



LEED for Homes v4: Multifamily Mid-Rise
 Arva Apartments
 June 3, 2022



2	0	0	Integrative Process		Possible Points: 2
Y	?	N			
2			Credit	Integrative Process	

14.0	0	1	Location and Transportation		Possible Points: 15
Y	?	N			
Y			Prereq	Floodplain Avoidance	Required
8			Credit	Site Selection	8
3			Credit	Compact Development	3
2			Credit	Community Resources	2
1		1	Credit	Access to Transit	2

2	3.5	1.5	Sustainable Sites		Possible Points: 7
Y	?	N			
Y			Prereq	Construction Activity Pollution Prevention	Required
Y			Prereq	No Invasive Plants	Required
1		1	Credit	Heat Island Reduction	2
	3		Credit	Rainwater Management	3
1	0.5	0.5	Credit	Non-Toxic Pest Control	2

5	2	5	Water Efficiency		Possible Points: 12
Y	?	N			
Y			Prereq	Water Metering	Required
5	2	5	Credit	Total Water Use	12

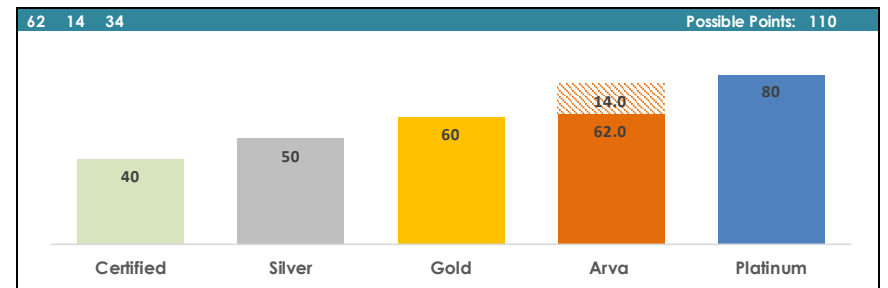
22	5	10	Energy and Atmosphere		Possible Points: 37
Y	?	N			
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Energy Metering	Required
Y			Prereq	Education of the Homeowner, Tenant or Building Manager	Required
21	4	5	Credit	Annual Energy Use	30
		5	Credit	Efficient Hot Water Distribution	5
1	1		Credit	Advanced Utility Tracking	2

3.5	0	5.5	Materials and Resources		Possible Points: 9
Y	?	N			
Y			Prereq	Certified Tropical Wood	Required
Y			Prereq	Durability Management	Required
1			Credit	Durability Management Verification	1
0.5		4.5	Credit	Environmentally Preferable Products	5
2		1	Credit	Construction Waste Management	3

7.5	0.5	10	Indoor Environmental Quality		Possible Points: 18
Y	?	N			
Y			Prereq	Ventilation	Required
Y			Prereq	Combustion Venting	Required
Y			Prereq	Garage Pollutant Protection	Required
Y			Prereq	Radon-Resistant Construction	Required
Y			Prereq	Air Filtering	Required
Y			Prereq	Environmental Tobacco Smoke	Required
Y			Prereq	Compartmentalization	Required
1		2	Credit	Enhanced Ventilation	3
	0.5	1.5	Credit	Contaminant Control	2
1		2	Credit	Balancing of Heating and Cooling Distribution Systems	3
		3	Credit	Enhanced Compartmentalization	3
2			Credit	Enhanced Combustion Venting	2
1			Credit	Enhanced Garage Pollutant Protection	1
1.5		1.5	Credit	Low Emitting Products	3
1			Credit	No Environmental Tobacco Smoke	1

4	2	0	Innovation		Possible Points: 6
Y	?	N			
3	2		Credit	Innovation	5
1			Credit	LEED AP Homes	1

2	1	1	Regional Priority Credits		Possible Points: 4
Y	?	N			
1			Credit	Site Selection (8 pts)	1
1			Credit	Community Resources (2 pts)	1
		1	Credit	Access to Transit (2 pts)	1
	1		Credit	Total Water Use (12), Rainwater M. (3), Const. Waste M. (3)	1



Note:
 - min 8 points total in LT and EA required
 - min 3 points in WE required
 - min 3 points in EQ required



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference
General Information						
2020 Green Incentive Policy	0.25 FAR Targeted, summary of key elements (more included in full policy) - LEED Gold - ENERGY STAR Score 75 - 20% Energy cost Savings - In-unit ENERGY STAR Appliances and Fixtures (clothes washers, dishwashers, clothes dryers, refrigerators, and 90% of lighting) - WaterSense labeled in-unit toilets, lavatory faucets, and showerheads - Refrigerant leakage verification by CxA - Air sealing of ventilation supply and exhaust w/ aerosized duct sealant - Human interaction with nature - Bird Friendly Glass - 4% EV Charging Stations & 15% EV Ready - Renewable Energy (2W/sf, or 12% green roof w/ 1.5 W/sf, or 1 pt under LEED v4.1 Renewable Energy Credit(Tier 2). Tier 2 is currently off-site purchase of new renewable energy built within past 5 years representing a 10% offset of annual energy use over 10 years). - Light pollution reduction for 90% of exterior fixtures (do not emit above 90 degrees with no sag/drop lenses or side light panels and <3000K temperature; must also be placed on motion/photo/timelock control - Equity, diversion, and inclusion program	Team	Y		Team acknowledges full 2020 Green Incentive Policy requirements. Note the following updates on requirements not addressed in the credits below: - Project team is confirming entity who will demonstrate compliance with equity, diversion, and inclusion program - Studios has confirmed bird-friendly glass requirements will be included in design - Unit/room air leakage testing of conditioned spaces that abut the envelope (units and common area spaces) will occur to meet the whole building Air Leakage testing requirement - Exterior light fixtures will be selected and placed on appropriate controls to meet requirements	--
Area / Occupancy	Project Areas - Retail = 3,288 sf - Residential (Units + Amenity) = 267,903 sf Residential Units = 251 - Studio = 18 - 1 BR JR = 28 - 1 BR = 108 - 1 BR + Den = 20 - 2 BR Loft = 20 - 2 BR = 48 - 2 BR + Den = 9	Team	Y		Project team to confirm project GSF and unit count/type.	--
LEED Boundary	LEED Project Boundary to follow the building footprint.	Team	Y		No Action Required	--
Specifications	Specifications have not been provided at this time.	Studios	Y		SBP will provide Div 1 Specs to be incorporated into Project Manual. Will perform full specification reviews.	--
Integrative Process						
Credit 1	Integrative Process	Option 1. Integrative Project Team (1 pt) - Team includes 3 skill sets - Team involved in 3 phases of design and construction - Team conducts monthly meetings Option 2. Design Charrette (1 pt) - 1 full day or 2 half day workshop no later than DD Option 3. Trades Training (1 pt) - Combined 8 hours of green training for subcontractors	SBP	2	Maintain list of meetings (date, attendees, length, agenda) Note: SBP will conduct trades training before start of construction.	--



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit		Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference
Location and Transportation (min 8 pts total in LT and EA reqd)							
Prereq 1	Floodplain Avoidance	<p>Option 1. Project is not built in 100-year floodplain</p> <p>Option 2. Project building in flood hazard area iaw local flood provisions</p> <p>Option 3. Project is previously developed building and hardscape</p> <p>Observed: Project not built in 100-year floodplain</p>	SBP	Y		No Action Required	Web Research
Credit 1	Site Selection v4.1	<p>Option 1. Sensitive Land Protection (3-4 pts)</p> <p>Path 1. Previously Developed (4 pts) - 75% of buildable land located on previously developed land.</p> <p>Path 2. Avoidance of Sensitive Land (3 pts) - Project does not consist of prime farmland, public parkland, 100-year floodplain, endangered species habitat, w/in 50' wetlands, w/in 100' water</p> <p>Observed: Project is built on previously developed land.</p>	SBP	4		No Action Required	Web Research
		<p>Option 2. Infill Development (2 pts) - 75% of land w/in 1/2 mi of project boundary is previously developed</p> <p>Observed: <75% of land w/in 1/2 mile of the project is previously developed</p>	SBP	2		No Action Required	Web Research
		<p>Option 3. Open Space (1 pt) - Built w/in 1/2 mi public open space > 3/4 acres or public open space provided on project</p> <p>Observed: Project is built within 1/2 mile walking distance from Lyon Park</p>	SBP	1		No Action Required	Web Research
		<p>Option 5. Bicycle Network (1 pt) - Meet all of the following:</p> <ul style="list-style-type: none"> - Provide bike storage w/in 200 yds of bike network that connects to ≥ 10 uses, school or employment center, or bus rapid transit/rail/ferry terminal w/in 3 mi of project - Short term bike parking = (2.5% occupants, min 4 spaces) - Long term bike parking = (1.5% occupants, min 1 per 3 res units) 	Studios	1		Provide 91 long term bike storage spaces and 15 short term bike storage spaces.	--
		+1 EP for earning all 9 points	SBP	1		No Action Required	
Credit 2	Compact Development	<p>Required: Meet the following density (dwelling units/acre)</p> <ul style="list-style-type: none"> ≥ 30 (1 pt) ≥ 55 (2 pts) ≥ 80 (3 pts) <p>Observed:</p> <ul style="list-style-type: none"> Lot Size = 2.37 acres # of Units = 251 105.91 DU/acre 	SBP	3		No Action Required	C03.00



