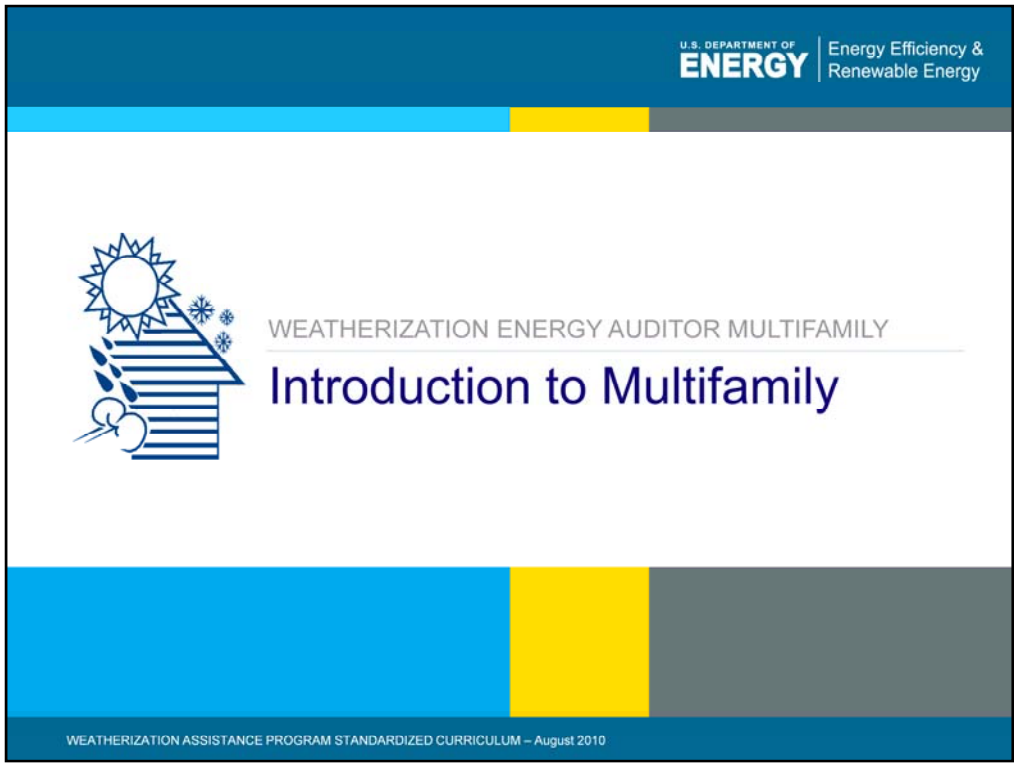
WEATHERIZATION ASSISTANCE PROGRAM

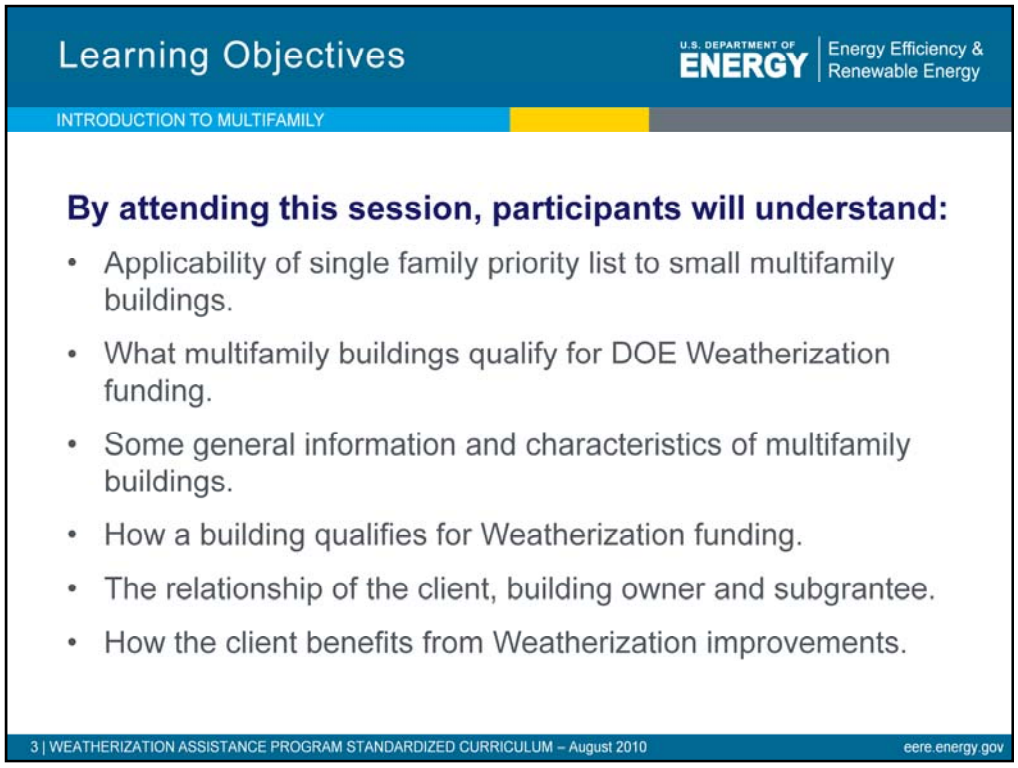
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Weatherization Energy Auditor Multifamily

Weatherization Assistance Program Standardized Training Curriculum

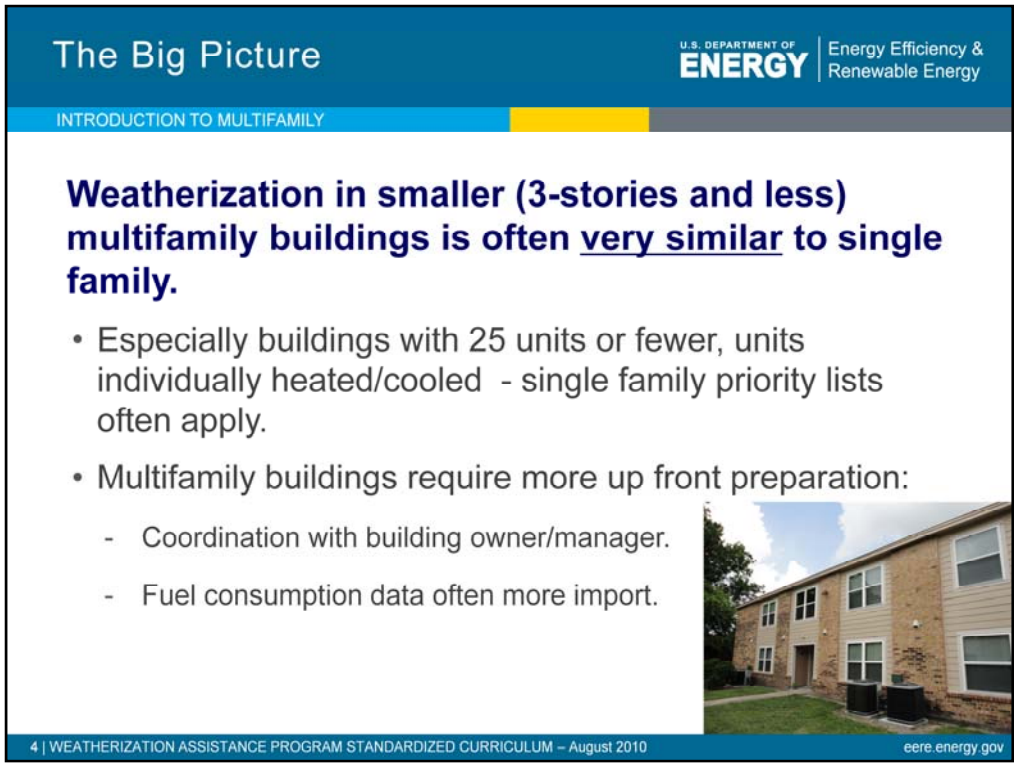
August 2010


U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy
WEATHERIZATION ENERGY AUDITOR MULTIFAMILY
Introduction to Multifamily
WEATHERIZATION ASSISTANCE PROGRAM STANDARDIZED CURRICULUM – August 2010



By attending this session, participants will understand:

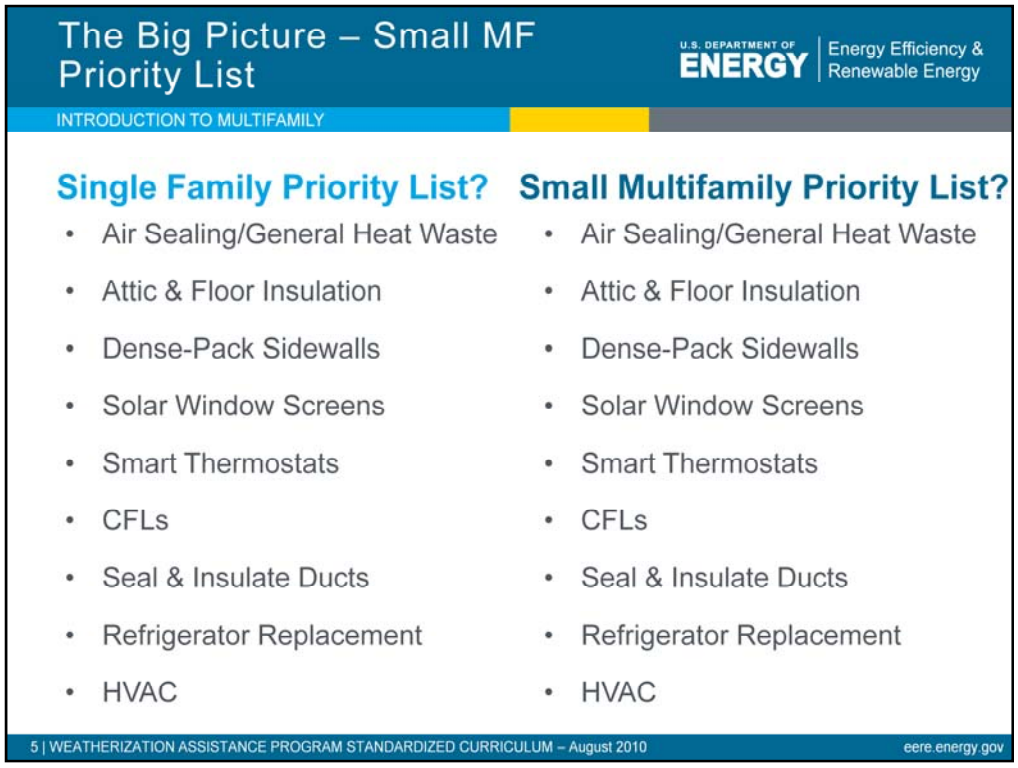
- The applicability of single family priority list to small multifamily buildings.
- What multifamily buildings qualify for DOE Weatherization funding.
- Some general information and characteristics of multifamily buildings.
- How a building qualifies for Weatherization funding.
- The relationship of the client, building owner and subgrantee.
- How the client benefits from Weatherization improvements.



It is important to remember that Weatherization in smaller (3-stories and less) multifamily buildings is often very similar to single family.

- This is often true for buildings with 25 units or fewer, individually heated/cooled. In such multifamily buildings single family priority lists often apply.
- One of the main differences between single family and multifamily buildings is that multifamily buildings require more up front preparation:
  - Coordination with building owner/manager.
  - Fuel consumption data often more important.

I will repeat this for emphasis: It is important to remember that Weatherization in smaller (3-stories and less) multifamily buildings are often very similar to single family.



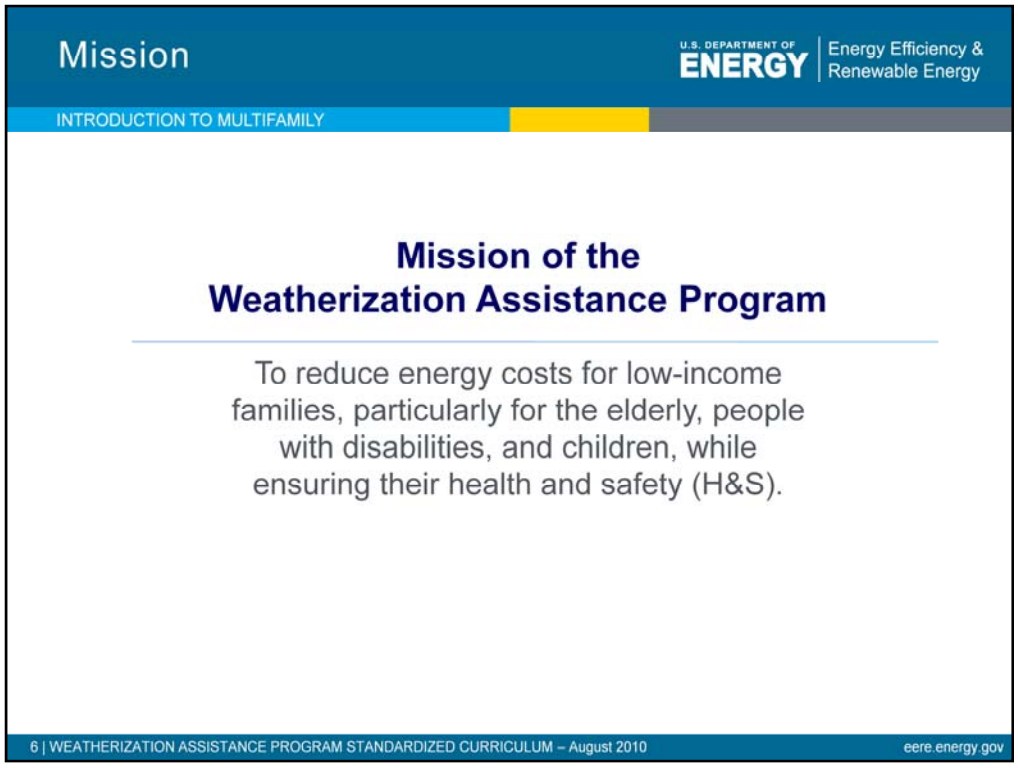
The single family priority list is often applicable – or nearly applicable for smaller (3-stories and less) multifamily buildings.

Here is a typical single family priority list:

- Air Sealing/General Heat Waste.
- Attic & Floor Insulation.
- Dense-Pack Sidewalls.
- Solar Window Screens.
- Smart Thermostats.
- CFLs.
- Seal and Insulate Ducts.
- Refrigerator Replacement.
- HVAC.

The measures applicable for small multifamily buildings would be almost identical in many cases:

- Air Sealing/General Heat Waste.
- Attic ~~& Floor~~ Insulation, but even floor insulation might be applicable if the building was not built on a slab.
- ~~Dense-Pack Sidewalls~~, but again, for a small, wood-framed building, this measure might be applicable.
- Solar Window Screens.
- Smart Thermostats.
- CFLs.
- Seal & Insulate Ducts.
- Refrigerator Replacement.
- HVAC.



The legislative mission of the ***Weatherization Assistance Program (WAP)*** is:

- To reduce energy costs for low-income families, particularly for the elderly, people with disabilities, and children, while ensuring their ***health and safety (H&S)***.

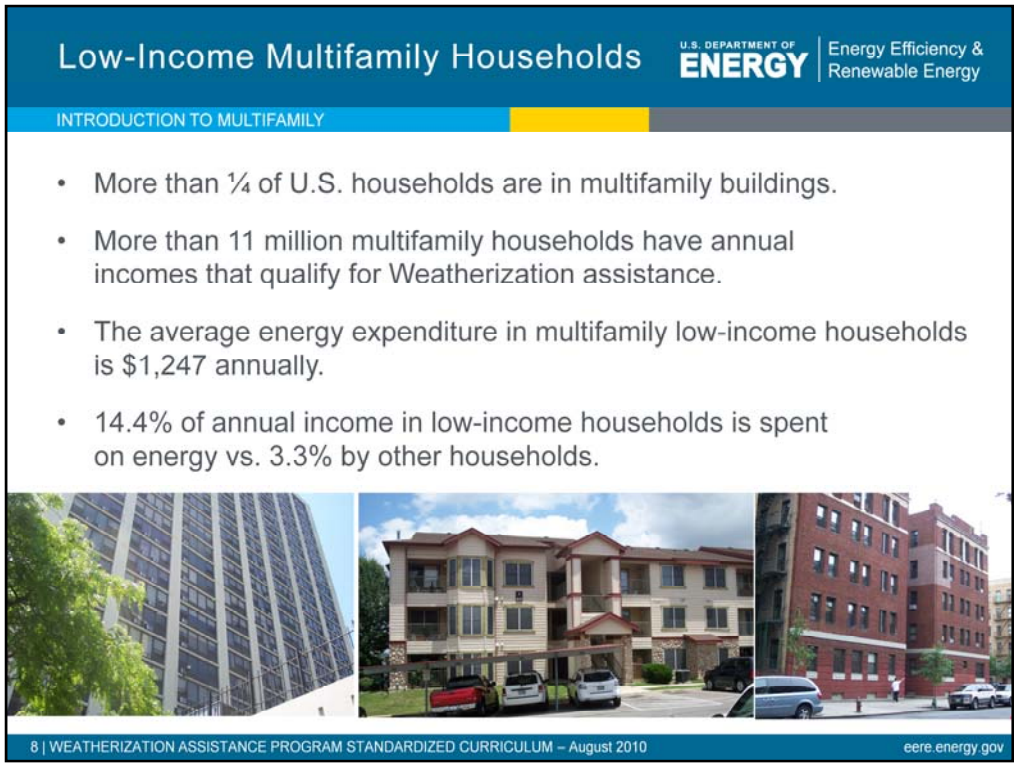
The purpose of the program was changed in the law to include health and safety in the enabling legislation of 1990.

Illustrates the flow of dollars through the program:

- The Federal government distributes funds to the ***U.S. Department of Energy (DOE)***, where the program is managed by the Project Management Center (PMC).
- Funds pass to each of the ***Grantees***: the 50 State Offices, the District of Columbia, Native American Tribal Organizations, and the 5 Territories.
- Grantees distribute funds to over 900 local agencies nationwide according to approved budgets.
- The money is used to install cost-effective energy-saving measures in low-income households.

