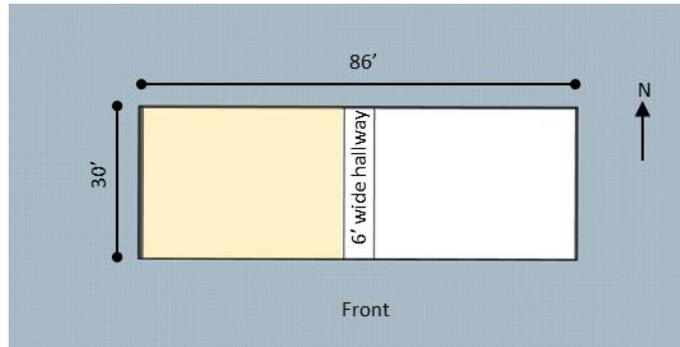
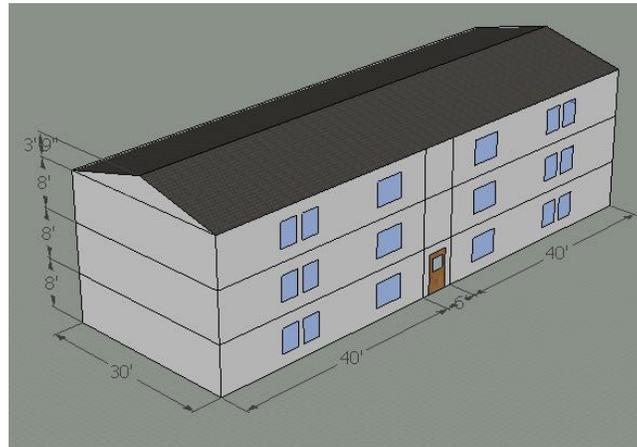


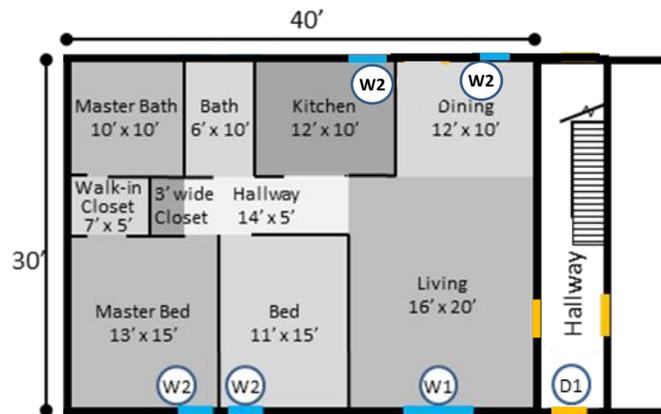
**MulTEA Demonstration Building (Sample Building 0):
Three-story Walkup with Slab-on-grade Floor
(06/22/2017)**



Site Plan



Front View



Layout of a Dwelling Unit

Existing Building Description

General Characteristics

- Located in a suburban area in Boston, MA
- Box-shape, 7,740 sq ft, three-story building on slab-on-grade floor
- Six units (two units per floor)
- Double-loaded, enclosed, unconditioned hallways (including the stairwell)
- 12 occupants, with 3 occupants home during daytime
- Located on a lot having old asphalt ground surface

Walls

- All walls (exterior and partition) constructed with 8" hollow concrete blocks
- Stucco finish with medium-dark color on the exterior walls

Windows

- A 60"x48" (W1) and four 36"x48" (W2) windows in each unit; no window in hallways
- All windows are vertical slider with single-pane, clear glass, wood frame, and default leakage
- Each window has blinds

Doors

- Building entrance door in the hallway on first floor
 - 42" x 80" hinged, hollow core, steel door with default leakage
 - 20% of door is single-pane glass
- Apartment entrance doors (opening to the hallway; not to be modeled)
 - 36" x 78" hinged, solid core wood door with default leakage

Roof/Ceiling

- A 3.75' high attic roof with 3/12 slope over the second floor
- 2x6 @ 24" wood-frame construction
- 3" normal density, fiberglass batt ceiling insulation
- Asphalt shingle roofing, dark color

Floor

- Uninsulated concrete, Slab-on-grade floor with 80% carpet

HVAC System

- A 5 kW electric baseboard heater, and a1.5 ton and a1 ton room air conditioners in each apartment
- No outside air ventilation associated with systems
- All systems manufactured and installed in 1998
- Default thermostat schedules (i.e., 68°F in heating mode and 76°F in cooling mode)

Infiltration

- 0.75 air changes per hour for the whole building

Water heaters

- A 40-gallon, 3 kW, electric, storage type water heater in each apartment
- All water heaters manufactured and installed in 1998
- Hot water supply temperature set at 130°F

Lighting

- An average of 0.5 watts/ sq ft in the building, with medium usage pattern
- 100 watts of exterior lighting

Appliances

- An average of 0.5 watts/ sq ft in apartments, with medium usage pattern

Utility Bills

Start date	End date	Whole-building electricity use (kWh)	Heating degree days (HDD65°F)	Cooling degree days (CDD65°F)
01/01/2013	01/31/2013	19,046	1,024	0
02/01/2013	02/28/2013	17,893	952	0
03/01/2013	03/31/2013	16,275	851	0
03/01/2013	04/30/2013	10,903	514	3
05/01/2013	05/31/2013	7,142	255	52
06/01/2013	06/30/2013	4,863	53	173
07/01/2013	07/31/2013	5,499	5	351
08/01/2013	08/31/2013	4,497	8	218
09/01/2013	09/30/2013	5,207	112	97
10/01/2013	10/31/2013	7,482	291	22
11/01/2013	11/30/2013	13,505	677	2
12/01/2013	12/31/2013	18,421	985	0

Retrofit Measures

1. Replace all windows (i.e., 6 W1 and 24 W2) with new double pane, low-e, high solar, vinyl frame windows
2. Replace building entrance door with a steel, polystyrene core door with 20% single pane glass
3. Add 6" normal density, blown cellulose ceiling insulation in the attic
4. Air seal the building to reduce whole-building air infiltration to 0.5 ACH
5. Replace 48-75 W incandescent lamps in apartments (8 lamps per apartment), operating 4 hours per day, with 23 W compact fluorescent lamps
6. Install 3 motion sensors in hallways (one per floor) to reduce the usage of 6-40 W fluorescent lamps (2 lamps per floor) from 24 hours per day to 4 hours per day
7. Replace six 18.5 cu ft existing refrigerators (1998 manufactured, top freezer, automatic defrost, and fair door seal condition) with new 18.5 cu ft refrigerators rated at 500 kWh annual energy use