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference
Credit 3	Community Resources <u>Required:</u> Provide community resources w/in 1/2 mi walking distance: 4-7 uses (1 pt) 8-11 uses (1.5 pt) 12-15 uses (2 pt) 16-19 uses (+0.5 pt EP) 20 uses (+1 pt EP) <u>Observed:</u> Projects located within 1/2 mi walking distance of 16 use categories.	SBP	2		No Action Required	Web Research
Credit 4	Access to Transit <u>Required:</u> - 1/4 mi walking distance of bus OR - 1/2 mi walking distance of bus rapid, It/hvy rail, ferry AND - Meet min transit stops below <u>Multiple Transit</u> Weekday Weekend Trips Multifamily Points 72 30 1 100 70 1.5 144 108 2 <u>Observed:</u> The project is within walking distance of several bus stops and lines.	SBP	1		No Action Required	Web Research
Sustainable Sites						
Prereq 1	Construction Activity Pollution Prevention <u>Required:</u> 1. Include ESC measures in drawings - stockpiling topsoil - manage path/velocity of runoff - protect storm sewers/streams/lakes - divert surface water from hills - stabilize soils +15% slope - prevent air pollution from dust) 2. Provide ESC drawings that meet 2012 EPA CGP or local codes	Bowman	Y		Include ESC drawings	--
Prereq 2	No Invasive Plants <u>Required:</u> Do not install invasive plants	LandDesign	Y		Design for all native plants. Include plant list in drawings and a third party resource for comparison.	--
Credit 1	Heat Island Reduction <i>AriCo GIP Alignment</i> <u>Option 1, Shading:</u> Shade hardscape and roof w/ 10 year plant canopy <u>Option 2, Nonabsorptive Materials:</u> Use any of the following for hardscape and roof: - ENERGY STAR roofing material - Vegetated Roof - Open Pavers - Paving w/ 3-year SR \geq 0.28 (or initial SR \geq 0.33) Total Area met by Option 1 or Option 2: 50-75% (1 pt) >75% (2 pts) <i>GIP Requirement - incorporate elements of human connection with nature</i> <u>Observed:</u> Drawings indicate there will be amenity areas on the roof with planters. 1 pt on track with high-SRI products on remaining penthouse roof areas.	Studios	1		Design for at least 50% compliant roofing. Will require a combination of green roof, Energy Star roofing, and/or SR compliant terrace pavers. A weighted calculation will be performed at DDs to refine quantity of each roofing material. GIP - consider how roof design will implement human interaction with nature.	A3.11



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference
Credit 2	<p>Rainwater Management</p> <p>Case 1. Low Impact Development (1-2 pts): Minimize stormwater run-off using low-impact development techniques including: - native or adaptive plantings - vegetated roof - permeable paving - permanent infiltration collection feature that can handle 100% of run-off from 2-yr, 24-hr storm</p> <p>Percent of permeable area total lot area - 50-64% (1 pt) - 65-79% (2 pts) - >80% (3 pts)</p> <p>Case 2. NPDES Projects (2-3 pts): Use low-impact development and green infrastructure to replace natural site hydrology and manage the percentile rainfall event: - 95th percentile (2 pts) - 98th percentile (3 pts) - 85th percentile (3 pts for zero lot line projects)</p>	Bowman		3	Advise if the project can manage on-site runoff for the 85th percentile storm event via infiltration and rainwater re-use for irrigation.	--
Credit 3	<p>Nontoxic Pest Control</p> <p><u>Required:</u> - Implement IPM Plan (Reqd)</p> <p>Up to (2 pts, each additional +0.5 pt EP up to 1 EP): - Steel mesh barrier termite control system (1 pt) - Physical termite barrier system (1 pt) - Below grade walls solid concrete, masonry w/ bond beam, concrete filled block (0.5 pt) - Post-tension slabs (0.5 pt) - Borate treatment of wood framing (0.5 pt) - Non-wood structural elements (0.5 pt) - Parts/openings at slab plumbing penetrations (0.5 pt) - 6"+ space btw landscape grade/nonmasonry siding (0.5 pt) - Seal cracks/joints/penetrations, install pest screens (0.5 pt) - Water discharge points 24"+ from foundation (0.5 pt) - 18"+ btwn landscape and exterior wall (0.5 pt)</p>	Team	1	.5	<p>Implement and IPM at occupancy. SBP can provide for review and approval or provide copy of one currently in use.</p> <p>Include drawing details for the following measures: - Solid concrete below grade walls (0.5 pt) - Seal all cracks/joints/penetrations, install pest proof screens (0.5 pt) - Water discharge points 24"+ from foundation (0.5 pt)</p>	--



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit		Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference
Water Efficiency (min 3 pts reqd)							
Prereq 1	Water Metering	<u>Required:</u> Install water meter for each unit or entire building	EDG2	Y		Clarify whether a whole building water meter or individual unit water meters will be provided.	--
Credit 1	Total Water Use <i>Performance Path</i> <i>AriCo GIP Alignment</i>	<p><u>Required:</u> Reduce total water use (indoor + outdoor) 10% (1 pt) to 65% (12 pts), 70% (+1 EP).</p> <p>30% - 5 pts 35% - 6 pts 40% - 7 pts</p> <p><u>GIP Requirements - WaterSense showerhead, lavatory, and toilet and ENERGY STAR dishwashers, clothes washers, refrigerators, and dryer.</u></p> <p><u>Observed:</u> Team to have all Energy Star Appliances and applicable WaterSense fixtures. ADA units to have side by side washer/dryer and units to have stacked washer and dry (not combo).</p>	Team	5	2	<p>1. Incorporate low-flow plumbing fixture selections and Energy Star appliances. Target the following: - WC = 1.28gpf + WaterSense - Lav = 1.0 gpm + WaterSense - Kitchen = 1.5 gpm - Shwr = 1.75 gpm + WaterSense - CW = Energy Star - DW = Energy Star</p> <p>2. Clarify irrigation strategy. Design for drip irrigation, moisture sensors, and controller or NO irrigation.</p> <p>Note, to perform preliminary calculations at DD, provide: - Area of each irrigation zone (shrubs, groundcover, trees) - Irrigation type for each zone (drip, sprinkler) - Confirm smart controller with efficiency of 0.7 can be installed.</p> <p><u>Arlington Site Plan Conditions</u> - Select WaterSense labeled WC, Lav, Shower and Energy Star CW, DW, Refrigerator (and clothes dryer).</p>	--
Energy and Atmosphere (min 8 pts total in LT and EA reqd)							
Prereq 1	Minimum Energy Performance <i>AriCo GIP Alignment</i>	<p><u>Required:</u> Energy Model 1. Meet mandatory provisions of ASHRAE 90.1-2010 2. Achieve 5% (prereq) to 90% (29 pts). Over 65% earns project +1 EP energy cost savings over ASHRAE 90.1-2010</p> <p><u>AND</u> Option 1. ENERGY STAR MFHR Testing and Verification Protocols</p> <p><u>OR</u> Option 2. Commissioning 1. In-Unit Duck Leakage (4 cfm25 per 100 sf of conditioned floor area) (6 cfm25 per 100 sf for units smaller than 1,200 sf) (8 cfm25 per 100 sf of conditioned floor area total) 2. Central HVAC - meet NC v4 requirements</p> <p>3. Include air barrier, compartmentalization sheet, and elements to be sealed.</p> <p>4. Provide load calculations, system selection, and duct sizing calculations.</p> <p><u>GIP Requirements - 20% energy cost savings, ENERGY STAR Score 75, aerosized duct sealant of ventilation supply and exhaust, refrigerant leakage verification by CxA, on-site or off-site renewables.</u></p> <p><u>EMR:</u> Shows 20% (15 pts) energy cost savings and ENERGY STAR Score of 75-80 for current design. EEOs included to be discussed throughout design development. <u>On-site vs Off-site renewables:</u> Team is exploring options for PV on the Upper Penthouse but the current plan to meet the GIP is to purchase RECs and Carbon Offset.</p>	Team	Y		<p>MEP: - Review the Energy Star v3 checklists. Meet or exceed these requirements. - Provide load calculations, system selection, and duct sizing calculations.</p> <p>Studios: - Include air sealing and compartmentalization details in the drawings.</p> <p>SBP: - SBP will do a full energy model update at DDs. Will provide the team a list of EEOs to increase efficiency and energy cost savings if necessary, to meet target.</p>	--