Lyndon Johnson's "War on Poverty" laid the groundwork for the Weatherization Assistance Program (WAP) by creating the infrastructure of ***Community Action Programs (CAPs)*** that now exist in every State. These CAPs often act as subgrantees. The War on Poverty included Head Start, the Low-Income Home Energy Assistance Program (LIHEAP), and after-school programs for children so parents could be part of the work force.

CAPs have the right of first refusal to be a local weatherization agency. Only non-profits and local government agencies are also allowed to act as ***subgrantees***.



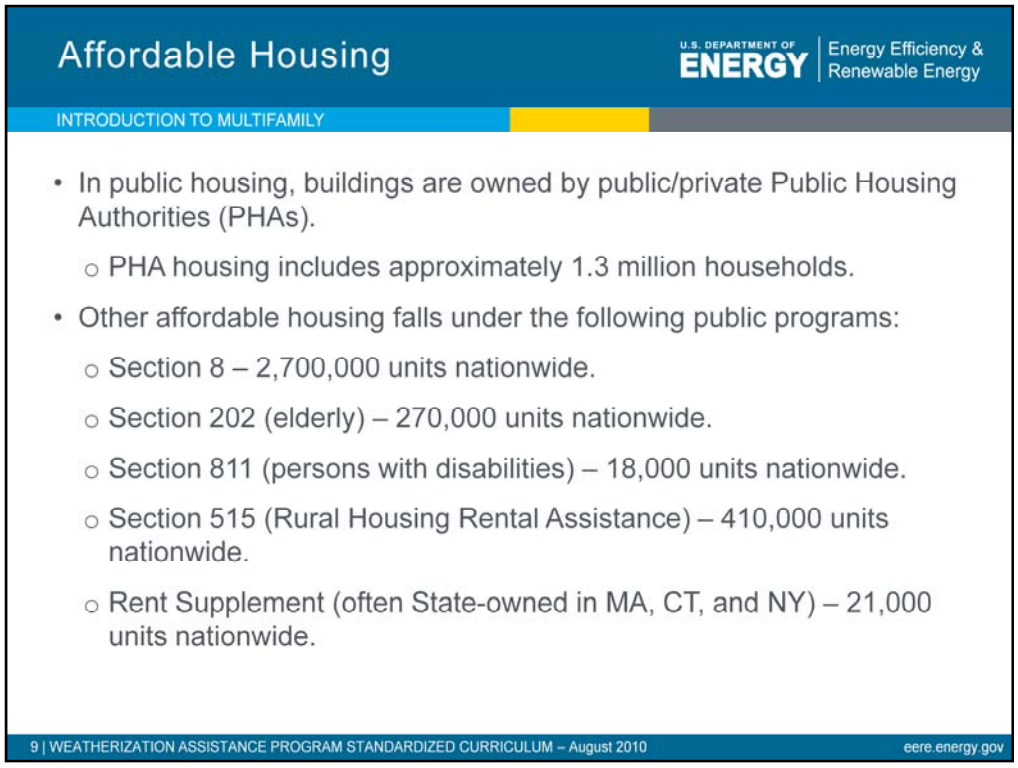
Facts:

- More than one-quarter of U.S. households are in multifamily buildings.
- More than 11 million multifamily households have annual incomes that qualify for Weatherization assistance.
- The average energy expenditure in multifamily low-income households is $1,247 annually.
- According to DOE's ***Energy Information Administration (EIA)***, low-income households spend 14.4% of their annual income on energy, while other households only spend 3.3%.

These statistics highlight not only the number of multifamily households that are eligible for WAP funding, but also the importance of reducing the ***energy burden*** on our clients.

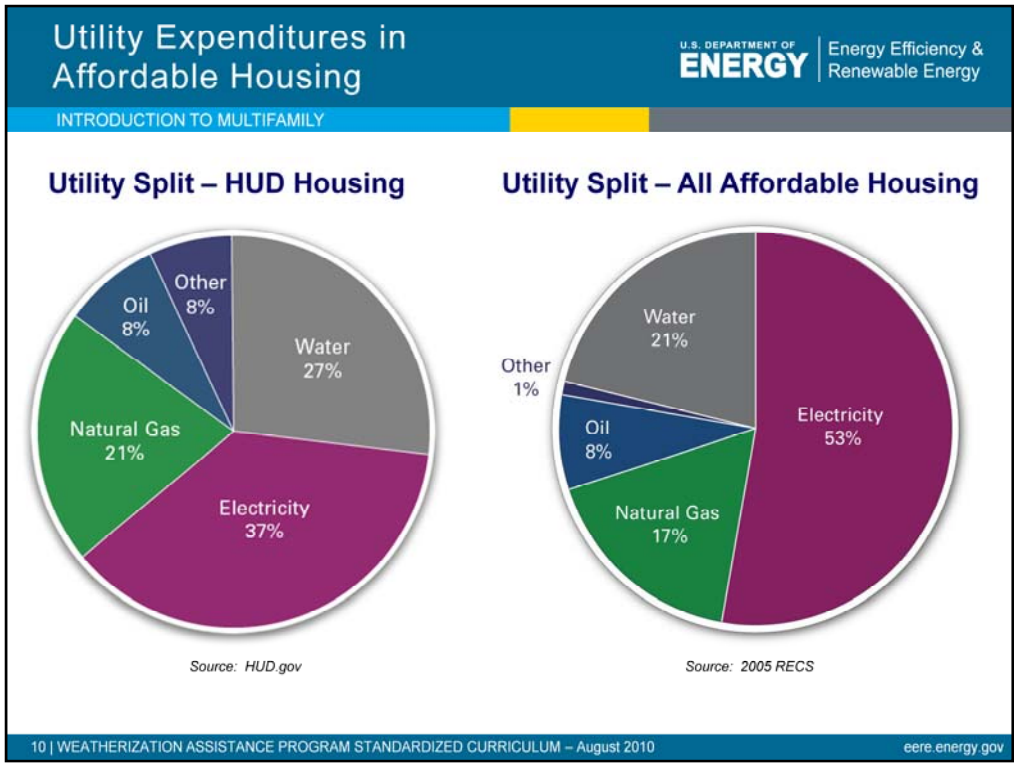
- Energy burden refers to the percentage of a household's income that must be used for energy bills. The energy burden for low-income households is more than four times that of other households.

This data, provided by Joel Eisenberg, Oak Ridge National Laboratory, and Meg Power, Economic Opportunity Studies, is based on raw data from the Residential Energy Consumption survey conducted by EIA. Source 1: ORNL/CON-493, ORNL/CON-484, EIA February 2008 Short-Term Energy Outlook Source 2: ORNL/TM-2010/66, EIA February 2010 Short Term Energy Outlook



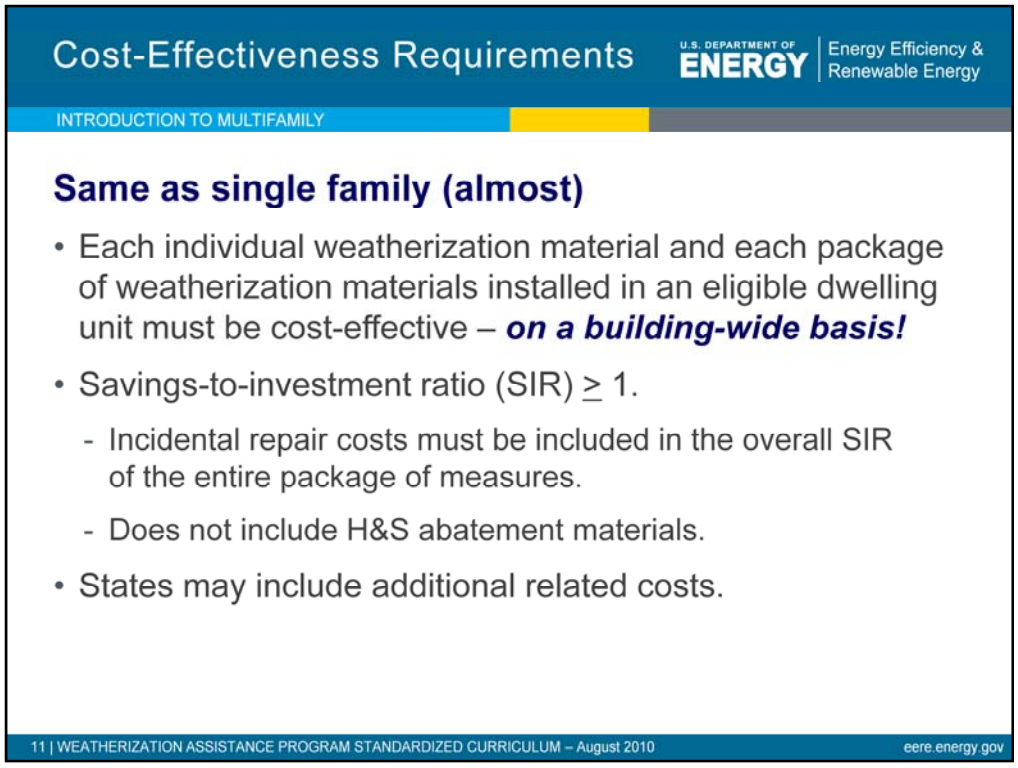
- In public housing, buildings are owned by public/private ***Public Housing Authorities (PHAs)*** (also known as Public Housing Agencies) that are at least partially supported by the Federal government.
- PHA housing (administered by the ***U.S. Department of Housing and Urban Development (HUD)***) includes approximately 1.3 million households. The Weatherization subgrantees access this housing through PHAs.
- Other affordable housing falls under the following public programs. The buildings are usually privately owned. Rent and, when available, utility supplements are usually provided to residents through vouchers. Subgrantees access this housing through private landlords.
  - ***Section 8*** – 2,700,000 units nationwide.
  - Section 202 (elderly) – 270,000 units nationwide.
  - Section 811 (persons with disabilities) – 18,000 units nationwide.
  - Section 515 (Rural Housing Rental Assistance) – 410,000 units nationwide.
  - Rent Supplement (often State-owned in MA, CT, and NY) – 21,000 units nationwide.

"Meeting Our Nation's Housing Challenges," Millennium Housing Commission, 2002.



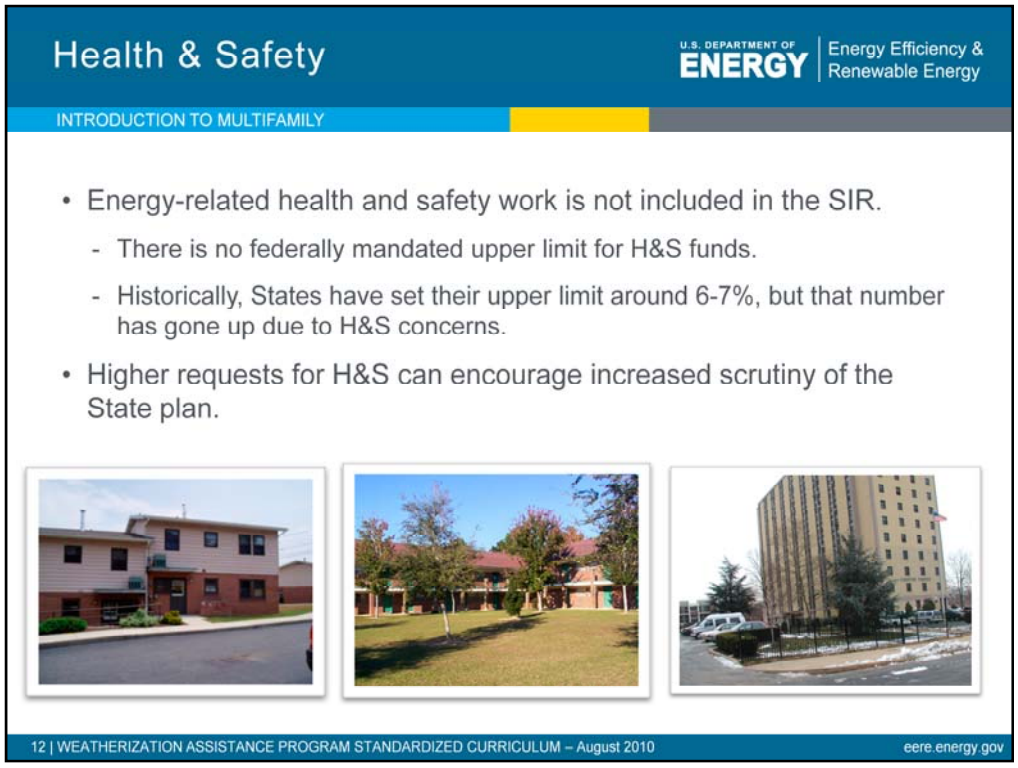
The two pie charts on this slide show the utility splits – electricity, natural gas, water, fuel oil and other utilities (such as propane, firewood, coal) – common in affordable, multifamily housing.

- Opening up affordable multifamily housing to WAP assistance brings in a large, underserved group of low- to moderate-income residents.
- There are several types of affordable housing: Federal, State, and local.
- Residents of public housing account for a large amount of energy consumption. Public housing alone accounts for $1.5 billion/year in utility costs.
- Utility expenses for Section 8 housing are another $2.5 billion/year.
- It is important that WAP financial benefits go to the residents and not the building owner. More on that later.

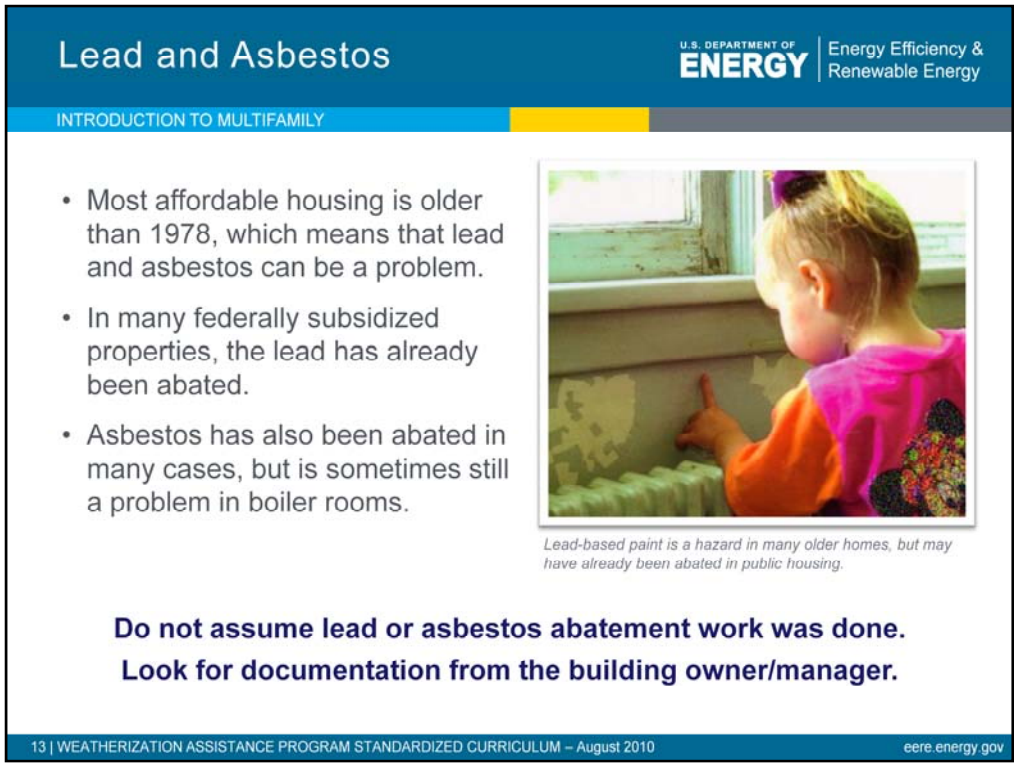


Two key principles guide the installation of measures: cost-effectiveness and the availability of health and safety funds. The requirements are almost the same as for single family homes.

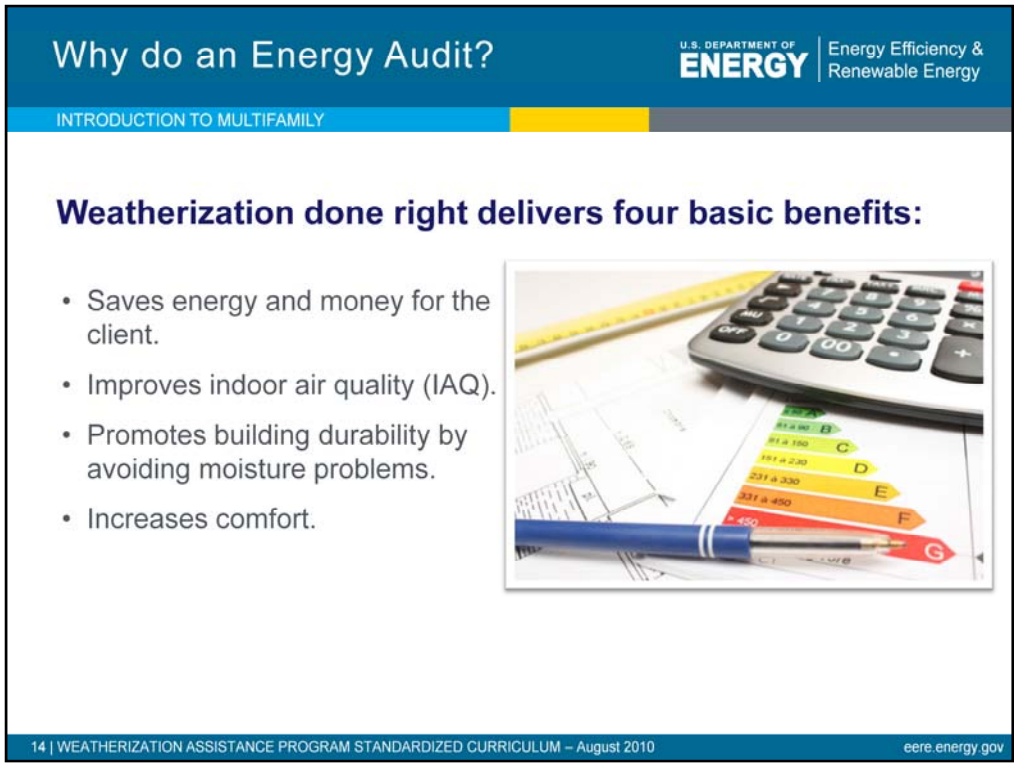
- Each individual weatherization measure and each package of weatherization materials and measures installed in an eligible dwelling unit must be cost-effective *on a building-wide basis*! For some units, the measures might not achieve a high enough ***savings-to-investment ratio (SIR)***, but they will on average.
- SIR must be ≥1.
- ***Incidental repair*** costs must be included in the SIR of the entire package of measures.
- States may include additional, related costs.



