



U.S. Department of Housing and Urban Development  
New York State Office  
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New York, New York 10278-0068  
<http://www.hud.gov/local/nyn/>

**Bookletter #3**  
**FY 2007 - 2AHMLAP**

January 16, 2007

MEMORANDUM FOR: All Management Agents;  
Section 236, 221(d)3, or Rent Supplement Assisted Projects;  
Direct Loan, Section 202 Elderly or Handicapped projects constructed  
more than 15 years ago; and  
Converted Section 236 or RAP projects to Section 8 HAP program.

FROM: Deborah VanAmerongen, Director, New York Multifamily Hub, 2AHMLA

SUBJECT: Energy Conservation Plans

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The Revised form HUD-9834, Management Review for Multifamily Housing Projects, now includes the following question (#7) "Is a HUD-approved Energy Conservation Plan required?"

The Energy Conservation Plan applies to the following:

- 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 and is older than fifteen years 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-based Rent Increase Method.

For information regarding HUD-approved Energy Conservation Plans, you may review the HUD 4350.1 (REV-1) Handbook, Chapter 12 (Energy Conservation). Additionally, you should use the attached Walk-Through Energy Survey as a tool to help prepare your Plan, and submit a copy of the Survey with your Plan.

You must submit and obtain approval for your plan prior to any budget-based rent increase or reserve for replacement withdrawal requests, contract renewals, or your next Management Review.

**You will be cited in your next Management Review if you do not have and maintain an approved Plan at your site!**

For approval, plans should be mailed to the New York Office at the address above, attention Dorothy Williams.

Once you have obtained approval for your plan, you must update your Survey and resubmit your plan for approval every five years.

If you have any questions, you may call Benjamin Ashmore at (212) 542-7785 or Brooke Schlageter at (212) 542-7805.

# Walk-Through Energy Survey

(Revised 01/01/07 - NYC Hub)

This survey is designed to assist the owner in assessing the energy conservation needs of the property. If the answer to a question appears in bold type, it will indicate an area where conservation measures may be needed. Each question also provides a reference number, which can assist an owner in presenting measures that may be taken to correct the problem and increase the energy efficiency of the property.

If you are required to submit an Energy Conservation Plan for HD approval, you should complete this survey and include it with your plan to address energy inefficiencies at your project. You should also update this survey and your HD-approved Energy Conservation Plan every five years and maintain a copy of both on site at your project.

## General Building Data

Number of Floors in Building	Number of Dwelling Units	Floor Area of Building (sq. ft.)

Orientation of Building (sketch below in the space provided a plan view of the building with an arrow indicating North)

**Walls--Construction.** Check any items that describe the walls in this building.

Wood frame     Cavity wall     Concrete wall     Brick veneer     Aluminum, vinyl siding     Wood siding

Are walls insulated?  Yes     No    If No, Ref. No. E.2

**Roof--Construction.** Check any items that describe the roof in this building.

Flat     Wood frame     Pitched     Concrete

Is roof insulated?  Yes     No    If No, Ref. No. E.2

## Basement

Is any part of the building built on a concrete slab?

Yes     No

Is basement heated?

Yes     No

If Yes, Ref. No. E.2

Is floor insulated over unheated basement or slab?

Yes     No

If No, Ref. No. E.2

**Apartment--** The assumption made is that one apartment is representative of all the apartments in the entire complex. Size of apartment is unimportant. Therefore, a survey of one typical apartment is usually adequate to fill out the survey and can represent the aggregate opportunities for energy savings. If this assumption is incorrect for your particular complex, a survey should be filled out for each type of apartment. The typical apartment selected for the survey should be the one farthest from the heating plant.

Apartment No. \_\_\_\_\_

**Inspect Apartment Door--**If any apartment door opens to the outdoors, complete this section of the survey.

Is storm door installed?

Yes     No

If No, Ref. No. E.3

Check condition of door weatherstrip (Good weather stripping is not dried or cracked and seals space between door and frame completely.)

Good     Bad

If Bad, Ref. No. E.3, E.4

Does door fit tightly to frame when closed? (No large gaps at top, bottom, or sides of door.)

Yes     No

If No, Ref. No. E.4

If automatic, does door close quickly and completely?

Yes     No

If No, Ref. No. E.4

**Inspect Apartment Windows--**Type of windows:

Sliding     Hinged (Awning or Hopper)     Casement     Double Hung     Fixed     Other: \_\_\_\_\_

Are storm windows installed?

