3.0 Part 2: Energy Audit

AKTPEERLESS

Rental Assistance Demonstration (RAD):

PART 2: ENERGY AUDIT

3681-3689 Platt Road Ann Arbor, Michigan 48108
UPPER PLATT COLONIAL

PREPARED FOR Norstar Development USA, LP
733 Broadway
Albany, NY 12207

ON BEHALF OF The Ann Arbor
Housing Commission
727 Miller Ave
Ann Arbor, MI 48103

PROJECT # 8357E-2-96

PIC # MI064

DATE October 7, 2013

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1.0 Executive Summary

This report presents the findings and recommendations from a RPCA Energy Audit conducted at Upper Platt Colonial located at 3681-3689 Platt Road in Ann Arbor, Michigan. The Energy Audit follows industry standards and acceptable practice for assessing energy and water performance of multi-family buildings. The audit has been conducted by AKT Peerless and has involved a coordinated effort between AKT Peerless, the Client and building operating staff.

Documents were provided for review, interviews and field investigations were conducted, and building systems were analyzed. In the year analyzed (March, 2012 to February, 2013) the Ann Arbor Housing Commission spent $3,540 on utilities at the subject property. Tenants spent a total of $8,355 on utilities at the subject property.

AKT Peerless identified five (5) separate Energy Conservation Measures (ECMs) and one (1) Water Conservation Measure. The annualized savings of all recommendations totals $4,073 (at current energy and water prices), with the potential to reduce total energy consumption and GHG emissions by 37%. If fully implemented, the payback period from annual energy savings for these ECMs is estimated to be 4.6. Measures associated with common areas (PHA expenses) and measures specific to tenant units have been separated for planning purposes.

Measures best suited for implementation at the End of Useful Life (EUL), advanced ECMs, and measures recommended for further evaluation have been identified and are included in Sections 9-10 of this report.

A preliminary energy use assessment was conducted prior to the cost reduction measure analysis. The figure below describes the historical annual energy consumption and cost for the subject property.

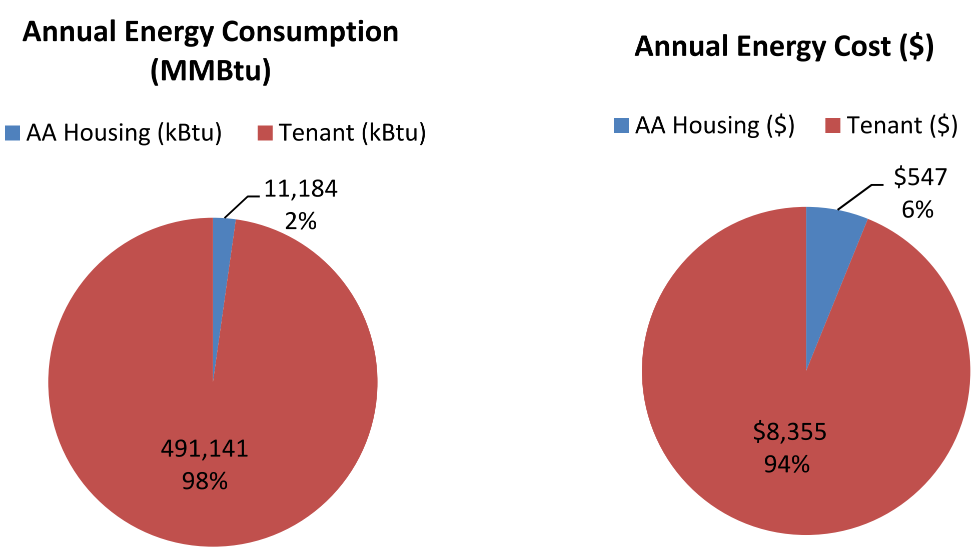
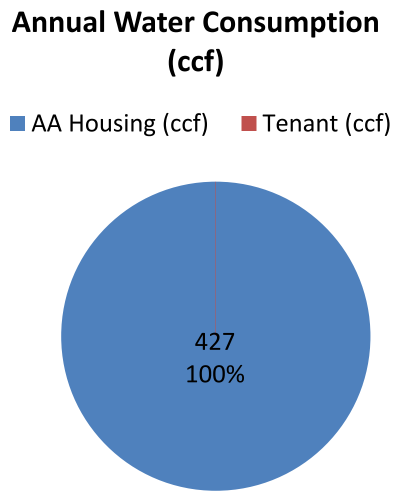


Figure 1. Historical Annual Energy Consumption and Cost



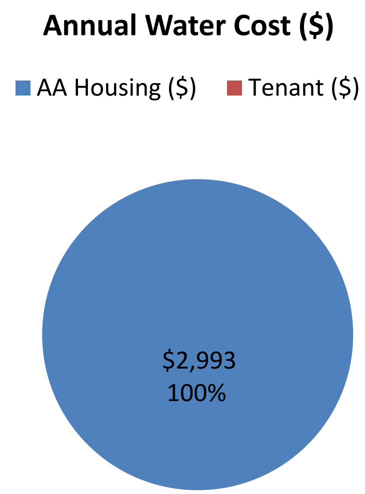


Figure 2. Historical Annual Water Consumption and Cost

The implementation costs and annual savings estimates for each proposed Energy and Water Conservation Measure are presented in Table 1 and Table 2. Table 1 outlines ECMs and WCMs that will directly impact the Owner's annual costs.

Table 1. Financial Summary of All Energy Conservation Measures (Owner)

Energy or Water Conservation Measure	ID	Additional First Cost	Annual Savings	Simple Payback (yrs)
Install Water-Saving Toilets, Showerheads and Faucet Aerators	WCM1	$4,700	$887	5.3
Exterior Lighting Retrofit	ECM1	$2,235	$427	5.2
Totals		**$6,935**	**$1,314**	**5.3**

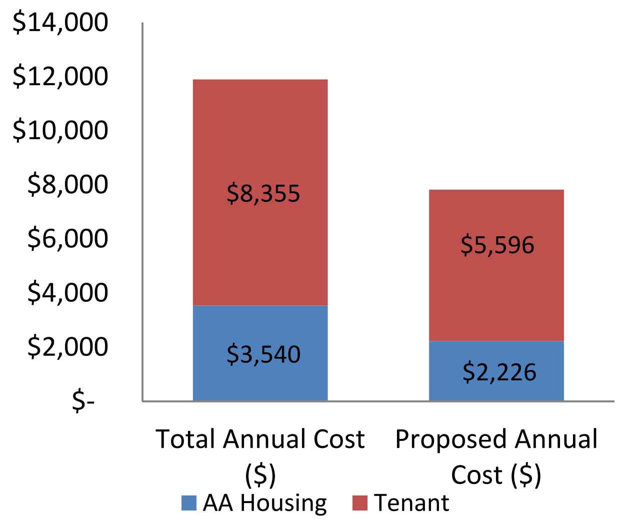
The following ECMs are recommended specifically for tenant spaces. Due to separate billing for tenants, the following energy and cost savings will only benefit the tenants.

Table 2. Financial Summary of All Energy Conservation Measures (Tenant)

Energy Cost Reduction Measure (ECM)	ID	Additional First Cost	Annual Savings	Simple Payback (yrs)
Replace Incandescent Bulbs with CFLs	ECM2	$512	$961	0.5
Install Replacement Windows	ECM3	$8,150	$901	9.0
Seal and Repair Ducts	ECM4	$1,200	$395	3.0
Control Air Leakage	ECM5	$2,000	$502	4.0
Totals		**$11,862**	**$2,759**	**4.3**

Table 3. Impact Summary

% Energy Savings	41%
% Water Savings	26%
% Cost Savings	34%
Annual Cost Savings ($)	$4,073
% Reduction in GHG Emissions (CO_2 Equivalent Metric Tonnes)	37%



2.0 Purpose and Scope

Norstar Development USA, LP, on behalf of the Ann Arbor Housing Commission (the Client), retained AKT Peerless Environmental & Energy Services (AKT Peerless) to conduct an RPCA Energy Audit of Upper Platt Colonial located at 3681-3689 Platt Road in Ann Arbor, Michigan.

AKT Peerless' scope of work for this Energy Audit is based on proposal PE-14790, dated June 26, 2013 and authorized by Norstar Development USA, LP on behalf of the Ann Arbor Housing Commission (the Client), and the terms and conditions of that agreement.

The purpose of this report is to assist the Client in evaluating the current energy and water use and energy and water cost of the subject property relative to other, similar properties; and also to identify and develop modifications that will reduce the energy and water use and /or cost of operating the property. This report will identify and provide the savings and cost analysis of all practical measures that meet the client's constraints and economic criteria, along with a discussion of any changes to operation and maintenance procedures. It may also provide a listing of potential capital-intensive improvements that require more thorough data collection and engineering analysis, and a judgment of potential costs and savings. Additionally, this report will identify the feasibility of green energy technologies, as well as, determine if further analysis is recommended.

Relevant documentation has been requested from the client that could aid in the understanding of the subject property's historical energy use. The review of submitted documents does not include comment on the accuracy of such documents or their preparation, methodology, or protocol. The following documents were available for review while performing the analysis:

- Energy Utility Bills
- 2009 United States Greenhouse Gas Inventory, Annex 2
- USEPA Climate Leaders Calculator for Low Emitters
- HUD Residential Energy Benchmark Tool
- HUD Residential Water Use Benchmarking Tool
- National Oceanic Atmospheric Administration "Normal Monthly Heating Degree Days (Base 65)" and "Normal Monthly Cooling Degree Days (Base 65)"

3.0 Additional Scope Considerations

In addition to fully satisfying the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Procedures for Commercial Building Energy Audits, Second Edition 2011, Level II guidelines, this report includes all the necessary requirements of an Energy Audit as defined in the Rental Assistance Demonstration (RAD): Physical Condition Assessment (RPCA) statement of Work and Contractor Qualifications released by the Department of Housing and Urban Development (HUD) in October 2012 (Version 1). These items are identified as follows:

- Heating and cooling systems sized according to the methodology proposed in the Air Conditioning Contractors of America (ACCA) Manual J guide. (See Section 11.1 and 13.1)
- Hot water heater analysis of existing size of individual hot water heater and the appropriate efficiency replacement sizing using First Hour Rating or another professionally recognized sizing tool. (See Section 11.2)
- An initial assessment of the potential feasibility of installing alternative technologies for electricity, heating and cooling systems, and hot water heating at the property. (See Section 14.0)
- An expected end of useful life study for all recommended energy and water efficiency measures.
- Recommendations of any additional professional reports needed (including, for example alternative energy system feasibility studies, air infiltration tests for energy loss and ventilation needs, blower door tests, infrared imaging, duct blasting, etc.)

4.0 General Information

4.1 Audit Team

This audit is the result of a collaborative process between the following AKT Peerless and client personnel:

Table 4. Audit Team

Name	Organization	Title
Henry McElvery	AKT Peerless	Building Energy Analyst
Lance Mitchell	Ann Arbor Housing Commission	Facilities & Maintenance Property Manager
Jennifer Hall	Ann Arbor Housing Commission	Executive Director

4.2 Audit Process

AKT Peerless collected historical energy data and floor plans for the building, when available. The square footage of all spaces was determined and the size and location of pertinent mechanical equipment was documented. AKT Peerless conducted a walk-through survey of the building initially on January 29, 2013 and then on August 6, 2013, collecting specific information on the mechanical, electrical, and plumbing systems as well as occupancy, scheduling, and use patterns.

AKT Peerless utilized industry accepted measuring devices, including but not limited to: a blower door to quantify air infiltration, an infrared camera to visually identify areas of potential energy loss, and a ballast discriminator to identify existing T12 lighting. Light levels were measured using a light meter in various areas to compare to Illuminating Engineering Society of North America (IESNA) recommended levels.

A visual inspection of the mechanical equipment, lighting systems, controls, building envelope and plug loads was performed. Mechanical equipment nameplate data was recorded and the specifications and performance data were reviewed and used in this analysis. Additionally, a blower door test was performed on one of the units to determine the air tightness of the apartment units, as well as identify areas of infiltration.

4.3 Energy Calculations Methodology

The primary methods of energy calculation for this analysis were simplified manual and spreadsheet tabulations based on professional standards. Actual calculation methods are discussed in each applicable section.

The end use consumption breakdown, found later in this report, is based on 2003 Commercial Buildings Energy Consumption Survey (CBECS) data for lodgings of relatively similar scale and age.

5.0 Property Description

This section summarizes physical characteristics and general use of the subject property.

5.1 Location

The subject property is located in ASHRAE Climate Zone 5A. According to National Oceanic and Atmospheric Administration recording of heating and cooling degree days, on an annual basis Ann Arbor, MI is expected to experience an average of 6,818 heating degree days (HDD) and 840 cooling degree days (CDD) with a basepoint temperature of 65 degrees Fahrenheit.

5.2 Property Characteristics

General information pertaining to the subject building is summarized in the following table:

Table 5. Property Characteristics

Primary Building Type / Occupancy	Multi-Family (General)
Region	ASHRAE 5A
Date of Construction	1964
Approximate Total Square Footage	5,858 sq ft

The multi-family property has one two-story building containing 5,858 square feet in five apartments. The site area is approximately 0.70 acres. Construction of the property was completed in 1964. Significant renovations to the apartment interiors were performed in 2004.The subject property Primary Building Type is designated as Multi-Family (General). For all energy performance comparisons presented in this report the subject building will be compared to similar buildings of the same Primary Building Type.

5.3 Property Spaces

Spaces refer to the building as a whole and the rooms that comprise the building. Typically, the various space types will serve specific functions within the facility. The following table identifies the space types for the subject building.

Table 6. Summary of Property Spaces

Space	Use	Sq Footage	% of Total Area
In-Unit	Domestic	5,858 ft^2	100%

5.4 Building Occupancy

Occupancy schedule has a significant impact on a facilities energy usage. In fact, the relationship between occupancy and system operating schedules and setpoints are typically more important than equipment efficiencies. The occupancy schedules for the subject building as follows:

Table 7. Building Occupancy Schedule

Day	Time	Use	Average Population
Sunday-Saturday	Varies	Living Space	13-15

5.5 Building Envelope

This section summarizes physical characteristics of the subject building envelope.

5.5.1 Walls and Wall Insulation

The below-grade walls are poured concrete foundation walls that are assumed to be un-insulated. The building is a conventional wood-framed structure with load-bearing wood-framed exterior and interior walls supporting the upper floor and roof. The exterior walls are finished with brick masonry veneer along the lower elevations and aluminum siding on the upper elevations. The walls were reported to be insulated and standard construction practice for the time period of construction typically consists of three to four inches of batt insulation in the walls. It could not be visually verified if the exterior walls were insulated.

5.5.2 Roof and Roof Insulation

The primary roofs are steeply sloped gable roofs. The roofs are finished with asphalt shingles over asphalt-saturated paper. The shingle color is black. The attic is insulated with eight inches of loose-fill fiberglass insulation. The estimated insulation value is R-20. Ventilation of the attic areas is soffit to ridge, with additional gable vents at each end of the building.

5.5.3 Windows and Other Fenestrations

The windows are aluminum-framed single-pane glazed sliding units with exterior storm windows. The window units are in poor overall condition. Some of the exterior sashes are missing, seals are worn or non-existent, and they are not energy efficient. The sealant and caulking observed between the outside perimeter of the aluminum frame and the adjacent aluminum siding is in poor condition.

The basement has builders grade, steel frame, single pane windows that tilt in. There are two windows per basement that are 32” x 16”. There are gaps evident between the window frame and the rough opening that airs leaks through. The tilt mechanism is broken on many of the windows, and leakage between the sash and frame also.

5.5.4 Doors

The apartment unit exterior entrance doors are painted hollow metal doors set in wood frames.

5.5.5 Air Leakage

A blower door test was conducted on the building during the site visit. The blower door test was used to quantify air leakage by determining the 50-Pascal airflow rate. This blower door reading, expressed in cubic feet per minute (CFM_{50}), is the actual flow rate measured at 50 Pascals of house pressure. CFM_{50} is the most direct measurement of the airtightness of a building. For the subject property, Upper Platt Colonial, the blower door airflow rate was 2,525 CFM_{50}.

Using standard industry practice (accounting for wind speed, shielding of the building by external elements, and the buildings height and size), the estimated natural air change rate was calculated to be 0.81 air changes per hour (ACH_n).

5.5.6 Minimum Ventilation Requirement (MVR)

Either air leakage or a whole-house ventilation system must provide acceptable indoor air quality. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) set minimum ventilation requirements (MVRs) to ensure acceptable indoor air quality in homes. The older ASHRAE Standard 62-1989 recognizes air leakage as a legitimate ventilation strategy. The newer ASHRAE Standard 62.2-2007 requires a whole-house mechanical ventilation system.

ASHRAE Standard 62-1989 requires that air leakage must provide at least 15 CFM per person or 0.35 air changes per hour, whichever is greater. For the subject property, Upper Platt Colonial, the MVR was calculated to be 60 CFM (=0.3 ACH) per average unit. This equates to a building tightness limit (BTL) of 1,206 CFM50 per average unit.

The blower door test (0.73 ACH) determined that air leakage provides excessive ventilation.

5.6 Heating, Ventilation, and Air Conditioning (HVAC)

Each of the units is heated by their own gas-fired, forced-air furnace located in each basement. Five of the units have a Trane XL80 (model #TUE080A936L3) rated at 80 kBtu/h input capacity and an 80% efficiency. One of the units has a Trane furnace (model #TDD060C924F3) rated at 60 kBtu/h and an 80% efficiency. Supply and return air is through unsealed metal ducting, and some duct components were disconnected in the unit observed. The furnace filter was overdue for filter change and was changed. The heating for each unit is controlled by a single Honeywell programmable thermostat.

During the cooling season, some of the tenants are reported to use personal portable air-conditioning units. Units 3681 and 3687 have one air conditioner in the bedroom and Unit 3681 also has an air conditioner in the living room. These air conditioners are approximately 3 years old and considered to be standard efficiency units.

The domestic hot water for each unit is supplied by a dedicated tank-style, gas-fired, water heater located in the basement or mechanical closet. The unit inspected during the site visit contained a Lochinvar 40 gallon tank with a 34 kBtu/h rating that was installed in 2011. Information regarding the types of domestic hot water heaters is further detailed in Section 11.2.

5.7 Lighting

This section describes this property's interior and exterior lighting.

5.7.1 Interior Lighting

Interior lighting consists of fixtures that hold either incandescent or compact fluorescent (CFL) lamps. There were a total of nineteen 60 watt incandescent lamps and four 13 watt CFLs in the inspected home. A lighting summary is provided in the appendix of this report.

5.7.2 Exterior Lighting

There are exterior lighting (wall pack) fixtures located near the front and rear entrance doors of each home. These wall packs are of the high intensity discharge (HID) type with high pressure sodium (HPS) lamps that are 50 watts each. There is also one larger flood light installed on the gable end to light the parking area. This flood light is also a high intensity discharge (HID) type with high pressure sodium (HPS) lamps that appeared to be 250 watts each. The site visit light count total was 10 of the smaller wall packs and 1 of the larger flood lights.

5.1 Other Equipment (Energy)

Typical apartment unit kitchens include a refrigerator, microwave and range hood for the natural gas-fired stove. Equipment is generally considered standard efficiency equipment. The range hood only circulates air, and is not vented to the outside. The refrigerator in the inspected unit (#3565) was a newer Hotpoint model.

Each apartment unit also supplies a hook up (vent, water, and electricity) for a washer and gas dryer in the basement. Typical washers and dryers observed during field investigations were standard or substandard efficiency units.

5.2 Water Consuming Devices

Each of the attached homes has devices in the kitchen, bath and basement that consume water. These homes have one bathroom which has a lavatory, toilet and shower/bath and an additional half-bath with another lavatory and toilet.

Kitchens appear to have a standard double sink with standard efficiency aerators, unit inspected had 2.0 GPM. It appears most units have standard-flow devices installed in each of the bathrooms, including 2.5 GPM showerheads and 2.2 GPM faucet aerators. Toilet upstairs was 1.6 GPF, and toilet downstairs was currently being replaced with a 1.6 GPF.

Each typical basement is equipped with a slop sink and laundry hook-up. Washers and slop sink aerators appear to be standard efficiency/flow units in most apartments.

6.0 Energy Use Analysis

This section provides information on energy delivery to the subject property.

Energy use and cost indices for each fuel or demand type, and their combined total, have been developed using generally accepted industry methods and benchmarking tools provided by the Department of Housing and Urban Development (HUD) . The Energy Utilization Index (EUI) and cost index of the subject building are compared (benchmarked) with the EUI and cost index of similar buildings evaluated in the HUD Residential Energy Benchmark Tool.

AKT Peerless was not provided with tenant utility bills for this analysis, and this portion has been estimated. The following figures summarize the most recent annual energy consumption and costs for this property. These graphs reflect Upper Platt Colonial's estimated annual utility consumption and cost.