- Energy-related health and safety work is not included in the SIR.
  - There is no federally mandated upper limit for H&S funds. Each State designates this in its State plan.
  - Historically, States have set their upper limit around 6-7%. That number has gone up with the increase in the amount of ***lead safe weatherization (LSW)*** and furnace replacements, which often involve asbestos.
- Higher requests for H&S can encourage increased scrutiny of the State plan.



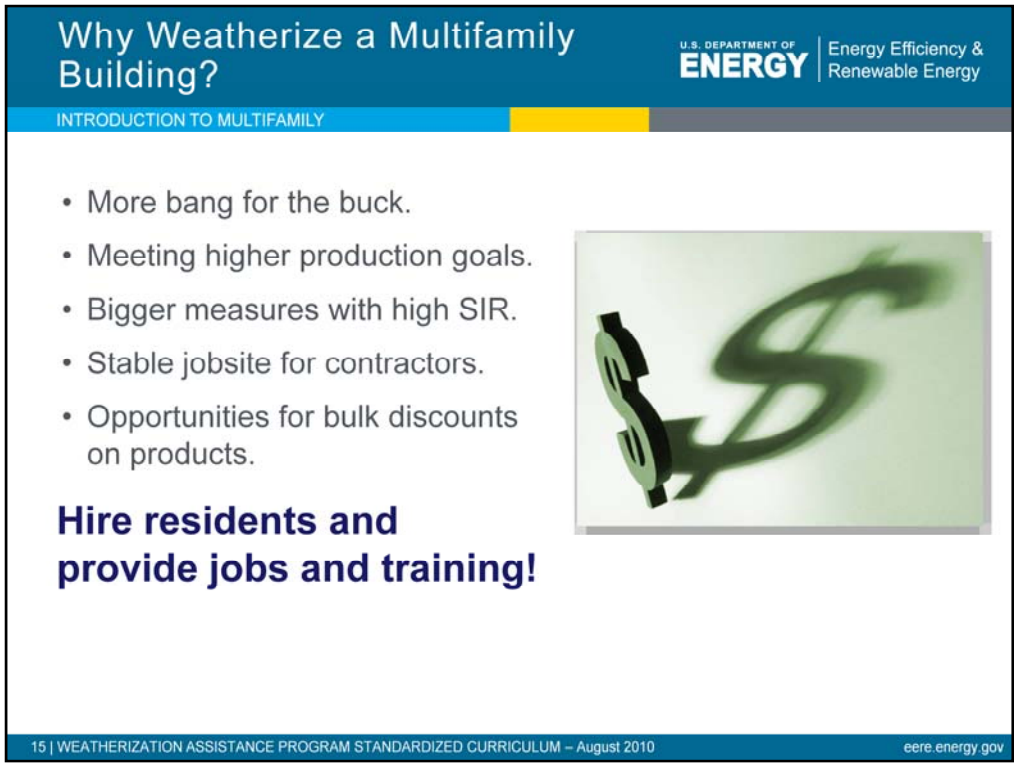
- Most affordable housing is older than 1978, which means that lead and asbestos can be a problem. For guidance on lead and asbestos, see Weatherization Program Notices 02-5, 02-6, 08-6 and 09-6. State-specific guidelines can be found in the State plan and/or policy and procedures manual.
- In many cases, the lead has been abated on federally subsidized properties, since it is a HUD requirement and HUD provided funds to do the abatement or encapsulation.
- Asbestos has also been abated in many cases, but is sometimes still a problem in boiler rooms.
- *Do not assume lead or asbestos abatement work was done. Look for documentation from the building owner/manager.*



Weatherization done right delivers four basic benefits:

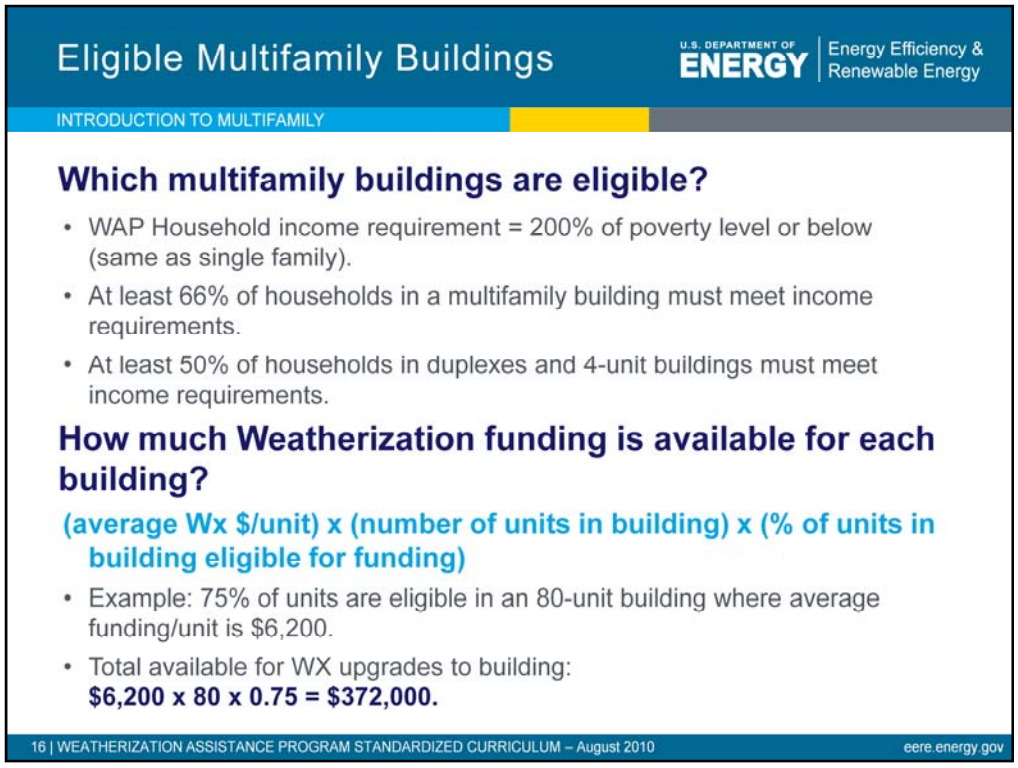
- Saves energy and money for the client.
- Improves ***indoor air quality (IAQ).***
- Promotes building durability by avoiding moisture problems.
- Increases comfort.

The only group that does not benefit from weatherization is energy vendors (except in the few enlightened states where public utilities' energy sales are not linked to profits. This encourages the utility to promote energy efficiency).



- More bang for the buck: Dollars spent per residence go farther in a multifamily building than in a single family home.
- Meeting your production goals: If your agency has a goal to weatherize a certain number of residences, it's easier to meet that goal by concentrating on multifamily buildings.
- Bigger measures with high SIR: Replacement or major repairs to central ***heating, ventilating, and air conditioning (HVAC)*** systems and central hot water have high SIRs.
- Stable jobsite for contractors: Larger projects with more housing units provide longer site duration and continuous work for installers.
- Opportunities for bulk discounts on products.

Hire residents, which will provide local jobs and job training! This will also teach other residents about energy efficiency. Often, residents or local groups can be used to install screw-in compact fluorescent lights, low-flow showerheads and faucet aerators.



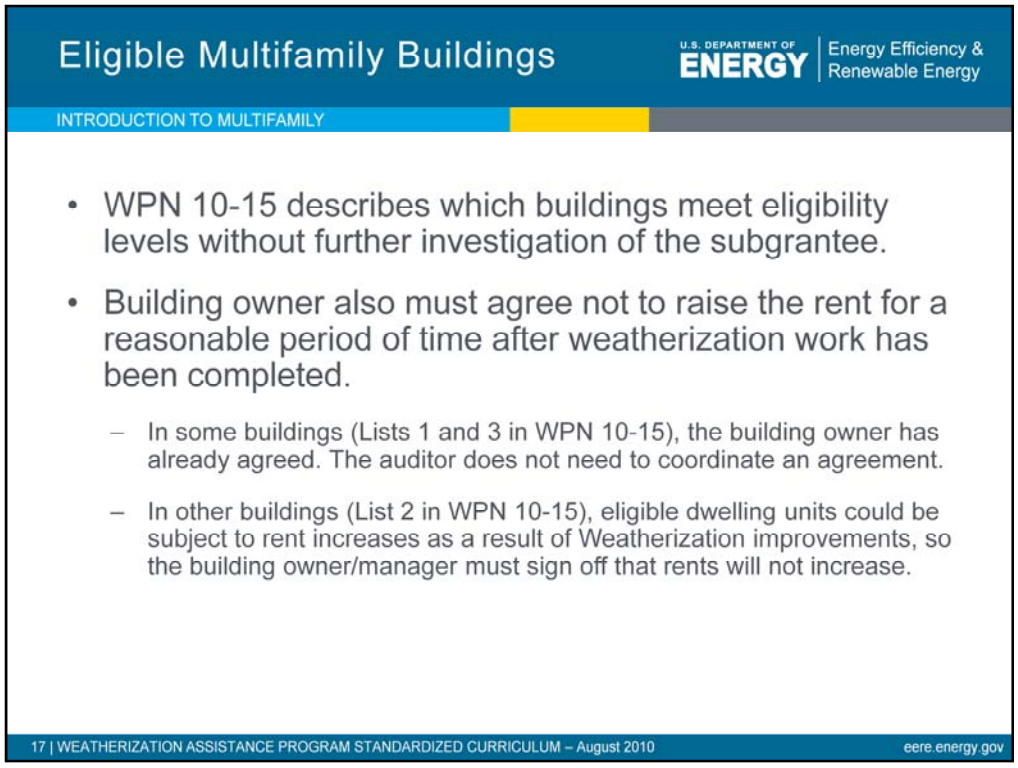
Which multifamily buildings are eligible?

Because multifamily buildings usually house families of various income levels, the question isn't always easy to answer.

- Fortunately, DOE issued Weatherization Program Notice (WPN) 10-15 on March 2, 2010, to help identify HUD and ***U.S. Department of Agriculture (USDA)*** buildings eligible for WAP funding.
  - The household income requirement for WAP eligibility is at or below 200% of poverty level. This is the same for single family and multifamily.
  - At least 66% of households in a multifamily building must meet Weatherization income requirements. So we can weatherize a 100-unit building if at least 66 of the units are occupied by income-eligible clients.
  - At least 50% of households must meet Weatherization income requirements in duplexes and 4-unit buildings.

How much Weatherization funding is available for each building?

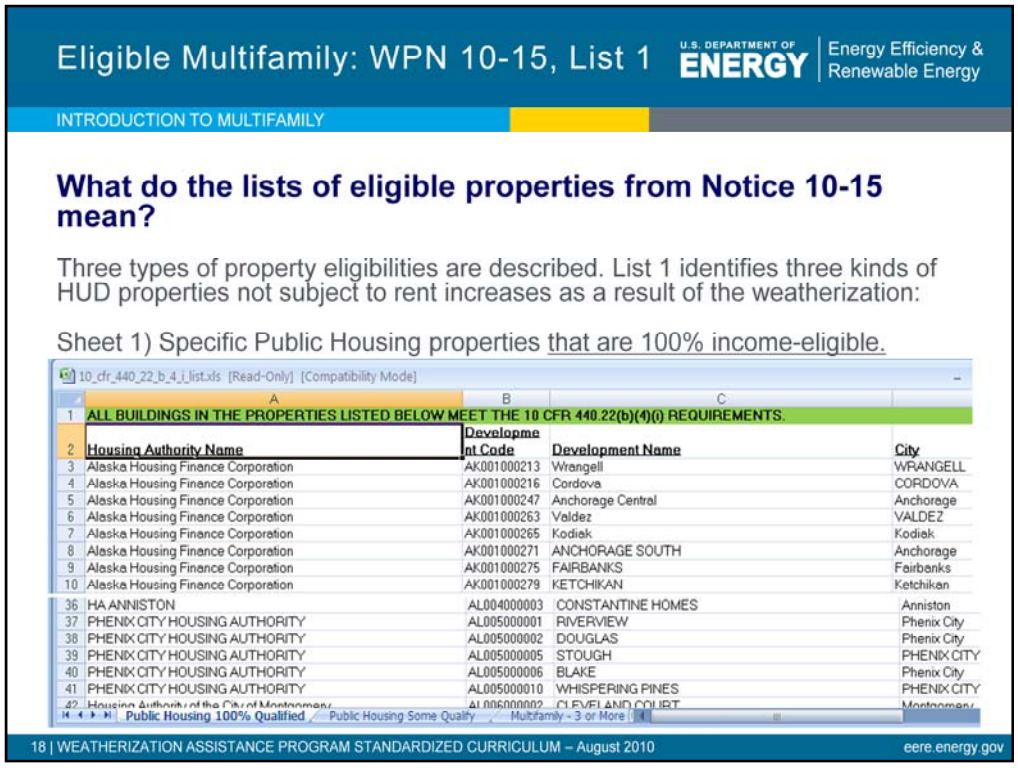
- (average Weatherization $/unit) x (number of units in building) x (% of units in building eligible for funding)
  - For example: 75% of units are eligible in an 80-unit building where average funding/unit is $6,200. The total available for Weatherization upgrades to the building is $6,200 x 80 x 0.75 = $372,000.



WPN 10-15 describes which buildings meet eligibility levels without further investigation by the subgrantee.

For a building to be eligible, the building owner also must agree not to raise the rent for a reasonable period of time – usually three years – after weatherization work has been completed (as required under 10 CFR 440.22(b)(3)(i)).

- In some buildings (Lists 1 and 3 in WPN 10-15), the building owner has already agreed that eligible dwelling units will not be subject to rent increases as a result of Weatherization improvements. The auditor does not need to coordinate an agreement.
- In other buildings (List 2 in WPN 10-15), eligible dwelling units could be subject to rent increases as a result of Weatherization improvements, so the building owner/manager must sign off that rents will not increase. In this case, the subgrantee must ensure that there is agreement between the building owner and the subgrantee that the rent will not increase as a result of the WAP improvements.

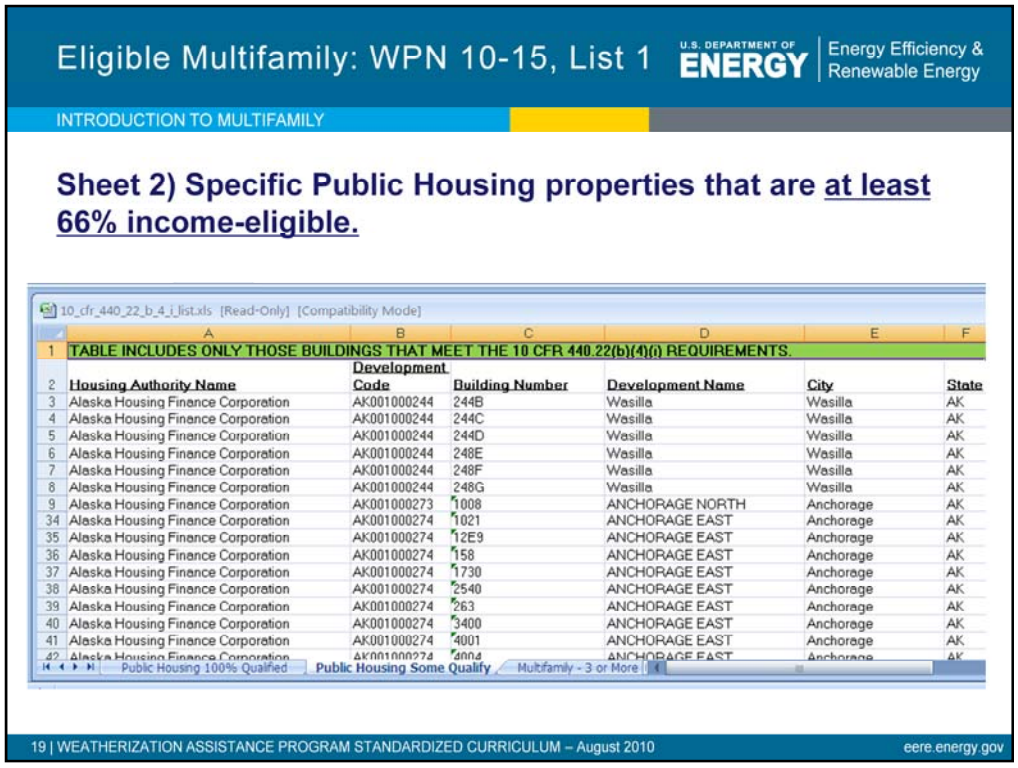


What do the tables of eligible properties from WPN 10-15 mean?