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference	
Prereq 2	Energy Metering <i>ArCo GIP Alignment</i>	<u>Required:</u> 1. Electric submeters in each Unit 2. Whole building gas meter or submeter in each Unit <i>GIP Requirements - whole building energy and water metering</i>	EDG2	Y		Include drawing details demonstrating the location of meters and metering strategy.	--
Prereq 3	Education of Homeowner, Tenant or Building Manager	<u>Required:</u> 1. Provide O&M binder/CD to those responsible for maintaining Units 2. Perform 1-hr walkthrough of home with occupants and building manager	Team	Y		Confirm O&M material will be provided and 1-hour walk-through will occur with tenants and building manager.	--
Credit 1	Annual Energy Use	<u>Required:</u> Achieve savings from 1% (1pt) to 90% (29 pts). Over 65% earns project +1 EP	SBP	21	4	Target 20% energy cost savings. SBP will complete energy model at mid-DDs and provide a list of EEOs to increase energy efficiency and energy cost saving. Project will incorporate measures into design to meet target.	--
Credit 3	Advanced Utility Tracking <i>ArCo GIP Alignment</i>	<u>Option 1, Electric and Water (1 pt):</u> Meet one: - Units: permanent energy-monitoring system at 1-hr interval - Irrigation: irrigated area 1,000sf+ w/ submeter AND/OR <u>Option 2, Third Party Utility Reporting (1 pt):</u> Meet one: - Share utility data with USGBC - 50% of unit owner share utility data with USGBC for 1 year +1 EP for metering 4 end uses (i.e. space heating, DHW, lighting, plug loads) <i>GIP - share whole building energy usage data achieve</i>	Team	1	1	1. Confirm an area ≥1,000 sf will be provided and irrigation submeter will be installed. 2. Share utility data with USGBC for 5 years. Show whole-building and end-use meters on riser diagram.	--
Materials and Resources							
Prereq 1	Certified Tropical Wood	<u>Required:</u> All wood is nontropical, reused/reclaimed, FSC	Studios	Y		Determine if tropical wood will be installed on the project (i.e. IPE). Include requirements for FSC Certification if tropical wood is planned.	--
Prereq 2	Durability Management	<u>Required:</u> 1. Complete ENERGY STAR for Homes v3 Water Management System Checklist 2. Implement the following: - Nonpaper faced backer board in baths/showers/spas - Water-resistant flooring in kitchen/bath/laundry/spa - Water-resistant flooring in entry w/in 3 feet exterior door - Drain+pan, pan+auto water shut off, or FD+slope for tank water heaters and clothes washers over living space - Exhaust clothes dryers	Team	Y		Arch: 1. Confirm non-paper faced backer board is used at shower/tub. Include note in drawings or specifications. 2. Include the requirements of Water Management System Checklist in drawings (attached). MEP: Confirm drain+pan OR pan+auto water shut-off provided at clothes washer and water heaters.	--
Credit 1	Durability Management Verification	<u>Required:</u> ENERGY STAR for Homes v3 Water Management System Checklist verified by Verification Team	SBP	1		No Action Required Construction Activity	--



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference
Credit 2	<p>Environmentally Preferable Products</p> <p>Option 1. Local Production: 50% of products extracted, processed, and manufactured w/in 100 mi project site - Framing (0.5 pt) - Concrete aggregate (0.5 pt) - Drywall and interior sheathing (0.5 pt)</p> <p>Option 2. Environmental Preferable Products: Provide 25% reclaimed / extended producer responsibility, 25% pre and 50% post consumer, FSC, sustainable agriculture standard, 30% fly ash/slag+50% recycled aggregate/90% recycled for 90% of the following - no floor covering (2 pts) - flooring (1 pt) - insulation (1 pt) - sheathing (1 pt) - framing (1 pt) - drywall (1 pt) - concrete (1 pt) - roofing (1 pt) - siding (1 pt) - 3 of the following (1 pt): doors, cabinets, counters, interior trim, decking/patio, windows</p> <p>For Option 2, earn 4 points to earn another +2 EP</p>	Studios		.5	Local concrete aggregate expected. Include Spec 018113 in Project Manual or add notes to drawings.	--
Credit 3	<p>Construction Waste Management v4.1</p> <p>Required: - Divert at least 50% (1 pt) or 75% (2 pts) of construction waste from landfill (CIR 10479).</p>	SBP		2	SBP will provide specification language.	--
Indoor Environmental Quality (min 3 pts reqd)						
Prereq 1	<p>Ventilation</p> <p>Required: 1. Local exhaust - Meets ASHRAE 62.2-2010 Sections 5-7 for baths (50 cfm) and kitchens (100 cfm) - Exhausted to outdoors - Bath fans ENERGY STAR - Kitchen exhaust > 400 cfm as makeup air</p> <p>2. Whole Unit mechanical ventilation that meets ASHRAE 62.2-2010 Sections 4-7</p> <p>3. Non-Unit spaces met ASHRAE 62.1-2010 Sections 4-7</p>	EDG2		Y	1. Design the ventilation strategy to meet the requirements. OA must be ducted to residential units and compliance demonstrated as follows: - Units using ASHRAE 62.2-2010 - Common Spaces using ASHRAE 62.1-2010 using the USGBC Calculator 2. Specify ENERGY STAR bath fans that exhaust at 50 cfm to outdoors 3. Specify kitchen exhaust fans that exhaust at 100 cfm to outdoors	--
Prereq 2	<p>Combustion Venting</p> <p>Required: 1. No unvented combustion appliances (ovens/range excl) 2. CO monitor in each unit 3. Fireplaces must have doors or glass enclosure, closed-combustion or power-vented or passes BPI/RESNET 4. Combustion space and water heating must have closed combustion, or power-vented exhaust, or in detached building/open air facility</p>	EDG2		Y	1. Include CO sensor in Units. 2. Clarify whether any fireplaces will be installed.	--
Prereq 3	<p>Garage Pollutant Protection</p> <p>Required: 1. Locate all AHU equipment and ductwork outside garage 2. For conditioned space next to/above garage - Seal surfaces - Seal penetrations and connecting floors/ceilings - Weather strip doors - CO detectors in rooms that share door w/ garage - Seal penetrations and cracks</p>	EDG2		Y	Include requirements in the drawings. Provide mechanical drawings indicating all of the requirements within the parking garage spaces.	--



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference
Prereq 4	Radon-Resistant Construction <u>Required:</u> For Zone 1, design and build with radon-resistant construction techniques. Follow all the requirements listed in Indoor airPLUS, 2.1: - Provide a capillary break per the Indoor airPLUS 2.1: - Provide an electrical outlet near vent piping in the attic to facilitate future fan installation - Install a 3- or 4-inc diameter gas tight vertical vent pipe with no bends greater than 45 degrees extending up through the conditioned spaces. *A garage under a building is an acceptable alternative. <u>Observed:</u> Project located in Zone 1 and a parking garage is located under the building.	EDG2	Y		No Action Required.	--
Prereq 5	Air Filtering <u>Required:</u> Recirculating Space Conditioning - MERV 8 filters OA Systems - MERV 6 filters	EDG2	Y		Specify minimum MERV 8 filters on Unit HVAC systems and MERV 6 on OA systems	--
Prereq 6	Environmental Tobacco Smoke v4.1 <u>Required:</u> Include signage that prohibits smoking in - interior common areas - outside the building except in designated smoking areas within 25 feet of all entries, OA intakes, operable windows	Team	Y		1. Provide lease agreement that indicates smoking is prohibited in common areas (and Units for credit) 2. Advise if a designated smoking area will be provided outside. Must be >25' from the building. 3. Include signage detail in drawings that states "No smoking within 25 feet of building"	--
Prereq 7	Compartmentalization <i>ArtCo GIP Alignment</i> <u>Required:</u> Meet all of the following for Units: 1. Seal all penetrations 2. Weatherstrip all doors to common halls 3. Weatherstrip all exterior door and operable windows 4. Achieve max leakage rate of 0.23 cfm50 per sqft (if average unit size is < 1,200 sf max 0.30 cfm50 per sqft)	Studios	Y		1. Include compartmentalization sheet in drawings for units and common area spaces. Include details on: - Top/bottom plates to sheathing and common walls - Floor joist cavities blocked and sealed - Vertical studs sealed to exterior sheathing and common walls (at panel joints) - Ducts, exhaust (kitchen, bath) housings sealed (any penetration) 2. Add weather-stripping requirement to door schedule, window schedule, and/or specifications for all Unit entry doors, exterior doors, and operable windows.	--
Credit 1	Enhanced Ventilation <u>Option 1. Enhanced Local Exhaust (1 pt):</u> Provide one of the following for bath exhaust fans in Units: - occupancy sensor - automatic humidistat controller - continuous fan - timer that runs fan for 20+ min post occupancy AND/OR <u>Option 2. Enhanced Whole-House Ventilation (2 pts):</u> Provide whole-house ventilation system that meets ASHRAE 62.20-2010 Sections 4-7 in each Unit. Do not exceed requirements by more than 10%. Note: Exhaust only and Supply only systems not eligible.	EDG2	1		Specify Bath Exhaust Fan to meet one of the following: - occupancy sensor - automatic humidistat controller - continuous fan - timer that runs fan for 20+ min post occupancy	--