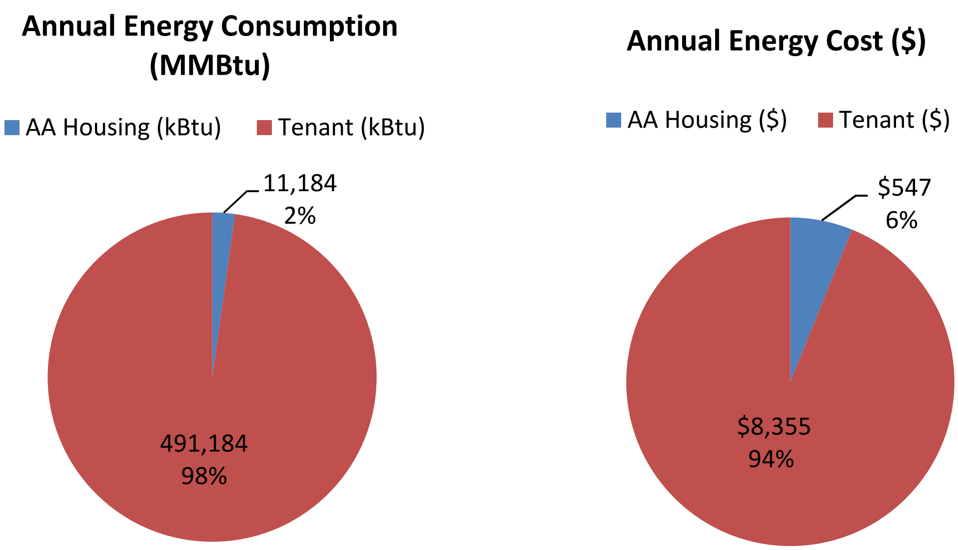


Figure 3. Historical Annual Energy Consumption and Cost

6.1 Electricity

Electricity is supplied and delivered to the subject property by DTE Energy. Historic common area and tenant electrical use compared to cooling degree days is summarized in the following figure:

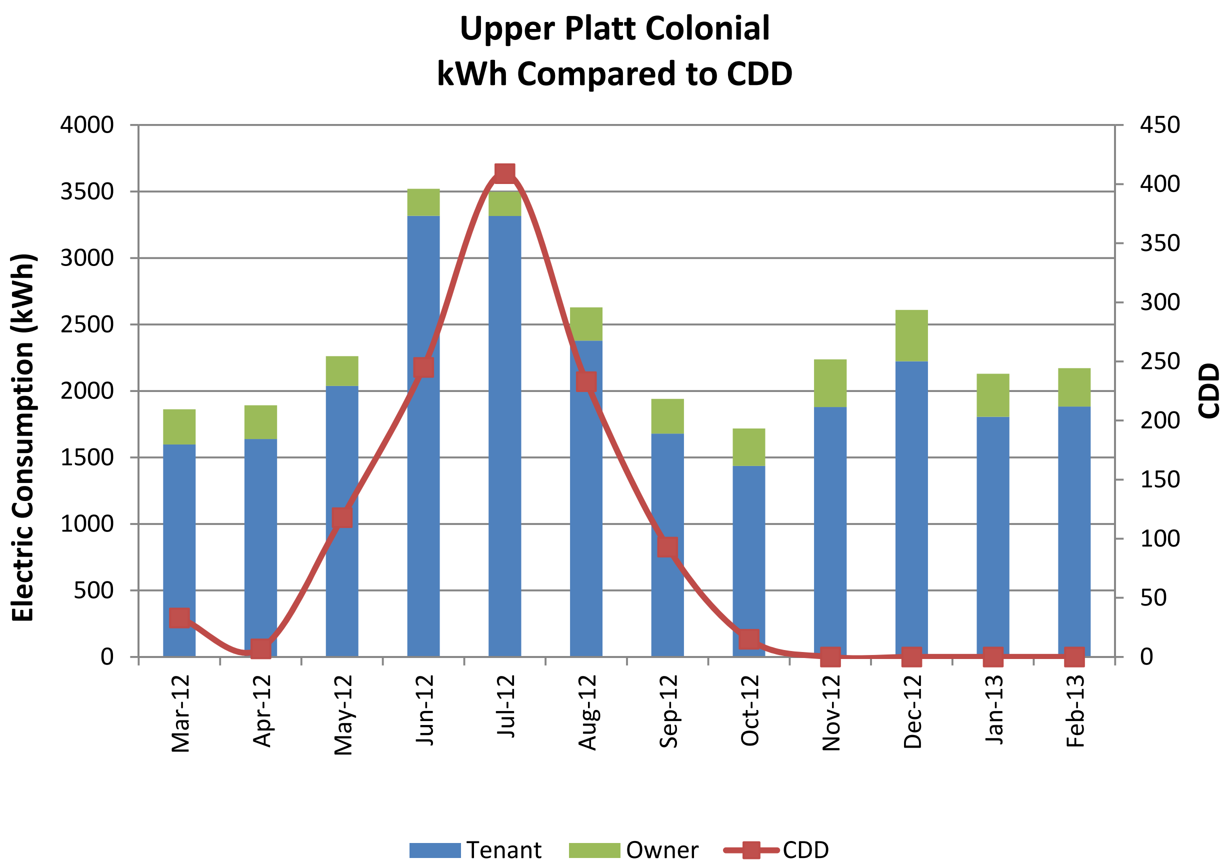


Figure 4. Electricity Consumption Graph

Table 8. Annual Electricity Metrics

	Owner	Tenant
Consumption	3,277 kWh	25,193 kWh
Energy Use Intensity	0.56 kWh / sf	4.30 kWh / sf
MMBtu	11 MMBtu	86 MMBtu

	Owner	Tenant
Cost per kWh	\$0.167 / kWh	\$0.158 / kWh
Cost per ft^2	\$0.09 / sf	\$0.68 / sf
Electricity Cost	\$547	\$3,982

Based on the method described in Section 3.3, Energy Calculations Methodology, the following figure shows the estimated electricity consumption per end use.

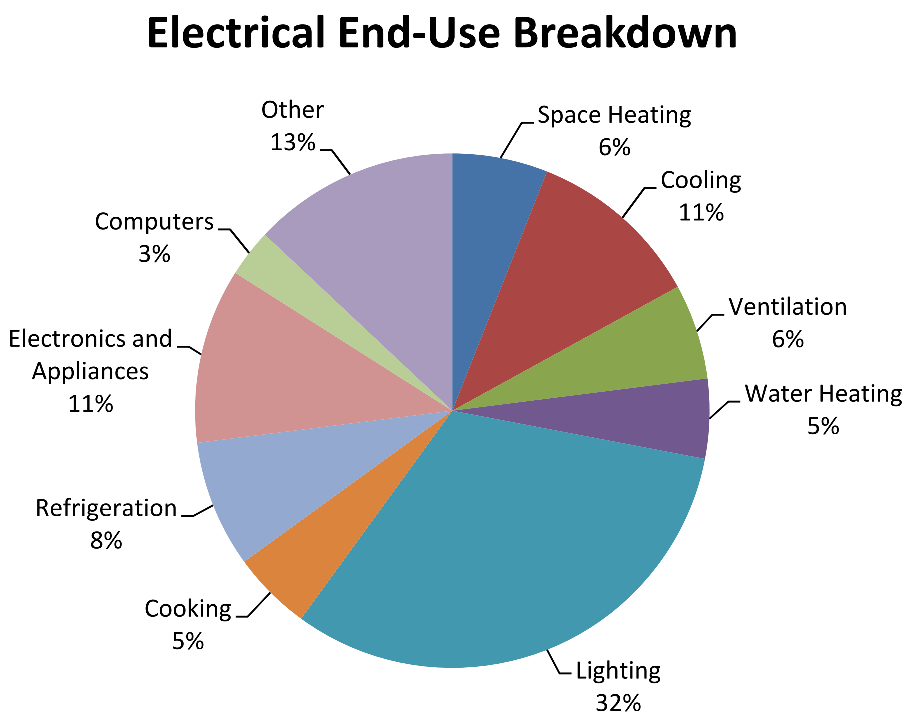


Figure 5. Estimated Electricity Consumption Per End Use

6.2 Natural Gas

Natural gas is supplied and delivered to the subject property by DTE Energy. Historic natural gas use is summarized in the following figures:

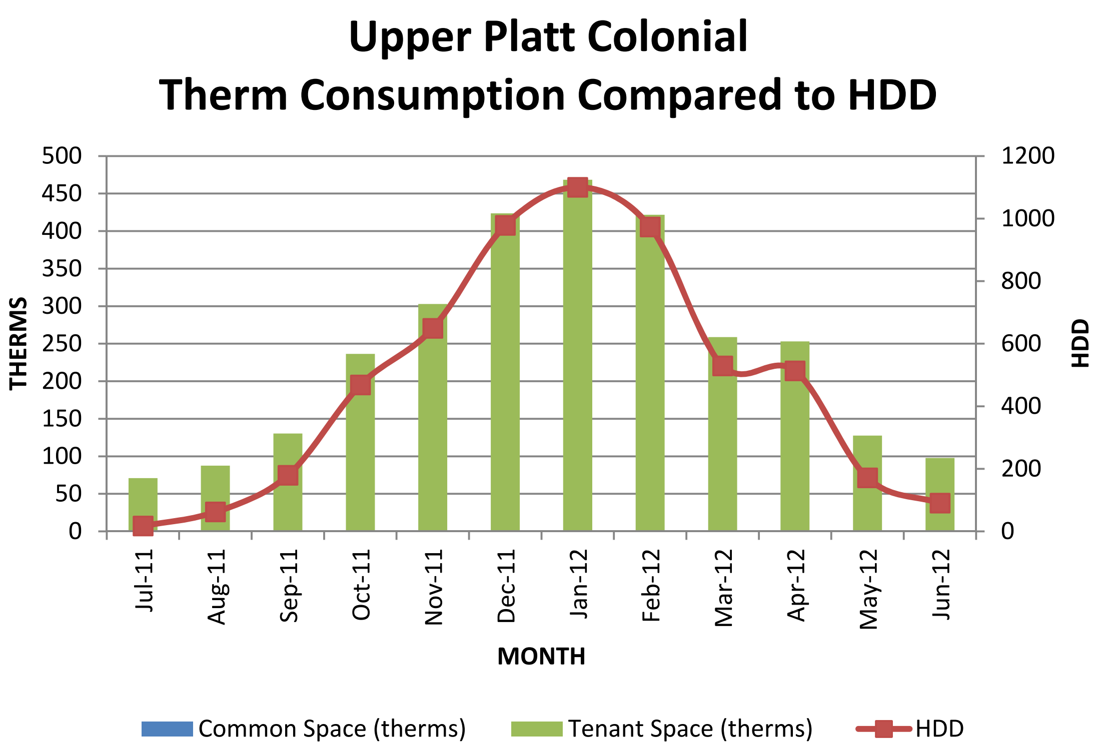


Figure 6. Natural Gas Consumption Graph

Table 9. Annual Natural Gas Metrics

	Tenant
Consumption	4,047 therms
Energy Use Intensity	0.69 therms / ft^2
MMBtu	405 MMBtu

	Tenant
Cost per therm	$1.08 / therm
Cost per ft^2	$0.75 / ft^2
Natural Gas Cost	$4,382

Based on the method described in Section 3.3, Energy Calculations Methodology, the following figure shows the estimated natural gas consumption breakdown by end use.

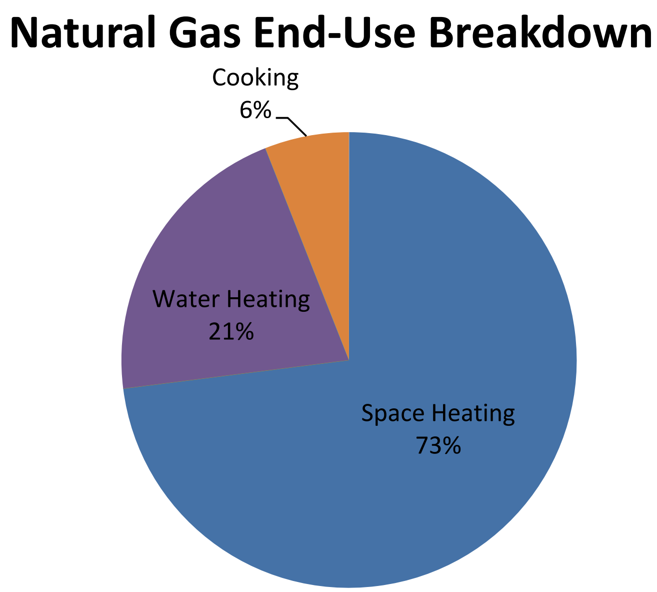


Figure 7. Estimated Natural Gas Consumption Per End Use

6.3 Domestic Water Use

For the time period covered by client provided records, historic domestic water use is summarized in the following figures.

Providers	Number of Meters Provided	Unit of Consumption
City of Ann Arbor	5	CCF

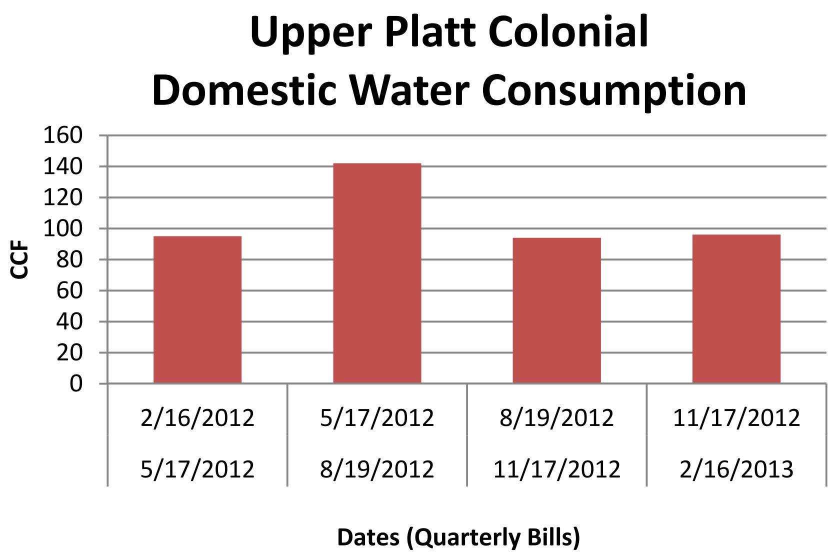


Figure 8. Domestic Water Consumption Graph (Owner)

Table 10. Annual Domestic Water Metrics

Consumption	427 CCF
Water Cost	$2,993

Cost per ccf	$7.01 / CCF
Cost per ft^2	$0.51 / ft^2

The provided annual water consumption was 427 CCF. Average cost per CCF for domestic water and sewer on an annual basis is $7.01. Total annual domestic water and sewer cost is $2,993.

According to the EPA, residential water use accounts for more than half of the publicly supplied water in the United States. For this reason, the EPA has introduced the WaterSense program to identify possible water efficiency methods and technologies for consumers throughout the country. Considering the responsibility that typically lies with the tenants, multi-family homes are no stranger to excessive water usage. Fortunately, implementation of improved technologies throughout these facilities can impact the water supply as well as the rising overhead costs associated with distribution and collection.

The HUD Energy Benchmarking Tool was used to compare water consumption data for the subject property to typical water consumption data for similar HUD properties. The tool utilizes normalized data from its database of more than 9,100 buildings to provide comparative metrics on domestic water consumption based on a facility's historic water data and design characteristics. Finally, a score is generated for the analyzed building to identify its ranking among similar buildings.

The Residential End Uses of Water study (REUWS) published in 1999 by the AWWA Research Foundation and the American Water Works Association is a research study that examined where water is used in single-family homes in North America. Conducted by Aquacraft, PMCL, and John Olaf Nelson, the REUWS was the largest study of its kind to be completed in North America and efforts are underway to repeat the effort and obtain updated results. The "end uses" of water include all the places where water is used in a single-family home such as toilets, showers, clothes washers, faucets, lawn watering, etc. The full REUWS final report is available to the public at no charge from the Water Research Foundation (WRF).

Figure 8 below shows the REUWS typical domestic water consumption breakdown by end use.

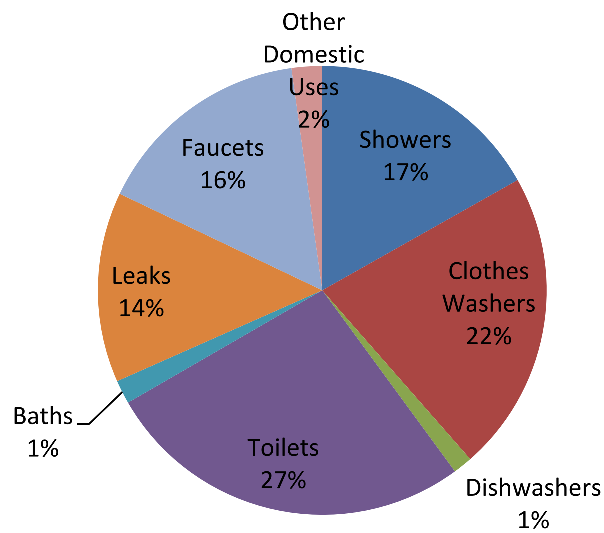


Figure 9. Domestic Water Typical End Use

6.4 Utility Cost Breakdown

The disparate energy types (electricity and natural gas for this facility) and water costs have been aggregated to provide a breakdown of total utility cost into end use components. The breakdown of energy and water cost is based on the energy use breakdown, as described in Section 3.3, Energy Calculations Methodology.

The following table and charts detail the breakdown of energy and water costs. It should be noted that the consumption percentage identified in Section 5.1 Electricity, Section 5.2 Natural Gas, and Section 5.3 Domestic Water Use and the overall cost percentage for each end use are different. This is due to the cost difference for purchasing each energy type.

Currently, Ann Arbor Housing Commission pays $48.89 per MMBtu of electricity. The tenants pay $46.54 per MMBtu of electricity and $10.83 per MMBtu of natural gas.

Table 11. Annual Utility Use Breakdown

Categories	Electricity (MMBtu)	NG (MMBtu)	Total Consumption (MMBtu)	Consumption (%)
Space Heating	6	295	301	60%
Cooling	11	0	11	2%
Ventilation	6	0	6	1%
Water Heating	5	85	90	18%
Lighting	31	0	31	6%
Cooking	5	24	29	6%
Refrigeration	8	0	8	2%
Electronics and Appliances	11	0	11	2%
Computers	3	0	3	1%
Other	13	0	13	3%
TOTAL	**97**	**405**	**502**	

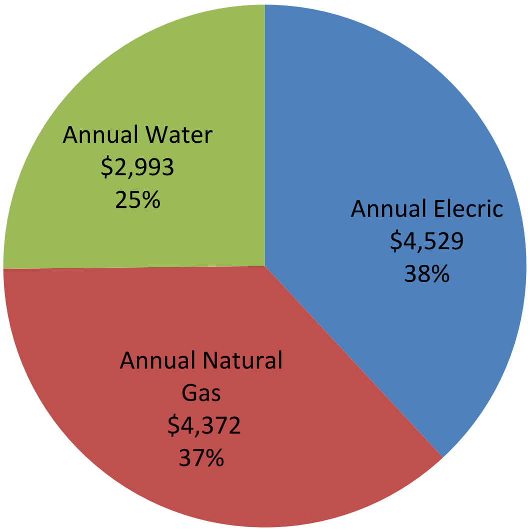


Figure 10. Annual Utility Cost by Type (Owner + Tenant)

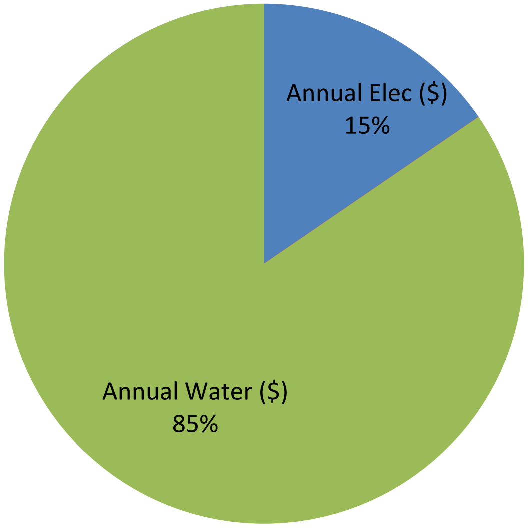


Figure 11. Annual Utility Cost by Type (Owner)

7.0 Energy Performance Benchmark

A benchmark is a standard by which something can be measured. Energy Benchmarking is the comparison of one building's energy consumption to the use of energy in a similar building. HUD's Office of Public and Indian Housing (PIH) has developed the Energy Benchmarking Tool to establish if a building's energy consumption is higher or lower than expected energy usage for similar buildings. AKT Peerless utilized the HUD Energy Benchmarking Tool to quantify the performance of the subject building relative to the family of HUD residential buildings.

This statistical analysis of the HUD tool is based on filters for the building's location, gross square footage, total number of units and year of construction (refer to the appendix for more information regarding dataset filters). This filtered data set is used to calculate the benchmarks for an overall benchmark Energy Use Intensity (EUI) as well as the Energy Cost Intensity (ECI). The benchmarks shown in the portfolio summary are derived from the statistical analysis described in this section.

The following table compares the building energy performance of the subject property and the established benchmark.

Table 12. HUD Residential Energy Use Benchmarking Tool

	Actual	Benchmark
Score Against Peers	61	50
EUI (Energy Use Index)	85.7 kBtu/ft^2	95.2 kBtu/ft^2
$ ECI (Energy Cost Index)	1.53 $ / ft^2	1.69 $ / ft^2

8.0 Water Performance Benchmark

Water Benchmarking is the comparison of one building's water utilization to the use of water in a similar building. HUD's Office of Public and Indian Housing (PIH) has developed the preliminary benchmarking tool to establish if a building's water utilization is higher or lower than normal usage for similar buildings.

In order to develop the water consumption benchmarking tool, water consumption data was collected through voluntary release of information from thousands of buildings in nearly 350 PHAs nationwide. Regression analyses were performed on these datasets to see which of over 30 characteristics were most closely linked to water conservation.

Your building will score from 0 - 100, where 0 means water consumption is probably excessive and 100 means that the building probably uses water very efficiently. Important: this is a whole-building tool. Water use inputs include resident-paid consumption, when applicable/available.

The table below quantifies the performance of a use-defined building relative to the family of HUD residential buildings.

Table 13. HUD Residential Water Use Benchmarking Tool

	Actual	Benchmark
Score Against Peers	66	50
WUI (Water Use Intensity)	54.5 gal/ft^2	73.3 gal/ft^2
WCI(Water Cost Intensity)	0.51 \$ / ft^2	0.69 \$ / ft^2

9.0 Operations and Maintenance (O&M) Opportunities

Operation and maintenance make up the largest portion of the economic and environmental life cycle of a building and have become primary considerations of building owners and operators. Effective O&M is one of the most cost-effective methods for ensuring reliability, safety, and energy efficiency. Inadequate maintenance of energy-using systems is a major cause of energy waste in both the Federal government and the private sector. Improvements to facility maintenance programs can often be accomplished immediately and at a relatively low cost.

The following recommendations are believed to have the opportunity to reduce energy and water consumption for the facility.

9.1 Develop a Preventative Maintenance Plan for Equipment

Planned or preventative maintenance is proactive (in contrast to reactive) and allows the maintenance manager control over when and how maintenance activities are completed. When a maintenance manager has control over facility maintenance, budgets can be established accurately, staff time can be used effectively, and the spare parts and supplies inventory can be managed more efficiently.

Regardless of which strategy is used, maintenance should be seen as a way to maximize profit and/or reduce operating costs. From this perspective, the main functions of a maintenance department/staff are as follows:

- Control availability of equipment at minimum cost
- Extend the useful life of equipment
- Keep equipment in a condition to operate as economically and energy efficiently as is practical

The maintenance department/staff would be responsible for the following tasks:

- Maintenance planning
- Organizing resources, including staffing, parts, tools, and equipment
- Developing and executing the maintenance plan
- Controlling maintenance activities
- Budgeting

9.2 Institute an Energy Star Purchasing Policy

Energy costs associated with electrical plug loads should be minimized where possible. Plug loads are electrical devices plugged into the building's electrical system and generally include things like appliances and fixtures. When purchasing appliances and fixtures, the U.S. EPA ENERGY STAR standards should be specified. Manufacturers are required to meet certain energy efficiency criteria before they can label a product with the ENERGY STAR emblem, so these products represent your best energy saving value.

9.3 Utilize Setback/Programmable Thermostats

Heating requirements in residential buildings will typically depend on the comfort level of the occupants. Generally speaking, residents should try to keep the temperature at the lowest possible level while still maintaining comfort for all its occupants. Natural gas savings for this measure can be significant (5%-20%).

Recommended heating temperatures for residential buildings is in the range of 68-72°F. These temperatures apply to occupied daytime hours; a reduction to 55°F is recommended when homes are unoccupied or occupants are asleep.

Even a minor temperature setback during unoccupied building hours can produce a substantial savings. Owners should consider reviewing current heating temperatures in comparison to recommended levels with their residents. Significant energy savings can often be achieved for FREE by adjusting thermostats.

The recommended cooling temperature for residential buildings is 76°F during daytime hours. When air conditioning a building, you should try to keep the cooling temperature at the highest possible setting while still maintaining comfort.

The savings can be quite significant for this measure. For example, it can cost up to *36% more* to cool offices to 72°F rather than 76°F.