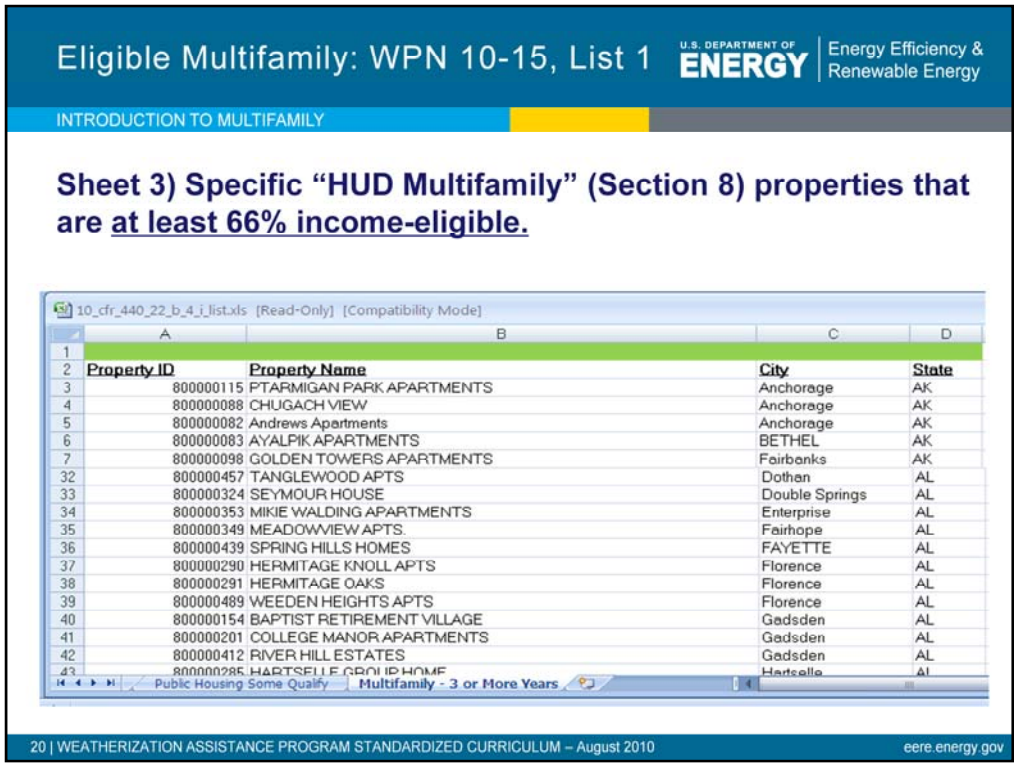
There are three lists in WPN 10-15. Each list is an Excel file. Each of the Excel files contains at least one and up to three worksheets. The information in List 1 is for buildings in which the rent is controlled per WAP guidelines, so the owner/manager cannot raise the rent after the weatherization work, which satisfies Program requirements.

- The first worksheet in List 1 shows only the specific buildings in public housing that are 100% income-eligible. The subgrantee does not have to do any further work to determine income eligibility for these buildings.
- For purposes of showing that the property is eligible, include a copy of the list with the property in question highlighted in the overall file for the project. If the client files for each unit may be separated from the bunch, copy and paste that property's identification from the List onto the income eligibility page to demonstrate that the residents qualify.

To gather demographics, which many grantees require, the subgrantee can obtain the demographic breakdown from the building owner. For buildings pre-qualified on these Lists the grantee does not have to gather individual statistics from each residence.

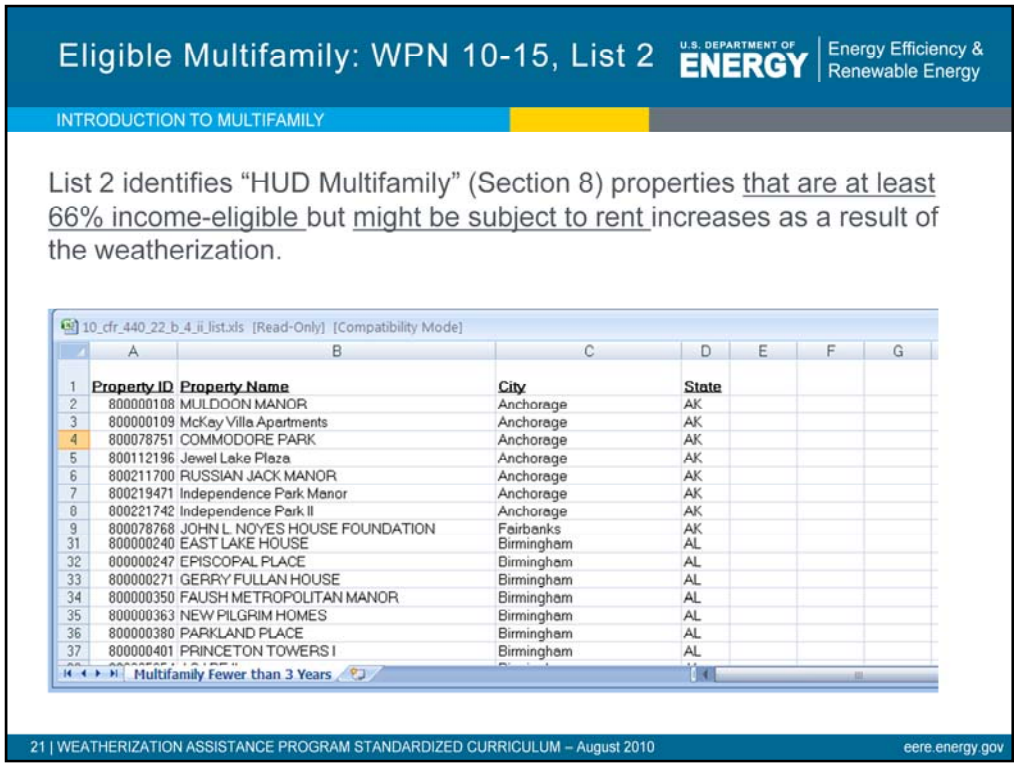


- The second worksheet in List 1 shows the public housing buildings in which at least 66% of the residences are income eligible. Subgrantee can use the equivalent funds (e.g., 66% of $6,500/unit x 100 units = $429,000) to weatherize the entire building. However, if the subgrantee feels that more than 66% of the units are income-eligible, the subgrantee can do the necessary eligibility determination and then can use the total funding that would be available for that number of units (e.g., 73% of $6,500/unit x 100 units = $474,5000.
- Some things to consider before pursuing eligibility determination on these properties:
  - Eligibility must be determined for the entire building, you do not start at 66% and go from there.
  - Is the additional funding worth the effort of determining eligibility?
  - Is that additional funding even needed to complete the WAP improvements?



Property ID	Property Name	City	State
800000115	PTARMIGAN PARK APARTMENTS	Anchorage	AK
800000088	CHUGACH VIEW	Anchorage	AK
800000082	Andrews Apartments	Anchorage	AK
800000083	AYALPIK APARTMENTS	BETHEL	AK
800000098	GOLDEN TOWERS APARTMENTS	Fairbanks	AK
800000457	TANGLEWOOD APTS	Dothan	AL
800000324	SEYMOUR HOUSE	Double Springs	AL
800000353	MIKIE WALDING APARTMENTS	Enterprise	AL
800000349	MEADOWVIEW APTS.	Fairhope	AL
800000439	SPRING HILLS HOMES	FAYETTE	AL
800000290	HERMITAGE KNOLL APTS	Florence	AL
800000291	HERMITAGE OAKS	Florence	AL
800000489	WEEDEN HEIGHTS APTS	Florence	AL
800000154	BAPTIST RETIREMENT VILLAGE	Gadsden	AL
800000201	COLLEGE MANOR APARTMENTS	Gadsden	AL
800000412	RIVER HILL ESTATES	Gadsden	AL

- The third worksheet in List 1 shows the specific buildings in Section 8 housing that are at least 66% income-eligible. This is a different type of subsidized housing, but the eligibility standards are the same as described in the previous slide.
- If the subgrantee feels that more than 66% of the units are income-eligible, subgrantee can do the necessary eligibility determination and then can use the total funding that would be available for that number of units.



- List #2 shows the specific buildings in Section 8 housing that are at least 66% income-eligible but the rent is NOT frozen. The subgrantee must include language in the contract guaranteeing that the building owner/manager WOULD NOT raise rents as a result of the WAP work. Also, if the subgrantee feels that more than 66% of the units are income-eligible, subgrantee can do the necessary eligibility determination and then can use the total funding that would be available for that number of units.

Eligible Multifamily: WPN 10-15, List 3

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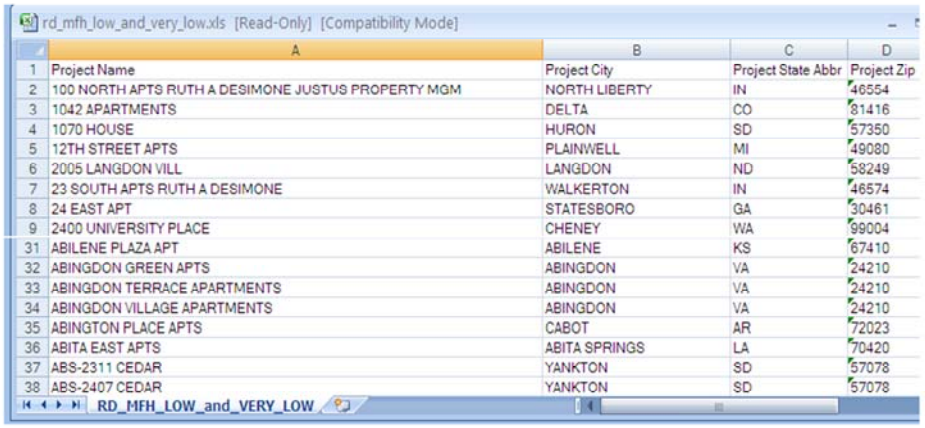
INTRODUCTION TO MULTIFAMILY

List 3 identifies USDA properties that are 100% income-eligible.



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	A	B	C	D
1	Project Name	Project City	Project State Abbr	Project Zip
2	100 NORTH APTS RUTH A DESIMONE JUSTUS PROPERTY MGM	NORTH LIBERTY	IN	46554
3	1042 APARTMENTS	DELTA	CO	81416
4	1070 HOUSE	HURON	SD	57350
5	12TH STREET APTS	PLAINWELL	MI	49080
6	2005 LANGDON VILL	LANGDON	ND	58249
7	23 SOUTH APTS RUTH A DESIMONE	WALKERTON	IN	46574
8	24 EAST APT	STATESBORO	GA	30461
9	2400 UNIVERSITY PLACE	CHENEY	WA	99004
31	ABILENE PLAZA APT	ABILENE	KS	67410
32	ABINGDON GREEN APTS	ABINGDON	VA	24210
33	ABINGDON TERRACE APARTMENTS	ABINGDON	VA	24210
34	ABINGDON VILLAGE APARTMENTS	ABINGDON	VA	24210
35	ABINGTON PLACE APTS	CABOT	AR	72023
36	ABITA EAST APTS	ABITA SPRINGS	LA	70420
37	ABS-2311 CEDAR	YANKTON	SD	57078
38	ABS-2407 CEDAR	YANKTON	SD	57078

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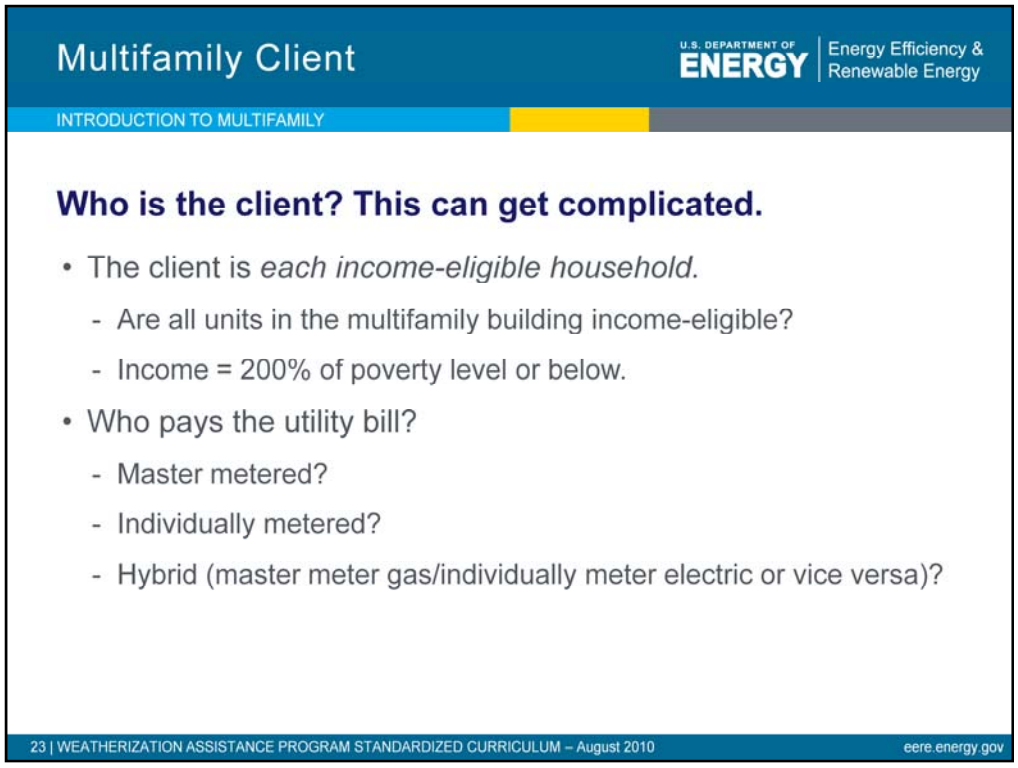
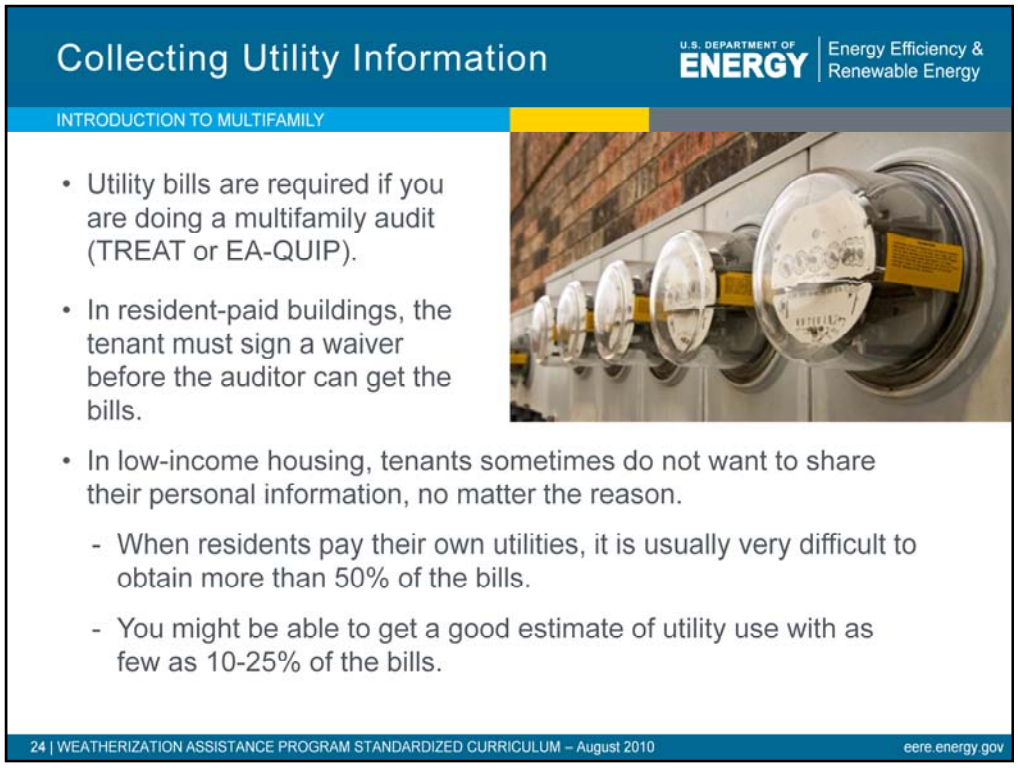
- Properties listed in this spreadsheet, list #3, have the same eligibility (100% of units are income-eligible) and rent controls (rent cannot be raised as a result of WAP improvements) as the first worksheet in List 1. The only difference is that this is USDA housing instead of HUD housing.



- Who is the client? This can get complicated with a multifamily residence.
  - The short answer is that there are *many clients*, because all the income-eligible households in the building are your clients. (Income-eligible households are at 200% of the poverty level or below.)
- You also need to know who pays the utility bill:
  - Utility bills are very helpful in some audits, especially for larger (25+ unit) buildings and buildings with shared HVAC.
  - If the clients pay the bills, then the benefits of the WAP improvements automatically go to the clients. You'll need to go to the clients (all of them) to obtain copies or to sign a waiver allowing you to obtain copies from the utility provider.
  - If the building owner pays the bills, you will need to go to the owner to get him/her to agree in writing that the residents will benefit in some quantifiable way (more on this point later).
- This gets more complicated depending on how the building is metered.
  - Is the system hybrid, where the gas is master metered but electricity is individually metered, or vice versa?
  - Are there master metered common areas and individually metered dwelling units?
  - If the system is master metered, you need to go to the building owner. If it is individually metered, you need to go to the clients. Or you may need to go to both.