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference
Credit 2	<p>Contaminant Control</p> <p>Option 1. Walk-off Mats (0.5 pt): Provide the following: - 4' permanent walk-off mat at primary Unit entryways from outdoors - 10' permanent entryway system at publicly accessible exterior entries to common space</p> <p>AND/OR</p> <p>Option 2. Shoe Removal and Storage (0.5 pt): Provide permanent architectural shoe removal and storage system in Unit entryway without carpet.</p> <p>AND/OR</p> <p>Option 3. Preoccupancy Flush (0.5 pt): - During Construction: seal all ducts and vents - After Construction: remove dust/debris from ducts and flush Unit for 48+ hours w/ all windows open and a continuous fan or all HVAC fans/exhaust fans</p> <p>AND/OR</p> <p>Option 4. Air Testing (1 pt): Testing building for air contaminants</p> <p>Achieve 2.5 pts for earn +0.5 EP</p>	Studios		.5	<p><u>Walk of Mats</u> Provide 10' long entry mats at publicly accessible entrances.</p> <p>Note: Roll-out mats are acceptable as long as they are cleaned 1x/week.</p>	--
Credit 3	<p>Balancing of Heating and Cooling Distribution Systems</p> <p>For Forced-Air Systems (up to 3 pts)</p> <p>Option 1. Multiple Zones (1 pt): Meet one of the following: - 2 space-conditioning zones with independent thermostats - Average unit size is < 1,200 sf</p> <p>AND/OR</p> <p>Option 2. Supply-Air Flow Testing (1 pt): Supply airflow rates are within +/- 20% (or +/- 25 cfm) of Manual J calculations</p> <p>AND/OR</p> <p>Option 3. Pressure Balancing (1 pt): Pressure differential between bedroom and rest of Unit is < 3 Pa (transfer grilles)</p>	EDG2	1		<p>No Action Required Average unit size is < 1,200 sf. Advise of any changes.</p>	--
Credit 5	<p>Enhanced Combustion Venting</p> <p>Option 1. No Fireplaces or Woodstoves (2 pts)</p> <p>OR</p> <p>Option 2. Enhanced Combustion Venting Measures (1 pt): Meet the following: - wood/pellet burning fireplace is power or direct vented - gas/propane/alcohol stove is approved by testing facility and is power or direct vented - gas/propane/alcohol stove has permanently fixed glass front or gasketed door and electronic pilot</p>	EDG2	2		Clarify whether any fireplaces are planned.	--
Credit 6	<p>Enhanced Garage Pollutant Protection</p> <p>Option 1. Exhaust Fan on Controls for Garage (1 pt): Meet all of the following: - ASHRAE 62.1-2010 garage ventilation requirements - Negative pressure created - Self-closing doors - Deck-to-deck partitions or hard lid ceiling - Continuous exhaust fan OR CO sensor activated at 35 ppm</p> <p>OR</p> <p>Option 2. Detached Garage or No Garage or Carport (1 pt): No garage or a detached garage has been constructed</p>	Studios EDG2	1		<ol style="list-style-type: none"> 1. Meet ASHRAE 62.1-2010 garage ventilation requirements. 2. Include CO sensors in conditioned areas that connect to garage. 3. Include requirement for door closers 	--



Arva Apartments

LEED-Homes v4: Multifamily Midrise

June 3, 2022

Arlington 4.1 Submission



Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action	Drawing Reference	
Credit 7	Low-Emitting Products v4.1	<p><u>Required:</u> Meet requirement for at least 90% of the following components (up to 3 pts):</p> <ul style="list-style-type: none"> - Site-applied interior paints/coatings: CA 1350 (0.5 pt) - Site-applied interior adhesives/sealants: CA 1350 (0.5 pt) - Flooring: CA 1350 (0.5 pt) - Insulation: CA 1350 (0.5 pt) - Composite wood products: CARB ULEF (1 pt) 	Studios EDG2	2		Include Specification 018113 to be provided by SBP. (SBP can review finish schedule).	--
Credit 8	No Environmental Tobacco Smoke v4.1	<u>Required:</u> Prohibit smoking in the entire building (including units).	Arlington Blvd	1		Confirm no smoking in units. Provide lease language that prohibits smoking in Units. Language must include restrictions and provisions for enforcement	
Innovation In Design							
Credit 1	Exemplary Performance	Community Resources - 16 uses	SBP	1		No Action Required	--
Credit 2	Innovation in Design	Whole Building LCA	Team	1		Will document at end of construction.	--
Credit 3	v4.1 Credit Substitution Requested <i>ArtCo GIP Alignment</i>	<p><u>Electric Vehicles:</u></p> <p>Install electrical vehicle supply equipment (EVSE) in 2% (4 spaces) of all parking spaces. The EVSE must:</p> <ul style="list-style-type: none"> - Provide a Level 2 charging capacity - Comply with J1772 - Be vehicle to grid connected and network connection. <p>Or, provide EV infrastructure for 6% (12 spaces) of all parking spaces.</p> <p><i>GIP requirement: Provide EV charging stations for 4% (8 spaces) of parking spaces and 15% EV-ready infrastructure (30 spaces) of parking spaces</i></p>	Team	1		Show 8 EV charging station spaces and 30 EV ready spaces	A3.03
Credit 4	Innovation in Design	<p><u>Identify a credit</u></p> <ul style="list-style-type: none"> - EPDs (20 products) - Enhanced Commissioning - Purchase Protected Land - Water Restoration Certificates - Material Ingredients (20 products) 	Team		1	Project team to identify possible credits to pursue.	--
Credit 6	LEED AP for Homes	LEED AP	SBP	1		No Action Required	--
Regional Priority							
Credit 1	Regional Priority	Site Selection (8 pts)	SBP	1		No Action Required	--
Credit 2	Regional Priority	Community Resources	SBP	1		No Action Required	--
Credit 3	Regional Priority	Access to Transit	SBP			See credit requirements.	--
Credit 4	Regional Priority	Total Water Use (12), Rainwater Management (3), Construction Waste M. (3)	SBP		1	See credit requirements.	--



ENERGY STAR[®] Statement of Energy Design Intent (SEDI)¹

Arva Apartments

LEARN MORE AT
energystar.gov

75

Primary Property Type: Multifamily Housing
Gross Floor Area (ft²): 270,000
Estimated Date of Certification of Occupancy: _____

Date Generated: September 01, 2022

ENERGY STAR[®]
Design Score²

1. This form is required when applying for Designed to Earn the ENERGY STAR recognition. It was generated from ENERGY STAR Portfolio Manager.

2. The ENERGY STAR 1 – 100 Score is based on total annual Source Energy. To be eligible for Designed to Earn the ENERGY STAR recognition you must score at least 75.

Property & Contact Information for Design Project

Property Address Arva Apartments 2201 Arlington Blvd _____, Virginia 22201	Project Architect _____ (____)____-____ _____	Owner Contact _____ (____)____-____ _____
Property ID: 22490102	Architect Of Record _____ _____ (____)____-____ _____	Property Owner _____ (____)____-____ _____

Estimated Design Energy

Fuel Type	Usage	Energy Rate (\$/Unit)
Electric - Grid	2,800,000 kWh (thousand Watt-hours)	\$ 0.12/kWh (thousand Watt-hours)
Natural Gas	30,000 therms	\$ 1.00/therms

Estimated Design Use Details

★ This Use Detail is used to calculate the 1-100 ENERGY STAR Score.

Multifamily Housing		Parking	
Number of Laundry Hookups in Common Area(s)	10	★ Partially Enclosed Parking Garage Size	0 Sq. Ft.
Percent That Can Be Cooled	All of it - 100%	★ Open Parking Lot Size	0 Sq. Ft.
Common Entrance	Yes	★ Completely Enclosed Parking Garage	85,000 Sq. Ft.
Resident Population Type	No specific resident population	★ Supplemental Heating	No
★ Number of Residential Living Units in a Low-rise Building (1-4 stories)	0		
★ Total Number of Residential Living Units	251		
Number of Laundry Hookups in All Units	502		
★ Number of Bedrooms	335		
★ Number of Residential Living Units in a Mid-rise Building (5-9 stories)	251		
Percent That Can Be Heated	All of it - 100%		
★ Gross Floor Area	265,000 Sq. Ft.		
★ Number of Residential Living Units in a High-rise Building (10 or more stories)	0		
Government Subsidized Housing	No		

Retail Store

★ Number of Workers on Main Shift	15
★ Percent That Can Be Cooled	All of it - 100% ← default value
Number of Computers	10
Length of All Open or Closed Refrigeration/ Freezer Units	0 Ft. ← default value
★ Number of Walk-in Refrigeration/Freezer Units	1
Number of Cash Registers	5
Cooking Facilities	Yes
★ Number of Open or Closed Refrigeration/ Freezer Units	2
★ Weekly Operating Hours	90
★ Percent That Can Be Heated	All of it - 100% ← default value
★ Gross Floor Area	5,000 Sq. Ft.
★ Exterior Entrance to the Public	Yes ← default value
★ Single Store	Yes ← default value
Area of All Walk-in Refrigeration/Freezer Units	

