LEED for Homes v4: Multifamily Midrise

2480 S Glebe Rd - Multifamily-Flats

8/20/2024

SUSTAINABLE BUILDING PARTNERS

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

14	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

3	4	0	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
2			Credit	Non-Toxic Pest Control	2

6	2	4	Water Efficiency		Possible Points: 12
Y	?	N			
Y			Prereq	Water Metering	Required
6	2	4		Total Water Use	12

26	3	8.5	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
25	2	3.5	Credit	Annual Energy Use	30
		5	Credit	Efficient Hot Water Distribution	5
1	1		Credit	Advanced Utility Tracking	2

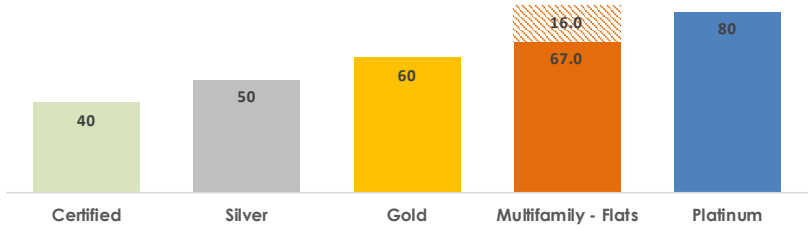
3.5	1	4.5	Materials and Resources		Possible Points: 9
Y	?	N			
Y			Prereq	Certified Tropical Wood	Required
Y			Prereq	Durability Management	Required
1			Credit	Durability Management Verification	1
0.5	1	3.5	Credit	Environmentally Preferable Products	5
2		1	Credit	Construction Waste Management	3

5	4	9	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
		2	Credit	Contaminant Control	2
1		2	Credit	Balancing of Heating and Cooling Distribution Systems	3
		3	Credit	Enhanced Compartmentalization	3
1	1		Credit	Enhanced Combustion Venting	2
1			Credit	Enhanced Garage Pollutant Protection	1
1	2		Credit	Low Emitting Products	3
1			Credit	No Environmental Tobacco Smoke	1

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

2	2	0	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

67	16	27			Possible Points: 110



Note:

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

LEED for Homes v4: Multifamily Midrise

2480 S Glebe Rd - Multifamily - Multistory

8/20/2024

SUSTAINABLE BUILDING PARTNERS

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

13	1	1	Location and Transportation	Possible Points: 15	
Y	?	N			
Y			Prereq	Floodplain Avoidance	Required
7	1		Credit	Site Selection	8
3			Credit	Compact Development	3
2			Credit	Community Resources	2
1		1	Credit	Access to Transit	2

3	1	3	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
2			Credit	Non-Toxic Pest Control	2

6	2	4	Water Efficiency	Possible Points: 12	
Y	?	N			
Y			Prereq	Water Metering	Required
6	2	4		Total Water Use	12

18	10	10	Energy and Atmosphere	Possible Points: 38	
Y	?	N			
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Energy Metering	Required
Y			Prereq	Education of the Homeowner, Tenant or Building Manager	Required
17	7	5	Credit	Annual Energy Use	29
		5	Credit	Efficient Hot Water Distribution	5
1	1		Credit	Advanced Utility Tracking	2
	1		Credit	Active Solar Ready Design	1
	1		Credit	HVAC Start-up Credentialing	1

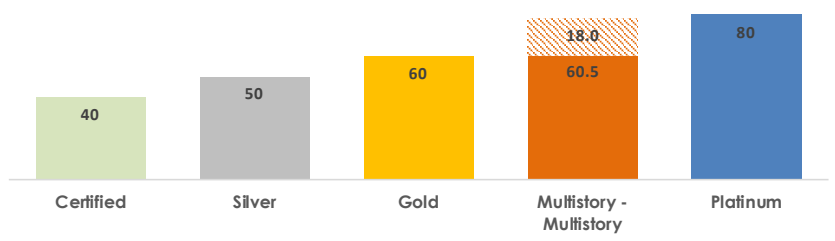
3.5	1	5.5	Materials and Resources	Possible Points: 10	
Y	?	N			
Y			Prereq	Certified Tropical Wood	Required
Y			Prereq	Durability Management	Required
1			Credit	Durability Management Verification	1
0.5	1	2.5	Credit	Environmentally Preferable Products	4
2		1	Credit	Construction Waste Management v4.1	3
		2	Credit	Material Efficient Framing	2