(Ideally, the air conditioning should be shut off when the building is unoccupied, but studies have shown that over half of the savings available are achieved with just a 5-degree increase. Even minor temperature increases during unoccupied hours can produce a good savings).

9.4 Water Heater Tank and Pipe Insulation

A water heater keeps water continually heated to a specific, set temperature. As the water loses heat through the tank walls during periods of non-use, the burner or heating element has to reheat the water. An insulation jacket will reduce the heat loss and, as a result, the energy required to maintain the hot water temperature and the water heater will not need to cycle as often. The insulation jacket enables the heater to bring the water up to temperature quicker, too, saving additional energy. Certain manufacturers may prohibit this on newer models. Please consult the tank manufacturer for newer models.

During periods of non-use, the heated water will rise to the top of the tank. The pipes can actually draw heat out of the tank, like a *wick*, and should be insulated. The first ten feet of hot and cold piping, if accessible, should be wrapped. If the water heating system is located in an unconditioned (cold) area, all accessible piping should be insulated.

9.5 Adequately Seal Doors and Windows

Infiltration is the flow of air through openings in a building. In order to reduce infiltration, the cracks and holes in a building must be adequately sealed. Maintaining caulking and weather stripping in good condition saves both money and energy. It also preserves the building and improves the comfort of its occupants. Verify that all doors and windows are adequately sealed. Verify that doors in existing entrance hallways are being closed to prevent unnecessary infiltration. Also, inspect the exterior of the buildings for cracks or other damage.

Older windows can be a major source of heat loss and air leakage, and can greatly impact the heating load on a building. A detailed engineering study is generally required to determine the best way to upgrade windows. However, be sure to consider low-e high performance glazing when window replacement becomes necessary. The additional cost will usually be paid for in energy savings in less than ten years.

A solution to infiltration from the bathroom exhaust fan involves installing a backdraft damper in the vent to restrict the flow of unwanted air into the building while still allowing the fan to properly exhaust unwanted air.

9.6 Regularly Clean Heating Equipment and Ductwork

A typical problem with multifamily properties is the presence of uneven heating within each unit. This is often attributed to the distribution system as well as the maintenance of the heating equipment. Heating systems that are not maintained can begin to collect debris in places like filters or the interior of the ductwork where it interferes with the flow of conditioned air from the furnace. This misdirected flow can cause a temperature differential between the rooms in the apartment and influence the occupants to adjust the appropriate thermostat set point.

Scheduled cleaning maintenance of the heating equipment and distribution system will not only ensure the occupant’s continued comfort, but will also reduce the unnecessary energy consumption from increased temperature settings. Additionally, the proper maintenance will increase the lifetime of the equipment.

9.7 Change Furnace Filters on a Regular Basis

The furnace filter in the inspected home had far surpassed its intended life. The filter was built up with dust and other contaminants, restricting airflow through the furnace unit. This filter was changed during the site visit, but the filters at the remaining homes should be inspected.

As furnace filters get dirty, they become more efficient at catching dust up to a certain point. Then, if the furnace filter is not changed, it will begin to restrict airflow. This causes your furnace to work much harder to heat and cool your home because it must run longer, thus using more electricity.

A furnace filter pulls a majority of unwanted particles from the indoor air. Examples are mold spores, pet dander, household dust, smoke, pollen, dust mites and smog. Regular filter change is an easy way to reduce energy consumption. A dirty filter will force your system to work harder to push air through the filter, while a clean one will allow the air travel more freely. The filter also keeps the coils and the heat exchanges in your system clean, minimizing maintenance issues and extending the life of the equipment. It will also help maintain peak performance of the furnace or air conditioner.

A clean furnace filter helps the occupants breathe the cleanest air possible by pulling all those unwanted particles from the air. Changing your furnace filters at the recommended time frames will help keep occupants healthy and prevent airborne sickness and diseases. A clean furnace filter is a great way to help people with allergies and asthma live a healthier life by pulling aggravating allergens from the air.

A basic fiberglass furnace filter should be changed about every 30 days, while a pleated furnace filter lasts longer and should be changed about every

10.0 Proposed Energy Conservations Measures (ECMs) and Water Conservation Measures (WCMs)

This analysis identified and included three primary types of ECM/WCMs:

- ECM/WCMs impacting the Owner (the Client) costs; and
- ECM/WCMs impacting the Tenant(s) costs; and
- ECM/WCMs to be implemented at the End of Useful Life (EUL) of equipment (includes both Owner and Tenant impacts)

The energy and water audit of the facility identified five (5) energy conservation measures (ECMs) and one (1) water conservation measure (WCM). These ECMs are estimated to provide approximately $4,073 in annual savings. The investment required to implement all of the measures before the inclusion of applicable utility incentives is estimated to be $18,797. These savings measures are summarized within this section. Incentives are not included in the calculation of payback times and savings calculations. Utilizing available incentives is expected to reduce project costs and decrease simple payback.

Table 14. Financial Summary of ECMs and WCMs

Energy Cost Reduction Measure (ECM)	ID	Additional First Cost	Annual Savings	Simple Payback (yrs)
Install Water-Saving Toilets, Showerheads and Faucet Aerators	WCM1	$4,700	$887	5.3
Exterior Lighting Retrofit	ECM1	$2,235	$427	5.2
Replace Incandescent Bulbs with CFLs	ECM2	$512	$961	0.5
Install Replacement Windows	ECM3	$8,150	$901	9.0
Seal and Repair Ducts	ECM4	$1,200	$395	3.0
Control Air Leakage	ECM5	$2,000	$502	4.0
Total		**$18,797**	**$4,073**	**4.6**

Table 15. Summary of Energy Savings for ECMs and WCMs

ECM Description	kWh Annual Savings (kWh)	Therm Annual Savings (Therms)	Water Annual Savings (gallons)	GHG Reduction (Metric Tonnes)
Install Water-Saving Toilets, Showerheads and Faucet Aerators	0	95	83,769	0.50
Exterior Lighting Retrofit	2,556	0	0	1.89
Replace Incandescent Bulbs with CFLs	6,080	0	0	4.50
Install Replacement Windows	0	835	0	4.43
Seal and Repair Ducts	0	366	0	1.94
Control Air Leakage	0	465	0	2.47
Totals	**8,636**	**1,761**	**83,769**	**15.74**

Table 16. Measures for Consideration at the End of Useful Life (EUL) of Equipment

Energy Cost Reduction Measure (ECM)	ID	Additional First Cost	Annual Savings	Simple Payback (yrs)
Install High Efficiency Furnaces	EUL1	$4,500	$540	8.3
Install Tankless On-Demand Water Heaters	EUL2	$750	$135	5.6
Total		**$5,250**	**$675**	**7.8**

10.1 WCM1 - Install Water-Saving Toilets, Showerheads and Faucet Aerators

Summary					
Cost to Implement	Estimated Annual Cost Savings	Simple Payback (years)	Natural Gas Savings (therms)	Water Savings (gal/yr)	GHG Reduction (Metric Tonnes)
$4,700	$887	5.3	95	83,769	0.50

Recommendation Description

In some areas, water and sewer rates have increased dramatically over the past few years and are rivaling the cost of energy. Reducing water use through conservation strategies can generate significant cost savings. These strategies include implementing low flow shower heads and faucet aerators, along with low-flush volume toilets.

It should be noted that compared to the last energy and water audit (July 2008 to July 2009) water consumption has been reduced in this audit period (May 2011 to May 2012). Water consumption was reduced 34% and water cost associated with the property has reduced 24%. It was reported that the facility has participated in the DTE Energy Efficiency Direct Installed Program for low flow showerheads and faucet aerators.

Site observations revealed that the existing showerhead was rated at 2.5 GPM and bathroom faucet aerators were rated at 2.2 GPM (most common). Therefore, it is being assumed that not all units were retrofit (assumed 2 units). It is further assumed that 4 older 3.5 GPF toilets (40%) have not been retrofit to 1.6 GPF.

It is recommended to install an ultra low-flow shower head (1.5 GPM) and ultra low-flow faucet aerators (1 GPM) in the bathrooms of all remaining units that have not been retrofit. This conservation measure will save both water and energy used for heating water.

It is recommended that all older toilets (pre-1994) be replaced with new toilets meeting the 1.6 GPF criteria. Even better would be to replace with a toilet certified with the WaterSense label. Such toilets use 20 percent less water than the current federal standard, while still providing equal or superior performance. WaterSense, a program sponsored by the U.S. Environmental Protection Agency (EPA), is helping consumers identify high performance water-efficient toilets that can reduce water use in the home and help preserve the nation's water resources.

Significant advances in technology over the past decade have resulted in the availability of reliable, high-quality water-saving toilets on the market. Older toilets (pre-1994) typically have a flush volume of 3.5 gallons per flush (GPF) or greater. The current standard for new toilets is 1.6 GPF.

Assumptions

Calculation of savings is based on replacing two (2) showerheads using 2.5 GPM with ultra low-flow shower heads (1.5 GPM). Average shower duration of eight (8) minutes per occupant per day (from the REUWS survey referenced in Section 5.3) was used, assuming three (3) occupants in each home. This

method produced a water savings of 17,560 gallons per year. Calculation of savings is based on replacing four (4) faucet aerators using 2.2 GPM with ultra-low-flow faucet aerators (1 GPM). An average faucet usage time of 6 minutes per capita per day (from the REUWS survey referenced in Section 5.3) was used, assuming three (3) occupants in the house. This method produced a water savings of 15,567 gallons per year. The natural gas savings was calculated using the assumption that 50% of the water used at shower and faucets was hot water. Calculation of savings is based on replacing 4 toilets using 3.5 GPF with new toilets using 1.6 GPF. A value of 5 flushes per occupant per day (from the REUWS survey referenced in Section 5.3) was used, assuming 1.5 occupants (half of 3 due to two toilets) in each of the 2 homes. This method produced a water savings of 26,000 gallons per year.
Incentives
DTE Energy's Multifamily Program is offering a direct install incentive for installing low-flow aerators and showerheads in the individual units; however there is no incentive for installing low-flow toilets at the present time. The application for these incentives is included in the appendix.
Expected Useful Life Study
Faucet aerators and showerheads have an expected useful life of ten years and toilets have an expected useful life of 20 years. It is believed that faucets and showerheads were installed approximately 10 years and are need of replacement.

10.2 ECM1 - Exterior Lighting Retrofit

Summary					
Cost to Implement	Estimated Annual Cost Savings	Simple Payback (years)	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Reduction (Metric Tonnes)
$2,235	$427	5.2	2,556	0	1.89

Recommendation Description

There are exterior lighting (wall pack) fixtures located near the front and rear entrance doors of each home. These wall packs are of the high intensity discharge (HID) type with metal halide (MH) lamps that are 50 watts each. There is also one larger flood light installed on the gable end to light the parking area. This flood light is also a high intensity discharge (HID) type with metal halide (MH) lamps that appeared to be 250 watts each. The site visit light count total was 10 of the smaller wall packs and 1 of the larger flood lights.

The existing HID exterior lighting is outdated, and significantly more efficient lighting options are readily available. For this application, it is recommended that exterior lighting be retrofitted with more efficient light emitting diode (LED) lighting.

Along with significant electrical savings at equivalent lumen output, maintenance will be greatly reduced as the LED lights proposed have an L_{70} lifespan of 100,000 hours. L_{70} is an industry standard to express the useful lifespan of an LED. It indicates the number of hours before light output drops to 70% of initial output. Maintenance reduction is not factored into the savings calculated for this report. LED lighting is considered a green technology due to the high fixture efficacy and the absence of mercury, arsenic, and ultraviolet (UV) light.

This ECM analysis was based on replacing the existing wall pack fixtures with a 10 watt high performance LED wall packs. The existing flood light is replaced with model #FXLED78T (RAB Lighting) **or equivalent**, 78 watt high performance LED flood. The specification sheets for the analyzed models are included in the appendix.

The initial cost of this project is the material cost for 10 wall packs and 1 flood light. The fixtures have provisions for junction box and surface mount for recessed box applications, and are assumed to be installed by in-house maintenance staff. Again, the additional savings associated with reduced maintenance costs are not included in the calculated savings.

Assumptions

Installation of new LED wall packs would be performed by in-house maintenance staff at no additional labor cost.

It is assumed that the proposed fixtures will provide adequate light level for safety and security purposes. The lighting calculator spreadsheet result is included in the appendix.

The existing wall packs contain 50 watt metal halide (MH) lamps and have an input wattage of 56 watts each.

The existing flood lights contain 250 watt metal halide (MH) lamps and have an input wattage of 275 watts each.

Calculations

$$Energy\ Cost\ Savings = Energy\ Consumption\ Savings\ \times Energy\ Cost\ per\ kWh$$

Where:

$$Energy\ Consumption\ Savings = Existing\ Usage - Proposed\ Usage$$

$$Usage = \sum (\#\ of\ fixtures\ \times watts\ per\ fixture\ \times burn\ hours)$$

Incentives

DTE Energy's Multifamily Program is offering incentives for replacing existing HID exterior lighting with LED lighting. Existing lighting must operate more than 3,833 hours per year and replacement must result in at least a 40% power reduction. In addition, the replacement lamp must have an efficacy of at least 35 lumens per watt. The application and specifications for these incentives is included in the appendix.

Expected Useful Life Study

Lamps in the exterior light fixtures were installed in 2008 and have an expected useful life of six years. It is believed that the lamps will need to be replaced next year. The expected useful life of an LED replacement fixture is typically around 15 years.

10.3 ECM2 - Replace Incandescent Bulbs with CFLs

Summary

Cost to Implement	Estimated Annual Cost Savings	Simple Payback (years)	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Reduction (Metric Tonnes)
$512	$961	0.5	6,080	0	4.50

Recommendation Description

A total of (64) incandescent lamps (80% of total lamps), in various fixtures, were observed in the unit inspected during the site visit. The majority of the incandescent lamps were 60 watt lamps. It is recommended that **all** incandescent lamps be upgraded to compact fluorescent lamps (CFLs). The existing incandescent lamps are inefficient and require unnecessary amounts of energy. The incandescent lamps 60 watt which could use 16 watt or 19 watt CFL replacements.

Compact fluorescent lamps are a great alternative to incandescent bulbs. On average, CFLs use seventy-five percent less electricity than incandescent bulbs and have a lifetime that is 10 times longer. Advances in technology over the past few years have brought great improvements to CFLs in terms of light quality and appearance, and they are available in a variety of shapes and sizes.

Assumptions

This ECM is calculated using a replacement total of 64 CFLs. Lamps are assumed to operate 1,456 hours per year (4 hours per day each). It is assumed all of the existing lamps are 60 watt incandescent, and they will be replaced with 19 watt CFLs. The lighting calculator spreadsheet result is included in the appendix.

Calculations

$$Energy\ Cost\ Savings = Energy\ Consumption\ Savings\ \times Energy\ Cost\ per\ kWh$$

Where:

$$Energy\ Consumption\ Savings = Existing\ Usage - Proposed\ Usage$$

$$Usage = \sum(\#\ of\ fixtures\ \times watts\ per\ fixture\ \times burn\ hours)$$

Incentives

DTE Energy's Multifamily Program is offering direct install incentives for replacing incandescent lamps with CFLs in tenant spaces. The required application for this program is included in the appendix of this report.

Expected Useful Life Study

Incandescent lamps have an expected useful life of 1-2 years. Alternatively, compact fluorescent lamps have an expected useful life of 6-8 years, depending on the amount of usage per day.

10.4 ECM3 - Install Replacement Windows

Summary					
Cost to Implement	Estimated Annual Cost Savings	Simple Payback (years)	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Reduction (Metric Tonnes)
$8,150	$901	9.0	0	835	4.43

Recommendation Description

Windows play a major role in the energy use and comfort of a dwelling unit. In the winter, heat in a room is lost when cold outside air infiltrates around the edges of windows. Heat also can be lost by conduction directly through the pane, even if the window fits tightly. The cold drafts and the chilly windowpane make the room uncomfortable. But windows also can help to heat a room by letting the sun's rays enter. While this solar radiation is beneficial in the winter, it can be a major source of discomfort in hot, summer climates.

The windows are aluminum-framed single-pane glazed sliding units with exterior storm windows. The window units are in poor overall condition. Some of the exterior sashes are missing, seals are worn or non-existent and they are not energy efficient. The sealant and caulking observed between the outside perimeter of the aluminum frame and the adjacent aluminum siding is in poor condition. Since the property is located in a typically cold climate, more significant savings may be realized than what was calculated in the ECM.

Recommendation is to install energy efficient, vinyl, thermal pane, replacement windows. The upgrade to Energy Star rated windows should be considered.

ENERGY STAR® Qualification Criteria for Residential Windows, Doors, and Skylights

Windows

Climate Zone	U-Factor[1]	SHGC[2]	
Northern	≤ 0.30	Any	Prescriptive
	=0.31	≥ 0.35	Equivalent Energy Performance
	=0.32	≥ 0.40	
North-Central	≤ 0.32	≤ 0.40	
South-Central	≤ 0.35	≤ 0.30	
Southern	≤ 0.60	≤ 0.27	

[1] *Btu/h-ft²·°F*

[2] *Fraction of incident solar radiation*

Doors

Glazing Level	U-Factor[1]	SHGC[2]
Opaque	≤ 0.21	No Rating
≤ ½-Lite	≤ 0.27	≤ 0.30
> ½-Lite	≤ 0.32	≤ 0.30

Skylights

Climate Zone	U-Factor[1]	SHGC[2]
Northern	≤ 0.55	Any
North-Central	≤ 0.55	≤ 0.40
South-Central	≤ 0.57	≤ 0.30
Southern	≤ 0.70	≤ 0.30

Source:
http://www.energystar.gov/ia/partners/prod_development/archives/downloads/windows_doors/Windows_Doors_and_Skylights_Program_Requirements.pdf?8c9b-add8

Assumptions
Retrofit cost for this ECM is based on replacing all 33 windows at a cost estimate of approximately $15 per square foot of windows.
Calculations
The Cost/Benefit worksheet from the "Energy Conservation for Housing – A Workbook" was used for this analysis.
Incentives
DTE Energy's Multifamily Program is not offering incentives for replacement windows at the present time.
Expected Useful Life Study
Windows have an expected useful life of 30 years. The existing windows are believed to be at or near their expected useful life and are in need of replacement.

10.5 ECM4 - Seal and Insulate Ducts

Summary					
Cost to Implement	Estimated Annual Cost Savings	Simple Payback (years)	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Reduction (Metric Tonnes)
$1,200	$395	3.0	0	366	1.94

Recommendation Description

In buildings with forced-air heating (or cooling) systems, warm (or cold) air is distributed to each room through flexible or sheet metal ductwork. The air travels from the furnace, heat pump, or air conditioner through a supply duct to each room, and it returns to the furnace or heat pump through a return duct to be heated (or cooled) again.

Forced-air distribution systems can lose energy in two ways. First, uninsulated ducts running through unconditioned spaces such as basements, crawlspaces, and attics loose energy through conduction. Second, ducts lose energy through leaks, or convection. Studies show that duct leaks typically raise a home's heating and cooling costs by 20-30 percent. That figure can double in homes where ducts are not insulated. When supply ducts leak to an unconditioned space, less air reaches the room or apartment. To make matters worse, because not enough air is reaching the conditioned space, the room or apartment may become depressurized, which causes outside air to rush into the space through any path it can find, such as around windows or doors. The furnace (or air conditioner) then has to work harder to heat or cool the space. When return ducts have leaks, air from unconditioned spaces enters the return duct, reducing the amount of heated (or cooled) air that can enter it through the return grille. Because air cannot leave the room through the grille, the room or apartment becomes pressurized, and the air, seeking another escape route, squeezes its way to the outside. Not only do leaky return ducts waste energy, but they can cause indoor air quality problems as fumes from combustion appliances, vapors from household cleaners stored in the basement, and soil gases such as methane enter the conditioned space.

To cut energy waste, ducts should be sealed to eliminate any leaks, and then wrapped with insulation. The first step to sealing ducts is to diagnose where the leaks are. This process requires diagnostic tools such as blower doors or pressurization devices and should be done by experienced technicians.
The ductwork in the apartments is approximately 45 years old and possible sources of leakage were observed at the seams and edges of the exposed ductwork. This ECM recommends checking all ductwork for leakage, making required repairs, and wrapping the exposed ductwork in the basements with duct insulation.

Calculations
The Cost/Benefit worksheet from the “Energy Conservation for Housing – A Workbook” was used for this analysis.
Incentives
DTE Energy’s Multifamily Program is not offering incentives for duct sealing at the present time.
Expected Useful Life Study
Aside from potential exposure to environmental elements, insulation, for the most part, has an expected useful life of over fifty years.

10.6 ECM5 - Control Air Leakage

Summary					
Cost to Implement	Estimated Annual Cost Savings	Simple Payback (years)	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Reduction (Metric Tonnes)
$2,000	$502	4.0	0	465	2.47

Recommendation Description

Air leakage through holes, gaps, cracks, penetrations, and electrical receptacles is a major source of heat loss from a dwelling unit. Controlling this air leakage through a combination of weather stripping and strategic sealing can significantly reduce the amount of heat lost to the outside, thus reducing the amount of energy needed to heat the dwelling unit. Insulation also can help reduce air leakage.

In addition to saving energy, controlling air leakage can reduce moisture problems and reduce the influx of odors and contaminated air from the basement and other units, while increasing the overall comfort of the residents.

But reducing air leakage through air-sealing techniques is more complicated than simply weather-stripping and caulking. Two important principles must be understood. First, even if a building is full of holes, air will not move through those holes unless there is a difference in pressure between indoors and outdoors. This pressure differential depends on the difference between indoor and outdoor temperatures, wind speed and direction, and mechanical ventilation. If there is no pressure differential, the air stands still and does not leak in or out. This is important because sealing a hole where there is no pressure differential will not save energy. Pressure tends to be highest on upper and lower floors and in basements. In the heating season, hot air rises and pushes on the ceiling, creating high positive pressure and eventually leaking out. When it does leak out, it is replaced by cold air coming into the lower part of a building, where the pressure is negative from all the warm air moving upward. This force is called the "stack effect."

The second important principle is that air sealing can affect air quality. Air leakage is the primary source of ventilation in many buildings. Tightening a building by reducing air leakage can endanger the health of the occupants in buildings with no mechanical ventilation. This risk is highest in buildings with significant sources of indoor air pollution, such as back drafting from gas appliances or high occupancy levels. If a building does not have mechanical ventilation, it is recommended that a ventilation system be installed before any significant air leakage is significantly reduced.

<u>For the subject property, Upper Platt:</u> (see Section 5.5.5 and 5.5.6 for details)

The blower door test determined that air leakage is adequate for ventilation.
The blower door airflow rate was 2,525 CFM_{50}.
The building tightness limit (BTL) is 1,206 CFM_{50}.
Therefore, an air leakage reduction limit of 52% should not be exceeded.

Air Sealing Strategy:

Air seal the home to the minimum ventilation rate (MVR) for air leakage, but **not** below (unless mechanical ventilation will be installed).