Yes     No

If No, Ref. No. E.3

Window frame materials:

Aluminum     Vinyl     Wood     Other

Are windows double glazed?

Yes     No

If No, Ref. No. E.3

Are windows in good repair?  Good  Bad  
 Weatherstripping  Good  Bad If Bad or Loose,  
 Putty  Good  Bad Ref. No. E.3, E.4  
 Caulking  Good  Bad  
 Fit of windows  Tight  Loose

**Inspect Apartment Heating and Cooling— Type of Heating Units Installed:**

Radiator  Wall Furnace  Electric Baseboard  Forced Air  
 Do shut-off valves operate properly?  Yes  No If No, Ref. No. H.5  
 Do air vents on radiators operate properly?  Yes  No If No, Ref. No. H.5  
 Is there a thermostatic control valve in this apartment?  Yes  No If No, Ref. No. H.6  
 Does it have a set-back?  Yes  No If No, Ref. No. H.6  
 Is thermostat located on an interior wall?  Yes  No If No, Ref. No. H.6

Are there any window-mounted air conditioners?  Yes  No If Yes, Ref. No. E.4  
 If so, do the units have covers?  Yes  No If No, Ref. No. E.4  
 Are there any removable panels or through-the-wall sleeves for air conditioners?  Yes  No If Yes, Ref. No. E.4

**Inspect Apartment Hot Water.**

Are any faucets or showerheads leaking or dripping?  Yes  No If Yes, Ref. No. W.3  
 Are low-flow showerheads installed in showers?  Yes  No If No, Ref. No. W.1  
 Are flow restricting aerators installed on all faucets?  Yes  No If No, Ref. No. W.1  
 Does the apartment have its own hot water heater? If Yes, answer the following questions:  
 Measure and record temperature of hot water. This can be done by filling a glass with hot water and measuring with thermometer.  
 Temperature \_\_\_\_\_ Ref. No. W.3  
 Does the water heater have an insulating blanket?  Yes  No If No, Ref. No. W.3

**Inspect Apartment Exhaust Ventilation**

Is there an exhaust fan or grill in bathroom?  Yes  No Ref. No. H.4  
 If Yes, is air exhausted continuously?  Yes  No If Yes, Ref. No. H.4  
 Is there a vent damper installed?  Yes  No If No, Ref. No. H.4  
 Is there an exhaust fan or grill in the kitchen?  Yes  No  
 If Yes, is air exhausted continuously?  Yes  No If Yes, Ref. No. H.4  
 Is there a vent damper installed?  Yes  No If No, Ref. No. H.4

**Inspect Apartment Lighting**

What type of lighting is in the kitchen?  Fluor.  Incand. If Incand.,  
 What type of lighting is in the bathroom?  Fluor.  Incand. Ref. No. L.2

**Common Areas: Entrance, Lobby, Stairwell and Corridor.** The general assumption made is that the common areas are typical throughout the building. Therefore, only one survey need be filled out and will be representative of the conditions that exist in all the corridors throughout the site. If this assumption is incorrect for your particular complex, a survey should be filled out for each unique area.

**Inspect Corridor and Stairwell Windows**

Type of windows:  
 Sliding  Hinged (Awning or Hopper)  Casement  Double Hung  Fixed  Other: \_\_\_\_\_  
 Are storm windows installed?  Yes  No If No, Ref. No. E.3  
 Window frame material:  
 Aluminum  Vinyl  Wood  Other \_\_\_\_\_  
 Do windows have multiple panes?  Yes  No If No, Ref. No. E.3  
 Are windows in good repair?  Yes  No  
 Weatherstripping  Good  Bad If No, Bad, or  
 Putty  Good  Bad Loose,  
 Caulking  Good  Bad Ref. No. E.3, E.4  
 Check fit of windows  Tight  Loose

**Inspect Interior Doors (other than apartment)**

Do doors close automatically?  Yes  No If No or Bad,  
 Do doors close quickly and tightly?  Yes  No Ref. No. E.4  
 What is condition of weatherstripping?  Good  Bad

**Inspect Common Area Lighting—Add up the total watts of incandescent and fluorescent lighting in each area. Ref. No. L.2**

	Incandescent (watts)	Fluorescent (watts)
Entrance		
Lobby		
Stairwell		
Corridor		
Total		

Are the diffusers (lamp covers) in good condition?  Yes  No If No, Ref. No. L.3  
 Are lights near windows shut off during daytime?  Yes  No If No, Ref. No. L.1  
 Is hall lighting bright or dim?  Bright  Dim If Bright, Ref. No. L.1  
 Are the walls painted or papered with light colors?  Yes  No If No, Ref. No. L.3  
 Are all or some lights controlled automatically? If so, type of control:  
 Clock  Photo-cell  Other  Yes  No If No, Ref. No. L.1