Building

Building

Building Size and Occupancy

Number of Dwelling Units:

Gross Floor Area of Building (sq ft):

Number of Floors Above Grade:

Number of Floors Below Grade:

Average Floor Height (ft):

Number of Occupants:

During Daytime:

During Nighttime:

Elevation of First Floor Above Grade (ft):

Depth of Building Below Grade (ft):

Site Grade Changes:

Depth of Building Below Grade:

On the Back (ft):

On the Right (ft):

On the Front (ft):

On the Left (ft):

Site Definition

Site Shielding and Terrain:

Ground Surface:

Building Layout

Building Shape: Total Number of Dwelling Units:

Hallway Configuration: Top Floor:

Hallways Are Conditioned: Intermediate Floor(s):

Orientation of Building (deg): First Floor Above Grade:

First Floor Below Grade:

Configuration

Floor	Area (sq ft)				Floor Sum
	Units	Hallways	Other Conditioned Spaces	Other Unconditioned Spaces	
A3	2400	180	0	0	2580
A2	2400	180	0	0	2580
A1	2400	180	0	0	2580
B1	0	0	0	0	0
B2	NA	0	0	0	0
Bldg Totals:	7200	540	0	0	7740

Bldg totals include no floor multipliers.

Number of Dwelling Units

First Floor Below Grade	First Floor Above Grade	Intermediate Floor(s)	Top Floor
<input type="checkbox"/> Exposed Walls in one orientation			
<input type="checkbox"/> Exposed Walls in two adjacent orientations			
<input type="checkbox"/> Exposed Walls in two opposite orientations			
<input checked="" type="checkbox"/> Exposed Walls in three orientations			
<input type="checkbox"/> Exposed Walls in all orientations			

Comments

Delete OK Apply Cancel

Walls

Exterior 1 | Exterior 2 | Exterior 3 | Exterior 4 | Underground 1 | Underground 2 | Interior 1 | Interior 2

Wall Code:

Construction
 Wall Construction:
 Construction Material:

Stud Dimensions: Size: Spacing (in):

Wall Insulation:
 Cavity Insulation: Type: Thickness (in): R-value:
 Exterior Insulation: Type: Thickness (in): R-value:
 Interior Insulation: Type: Thickness (in): R-value:

Wall Exterior:
 Exterior Finish:
 Exterior Color:

Configuration

Space	Area (sq ft)				
	Back	Right	Front	Left	Sum
Units	1920	720	1920	720	5280
Hallways	144	0	144	0	288
Crawlspace	0	0	0	0	0
Totals:	2064.0	720.0	2064.0	720.0	5568.0

All Walls

Wall Code	Wall Tab	Construction Material	Last Edited
Exterior walls of units	Exterior 1	8" Concrete Block, Hollow	06-21-2017 4:49 PM
Walls between units and unconditioned hallways	Interior 1	8" Concrete Block, Hollow	06-21-2017 4:50 PM

Walls (cont.)

Exterior 1 Exterior 2 Exterior 3 Exterior 4 Underground 1 Underground 2 **Interior 1** Interior 2

Wall Code: Partition walls between units and hallways

Construction

Wall Construction:

Construction Material: 8" Concrete Block, Hollow

Stud Dimensions: Size: Spacing (in):

Wall Insulation:

Cavity Insulation: Type: Thickness (in): R-value:

Exterior Insulation: Type: None Thickness (in): R-value:

Interior Insulation: Type: None Thickness (in): R-value:

Wall Exterior:

Exterior Finish:

Exterior Color:

Configuration

Gross Area of Wall		
Conditioned Space	Unconditioned Attached Space	Area (sq ft)
Units	Hallways	1440
Units	Attic	0
Units	Crawlspace	0
Totals:		1440.0

Delete OK Apply Cancel

All Walls

Wall Code	Wall Tab	Construction Material	Last Edited
Exterior walls of units	Exterior 1	8" Concrete Block, Hollow	06-21-2017 4:49 PM
Partition walls between units and hallways	Interior 1	8" Concrete Block, Hollow	06-21-2017 6:14 PM

Windows

Window 1
Window 2
Window 3
Window 4
Window 5
Window 6
Window 7
Window 8

Window Code:

Construction

Window Type:

Default Leakiness:

Input NFRC Ratings: U-value: SHGC:

Glazing Assembly:

Glass Type:

Frame Type:

Width (in): Height (in):

Installed Characteristics

Installed Leakiness:

Storm Window:

Interior Shading:

Exterior Shading:

Overhang/Awning:

Horizontal Projection (in): Distance from Lintel (in):

Configuration

Wall Tab	Wall Code	Space	Number				
			Back	Right	Front	Left	Sum
Exterior 1	Exterior walls of units	Units	0	0	6	0	6
Exterior 1	Exterior walls of units	Hallways	0	0	0	0	0
Totals:			0	0	6	0	6

Retrofit Measures

Active: **Replace Window:** Input NFRC Ratings: U-value: SHGC:

Glazing Assembly:

Glass Type:

Active: **Add Storm Window:** Storm Window Type:

Active: **Add Shading:** Shading Type:

Active: **Add Awning:** Horizontal Projection (in): Distance from Lintel (in):

Comments

All Windows

Window Code	Window Tab	Window Type	Glazing Assembly	Glass Type	Frame Type	Last Edited
W1 60x48 windows	Window 1	Vertical Slider	Single Pane	Clear	Wood	06-21-2017 4:52 PM
W2 36x48 windows	Window 2	Vertical Slider	Single Pane	Clear	Wood	06-21-2017 4:52 PM

Windows (cont.)