Air leakage was identified to be from and around the windows. The main windows have been recommended for replacement, but the basement windows need attention. The basement has builders grade, steel frame, single pane windows that tilt in. There are two windows per basement that are 32" x 16". There are gaps evident between the window frame and the rough opening that airs leaks through. The tilt mechanism is broken on many of the windows, and leakage between the sash and frame also. These windows should be air sealed (or replaced if budget allows).

There is a very significant air bypass located in the upstairs bathroom behind the vanity. This was the single largest point of leakage identified during the blower door test. This should be air sealed complete. Best solution would involve removing the vanity, covering the open wall cavity with wall board, and reinstall vanity.

Install weather stripping at the entry doors (complete jambs and new threshold sweep). All attic hatches should also be weatherized with adhesive weather strip. Also, air leaks around the rim/band joist on the front and back sides of the building (exterior perimeter) should be sealed.

Next step, if necessary, would be to air seal the attic. This would include ceiling and top plate penetrations (electrical and plumbing vent stack).

Calculations

The Cost/Benefit worksheet from the "Energy Conservation for Housing – A Workbook" was used for this analysis.

Incentives

DTE Energy's Multifamily Program is not offering incentives for air sealing at the present time.

Expected Useful Life Study

Depending on the applied location, the life expectancy of caulks and sealants can be in the range of five to ten years. It is believed that the areas identified with air leakage have either never been sealed in the past or need to be resealed.

11.0 ECMs for End of Useful Life (EUL)

The following are ECMs for which the calculated payback period exceeds the useful life of the product, when considered for immediate replacement. However, these ECMs have a viable payback period when the replacement occurs at the end of the product's useful life (EUL), since the item would be replaced at this time in any case. In order to demonstrate the benefit of upgrading to an energy efficient product, only the premium cost for upgrading to the energy efficient product is considered in the initial investment. The premium cost is the difference between the cost of the energy efficient item and the standard replacement item.

11.1 EUL1 - Replace Standard Efficiency Furnaces

Summary-					
Premium Cost to Upgrade	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Emissions (Metric Tonnes)**
$4,500	$540	8.3	0	500	2.66

Recommendation Description

Replacing the old heating plant in a building can generate considerable savings if the existing equipment is inefficient and/or the fuel source is expensive compared to other options. A furnace near the end of its useful life is a particularly good candidate for replacement with high-efficiency equipment. Unfortunately, this opportunity was missed by the AAHC when all five (5) of the furnaces were replaced with standard efficiency (80%) units in 2004.

Because of technology advances, new furnaces are much more efficient than they used to be, presenting opportunities for significant savings on heating costs. Existing furnaces have a designed efficiency of 80-81%. Replacement units are available with efficiencies of up to 95%. Significant energy savings can be realized with the installation of more efficient units. This ECM is calculated for replacing all eight (8) furnaces (80% AFUE) with high efficiency furnaces, (92% AFUE) at the end of useful life.

Calculations

Natural gas consumption of existing furnaces is approximately equal to 73% of total consumption (2,954 therms for furnace heating). Efficiency gain from 80% to 92% with high efficiency units.

Base cost of $1,900 for standard efficiency furnaces (80% AFUE).
Base cost of $2,600 for high efficiency furnaces (92% AFUE).
Additional labor cost of $200 per furnace for high efficiency installation. This is for the cost of installing necessary PVC venting runs through the exterior wall.

Incentives

The Detroit HVAC Incentives offers up to $300 in incentives for a replacement of natural gas furnaces.

An implementation of this incentive with the ECM would aggregate savings with labor and the new furnace to $300 for a natural gas furnace of 94% or higher efficiency. A retrofit of 5 new furnaces on the property amounts to a potential of $1,500 in incentives.

Additional Federal Tax Credits are available for replacing furnaces where up to 30% of the installed cost or $1,500 for all systems in each unit retrofit, whichever is less, can be reimbursed at the end of the year.

Expected Useful Life Study

Furnaces have an expected useful life of 15 years. The existing standard efficiency units were installed in 2004. It is recommended to replace all of the units at the end of their useful life.

Manual J Calculation Results

To confirm appropriate sizing of the recommended heating equipment, AKT Peerless performed calculations in accordance with Air Conditioning Contractors of America (ACCA) Manual J guidelines. An industry accepted software program, HVAC-Calc Residential 4.0.58c, was used to calculate the heat loss and heat gain in a unit. Detailed reports of the Manual J calculations for each unit are included in the appendix of this report.

All of the units at Upper Platt were constructed differently; therefore the results of each load calculations vary. Overall values for the heat loss within the software are often increased by a factor of 15% to 25% to account for averages used in the winter design temperatures. The following table lists the calculated values for heat transfer in each unit:

Tenant Unit #	# of Bedrooms	Heat Gain (Btu/h)	Heat Loss w/ 25% Factor Increase (Btu/h)	Recommended Furnace Size (Btu/h)
3681	3	12,854	33,510	45,000
3683	2	11,970	27,308	45,000
3685	4	14,601	37,289	45,000
3687	2	11,132	33,426	45,000
3689	1	8,339	21,171	45,000

Because high-efficiency furnaces are not typically manufactured with a rating below 45,000 Btu/h, it is believed that this size furnace is sufficient for units with a calculated heat loss at or below 45,000 Btu/h.

11.2 EUL2 - Install Tankless On-Demand Water Heaters

Summary					
Premium Cost	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Reduction (Metric Tonnes)**
$750	$135	5.6	0	125	0.66

Recommendation Description

Usually, a water heater is replaced only when it fails. But if the existing water heater is at least ten years old, it is near the end of its useful life, and it may make sense to replace it before it fails. By replacing the water heater before it stops working, the HA may enjoy significant energy savings, in addition to avoiding a situation in which residents are without hot water while a new system is being selected. Replacements of old water heaters that are oversized will generally yield higher savings than if the old system is appropriately sized. In any case, if the old water heater is leaking or shows signs of heavy rust or water streaking in the combustion chamber, it should be replaced (Weingarten and Weingarten 1996).

The energy factor (EF) indicates a water heater's overall energy efficiency based on the amount of hot water produced per unit of fuel consumed over a typical day. This includes the following:

- Recovery efficiency – how efficiently the heat from the energy source is transferred to the water
- Standby losses – the percentage of heat loss per hour from the stored water compared to the heat content of the water (water heaters with storage tanks)
- Cycling losses – the loss of heat as the water circulates through a water heater tank, and/or inlet and outlet pipes.

A new standard efficiency 40-gallon gas water heater has a current minimum Energy Factor of 0.59, due to inefficiencies of combustion, a central flue carrying heat away with combustion exhaust, and a continuous gas pilot light, as well as standby losses through insulation and thermo-siphoning.

This ECM recommends on-demand tankless hot water heaters (Energy Factor of .82 or greater). This represents a 15% percent energy savings compared to a standard efficiency gas water heater.

Energy Star Qualifying Models: Residential High-Efficiency Gas Instantaneous Water Heaters
http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=WGS

- Minimum Energy Factor (EF) of 0.82 as of September 1st, 2010.
- Minimum Gallons per Minute of 2.5 gpm over a 7.7° rise
- Annual energy savings of 15% (Based on the National Gas Average Energy Cost and a comparison to a conventional gas water heater with an EF rating of 0.59)

Calculations

Data used in this ECM are from a cost comparison study conducted by the American Council for an Energy-Efficient Economy (ACEEE). http://aceee.org/about

Incentives

DTE Energy's Multifamily Program may not offer incentives for replacing older hot water heaters with tankless on-demand units at this time.

Expected Useful Life Study

Hot water heaters have an expected useful life of ten years. The existing hot water heaters were installed at different times. The following lists the hot waters per tenant unit and the installed date:

Tenant Unit #	Tank Size	Installed Date
Unit 3685	40 gallon	2004
Unit 3683, 3689	40 gallon	2011
Unit 3681, 3687	40 gallon	2012

Unit 3685 has a hot water heater that is near its expected useful life and is in need of replacement in the near future.

Rating Calculation

Fixture	Fixture's GPM Rating
Showerhead	1.5
Bathroom Faucet	0.5
Kitchen Faucet	1.0
Clothes Washer	2.5
Total GPM Demand	5.5

It is recommended to install an instantaneous hot water heater with at least a 5.5 gpm rating to fulfill the maximum demand at a certain time. In units with 1.5 bathrooms, the recommended rating should increase to at least 6.0 gpm to account for the second faucet. Typical uses require at most 120°F hot water, therefore the recommended rated temperature rise for these units should be 70°F.

12.0 Advanced ECMs and/or ECMs Recommended for Further Evaluation

The following capital intensive measures may be feasible but would require an additional, detailed engineering analysis of the entire facility.

12.1 FE1 - Replace/Invest in Energy Star Clothes Washers

Recommendation Description
Because the Owner of the property is responsible for paying the water utility, the audit team believes an investigation into high efficiency clothes washers may be a sound investment for the Ann Arbor Housing Commission. It appears that some of the units currently have high efficiency clothes washers and other units have older, standard efficiency units. Typically, residents are responsible for providing their own washers and dryers. This reduces a first cost for the housing commission – however, residents appear to be installing/utilizing the cheapest functioning units available. These units are often very old, and extremely inefficient. This results in high electrical energy consumption, but even greater water consumption. In the past few years, the change in design and operation of the clothes washer units has allowed the consumer to reduce water usage and drying time. Typical high-efficiency washers use 27 gallons of water per load. In contrast, conventional models that were built from 1980 to the late nineties consumed between 43 and 51 gallons of water per load. In addition to a reduction in water usage, many of the energy efficient washers will minimize the amount of hot water use by utilizing cold water as much as possible. The faster cycle on the efficient washers also minimizes the time needed to dry clothes, which overall minimizes the electrical consumption for laundry. It is assumed that all tenant units are occupied; however, the typical usage of the laundry units is unknown and would require additional analysis to properly determine the savings from installing Energy Star rated washing machine units. Additionally, converting the existing washing machines to only using a cold rinse can also provide substantial savings based on tenant usage. Because the Owner is responsible for water consumption, and water costs continue to rise, the team recommends a further life cycle investigation into funding and installing Owner-supplied (cold rinse) Energy Star units.
Incentives
Presently, DTE Energy's Multifamily Program is not offering incentives for installing Energy Star products at this time.

Expected Useful Life Study
With typical use, the average clothes washing machine has an expected useful life of 14 years. It is believed that the existing units are at or near the end of their useful life.

13.0 ECMs Evaluated but Not Recommended

The following ECMs were evaluated but are not recommended for implementation:

13.1 NREC1 - Ground Source Heat Pump System

Summary					
Premium Cost*	Estimated Annual Cost Savings*	Simple Payback (years)	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Reduction (Metric Tonnes)
$58,339	$2,486	23.5	6,000	1,425	12.01

Description

According to the Great Lakes Adaption Assessment for Cities, the estimated number of days reaching temperatures at or above 90 degrees in Southeast Michigan will increase to 30-50 days per year due to global climate changes. With many of the Ann Arbor Housing residents being disabled or elderly, health issues often are exacerbated by the hot and humid weather. Consequently, AAHC plans on including air conditioning to all the tenant spaces.

At the present time, only a few of the tenant units at Upper Platt have window air conditioners for space cooling. It was stated that two of the units have at least one air conditioner, with one of these units having two air conditioners. In cases where window air conditioners are present, the resident is responsible for those purchases and installation. Often, improper installation can cause damage to the windows and walls. Additionally, the appropriate size is not always selected; thus reducing the efficiency of the unit and increasing energy costs.

As previously stated, the existing furnaces are approximately 10 years old with an expected useful life of 15 years. Existing furnaces have a standard efficiency rating and are believed to be oversized.

With this in mind, AAHC has considered installing a ground source heat pump system for the overall heating and cooling needs. The property has sufficient acreage to drill wells and will benefit from energy cost savings for space heating in the tenant spaces. Ground source heat pumps (GSHP) are among the most energy efficient technologies for providing heating and air conditioning.

For heating, the efficiency of a heat pump is identified by the coefficient of performance (COP) rating. The COP is the ratio of the heating supplied over the electrical energy consumed. The higher the unit's COP rating, the more energy efficient it is. Typical COP values for air source heat pumps are within the range of 2 to 2.5 while the typical COP for a ground source heat pump is between 3 and 6.

For cooling, the efficiency is identified by the Energy Efficiency Ratio (EER) rating. The EER rating of a unit is the cooling output over the total electric energy input. Similar to the COP, the higher the unit's EER rating, the more energy efficient it is. Typical EER ratings for ground source heat pumps are between 11 and 30. It is recommended that AAHC install a system with the highest EER rating that is feasible.

Energy savings for this ECM were based on a ground source heat pump system with a COP rating of 4.5 and an EER of 20.

Based on the estimated installation costs and calculated energy savings, payback for implementation is expected to be over 20 years. For this reason, a ground source heat pump system is not recommended.

It should be noted that our analysis does not account for maintenance savings, site security issues related to exterior equipment, renewable energy incentives that are not currently available to the Client and the durability of the entire system. Further evaluation of these items may increase the overall economic benefit of implementing this ECM.

Calculations

This ECM analyzes the cost savings associated with installing a ground source heat pump system over the existing standard efficiency furnaces and installing a central air-conditioning system in all of the units at Upper Platt.

*The premium cost is the difference between the overall cost of the high efficiency item (ground source heat pump system) and overall cost to add the standard replacement item (central air conditioners).

Base cost of $2,800 for standard efficiency condensing unit/evaporator coil.
Overall installation and equipment cost of $72,339.25 for ground source heat pump (20 EER; 4.5 COP) at site.

Incentives

DTE Energy's Multifamily Program is not offering incentives to install ground source heat pump systems at the present time.

Expected Useful Life Study

Furnaces typically have an expected useful life of 15 years. Standard efficiency condensing unit/evaporator coil system also has an expected useful life of 15 years. The interior units of a ground source heat pump system typically have an expected life of 20 years while the ground loop is anticipated to have an expected useful life beyond 100 years.

Manual J Calculation Results

To confirm appropriate sizing of the recommended equipment for the property, AKT Peerless performed calculations in accordance with Air Conditioning Contractors of America (ACCA) Manual J guidelines. An industry accepted software program, HVAC-Calc Residential 4.0.58c, was used to calculate the heat loss and heat gain in a unit. Detailed reports of the Manual J calculations for each unit are included in the appendix of this report.

All of the units at Upper Platt were constructed differently; therefore the results of each load calculations vary. Overall values for the heat loss within the software are often increased by a factor of 15% to 25% to account for averages used in the winter design temperatures. The following table lists the calculated values for heat transfer in each unit:

Tenant Unit #	# of Bedrooms	Heat Gain (Btu/h)	Heat Loss w/ 25% Factor Increase (Btu/h)
3681	3	12,854	33,510
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3685	4	14,601	37,289
3687	2	11,132	33,426
3689	1	8,339	21,171

These calculations have assumed previously recommended ECMs have already been implemented. It is recommended that all building envelope improvements be performed before installing a new heating and cooling system.

14.0 Feasibility Assessment of Green Energy Technologies

The following Green Energy Technologies were evaluated for their application at the subject property:

14.1 Photovoltaic for Electricity

Implementing photovoltaic panels for electricity at the subject property is not recommended due to high installation costs. Further study is not recommended.

14.2 Solar Thermal for Hot Water Heating

Hot water usage at the subject property is not high enough to justify initial costs of solar heating therefore the property is not a viable candidate of solar thermal for hot water heating. Further study is not recommended.

14.3 Wind Turbine

The property is not a viable candidate of installing wind turbines due to insufficient wind power in this geographic area. Further study is not recommended.

14.4 Combined Heat and Power

The property has less than 80 units (a rule of thumb for minimum number of units for feasibility) and does not have a central power source. The property is not a viable candidate of implementing combined heat and power and further study is not recommended.

14.5 Fuel Cells

Due to the high initial costs associated with fuel cells, implementation is not recommended at the subject property. Further study is not recommended.

15.0 Recommendations & Impact

Based on the analysis described in this report, AKT Peerless believes substantial energy conservation opportunities are available, and recommends implementation of all proposed ECMs.

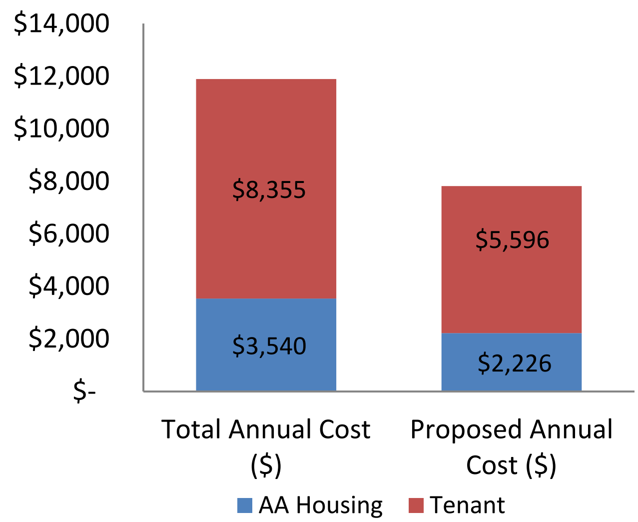
The combined annual EUI for the subject building is estimated at 85.8 kBtu per square foot per year. The annual energy cost index is an estimated $1.52 per square foot per year. Reduction of fuel (non-electrical) and electrical energy consumption through the implementation of recommended ECMs will potentially result in a reduced EUI of 50.66 kBtu per square foot per year, a potentially reduced annual cost index of $0.82 per square foot per year, and potential total annual energy cost savings of $4,073 per year.

An additional result of implementing the recommended ECMs would be the reduction of greenhouse gas (GHG) emissions by 15.74 metric tonnes. Measurements of greenhouse gas emissions are based on data gathered from the United States Environmental Protection Agency (USEPA) eGRID database.

The subject building is located in eGRID electric utility sub-region RFCW. Greenhouse gas emissions from electrical consumption are based on emissions data measured at the electrical generating facilities serving consumers located in the specified eGRID utility sub-region, and therefore greenhouse gas emissions and the estimated reduction in greenhouse gas emissions reflect the mix of fuel sources used by the regional electrical utilities serving the subject property. Emissions factors for natural gas consumption are based on data gathered from the 2009 United States Greenhouse Gas Inventory, Annex 2.

Table 17. Impact Summary

% Energy Savings	41%
% Water Savings	26%
% Cost Savings	34%
Annual Cost Savings ($)	$4,073
% Reduction in GHG Emissions (CO_2 Equivalent Metric Tonnes)	37%



16.0 Limitations

AKT Peerless accepts responsibility for the competent performance of its duties in executing this assignment and preparing this report in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages. Although AKT Peerless believes the results contained in herein are reliable, AKT Peerless cannot warrant or guarantee that the information provided is exhaustive, or that the information provided by the client, third parties, or the secondary information sources cited in this report is complete or accurate.

Nothing in this report constitutes a legal opinion or legal advice. For information regarding individual or organizational liability, AKT Peerless recommends consultation with independent legal counsel.

ASHRAE *Procedures for Commercial Building Energy Audits* recommends that the Energy Analyst apply a consistent definition of building square footage to both the subject building and to similar buildings used for energy performance comparisons. AKT Peerless cannot evaluate the accuracy or consistency of building square footage measurements of similar buildings included in the comparison database.

The Energy Analyst has not evaluated the potential financial savings from changing to a different utility price structure due to limited details on provided rate structures.

Also, the Energy Analyst has not verified that the property owner/operator has reported all sources and records of energy consumed at the subject property. Potentially unreported information may include, but is not limited to, bills, meters, and types of energy consumed. Inaccurate information provided to the energy analyst and information not reported to the energy analyst may influence the findings of report.

17.0 Signatures

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Building Analyst Professional No. 5023902
Building Performance Institute

Recent annual natural gas and electricity consumption with cost is summarized in the following tables:

Natural Gas

NATURAL GAS UBA									
AAHC Site: **Upper Platt Colonial**									
Month	**Start**	**End**	**Days**	**HDD**	**Consumption Therms**	**Actual (0) Estm. (1)**	**Delivery $**	**Gas $**	**Total $**
Mar-12	6-Mar-12		29	529	348	0	$ -	$378	$378
Apr-12	5-Apr-12		32	513	313	0	$ -	$351	$351
May-12	7-May-12		30	171	168	0	$ -	$207	$207
Jun-12	8-Jun-12		30	90	121	0	$ -	$170	$170
Jul-12	9-Jul-12		28	23	104	0	$ -	$153	$153
Aug-12	4-Aug-12		34	80	109	0	$ -	$161	$161
Sep-12	5-Sep-12		28	223	141	0	$ -	$185	$185
Oct-12	4-Oct-12		28	478	245	0	$ -	$272	$272
Nov-12	1-Nov-12		32	836	489	0	$ -	$517	$517
Dec-12	4-Dec-12		31	946	678	0	$ -	$679	$679
Jan-12	7-Jan-12		32	1100	722	0	$ -	$689	$689
Feb-12	6-Feb-12		30	973	614	0	$ -	$609	$609
				5,962	**4,052**				**$4,372.38**
									$1.0790671 $/Therm

Electricity

ELECTRICAL UBA								
AAHC Site: **Upper Platt**								
Month	**Start**	**End**	**Days**	**HDD**	**CDD**	**Actual (0) Estm. (1)**	**Consumption kWh**	**Total Charges ($)**
Mar-12	15-Mar-12		29	529	33	0	1862	$312.72
Apr-12	13-Apr-12		32	513	7	0	1892	$320.49
May-12	15-May-12		30	171	118	0	2262	$295.64
Jun-12	14-Jun-12		30	90	245	0	3520	$566.13
Jul-12	14-Jul-12		28	23	409	0	3498	$558.34
Aug-12	11-Aug-12		34	80	233	0	2629	$418.03
Sep-12	14-Sep-12		28	223	93	0	1940	$316.64
Oct-12	12-Oct-12		28	478	15	0	1718	$286.86
Nov-12	9-Nov-12		32	836	0	0	2238	$359.43
Dec-12	11-Dec-12		31	946	0	0	2609	$414.12
Jan-13	11-Jan-13		32	1170	0	0	2130	$333.67
Feb-13	12-Feb-13		30	1098	0	0	2172	$347.02
				6157	**1153**		**28,470**	**$4,529.09**
								$0.159083 Blended $/kWh

HUD Residential Energy Use Benchmarking Tool

For single-family, semi-detached, row/townhouse, multi-family walk-up, and elevator buildings.

The HUD Residential Energy Use Benchmarking Tool quantifies the performance of a user-defined building relative to the family of HUD residential buildings. A score of 75 denotes performance at the top 25th percentile of HUD residential buildings. A score of 50 denotes performance at the 50th percentile (in the middle) of HUD residential buildings. For definitions or help on the terms below, simply click on any underlined text. Click on "Return" to come back to this page.

***Directions:* Provide entries in ALL the grey spaces that apply for your Building Description and Annual Energy Consumption.**

Building Description

Preliminary: 9/17/07

Building Name: Upper Platt Colonial (optional entry)

5-digit Zip Code: 48108 — Not Sure?

