ALTOONA TOWERS ENERGY EFFICIENCY STRATEGIES — BUNDLE 1

General Service Area Energy Efficiency Strategies [1]		Energy Strategy Reference [2]		Energy Savings Data [3]		
Strategy Category	Bundle 1 [4]	CNC/EDA Strategy Report		CNC / EDA Bundle Report		
General Description		ID Code	Details	MMBTU	%	Cost
Envelope Insulation Strategies						
An exterior wall and roof assembly with various materials, configurations and wall finishes increase the importance of wall thermal performance. Thermal and moisture integrity for the building envelope is maintained by a wall sheathing system with integrated moisture and air barrier (trade name 'ZIP System Sheathing'). An open cell spray foam insulation system fills the 2x6 wood framed wall cavity resulting in a wall assembly thermal resistance approaching R-20. The spray foam insulation system effectively seals any wall openings, essentially eliminating infiltration and air migration through the wall and increasing the effectiveness of the insulation R-Value.		EWN01	SR p18-19	15	0.2%	$205
Glazing Strategies						
High performance vinyl casement windows with low-e insulating glass and exceeding Energy Star requirements with a U-Factor of 0.27; Solar Heat Gain Coefficient (SHGC) of 0.25 and 0.44 visible transmittance. Casement type windows with latch compression seals have the lowest operational leakage ratings of operable window types. The outward swing casement windows also increase natural ventilation and are easy to monitor externally for problems or inappropriate operation.		WGB01	SR p22-23	34	0.4%	$582
Glazing Strategies						
Design sliding glass doors with low-e insulating glass exceeding Energy Star requirements with a U-Factor of 0.28; SHGC of 0.32 and 0.59 visible transmittance		WGC01	SR p22-23	13	0.2%	$232
Other Envelope Strategies						
The integrated wall sheathing system, spray foam insulation system, low air leakage windows and sliding glass doors and quilted window shades contribute to tightly sealed building envelope with extremely low air infiltration.		EWRF2	SR p20-21	52	0.7%	$586

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February 27, 2015
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General Service Area Energy Efficiency Strategies [1]		Energy Strategy Reference [2]		Energy Savings Data [3]		
Strategy Category	Bundle 1 [4]	CNC/EDA Strategy Report		CNC / EDA Bundle Report		
General Description		ID Code	Details	MMBTU	%	Cost
Daylighting and Lighting Control Strategies		DGA06	SR p24-28	10	0.1%	$124
Stepped daylighting control of lights in stairwell landings and occupancy control of lights in offices, public spaces, restrooms, laundry rooms, storage areas, fitness areas and other common use areas.		LCCI2	SR p30-31	23	0.3%	$263
		LCST1	SR p30-31	1	0.0%	$8
		LCME1	SR p30-31	9	0.1%	$100
		LCRR1	SR p30-31	1	0.0%	$6
		LCFT1	SR p30-31	14	0.2%	$154
		LCLR1	SR p30-31	1	0.0%	$5
		LCCM1	SR p30-31	3	0.0%	$30
		LCPO1	SR p30-31	2	0.0%	$28
		LCOO1	SR p30-31	2	0.0%	$27
		LCLA1	SR p30-31	0.5	0.0%	$7
		LCSV1	SR p30-31	1	0.0%	$6
Lighting Design Strategies						
High performance linear fluorescent and LED lighting to provide low lighting power densities for public spaces.		L03BW	SR p32-34	104	1.3%	$1,139
HVAC Efficiency Strategies						
High Efficiency air source heat pumps serving the community room, fitness center and other common areas with a 16 SEER and 9 HSPF rating		MPT03	SR p36-37	11	0.1%	$175
Conditioning of Outside Air Strategies						
Total heat recovery ventilation system providing fresh air and exhaust air for the fitness center operating at 65% sensible and 65% latent effectiveness.		MHRT1	SR p40-43	36	0.5%	$625
Service Water Heating Strategies						
Domestic water heating with a centralized, condensing high efficiency boiler coupled with an indirect heat exchanger/ storage tank system. The system operates at 92 to 94% efficiency.		MHW03	SR p44-45	270	3.4%	$1,942
Appliance Efficiency Strategies						
Low water flow showerheads and low flow aerators on kitchen and bathroom sink faucets reduce water heating energy and save water.		AHW01	SR p46-47	304	3.8%	$2,190
		AHW02	SR p46-47	111	1.4%	$796
Building elevators with energy efficient regenerative drive systems reduce energy consumption.		MREL1	SR p	97	1.2%	$1,357