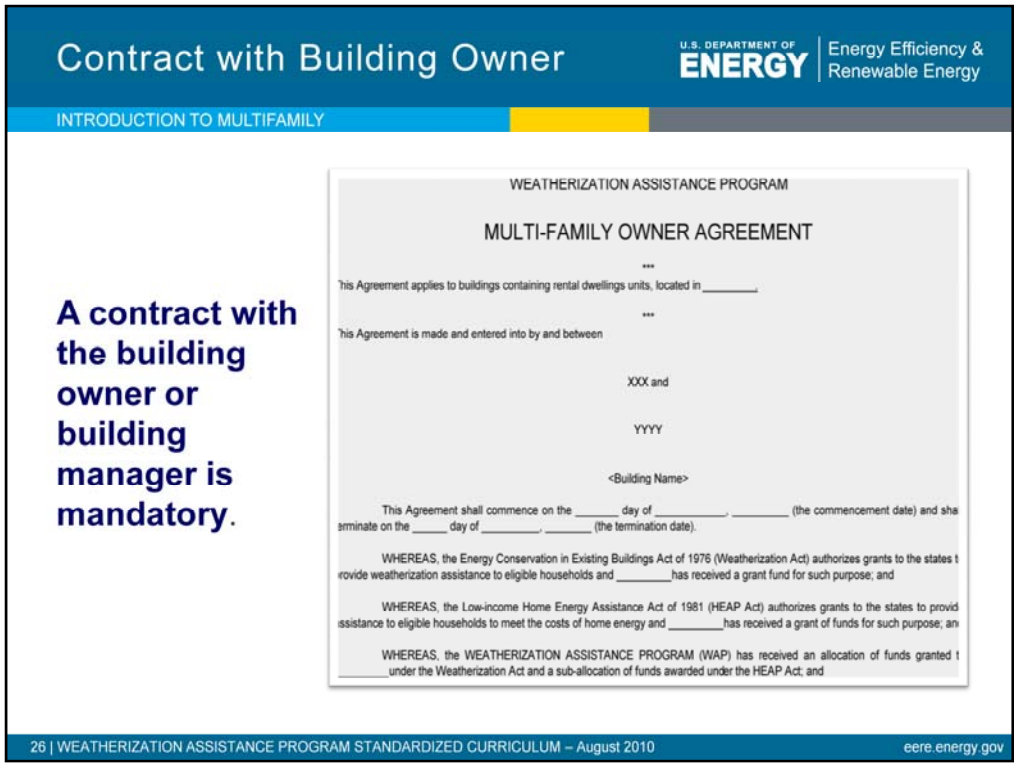
Utility bills are required if you are doing a multifamily audit ***(Targeted Retrofit Energy Analysis Tool (TREAT)*** or ***Energy Audit using the Queens Information Package (EA-QUIP))*** – more on these audit tools later), because the bills are very important in "calibrating" the model.

In resident-paid buildings, the tenant must sign a waiver before the auditor can get the bills.

- In low-income housing, the tenants sometimes have a combative relationship with the owner/manager and do not want to share their personal information, no matter the reason.
  - When residents pay their own utilities, it is usually very difficult to obtain more than 50% of the bills for a building.
  - If you can get a representative sampling of bills (considering size of apartment, number of bedrooms, and number of levels), you might be able to get a good estimate of utility use with as few as 10-25% of the bills.

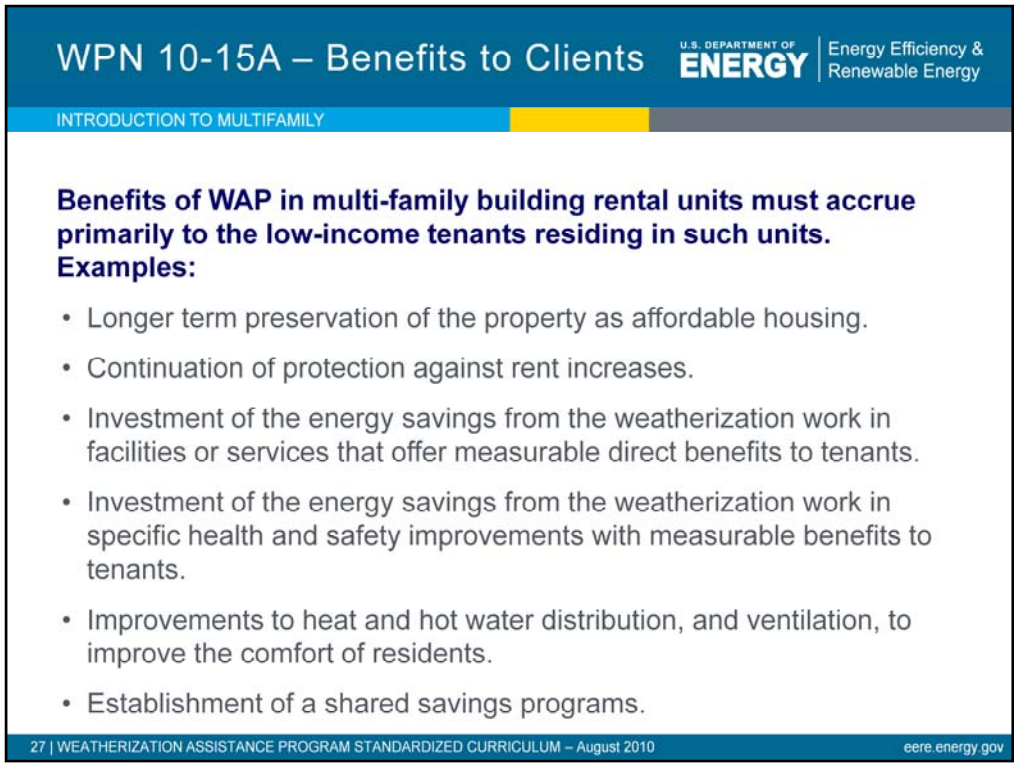
Who is the contact? This also gets complicated for multifamily buildings.

- The building owner/manager is the primary contact and must be a partner in the WAP project. *The building owner/manager's participation is vital.*
  - WAP services are coordinated and delivered to residents though the building owner/manager.
  - The building owner/manager applies for WAP services.
  - The building owner can provide data on income qualification for all of the tenants.
- Resident groups may also play a role.
  - A residents' group might encourage or persuade the building owner/manager to apply.
  - A residents' group might participate in the application process.



A contract with the building owner or building manager is mandatory. Standardized contracts are available. In addition to the usual agreement terms and conditions, scope of work and budget, the contract must include the following (at least as an attachment):

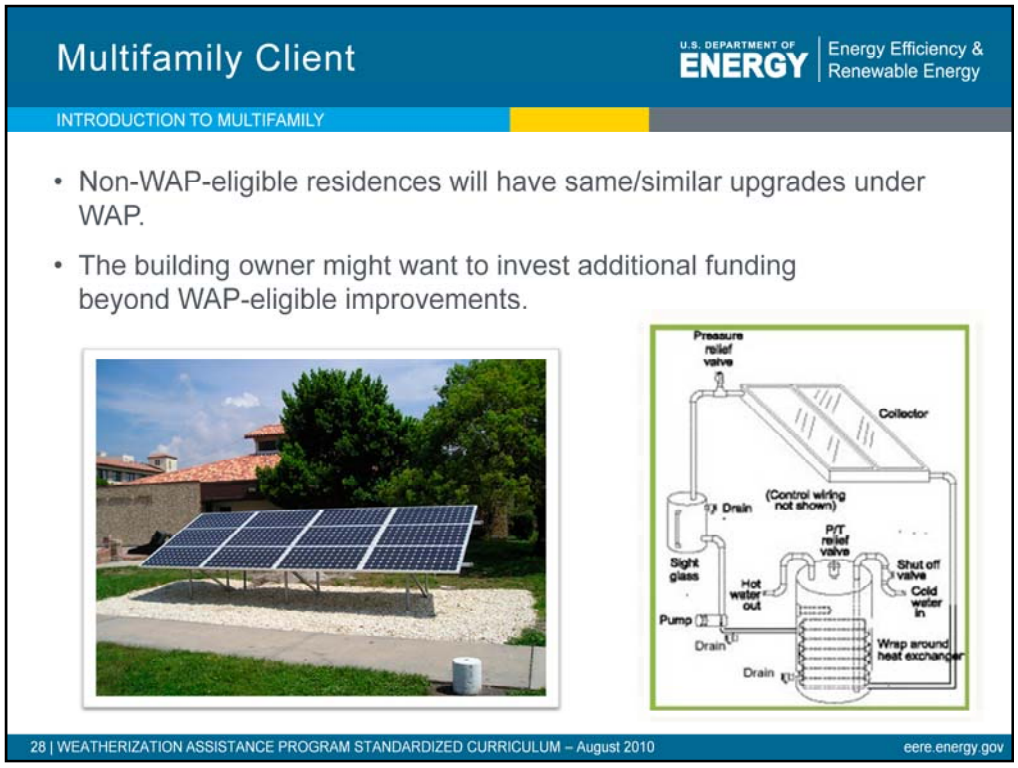
- The Owner/Operator's contribution to the project.
- The Owner/Operator's plan to ensure that WAP benefits go to the eligible residents (WPN 10-15A).



Benefits of WAP in multifamily building rental units must accrue primarily to the low-income tenants residing there. This can be complicated when the residents' utility bills are paid for by the building owner and included in the rent.

When a tenant does not pay for energy directly, a combination of several categories of benefits could be used to demonstrate that the benefits of the weatherization accrue primarily to the tenant. Benefits that could be combined, include, but are not limited to the following:

- Longer term preservation of the property as affordable housing.
- Continuation of protection against rent increases beyond that required under the WAP regulations (10 CFR 440.22(b)(3)(ii)).
- Investment of the energy savings in facilities or services that offer measurable direct benefits to tenants, i.e., creating community rooms, improvements to common areas, roof repairs, etc.
- Investment of the energy savings from the weatherization work in specific health and safety improvements with measurable benefits to tenants, i.e., lead or asbestos remediation, improved pest control, etc.
- Improvements to heat and hot water distribution, and ventilation, to improve the comfort of residents.
- Establishment of a shared savings programs.



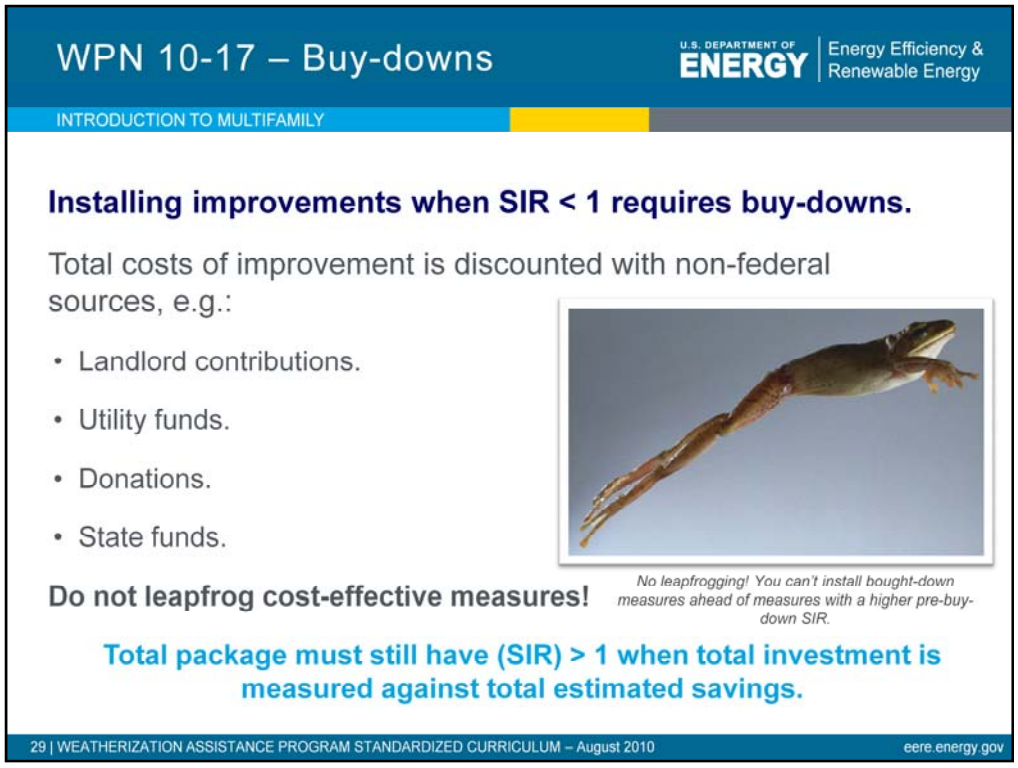
Pictured: a solar photovoltaic (PV) collector and a drainback solar hot water system.

Some building owners might take the opportunity to make improvements unrelated to WAP while construction is going on.

- The building owner might want to invest additional funding beyond WAP-eligible improvements.
- In the interest of applying "house as a system" thinking to multifamily buildings, the subgrantee and building owner must ensure that non-WAP-eligible residences have the same or similar WAP upgrades as eligible residences. This means if the attic is insulated, the entire attic is insulated, even those sections over non-eligible dwellings.
  - In the case of base load measures, just as the weatherization upgrades must be shown to directly benefit the low-income residents, appliance replacements in non-eligible dwellings should be limited to those that convey with the rental unit. In other words, if the resident will take the appliance with them upon move-out, it might not be prudent to replace refrigerators in the non-eligible units.

Q: What non-WAP improvements might a building owner install during WAP upgrades without any additional inconvenience to residents?

A: Solar electricity or hot water collectors on roof, new energy- and water-saving clothes washers, new outdoor lighting with photoswitches, or new windows. (New windows usually don't meet the SIR required by WAP.)



If the owner or subgrantee wishes to install improvements when the SIR < 1, the measure can be "bought down" so the DOE contribution for that measure has an SIR ≥ 1.

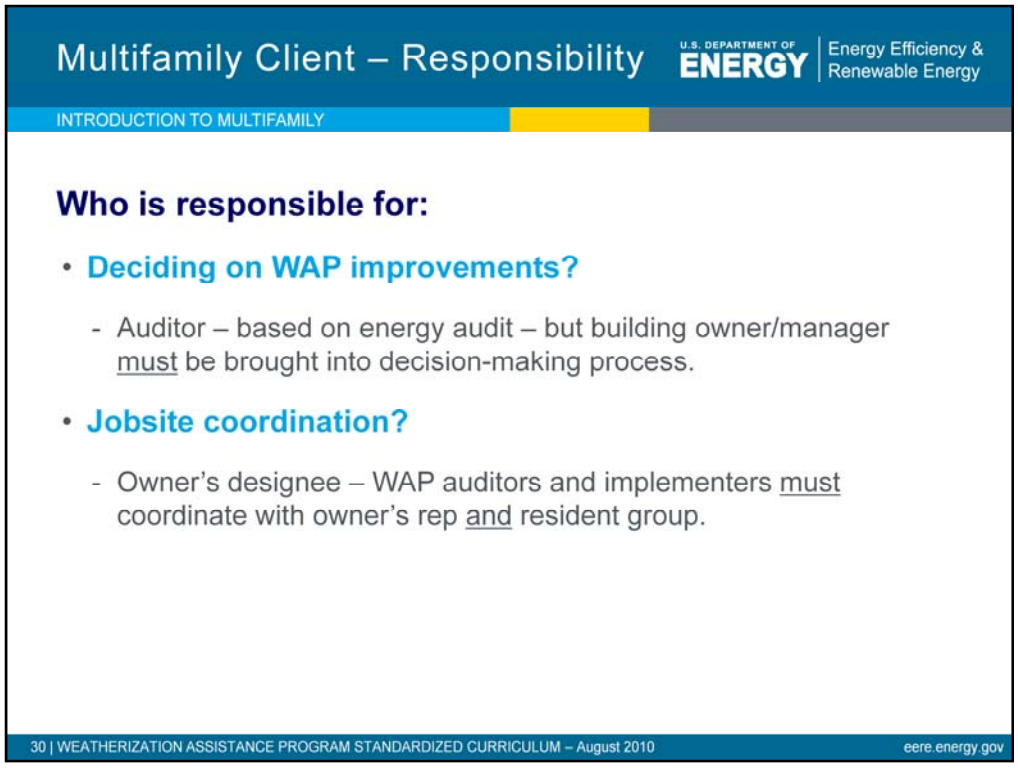
- Furnace replacements, fenestration, etc.
- Health & Safety improvements beyond budget.

The buy-downs must be with non-Federal funds. The total costs of improvement is discounted with non-Federal sources, e.g.

- Landlord contributions.
- Utility funds.
- Donations.
- State funds.

Do not leapfrog cost-effective measures! WAP funds cannot be used to install a measure with a lower pre-buy-down SIR if that will preclude installing measures with a higher SIR and no buy-down.

The total package must still be cost effective overall. The total package must have an SIR ≥ 1 with buy-downs excluded.



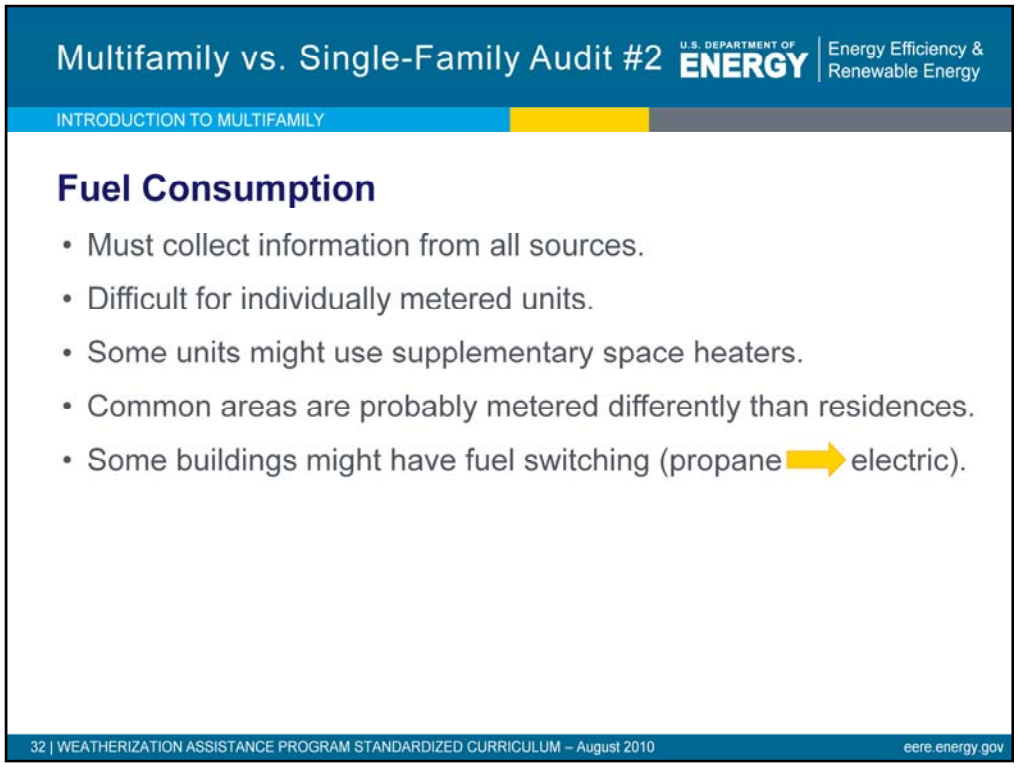
- The auditor is responsible for selecting WAP improvements based on the energy audit, but the building owner/manager must be part of the decision-making process.
- The building owner's designee is responsible for jobsite coordination. WAP auditors and implementers must coordinate with the owner's representative and resident groups.