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	75	50	N/A
Energy Reduction (from Median)(%)	-15.5	0	N/A
Source Energy Use Intensity (kBtu/ft ² /yr)	110	131	21
Site Energy Use Intensity (kBtu/ft ² /yr)	46	55	9
Source Energy Use (kBtu/yr)	29,900,083	35,389,325	5,489,242
Site Energy Use (kBtu/yr)	12,553,601	14,858,268	2,304,667
Energy Costs (\$)	366,000	433,192	67,192
Total GHG Emissions (Metric Tons CO ₂ e)	954	1,130	176

Designed to Earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

- 1) Does your [property type](#) match the function or use of a property that's eligibility to receive an ENERGY STAR design score? Yes No/Not Sure

If you are not sure your project is eligible for an ENERGY STAR design score, please describe the property's major functions or use:

- 2) Is the design project at least 95% complete with construction documents? Yes No

If no, please explain:

- 3) Is the property currently unoccupied and not yet generating energy bills? Yes No

- 4) Do energy calculations account for the whole building intended operations and all energy sources? Yes No

- 5) Is the Architect of Record (AOR) applying for ENERGY STAR partnership? Yes No

- 6) Was the design record created in the owner's Portfolio Manager account? Yes No

- 7) Are you seeking other qualifications for this design project? Yes No

If so, please select all that apply:

- AIA 2030 Commitment
- Architecture 2030 Challenge
- Federal, State or Local Disclosure Ordinance
- Green Globes
- LEED
- Other, please indicate: _____

Professional Verification

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Verifying Professional

,
(____)____ - _____



**Verifying Professional Stamp
(if applicable)**

Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

I agree to adhere to the ENERGY STAR Identity Guidelines when using the Designed to Earn the ENERGY STAR recognition graphic in association with this project.

Architect of Record Acknowledgement

As the Architect of Record representative, I confirm that the information on this SEDI is true and accurate to the best of my knowledge. It is our best estimate for all energy use of specified systems and processes but does not guarantee the operational performance of this building. Instead, this project has been specified to achieve Designed to Earn the ENERGY STAR recognition in an effort to assist the Owner/Developer in meeting their operational performance goal for the building to earn ENERGY STAR certification.

Signature: _____

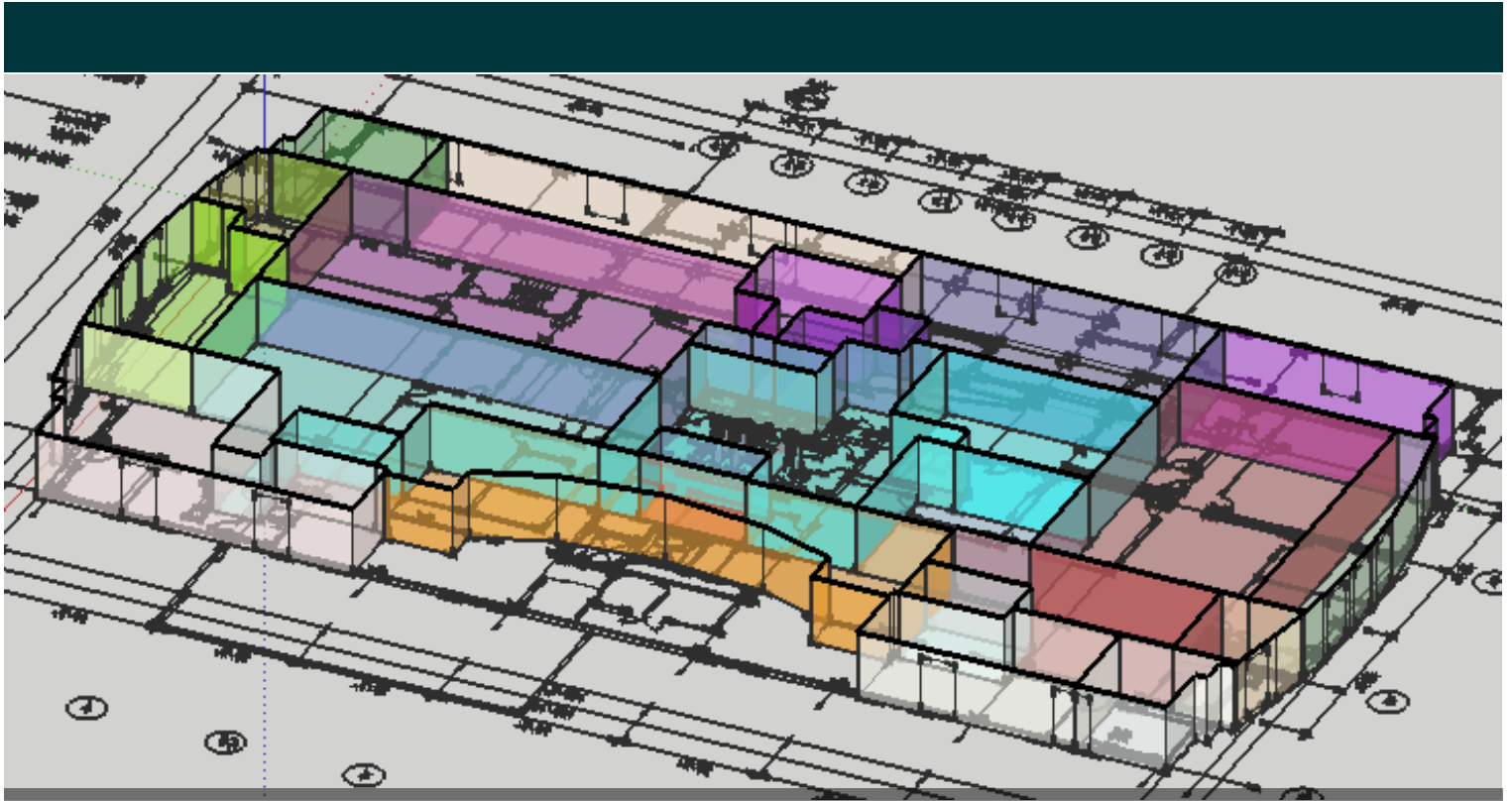
Date: _____

Building Owner/Developer Acknowledgement

As the Building Owner/Developer representative, I concur that this project be nominated for Designed to Earn the ENERGY STAR recognition. Our organization understands the importance of measuring actual energy use in Portfolio Manager after receiving the Certificate of Occupancy to verify that this property is performing as intended. We understand that once the building earns an ENERGY STAR score of 75 or higher, it may be eligible for ENERGY STAR certification.

Signature: _____

Date: _____



Preliminary Energy Performance Analysis

Arlington County 4.1 Site Plan Submission **(DRAFT)**

Arva Apartments – 2201 Arlington Boulevard

Arlington, VA

Arlington 4.1 SP Report v1.0 - DRAFT

May 2nd, 2022



2701 Prosperity Ave, Ste. 100
Fairfax, Virginia 22031

www.sustainbldgs.com



Table of Contents

Purpose	3
Arlington County 4.1 Site Plan Submission.....	3
Performance Disclaimer.....	3
Preliminary Energy Estimates	4
Summary of Performance & Primary Design Alternates.....	4
Design Considerations	5
Preliminary Design	5
Primary Features Driving Energy Performance	5
Domestic Hot Water.....	6
Dedicated Outside Air System (DOAS)	6
Energy Efficiency Opportunities	7
Measure Narrative Descriptions	8
Preliminary Basis of Design	9
General Design & Operational Parameters	9
Exterior Opaque Constructions	9
Window Assemblies.....	10
Lighting Systems.....	10
Equipment & Appliances	11
Domestic Hot Water System	11
Base Building HVAC Narrative	11
Appendix – Opaque Assembly Calculations	12
Appendix - Simulation Output Files.....	14
Proposed Model Output Reports	14
ASHRAE Baseline Building Output Reports	15
Acronym Legend.....	16

Purpose

Sustainable Building Partners, LLC (SBP) has developed a whole building energy simulation using Energy Plus v9.6 via the Open Studio v1.3 interface for the proposed Arva Apartments multifamily building in Alexandria, VA. SBP utilizes the model as a design tool for the purpose of enhancing the energy performance of the facility and to increase LEED Energy & Atmosphere Credit 1 points. SBP's modeling methodology is consistent with LEED and ASHRAE 90.1-2010 Appendix G modeling protocol and best practices.