Window 1 **Window 2** Window 3 Window 4 Window 5 Window 6 Window 7 Window 8

Window Code:

Width (in): Height (in):

Construction

Window Type:

Default Leakiness:

Input NFRC Ratings: U-value: SHGC:

Glazing Assembly:

Glass Type:

Frame Type:

Installed Characteristics

Installed Leakiness:

Storm Window:

Interior Shading:

Exterior Shading:

Overhang/Awning:
Horizontal Projection (in): Distance from Lintel (in):

Configuration

Number of Windows

Wall Tab	Wall Code	Space	Number				
			Back	Right	Front	Left	Sum
Exterior 1	Exterior walls of units	Units	12	0	12	0	24
Exterior 1	Exterior walls of units	Hallways	0	0	0	0	0
Totals:			12	0	12	0	24

Retrofit Measures

Active: Replace Window: Input NFRC Ratings: U-value: SHGC:

Glazing Assembly:

Glass Type:

Active: Add Storm Window: Storm Window Type:

Active: Add Shading: Shading Type:

Active: Add Awning: Horizontal Projection (in): Distance from Lintel (in):

Comments

Delete **OK** **Apply** **Cancel**

All Windows

Window Code	Window Tab	Window Type	Glazing Assembly	Glass Type	Frame Type	Last Edited
W1 60x48 windows	Window 1	Vertical Slider	Single Pane	Clear	Wood	06-21-2017 4:52 PM
W2 36x48 windows	Window 2	Vertical Slider	Single Pane	Clear	Wood	06-21-2017 4:52 PM

Doors

Door 1
Door 2
Door 3
Door 4

Door Code:

Construction

Door Type:

Default Leakiness:

Door U-value is known: U-value:

Construction Material:

Glass Area (%):

Glass Type:

Width (in): Height (in):

Installed Characteristics

Installed Leakiness:

Storm Door Frame Type:

Configuration

Number of Doors							
Wall Tab	Wall Code	Space	Number				
			Back	Right	Front	Left	Sum
Exterior 1	Exterior walls of units	Units	0	0	0	0	0
Exterior 1	Exterior walls of units	Hallways	0	0	1	0	1
Totals:			0	0	1	0	1

Retrofit Measures

Active: Replace Door: Door U-value is known: U-value:

Construction Material:

Glass Area (%):

Glass Type:

Active: Add Storm Door: Storm Door Frame Type:

Comments

Delete
OK
Apply
Cancel

All Doors

Door Code	Door Tab	Construction Material	Last Edited
Building entrance door	Door 1	Steel, Hollow Core	06-21-2017 4:53 PM

Roof

Attic 1 Attic 2 Attic 3 Attic 4 Cathedral 1 Cathedral 2 Flat 1 Flat 2

Roof Code:

Construction

Roof Construction:

Construction Material:

Truss / Joist: Size: Spacing:

Roof Insulation:

Ceiling Insulation: Type: Thickness (in): R-value:

Roof Insulation: Type: Thickness (in): R-value:

Radiant Barrier:

Roof Exterior:

Roofing Material:

Roof Color: Absorptance:

Configuration

Area of Roof		
Floor	Space	Area (sq ft)
A3	Units	2400
A3	Hallways	180
A2	Units	0
Totals:		2580.0

Roof Slope (x/12):

Attic Height (ft):

Attic Volume (cu ft):

Retrofit Measures

Active: Add Ceiling Insulation: Type: Thickness (in): R-value:

Active: Add Roof Insulation: Type: Thickness (in): R-value:

All Roofs

Roof Code	Roof Tab	Construction Material	Roof Color	Last Edited
Attic roof	Attic 1	Asphalt Shingles	Dark	06-21-2017 4:53 PM

Floor

Underground 1 | Underground 2 | Exposed 1 | Exposed 2 | Interior 1 | Interior 2 | Above Crawlspace 1 | Above Crawlspace 2

Floor Code:

Construction
 Floor Construction:

Construction Material:

Truss / Joist: Depth: Spacing:

Floor Insulation:

Slab Insulation: Location: Width/Depth (ft): [Show Slab Insulation Diagram](#)

Exterior Insulation: Type: Thickness (in): R-value:

Interior Insulation: Type: Thickness (in): R-value:

Sill Box Insulation: Type: Thickness (in): R-value:

Floor Covering:

Carpet Area (%):

Configuration

Area and Exposed Perimeter of Floor			
Floor	Space	Floor Area (sq ft)	Exposed Perimeter (ft)
A1	Units	2400	0
A1	Hallways	180	0
Totals:		2580.0	0.0

All Floors

Floor Code	Floor Tab	Construction Material	Last Edited
Sla-on-grade floor	Underground 1	Concrete	06-21-2017 4:54 PM

HVAC (cont.)

System 1	System 2	System 3	System 4	System 5	System 6	Units Thermostat	Hallways Thermostat	Other Conditioned Spaces Thermostat
HVAC System Code:		1 ton AC		Location Served:		Units		
System Configuration:		Cooling Only		Number of Same Systems:		B2: 1	B1: 1	A1: 2 A2: 2 A3: 2
Outside Air Ventilation Rate (cfm):		0						
Heating Equipment				Cooling Equipment				
System Type:				System Type:		Individual		
Equipment:				Equipment:		Room (Wall) Air Conditioner		
Fuel:				Efficiency Input Method:		Year Manufactured		
Efficiency Input Method:				Year Manufactured:		1998		
Year Manufactured:		0		Efficiency:		9.08 EER		
Steady State Efficiency % (Site Measured):				Capacity:		1 Tons		
Efficiency (Nameplate/Rated):								
Capacity:								
Pilot Light/IID:								
Retrofit Measures								
Active: <input type="checkbox"/> Change Ventilation Rate:		Outside Air Ventilation Rate (cfm):						
Active: <input type="checkbox"/> Replace the System:		System Configuration:				Cooling Equipment:		
		Heating Equipment:				Cooling Efficiency:		
		Heating Fuel:				Cooling Capacity:		
		Heating Efficiency:						
		Heating Capacity:						
Delete							OK Apply Cancel	
All HVAC Systems								
HVAC System Code	HVAC Tab	Location Served	System Configuration	Heating System Type	Cooling System Type	Last Edited		
5 kW Baseboard	System 1	Units	Heating Only	Individual	None	06-11-2017 11:27 PM		
1.5 ton AC	System 2	Units	Cooling Only	None	Individual	06-11-2017 11:29 PM		
1 ton AC	System 3	Units	Cooling Only	None	Individual	06-11-2017 11:30 PM		

Infiltration/Vent.