ALTOONA TOWERS ENERGY EFFICIENCY STRATEGIES — BUNDLE 2

Residential Apartment Unit Energy Efficiency Strategies [1]		Energy Strategy Reference [2]		Energy Savings Data [3]		
Strategy Category	Bundle 2 [4]	CNC/EDA Strategy Report		CNC / EDA Bundle Report		
General Description		ID Code	Details	MMBTU	%	Cost
Envelope Insulation Strategies						
Attic blown-in insulation system provides an R-50 insulation value over residential apartment unit ceiling areas in contrast to the R-37 energy code requirement		ERN01	SR p18-19	26	0.3%	$305
Lighting Design Strategies						
Apartment lighting using linear and compact fluorescent lamps as well as LED solid state lighting to achieve a low lighting power density of 0.43 watts per square foot; about 70% less than typical residential lighting power densities.		L02AP	SR p32-34	345	4.4%	$6,328
		L04GR	SR p32-34	19	0.2%	$344
HVAC Efficiency Strategies						
High efficiency, inverter driven, variable capacity, ducted mini-split air source heat pump systems provide heating and cooling for the residential apartments at an HSPF of greater than 11 and SEER of 20 at part load conditions. Performance ratings are over 40% better for cooling and 26% for heating. Heat pumps also have a fan energy rating of 0.17 brake horsepower per 1000 CFM capacity – 45% less fan operating energy than standard fans.		MPT01	SR p36-37	858	10.8%	$13,593
		MPT02	SR p36-37	4	0.1%	$86
		MFD04	SR p38-39	175	2.2%	$3,258
Conditioning of Outside Air Strategies						
Energy Star qualified low energy bathroom exhaust fan with occupancy sensor control and integrated LED lighting. These fans would be six times more efficient than a standard fan.		MOA02	SR p40-43	388	4.9%	$4,260
Appliance Efficiency Strategies						
A full complement of Energy Star appliances for each residential apartment: Refrigerators rated 20% better than NAECA; Clothes washers with a 2.4 MEF; and Dishwashers rated at 275 kWH/yr. or 22% over NAECA.		ACW02	SR p46-47	219	2.8%	$2,391
		ADW02	SR p46-47	47	0.6%	$276
		ARF01	SR p46-47	46	0.6%	$794
Energy Star rated ceiling fan and light assemblies for the residential apartment units.		Not Analyzed	n/a	---	---	---