What sort of warning should you give residents before inspecting their units?

- Ask your building contact (your liaison with the owner) to make an appointment with the residents at least one day in advance, but most properties have a defined policy. If there are specific units you want to inspect, make appointments with those renters up to a week in advance to ensure those units are available for inspection so you don't have to make a special trip later. Call to remind them the day before. Many properties will require an escort. Others won't allow access without the tenant being home.

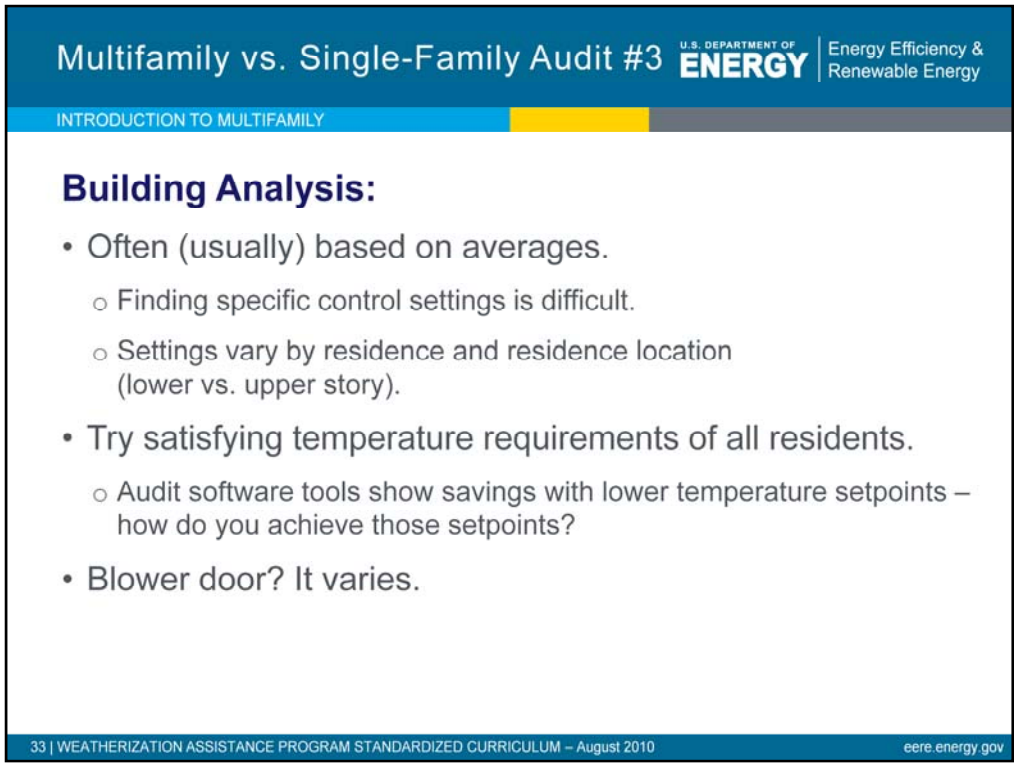
How is the multifamily audit different?

- Multiple parties are involved:
  - Service provider (subgrantee).
  - Building owner/manager.
  - Maintenance department.
  - Residents.
- Every group or individual has its own priorities/interests/proclivities/problems…whatever!



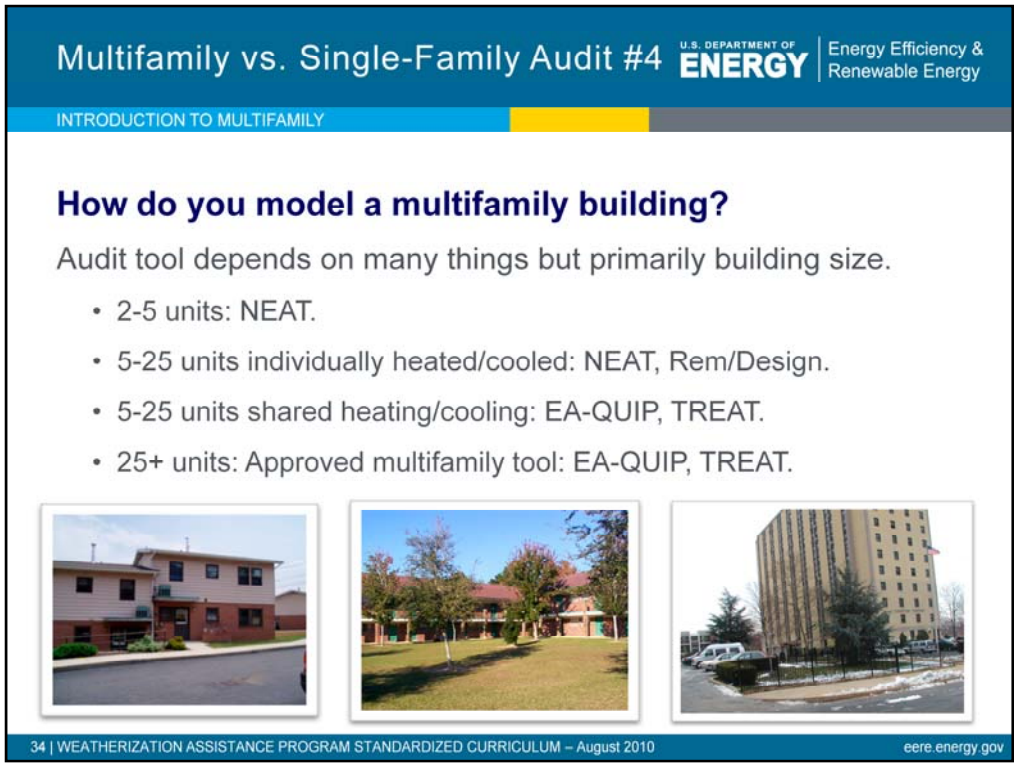
Fuel consumption:

- Must collect information from all sources – preferably monthly utility consumption for at least 12 continuous months.
  - This is difficult for individually metered units.
  - Some units might use supplementary space heaters.
  - Common areas are probably metered differently than residences.
  - Some buildings might have fuel switching (gas or oil).



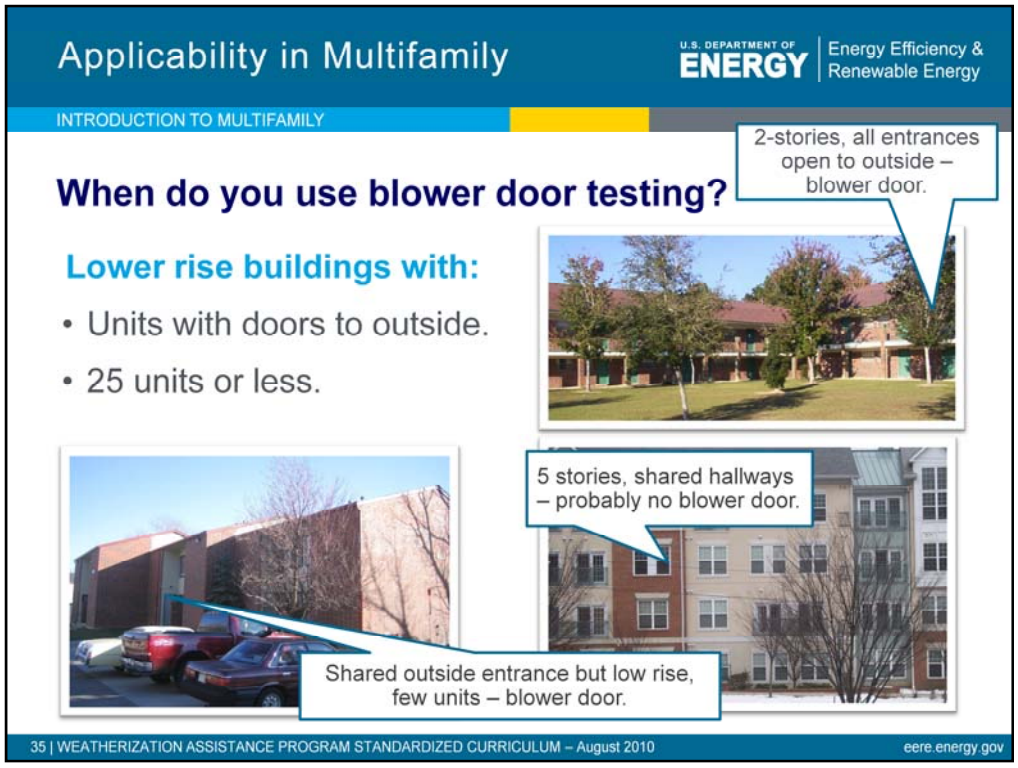
Building analysis:

- Often (usually) based on averages.
  - Finding specific control settings is difficult.
  - Settings vary by residence and residence location (lower vs. upper story).
- Try satisfying temperature requirements of all residents – please!
  - Audit software tools show savings with lower temperature setpoints, but how do you achieve those setpoints in many units at once?
    - Present data showing the variation across multiple apartments.
    - The analysis can be done for average conditions or for single apartments.
- Should you do a blower door test?
  - Sometimes, but use varies. A blower door isn't always used on large multifamily buildings.
  - When the blower door is used for multifamily buildings, it is usually not used on every unit (more on this in later modules).



Which audit tool would you use to model a multifamily building?

- The audit tool depends on many things but primarily building size:
  - 2-5 units: ***National Energy Audit Tool (NEAT)***.
  - 5-25 units individually heated/cooled: NEAT, RemDesign.
  - 5-25 units with shared heating/cooling: EA-QUIP, TREAT.
  - 25+ units: Approved multifamily tool: EA-QUIP, TREAT.



When do you use blower door testing? Usually in the following low rise (three stories or fewer) buildings:

- Units with doors to the outside (garden apartments).
- Buildings with 25 units or fewer.

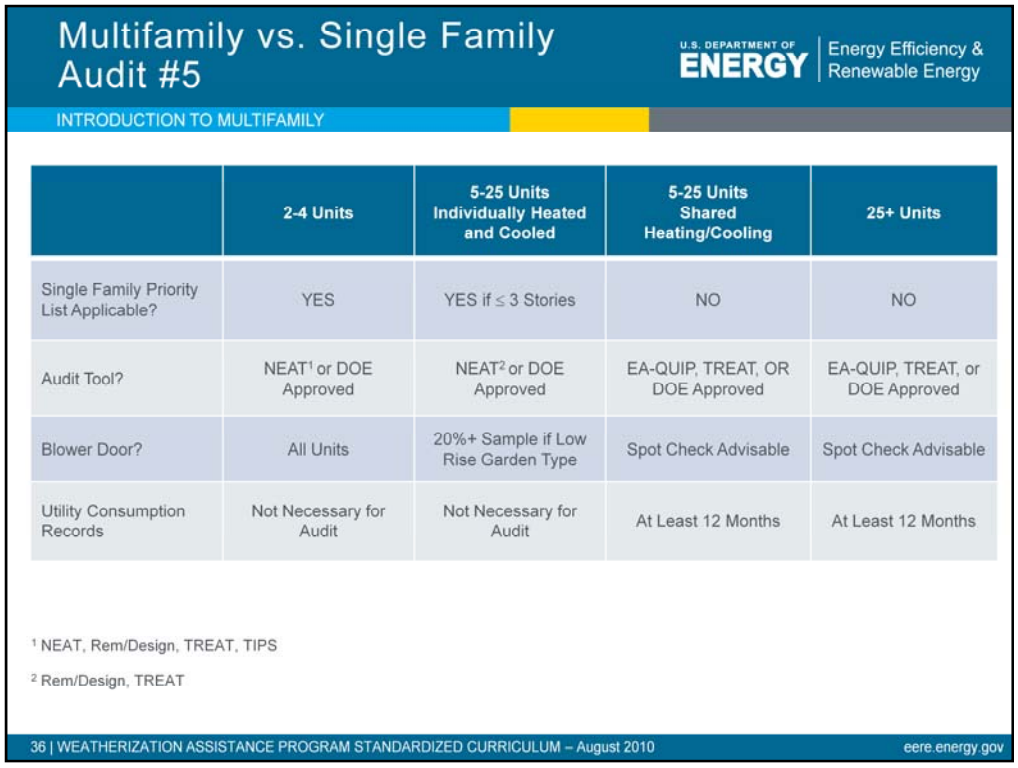
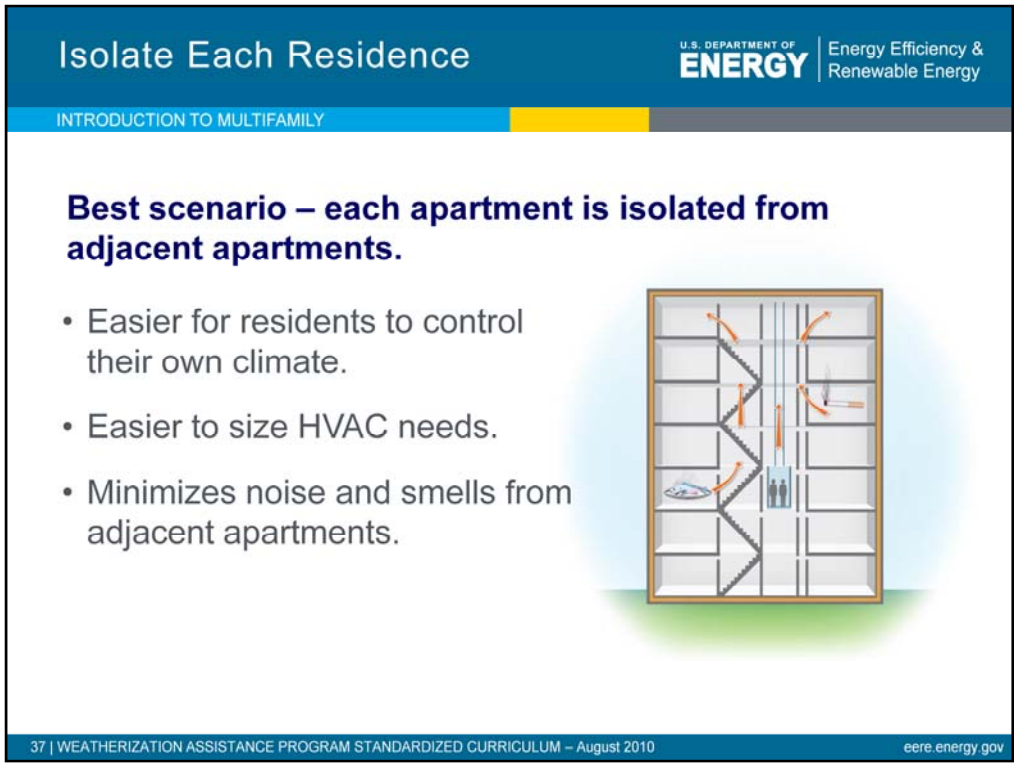


Chart shows, based on various building sizes:

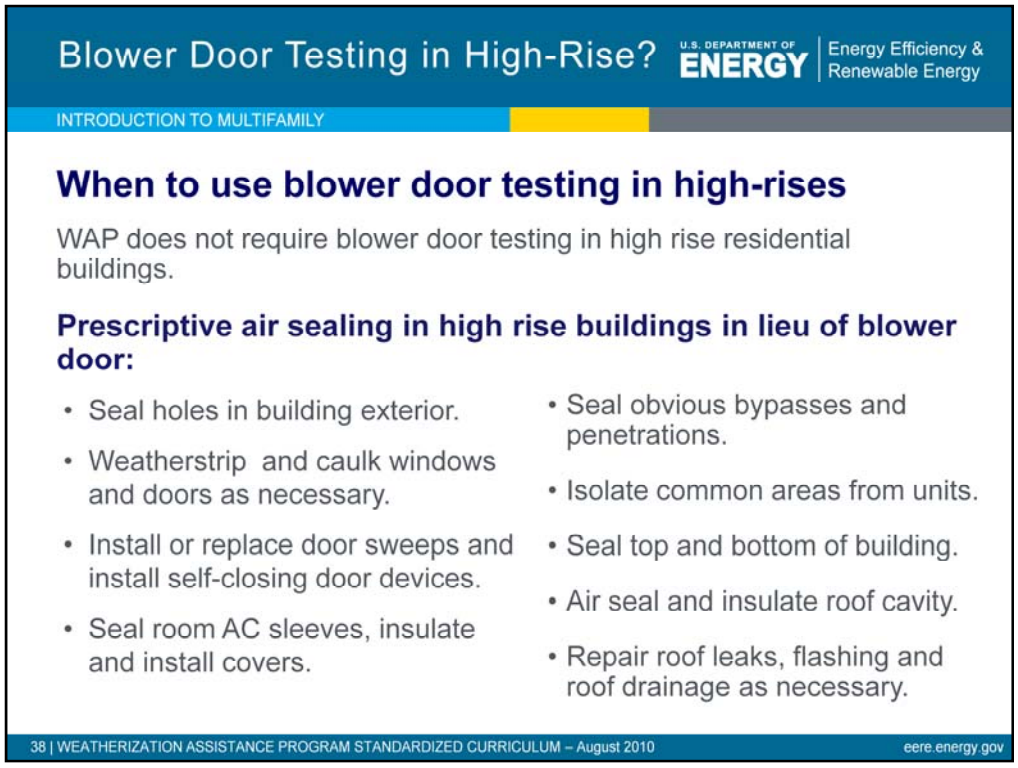
- Whether a single family priority list might be applicable.
- What type of audit is required?
- Whether blower door testing is required.
- Whether utility consumption data is necessary.