7	1	8	Indoor Environmental Quality	Possible Points: 16	
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
		2	Credit	Contaminant Control	2
1		2	Credit	Balancing of Heating and Cooling Distribution Systems	3
		1	Credit	Enhanced Compartmentalization	1
1	1		Credit	Enhanced Combustion Venting	2
1		1	Credit	Enhanced Garage Pollutant Protection	2
3			Credit	Low Emitting Products	3

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

2	2	0	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

60.5	18	32	Possible Points: 110



Note:

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

2480 South Glebe Rd - Multifamily Flats & Multistory

LEED-Homes v4: Multifamily Midrise & Homes

8/20/2024

Arlington 4.1 Submission

Scorecard

Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action
Arlington County 2020 Green Building Incentive Policy					
2020 Green Building Incentive Policy	The project team acknowledges and will comply with all mandatory Baseline Prerequisites of the 2020 Arlington Green Building Incentive Policy. - LEED Gold v4 - Energy Optimization Performance Improvement (24%) (HERS 60 THs) - ENERGY STAR Score 75 - ENERGY STAR Appliances & Fixtures (including lighting) - WaterSense Plumbing Fixtures - Refrigerant Leakage - Equity, Diversion, and Inclusion Program - Energy Benchmarking - Air Sealing of Ventilation Supply & Exhaust - Electric Vehicle Charging Infrastructure - Human Interaction with Nature (Biophilia) - Bird Friendly Materials - Renewable Energy - Light Pollution Reduction (Dark Sky Approved Fixtures)	Team	Y		Team acknowledges the full 2020 Green Building Incentive Policy requirements.
Baseline Prerequisite - ENERGY STAR Appliances & Fixtures	ENERGY STAR label for the following: - Clothes Washers - Dryers - Refrigerators - Dishwashers - 90% LED or ENERGY STAR labeled light fixtures	Team	Y		Project to comply with requirement.
Baseline Prerequisite - WaterSense Plumbing Fixtures	WaterSense label for all toilets, bathroom faucets, and showerheads.	Team	Y		Project to comply with requirement.
Baseline Prerequisite - Refrigerant Leakage	Refrigerant Leakage verification by the Commissioning Agent. - Oversee on-site refrigerant charging process. - Collect as-built refrigerant piping line length calculations. - Collect charge confirmation documentation.	Team	Y		Project to comply with requirement.
Baseline Prerequisite - Equity, Diversity, and Inclusion Program.	At least one member of development team to be employed by an organization w/ an racial, ethnic, diversity and equity program. Documentation requirements include: - Staff training plan. - Professional development opportunities - Strategies to ensure inclusion at all levels of the organization.	Team	Y		SBP to provide documentation at or before CofO in accordance with the Equity, Diversity, and Inclusion Program baseline requirement.
Baseline Prerequisite - Energy Benchmarking	Energy metering and monitoring devices to track whole building energy usage. Report in ENERGY STAR Portfolio Manager for 10 years.	Team	Y		Project to comply with requirement.
Baseline Prerequisite - Air Sealing of Ventilation Supply & Exhaust	Seal central vertical and horizontal duct with aerosolized duct sealant and test in accordance with ENERGY STAR Multifamily High-rise.	Team	Y		Project to comply with requirement.
Baseline Prerequisite - Electric Vehicle Charging Infrastructure	Provide EV Charging Stations for at least 4% of parking spaces and infrastructure for at least 15% of parking spaces.	Team	Y		Project to comply with requirement.
Baseline Prerequisite - Human Interaction with Nature (Biophilia)	Provide a narrative describing how the project enhances existing and/or creates new natural spaces for occupants and the public to interact with nature and creates habitat.	Team	Y		Project to comply with requirement and provide a biophilia narrative.
Baseline Prerequisite - Bird-Friendly Materials	Use building materials that have or treated to have max threat factor of 30. - Bird friendly materials first 8 – 36 feet above ground OR weighted max Bird Collision Threat Factor (BCTR) < 15. - Non-bird friendly materials shall not exceed 10 sf within any 10x10 exterior wall between 8- 36 ft above ground.	Team	Y		Project to comply with requirement.

