owner/manager should contact the HUD Field Office concerning the feasibility of applying for a Capital Improvement Loan under the Flexible Subsidy Program. NOTE: The owner/manager must obtain permission from the first mortgagee before accepting any financing which will require a second mortgage to secure such financing.

- a. Energy grants - These may be obtained from sources such as the State, county or city agencies. For example, Community Development Block Grants may be available for this purpose.
- b. DOE loans and grants - WAP and NATAS are valuable sources of information as well as possible sources of funding. Additional funding options that may be more suitable to an owner's needs may be available from DOE. For information contact: The U. S. Department of Energy at (202)586-5000.
- c. Utility loans and related programs - Special energy loans and service programs are often provided through local utility companies or reputable energy management firms.
- d. Rent increases - Consider the feasibility of implementing increases to cover such costs in stages. It should be noted that rent increases

must be approved by HUD under the required guidelines (Handbook 4350.1, Chapter 7). If ECMs are financed through a rent increase, then tenant comments must be taken into consideration prior to HUD approving the rent increase to implement the measures (for additional guidance see Chapter 7, Handbook 4350.1).

- e. Conventional Financing for capital improvements, etc. - The terms of such a loan must be approved by the Field Office if repayment of the loan is to be made out of project income as an allowable line

item in the rent formula, rather than from surplus cash.

- f. Section 241 HUD-insured supplementary loan - Proceeds of this loan are available for purchasing and installing energy-conserving improvements, solar energy systems and individual utility meters. This loan is obtained through the project's mortgagee and prior HUD approval is required.
- g. Owner's loan to the project - The terms of this loan must be approved by the Field Office if repayment is to be made out of project income as an allowable line item in the rent formula prior to the owner lending the money.
- h. Advances by the owner - The terms for repayment of advances must be approved by the Field Office if repayment comes from sources other than surplus cash.
- i. Flexible Subsidy - The Capital Improvement Loan program was designed to fund measures such as energy efficient improvements. An owner contribution is required and the measure is subject to the competitive funding process. This program and the requirements are set forth in Handbook 4355.1.
- j. Change in ownership - The new owner's equity investment can be designated for this purpose.
- k. Release from residual receipts account, if applicable.

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- 1. Advances from the reserve for replacement account. Be sure to consider immediate as well as future replacement needs and whether the use of reserve funds for energy purposes would outweigh those replacement needs. A HUD-approved plan for repayment of the advance shall be required unless there is adequate justification for a waiver.

12-17.

HUD Approval

The Field Office should give serious consideration to reasonable requests for approval of financing mechanisms (if funds are available and appropriate eligibility requirements have been met) to accomplish the objective of reducing energy consumption and costs



as a part of the overall Capital Improvement request. When recommending or approving financial arrangements for implementing the project's energy conservation measures, the Field Office should consider the financial and physical viability of the project and how the measures fit into the overall needs of the project. Particular attention should be given to the approval of project-funded mechanisms with respect to their resulting effect on project rents. HUD's approval should be based on its analysis that what is requested will result in a reduction in energy usage and/or a corresponding reduction in energy cost that will not be detrimental to the project.

SECTION 5: CONVERSION FROM MASTER METERED UTILITIES TO INDIVIDUALLY METERED (TENANT PAID) UTILITIES

12-18. Background and Purpose

In complying with the requirements set forth in the National Energy Strategy, HUD continues to support and encourage efforts of all parties to bring about the reduction of energy consumption. Since the early 1970s, HUD has encouraged owners/developers to produce housing which would provide increased energy efficiency, both structurally and operationally. A major thrust of this endeavor is the design of efficient project utility systems which feature individual meters rather than master-metered systems. This provides an incentive for tenants to play a role in the energy conservation efforts of the project. The purpose of this section is to provide guidance to the Loan Management staff in carrying out the approval process.