Heating Degree Days: 6818

Mapping Location: *Ann Arbor, MI*

Cooling Degree Days: 840

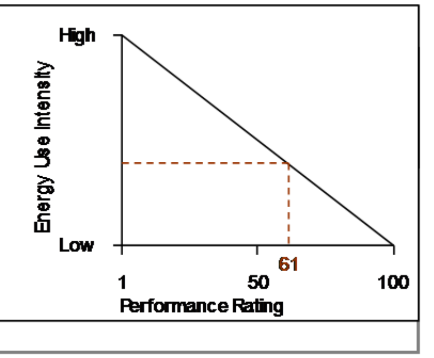
	Gross Floor Area (ft2)	Total Number of Units	Is This a Multifamily Building with Central Laundry? (Y/N)	Is this a Multi-Family Walkup Building? (Y/N)	Heated Floor Area (ft2)	Year Built
Building Description:	5,858	5	N	N	5,858	1964

Annual Consumption

	Electricity	Gas	#2 Fuel Oil	#4 Fuel Oil	District Steam	District Hot Water	Propane
Select Units:	kWh	Therms	Gal	Gal	kLbs	MMBtu	Gal
Energy	28,604	4,047					
Cost ($)	4,556	4,382					
Calculated unit cost:	$0.16 $/kWh	$1.08 $/therm	$/gallon	$/gallon	$/klbs	$/kBtu	$/gallon

Results

	Your Building	HUD Typical
Score Against Peers	**61**	50
Building Site Energy Use (kBtu/year)	502,297	557,943
Site Energy Use Intensity (kBtu/ft2-year)	85.7	95.2
Energy Cost Intensity ($/ft2-year)	1.53	1.69
Total Annual Energy Cost ($/year)	8,938	9,928



The HUD Residential Water Use Benchmarking Tool quantifies the performance of a user-defined building relative to the family of HUD residential buildings. A score of 75 denotes performance at the top 25th percentile of HUD residential buildings. A score of 50 denotes performance at the 50th percentile (in the middle) of HUD residential buildings. For definitions or help on the terms below, simply click on any underlined text. Click on "Return" text to come back to this page.

Directions: Provide entries in the gray spaces below with your building description and annual water consumption.

Building Description

ORNL 8/22/2007

Building Name: Upper Platt Colonial (optional entry)

5-digit Zip Code: 48108 Not Sure?

Mapping Location: *Ann Arbor, MI*

	Gross Floor Area of Building(s) (ft2)	Building(s) is Single-Family Detached or Semi-Detached? (Y/N)	Is Residents Water Use Paid Directly by the PHA? (Y/N)	Number of Units in Building(s)	Number of Units in Building(s) with In-Unit Laundry Hookups or Central Laundry Access?	How Many Buildings share this Water Meter?
Building Description:	5,858	Y	Y	5	5	1

Annual Consumption

Building Annual Water Use: 319,396 (gallons/year)

Building Annual Water Use Cost: 2,993 ($/year)

Average Annual Water Cost: $0.9 ($/100 gallons)

Results

	Your Building	HUD Typical
Score Against Peers	66	50
Annual Water Use (gal/year)	319,396	429,314
Annual Water Use Intensity (gal/ft2-year)	54.5	73.3
Annual Water Cost Intensity ($/ft2-year)	0.51	0.69
Total Annual Water Cost ($/year)	2,993	4,023

Photo 1: Exterior view of the complex

Photo 2: Utility meters on side of complex

Photo 3: Exterior wallpack on side of complex

Photo 4: Exterior view of the back of the complex

Photo 5: Soffit venting

Photo 6: Basement slider windows

Photo 7: Programmable thermostats in units

Photo 8: First floor joists and basement walls

Photo 9: Sink basin in basement near dryer

Photo 10: Clothes dryer in basement

Photo 11: Residential DHW storage tank in basement

Photo 12: Interior of furnace in basement

Photo 13: Unfinished bathroom in complex unit

Photo 14: Typical horizontal sliding window frame

Photo 13: Old furnace filter

Photo 14: Typical gas stove in unit

Photo 13: Kitchen faucet and sink

Photo 14: Bathroom faucet with aerator

Photo 13: Fiberglass blown insulation in attic

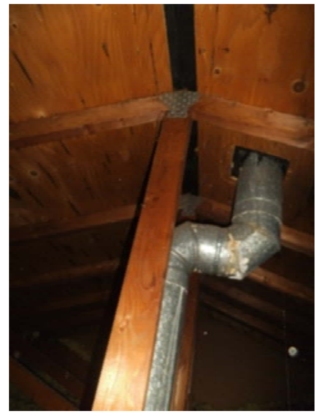


Photo 14: Vent stack to the roof

Lighting Summary

Interior Lighting

Zone / Space	Qty	Burn Hours	Existing Fixture Type	Existing Fixture	Input Watts per Fixture	Annual Consumption (kWh)	Proposed Fixture Type	Proposed Fixture	Input Watts per Fixture2	Annual Consumption (kWh)3	Demand Reduction (kW)	Retrofit Cost ($)	Annual Energy Savings (kWh)	Annual Cost Savings ($)	SP (yrs)
All Interior Lighting (3 units	66	1456	Incandescent	Incandescent - 60W	60	5766	CFL	19 watt CFL	19	1826	2.71	$ 198.00	3940	$622.79	0.3
											2.706	$ 198.00	3,939.94	$622.79	0.3

Exterior Lighting

Zone / Space	Qty	Burn Hours	Existing Fixture Type	Existing Fixture	Input Watts per Fixture	Annual Consumption (kWh)	Proposed Fixture Type	Proposed Fixture	Input Watts per Fixture2	Annual Consumption (kWh)3	Demand Reduction (kW)	Retrofit Cost ($)	Annual Energy Savings (kWh)	Annual Cost Savings ($)	SP (yrs)
Exterior Wallpacks	10	3925	HPS50	50 watt Metal Halide	56	2198	LED 10W WP	10W LED Wall Pack	10	364	N/A	$1,750.00	1834	$306.04	5.72
Exterior Wallpacks	1	3925	HPS250	250 watt Metal Halide	275	1079	FXLEDSFN/PCS	RAB 78w LED Wall Pack	91	357	N/A	$485.00	722	$120.51	4.02
						3277						$2,235.00	2,556.20	$426.55	5.24

TLED101

MINI POLYCARBONATE LED WALL PACK

TRACE LITE BARRON

Model Number:	Approvals:
Accessories:	
Type:	
Job:	

DESCRIPTION

The TLED101 series mini wallpack features a durable, vandal resistant, injection molded Bronze polycarbonate enclosure combined with a high performance LED light source that makes it a durable and efficient choice. Constructed of polycarbonate with a die cast aluminum base plate, the TLED101 is fully sealed and gasketed, is IP 65 rated and UL listed for Wet Locations. Available with a 10 watt LED light engine, the TLED101 provides an ideal light distribution and has a wide spectrum of applications including schools, office complexes, light commercial, apartments and recreational facilities.

SPECIFICATIONS

Construction:
Precision molded polycarbonate housing is mounted to a die cast aluminum base plate that provides superior heat dissipation while still maintaining an economical luminaire with durable performance. Fixture is completely sealed and gasketed with corrosion-resistant stainless steel captive fasteners. The LED light engine is protected by a high impact, UV stabilized polycarbonate prismatic refractor.

Optics:
TLED101 series mini wallpack delivers exceptional light quality, efficiency and light distribution. The 10 watt LED light engine powered by a constant current control driver provides a 50,000 hour rated life, 70% lumen maintenance, 4700K CCT and a CRI of ≥85. A low LED thermal junction (Tj) of 70°C (158°F) at a design ambient of 25°C (77°F) supports long life and low lumen depreciation.

Electrical:
LED light engines and drivers are securely mounted directly to the die cast aluminum base plate optimizing thermal management. LEDLITElogic heat sinking technology moves heat away from the LEDs maximizing system performance and delivering 50,000+ hour life with >70% lumen maintenance. The TLED101 series operates from 120-277V 50/60Hz with an auto-ranging voltage controlled circuit and simple two (2) wire input. The TLED101 is suitable for operation in -30°C (-22°F) to 40°C (104°F) ambient conditions. Optional transient surge protection and photocontrols are available.

Environmentally Friendly Design:
TLED101 luminaires consume very little energy and provide long life in comparison to traditional lamp technologies. Our manufacturing process utilizes no harmful chemicals such as mercury or lead and the LED light engines emit an extremely low UV and minimal heat. The compact design allows for the use of fewer materials and is recyclable, resulting in less overall waste.

Installation:
The TLED101 series is ideal for mounting to any vertical surface and easily attaches to a 3″ or 4″ j-box. The TLED101 can also be surface mounted using the ½″ conduit entry point at the bottom of the housing.

IESNA LM-79 and LM-80:
The TLED101 is evaluated in accordance with the parameters outlined and reported by LM-79 and LM-80 documents.

Listing:
UL Listed for wet locations.

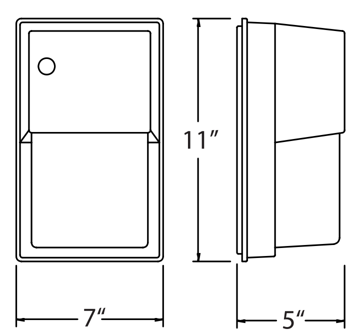
Warranty:
The TLED101 LEDLITElogic series features a 5 year warranty.

LEDLITElogic

Fixture Performance			
Watts	Lumens	Lumens Per Watt (LPW)	Total Watts
10	900	90	14

NOTE: Lumen maintenance and lfe (part of LM-80 data) are per published information from primary LED suppliers and is based on design operation at their specified thermal management and electrical design parameters.

DIMENSIONS



Approximate Weight: 4 lbs.

RoHS COMPLIANT

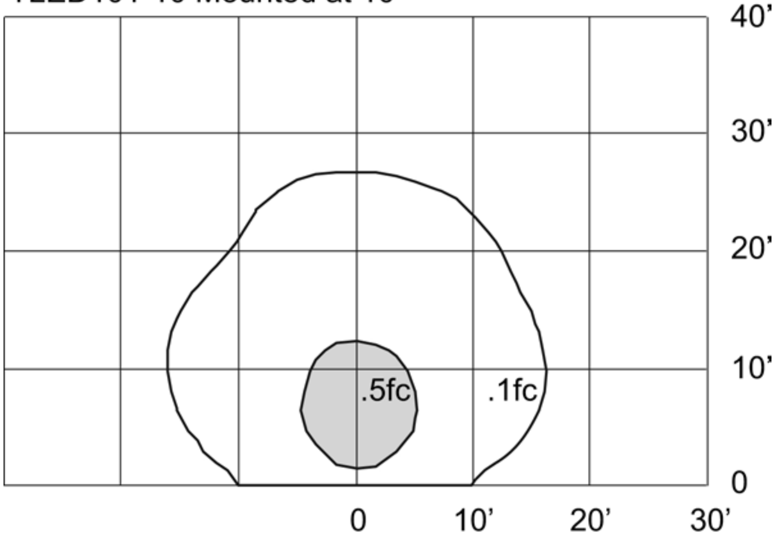
c UL us LISTED

SPECIFICATIONS ARE SUBJECT
TO CHANGE WITHOUT NOTICE

10810196 06/11

SAMPLE PHOTOMETRICS

TLED101-10 Mounted at 10'



ORDERING INFORMATION

TLED101	10	DT	TP	PC1
SERIES	TOTAL WATTS	VOLTS	OPTIONS (Factory Installed)	ACCESSORIES[1] (Field Installed)
TLED101	10 = 10 Watts	DT = 120/277V	TP = Transient Protection System	PC1 = 120V Photocontrol PC2 = 208-277V Photocontrol

[1] Order As Separate Line Item

BARRON lighting group

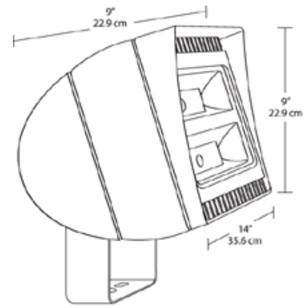
1911 West Parkside Lane • Phoenix, AZ 85027
888.533.3948 • 623.580.3948 • Fax: 623.580.8948
www.trace-lite.com • www.barronltg.com

FXLED78T

High power, wide distribution LED floodlight. Replaces 250W MH. Patent Pending airflow technology ensures long LED and driver lifespan. Use for building facade lighting, sign lighting, LED landscape lighting and instant-on security lighting.

Color: Bronze

Weight: 24.0 lbs



LED Info

Watts:	78W
Color Temp:	5100K (Cool)
Color Accuracy:	67
L70 Lifespan:	100000
LM79 Lumens:	5,927
Efficacy:	65 LPW

Driver Info

Type:	Constant Current
120V:	0.79
208V:	0.49
240V:	0.42
277V:	0.37
Input Watts:	91W
Efficiency:	86%

Technical Specifications

UL Listing:
Suitable for wet locations. Suitable for mounting within 1.2m (4ft) of the ground.

Lumen Maintenance:
100,000-hour LED lifespan based on IES LM-80 results and TM-21 calculations.

IP Rating:
Ingress Protection rating of IP66 for dust and water

EPA:
2

NEMA Type:
6H x 5V Beam Spread

Replacement Range:
The FXLED78 can be used to replace 150 - 320W Metal Halide Floodlights based on delivered lumens.

LEDs:
Six multi-chip, 13Watt high-output, long-life LEDs

Drivers (3):
Constant Current, Class 2, 720mA, 100 - 277V, 50 - 60 Hz, 100 - 277VAC 0.4 Amps

Fixture Efficacy:
65 Lumens per Watt

Surge Protection:
6 KV

Ambient Temperature:
Suitable for use in 40°C ambient temperatures.

Cold Weather Starting:
The minimum starting temperature is -40°F/-40°C.

Thermal Management:
Superior heat sinking with external Air-Flow fins.

Housing:
Die-cast aluminum housing and door frame

Mounting:
Heavy-duty Trunnion mount with stainless steel hardware

Color Stability:
RAB LED products exceed industry standards for chromatic stability.

Color Accuracy:
67 CRI

Color Temperature (Nominal CCT):
5100K

Color Uniformity:
RAB's range of CCT (Correlated Color Temperature) follows the guidelines of the American National Standard for (SSL) Products, ANSI C78.377-2008.

Reflector:
Semi-specular anodized aluminum

Gaskets:
High-temperature silicone gaskets

Finish:
Chip and fade resistant polyester powder coat finish.

Green Technology:
Mercury and UV free

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Note: Specifications are subject to change without notice

IESNA LM-79 & LM-80 Testing:
RAB LED luminaires have been tested by an independent laboratory in accordance with IESNA LM-79 and LM-80, and have received the Department of Energy Lighting Facts label.

California Title 24:
FFLED78 complies with California Title 24 building and electrical codes.

Warranty:
RAB LED fixtures give you peace of mind because both the fixture and driver components are backed by RAB's 5 Year Warranty. For more information,

Patents:
The FXLED78 design is protected by Taiwan Patent 01510949 and patents pending in the U.S., Canada, China, and Mexico.

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DTE Energy Multifamily Program Lighting Specifications

LIGHTING SPECIFICATIONS

All lighting projects are expected to comply with the Illuminating Engineering Society of North America (IESNA) recommended lighting levels or the local code. All final applications must include manufacturers' specification sheets for lamps and ballasts. All incentives are for one-for-one replacements except as noted.

Compact Fluorescent Lamps, Screw-In (≤ 31 Watts)
Incentives are available for the replacement of incandescent lamps with CFLs that are ENERGY STAR® rated or that meet ENERGY STAR® criteria. The lamps must have a luminous efficacy of ≥ 50 lumens per watt (LPW). Incentive is per lamp. *Note: This incentive is not available for CFLs purchased at retail stores participating in the DTE Energy CFL discount program. Incentives for CFLs purchased from those retailers is included in the discounted price.*

Compact Fluorescent Lamps, Screw-In (> 31 Watts)
Incentives are available for the replacement of incandescent lamps with high wattage CFLs. The new lamp must have a luminous efficacy of ≥ 65 lumens per watt (LPW). Incentive is per lamp. *Note: This incentive is not available for CFLs purchased at retail stores participating in the DTE Energy CFL discount program. Incentives for CFLs purchased from those retailers is included in the discounted price.*

Compact Fluorescent Fixtures
Incentives are available for upgrades to interior hardwired compact fluorescent fixtures. Replacement fixtures must be new fixtures or modular hardwired retrofits with hardwired electronic ballasts. The compact fluorescent ballast must be programmed start or programmed rapid start with a power factor (PF) ≥ 0.90 and a total harmonic distortion (THD) ≤ 20%. Incentive is per fixture.

Compact Fluorescent Reflector Flood Lamps
Incentives are available to install CFL reflector flood lamps to replace incandescent reflector flood lamps. The CFL reflector flood lamps must have a luminous efficacy of ≥ 33 lumens per watt (LPW). Incentive is per lamp. *Note: This incentive is not available for CFL's purchased at retail stores participating in the DTE Energy CFL discount program. Incentives for CFLs purchased from those retailers is included in the discounted price.*

42W 8-Lamp Compact Fluorescent High Bay Fixture
Incentives are available in high-bay applications (ceiling heights over 15 feet) for replacing any lighting fixtures greater than or equal to 350W with 42 Watt, 8 lamp compact fluorescent fixtures. Replacement fixtures must contain specular reflectors and electronic ballasts with a power factor (PF) ≥ 0.90. Incentive is per fixture.

ENERGY STAR® Qualified LED Recessed Down Light
Incentives are available to replace incandescent recessed lights with ENERGY STAR® qualified LED recessed down lights. Replacement lights must have a minimum efficacy of 35 lumens per watt. Incentive is per lamp. *Note: This incentive is not available for lamps purchased at retail stores participating in the DTE Energy lamp discount program. Incentive for lamps purchased from those retailers is included in the discounted price.*

Standard Linear Fluorescent Retrofit
Incentives are available for replacing existing T12 lamps and magnetic ballasts with T8 or T5 lamps and electronic ballasts. The new fixture lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥ 20 kHz), UL listed, and warranted against defects for a minimum of 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic discharge (THD) ≤ 20 % at full power output. For 2 and 3-foot lamps, ballasts must have THD ≤ 32 % at full light output. Incentive is per fixture.

High Output T8/T5 Lamp and Ballast replacing T12 Fluorescent Lamp
Incentives are available for replacing existing T12 lamps and magnetic ballasts with T5HO or T8HO lamps and electronic ballasts. The replacement lamps must have a CRI ≥ 80. Incentive is per fixture.

Low Wattage 4-foot T8 Lamps (Lamps Only)
Incentives are available for replacing 32 Watt T8 lamps with reduced (low) wattage T8 lamps when an electronic ballast is already present. The lamps must be reduced wattage in accordance with the Consortium for Energy Efficiency© (CEE©) specifications (www.cee1.org) and as summarized in Table 2 below. Low wattage lamps must be either 25W or 28W and CEE© Listed. Qualified products can be found at http://www.cee1.org/com/com-lt/com-lt-main.php3. Incentive is per lamp.

High Performance 4-foot T8 Lamp and Ballast
Incentives are available for replacing existing T12 or T12HO lamps and magnetic ballasts or standard T8 lamps and electronic ballasts with high performance T8 lamps and electronic ballasts. Replacement fixtures must high performance in accordance with the Consortium for Energy Efficiency© (CEE©) high performance T8 specification, available at www.cee1.org, which and is summarized in Table 1 below. A list of qualified lamps and ballasts can be found at: http://www.cee1.org/com/com-lt/com-lt-main.php3. Both the lamp and ballast must meet the specification in order to be eligible for an incentive. Incentive is per fixture.

LIGHTING SPECIFICATIONS

Table 1: High Performance T8 Specifications

High Performance T8 and T5 Characteristics				
Mean System Efficacy	≥ 90 Mean Lumens per Watt (MLPW) for Instant Start Ballasts			
	≥ 88 MLPW for Programmed Rapid Start Ballasts			
Performance Characteristics for Lamps				
Color Rendering Index (CRI)	≥ 80			
Minimum Initial Lamp Lumens	≥ 3100 Lumens *			
Lamp Life	≥ 24,000 Hours			
Lumen Maintenance or Minimum Mean Lumens	≥ 94% or ≥ 2900 Mean Lumens			
Performance Characteristics for Ballasts				
Ballast Efficacy Factor (BEF) BEF = (BFx100)/Ballast Input Watts	**Instant Start Ballast (BEF)**			
	Lamps	Low BF ≤ 0.85	Norm 0.85 < BF ≤ 1.0	High BF ≥ 1.01
	1	> 3.08	> 3.11	NA
	2	> 1.60	> 1.58	> 1.55
	3	≥ 1.04	≥ 1.05	≥ 1.04
	4	≥ 0.79	≥ 0.80	≥ 0.77
	Programmed Rapid Start Ballast (BEF)			
	1	≥ 2.84	≥ 2.84	NA
	2	≥ 1.48	≥ 1.47	≥ 1.51
	3	≥ 0.97	≥ 1.00	≥ 1.00
	4	≥ 0.76	≥ 0.75	≥ 0.75
Ballast Frequency	20 to 33 kHz or ≥ 40 kHz			
Power Factor	≥ 0.90			
Total Harmonic Distortion	≤ 20%			

* For lamp with color temperatures ≥ 4500k. 2950 minimum initial lamp lumens are allowed.

Low Wattage 4-foot T8 Lamp and Ballast

Incentives are available for replacing T12 systems with reduced (low) wattage lamp and electronic ballast systems. The lamps and ballasts must meet the Consortium for Energy Efficiency© (CEE©) specification (www.cee1.org) and summarized in Table 8-2 on the following page. Qualified lamp and ballast products can be found at http://www.cee1.org/com/com-lt/com-lt-main.php3. Both the lamp and ballast must qualify in order to receive an incentive for the system. Incentive is per fixture.

Table 2: Reduced (Low) Wattage 4-foot Lamps and Ballasts

Performance Characteristics for Lamps(1)		
Mean System Efficacy	≥ 90 MLPW	
Color Rendering Index (CRI)	≥ 80	
Minimum Initial Lamp Lumens	≥ 2585 Lumens for 28 W	
	≥ 2400 Lumens for 25 W	
Lamp Life(2)	≥ 18,000 hrs at three hours per start	
Lumen Maintenance –or- Minimum Mean Lumens(3)	≥ 94% -or- ≥ 2430 Lumens for 28 W ≥ 2256 Lumens for 25 W	
Performance Characteristics for 28 and 25 W Ballasts		
Ballast Frequency	20 to 33 Hz or ≥ 40 kHz	
Power Factor	≥ 0.90	
Total Harmonic Distortion	≤ 20%	
Performance Characteristics for Ballasts(4), 28 W systems		
Ballast Efficiency Factor (BEF)	Instant Start Ballast (BEF)	
BEF = [BF x 100]/Ballast Input Watts Based on: (1) Type of ballast (2) No. of lamps driven by ballast (3) Ballast Factor	Lamps	All BEF Ranges
	1	≥ 3.52
	2	≥ 1.76
	3	≥ 1.16
	4	≥ 0.88
Performance Characteristics for Ballasts(4), 25 W systems		
Ballast Efficiency Factor (BEF)	Instant Start Ballast (BEF)	
BEF = [BF x 100]/Ballast Input Watts Based on: (1) Type of ballast (2) No. of lamps driven by ballast (3) Ballast Factor	Lamps	All BEF Ranges
	1	≥ 3.95
	2	≥ 1.98
	3	≥ 1.32
	4	≥ 0.99

(1) Lamps ≥ 4500 K and/or 24,000 hours have a system efficacy specified ≥ 88 MLPW. Minimum initial and mean lumen levels are specified as follows: for 28 W lamps, limits are 2600/2340. For 25 W lamps, limits are 2300/2185.