**Inspect Corridor and Stairwell Heating**

Is corridor heated?  Yes  No If Yes, Ref. No. H.7  
 Are controls provided to limit the amount of deliverable heat? (Manual valves, thermostatic valves.)  Yes  No If No, Ref. No. H.7  
 What is the thermostat setting? \_\_\_\_ Deg. F. Ref. No. H.7  
 Are controls operable?  Yes  No If No, Ref. No. H.7  
 Is stairwell heated?  Yes  No If Yes, Ref. No. H.7  
 Are controls provided to limit the amount of deliverable heat? (Throttle valves, thermostatic valves.)  Yes  No If No, Ref. No. H.7  
 What is the thermostat setting? \_\_\_\_ Deg. F. Ref. No. H.7  
 Are controls operable?  Yes  No If No, Ref. No. H.5

**Inspect Lobby and Entrance Door**

Does outside entrance door open into a vestibule?  Yes  No If No, Ref. No. E.3  
 Type of Door:  
 Single  Double  Revolving  Other: \_\_\_\_  
 Do doors close automatically?  Yes  No If No, Ref. No. E.4  
 Do doors close quickly and tightly?  Yes  No If No, Ref. No. E.4  
 Do doors fit tightly to frame when closed? (No large gaps on top, bottom or sides of door.)  Yes  No If No, Ref. No. E.4  
 Condition of weatherstrip:  Good  Bad If Bad, Ref. No. E.4

**Inspect Lobby Heating**

Are controls provided to limit the amount of deliverable heat?  Yes  No If No, Ref. No. H.7  
 Type of Control:  
 Throttle valve  Thermostatic valve  
 What is the thermostat setting? \_\_\_\_ Deg. F.  Yes  No If No, Ref. No. H.5  
 Are controls operable?  Yes  No If No, Ref. No. H.5

**Heating Plant**

Make this survey on a day when the heating plant is operating.  
 Walk around the equipment and observe the various items as instructed by the survey.  
 Spend adequate time to watch the items operate through their full cycle (dampers, linkages, etc.).  
 Spend enough time to make sure you are looking at the item called for in the question.

**General**

Source of Heating Energy:  
 Hot Water  Steam  Electric Resistance  Forced Air  Other  
 Boiler Type  
 Fire Tube  Water Tube  Electric Resistance  Other  
 Fuel Used:  
 Oil No. \_\_\_\_  Natural Gas  Electric  
 Burner Type  
 Rotary Cup  Pressure Atomized  Air Atomized  Steam Atomized

**Observe (Exterior of Heating Plant) -with the boilers firing on a typical heating day, note the following:**

Is there more than one boiler?  Yes  No  
 If so, do two or more fire up and shut down at the same time?  Yes  No If Yes, Ref. No. H.1  
 Does boiler frequently cycle on and off? (About 5 minutes on and five minutes off.)  Yes  No If Yes, Ref. No. H.2  
 Is a hot boiler kept on "standby"?  Yes  No If Yes, Ref. No. H.1  
 Is boiler insulation cracked or missing?  Yes  No If Yes, Ref. No. H.2  
 Are doors and access holes sealed tightly?  Yes  No If No, Ref. No. H.2  
 Is there an automatic flue damper installed in each boiler breeching?  Yes  No If No, Ref. No. H.2  
 Does the flue damper operate properly? (Open prior to firing, close when boiler shuts down.)  Yes  No If No, Ref. No. H.2  
 Is there a barometric damper installed in the main breeching?  Yes  No If No, Ref. No. H.2  
 Does the barometric damper swing freely?  Yes  No If No, Ref. No. H.2  
 Does the secondary air damper operate properly? (It should close at shutdown and open during firing.)  Yes  No If No, Ref. No. H.2  
 How is boiler operation controlled?  
 Pressure only  Interior thermostat  Interior/exterior thermostat  Variable temperature reset

Is the heating system provided with:  
 Flue gas analyzer     Temperature gauges     Draft gauges  
 Do gauges operate properly?     Yes     No    If No, Ref. No. H.1  
 What is the present combustion efficiency?  
 Greater than 80%     Less than 80%     Don't know