Infiltration Mechanical Ventilation

Infiltration Data
Data Input Method: Space Specific Whole Building
Type of Measurement: Natural Air Changes per Hour (ACH) Blower Door Data

Space Specific Infiltration

Floor	Space	Natural ACH
A3	Units	0.75
A3	Hallways	0.75
A2	Units	0.75
A2	Hallways	0.75
A1	Units	0.75

Whole Building Infiltration:
Natural ACH:
Blower Door Reading (CFM50):

Retrofit Building
Airsealing Measures Planned:

Space Specific Infiltration

Floor	Space	Natural ACH
A3	Units	0.5
A3	Hallways	0.5
A2	Units	0.5
A2	Hallways	0.5
A1	Units	0.5

Whole Building Infiltration:
Natural ACH:
Blower Door Reading (CFM50):

Comments

Delete OK Apply Cancel

Water Heating

Individual System 1				Individual System 2	Individual System 3	Individual System 4	Central System
DHW Individual System Code:		40-gal electric water heater		Water Use Calibration Factor:		1	
Water Heating Equipment - Individual							
Equipment Type:	Storage	Tank Size (gal):	40	Rated Input:	3	kW	
Location:	Conditioned Space	Efficiency Input Method:	Year Manufactured	Year Manufactured:	1998	Energy Factor: 0.86	
Number of Same Water Heaters:	6	Recovery Efficiency:	0.98				
Set-Point Temperature (F):	130						
Primary Fuel:	Electricity						
Water Heater Wrap R-value:	0						
Insulated Pipe Length (ft):	0						
Retrofit Measures - Individual							
Active:	<input type="checkbox"/> Replace the System:	Equipment Type:		Tank Size (gal):			
		Number of Same Water Heaters:		Rated Input:			
		Primary Fuel:		Energy Factor:			
Active:	<input type="checkbox"/> Change Set-Point Temperature:	Set-Point Temperature (F):		Recovery Efficiency:			
Active:	<input type="checkbox"/> Install Water Heater Wrap:	Water Heater Wrap R-value:					
Active:	<input type="checkbox"/> Add Insulation on Water Heater Pipes:	Insulation Thickness (in):		Length of Pipe to Insulate (ft):			
Delete				OK Apply Cancel			
All DHW Systems							
DHW System Code	DHW Tab	Location	Last Edited				
40-gal electric water heater	Individual 1	Conditioned Space	06-11-2017 11:31 PM				

Lighting

Basecase

Lighting Loads

Data Input Method: Space Specific Whole Building

Space Specific Lighting Loads

Floor	Space	Power Density (W/sq ft)	Wattage
A3	Units	0.5	
A3	Hallways	0.5	
A2	Units	0.5	
A2	Hallways	0.5	
A1	Units	0.5	

Whole Building Power Density (W/sq ft):

Usage Schedule: High Medium Low

Exterior Installed Wattage (W):

Comments

Lighting Systems

Lighting Systems

Lighting System 1

Lighting System 2

Lighting System Code:

Location:

Existing Lighting System

Lamp Type:

Wattage (W):

Usage (hr/day):

Number of Lamps:

Retrofit Lighting System

Retrofit Measure Action:

Lamp Type:

Usage (hr/day):

Number of New Ballasts, Sensors, or Controls:

Wattage (W):

Number of Lamps:

Comments

Lighting (cont.)

Lighting Systems

Lighting Systems

Lighting System 1

Lighting System 2

Lighting System Code:

Location:

Existing Lighting System

Lamp Type:

Wattage (W):

Usage (hr/day):

Number of Lamps:

Retrofit Lighting System

Retrofit Measure Action:

Lamp Type:

Usage (hr/day):

Number of New Ballasts, Sensors, or Controls:

Wattage (W):

Number of Lamps:

Comments

Appliances/Eqpt.

Appliance Basecase

Basecase Appliance Loads

Data Input Method: Space Specific Whole Building

Floor	Space	Power Density (W/sq ft)
A3	Units	0.5
A3	Hallways	0.5
A2	Units	0.5
A2	Hallways	0.5
A1	Units	0.5

Whole Building Power Density (W/sq ft):

Usage Schedule: High Medium Low

Comments

Delete **OK** **Apply** **Cancel**

Refrigerator

Refrigerator 1	Refrigerator 2	Refrigerator 3	Refrigerator 4	Refrigerator 5	Refrigerator 6	Refrigerator 7	Refrigerator 8
Refrigerator Code: Refrigerator Replacement		Location: Units		Number of Units to be Replaced: 6			
Existing Refrigerator							
Preferred Input Method: Use Yearly Shipment Weighted Datab		Manufacturer:		Metering Data: Minutes: Wh:		Defrost Cycle During Metering:	
Model:		Year Made: 1998		Door Seal Condition: Fair - Some Wear		Calculated Consumption (kWh/year): 992.42	
Label or Database (kWh/year):		Size (cu ft): 18.5		Style: Top Freezer		Defrost Type: Automatic	
Replacement Refrigerator							
Preferred Input Method: Enter kWh/year from Label		Manufacturer:		Refrigerator Dimensions: Height (in): Width (in): Depth (in):		Adjusted Consumption (kWh/year): 550	
Model:		Label or Database (kWh/year): 500		Size (cu ft): 18.5		Style:	
Defrost Type:							
Comments							
Delete						OK Apply Cancel	
All Refrigerators							
Refrigerator Code	Refrigerator Tab	Location	Number of Units Replaced	Last Edited			
Refrigerator Replacement	Refrigerator 1	Units	6	06-11-2017 11:36 PM			

Utility Bills

Electricity Fossil Fuels

Meter Code:

Coverage:

Data Entry Type:

Units:

Degree Days Base Temp. (F):

Utility Bill Information

Utility Bill Information

Select All Deselect All

Use	Index	Start Date	End Date	Usage	HDD	CDD	
<input checked="" type="checkbox"/>	1	01-01-2013	01-31-2013	19046.0	1024.0	0.0	▲
<input checked="" type="checkbox"/>	2	02-01-2013	02-28-2013	17893.0	952.0	0.0	■
<input checked="" type="checkbox"/>	3	03-01-2013	03-31-2013	16275.0	851.0	0.0	▲
<input checked="" type="checkbox"/>	4	04-01-2013	04-30-2013	10903.0	514.0	3.0	▲
<input checked="" type="checkbox"/>	5	05-01-2013	05-31-2013	7142.0	255.0	52.0	▲
<input checked="" type="checkbox"/>	6	06-01-2013	06-30-2013	4863.0	53.0	173.0	▼
<input checked="" type="checkbox"/>	7	07-01-2013	07-31-2013	5499.0	5.0	351.0	▲
<input checked="" type="checkbox"/>	8	08-01-2013	08-31-2013	4497.0	8.0	218.0	■
<input checked="" type="checkbox"/>	9	09-01-2013	09-30-2013	5207.0	112.0	97.0	▲
<input checked="" type="checkbox"/>	10	10-01-2013	10-31-2013	7482.0	291.0	22.0	▲
<input checked="" type="checkbox"/>	11	11-01-2013	11-30-2013	13505.0	677.0	2.0	▲
<input checked="" type="checkbox"/>	12	12-01-2013	12-31-2013	18421.0	985.0	0.0	▼

Comments

Utility Bills

Code	Type	Coverage	Units	Degree Days Base Temp. (F)	Comments
Electric meter	Electricity	Whole Building	kWh	65	

MuTEA Building Audit Calibration Report

Report Printed on Thursday, June 22, 2017 at 2:35 p.m.