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12-19. Tenant Paid Utilities

Subject to HUD approval, utilities can be structured so that the tenant is responsible for making payment directly to the utility company. Most tenants have a greater incentive to conserve consumption of utilities when they are billed directly for their actual use. Tenant paid utilities can be structured in one of two ways:

- o Master-metered utilities may be converted to individually-metered utilities;
- o Submetering and apportioning of the project's energy usage costs utilizing a specially-designed computer billing system which monitors/measures a

tenant's actual energy consumption. (This type of system must print out the tenant's actual energy consumption and will not be considered a submetered property by HUD unless the print out of the energy usage is directly from the metering instrument and may not be influence by an outside entity. The owner will be required to keep records on individual tenant energy consumption for at least 3 years for audit purposes.)

Additional information on these alternatives may be obtained from energy management firms that provide these utility services and/or by obtaining the IREM publication entitled, Alternatives to Master Metering in Multifamily Housing. HUD approval is required prior to implementing alternative utility programs. In addition, State and/or local law prevails with respect to the establishment of such utility programs.

- 12-20. Practicality of conversion to tenant paid utilities. As the owner/manager begins to evaluate the practicality of conversion to tenant paid utilities, they should take into consideration the Survey and the project's energy consumption/cost levels when determining whether the conversion to a tenant-paid utility arrangement will be the most effective means of addressing the project's energy consumption problems. Other items that should also be considered include:
- a. Possible structural difficulties in converting the utility system.
  - b. The cost of the conversion.

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- c. How the conversion will be funded and the effect, if any, that such financing will have on project rents, especially where tenant rents are not based on a percentage of income formula.
  - d. The estimated savings to the project.
  - e. Other factors such as marketing, occupancy implications, effect on utility rates, etc.
- 12-21. Submitting the Conversion Request  
If after evaluation of the above items the owner/manager feels that conversion to individually metered utilities is in the best interest of the energy conservation needs of the project, then a written

request should be submitted to the local HUD Field Office for approval of the conversion and the utility allowance. The owner's request should include the following documentation:

- a. A copy of the Notice to tenants (described in paragraph 12-22)
- b. The type of utility(s) to be converted (gas, electric) and the utility combination involved (space heating, cooling, domestic hot water, cooking, lighting).
- c. A breakdown of the number of units by unit type and size.
- d. Monthly cost for the past year of paying for the utility or utilities involved on a project basis (actual cost) and by unit type and size (estimated cost).
- e. A statement from the utility company(s) addressing the average monthly level of energy consumption and cost for each size and type unit, taking into consideration the type of building(s) involved. This statement should include any foreseeable rate increases for the next 12 months.
- f. A recommended utility allowance for each size unit, taking into consideration: the utility company's estimate; other data obtained; the impact of energy improvements; and increases in utility rates expected in the next 12 months.

- g. The total conversion costs involved, as obtained from the utility company or from contractor bids and to the extent known, the source and terms of financing the conversion.
- h. The estimated effect of the conversion on the total housing cost of the tenants by unit type and size, taking into account:
  1. The estimated monthly cost of utilities to be paid by the tenants by unit type and size;
  2. The estimated cost of conversion (including the cost of financing)

3. The proposed utility allowances; and
  4. The estimated change in rents paid to the mortgagor as a result of the conversion.
- i. Provide a copy of the project's latest form of compliance documentation and time frames, annotated to indicate progress made toward the implementation of conservation measures in areas identified as needing improvement (if any).
  - j. Comments received during the tenant review process.

12-22. Tenant Input. The request should be accompanied by the tenant input as received by the owner when complying with the tenant review procedures outlined in 24 CFR 245, Subpart E. These procedures require that tenants be notified 30 days prior to the owners submission of the conversion request to HUD, by a notice which states the following:

- a. The mortgagor intends to submit a request to HUD for approval of conversion from Project-paid utilities to tenant-paid utilities, or of a reduction of tenant utility allowances;
- b. That tenants (including any legal or other representatives acting for the tenants individually or as a group) have a right to participate through:
  1. A 30 day review period. This period will commence from the date of the Notice during which time tenants may review the conversion package to be submitted to HUD (including any

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rent increase request). This process includes the right to inspect and copy the materials that the mortgagor is required to submit to HUD. The mortgagor must provide a place (which will be specified in the notice) which is reasonably convenient to tenants and their representatives to inspect the package during normal business hours.