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2480 South Glebe Rd - Multifamily Flats & Multistory

LEED-Homes v4: Multifamily Midrise & Homes

August 15, 2024

Arlington 4.1 Submission

Scorecard

Credit		Requirement & Comments	Responsible Party	Yes	Maybe	Action
Baseline Prerequisite - Renewable Energy		Meet one of the following: - On-site solar = 2 W/sf of roof area - Integrated green roof and solar = 12% of roof area and on-site generation = 1.5 W/sf - Procure off-site solar for 1 pt under Tier 2 of LEED v4.1 – procure new off-site renewable equal to 10% of annual energy use for a 10-year term. - "New" is considered an asset-built w/in the last 5 years. - For projects without sufficient solar exposure, contribute $4/sf of roof area to Green Building Fund.	Team	**Y**		Project to comply with requirement.
Baseline Prerequisite - Light Pollution Reduction		90% of exterior fixtures shall have motion, photo, or timeclock control AND must not emit above 90 degrees, no sag or drop lenses/side light panels/up-light panels and be 3000K or lower. Note - Dark Sky-approved fixtures meet requirements.	Team	**Y**		Project to comply with requirement.
Extra items		The project is only seeking 0.25 Bonus Density and therefore is not identifying any extra items.	Team	**Y**		No Action Required
General Information						
Area / Occupancy		**Flats** - Residential (Units + Amenity) = 521,555 sf - Parking = 198,565sf (8 stories, 546 spaces) - Units = 500 (~1,200 residents) **Multistory** - Flats = ~75,000 sf - Parking = 68 total (34 garage / 34 surface spaces) - Units = 37 Flats	Team	**Y**		**No Action Required**
LEED Boundary		LEED Project Boundary to follow the building footprint.	Team	**Y**		**No Action Required**
Specifications		Specifications have not been provided at this time.	Architect	**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**		SBP to maintain list of meetings (date, attendees, length, agenda) Note: SBP will conduct trades training before start of construction.
Location and Transportation (min 8 pts total in LT and EA reqd)						
Prereq 1	Floodplain Avoidance	**Option 1. Project is not built in 100-year floodplain** Option 2. Project building in flood hazard area iaw local flood provisions Option 3. Project is previously developed building and hardscape Observed: Project not built in 100-year floodplain	SBP	**Y**		**No Action Required**

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Credit		Requirement & Comments	Responsible Party	Yes	Maybe	Action
Credit 1	Site Selection	Option 1. Sensitive Land Protection (3-4 pts) **Path 1. Previously Developed (4 pts)** - 75% of buildable land located on previously developed land. 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 Observed: Project is built on previously developed land.	SBP	**4**		**No Action Required**
		Option 2. Infill Development (2 pts) - 75% of land w/in 1/2 mi of project boundary is previously developed Observed: <75% of land w/in 1/2 mile of the project is previously developed	SBP	**2**		**No Action Required**
		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 Observed: Project is built within 0.5 walking distance to Drew Park Playground and Spray Park.	SBP	**1**		**No Action Required**
		Option 5. Bicycle Network (1 pt) **-** Meet all of the following: - 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 = (15% occupants, min 1 per 3 res units) Observed: - 210 long term / 12 short term	Architect	**1 Flats**	**1 Multi**	Discuss whether flats strategy meets LEED requirements.
Credit 2	Compact Development	Required: Meet the following density (dwelling units/acre) ≥ 30 MF / 7 TH (1 pt) ≥ 55 MF / 12 TH(2 pts) **≥ 80 MF / 20 TH (3 pts)** Observed: Meets 3 pts.	SBP	**3**		**No Action Required**