Agency Information

Agency: ORNL
Address: 1 Bethel valley Road
City: Oak Ridge
State: TN
Zip Code:
Phone Number: 8652416765

Account Information

Account Name: Sample Account 0
Account Number: S0000
Other ID Number:
Address:
Unit:
City: Boston
State: MA
Zip:
Comments: Three-story walkup with slab-on-grade floor

Audit Information

Audit Name: Sample Audit 0
Audit Number: 989
Auditor: ORNL LeadAuditor
Audit Date: June 9, 2017
Audit Created Date: June 9, 2017
Audit Comments: Three-story walkup with slab-on-grade floor

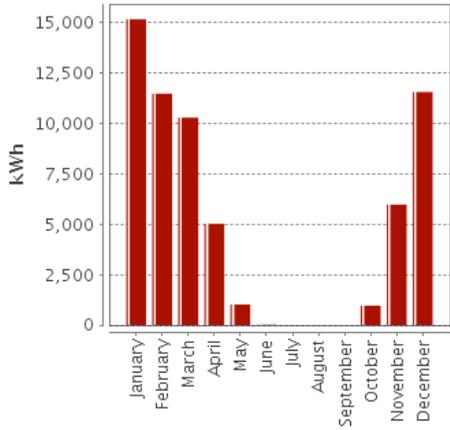
Audit Run Details

Version: 0.9
Weather Station: Boston Logan IntL Arpt
Weather State: MA
Building ID: 15058
Building Result ID: 2395

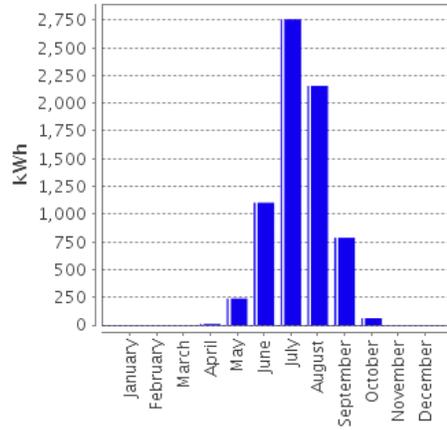
MuTEA Estimated Electricity Consumption (kWh)

Month	Heating	Cooling	Hot Water	Appliances	Lighting	Building Total
January	15,170	0	1,249	2,602	1,374	20,395
February	11,470	0	1,145	2,351	1,241	16,207
March	10,286	0	1,242	2,603	1,374	15,506
April	5,022	10	1,141	2,518	1,254	9,945
May	1,014	238	1,093	2,602	1,296	6,243
June	18	1,103	975	2,519	1,254	5,870
July	0	2,758	946	2,602	1,296	7,602
August	0	2,157	923	2,602	1,296	6,978
September	0	787	914	2,519	1,254	5,474
October	959	61	1,006	2,602	1,374	6,002
November	5,977	0	1,055	2,520	1,330	10,882
December	11,555	0	1,176	2,603	1,374	16,709
Annual	61,471	7,114	12,866	30,643	15,719	127,813