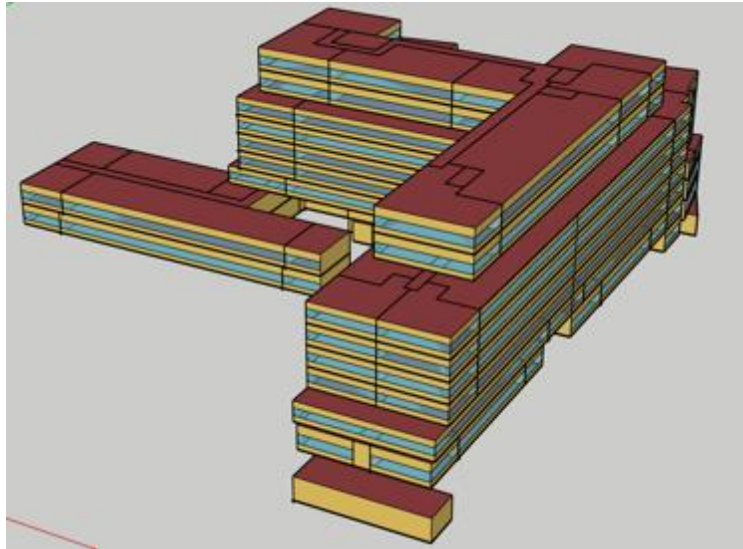


Figure 1: Energy Model Rendering of Arva Apartments

Arlington County 4.1 Site Plan Submission

As part of the conditions packaged for the Arlington 4.1 Site Plan Submission (SPC), the project is required to demonstrate compliance the following energy performance targets:

- **20% Energy Cost Savings as compared to a LEED Baseline design (ASHRAE 90.1-2010 Appendix G)**

Performance Disclaimer

This analysis is based on an early Schematic Design thus all results and benchmarking should be viewed as relative order-of-magnitude (RoM). This report works to establish high-level performance targets and general design standards but does not guarantee future performance.



Preliminary Energy Estimates

This section of the report summarizes the results and benchmarking of the preliminary whole building hourly energy simulations. Table 1 provides the results of the hourly energy simulations.

Summary of Performance & Primary Design Alternates

Performance Statement: This facility is on track to achieve ≥20% energy cost savings as compared to an ASHRAE 90.1-2010 Appendix G Baseline design.

Table 1: Annual Energy Consumption & Performance Benchmarking

Description ⁽³⁾	Total Energy Cost (\$/sqft)	Energy Cost Savings ⁽¹⁾	Site EUI (kBtu/sf)	Source EUI (kBtu/sf)	GHG ⁽²⁾ (Tons CO2e)	Energy Star Score
Base Design as of 50% SD	\$1.10 – \$1.20	20 - 25%	40 - 45	100 - 105	1,100+	75 - 80
Tier 2 Design (≥25%) ⁽³⁾	≤\$1.10	25%+	≤40	≤100	≤1,100	80 – 85+

(1) ASHRAE 90.1-2010 (LEED) Baseline design

(2) Estimated based on Year 1 (current) electric grid profile (EGRID projections)

(3) The design schemes are as follows:

- **Base Design:** The current design as of the SD set plus anticipated features included based on standard design practices. See [basis of design](#) section below.
- **Tier 2:** Proposed design plus additional load reduction and energy saving strategies that would increase the overall energy performance of the building and maintain a high level of confidence that the design obtains at least 25%+ energy cost savings. **This design package includes the Base Design PLUS a ≥20% interior lighting power reduction.**

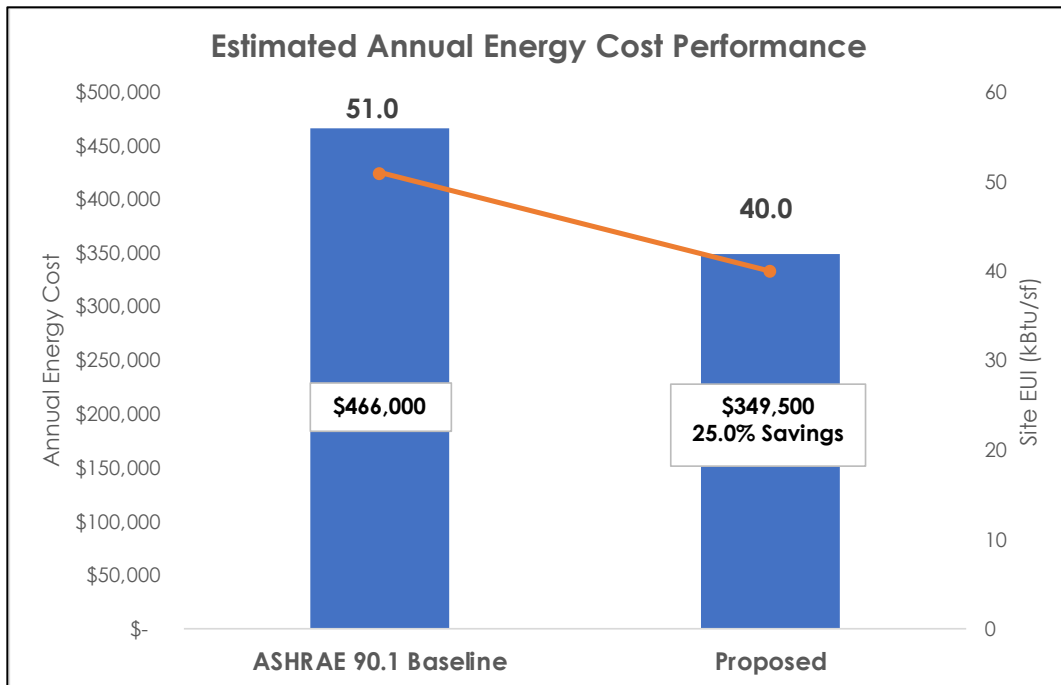


Figure 2: Annual Energy Cost Savings & Preliminary ASHRAE 90.1 App G. Performance



Design Considerations

The following subsections summarize the primary limiting factors and other unique conditions associated with this design.

Preliminary Design

Throughout the early-design process, the project team has worked to optimize the building design through the quantitative and qualitative evaluation of various Energy Efficiency Opportunities (EEOs). Many of the discussed EEOs have already been built into the base design (e.g. heat pump DOAS), will be incorporated later in the design process (e.g. lighting), or are still being actively evaluated at this stage. All measures are evaluated based on energy savings, first cost, maintenance considerations, operational considerations, and infrastructure limitations.

Primary Features Driving Energy Performance

Please see the [BOD](#) section for full design details. This sections a provide a summary of the specific items driving overall energy performance.

Air-cooled variable refrigerant flow systems

- Premium part-load operation (18+ IEER)
- Heat recovery capabilities during simultaneous heating/cooling
- Heat pump heating capacity can be maintained at low ambient temperatures without requiring auxiliary system

Decoupled ventilation strategy

- Allows local recirculating VRFs fans to run independent of ventilation requirements
- More effective control of outside air volume
- More effective dehumidification

Heat Pump DOAS

- See below

Garage Lighting Power Reductions

- Estimated $\geq 40\%$ reduction in designed lighting power (anticipated)

EnergyStar Appliances

- Fridge, dishwasher, clothes washer

Low Flow Plumbing Fixtures

- 1.75 GPM Showers, 1.5 GPM Faucets

Gas-Fired Condensing Boilers

- $\geq 20\%$ improvement in nominal thermal efficiency over standard boilers
- See below



Domestic Hot Water

Current BOD: Gas-fired condensing water heaters (central)

Design Alternates:

- In-unit electric-resistance storage (market standard)
- Heat pumps (in-unit or clustered)
- Heat pumps (central)

Table 2: DHW Performance Comparison (annualized, per unit)

DHW System	Annual Energy Per Unit (avg)	Annual Cost Per Unit (avg)	Source Energy Per Unit (kBtu/yr)	GHG Per Unit (lbs CO ₂ e/yr) ⁽¹⁾
In-Unit Electric Storage	2,015 kWh/yr	\$240	21,400	1,300
Gas-fired Condensing	95 thm/yr	\$95	10,100	1,100
Heat Pump	705 kWh/yr	\$85	7,500	440

(1) Estimated based on Year 1 (current) EGRID projections

Challenges/Limiting Factors

- In-unit Electric: Highest operating energy, cost, short- and mid-term emissions
- In-unit or clustered HPWHs: Challenging space and venting requirements
- Central HPWHs (ganged plant): Scalability, plant size
- Central HPWHs (commercial): Cost, low-temperature operation, limited number of manufacturers
- Gas-Fired: Highest first cost, counter to long-term electrification initiatives

Dedicated Outside Air System (DOAS)

Current BOD: Air-source heat pump with gas-fired auxiliary

Design Alternates:

- Air-cooled DX with gas-fired furnace (market standard)
- Air-source heat pump with electric-resistance auxiliary
- Air-cooled DX with electric resistance heating

Table 3: DOAS Performance Comparison (Annualized, per 1k CFM)