(2)Life rating is based on an Instant Start Ballast tested in accordance with ANSI protocols. When used for Programmed Start Ballast, life may be increased depending upon the operating hours per start.

(3) Mean lumens measures at 7,200 hours

(4) Multi-Voltage Ballasts must meet or exceed the listed Ballast Efficiency Factor when operated on at least one of the intended operating voltages.

LIGHTING SPECIFICATIONS

High Output T5 and 4-foot T8 New Fixture Replacing HID

Incentives are available for replacements of HID fixtures with T8 or T5HO lamps and electronic ballasts. The T8 or T5HO lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥ 20 kHz), UL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic distortion (THD) ≤ 20% at full light output. This incentive is available for high-bay and low-bay fluorescent applications. Incentive is per fixture.

Pulse Start Metal Halide (retrofit only)

Incentives are available for replacing existing HID fixtures with pulse start metal halide fixtures in high-bay applications. Incentive is per fixture.

Exterior HID to LED/Induction Lighting Retrofit

Incentives are available for exterior applications for replacing existing high intensity discharge fixtures with LED or Induction fixtures. Existing fixtures must operate > 3,833 hours per year (> 10.5 hours per day). Fixture replacement must result in at least a 40% power reduction. LED fixtures must have a minimum efficacy of 35 lumens per watt. Eligible applications include canopy lighting and wall-packs. This incentive can be combined with incentives for exterior/garage bi-level control. Incentive is per fixture.

Garage HID to LED/Induction Lighting Retrofit

Incentives are available for garage and parking deck applications for replacing existing high intensity discharge fixtures with LED or Induction fixtures. Existing fixtures must operate 8760 hours per year or whenever the garage is open. Fixture replacement must result in at least a 40% power reduction. LED fixtures must have a minimum efficacy of 35 lumens per watt. Incentive is per fixture.

Exit Signs

Incentives are available for high-efficiency exit signs replacing or retrofitting an existing incandescent exit sign. Electroluminescent, T1, and LED exit signs are eligible. Non-electrified and remote exit signs are not eligible. All replacement exit signs must be UL or ETL listed, have a minimum lifetime of 10 years, and have an input wattage ≤ 5 Watts per face or be ENERGY STAR® listed. Incentive is per sign.

LED Traffic and Pedestrian Lights

Incentives are available for LED traffic lights on a per-signal basis (including arrows) that replace or retrofit an existing incandescent traffic signal. At minimum, red and green lamps must be retrofitted to qualify for the signal incentive. LED Signals must have a wattage of ≤17 watts per signal. Incentives are not available for spare lights. Lights must be hardwired, with the exception of pedestrian hand signals. Incentive is per signal.

Occupancy Sensors

Incentives are available for occupancy sensors for low occupancy interior areas, which automatically turn lights on when movement is detected. The minimum amount of time for the lights to stay on when no movement is sensed (delay set time) should be 10 minutes. The sensors can be passive infrared (PIR) or ultrasonic. All sensors should be hard-wired and control interior lighting fixtures. *To assist in rebate processing, provide the inventory of the controlled fixtures with the Final Application*. Incentive is per sensor.

Central Lighting Control

Incentives are available for automated central lighting control systems with override capabilities. This measure includes time clocks, package programmable relay panels, and complete building automation controls. Photo-sensors may also be incorporated into the central lighting control system. Incentive is per 10,000 square feet of controlled area.

Switching Controls for Multilevel Lighting

Incentives are available to install switching controls for multilevel lighting which may be used with daylight or occupancy sensors. If combined with daylight sensors, the controls must be commissioned in order to ensure proper sensor calibration and energy savings. This measure is applicable to spaces that require various lighting schemes such as classrooms, auditoriums, conference rooms and warehouses with skylights. Incentive is per 10,000 square feet of controlled area.

Daylight Sensor Controls

Incentives are available for new daylight sensor controls in spaces with reasonable amounts of sunlight exposure and areas where task lighting is not critical. The controls can be on/off, stepped, or continuous (dimming). The on/off controller should turn off artificial lighting when the interior illuminance meets the desired indoor lighting level. Daylight sensor controls are required to be commissioned in order to ensure proper sensor calibration and energy savings. Incentive is per 10,000 SF of controlled area.

Exterior Lighting, Bi-Level Control with Override

Incentives are available for retrofitting existing, exterior HID lighting with bi-level controls that reduce lighting levels by at least 50% when the space is unoccupied. The HID lighting must have an electronic ballast capable of reduced power levels, and be coupled with motion sensors to bring the light back to full lumen output for security reasons. Eligible controls include on-off controls, dimmers, and hi-lo ballast controls. This measure is applicable to exterior fixtures that are on during the night. Incentive is per fixture.

Light Tube

Incentives are available for new light tubes (tubular skylights) 10 inches to 21 inches in diameter. This measure is applicable to spaces that normally require electric lighting during peak hours (1 - 4 p.m. weekdays during the summer). The light tube must still allow an adequate amount of light during overcast conditions and must be coupled to daylight sensing controls. Incentive is per tube.

Delamping

Incentives are available for the permanent removal of existing fluorescent lamps. Permanent lamp removal is the net reduction in the quantity of lamps after a project is completed. Customers are responsible for determining whether reflectors are necessary in order to maintain adequate lighting levels. Lighting retrofits are expected to meet the Illuminating Engineering Society of North America (IESNA) recommended light levels. Unused lamps, lamp holders, and ballasts must be removed permanently from the fixture and disposed of in accordance with local regulations. This measure is applicable when retrofitting from T12 lamps to T8 lamps only. Removal of lamps from a T12 fixture that is not being retrofitted with T8 lamps is not eligible for this incentive, but may be eligible for other incentives. Incentive is per lamp removed.

HVAC (ELECTRIC) SPECIFICATIONS

Programmable Thermostat Setback/Setup (Air Conditioning)

Incentives are available for replacement programmable thermostats that meet ENERGY STAR® criteria and replace any non-programmable thermostat to automatically adjust the temperature at pre-selected times. To meet ENERGY STAR® standards, thermostats must be capable of maintaining two separate programs (to address the different comfort needs of weekdays and weekends) and up to four temperature settings for each program. A current list of ENERGY STAR® qualified thermostats may be found at http://downloads.energystar.gov/bi/qplist/prog_thermostat_prod_list.pdf. Incentive is per thermostat.

GAS SPECIFICATIONS

All final applications must include manufacturers' equipment specification sheets

General Clause for Heating Measures

Prescriptive incentives are available only for retrofit projects using natural gas as the primary fuel source. If a dual-fuel system is used, or if natural gas is the back-up or redundant fuel, the custom incentive application must be used. The incentives for boilers are only available for equipment used in space heating conditions, except for steam traps. Equipment for process load may be eligible for custom incentives.

Steam Trap Repair/Replacement

Incentives are available for the repair or replacement of steam traps that have failed open and that are leaking steam. Incentive is not available for traps that have failed closed or that are plugged. Replacement with an orifice trap is not eligible. Incentive is available once per 24 month period, per facility. Steam trap repair work must be recorded and the service report must be attached to the incentive application. Incentive is per repaired or replaced trap. The report must contain:

- Name of Survey/Repair Technician
- Survey/Repair Date
- System nominal steam pressure
- Annual hours of operation
- Number of steam traps serviced
- Per steam trap:
  - o ID tag number, location and type of trap
  - o If repair or replaced:
    - Orifice Size
    - Pre-and Post Conditions (e.g., Functioning/Not Functioning, Leaking/Not Leaking)

Pipe Wrap - Steam Boiler

Incentives are available for insulation applied to bare steam boiler piping. Insulation must have an applied thickness of 1 inch and an thermal resistance of R-4. A minimum of 10 linear feet of pipe must be insulated. The bare pipe size must be ½ inch or larger. Incentive is per linear foot of insulation.

Pipe Wrap - Hot Water Boiler

Incentives are available for insulation applied to bare hot water boiler piping. Insulation must have an applied thickness of 1 inch and an thermal resistance of R-4. A minimum of 10 linear feet of pipe must be insulated. The bare pipe size must be ½ inch or larger. Incentive is per linear foot of insulation.

Programmable Thermostat Setback/Setup (Gas Heat)

Incentives are available for new programmable thermostats that meet ENERGY STAR® criteria and replace any non-programmable thermostat to automatically adjust the temperature at pre-selected times. To meet ENERGY STAR® criteria, thermostats must be capable of maintaining two separate programs (to address the different comfort needs of weekdays and weekends) and up to four temperature settings for each program. A current list of ENERGY STAR® qualified thermostats may be found at http://downloads.energystar.gov/bi/qplist/prog_thermostat_prod_list.pdf. Incentive is per thermostat.

GAS SPECIFICATIONS

All final applications must include manufacturers' equipment specification sheets

Boiler Tune-up (Space Heating Boilers Only)

Incentives are available for tune-ups to natural gas fired, space heating boilers. Burners must be adjusted to improve combustion efficiency as needed. The incentive is available once in a 24 month period. Boiler size must be 110 MBH or greater. The service provider must perform before and after combustion analyses and attach the tune-up report to the Final Application. Incentive is per boiler. Tune-up report must contain the following information:

- Name of the technician performing tune-up
- Date of tune-up
- Boiler type (hot water, low pressure steam, high pressure steam)
- Boiler nameplate information (make, model, capacity)
- Annual hours of operation
- Pre-and Post combustion analysis results (an electronic flue gas analyzer must be used) including
    - o Combustion efficiency
    - o Stack temperature
    - o Flue gas levels of O2, CO2 and CO
- Statement that the following were performed:
    - o Check and adjust combustion air flow and air intake as needed
    - o Check burner and gas input
    - o Check draft control dampers
    - o Clean burners, nozzles, combustion chamber and heat exchanger surface (when weather or operating schedule permits
    - o Check combustion chamber seals
    - o Check for proper venting
    - o Complete visual inspection of system piping and installation
    - o Check safety controls

Boiler Water Reset Control

Incentives are available for boiler water reset controls added to existing boilers operating with a constant supply temperature. Incentives are for existing space heating boilers only. A replacement boiler with boiler reset controls is not eligible. The system must be set so that the minimum temperature is not more than 10°F above manufacturer's recommended minimum return temperature. For controls on multiple boilers to be eligible, control strategy must stage the lag boiler(s) only after the lead boiler fails to maintain the desired boiler water temperature. Incentive is per boiler.

YOUR ENERGY SAVINGS℠

YourEnergySavings.com

DTE Energy

DTE Energy
Multifamily Program

DTE Multifamily Program Application

Required Site Information

SITE NAME	FEDERAL TAX ID

SITE ADDRESS

CITY	STATE	ZIP CODE

SITE REPRESENTATIVE NAME	SITE REPRESENTATIVE PHONE #
SITE REPRESENTATIVE EMAIL ADDRESS	**SITE REPRESENTATIVE FAX #**
SECONDARY REPRESENTATIVE NAME	**SECONDARY REPRESENTATIVE PHONE #**

Required Management Company/Owner Information

MANAGEMENT COMPANY NAME	FEDERAL TAX ID

MAILING ADDRESS

CITY	STATE	ZIP CODE

MANAGEMENT COMPANY REPRESENTATIVE NAME	MANAGEMENT REPRESENTATIVE PHONE #
MANAGEMENT COMPANY EMAIL ADDRESS	**MANAGEMENT COMPANY FAX #**
SECONDARY REPRESENTATIVE NAME	**SECONDARY REPRESENTATIVE PHONE #**

Required Site Information

ELECTRICITY PROVIDER	ELECTRIC ACCOUNT NUMBER	GAS PROVIDER	GAS ACCOUNT NUMBER
YEAR BUILT	**TOTAL # OF UNITS**	**TOTAL # OF BUILDINGS**	**TOTAL # OF VACANT UNITS**

TOTAL NUMBER OF FLOORS	DOES BUILDING HAVE BASEMENTS?	MAX # OF BATHROOMS PER UNIT
MAX # OF SHOWERS PER UNIT	**MAX # OF SINKS PER BATHROOM**	**AVERAGE SQUARE FOOTAGE OF UNITS**

Optional Site Information

TOTAL # OF SHOWERS ON PROPERTY	TOTAL # OF SINKS ON PROPERTY	ARE WATER HEATERS IN UNITS?

In accordance with ACCA Manual J

Report Prepared By:

AKT Peerless

For:

3681 Upper Platt
3681 Platt Road
Ann Arbor, Michigan 48108

Design Conditions: Yipsilanti

Indoor:		Outdoor:	
Summer temperature:	75	Summer temperature:	89
Winter temperature:	70	Winter temperature:	5
Relative humidity:	50	Summer grains of moisture:	22
		Daily temperature range:	Medium

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Whole House	1,620 sq.ft.	12,849	920	13,769 (1 tons)	31,355
First Floor		6,417	920	7,337	15,366
All Rooms	540 sq.ft.	6,417	920	7,337	15,366
Infiltration - Tightness: Avg.; Winter ACH: .86 ; Summer ACH: .43		683	0	683	6,342
People	4	1,200	920	2,120	0
Miscellaneous		1,200	0	1,200	0
Floor - Over unheated basement; Hardwood or tile; No insulation	540 sq.ft.	0	0	0	5,476
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	124.5 sq.ft.	197	0	197	728
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	17.5 sq.ft.	1,218	0	1,218	564
Door - Metal; Fiberglass; Storm	18 sq.ft.	116	0	116	429
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	120.5 sq.ft.	191	0	191	705
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	21.5 sq.ft.	1,496	0	1,496	693
Door - Metal; Fiberglass; Storm	18 sq.ft.	116	0	116	429
Second Floor		5,946	0	5,946	10,558
All Rooms	540 sq.ft.	5,946	0	5,946	10,558

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Infiltration - Tightness: Avg.; Winter ACH: .86 ; Summer ACH: .43		413	0	413	3,839
Duct - Supply above 120; Exposed to outdoor ambient; R-4		776	0	776	1,760
Floor - Over conditioned space	540 sq.ft.	0	0	0	0
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	130 sq.ft.	206	0	206	761
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	30 sq.ft.	2,088	0	2,088	967
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	143.5 sq.ft.	227	0	227	839
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	16.5 sq.ft.	1,148	0	1,148	532
Ceiling - Under ventilated attic; R-19 (4 - 6.5 inch); Dark	540 sq.ft.	1,088	0	1,088	1,860
Basement		486	0	486	5,431
All Rooms	540 sq.ft.	486	0	486	5,431
Infiltration - Tightness: Avg.; Winter ACH: .86 ; Summer ACH: .43		36	0	36	334
Floor - Basement floor, 2' or more below grade; Concrete; Not applicable	540 sq.ft.	0	0	0	842
W Wall - Masonry, above grade; R-51 in.; 8 or 12 in. Block	60 sq.ft.	89	0	89	562
E Wall - Masonry, above grade; R-51 in.; 8 or 12 in. Block	56 sq.ft.	83	0	83	524
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	4 sq.ft.	278	0	278	129
E Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	100 sq.ft.	0	0	0	481
W Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	100 sq.ft.	0	0	0	481
S Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	216 sq.ft.	0	0	0	1,039
N Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	216 sq.ft.	0	0	0	1,039
Whole House	1,620 sq.ft.	12,849	920	13,769 (1 tons)	31,355

Load calculations are estimates only, actual loads may vary due to weather and construction differences.

In accordance with ACCA Manual J

Report Prepared By:

AKT Peerless

For:

3683 Upper Platt
3683 Platt Road
Ann Arbor, Michigan 48108

Design Conditions: Yipsilanti

Indoor:		Outdoor:	
Summer temperature:	75	Summer temperature:	89
Winter temperature:	70	Winter temperature:	5
Relative humidity:	50	Summer grains of moisture:	22
		Daily temperature range:	Medium

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Whole House	1,200 sq.ft.	12,043	690	12,733 (1 tons)	25,706
First Floor		6,164	690	6,854	12,826
All Rooms	400 sq.ft.	6,164	690	6,854	12,826
Infiltration - Tightness: Avg.; Winter ACH: 1 ; Summer ACH: .5		592	0	592	5,504
People	3	900	690	1,590	0
Miscellaneous		1,200	0	1,200	0
Floor - Over unheated basement; Hardwood or tile; No insulation	400 sq.ft.	0	0	0	4,056
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	92.5 sq.ft.	147	0	147	541
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	17.5 sq.ft.	1,218	0	1,218	564
Door - Metal; Fiberglass; Storm	18 sq.ft.	116	0	116	429
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	85 sq.ft.	135	0	135	497
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	25 sq.ft.	1,740	0	1,740	806
Door - Metal; Fiberglass; Storm	18 sq.ft.	116	0	116	429
Second Floor		5,427	0	5,427	8,770
All Rooms	400 sq.ft.	5,427	0	5,427	8,770

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Infiltration - Tightness: Avg.; Winter ACH: 1 ; Summer ACH: .5		345	0	345	3,205
Duct - Supply above 120; Exposed to outdoor ambient; R-4		708	0	708	1,462
Floor - Over conditioned space	400 sq.ft.	0	0	0	0
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	107 sq.ft.	169	0	169	626
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	21 sq.ft.	1,462	0	1,462	677
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	102.5 sq.ft.	162	0	162	600
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	25.5 sq.ft.	1,775	0	1,775	822
Ceiling - Under ventilated attic; R-19 (4 - 6.5 inch); Dark	400 sq.ft.	806	0	806	1,378
Basement		444	0	444	4,041
All Rooms	400 sq.ft.	444	0	444	4,041
Infiltration - Tightness: Avg.; Winter ACH: 1 ; Summer ACH: .5		30	0	30	279
Floor - Basement floor, 2' or more below grade; Concrete; Not applicable	400 sq.ft.	0	0	0	624
W Wall - Masonry, above grade; R-51 in.; 8 or 12 in. Block	48 sq.ft.	71	0	71	449
E Wall - Masonry, above grade; R-51 in.; 8 or 12 in. Block	44 sq.ft.	65	0	65	412
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	4 sq.ft.	278	0	278	129
E Wall BelowGr - Block or brick, extends over 5' below grade; R-51 in.; 8 or 12 in. Block	80 sq.ft.	0	0	0	307
W Wall BelowGr - Block or brick, extends over 5' below grade; R-51 in.; 8 or 12 in. Block	80 sq.ft.	0	0	0	307
S Wall BelowGr - Block or brick, extends over 5' below grade; R-51 in.; 8 or 12 in. Block	200 sq.ft.	0	0	0	767
N Wall BelowGr - Block or brick, extends over 5' below grade; R-51 in.; 8 or 12 in. Block	200 sq.ft.	0	0	0	767
Whole House	1,200 sq.ft.	12,043	690	12,733 (1 tons)	25,706

Load calculations are estimates only, actual loads may vary due to weather and construction differences.

In accordance with ACCA Manual J

Report Prepared By:

AKT Peerless

For: 3685 Upper Platt
3865 Platt Road
Ann Arbor, Michigan 48108

Design Conditions: Yipsilanti

Indoor:		Outdoor:	
Summer temperature:	75	Summer temperature:	89
Winter temperature:	70	Winter temperature:	5
Relative humidity:	50	Summer grains of moisture:	22
		Daily temperature range:	Medium

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Whole House	1,953 sq.ft.	14,327	1,150	15,477 (1.5 tons)	34,895
First Floor		5,734	1,150	6,884	15,033
All Rooms	651 sq.ft.	5,734	1,150	6,884	15,033
Infiltration - Tightness: Avg.; Winter ACH: .75 ; Summer ACH: .4		592	0	592	5,146
People	5	1,500	1,150	2,650	0
Miscellaneous		1,200	0	1,200	0
Floor - Over unheated basement; Hardwood or tile; No insulation	651 sq.ft.	0	0	0	6,601
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	132.5 sq.ft.	210	0	210	775
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	17.5 sq.ft.	1,218	0	1,218	564
Door - Metal; Fiberglass; Storm	18 sq.ft.	116	0	116	429
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	142 sq.ft.	225	0	225	831
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	8 sq.ft.	557	0	557	258
Door - Metal; Fiberglass; Storm	18 sq.ft.	116	0	116	429
Second Floor		8,096	0	8,096	13,847
All Rooms	651 sq.ft.	8,096	0	8,096	13,847

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Infiltration - Tightness: Avg.; Winter ACH: .75 ; Summer ACH: .4		640	0	640	5,562
Duct - Supply above 120; Exposed to outdoor ambient; R-4		1,056	0	1,056	2,308
Floor - Over conditioned space	651 sq.ft.	0	0	0	0
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	128 sq.ft.	203	0	203	749
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	40 sq.ft.	2,784	0	2,784	1,290
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	141 sq.ft.	223	0	223	825
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	27 sq.ft.	1,879	0	1,879	870
Ceiling - Under ventilated attic; R-19 (4 - 6.5 inch); Dark	651 sq.ft.	1,311	0	1,311	2,243
Basement		497	0	497	6,015
All Rooms	651 sq.ft.	497	0	497	6,015
Infiltration - Tightness: Avg.; Winter ACH: .75 ; Summer ACH: .4		38	0	38	332
Floor - Basement floor, 2' or more below grade; Concrete; Not applicable	651 sq.ft.	0	0	0	1,016
W Wall - Masonry, above grade; R-51 in.; 8 or 12 in. Block	63 sq.ft.	93	0	93	590
E Wall - Masonry, above grade; R-51 in.; 8 or 12 in. Block	59 sq.ft.	88	0	88	552
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	4 sq.ft.	278	0	278	129
E Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	105 sq.ft.	0	0	0	505
W Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	105 sq.ft.	0	0	0	505
S Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	248 sq.ft.	0	0	0	1,193
N Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	248 sq.ft.	0	0	0	1,193
Whole House	1,953 sq.ft.	14,327	1,150	15,477 (1.5 tons)	34,895

Load calculations are estimates only, actual loads may vary due to weather and construction differences.