ALTOONA TOWERS ENERGY EFFICIENCY STRATEGIES — SUPPLEMENTAL

Residential Apartment Unit Supplemental Energy Efficiency Strategies [1]		Energy Strategy Reference [2]		Energy Savings Data [3]		
Strategy Category	Supplemental [5]	CNC/EDA Strategy Report		CNC / EDA Bundle Report		
General Description		ID Code	Details	MMBTU	%	Cost
Envelope Insulation Strategies						
Retractable insulating quilted window coverings for all residential apartment unit windows and sliding glass doors reduce infiltration and glass transmission energy losses.		EWWQ2	SR p20-21	10	0.1%	$363
		Window Quilts	Supplemental	39	0.5%	$814
Reduced building infiltration and air migration resulting from continuous spray foam insulation systems; air and moisture barriers placed in ceilings and walls; extensive caulking and sealing of building joints and wall/ceiling penetrations; and slightly positive building pressurization from outside ventilation air inlets. These measures all serve to tightly seal the individual apartments and substantially reduce outside air leakage.		Reduce Infilt	Supplemental	47	0.6%	$752
Appliance Efficiency Strategies						
Upgrading to an Energy Star Qualified Bathroom Exhaust Fan 4 watt nightlight with a 0.8 watt LED nightlight.		Bath EA Nitelite	Supplemental	17	0.2%	$362
Ventless clothes dryers for each residential apartment unit condense the moisture in the airstream exiting the dryer, discharging the moisture into the washer standpipe and recirculating the air to the space.		Ventless Dryer	Supplemental	49	0.6%	$1,014
Range with Convection Oven capability which evenly circulates heated air around the food, allowing lower oven temperatures and a 30% reduction in cooking time. This translates to about a 20 to 30% reduction in cooking energy for a convection oven. At this time Ranges and Ovens are not Energy Star rated		Convect Oven	Supplemental	28	0.4%	$575
Non-Building/Non-Energy Strategies						
High efficiency LED Solid State exterior/site lighting is proposed for all facility walkways, parking lots, building security and canopy lighting. The proposed exterior lighting includes ambient light sensors and motion		Non-Bldg Energy		n/a	n/a	n/a
Water Efficiency strategies including Low Flow Toilets operating at 0.8 gallons per flush; Shower heads at 1.5 gallons per minute flow; and low flow aerators for kitchen and bathroom faucets.		Non-Energy Strategy		n/a	n/a	n/a

Note

1 Reference Technical Report Exhibit B; Section 5 - Energy Efficiency Strategies Description p7-8; and Request for Waiver and Approval of Pilot Project (January 09, 2015) p7-20.

2 Reference Technical Report Exhibit B; Appendix Section 1.1.B - Commercial New Construction Energy Design Assistance (CNC/EDA) *Strategy Report (SR)* dated February 20, 2014; SR page numbers noted. This Reference provides the strategy objective, description, and operational characteristics; assigns the strategy Identification code (ID Code); and establishes the criteria for comparison to the baseline. Additional technical details and product data sheets are included in Technical Report Exhibit B; Appendix Section 2.2 - Energy Systems and Equipment Technical Information.

3 Reference Technical Report Exhibit B; Appendix Section 1.1.C - Commercial New Construction Energy Design Assistance (CNC/EDA) *Bundle Report (BR)* dated March 27, 2014; BR p19. The "Annual Energy by Fuel Source" Table itemizes the isolated or independent energy savings for each energy efficient strategy/ID Code by energy type and amount as predicted by the building simulation energy model. The percent (%) savings is calculated energy saved against the 7,914 MMBTU (million BTU) annual energy use for the baseline facility. The Energy Costs Table on BR p16 itemizes the annual energy cost savings for each of the independent strategies by ID Code.

4 Reference Technical Report Exhibit B; Section 6 - Energy Efficiency Strategies Description p8-9; for description of Bundles or groups of energy efficient strategies. Bundle 1 includes strategies assigned to the general service or common areas. Bundle 2 includes strategies with direct impact on the individual residential apartment units. Several Bundle 1 strategies - such as envelope wall insulation; window and door glazing; service water heating; and low flow showerheads/sink faucets - also have a major impact on individual residential apartment units. However, all savings from overlapping strategies is assigned to the general service or common areas under Bundle 1.

Reference Technical Report Exhibit B; Section 6 - Building Energy Simulation Model Results p12-15 and Section 7 - Energy Economics p16-18 are based on CNC/EDA *Bundle Report* p7-8 "Bundle Results" Figures 1-4. The "Bundle Results" value take into consideration the interaction effects of the selected energy efficiency strategies; thus total Bundle savings are less that the sum of the independent strategies.

Reference Technical Report Exhibit B; Appendix Section 1.1.C - CNC/EDA Bundle Report (BR) dated March 27, 2014; BR p9. The "Bundle Composition" Table on p9 summarizes the energy efficiency strategies by type and ID Code and assigns each independent strategy to one or more strategy bundles to evaluate energy and energy cost savings against the baseline facility.

5 Reference Technical Report Exhibit B; Section 6 - Energy Efficiency Strategies Description (p9-10) for description of Supplemental Energy Efficiency Strategies. Reference Technical Report Exhibit B: Appendix Section 1.3 - Supplemental Energy Strategies Summary for energy and cost savings data.