Check the fuel supply and burner operation  
 Is the fuel oil preheated? Temperature: \_\_\_\_\_     Yes     No    If No, Ref. No. H.2  
 Is the combustion air preheated?     Yes     No    If No, Ref. No. H.2  
 Are there any fuel leaks on fuel supply and return lines?     Yes     No    If Yes, Ref. No. H.1  
 Are oil strainers clean?     Yes     No    If No, Ref. No. H.1  
 Is the burner nozzle or rotary cup cleaned and inspected regularly?     Yes     No    If No, Ref. No. H.1  
 Does burner modulate (vary the firing rate) automatically?     Yes     No    If No, Ref. No. H.2

Open the flame inspection plate and observe  
 Does flame fill firebox?     Yes     No    If No, Ref. No. H.1  
 Does flame impinge (touch) wall of firebox?     Yes     No    If Yes, Ref. No. H.1  
 Is flame clean (no smoke at flame tips)?     Yes     No    If No, Ref. No. H.1

Observe the operation of all linkages to assure proper operation.  
 Is boiler water chemically treated?     Yes     No    If No, Ref. No. H.1  
 How are chemicals added:  
 Manually     Automatically

Observe (Interior of boiler) Open up the access doors of the boiler after it has cooled down and with power shut off.  
 Are walls and corners of firebox blackened by soot?     Yes     No    If Yes, Ref. No. H.1  
 Is there any unburned oil in the firebox?     Yes     No    If Yes, Ref. No. H.1  
 Check and measure the average soot thickness accumulated on the fireside of the boiler: \_\_\_\_\_  
 Are tubulators installed? (Fire tube only)     Yes     No    If No, Ref. No. H.2  
 Check and measure (at a convenient time) the thickness of waterside scale: \_\_\_\_\_

Distribution and Piping System—Inspect all steam and hot water pipes and fittings for condition of insulation. Record all missing insulation. Ref. No. H.6

Location	Type of Pipe		Pipe Diameter	Uninsulated Length
	Hot Water?	Steam?		

Inspect all steam and hot water fittings for leaks. Record location of all leaks found. Ref. No. H.5

Are steam traps serviced annually?     Yes     No    If No, Ref. No. H.5  
 Does steam come out of condensate tank vents?     Yes     No    If Yes, Ref. No. H.5  
 What is the reading on the condensate return vacuum gauge? \_\_\_\_\_  
 Is this reading below minimum recommended by manufacturer of system?     Yes     No    If Yes, Ref. No. H.5  
 On hot air systems, are joints in ductwork taped to prevent leakage?     Yes     No    If No, Ref. No. H.5

Inspect ducting for missing insulation and record in table below. Ref. No. H.5

Location	Duct Size	Uninsulated Length

**Domestic Hot Water**

How is hot water heated?

- Same boiler used to heat building       Separate hot water heater  
 If separate heater, what type of fuel?       Oil     Gas     Electric  
 What is the recovery rate?       gallon per hour    Deg. F rise \_\_\_\_\_

If space heating boiler is used for domestic hot water, how is water heated?  
 Tankless coil     steam heat exchanger     immersed coil     water heat exchanger

Ref. No. W.3

What temperature is water heated to? \_\_\_\_\_ Deg. F

Is hot water circulated?       Yes     No      If Yes, Ref. No. W.3  
 If so, is circulation continuous?       Yes     No      If No, Ref. No. W.3

What is the size and storage capacity of tanks?

Capacity \_\_\_\_\_ gallons

Note thickness and condition of storage tank insulation

Needs repair

No insulation

Less than \_\_\_\_\_ inches

Yes     No      If Yes, Ref. No. W.3  
 Yes     No      If Yes, Ref. No. W.3

**Roof--** Inspect the general conditions of the roof and its equipment and answer the following questions:

Are there any gaps or openings from which interior air can escape (such as open or missing doors or windows, holes, other openings)?

Yes     No      If Yes, Ref. No. E.2

Are there any skylights?

Yes     No      If Yes, Ref. No. E.3

Is weatherstripping on all roof doors?

Yes     No      If No, Ref. No. E.4

Inspect any air intake ducts found on the roof:

Does each have a damper?

Yes     No      If No, Ref. No. H.4

If so, do the dampers fit tightly?

Yes     No      If No, Ref. No. H.4

Condition of filters:

Clean     Dirty      If Dirty, Ref. No. H.4

Control:

Man.     Auto.      If Man., Ref. No. H.4

Are there any roof air exhaust fans? If so, describe them (building plans or architectural drawings will be useful for this description):

Yes     No      If Yes, Ref. No. H.4

Control:

Man.     Auto.      If Man., Ref. No. H.4

Flow Rate:

Hours operated per day:

**Exterior Building**

Do exterior walls contain cracks and/or gaps that are not caulked? Check in particular window and door frames, and at the foundation.