DOAS Configuration	Energy Cost Per 1k CFM	Source Energy Per 1k CFM (mmBtu/yr)	GHG Emissions (tons CO ₂ e/yr) ⁽¹⁾
Gas-Fired Furnace	\$2,400	240	11
Heat Pump with Gas Auxiliary	\$2,400	219	7
Heat Pump with Electric Auxiliary	\$2,800	250	8
Electric-Resistance	\$7,000	639	19

(1) Estimated based on Year 1 (current) EGRID projections

Challenges/Limiting Factors

- Gas-fired Furnace: Counter to long-term electrification initiatives
- Heat Pumps: Size limitations (≤70-tons), auxiliary systems at low ambient temps
- Electric-Resistance: Highest operating energy, cost, and short- and mid-term emissions

Energy Efficiency Opportunities

The following is a list of specific load reduction and energy savings strategies that could increase the overall energy performance of the building. **At this phase of design, measures should be evaluated for RoM only.**

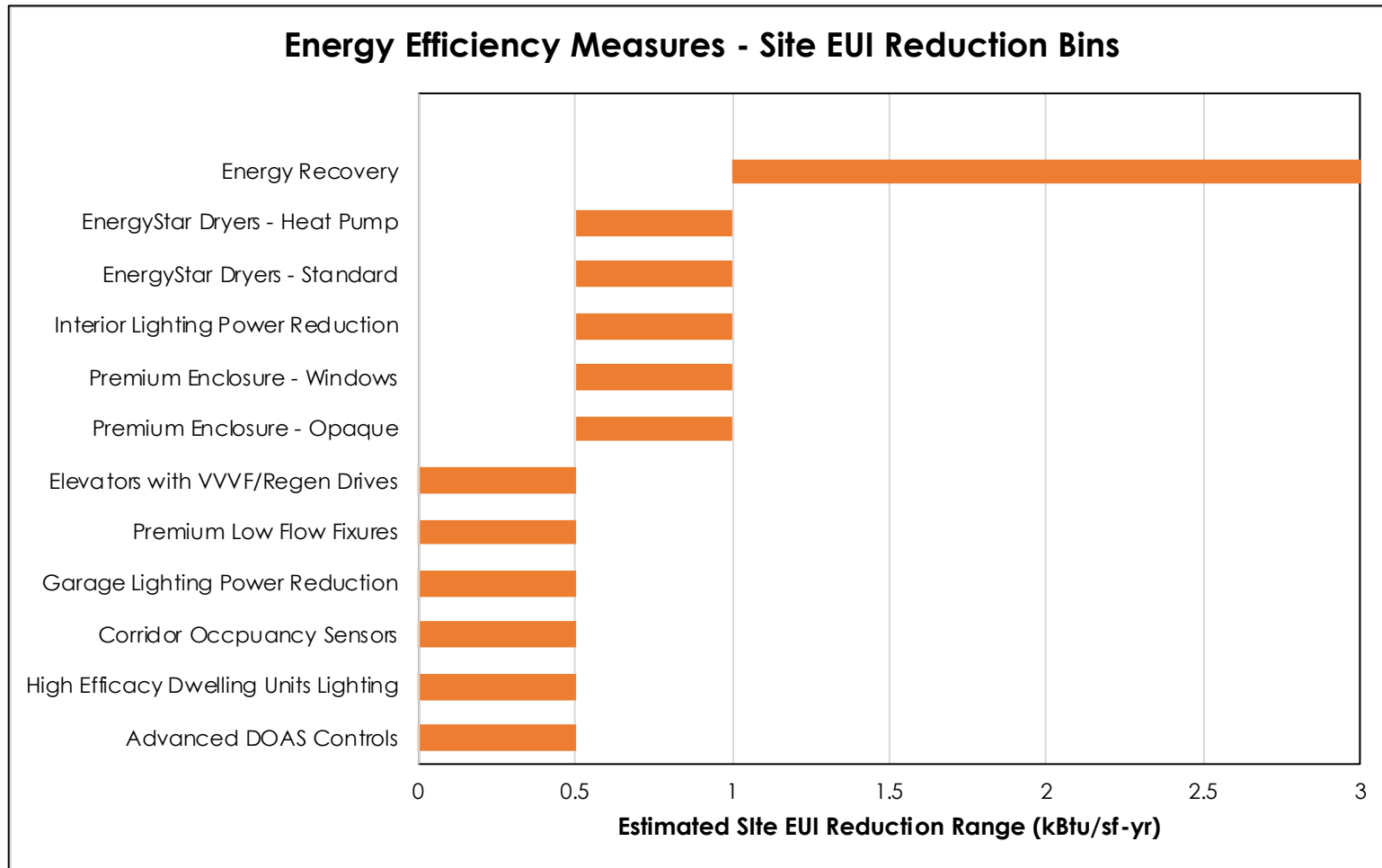


Figure 3: Estimated EEO Energy Reductions



Measure Narrative Descriptions

The subsequent tables provide general descriptions of the measures list in Figure 3 above.

Table 4: Energy Efficiency Opportunity (EEO) Summary

EEO	Measure	Category	Base Design	Measure Description
1	Premium Enclosure - Opaque	Building Enclosure	See enclosure section.	Roof: R-40+ Walls: ≥3" C.I. + No signif. points of thermal bridging
2	Premium Enclosure - Windows			U-0.35 / 0.25 SHGC
3	Interior Lighting Reduction	Lighting	0.60 W/sf (common & BOH areas)	0.48 W/sf
4	High Efficacy Dwelling Unit Lighting		40-50 lumens/Watt	≥60-70 lumens/Watt
5	Garage Lighting Reduction		0.15 W/sf	0.08 W/sf
6	Corridor Occupancy Controls		24/7 operation	Bi-level lighting controls (50% when unocc.)
7	EnergyStar Dryers	Process & Equipment	Standard Electric	Moisture Sensing OR Ventless Condensing HP
8	Elevators – VVVF & Regen. Drives		Standard traction	VVVF controls + regenerative drives
9	Premium Low Flow Fixtures	Plumbing	Shower – 1.75 GPM Faucets: 1.50 GPM	Showers – 1.5 GPM Lav. Faucets: 0.5 GPM
10	Discharge Air Temp. Reset Controls	HVAC	Fixed DAT: 70°F	Reset based on OAT 60°F DAT @ ≥76°F
11	Ventilation Energy Recovery		No Energy Recovery	Enthalpy wheel pretreats all incoming outdoor air



Preliminary Basis of Design

Many assumptions and placeholders have been used in this analysis given the early nature of the design. The intent of this type of analysis is relative order of magnitude (RoM), so small adjustments to design inputs or schedules likely won't change overall findings and takeaways from the analysis. SBP asks that the subsequent section be reviewed for general accuracy.

General Design & Operational Parameters

Table 5: General Project Parameters

Project Types	Mixed-Use: Multifamily & Retail
Modeling Software	EnergyPlus V9.6 / OpenStudio V1.3.0
Project Location	Arlington, VA
Climate Zone/Weather	4A / TMY3 – Washington, DC
Design Day Conditions	Cooling – 92°F / 77°F, Heating – 15°F
Design Temperatures	75°F – Cooling / 70°F Heating
Quantity of Floors	7 Floors + PH & Below-Grade Parking
Building Area (GSF)	~340,000 GSF
Dwelling Units	~250 Units
Electric Utility Rates	EIA, 2021 VA avg – Residential: \$0.1214/kWh EIA, 2021 VA avg – Commercial: \$0.0782/kWh
Gas Utility Rates	EIA, 2020 VA avg – Commercial: \$0.78/therm

Exterior Opaque Constructions

All assemblies have been developed in accordance with the SD design package, ASHRAE RP-1365, 2017 DC Energy Code, and ASHRAE 90.1 Appendix A.

Table 6: Opaque Envelope Performance Summary

Assembly Name	Assembly Type	Description	Proposed Performance	Points of Thermal Bridging
Brick Wall Assembly	Ext. Wall	Brick/Metal Stud 3" C.I + R-19 Batt	U-0.049	Metal studs, SS brick ties (nominal condition)
Typical Brick at Slab Edge	Ext. Wall	Brick/Metal Stud 3" C.I + R-19 Batt	U-0.091	Metal studs, SS brick ties, shelf angles, concrete slab edge
Typical Brick at Balcony	Ext. Wall	Brick/Metal Stud 3" C.I + R-19 Batt	U-0.136	Metal studs, SS brick ties, shelf angles, concrete cant. balcony
Metal Wall Assembly	Ext. Wall	MP/Metal Stud 3" C.I + R-19 Batt	0.046	Metal studs, Thermally broken Z- girts
MP at Slab Edge	Ext. Wall	MP/Metal Stud 3" C.I + R-19 Batt	0.071	Metal studs, Thermally broken Z- girts, concrete slab edge
Base Roof	Roof	Insulation above conc. deck, 5" XPS	0.038	--
Floor over garage	Floor	Est. R-12.6 insulation below conc. slab	0.071	--

See [Enclosure Calculation](#) section for full layer-by-layer sections.



Window Assemblies

All performance has been estimated based performance specifications provided by the design team.