Quiz students on different types of buildings and the requirements, and discuss why those requirements exist for each situation.



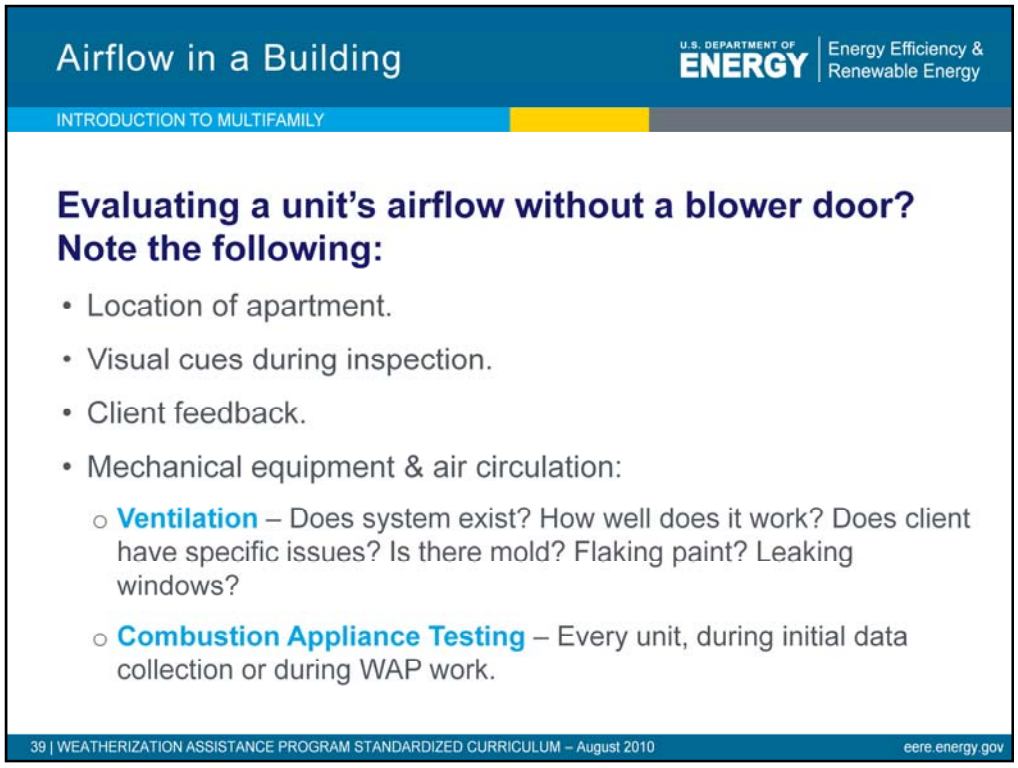
Best scenario – each apartment is isolated from adjacent apartments:

- Easier for residents to control their own climate.
- Easier to size HVAC needs.
- Minimize noise and smells from adjacent apartments.



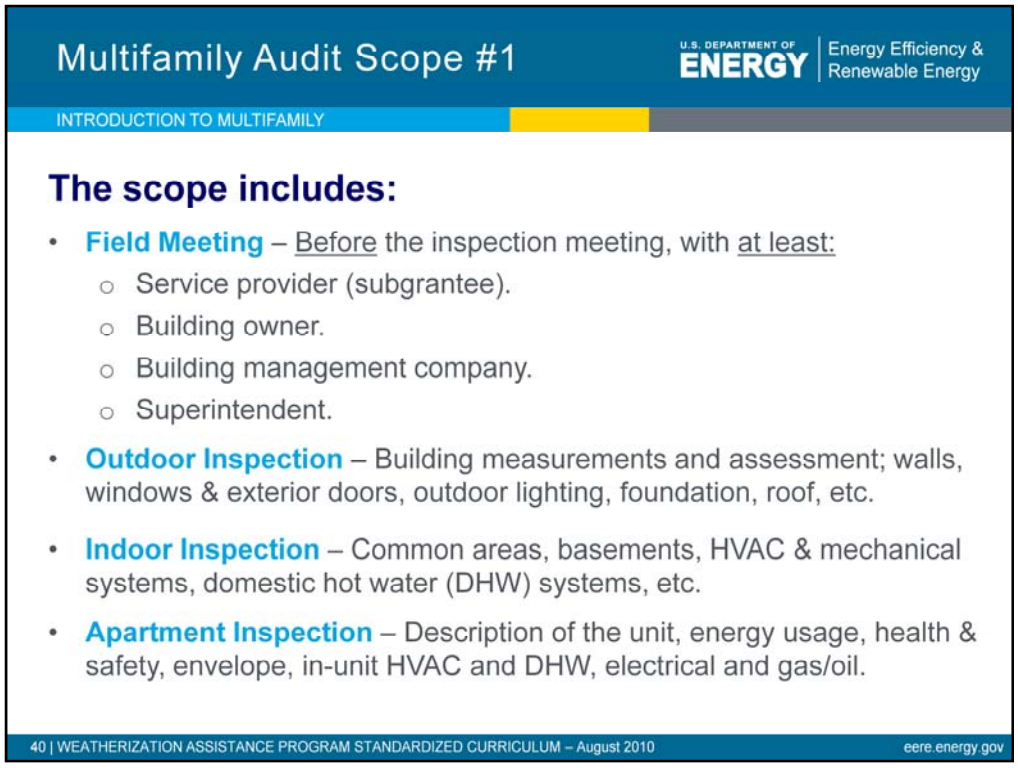
WAP does not require high rise residential buildings to be blower door tested. Prescriptive air sealing is common in high-rise buildings in lieu of blower door testing:

- Seal holes in building's exterior. Weatherstrip window/door frames.
- Replace inoperable or malfunctioning windows and doors as necessary.
- Caulk window frames and repair window balances.
- Install or replace door sweeps and install self-closing door devices.
- Seal room AC sleeves, insulate and install covers.
- Seal garbage chutes, ventilation shafts, plumbing and HVAC piping/ducts.
- Isolate stairwells, basement and mechanical rooms.
- Seal the top and bottom of building.
- Air seal and insulate the roof cavity.
- Repair roof leaks and flashing.
- Correct roof drainage and resurface as necessary.

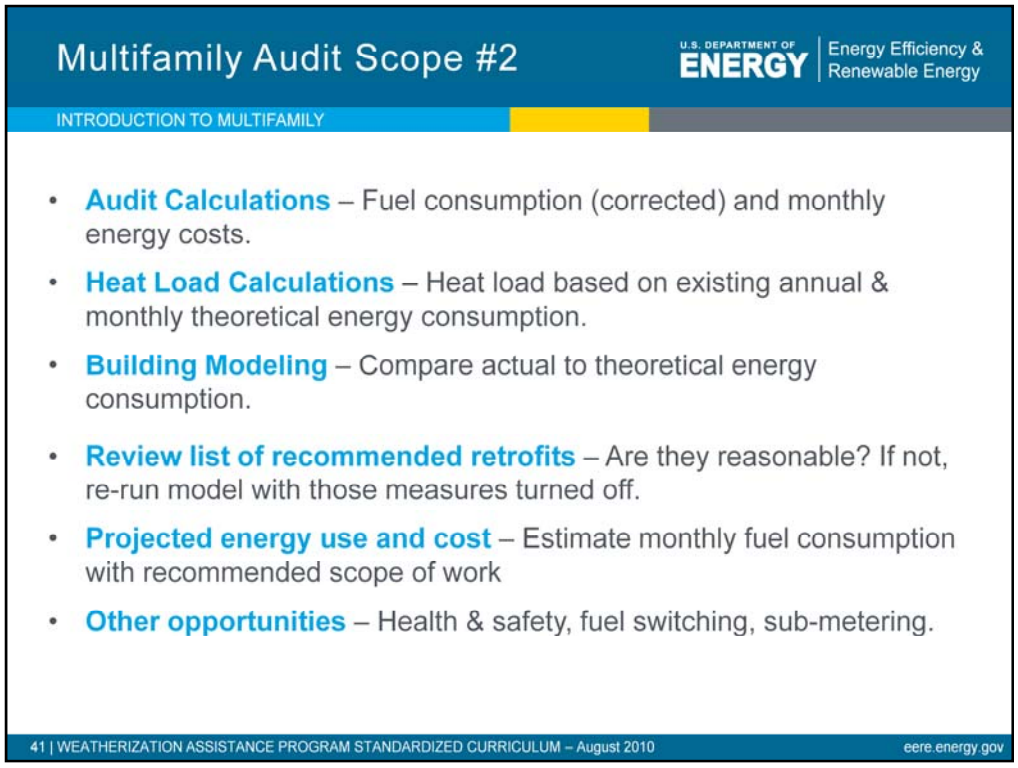


Take a relative approach when evaluating a unit's ventilation and airflow without blower door testing. Note the following:

- Take into account the location of the apartment (end unit vs. middle unit, upper vs. lower story vs. top story vs. bottom story).
- Visual cues during inspection – obvious bypasses on non-operational vent fans.
- Client feedback – is it drafty? Cold? Hot?
- Mechanical equipment & air circulation – obvious bypasses or non-operational vent fans.
- Ventilation – Does system exist? How well does it work? Does client have specific issues? Is there mold? Flaking paint? Leaking windows?
- Combustion Appliance Testing – Every unit.
  - Do pre-weatherization testing during initial walk-through audit, but you won't walk through every unit.
  - Do remaining units when weatherization modifications begin in those units.

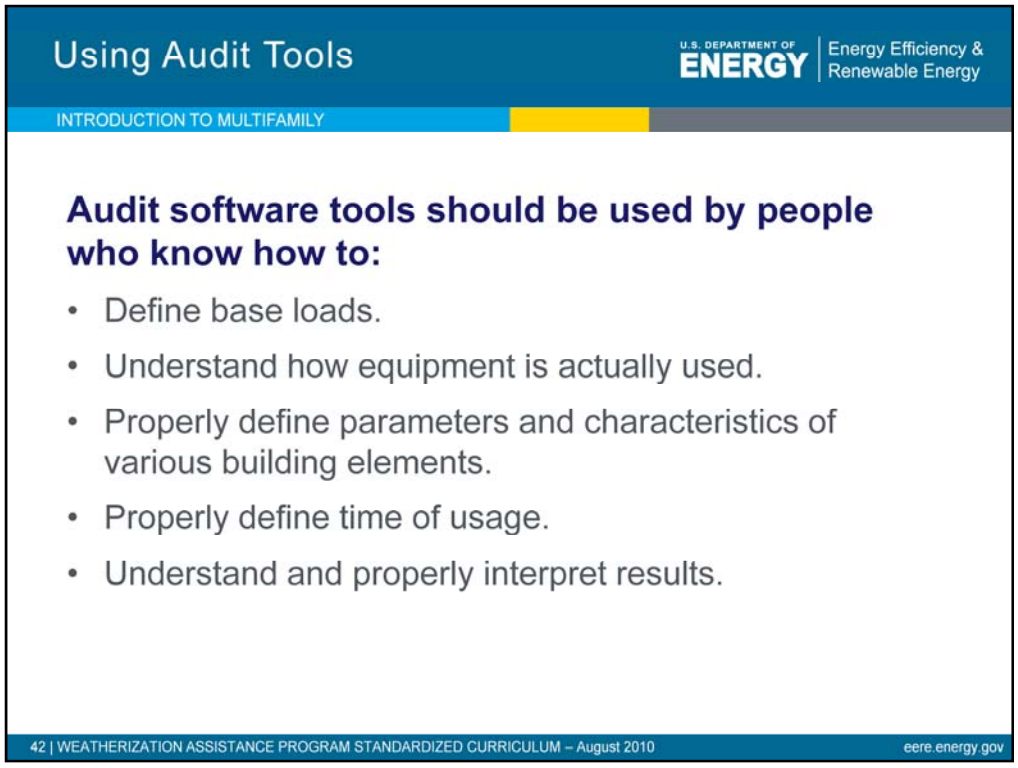


- Field meeting – Occurs *before* the inspection meeting with *at least the following attendees*:
  - Provider (subgrantee).
  - Building owner.
  - Building management company.
  - Superintendent.
- Outdoor inspection – Includes building measurements and assessment: evaluate walls, windows and exterior doors, outdoor lighting, foundation and the roof.
- Indoor inspection – Includes common areas, basements, HVAC systems, ***domestic hot water (DHW)*** systems, mechanical and ventilation systems.
- Apartment inspection – Includes a description of the unit, energy usage, health and safety, envelope, in-unit HVAC and DHW, wiring and gas/oil pipes.



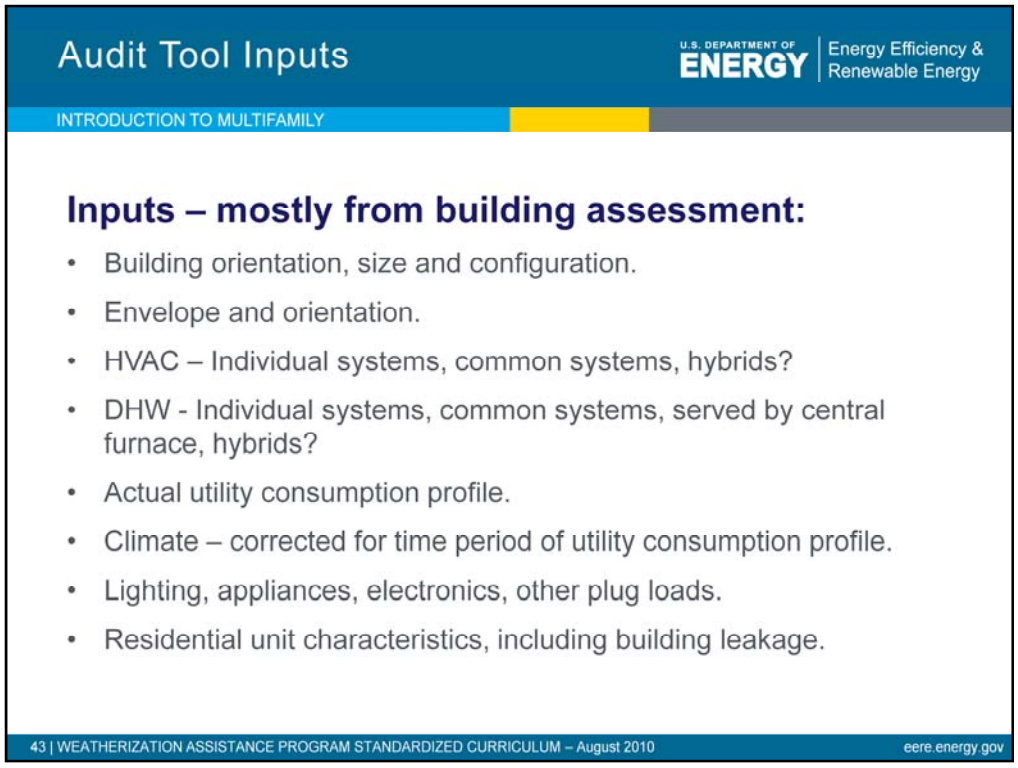
- Audit calculations – Include fuel consumption (corrected) and monthly energy costs.
- Heat load calculations – Calculate heat load based on existing annual and monthly theoretical energy consumption.
- Building modeling – Compare actual to theoretical energy consumption.
- Review list of recommended retrofits – Are they reasonable? If not, re-run the model with those measures turned off.
- Projected energy use and cost – Estimate monthly fuel consumption with recommended scope of work.
- Evaluate other opportunities for H&S, fuel switching, sub-metering.

And of course, provide a full report at the end.



Audit software tools should be used by people who know what they are doing. They should know how to:

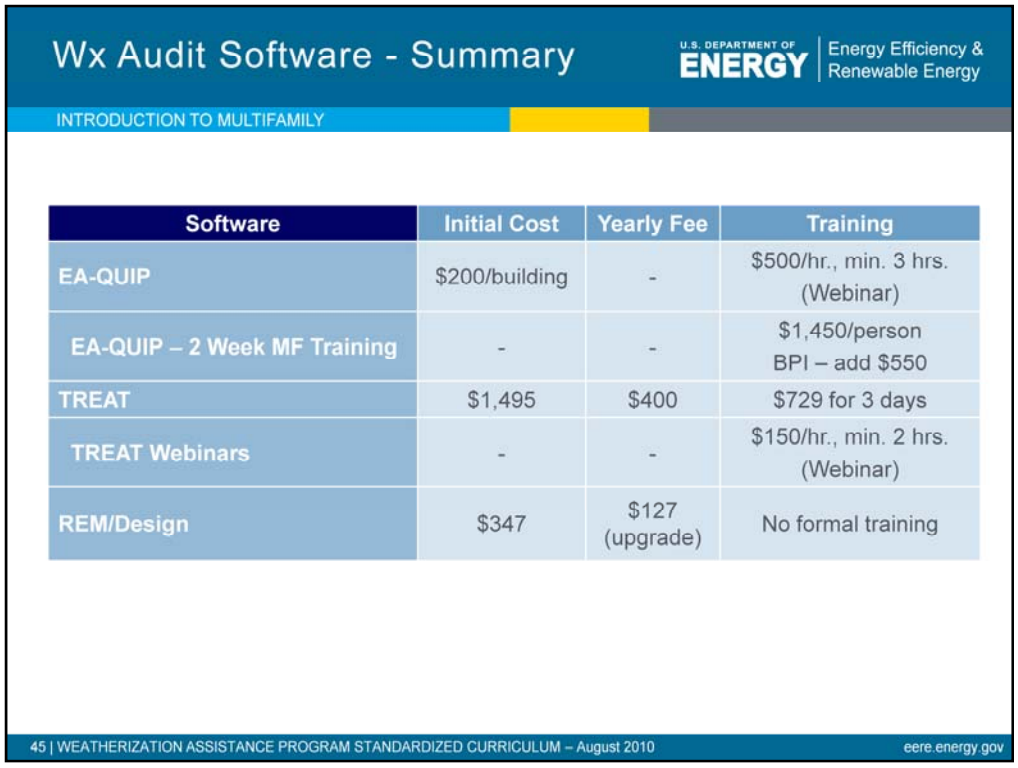
- Define base loads.
- Understand how equipment is actually used.
- Properly define parameters & characteristics of various building elements.
- Properly define time of usage.
- Understand and properly interpret results.