2. The submission of written comments. During the review period, tenants have the right to submit written comments on the proposed conversion/rent increase. The notice will provide the addresses (both at HUD and the

mortgagor) where tenants may submit comments concerning the proposed conversion/rent increase.

3. Tenant review of changes. If the mortgagor, whether at HUD's request or otherwise, makes any material change during a tenant comment period in the package to be submitted to HUD, the tenants must be notified of the changes and allowed an additional 15 days or the remainder of the initial review period, whichever is longer, to inspect, copy and comment on the changes.
- c. That HUD will base its decision on the information contained in the conversion package and with consideration given to the tenant comments; and
  - d. That the mortgagor will notify the tenants of HUD's decision and that it will not begin to effect any approved conversion or reduction (in accordance with the terms of existing leases) until at least 30 days from the date of service of the notification.

12-23. HUD Approval of the Plan

a. Approval of the Plan.

A member of the Loan Management Branch will review the information submitted by the owner/manager which will include the proposed conversion, the recommended utility allowance and tenant comments on the conversion. Approval of the plan will be based on:

1. The required data submitted by the owner;

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2. Data available on comparable projects;
  3. The staff member's knowledge of the project's needs;
  4. The owner satisfactorily addressing the implementation of the energy conservation measures identified by the survey or other means of documentation, especially with respect to items that are serious heat loss factors.
- b. Disapproval of the Plan. The Loan Management

Branch Chief will notify the owner/manager of reasons why the plan cannot be approved and, if applicable, advise the owner/manager of any actions that may be needed to modify the request.

c. Post-approval stage

When the utility conversion is approved by HUD the following actions should be taken:

1. Preparation of a new rental schedule (HUD 92458) reflecting (1) the deletion of utilities in rent charges and (2) the amount of the utility allowance for each size unit (in accordance with Chapter 7 of this handbook).
2. If the utility conversion request is accompanied by a request for a rent increase (in excess of the maximum permissible rents) then owners of subsidized projects must follow all outstanding instructions for Budgeted Rent Increases in Handbook 4350.1, Chapter 7. This should include a notice to tenants which allows them to comment on both the conversion request as well as the rent increase. (This will occur if the redetermined rental charge, with the cost of tenant paid utilities deducted, plus the new HUD approved utility allowances result in a rental rate greater than the current rental charges.) Once the conversion request is approved and the utility allowance is established, the rental increase request should be processed in the usual manner.

3. Advise tenants of the utility company(s) deposit requirements for establishing direct utility services.
4. After the utility conversion is approved, it is the project owner/manager's responsibility to request HUD's approval of any needed increase in the utility allowance. This should be done whenever any utility rate increase results in a 10% or more cumulative increase in utility costs. A reevaluation of utility allowances for possible increase should be performed simultaneously by the owner/manager with the submission of each

rent increase request.

- d. Required changes to Regulatory Agreements  
When a utility conversion is approved, the Regulatory Agreements controlling HUD-Insured and HUD-Held projects must be amended to reflect the use of tenant-paid utilities. This paragraph provides general guidance for amending these forms. The sample amendatory language provided below is applicable to the various Regulatory Agreements used under the Section 236 program (paragraph 7 of HUD 93134 and Paragraph 4 of HUD 93135 and HUD 93136). This sample language will also provide general guidance for use in amending Regulatory Agreements for other programs in a consistent manner. The applicable paragraphs of the existing forms shall be amended by the substitution of clauses which conform to the specific program requirements involved and are otherwise generally consistent with the following:

"(1) with the prior approval of the Commissioner, they will establish for each dwelling unit (1) a basic rental charge determined on the basis of operating the project with payments of principal and interest under a mortgage bearing interest at one percent and (2) a fair market rental charge determined on the basis of operating the project with payments of principal, interest and mortgage insurance premiums due under the insured mortgage on the project, provided however, that with respect to those projects which the Commissioner has determined have separate utility meters and in which tenants are billed directly and pay some or all of the utility charges attributable to the

units they occupy, the basic rental charge and the fair market rental charge shall be determined on the basis of operating the project without including the cost of such utility services for each unit;"

"(2) the rental charged for each unit will be equal to 30% of the tenant's adjusted income or the basic rental, whichever is greater, provided, however, that in projects with separate utility meters in the units where the tenants will be billed directly and pay for some or all of the utility charges to the utility company, the monthly

rental charged for each unit will be the greater of the basic rental or 30% of the tenant's adjusted income less a deduction for the utility allowance approved by the Commissioner, but in no event shall the tenant's rent be less than 25% of their adjusted monthly income; the rental charged shall never exceed the fair market rental;"

(Fair market is the rent referred to in Section 236 which is rent charged for a unit receiving no interest reduction assistance.)

NOTE: Keep in mind that the full amount of this change will not be accomplished until tenant's income reaches the full 30% ratio under the phase-in procedures applicable for Section 236 projects.

"(3) no change will be made in the basic rental or fair market rental unless approved by the Commissioner; and in the event that some or all of the utilities are individually metered, in which case the Commissioner will have approved a utility allowance for each unit, they agree to request from the Commissioner an adjustment in the approved utility allowance within 90 days if there are utility rate increases which result in a cumulative increase of 10 percent or more in the cost of utilities included in the latest approved utility allowance, and further agree to reevaluate the need to request an adjustment in the approved utility allowance at the time of each rent increase request."

- e. Required Changes to Lease Forms  
The dwelling leases must also be amended by the owner to indicate the utility service(s) the tenant will pay directly to the utility company and to delete the utility service(s) no longer included in the rental charge. Item 7, Charges for Utilities and Services, of the Model Lease for Subsidized Programs (Appendix 19a of Handbook 4350.3) should be amended to address this change to tenant-paid utilities for subsidized projects.
  
- f. Effect on Conversion of Management Fees  
Management fees are usually figured as a percentage of the total rent roll. When a tenant-paid utility conversion takes place, the total rent roll is reduced because the utility cost(s) is no longer



included in the computation. There is no intention of reducing management fees simply because the total rent roll is reduced. To address this imbalance, the percentage factor should be adjusted to yield the dollar amount of the previously-approved fee.

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Appendix 1

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#### HUD Multifamily Energy Survey

Energy conservation in HUD insured and assisted multifamily buildings has the potential to reduce energy costs to HUD, building owners, and tenants, as well as to increase tenant comfort and general well-being. This energy survey is an attempt to identify sensible conservation measures, in the form of both technical retrofits and improved maintenance practices. This survey is not meant to be comprehensive; rather, the proposed measures represent only the essential beginning efforts to improve the energy efficiency of multifamily housing.

How to use this survey

This survey consists of two sections: 1) the Walk-Through Energy Survey and 2) the Energy Conservation Measures (ECM). First, walk through each area of the building and answer as accurately as possible the question posed in the Walk-Through Energy Survey. Answering some of the questions may require persistence. Many of the questions appear in the following form:

- Is the thermostat installed?      yes    NO      If No, Ref. No. H.6

If the appropriate response is in uppercase bold script, in this case NO, then a problem exists and action may be called for. The letter and number (also in uppercase bold script) to the right of the response indicate the measure or group of measures that should be considered to remedy the problem. In this case, the appropriate group of measures is H.6, that dealing with HVAC Distribution system retrofits.