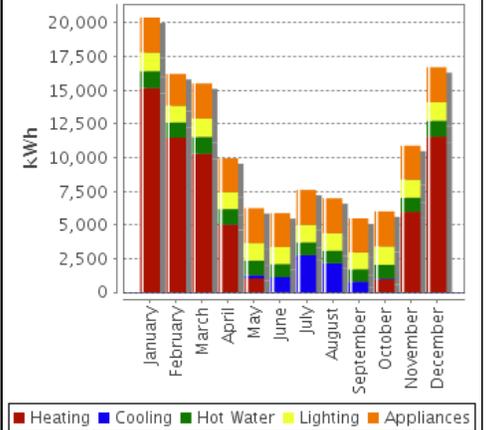
Heating Electricity Consumption



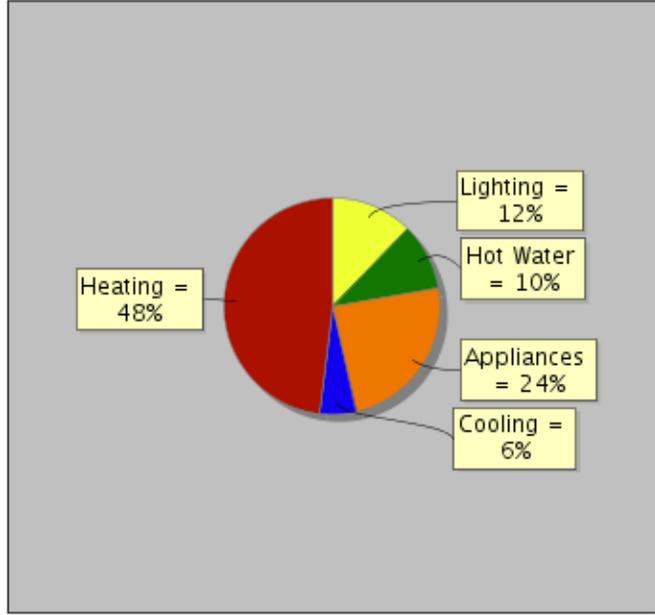
Cooling Electricity Consumption



Annual Electricity Consumption



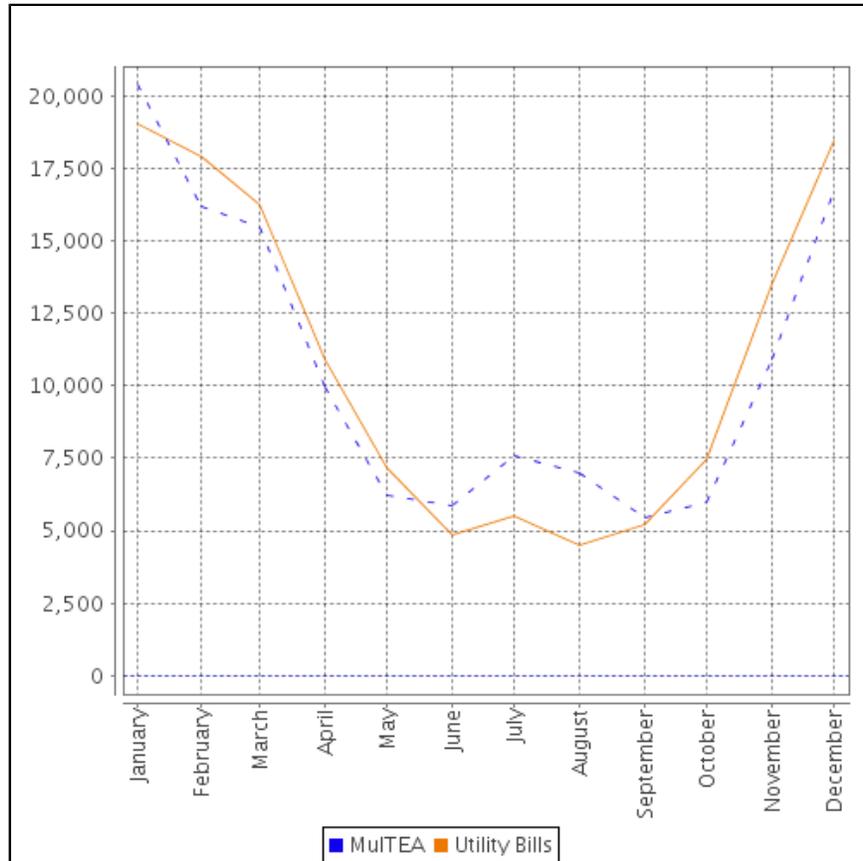
Annual Electricity Consumption



Building Total Electricity Consumption Comparison (kWh)

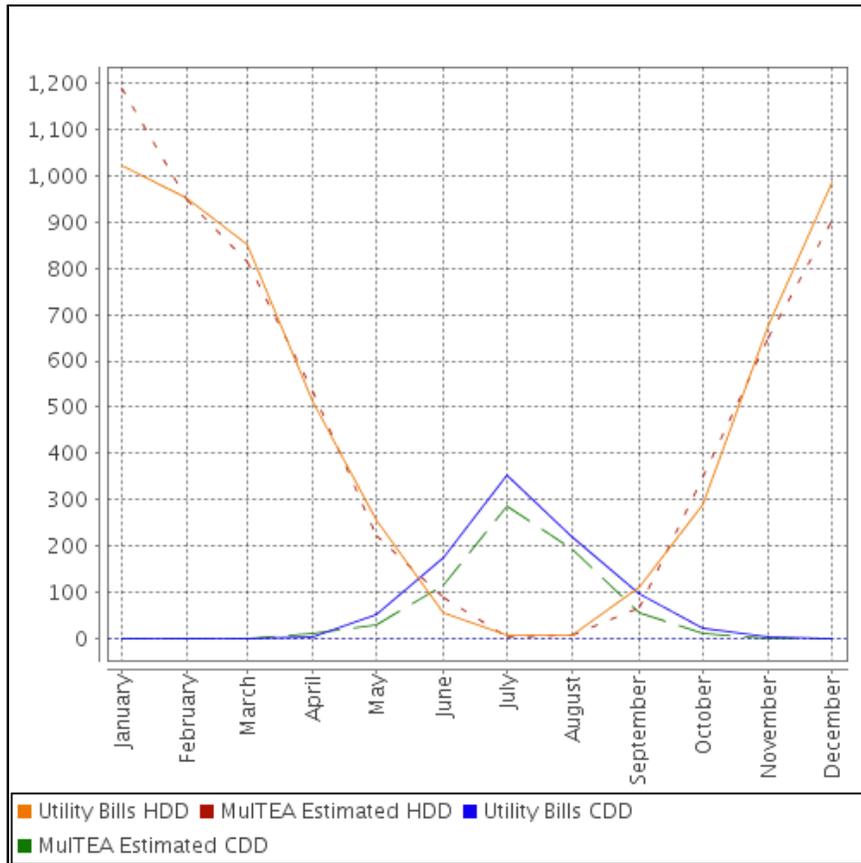
Month	MulTEA Estimate	Utility Bill	Difference	Percent Difference
January	20,395	19,046	1,349	7.1%
February	16,207	17,893	-1,686	-9.4%
March	15,506	16,275	-769	-4.7%
April	9,945	10,903	-958	-8.8%
May	6,243	7,142	-899	-12.6%
June	5,870	4,863	1,007	20.7%
July	7,602	5,499	2,103	38.2%
August	6,978	4,497	2,481	55.2%
September	5,474	5,207	267	5.1%
October	6,002	7,482	-1,480	-19.8%
November	10,882	13,505	-2,623	-19.4%
December	16,709	18,421	-1,712	-9.3%
Annual	127,813	130,733	-2,920	-2.2%

Usage Comparison (kWh)



Month	MuTEA HDD Estimate	Utility Bill HDD	Difference	Percent Difference	MuTEA CDD Estimate	Utility Bill CDD	Difference	Percent Difference
January	1,189	1,024	165	16.1%	0	0	0	NaN
February	950	952	-2	-.2%	0	0	0	NaN
March	813	851	-38	-4.5%	0	0	0	NaN
April	537	514	23	4.4%	9	3	6	200.0%
May	223	255	-32	-12.7%	30	52	-22	-41.5%
June	87	53	34	64.6%	116	173	-57	-32.8%
July	3	5	-2	-40.0%	284	351	-67	-19.0%
August	5	8	-3	-32.8%	192	218	-26	-11.9%
September	66	112	-46	-41.1%	53	97	-44	-44.9%
October	348	291	57	19.7%	9	22	-13	-60.5%
November	652	677	-25	-3.7%	0	2	-2	-100.0%
December	902	985	-83	-8.4%	0	0	0	NaN
Annual	5,776	5,727	49	.9%	694	918	-224	-24.4%

Heating and Cooling Degree Days Comparison



MuTEA Retrofit Measures Report

No Measure Interactions

AGENCY INFORMATION

Agency: ORNL
Address: 1 Bethel valley Road, P.O. Box 2008, Oak Ridge TN
Phone Number: 8652416765
Email: helpdesk@ornl.gov

ACCOUNT INFORMATION

Account Name: Sample Account 0
Account Number: S0000
Other ID Number:
Address: Boston MA
Comments: Three-story walkup with slab-on-grade floor

AUDIT INFORMATION

Audit Name: Sample Audit 0
Audit Number: 989
Auditor: ORNL_LeadAuditor
Audit Date: June 9, 2017
Last Edited On: June 22, 2017 2:05 PM
Comments: Three-story walkup with slab-on-grade floor

RETROFIT MEASURE RUN DETAILS

MuTEA Version: 0.1(build: 4967 rev: 23244:23672)
Calibration Run On: June 9, 2017 8:00 PM
Measures Run On: June 15, 2017 11:00 PM

Weather Station: Boston Logan IntL Arpt
Weather State: MA

Libraries:
Economic Parameters: Residential US Average - 2017
Measure Costs: Sample Buildings Measure Cost Library
Electricity: Average US Residential Electricity Costs - 2017 \$0.129/kWh
Natural Gas: Average US Residential Natural Gas Costs - 2017 \$9.9/Mcf
Propane: None
Fuel Oil: None
Kerosene: None