In accordance with ACCA Manual J

Report Prepared By:

AKT Peerless

For:

3867 Upper Platt
3867 Platt Road
Ann Arbor, Michigan 48108

Design Conditions: Yipsilanti

Indoor:		Outdoor:	
Summer temperature:	75	Summer temperature:	89
Winter temperature:	70	Winter temperature:	5
Relative humidity:	50	Summer grains of moisture:	22
		Daily temperature range:	Medium

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Whole House	1,102.5 sq.ft.	11,189	690	11,879 (1 tons)	26,180
First Floor		5,396	690	6,086	11,974
All Rooms	368 sq.ft.	5,396	690	6,086	11,974
Infiltration - Tightness: Avg.; Winter ACH: 1.03 ; Summer ACH: .5		535	0	535	5,132
People	3	900	690	1,590	0
Miscellaneous		1,200	0	1,200	0
Floor - Over unheated basement; Hardwood or tile; No insulation	367.5 sq.ft.	0	0	0	3,726
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	104.5 sq.ft.	166	0	166	611
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	17.5 sq.ft.	1,218	0	1,218	564
Door - Metal; Fiberglass; Storm	18 sq.ft.	116	0	116	429
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	108 sq.ft.	171	0	171	632
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	14 sq.ft.	974	0	974	451
Door - Metal; Fiberglass; Storm	18 sq.ft.	116	0	116	429
Second Floor		5,333	0	5,333	9,800
All Rooms	368 sq.ft.	5,333	0	5,333	9,800

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Infiltration - Tightness: Avg.; Winter ACH: 1.03 ; Summer ACH: .5		330	0	330	3,170
Duct - Supply above 120; Exposed to outdoor ambient; R-4		696	0	696	1,633
Floor - Over conditioned space	367.5 sq.ft.	0	0	0	0
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	119 sq.ft.	188	0	188	696
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	21 sq.ft.	1,462	0	1,462	677
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	119 sq.ft.	188	0	188	696
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	21 sq.ft.	1,462	0	1,462	677
S Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	168 sq.ft.	266	0	266	983
Ceiling - Under ventilated attic; R-19 (4 - 6.5 inch); Dark	368 sq.ft.	741	0	741	1,268
Basement		459	0	459	4,407
All Rooms	368 sq.ft.	459	0	459	4,407
Infiltration - Tightness: Avg.; Winter ACH: 1.03 ; Summer ACH: .5		31	0	31	302
Floor - Basement floor, 2' or more below grade; Concrete; Not applicable	367.5 sq.ft.	0	0	0	573
W Wall - Masonry, above grade; R-51 in.; 8 or 12 in. Block	52.5 sq.ft.	78	0	78	491
E Wall - Masonry, above grade; R-51 in.; 8 or 12 in. Block	48.5 sq.ft.	72	0	72	454
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	4 sq.ft.	278	0	278	129
E Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	87.5 sq.ft.	0	0	0	421
W Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	87.5 sq.ft.	0	0	0	421
S Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	168 sq.ft.	0	0	0	808
N Wall BelowGr - Block or brick, extends to 5' below grade; R-51 in.; 8 or 12 in. Block	168 sq.ft.	0	0	0	808
Whole House	1,102.5 sq.ft.	11,189	690	11,879 (1 tons)	26,180

In accordance with ACCA Manual J

Report Prepared By:

AKT Peerless

For:

3689 Upper Platt
3689 Platt Road
Ann Arbor, Michigan 48108

Design Conditions: Yipsilanti

Indoor:		Outdoor:	
Summer temperature:	75	Summer temperature:	89
Winter temperature:	70	Winter temperature:	5
Relative humidity:	50	Summer grains of moisture:	22
		Daily temperature range: Medium	

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Whole House	630 sq.ft.	8,632	460	9,092 (1 tons)	24,471
First Floor		8,639	460	9,099	24,553
All Rooms	630 sq.ft.	8,639	460	9,099	24,553
Infiltration - Tightness: Avg.; Winter ACH: 1.19 ; Summer ACH: .5		654	0	654	7,229
Duct - Supply above 120; Enclosed in unheated space; R-4		411	0	411	3,203
People	2	600	460	1,060	0
Miscellaneous		1,200	0	1,200	0
Floor - Over enclosed crawl space; Hardwood or tile; No insulation	630 sq.ft.	0	0	0	6,388
S Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	236 sq.ft.	374	0	374	1,381
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	4 sq.ft.	142	0	142	129
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	115 sq.ft.	182	0	182	673
Window - Double pane; Vinyl frame; Clear glass	35 sq.ft.	2,436	0	2,436	1,128

Building Component			Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
- No inside shading; Coating: None (clear glass); No outside shading.						
Door - Metal; Fiberglass; Storm	18	sq.ft.	116	0	116	429
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	137.5	sq.ft.	218	0	218	804
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	12.5	sq.ft.	870	0	870	403
Door - Metal; Fiberglass; Storm	18	sq.ft.	116	0	116	429
N Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	32	sq.ft.	51	0	51	187
Ceiling - Under ventilated attic; R-19 (4 - 6.5 inch); Dark	630	sq.ft.	1,269	0	1,269	2,170
Whole House	630	sq.ft.	8,632	460	9,092 (1 tons)	24,471

Load calculations are estimates only, actual loads may vary due to weather and construction differences.

AKTPEERLESS

3.1 Acknowledgements of Part 2: Energy Audit

The Energy Audit Report and Excel RPCA Model were completed by Jason Bing and Henry McElvery of AKT Peerless. AKT Peerless certifies that the report preparers meet the qualifications identified in the RAD Physical Condition Assessment Statement of Work and Contractor Qualifications Part 2.1 (Version 1, October 2012).

Jason Bing, RA, LEED AP
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Phone: 773.426.5454
Fax: 248.615.1334
Building Analyst Professional No. 5023902
Building Performance Institute

Date: October 9, 2013

Part 2 Energy Audit Report and Excel RPCA Model were Received and Reviewed by Owner:

Jennifer Hall, Executive Director
Ann Arbor Housing Commission
727 Miller Ave
Ann Arbor, MI 48103
Phone:734-794-6720
Fax: 734-994-0781

Date: 10-9-13

4.0 Part 3: Utility Consumption Baseline

AKTPEERLESS

Rental Assistance Demonstration (RAD): PART 3: UTILITY CONSUMPTION BASELINE

8361-8369 Platt Road, Ann Arbor, Michigan 48108
UPPER PLATT COLONIAL

PREPARED FOR Norstar Development USA, LP
733 Broadway
Albany, NY 12207

ON BEHALF OF The Ann Arbor
Housing Commission
727 Miller Ave
Ann Arbor, MI 48103

PROJECT # 8357E-3-96

PIC # MI064

DATE September 9, 2013

AKTPEERLESS

Rental Assistance Demonstration (RAD): CONSUMPTION NARRATIVE REPORT

8361-8369 Platt Road, Ann Arbor, Michigan 48108
UPPER PLATT COLONIAL

PREPARED FOR	Norstar Development USA, LP 733 Broadway Albany, NY 12207	**ON BEHALF OF**	The Ann Arbor Housing Commission 727 Miller Ave Ann Arbor, MI 48103
PROJECT #	8357E-3-96	**PIC #**	MI064
DATE	September 9, 2013		

Table of Contents

1.0 EXECUTIVE SUMMARY

1.1 Purpose and Scope of Work

The purpose of the Part 3: Utility Consumption Baseline is to establish a twelve-month consumption baseline for normalized heating, cooling, lighting, and other electric, gas and water usage (not cost) for the subject property as defined in the Rental Assistance Demonstration (RAD): Physical Condition Assessment (RPCA) statement of Work and Contractor Qualifications released by the Department of Housing and Urban Development (HUD) in October 2012 (Version 1).

This report contains data on all utility usage at the subject property, both tenant-paid and owner-paid (if applicable), and including all common areas for a full 12-month period. It establishes a baseline to allow for benchmarking, and for future measurement of consumption and costs. As such, the utility baseline creates a whole building consumption profile, addressing missing utility data, vacancies, and weather patterns, in achieving its aim of establishing that standard on which future consumption can be compared.

1.2 Subject Site Description

1.2.1 General Site Description

The subject property contains one (1) 5,858 square foot multi-family building. The subject building was constructed in 1964 and consists of four (4) story homes with a basement and one (1) single story home. There are two (2) two bedrooms, one bathroom units, one (1) four bedrooms, one and half bathroom unit, one (1) three bedrooms, one bathroom unit, and one (1) one bedroom, one bathroom unit at the site. The subject building is generally referred to as Upper Platt Colonial.

1.2.2 Site Utilities and Usage

Each unit at the subject property has an electric meter, a natural gas meter, and a water meter. One common meter exists at the site for exterior lighting. Therefore, there are a total of six (6) electric meters, five (5) natural gas meters, and five (5) water meters at the site.

1.3 Baseline Site Energy Consumption

The Actual Site Energy Use, Energy Use Intensity (EUI), Weather Normalized Site Energy Use and Weather Normalized EUI displayed below are consistent with the ASHRAE Procedures for Commercial Building Energy Audits. This methodology establishes the property's baseline use and cost conditions that are representative of the building's energy performance.

This statistical analysis removes the bias of independent variables such as historic weather, occupancy and operating hours. These calculations have been normalized to the mean values of the independent variables impacting the building's energy performance and represent the most probable performance under actual conditions accounting for weather, occupancy and operating hour variability.

As the subject site has been 100% occupied for the duration of the analysis period, no pro-forma adjustment factors to the consumption have been made.

1.3.1 Actual Site Energy Use and EUI

Actual Site Energy Use	Actual Site Energy Use Intensity (EUI)
502,368 kBtu/yr	85.76 kBtu/ ft^2/yr

1.3.2 Weather Normalized Site Energy Use and EUI

Weather Normalized Site Energy Use	Weather Normalized Site Energy Use Intensity (EUI)
546,283 kBtu/yr	93.25 kBtu/ft^2/yr

2.0 INTRODUCTION

2.1 Purpose

The purpose of the Part 3: Utility Consumption Baseline is to establish a twelve-month consumption baseline for normalized heating, cooling, lighting, and other electric, gas and water usage (not cost) for the subject property as defined in the Rental Assistance Demonstration (RAD): Physical Condition Assessment (RPCA) statement of Work and Contractor Qualifications released by the Department of Housing and Urban Development (HUD) in October 2012 (Version 1).

This report contains data on all utility usage at the subject property, both tenant-paid and owner-paid (if applicable), and including all common areas for a full 12-month period. It establishes a baseline to allow for benchmarking, and for future measurement of consumption and costs. As such, the utility baseline creates a whole building consumption profile, addressing missing utility data, vacancies, and weather patterns, in achieving its aim of establishing that standard on which future consumption can be compared.

2.2 Scope of Work

AKT Peerless' scope-of-services is based on its proposal PE-14790, dated June 26, 2013 and authorized by Norstar Development USA, LP on behalf of the Ann Arbor Housing Commission (the Client) on July 3, 2013, and the terms and conditions of that agreement.

The purpose of the Part 3: Utility Consumption Baseline is to establish a twelve-month consumption baseline for normalized heating, cooling, lighting, and other electric, gas and water usage (not cost) for the subject property as defined in the Rental Assistance Demonstration (RAD): Physical Condition Assessment (RPCA) statement of Work and Contractor Qualifications released by the Department of Housing and Urban Development (HUD) in October 2012 (Version 1).

This report contains data on all utility usage at the subject property, both tenant-paid and owner-paid (if applicable), and including all common areas for a full 12-month period. It establishes a baseline to allow

for benchmarking, and for future measurement of consumption and costs. As such, the utility baseline creates a whole building consumption profile, addressing missing utility data, vacancies, and weather patterns, in achieving its aim of establishing that standard on which future consumption can be compared.

3.0 SUBJECT SITE DESCRIPTION

3.1 General Site Description

The subject property contains one (1) 5,858 square foot multi-family building. The subject building was constructed in 1964 and consists of four (4) story homes with a basement and one (1) single story home. There are two (2) two bedrooms, one bathroom units, one (1) four bedrooms, one and half bathroom unit, one (1) three bedrooms, one bathroom unit, and one (1) one bedroom, one bathroom unit at the site. The subject building is generally referred to as Upper Platt Colonial.

3.2 Current/Planned Use of the Property

The subject property has been used as a multi-family structure and operated by the AAHC since its initial construction in 1964. AAHC is participating in HUD's Rental Assistance Demonstration pilot program and intends to continue operating the building as a multi-family residential facility.

4.0 ENERGY CONSUMPTION ANALYSIS

This section provides information on energy utilities associated with the subject property.

4.1 Electricity

The following figure (Figure 4.1) identifies monthly electrical consumption (kWh) in comparison to cooling degree days (CDD). Cooling Degree Days (CDD) are roughly proportional to the energy used for cooling a building, while Heating Degree Days, (HDD) are roughly proportional to the energy used for heating a building. In general, daily degree days are the difference between a base point temperature (65 degrees) and the average outside temperature.

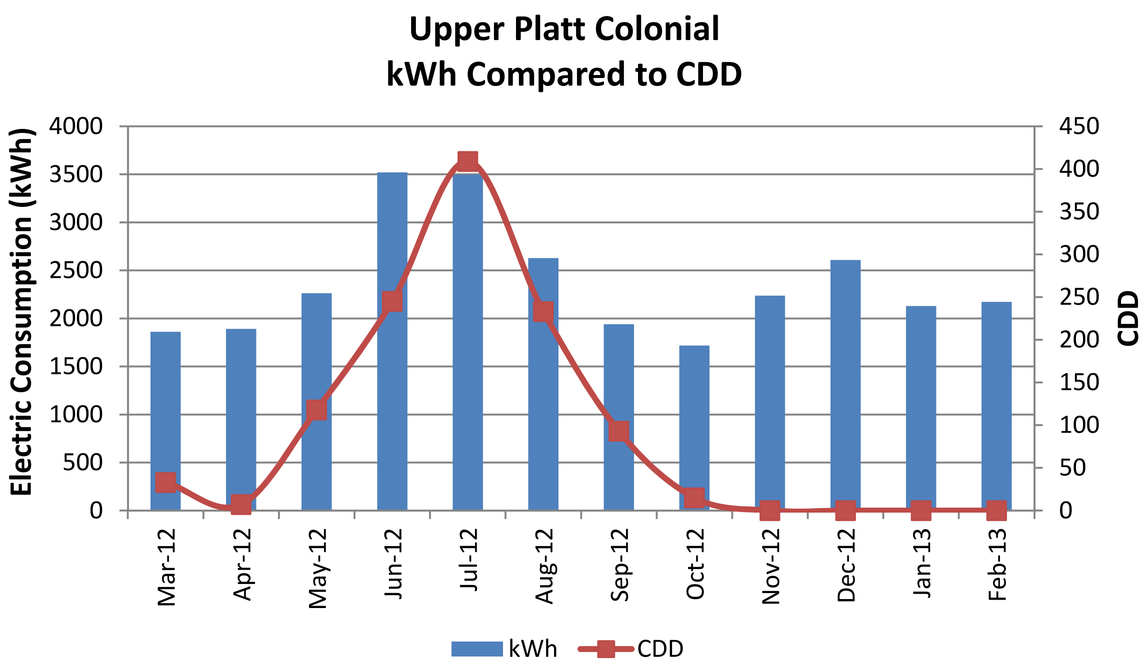

Figure 4.1 Electricity Consumption Graph

The following table (Table 4.1) identifies key information regarding the electric utility associated with the property.

Table 4.1 Annual Electricity Metrics

Vendor	DTE Energy
Meters on Site	Residential - Five (5) Non-Residential (Common) - One (1)
Use for Residential	Lighting, electric appliances, tenant plug loads, tenant ac window units (if present), washing machines, furnace blower and control.
Use for Non-Residential	Exterior Lighting
Responsible for Payment	Tenant; Owner (Common)
Rate	\$0.158 / kWh - Tenant \$0.167 / kWh - Common
Site Consumption	28,470 kWh / year (97,168 kBtu / year)
Energy Use Intensity (EUI)	4.86 kWh / ft^2 (16.59 kBtu / ft^2)

Weather Normalized Site Consumption	27,189 kWh / year (92,795 kBtu / year)
Weather Normalized EUI	4.64 kWh / ft^2 (15.84 kBtu / ft^2)

AKT Peerless received tenant electric bill information in an electronic spreadsheet from the owner (AAHC) for the subject property. This spreadsheet included the following information for each individual unit at the subject property: meter read date, invoice amount ($), usage days per billing period, and net usage (kWh). For the subject property, Upper Platt Colonial, monthly electrical data was included from September 2011 to February 2013. The most current twelve (12) months of electrical data provided (March 2012 through February 2013) were used for this analysis and input into the RPCA model.

The actual electric consumption was adjusted to produce a weather-normalized summary of electric consumption. This process involved the following steps:

- CDD for the base year billing periods were calculated. Source for CDD is www.degreedays.net (using temperature data from www.wunderground.com) at weather station ANN ARBOR MUNICIPAL AIRPORT, MI, US (83.74W,42.22N), Station ID: KARB.
- Base year billing consumption (kWh) and CDD were normalized by number of days in each billing period.
- Relationship between usage (kWh/day) and weather (CDD/day) was established by using spreadsheet software (Excel) to determine the “best fit” linear regression trend line and R^2 value. The R^2 value is a statistical indicator that represents goodness of fit of the tread line, with $R^2 > 0.75$ considered an acceptable fit.
- Weather Normalized Site Consumption was calculated using the linear regression equation and the 10 year average CDD per month.

4.2 Natural Gas

The following figure (Figure 4.2) identifies monthly natural gas consumption (therms) in comparison to heating degree days (HDD). HDD are roughly proportional to the energy used for heating a building. In general, daily degree days are the difference between a base point temperature (65 degrees) and the average outside temperature.

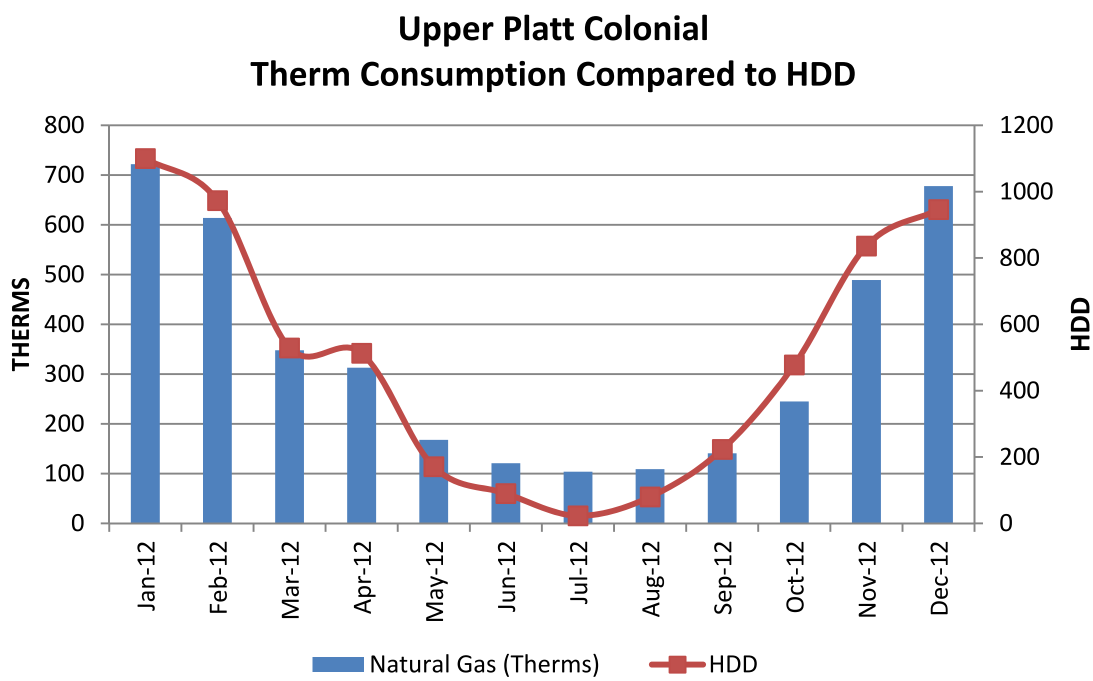

Figure 4.2 Natural Gas Consumption Graph

The following table (Table 4.2) identifies key information regarding the natural gas utility associated with the property.

Table 4.2 Annual Natural Gas Metrics

Vendor	DTE Energy
Meters on Site	Residential - Five (5) Non-Residential (Common) - None (0)
Use for Residential	Gas-fired furnaces for space heating, ranges for cooking, dryers for laundry.
Use for Non-Residential	None
Responsible for Payment	Tenant
Rate	$1.079 / therm
Site Consumption	4,052 therms / year (453,488 kBtu / year)
Energy Use Intensity (EUI)	69.17 kBtu / ft^2
Weather Normalized Site Consumption	4,535 therms / year (453,488 kBtu / year)
Weather Normalized EUI	77.41 kBtu / ft^2

AKT Peerless received tenant natural gas bill information in an electronic spreadsheet from the owner (AAHC) for the subject property. This spreadsheet included the following information for each individual unit at the subject property: meter read date, invoice amount ($), usage days per billing period, and net usage (therms). For the subject property, Hillside Manor, monthly natural gas data was included from October 2011 to March 2013. The most current twelve (12) months of natural gas data provided (April 2012 through March 2013) were used for this analysis and input into the RPCA model.

The actual natural gas consumption was adjusted to produce a weather-normalized summary of natural gas consumption. This process involved the following steps:

- HDD for the base year billing periods were calculated. Source for HDD is www.degreedays.net (using temperature data from www.wunderground.com) at weather station ANN ARBOR MUNICIPAL AIRPORT, MI, US (83.74W,42.22N), Station ID: KARB.
- Base year billing consumption (therms) and HDD were normalized by number of days in each billing period.
- Relationship between usage (therms/day) and weather (HDD/day) was established by using spreadsheet software (Excel) to determine the "best fit" linear regression trend line and R^2 value. The R^2 value is a statistical indicator that represents goodness of fit of the tread line, with $R^2 > 0.75$ considered an acceptable fit.
- Weather Normalized Site Consumption was calculated using the linear regression equation and the 10 year average HDD per month.

5.0 LIMITATIONS

5.1 Assumptions

The Ann Arbor Housing Commission (AAHC), the property owner, released utility information to AKT Peerless delivered directly from the utility provider(s), DTE Energy. It is assumed that this monthly usage and cost data is accurate and contains no data gaps or errors.

Information on how the utilities are utilized was generated from conversations with AAHC staff and results of the RPCA through the Energy Audit.

5.2 Limitations and Exceptions

AKT Peerless accepts responsibility for the competent performance of its duties in executing this assignment and preparing this report in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages. Although AKT Peerless believes the results contained herein are reliable, AKT Peerless cannot warrant or guarantee that the information provided is exhaustive, or that the information provided by the client, owner, third parties, or the secondary information sources cited in this report is complete or accurate.

AKT Peerless has not verified that the property owner/operator has reported all sources and records of energy consumed at the subject property. Potentially unreported information may include, but is not limited to, bills, meters, and types of energy consumed. Inaccurate information provided to AKT Peerless and information not reported to AKT Peerless may influence the findings of report.

AKT Peerless has not verified the accuracy of building floor area as reported by the owner.

Should additional information become available to the Client or Owner that differs significantly from our understanding of conditions presented in this report, AKT Peerless requests that such information be forwarded immediately to our attention so that we may reassess the conclusions provided herein and amend this project's scope of services as necessary and appropriate.

Nothing in this report constitutes a legal opinion or legal advice. For information regarding individual or organizational liability, AKT Peerless recommends consultation with independent legal counsel.

6.0 SIGNATURES

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Building Performance Institute

AKTPEERLESS

4.1 Acknowledgements of Part 3: Utility Consumption Baseline

The Consumption Narrative Report and Utility Consumption – Summary and Utility Consumption – Monthly worksheets in the RPCA Model were completed by Linnea Fraser and Henry McElvery of AKT Peerless. AKT Peerless certifies that the report preparers meet the qualifications identified in the RAD Physical Condition Assessment Statement of Work and Contractor Qualifications Part 3.2 (Version 1, October 2012).