Yes     No      If Yes, Ref. No. E.4

**Exterior and Parking Area Lighting**--Inspect all exterior lighting for which the building owner is responsible. Count the fluorescent and incandescent bulbs in each place and fill out the chart below. Ref. No. L.2

	Incandescent	Fluorescent/Mercury Vapor	High Pressure Sodium
Building exterior			
Parking area			

Control:     Always on     Photo cell     Timeclock

Ref. No. L.1

**Laundry Room**

Are washing machines installed? If so, how many? \_\_\_\_\_

Yes     No      If Yes, Ref. No. W.2

What temperature water does washer use?

Cold     Hot or Warm  
 Warm

Is there an exhaust fan

Yes     No      If Yes, Ref. No. W.2

Dryer fuel type:

Nat.     Elec.      If Elec., Ref. No. W.2  
 Gas

**Special Facilities**--Fill out a separate sheet for each special facility area.

Type of Facility: \_\_\_\_\_

Is area heated and separately controlled?

Yes     No      If No, Ref. No. H.7

If so, are controls provided to shut off system when not in use?

Yes     No      If No, Ref. No. H.7

What type of lighting is used?

Fluor.     Incand.      If Incand.,  
 Ref. No. L. 2

The following energy conservation measures (ECMs) are separated into four categories: Lighting, Envelope, HVAC, and Domestic Hot Water. Within each of these categories the ECMs are ranked by priority and ease of implementation. Since measures vary considerably in expense, the efficacy of a given measure (e.g. double glazed windows) will vary by climate. When there is doubt about the best retrofits to be done for a given building, a qualified auditor should be employed to calculate the payback times for the various retrofits. To assist in this decision, each ECM has been tagged with a symbol. Those marked with a filled circle (●) should be implemented immediately if the walk through audit indicates that they are needed. Those marked with an open circle (○) should not be implemented until a more detailed audit has been performed and at least a simple payback has been calculated.

## E-Envelope

### E.1 General

- Adapt vegetation to save energy. Trees and bushes on the south and west side of the building should allow sun to reach the building in winter and shade the building in summer.
- Use light exterior wall and roof colors to reduce cooling loads.

### E.2 Walls, Roof, and Floor

- Insulate roof: add insulation in attic by blowing, pouring or installing batts. Upgrade insulation of flat roofs externally.
- Insulate all exterior walls by blowing in insulation or by adding batts or insulating board externally.
- Insulate floors above unheated basement/crawl space.

### E.3 Windows and Doors

- Window repair: Repair broken glazing, maintain latches, etc.
- Cover, seal off, and/or insulate windows that are not necessary for ventilation or day-lighting.
- Install window film on glazing with excessive solar heat gain to limit local overheating and glare.
- Install temporary or permanent storm windows on single glazed windows.
- Replace poorly designed entry doors with revolving doors, vestibules, or insulated doors.
- Install double glazed windows with low emissivity glass.

### E.4 Infiltration

- Adjust/install automatic door closers.
- Repair/install weatherstrip on all doors and windows.
- Install covers on window air-conditioning units.
- Close convective paths in shafts and stairwells

## H-HVAC

### H.1 Boiler maintenance

- Shut boiler plant off when heating is not required. Shut off pilot if boiler will not be used for a long time.
- Adjust number of on-line boilers to meet the heating load: Turn off boilers as load reduces and isolate them hydraulically to avoid the standby losses.
- Check for scale buildup on water side. Chemically treat boiler water to preclude the need for regular cleaning.
- Check for soot buildup on fireside. Soot removal should be part of normal monthly maintenance.
- Tune up boiler, adjust air-fuel ratio for highest combustion efficiency.

### H.2 Boiler retrofits

- Install/repair boiler insulation. Make sure not to block the combustion air intake.
- Install/check flue dampers.
- Install tubulators in fire tube boilers.
- Decrease firing rate of burner or install smaller burner if high flue gas temperatures or frequent cycling indicate oversized equipment.
- Install more efficient burner. Multi-stage or modulating burner, electronic ignition, air rather than steam atomization.

### H.3 Heatpumps/Air-conditioners

- Eliminate leaks and maintain full charge of refrigerant.
- Reduce auxiliary equipment power consumption-This should be no more than 10% of total consumption. Check that crank case heaters have thermostatic or compressor lock-out. Timer initiated defrosting causes unnecessary cycling and should be replaced with demand control.