Retrofit Measure Energy Savings (No Interaction Among Measures)														
#	Retrofit Measure	Component	Code	Predicted Annual Energy Savings										
				Electricity (kWh)						Fossil Fuel (MMBtu)				
				Heating	Cooling	Water Heating	Appliances and Equipment	Lighting	Total	Heating	Water Heating	Appliances and Equipment	Total	
1	Replace Window	Windows	W1 60x48 windows	1,322	-88	0	0	0	0	1,234	0.00	0.00	0.00	0.00
2	Replace Window	Windows	W2 36x48 windows	3,665	-223	0	0	0	0	3,442	0.00	0.00	0.00	0.00
3	Replace Door	Doors	Building entrance door	20	0	0	0	0	0	20	0.00	0.00	0.00	0.00
4	Add Ceiling Insulation	Roofs	Attic roof	3,190	-1	0	0	0	0	3,189	0.00	0.00	0.00	0.00
5	Air Sealing	Infiltration/Ventilation	Infiltration	5,604	3	0	0	0	0	5,607	0.00	0.00	0.00	0.00
6	Replace Lamps	Lighting	Lamp Replacement	-1,822	411	0	0	3,644	0	2,234	0.00	0.00	0.00	0.00
7	Install Motion Sensors	Lighting	Hallway Motion Sensor	-613	126	0	0	2,102	0	1,616	0.00	0.00	0.00	0.00
8	Replace the Refrigerator	Refrigerator	Refrigerator Replacement	-1,271	309	0	2,654	0	0	1,692	0.00	0.00	0.00	0.00

Retrofit Measure Cost Savings (No Interaction Among Measures)									
#	Retrofit Measure	Component	Code	Predicted Annual Cost Savings (\$)					
				Heating	Cooling	Water Heating	Appliances and Equipment	Lighting	Total
1	Replace Window	Windows	W1 60x48 windows	\$171	-\$11	\$0	\$0	\$0	\$159
2	Replace Window	Windows	W2 36x48 windows	\$473	-\$29	\$0	\$0	\$0	\$444
3	Replace Door	Doors	Building entrance door	\$3	\$0	\$0	\$0	\$0	\$3
4	Add Ceiling Insulation	Roofs	Attic roof	\$412	\$0	\$0	\$0	\$0	\$411
5	Air Sealing	Infiltration/Ventilation	Infiltration	\$723	\$0	\$0	\$0	\$0	\$723
6	Replace Lamps	Lighting	Lamp Replacement	-\$235	\$53	\$0	\$0	\$470	\$288
7	Install Motion Sensors	Lighting	Hallway Motion Sensor	-\$79	\$16	\$0	\$0	\$271	\$208
8	Replace the Refrigerator	Refrigerator	Refrigerator Replacement	-\$164	\$40	\$0	\$342	\$0	\$218

Retrofit Measure Installation Costs								
#	Retrofit Measure	Component	Code	Material Details	Retrofit Measure Cost Name	Estimated Installation Cost (\$)		
						Default	Adjustment (+/-)	Final
1	Replace Window	Windows	W1 60x48 windows	Double Pane - Low-E, High Solar	Standard DP Low-E Window	\$3,888	\$0	\$3,888
2	Replace Window	Windows	W2 36x48 windows	Double Pane - Low-E, High Solar	Standard DP Low-E Window	\$12,096	\$0	\$12,096
3	Replace Door	Doors	Building entrance door	Steel, Polystyrene Core - 20% Single Pane Glass	Standard Poly Steel Door	\$500	\$0	\$500
4	Add Ceiling Insulation	Roofs	Attic roof	Cellulose Blown - Normal Density	Cellulose Ceiling Insulation	\$3,870	\$0	\$3,870
5	Air Sealing	Infiltration/Ventilation	Infiltration		None Defined	\$0	\$2,000	\$2,000
6	Replace Lamps	Lighting	Lamp Replacement		23W CFL	\$288	\$0	\$288
7	Install Motion Sensors	Lighting	Hallway Motion Sensor		Standard Motion Sensor Kit	\$900	\$0	\$900
8	Replace the Refrigerator	Refrigerator	Refrigerator Replacement		Medium Replacement Refrigerator	\$2,700	-\$350	\$2,350

Retrofit Measure Economics (No Interaction Among Measures)									
Include in Package	#	Retrofit Measure	Component	Code	Predicted Annual Cost Savings (\$)	Estimated Installation Cost (\$)	Lifetime (years)	Savings-to-Investment Ratio (SIR)	Simple Payback Period (years)
No	1	Replace Window	Windows	W1 60x48 windows	\$159	\$3,888	20.0	0.66	24.4
No	2	Replace Window	Windows	W2 36x48 windows	\$444	\$12,096	20.0	0.59	27.2
No	3	Replace Door	Doors	Building entrance door	\$3	\$500	20.0	0.08	193.8
No	4	Add Ceiling Insulation	Roofs	Attic roof	\$411	\$3,870	20.0	1.71	9.4
No	5	Air Sealing	Infiltration/Ventilation	Infiltration	\$723	\$2,000	10.0	3.26	2.8
No	6	Replace Lamps	Lighting	Lamp Replacement	\$288	\$288	6.8	6.47	1.0
No	7	Install Motion Sensors	Lighting	Hallway Motion Sensor	\$208	\$900	12.0	2.45	4.3
No	8	Replace the Refrigerator	Refrigerator	Refrigerator Replacement	\$218	\$2,350	15.0	1.19	10.8

MuTEA Retrofit Package Report

Measure Interactions Addressed

AGENCY INFORMATION

Agency: ORNL
Address: 1 Bethel valley Road, P.O. Box 2008, Oak Ridge TN
Phone Number: 8652416765
Email: helpdesk@ornl.gov

ACCOUNT INFORMATION

Account Name: Sample Account 0
Account Number: S0000
Other ID Number:
Address: Boston MA
Comments: Three-story walkup with slab-on-grade floor

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Audit Name: Sample Audit 0
Audit Number: 989
Auditor: ORNL_LeadAuditor
Audit Date: June 9, 2017
Last Edited On: June 22, 2017 2:05 PM
Comments: Three-story walkup with slab-on-grade floor

RETROFIT PACKAGE RUN DETAILS

MuTEA Version: 0.1(build: 4967 rev: 23244:23672)
Calibration Run On: June 9, 2017 8:00 PM
Measures Run On: June 15, 2017 11:00 PM
Package Run On: June 20, 2017 10:00 AM