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Date: October 9, 2013

Part 3 Consumption Narrative Report and Excel RPCA Model were Received and Reviewed by Owner:

Jennifer Hall

Jennifer Hall, Executive Director
Ann Arbor Housing Commission
727 Miller Ave
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Date: 10/9/13

5.0 Part 4: Integrated Pest Management Inspection

Rental Assistance Demonstration Program (RAD)
Integrated Pest Management Inspection Report

8/07/2013

Project Name:_____Ann Arbor Housing Upper Platt____
FHA Number:____
Section 8 Expiration Date:______________________________

Dear Ann Arbor Housing:

At the meeting held on July 26th of 2013, we provided the 5 units with Integrated Pest Management (IPM) materials and information to assist in gathering data for the property's IPM review. Below is a report of our glue trap findings, comments, and infestation status (high, moderate, low, none). (Lengthen the table as needed to reflect all units, whether glue traps were returned to IPM inspector or not. Include results from common areas monitored such as laundry, interior trash handling, and storage areas.)

Unit	Visually Inspected	# Traps Collected	Kitchen Trap Count	Bathroom Trap Count	Maintenance Issues	Housekeeping Issues	Other Comments	Status (H, M, L, N)
3689	No	2	0	N/A	-	Clutter	Tenants still sleeping when we arrived. Reports earwigs.	N
3687	No	0	-	-			Could not inspect. Tenant not	?

							answering door and chain engaged.	
3685	Yes	2	0	0		Sanitation/Clutter	4 bedroom, reports ants. 3 carpenter ants observed on kitchen glue board. Bedroom traps missing.	L
3683	No	2	0	0			2 bedroom. No glue boards found in bedrooms. Reports spiders and earwigs.	L
3681	Yes	2	0	0	Leaks in hallway possibly from upstairs bathroom and by several windows.	Sanitation	1 mosquito found in kitchen glue board, 1 drain fly and 1 fruit fly found in bathroom glue board. Signs or roaches in Kitchen.	L

After analyzing the findings of the glue traps, we conducted a visual inspection of **2 units (see attached photos)** and have concluded that the glue trap findings do reflect the current state of infestation in the units and property.

The Green Retrofit Physical Condition Assessment scope of work, at Part 3.2.D.ii requires a ". . . detailed narrative describing the property's pest infestation, if any, and a corrective course of action for each infestation, and if needed, specific actions for serious infestations within individual units." **(IPM Inspector – add comments below)**

We also provided monitoring devices for all bedrooms on 7/26/2013, and removed them on 08/06/2013. We felt it prudent to monitor these areas for bed bugs as they are of increasing concern. We did not capture any bed bugs in the monitoring devices we installed, nor did we observe any signs of bed bugs during our inspections.

During our inspection of the five units at Upper Platt, we found one unit with signs of roaches in the kitchen. Unit 3681 had fecal spotting and bait placements in the cabinets. I found no live activity during my inspection and the tenant said she wasn't having any issues so this may have been old from a previous infestation. This unit also had some small fly activity that was probably the result of the leaks in this unit. There was a leak in the hallway that appeared to be coming from the upstairs bathroom and several windows in this unit leaked. Fixing the leaks and repairing the damage will address this issue. In unit 3685, 3 carpenter ants were found in the kitchen glue board. Other units also reported seeing ants. There were a couple of trees outside that appear to have carpenter ant activity. Addressing the leaks in this building and treating the units and trees for carpenter ants will take care of this problem. All trees and bushes should be kept trimmed back so that they are not touching or overhanging the building as this is an easy way for ants to access a building. Unit 3687 would not answer the door and they had the chain engaged. We were unable to inspect this unit. 50% of the inspected units reported occasional invaders. To minimize the amount of activity of these occasional invaders, we recommend: sealing exterior entry points (gaps, holes, etc), removing the clutter from around the foundation which holds moisture against the side of the building. Some pipes and lines going into the building have gaps around them. These openings provide access to pests and should be sealed.

In addition to the inspection of the units, we inspected the interior and exterior areas of the property for evidence of infestations in the trash disposal areas, laundry facilities, storage areas and any other common area where water and/or food storage is present. Additionally, we inspected all areas where the envelope has been penetrated and all points of ingress/egress for any entry points for pests. Below are our findings for these areas, with a status (high, moderate, low, none) noted, and comments for corrective measures, both immediate and long-term. (Lengthen the table as needed to reflect all areas inspected)

Area	Comments	Status
Exterior	A few trees appeared to have carpenter ant activity. These should be treated and regularly inspected for activity. There were some exterior entry points (gaps, holes, etc) that should be sealed to prevent pest entry. Please see the photo log for specific examples. The screens on some windows are damaged or missing and should be replaced.	M

Based on the above findings, interviews with the property managers, maintenance staff, and tenants, and the review of all documentation made available to us regarding past Pest Control effort we conclude the following course of action is required: (The RPCA Scope of Work requires, at Part 3.2.D.iv, “[the report details]… an immediate course of action, which identifies and estimates the cost of the measures required to address the pest infestations for each identified group (see prior paragraph) and an continuing course of action for using IPM principles at the property”). **(IPM Inspector - add detailed comments below for the units and the common areas including the recommendations from Exhibit 2)**

We discussed current practices with the administrator. At this time a pest control professional with a staff person inspects/treats units on an as needed basis. All units are subject to annual inspections during which pest activity is also looked for. We recommend the following: 1) Adding exterior multicatch rodent traps on the exterior, particularly near entry doors, 2) Installing insect monitors in all units and schedule regular inspections by the pest control professional instead of relying on the observations of the staff and tenants, we estimate the cost of a monthly service to be around $8 per unit with a minimum service charge of $32. and 3) Most pest policies are currently verbal. We recommend developing specific policies for pests of concern and getting these policies down in writing.

Sincerely,
Christina L. Driksna License # C006070435
Service Supervisor, Griffin Pest Solutions
Member of QualityPro Green

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**
1. Communicate Policies Communicate ownership/ management's IPM policies and procedures to: • All building occupants • Administrative staff • Maintenance personnel • Contractors.	☒ Written pest control policy in place. ☒ Policy communicated to: ☒ Staff. ☒ Resident services. ☒ Maintenance staff. ☐ Renovation/rehabilitation staff/contractors. ☒ Pest control services. ☒ Policy communicated to residents.	The resident handbook is currently under revision at Upper Platt. It addresses what the tenants can expect from the housing commission, including treatment 2x a year. It also states tenant responsibilities. Residents are given 24 hours notice for any pest inspection or treatment. In the leasing contract, residents are notified there is a pest management company the apartment complex utilizes.
2. Identify Problem Pests Identify pests and environmental conditions that limit the spread of pests. ***CONTINUED FROM COLUMN ON THE FAR RIGHT: In the lease it is written that the tenant must contact the manager with any pest or housekeeping issues. Units are inspected annually. Maintenance and pest control notifies the office of any sanitation/clutter issues as well as any maintenance issues that are conducive to pest infestation when servicing units on an individual basis.	☒ Policy described strategy to address pests: ☒ Rats. ☒ Mice. ☒ Cockroaches. ☒ Bedbugs. ☐ Other pests: ________________________ ________________________________ ☒ Policy described strategy to address environmental conditions: ☒ Water damage and effective cleanup. ☒ Housekeeping and maintenance within the apartment units.	Verbal policy for the listed insects. Never had a problem with rats. If there is a problem with rats or mice, they will notify pest control and seal any areas the rodents are entering the apartment. Cockroach and bed bug issues are high priority and pest control is notified as soon as possible. All other reported pest issues are lower priority. Maintenance has ant bait stations that they hand out to tenants reporting ant issues. *Continued on the far left column.*

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**

3. Monitor and Track
Establish an ongoing monitoring and record keeping system for:
• Regular sampling and assessment of pests
• Surveillance techniques
• Remedial actions taken
• Assessment of program effectiveness.
	☒ Pest control complaints:
	  ☒ Maintained accurate, up-to-date, and accessible tracking reports maintained.
	  ☒ Recorded in electronic format.
	  ☒ Analyzed regularly for timeliness, recurrent problems and other trends.
	  ☒ Action taken based on analysis of complaints.
	☒ Ongoing and regular monitoring of trash handling areas and common areas:
	  ☒ Visual monitoring.
	  ☐ Glue trap monitoring.
	☐ Ongoing and regular inspection of exterior areas.
	☐ Results of visual monitoring and glue trap monitoring recorded and tracked.
	☒ Annual inspection of each resident for housekeeping and maintenance concerns.
	☐ Annual summary of results of complaint and monitoring analysis.
		Records are given from the pest management company and are available online through the customer portal.
		
		All work orders are input into the computer and are usually taken care of within 5 days by the pest management company if for high priority pests but no longer than 30 days
		- Trash areas are inspected once a week and cleaned if necessary
		
		Exterior inspections are completed on an as needed basis by maintenance staff.
		Results of monitoring are recorded by pest management company and made available online.
		
		Annual inspections are completed by a combination of managment, maintenance staff and outside contractors.
		All issues found are written up and everything is fixed asap

4. Set Thresholds for Action Determine, with involvement of residents: • Pest population levels – by species – that will be tolerated • Thresholds at which pest populations warrant action.	☒ Zero tolerance set for priority pests: rats, mice, cockroaches, and bedbugs. ☒ Residents and staff aware of zero tolerance policy. ☒ Tolerances set for other pests such as ants and spiders.	Staff is aware of verbal zero tolerance policy. Other low priority pests are addressed as needed. Office hands out bait stations for ants when issues are reported

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**
5. Improve Non-Pesticide Methods Improve: • Mechanical pest management methods • Sanitation • Waste management • Natural control agents.	☒ Regular and ongoing cleaning of [*Frequency]* ☐ Interior trash handling areas [n/a] ☒ Exterior trash handling areas [1 x week] ☐ Laundry rooms [n/a] ☐ Storage areas [n/a] ☐ Regular removal of interior trash [n/a] ☒ Confirm dumpsters ☒ Are of adequate size ☒ Are in good repair ☒ Have tightly fitting lids ☐ Are located at least 25 feet from building ☐ Show no signs of overflow problems.	Interior trash is taken out by tenants from their own apartments and placed in their trash bins that they must take to the road on trash day. Once a week on Thursday, maintenance checks for any oversized items that need to be picked up and disposed of.
6. Prevent Pest Entry and Movement • Monitor and maintain structures and grounds including ○ Sealing cracks ○ Eliminating moisture intrusion and accumulation • Add physical barriers to pest entry and movement.	☐ Exterior holes greater than ¼" sealed. ☐ Cracks in walls, foundation and floor sealed. ☒ Sewer traps filled with water. ☒ Screens in place on opened windows and doors in warm weather. ☒ Door sweeps in good working condition. ☐ Materials damaged by water quickly repaired or replaced. ☐ Cause of water damage corrected.	Exterior holes that are 1/4 inch or larger need to be sealed. There are some door sweeps that need to be lowered or replaced. Cracks in the foundation should be sealed to prevent pest entry. Ants are of particular issue because of this as well as the expansion joint between the sidewalk and the building not being sealed properly. Some signs of leaks around windows. The leaks should be corrected and the damage repaired. Some screens are damaged and need to be replaced.

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**

7. Educate Residents and Update Leases
• Develop an outreach/educational program
• Ensure that leases reflect residents' responsibilities for:
  ○ Proper housekeeping
  ○ Reporting presence of pests, leaks, and mold.
	☒ Resident leases set specific requirements for:
	  ☒ Housekeeping, sanitation, and trash storage.
	  ☒ Reporting of pests, leaks, and mold.
	☒ Educational materials on pest control and pesticide use provided to residents.
	☒ New residents expressly told that they are responsible for proper housekeeping and reporting presence of pests, leaks, and mold.
	☐ Units inspected within one month after moving in.
	☒ Residents regularly reminded of responsibilities.
	☐ Resident told to notify resident services before using any pesticides spray or fogger.
		Educational materials on bed bugs from the state are occasionally handed out along with a request that they report any issues to management immediately.
		
		Units are not inspected within one month of moving in unless a problem is reported.
		
		Resident responsibilities are posted and available in the resident handbook. Residents are not specifically prohibited from using pesticides nor required to notify resident services before their use. Residents are told to report any issues so that the pest management company can address them. However the handbook does recommend tenants use boric acid in their cupboards to control pests.

8. Enforce Lease Enforce lease provisions regarding resident responsibilities such as: • Housekeeping • Sanitation • Trash removal and storage.	☒ Pest control services and maintenance alerting resident services to housekeeping, sanitation and trash problems on an identified, established schedule. ☒ Resident services addressing residents with housekeeping problems through education. ☒ Residents with ongoing or unresolved housekeeping, sanitation or trash problems addressed through enforcement of lease.	Management tries to get assistance for tenants who have ongoing or unresolved housekeeping, sanitation or trash problems through resident services if the resident is unable to do it themselves. Failure to dispose of garbage, waste and rubbish in a safe and sanitary manner (16i) and failure to allow inspection or extermination services (16q) are listed as grounds for lease termination.

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**
9. Use Pesticides Only When Necessary Use pesticides only when necessary, with preference for products that, while producing the desired level of effectiveness, pose the least harm to human health and the environment, and, as appropriate, notifying PHA management before application.	☐ Snap traps used for mice. ☒ Rodenticides only used in tamper-resistant plastic boxes. ☒ No sprays or foggers used by staff, contractors, or residents without written, advance approval of property manager. ☐ Boric acid and baits used at unit turnover.	There is no specific treatment of units at turnover unless a problem is found. If a unit has an issue that is discovered at the time of turnover, the pest management company is notified and the unit is scheduled for treatment.
10. Post Signs Provide and post 'Pesticide Use Notification' signs or other warnings.	☒ Program in place to notify residents and staff of pesticide use. ☒ Signs used to notify residents and staff in advance of pesticide application (if for other than bait stations). ☒ Residents notified after units treated. ☒ Residents notified after common areas treated.	All staff are notified of pesticide use 24 hours in advance. All residents receive notices 24 hours prior to a pesticide application or inspection. Cloudy house stickers are provided by the pest management company after common areas are treated.
11. Summary	☒ How many of the ten Essential Elements of Effective IPM listed in this chart are: - Fully addressed? 4 - Partially addressed? 6 - Missing entirely? 0	There are a few policies that need to be written about the pest management service at Upper Platt and information pamphlets made available to tenants.

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Upper Platt**

Photo #1: Street elevation

Photo #2: Typical one bedroom unit, Living room

Photo #3: Typical one bedroom unit, Dining room

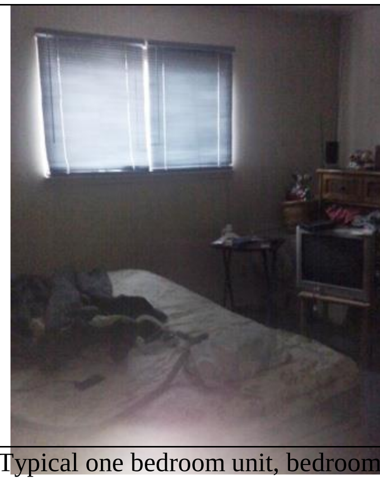

Photo #4: Typical one bedroom unit, bedroom

Photo #5: Typical one bedroom unit, kitchen

Photo #6: Typical one bedroom unit, bathroom

Project No.: XXXXX.09R-XXX.257 **Project Name: Upper Platt**

Photo #7:	Typical three bedroom unit, living room

Photo #8:	Typical three bedroom unit, kitchen

Photo #9:	Typical three bedroom unit, dining room

Photo #10:	Typical three bedroom unit, main level bathroom

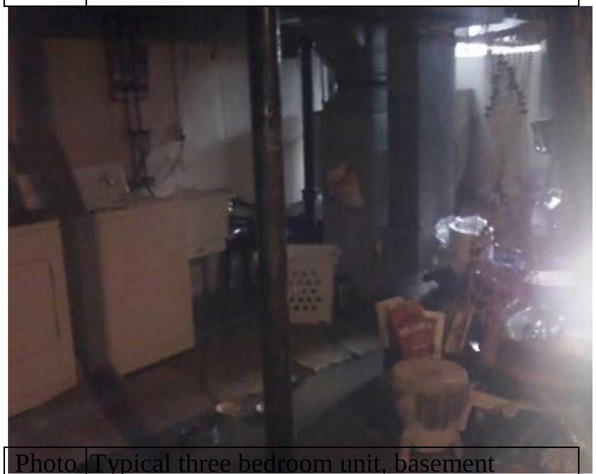

Photo #11:	Typical three bedroom unit, basement

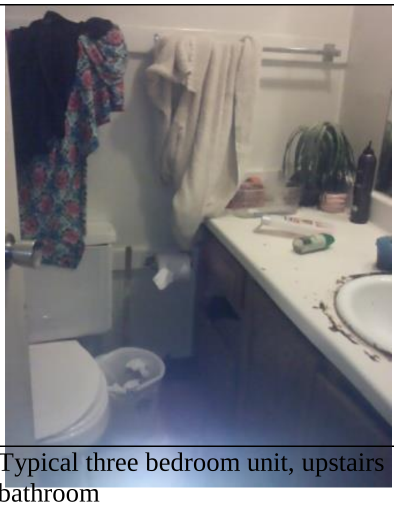

Photo #12:	Typical three bedroom unit, upstairs bathroom

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Upper Platt**

[redacted]

Photo #13: Typical three bedroom unit, bedroom 1

[redacted]

Photo #14: Typical three bedroom unit, Bedroom 2

Photo #15: Typical three bedroom unit, bedroom 3

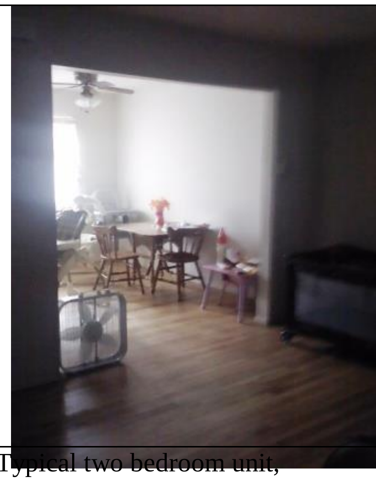

Photo #16: Typical two bedroom unit,

Photo #17: Typical two bedroom unit, kitchen

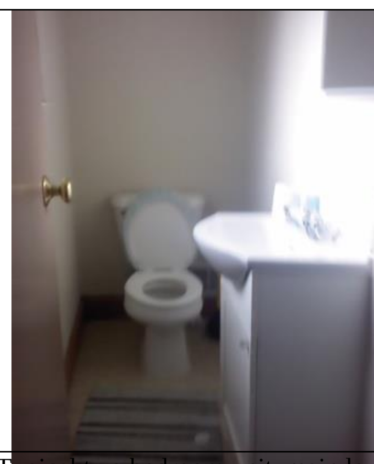

Photo #18: Typical two bedroom unit, main level bathroom

Photo #19:	Typical two bedroom unit, basement

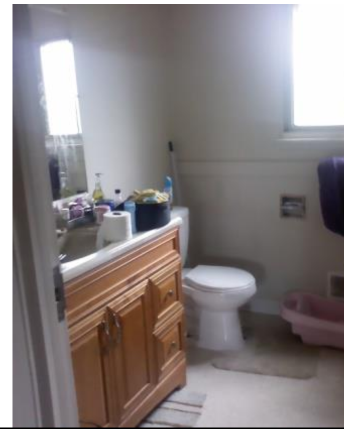

Photo #190:	Typical two bedroom unit, upstairs bathroom

[redacted]

Photo #21:	T[redacted]1

[redacted]

Photo #22:	T[redacted]2

Photo #23:	Unit 3681 water damage in hallway

Photo #24:	Unit 3681 water damage in basement

Pest Inspection Photographic Record

Project No.: XXXXX.09R-XXX.257 **Project Name: Upper Platt**

Photo #25: Unit 3681 Water damage in bathroom

Photo #26: Unit 3681 Moisture damage in bedroom 1

Photo #27: Unit 3681 Moisture damage in bedroom 2

Photo #28: Unit 3681 Moisture damage in bedroom 3 covered with paint

Photo #29: Carpenter ant crawling up doorway of unit 3681 with all the moisture damage.

Photo #30: Potential entry point for pests

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Upper Platt**

Photo #31:	Bottom of downspout missing. Water pools against foundation here.

Photo #32:	Potential entry point for pests.

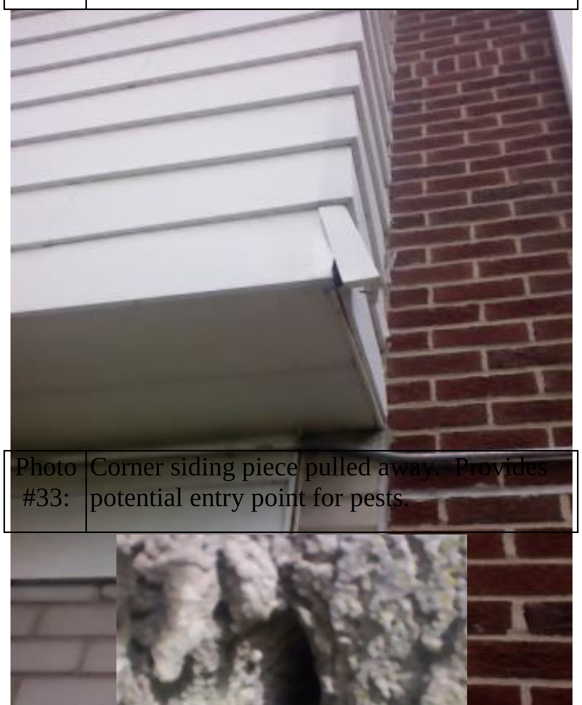

Photo #33:	Corner siding piece pulled away. Provides potential entry point for pests.

Photo #34:	Damaged screen should be replaced to prevent pest entry.

Photo #35:	Carpenter ant activity on tree on backside of building.

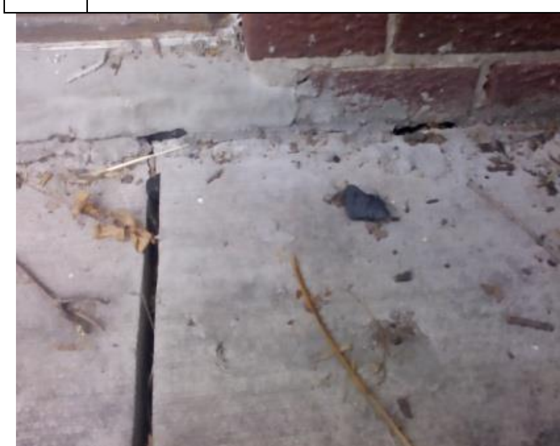

Photo #36:	Expansion joints between concrete slabs and building should be sealed to prevent pest issues.

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5.1 Acknowledgements of Part 4: Integrated Pest Management Inspection (IPMI)

The IPMI, Exhibit 4 – IPMI Report and Exhibit 5 – Effective IPM for Affordable Housing were completed by Christina L. Driksna of Griffin Pest Solutions. Griffin Pest Solutions certifies that the report preparers meet the qualifications identified in the RAD Physical Condition Assessment Statement of Work and Contractor Qualifications Part 4.1 (Version 1, October 2012).

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Date: October 9, 2013

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Date: 10-9-13