Window Area:

Glass%:
— Retail & Lobby: 60%
— Residential Level 1-2: 50%
— Residential Level 3-6: 40%
— Residential Level 7: 60%



Basis of Design - Glazing:

1" IGU, Double-pane, low-E, argon
Residential – Guardian SNX 62/27
Lobby/Retail – Guardian SN68

Basis of Design – Framing:

Residential: Peerless G200 Series
Lobby/Retail: Kawneer 1600



Table 7: Window Assembly Performance (frame + glass)



Window System	U-value	SHGC
Residential	0.40	0.26
Lobby/Retail	0.38	0.37

Lighting Systems

The lighting design was not available for this analysis and has been approximated based on a standard market design

Table 8: Lighting Summary

Use Type	Lighting Power (W/sf)	Occupancy / Daylighting Controls	Design Target LPD (W/sf) EEOs
Multifamily (common & BOH)	0.60	As required by 2015 VECC	0.48
Parking Garage	0.15	OS / Bi-Level	0.08
Dwelling Units (not regulated by 90.1)	40-50 lm/W	N/A	~60-70 lm/W



Equipment & Appliances

Table 9: Process & Equipment Summary

Component	Description
Dwelling Unit Appliances	<ul style="list-style-type: none"> • Fridge: EnergyStar • Dishwasher: EnergyStar • Clothes Washer: EnergyStar • Dryer: Electric, standard • Range: Electric, standard
Misc. Plug Loads	Modeled in accordance with LEED Multifamily Midrise Guidelines
Elevators	MRL Gearless Traction
Garage Ventilation	<ul style="list-style-type: none"> • 0.75 CFM/sf • DCV with VFD Controls

Domestic Hot Water System


The DHW system was described in the system narrative as follows.

Table 10: DHW Summary

Component	Description
Water Heater Type	Gas-fired condensing storage water heaters
Configuration	Central plant
Storage Capacity	130-gallons (per heater)
Efficiency	~95% Et

Base Building HVAC Narrative

Table 11: HVAC Basis of Design

Design Component	Description
Primary System	<u>Variable Refrigerant Volume (VRV) Heat Pumps</u> <ul style="list-style-type: none"> • BOD: Samsun • 18+ IEER • Heat recovery • Indoor units: primarily vertical ducted AHUs
Ventilation System	<u>100% Dedicated Outside Air Unit</u> <ul style="list-style-type: none"> • Air-source Heat Pump  • Gas-fired Auxiliary • Hot gas reheat • Fixed discharge air temperature (70°F)
Ventilation Rates	<ul style="list-style-type: none"> • Dwelling Units – ASHRAE 62.2 • Common – ASHRAE 62.1 • Corridors – 0.10 CFM/sf (<i>decoupled from space conditioning</i>)



Appendix – Opaque Assembly Calculations

Modeled assemblies have been developed consistent with Appendix A of ASHRAE 90.1-2010.

Brick Veneer Wall	
R-Value	Layer
0.17	Exterior Air Film
0.00	Brick Veneer with SS Brick Ties - Outside Thermal Boundary
11.34	3" C.I. derated for brick ties (R-12.6 nominal)
0.56	5/8" Sheathing
7.10	R-19 Batt Insulation between metal studs at 16" OC
0.56	5/8" GWB
0.68	Interior Air Film
20.41	Total R-Value
0.049	Assembly U-Value (nominal wall)
0.091	Assembly U-value (at slab edge) → predominant cond.
0.136	Assembly U-value (at balcony)

Metal Panel Wall Assembly	
R-Value	Layer
0.17	Exterior Air Film
0.00	Metal Panel w/ thermally-broken Z-girts
12.60	3" C.I. (R-12.6 nominal)
0.56	5/8" Sheathing
7.10	R-19 Batt Insulation Between Metal Studs at 16" OC
0.56	5/8" GWB
0.68	Interior Air Film
21.67	Total R-Value
0.046	Assembly U-Value (nominal wall)
0.071	Assembly U-value (at slab edge) → predominant cond.



Base Roof Assembly	
R-Value	Layer
0.17	Exterior Air Film
0.00	Ballast/Cover System (e.g. green, paver, etc)
25.00	5" XPS
0.38	Concrete roof deck
0.61	Interior Air Film
26.16	
Total R-Value	
0.038	
Assembly U-Value	

Typical Floor Assembly (over parking)	
R-Value	Layer
0.17	Exterior Air Film
12.60	3" mineral fiber (assumed)
0.38	Concrete Slab
0.92	Interior Air Film
14.07	
Total R-Value	
0.071	
Assembly U-Value	



Appendix - Simulation Output Files

The following screen captures are selected simulation output files for the Design Energy Cost (DEC) or Proposed case as well as those from the Performance Rating Method (PRM) or Baseline case.

Proposed Model Output Reports

	Electricity Energy Use [kWh]	Electricity Demand [W]	Natural Gas Energy Use [therm]	Natural Gas Demand [Btu/h]
Heating -- General	673960.22	646013.49	0.00	0.00
Cooling -- General	292816.85	352369.59	0.00	0.00
Interior Lighting -- General	298416.38	44476.07	0.00	0.00
Interior Lighting -- Residential	161031.62	40913.05	0.00	0.00
Exterior Lighting -- Elevators	74902.44	27180.40	0.00	0.00
Exterior Lighting -- Exterior Lighting	21780.02	5000.00	0.00	0.00
Exterior Lighting -- Garage Fans	106328.14	18855.00	0.00	0.00
Exterior Lighting -- Garage Lighting	82584.97	12570.00	0.00	0.00
Interior Equipment -- General	94104.83	19083.51	0.00	0.00
Interior Equipment -- Residential	763939.66	180429.63	0.00	0.00
Exterior Equipment -- Not Subdivided	0.00	0.00	0.00	0.00
Fans -- General	253387.63	28925.51	0.00	0.00
Pumps -- General	0.00	0.00	0.00	0.00
Heat Rejection -- Not Subdivided	0.00	0.00	0.00	0.00
Humidification -- Not Subdivided	0.00	0.00	0.00	0.00
Heat Recovery -- General	0.00	0.00	0.00	0.00
Water Systems -- General	0.00	0.00	0.00	0.00
Water Systems -- Service Hot Water Heating	0.00	0.00	31289.44	590618.96



ASHRAE Baseline Building Output Reports

EAp2-4/5. Performance Rating Method Compliance

	Electricity Energy Use [kWh]	Electricity Demand [W]	Natural Gas Energy Use [therm]	Natural Gas Demand [Btu/h]
Heating -- General	883884.27	1165858.21	0.00	0.00
Cooling -- General	562817.50	422959.34	0.00	0.00
Interior Lighting -- General	298416.38	44476.07	0.00	0.00
Interior Lighting -- Residential	161031.62	40913.05	0.00	0.00
Exterior Lighting -- Elevators	74902.44	27180.40	0.00	0.00
Exterior Lighting -- Exterior Lighting	21780.02	5000.00	0.00	0.00
Exterior Lighting -- Garage Fans	106328.14	18855.00	0.00	0.00
Exterior Lighting -- Garage Lighting	137641.61	20950.00	0.00	0.00
Interior Equipment -- General	94104.83	19083.51	0.00	0.00
Interior Equipment -- Residential	810117.82	191336.13	0.00	0.00
Exterior Equipment -- Not Subdivided	0.00	0.00	0.00	0.00
Fans -- General	698762.43	79767.34	0.00	0.00
Pumps -- General	0.00	0.00	0.00	0.00
Heat Rejection -- Not Subdivided	0.00	0.00	0.00	0.00
Humidification -- Not Subdivided	0.00	0.00	0.00	0.00
Heat Recovery -- Not Subdivided	0.00	0.00	0.00	0.00
Water Systems -- General	0.00	0.00	0.00	0.00
Water Systems -- Service Hot Water Heating	0.00	0.00	41163.15	1385157.60



Acronym Legend

AHU	Air-Handling Unit
CHW	Chilled Water
COP	Coefficient of Performance
CRI	Color Rendering Index
CS	Core & Shell
CW	Condenser Water
DEC	Design Energy Cost
DHW	Domestic Hot Water
EA	Energy & Atmosphere
ECM	Electronically Commutated Motor
EEO	Energy Efficiency Opportunity
EER	Energy Efficiency Ratio
EF	Energy Factor
EUI	Energy Use Index (kBtu/sf)
FCU	Fan Coil Unit
FP	Fan-Powered
HP	Heat Pump OR Horsepower
HSPF	Heating Seasonal Performance Factor
HW	Hot Water
LPD	Lighting Power Density
NC	New Construction
PRM	Performance Rating Method
REC	Renewable Energy Credit
RTU	Rooftop Unit
SAT	Supply Air Temperature
SC	Shading Coefficient
SEER	Seasonal Energy Efficiency Ratio
SHGC	Solar Heat Gain Coefficient
VAV	Variable Air Volume
VFD	Variable Frequency Drive
VSD	Variable Speed Drive
VT	Visible Transmittance