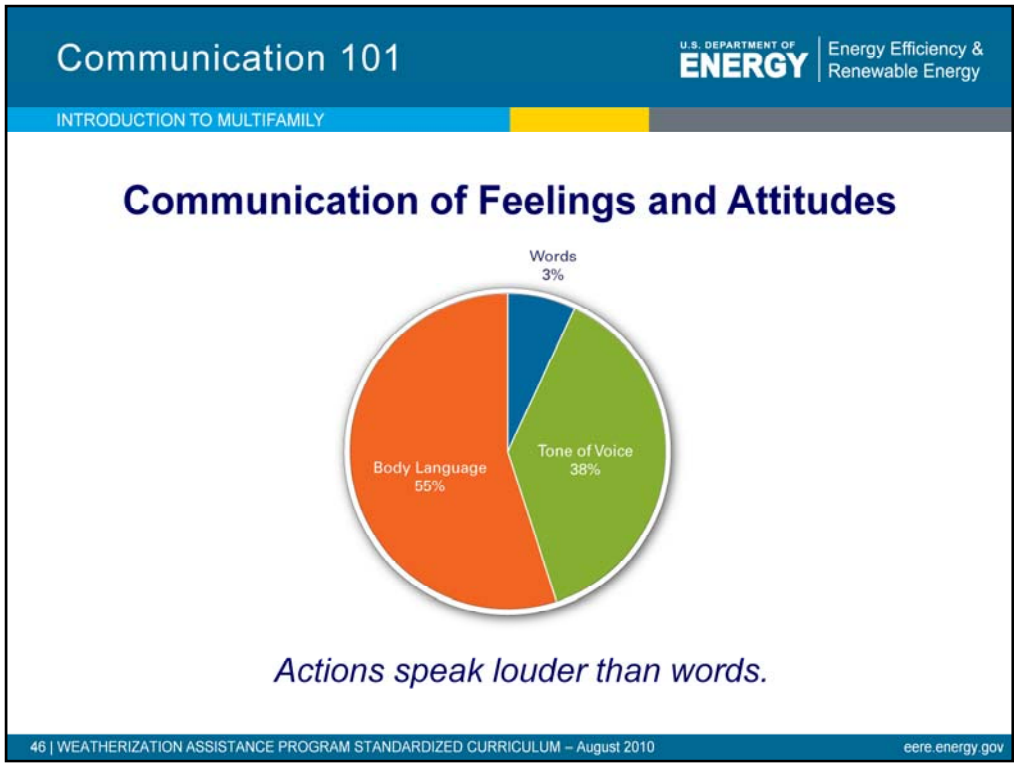
Most audit tool inputs come from data you collected during the building assessment:

- Building orientation, size and configuration.
- Envelope and orientation.
- HVAC – Individual systems, common systems, hybrids?
- DHW - Individual systems, common systems, served by central furnace, hybrids?
- Actual utility consumption profile.
- Climate – corrected for time period of utility consumption profile.
- Lighting, appliances, electronics, other plug loads.
- Residential unit characteristics, including building leakage.

Slide shows contacts for EA-QUIP, TREAT, NEAT and REM/Design



Slide shows initial cost, yearly fee (if applicable) and available training and training fees for multifamily software. Software decisions are made at the State or local level. Consider the options, and what will work best for your program.



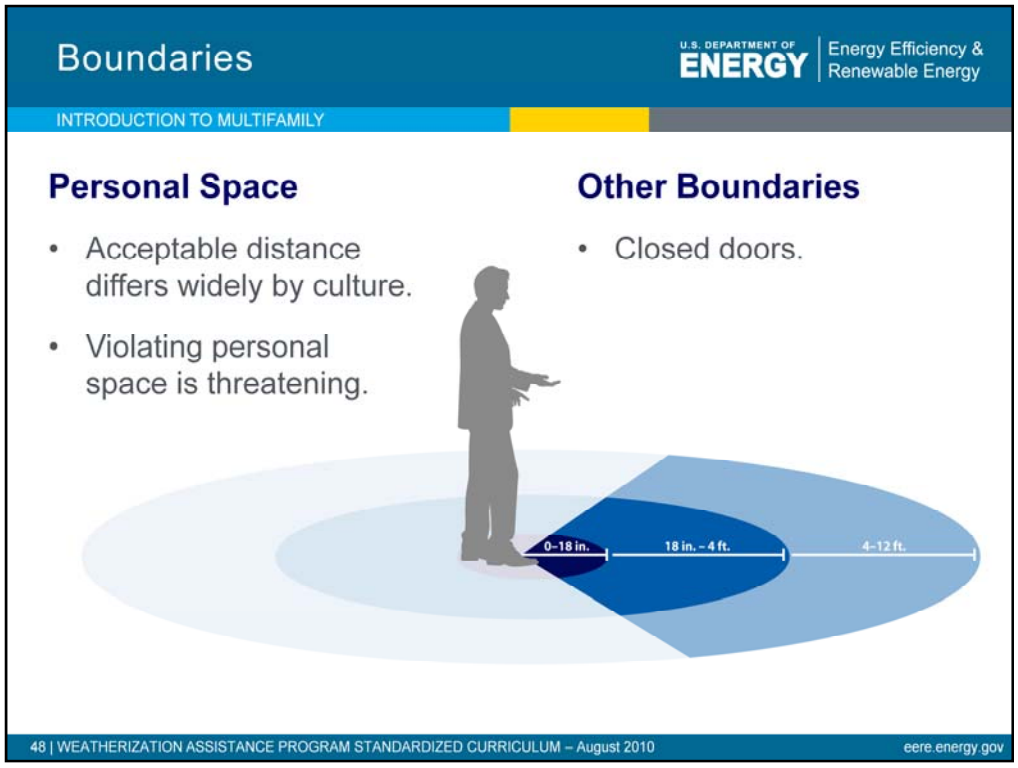
Communication can be even more important with multifamily clients because they often have a varied mixture of families and cultures. Be careful about your tone of voice, facial expression, and body language, as they express feelings and attitudes much more than words:

- Words – 7%
- Tone – 38%
- Body language – 55%

Actions speak louder than words.

These are the clients' homes and the owners' businesses. Be mindful of:

- Pride of ownership – Show respect for the property. It is probably an important part of the building owners' investment portfolio and they probably want their building to be a valuable part of the community. The owners also want the building to be attractive to potential renters. For the residents, it may not be much, but it may be all they have.
- Privacy – Always have your building contact with you when you are inspecting common areas and particularly when you are inspecting units. Have your contact arrange ahead of time for you to inspect units. Save yourself and the client a potentially embarrassing situation and knock before entering a room with a closed door. Do not handle personal materials, even if they are lying out.
- Sensitivity – Understand that world views, political views, and general standards of propriety vary widely among our client base. Do not discuss religion or politics. Do not use profanity.



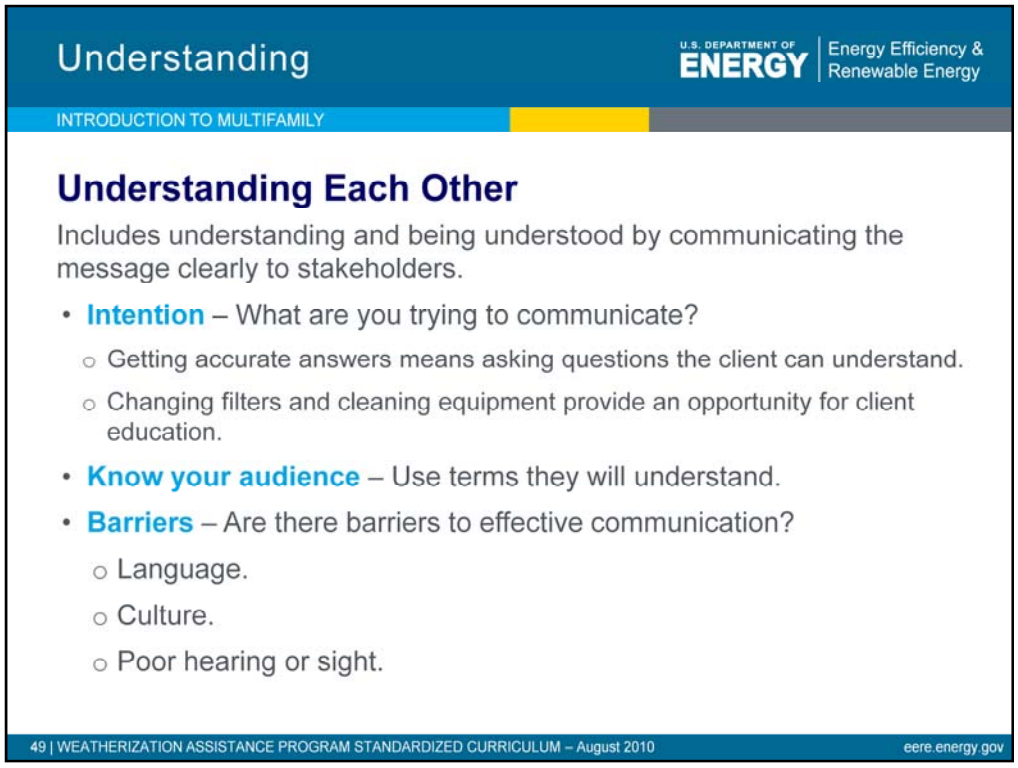
Personal space – There are distinct zones of comfort based on the type of relationship. Americans are remarkably uniform in their comfort zones:

0” to 18” – Reserved for intimate and deeply personal relationships.

18” to 4’ – Personal conversations with friends, family, or associates.

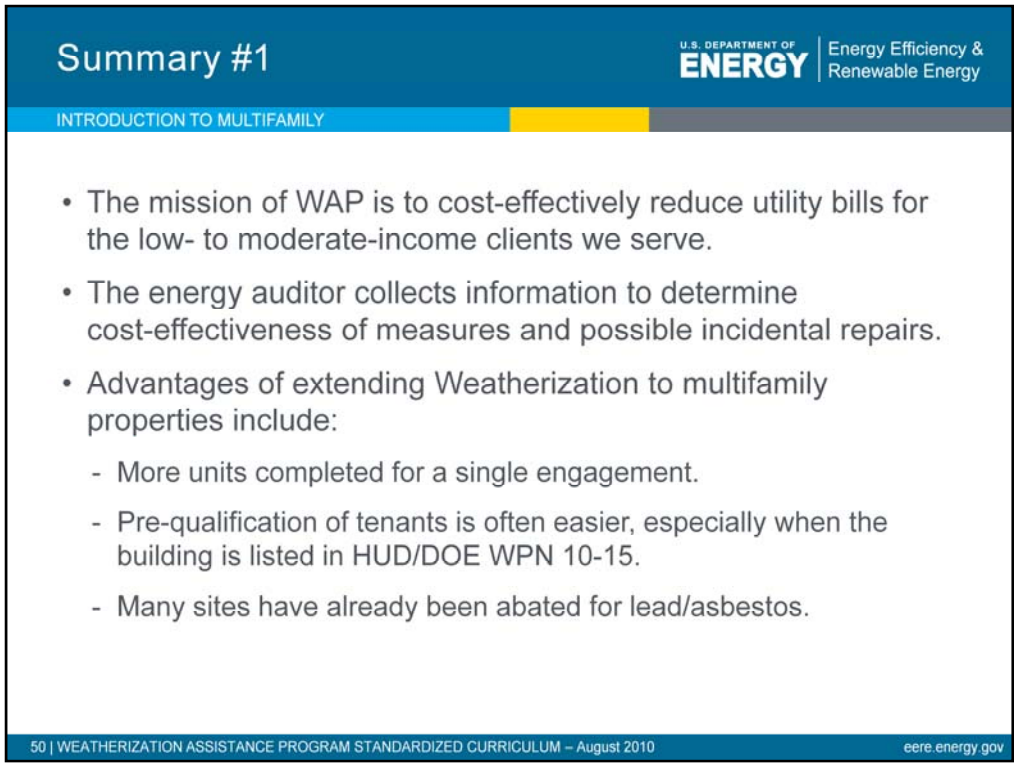
4’ to 12’ – Formal interactions, like interviews or official meetings.

- Acceptable distance differs widely by culture – Pay attention to the clients. If they seem uncomfortable or continuously back away, give them some room.
- Violating personal space is threatening – Invading personal space offends the sense of personal boundaries.

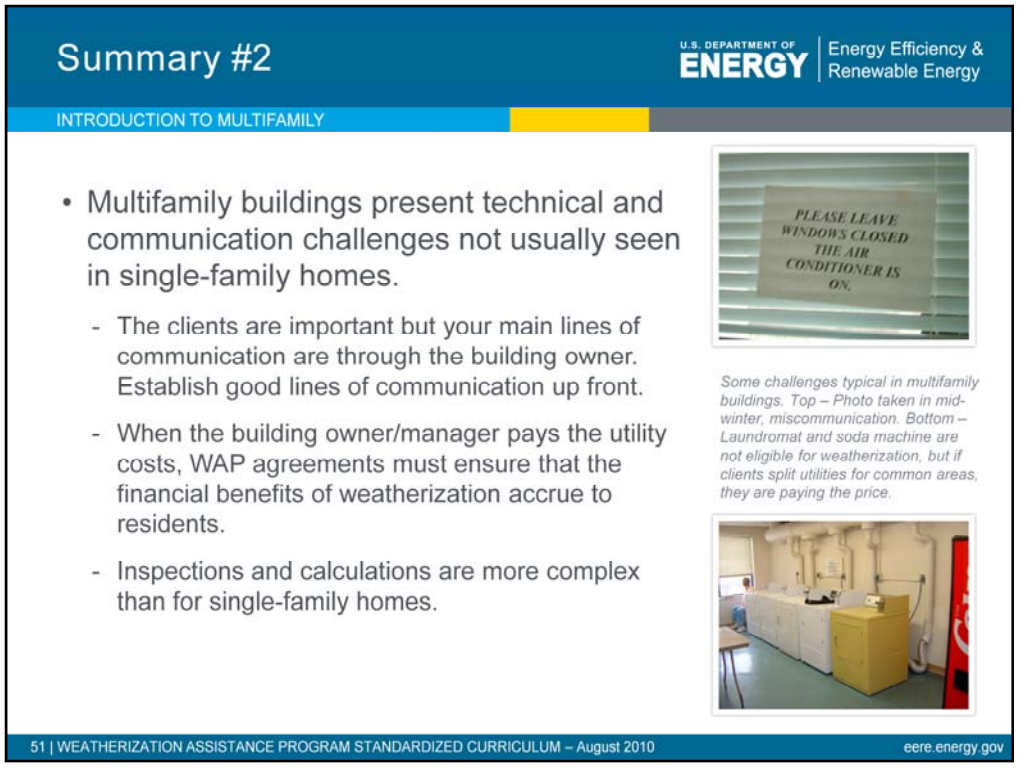


During the energy audit, you will need to ask the client a lot of questions. You will also need to educate the client on how to maintain the home. Clear communication is key.

- Think carefully about what you are trying to communicate.
  - Getting accurate answers means asking questions that the client can understand. Don't use technical jargon. If there are a few different words for the same building component, make sure you are talking about the same thing. For example, "heater" could refer to the furnace, the water heater, or something else depending on the house and the client. Be as clear as possible.
  - Changing filters and cleaning equipment provide an opportunity for client education. People are more likely to remember the lesson if they know how it benefits them. Make it clear that cleaning and maintaining equipment keeps it running efficiently, reduces the likelihood of costly repairs, and helps get the most out of the energy-saving measures being installed. Be clear about how often regular maintenance should take place.
- Consider barriers to effective communication.
  - Language – Do you speak the same language? Can a relative or neighbor help translate?
  - Culture – Cultural norms may dictate which family members you should interact with or how family members treat you in the home. Be flexible.
  - Poor hearing or sight – Someone suffering from sight or hearing loss may ask for a word or phrase to be repeated, or may not see what you're pointing at. Be mindful of their needs.



- The mission of WAP is to cost-effectively reduce utility bills for the low- to moderate-income clients we serve.
- The energy auditor collects information to determine cost-effectiveness of measures and possible incidental repairs.
- Advantages of extending Weatherization to multifamily properties include:
  - More units completed for a single engagement.
  - Pre-qualification of tenants is often easier, especially when the building is listed in HUD/DOE WPN 10-15. Even if it is not listed in that notice, the eligibility data is available from the building owner.
  - Many sites have already been abated for lead/asbestos.



- Multifamily buildings present technical and communication challenges not usually seen in single-family homes.
  - The clients are important but your main lines of communication are through the building owner. Establish good lines of communication up front.
  - When the building owner/manager pays the utility costs, WAP agreements must ensure that the financial benefits of weatherization accrue to residents.
  - Inspections and calculations are more complex than for single-family homes.

Note that both images on this slide are examples of real challenges in multifamily buildings. The first image shows a note that implies that air conditioning is on, but that picture was taken in mid-winter, when the air conditioning was not on! The second image shows a common Laundromat and a soda machine —neither of which is eligible for WAP funding. If the residents split the bills for common area utilities, then the residents will be paying the utility bills for the washers, dryers, and soda machine. Soda machines are usually supplied for free by the vendor and they are notorious electricity hogs.