Weather Station: Boston Logan IntL Arpt
Weather State: MA

Libraries:
 Economic Parameters: Residential US Average - 2017
 Measure Costs: Sample Buildings Measure Cost Library
 Electricity: Average US Residential Electricity Costs - 2017 \$0.129/kWh
 Natural Gas: Average US Residential Natural Gas Costs - 2017 \$9.9/Mcf
 Propane: None
 Fuel Oil: None
 Kerosene: None

Retrofit Package Energy Savings (Includes Interaction Among Measures)

#	Retrofit Measure	Component	Code	Predicted Annual Energy Savings									
				Electricity (kWh)						Fossil Fuel (MMBtu)			
				Heating	Cooling	Water Heating	Appliances and Equipment	Lighting	Total	Heating	Water Heating	Appliances and Equipment	Total
1	Replace Lamps	Lighting	Lamp Replacement	-1,822	411	0	0	3,644	2,234	0.00	0.00	0.00	0.00
2	Air Sealing	Infiltration/Ventilation	Infiltration	5,627	8	0	0	0	5,635	0.00	0.00	0.00	0.00
3	Install Motion Sensors	Lighting	Hallway Motion Sensor	-570	126	0	0	2,102	1,658	0.00	0.00	0.00	0.00
4	Add Ceiling Insulation	Roofs	Attic roof	3,646	7	0	0	0	3,653	0.00	0.00	0.00	0.00
5	Replace the Refrigerator	Refrigerator	Refrigerator Replacement	-1,270	313	0	2,654	0	1,697	0.00	0.00	0.00	0.00
6	Replace Window	Windows	W1 60x48 windows	1,536	-84	0	0	0	1,452	0.00	0.00	0.00	0.00
7	Replace Window	Windows	W2 36x48 windows	3,752	-223	0	0	0	3,529	0.00	0.00	0.00	0.00
8	Replace Door	Doors	Building entrance door	7	1	0	0	0	8	0.00	0.00	0.00	0.00
Package				10,906	559	0	2,654	5,747	19,866	0.00	0.00	0.00	0.00

Retrofit Package Cost Savings (Includes Interaction Among Measures)									
#	Retrofit Measure	Component	Code	Predicted Annual Cost Savings (\$)					
				Heating	Cooling	Water Heating	Appliances and Equipment	Lighting	Total
1	Replace Lamps	Lighting	Lamp Replacement	-\$235	\$53	\$0	\$0	\$470	\$288
2	Air Sealing	Infiltration/Ventilation	Infiltration	\$726	\$1	\$0	\$0	\$0	\$727
3	Install Motion Sensors	Lighting	Hallway Motion Sensor	-\$74	\$16	\$0	\$0	\$271	\$214
4	Add Ceiling Insulation	Roofs	Attic roof	\$470	\$1	\$0	\$0	\$0	\$471
5	Replace the Refrigerator	Refrigerator	Refrigerator Replacement	-\$164	\$40	\$0	\$342	\$0	\$219
6	Replace Window	Windows	W1 60x48 windows	\$198	-\$11	\$0	\$0	\$0	\$187
7	Replace Window	Windows	W2 36x48 windows	\$484	-\$29	\$0	\$0	\$0	\$455
8	Replace Door	Doors	Building entrance door	\$1	\$0	\$0	\$0	\$0	\$1
Package				\$1,407	\$72	\$0	\$342	\$741	\$2,563

Retrofit Package Economics (Includes Interaction Among Measures)								
#	Retrofit Measure	Component	Code	Predicted Annual Cost Savings (\$)	Estimated Installation Cost (\$)	Lifetime (years)	Savings-to-Investment Ratio (SIR)	Simple Payback Period (years)
1	Replace Lamps	Lighting	Lamp Replacement	\$288	\$288	6.8	6.47	1.0
2	Air Sealing	Infiltration/Ventilation	Infiltration	\$727	\$2,000	10.0	3.27	2.8
3	Install Motion Sensors	Lighting	Hallway Motion Sensor	\$214	\$900	12.0	2.52	4.2
4	Add Ceiling Insulation	Roofs	Attic roof	\$471	\$3,870	20.0	1.96	8.2
5	Replace the Refrigerator	Refrigerator	Refrigerator Replacement	\$219	\$2,350	15.0	1.19	10.7
6	Replace Window	Windows	W1 60x48 windows	\$187	\$3,888	20.0	0.77	20.8
7	Replace Window	Windows	W2 36x48 windows	\$455	\$12,096	20.0	0.60	26.6
8	Replace Door	Doors	Building entrance door	\$1	\$500	20.0	0.03	484.5
9	Fix Roof Leak - Attic Insulation			\$0	\$500	0.0	0.00	0.0
10	Repair roof (for Add Ceiling Insulation)			\$0	\$500	0.0	0.00	0.0
Package				\$2,563	\$26,892		1.17	10.5

Retrofit Package Leveraging (Includes Interaction Among Measures)									
#	Retrofit Measure	Component	Code	Estimated Installation Costs (\$)	Savings-to-Investment Ratio (SIR)	Leveraging			
						Buydown for SIR = 1.0 (\$)	Actual Buydown (\$)	Estimated Program Installation Cost (\$)	Program SIR
1	Replace Lamps	Lighting	Lamp Replacement	\$288	6.47	\$0	\$0	\$288	6.47
2	Air Sealing	Infiltration/Ventilation	Infiltration	\$2,000	3.27	\$0	\$0	\$2,000	3.27
3	Install Motion Sensors	Lighting	Hallway Motion Sensor	\$900	2.52	\$0	\$0	\$900	2.52
4	Add Ceiling Insulation	Roofs	Attic roof	\$3,870	1.96	\$0	\$0	\$3,870	1.96
5	Replace the Refrigerator	Refrigerator	Refrigerator Replacement	\$2,350	1.19	\$0	\$0	\$2,350	1.19
6	Replace Window	Windows	W1 60x48 windows	\$3,888	0.77	\$879	\$1,000	\$2,888	1.04
7	Replace Window	Windows	W2 36x48 windows	\$12,096	0.60	\$4,783	\$5,000	\$7,096	1.03
8	Replace Door	Doors	Building entrance door	\$500	0.03	\$483	\$0	\$500	0.03
9	Fix Roof Leak - Attic Insulation			\$500	0.00	\$0	\$0	\$500	0.00
10	Repair roof (for Add Ceiling Insulation)			\$500	0.00	\$0	\$0	\$500	0.00
Package				\$26,892	1.17		\$6,000	\$20,892	1.50