### H.4 Ventilation

- Install/repair back-draft or positive closure vent dampers in exhaust systems.
- Wire exhaust fans to light switches so that fans will work only when lights are on and the room is occupied.

### H.5 Distribution System Maintenance

- Repair leaks in pipes, valves, and duct distribution systems
- Reduce pressure drops in ducts: Remove dirt, clean filters, install turning vanes, eliminate long runs of flexible ductwork, etc.
- Check/replace steam traps
- Check that circulation hot water systems are operating at positive pressure, especially at upper floor radiators. Maintain proper water level in expansion tank and bleed air from system.
- Balance steam system.

### H.6 Distribution System Retrofits

- Add insulation, especially the reflecting type behind radiators on exterior walls.
- Install/repair insulation on steam lines and ducts. All leaks must be repaired first.
- Convert single pipe open loop steam system to condensate return system.

### H.7 Control

- Inform and instruct tenants on the correct use of thermostats, radiator set points, window blinds, lights, etc. This needs to be repeated at regular intervals to maintain effectiveness. Supply a short instruction manual.
- Check thermostat settings, location, and calibration. Check anticipator for proper operation.
- Install timers to control heat in unoccupied areas such as laundry rooms, recreations rooms, and community rooms.
- Check/install setback (clock) thermostats.
- Replace radiator valves with radiator thermostatic valves. Equipment with sensor separate from the valve are preferred. Avoid placing sensors close to windows, in drafts, or in the sun.



- Install temperature reset controls to reset the circulated hot water temperature in response to outside temperature.

## L-Lighting

### L.1 Reduce Lighting Levels

- Remove bulbs in overlit areas.
- Replace 40-watt fluorescent bulbs with 34-watt bulbs.
- Remove two tubes in four-tube fluorescent fixtures. Make sure to remove or disconnect the related ballast.
- Add separate switching to common areas that receive sufficient daylight.
- Install photo-cells and/or time clocks on outdoor lighting fixtures and indoor lighting fixtures which receive sufficient daylight.
- Install occupancy sensors or timers in common areas that are used sporadically such as recreation rooms, laundry rooms, and administration areas.

### L.2 Increase Lighting Efficiency

- Replace multiple small wattage incandescent with one large bulb, such as replacing two 60-watt bulbs with a single 100-watt.
- Convert incandescent exit lights to fluorescent (special exit light retrofit kits are available).
- Convert incandescent bulbs to fluorescent bulbs. In apartments this is best done with screw-in compact fluorescent. In common areas, consider replacing the existing fixtures with plate fixtures with separate ballasts to deter theft.
- Replace outdoor incandescent and mercury bulbs with high pressure sodium (HPS). This measure is not appropriate in areas that are switched on-and-off more than once every half hour since HPS lamps require time to restrike.
- Replace standard fluorescent fixture with T8 bulbs, electronic ballasts, and/or specular reflectors.

### L.3 Maintenance

- Set up regular fixture cleaning including cleaning and checking of all luminaire components. Should be done at least every 2000 operating hours.
- Implement scheduled relamping of all common area fluorescent based on the lamp life limit as specified by the manufacturer.
- Regularly check time clocks, photocells and control. Maintenance personnel should also monitor lighting and occupancy of common areas and suggest additional areas for controls.

- If wall painting or carpet replacement is needed, recommend lighter colors. (Note: Avoid carpet colors which are easily soiled.)

## W-Domestic Hot Water

### W.1 Apartment

- Install low-flow showerhead (flow <2.5 gpm). Flow restrictors are not recommended as they do not provide adequate results and are removed by tenants.
- Install flow restricting aerators on all faucets.

### W.2 Laundry

- Supply appropriate detergents for cold water washing.
- Retrofit washers for cold rinse cycle only.
- Install local hot water booster so that the supply water temperature can be lowered.

### W.3 Central

- Repair all leaks
- Reduce water temperature to satisfy the tenants farthest from the boiler. Reduce temperatures 5° F at a time since lower temperatures will reduce the amount of usable hot water available. A temperature of 100° F delivered is sufficient if there are not automatic dishwashers in the apartments.
- Insulate hot water storage tank with a minimum of 3 inches of insulation.
- Insulate distribution piping in recirculating systems with 1/2 inch of insulation.
- Add time clock to shut off recirculation system pumps during low demand periods.
- Install separate DHW heater in combined space heating and DHW systems.
- Add solar system.