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APPENDIX 1

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HUD Multifamily  
Walk-Through  
Energy Survey

(NOTE: Form HUD-9614 has been cancelled)

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		form HUD-9614 (4/92) ref. Handbook 4350.1
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		form HUD-9614
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form HUD-9614

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APPENDIX 1

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form HUD-9614

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Appendix 2

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WAYS THE TENANTS CAN ASSIST IN CONSERVING ENERGY

1. When high wattage light bulbs burn out, replace them with lower wattage bulbs.
2. Turn off lights when not in use -- both in own unit and in community rooms.
3. Do not use electric appliances longer than necessary, and be sure to turn off appliances when not in use.
4. Do not run hot water longer than absolutely necessary.
5. Do not leave stove burners on longer than absolutely

necessary.

6. Call the management office immediately to report leaky faucets, plumbing leaks and drafty rooms.
7. In the winter, close the shades or drapes in the evening and leave the thermostat at 70 degrees or less. Lower thermostat to 65 degree when retiring for the night. Open drapes or shades in the morning to admit winter sunlight and warmth through the windows.
8. In the summer, open shades or drapes in the evening and leave the thermostat at 78 degrees. Close drapes or shades in the morning to reduce heat from the sunlight.
9. If you leave your apartment for a day or more, set thermostat at 85 deg. in the summer and 60 deg. in the winter.
10. Never have heat or air conditioning on while doors and windows are kept open.
11. In nice weather, turn off heat and air conditioning and open windows.
12. Keep fan coil units, radiators and baseboard heater surfaces clean.
13. Schedule use of laundry (and dishwashing) machines to allow for full loads.
14. Report broken or cracked windows to the manager immediately.
15. Use cold water detergents in washing machine, and wash and rinse in cold water.

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Appendix 2

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16. Do not block air outlets or returns and radiators with furniture or curtains.
  17. Close doors and shut off heating supply to rooms that are seldom used.
  18. Increase amount of carpeting in unit.
  19. Call the management office if you have any questions or if you have some ideas on further energy conservation. They will be appreciated.
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Appendix 3

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ENERGY REDUCTION TIPS FOR PROJECT MANAGEMENT

1. Lower thermostat setting in winter/raise in summer to point that the unit furthest from the heat source will be at the minimum (maximum in summer) setting allowed by local law for day and night settings.
2. Reduce or turn off heat/air conditioning in unoccupied areas.
3. Turn off lights in community rooms and other common areas when not in use.
4. Reduce lighting and bulb wattage in public hallways, lobbies, garage and parking areas, consistent with safety requirements.
5. Replace exterior and interior incandescent lighting with fluorescent or other energy efficient lighting in common areas, and as appropriate, in individual units.
6. Thermostat settings in vacant units, where individually controlled, should be set to operate at a minimum level necessary to prevent damage to water systems.
7. If furnace has natural gas standing pilot, turn it off during the summer months.
8. If two boilers are used for space heating, leave one off several cold wintery days to test whether heating efficiency of single boiler is adequate.
9. Purchase heating fuel (oil) when rates are favorable.
10. When replacing kitchen appliances, install energy efficient appliances.
11. When painting common areas, use light or reflective paint or consider use of washable wallpaper.
12. Install carpeting in common areas.
13. Install window shades, external shading elements, tinted glass or interior blinds to direct sunlight, thereby reducing air conditioning needs.
14. When making replacements consider the installation of storm or other energy efficient doors and windows.

15. Where there are individual window units, install inside air conditioner covers during the winter months, and provide tenants with specifics as to proper size of a unit that they may install.
16. Install photoelectric sensors to turn on all exterior lights at dusk and off at daybreak.
17. If some halls and stairwells receive natural light, rewire so that lights can be turned off when not needed.
18. Reduce domestic hot water temperature to units to a suggested maximum level of 110 degree to units furthest from the boiler.
19. Reduce the burning rate of burners for heating equipment.
20. Turn off hot water to areas that do not require it.
21. Reduce hot water use through installation of water flow restricters.
22. Hang signs in the laundry room requesting that tenants use lower water temperatures and full loads when doing laundry.