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	Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action
Credit 3	Community Resources	Required: 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) Observed: Projects located within 1/2 mi walking distance of 8+ use categories. Need to finalize.	SBP	**2**		**No Action Required**
Credit 4	Access to Transit	Required: - 1/4 mi walking distance of bus OR - 1/2 mi walking distance of bus rapid, lt/hvy rail, ferry AND - Meet min transit stops below Multiple Transit Weekday / Weekend Trips / Multifamily Points **72 / 30 / 1** 100 / 70 / 1.5 144 / 108 / 2 Observed: The project is within walking distance of several bus stops and lines.	SBP	**1**		**No Action Required**
Sustainable Sites						
Prereq 1	Construction Activity Pollution Prevention	Required: 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	Civil	**Y**		Include ESC drawings.
Prereq 2	No Invasive Plants	Required: Do not install invasive plants	Landscape	**Y**		Design for all native plants. Include plant list in drawings and a third party resource for comparison.
Credit 1	Heat Island Reduction *ArlCo GBIP Alignment*	Option 1. Shading: Shade hardscape and roof w/ 10 year plant canopy **Option 2. Nonabsorptive Materials:** Use any of the following for hardscape and roof: - ENERGY STAR roofing material - Vegetated Roof - Open Pavers - Paving w/ 3-year SR ≥ 0.28 (or initial SR ≥ 0.33) Total Area met by Option 1 or Option 2: **50-75% (1 pt)** >75% (2 pts) *GBIP Requirement - incorporate elements of human connection with nature*	Architect	**1**	**1**	Select a combination of high SRI products for penthouse roof (white TPO w/ SRI>82), Energy Star Roofing Materials, or Green Roof. *GBIP - consider how roof design will implement human interaction with nature*

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	Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action
Credit 2 MF only	Rainwater Management	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 Percent of permeable area total lot area - 50-64% (1 pt) - 65-79% (2 pts) - >80% (3 pts) 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)**	Civil		**3**	For MF, 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	Nontoxic Pest Control	Required: - Implement IPM Plan (Reqd) 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) - Ports/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)	Team	**2**		Implement IPM at occupancy. SBP can provide for review and approval or provide copy of one currently in use. Include drawing details w/ features: - 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)
Water Efficiency (min 3 pts reqd)						
Prereq 1	Water Metering	Required: Install water meter for each unit or entire building	MEP	**Y**		Clarify whether a whole building water meter or individual unit water meters will be provided.
Credit 1	Total Water Use *Performance Path* *ArlCo GBIP Alignment*	Required: Reduce total water use (indoor + outdoor) 10% (1 pt) to 65% (12 pts), 70% (+1 EP). **30% - 5 pts** 35% - 6 pts 40% - 7 pts GBIP Requirements - WaterSense labeled in-unit toilets, lavs, showerheads; in-unit ENERGY STAR clothes washers, dryers, dishwashers, refrigerators	Team	**6**	**2**	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 2. Clarify irrigation strategy. Design for drip irrigation, moisture sensors, and controller or NO Irrigation. 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. Arlington Site Plan Conditions - Select WaterSense labeled WC, Lav, Shower and Energy Star CW, DW, Refrigerator (and clothes dryer).

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Arlington 4.1 Submission

Scorecard

Credit		Requirement & Comments	Responsible Party	Yes	Maybe	Action
Energy and Atmosphere (min 8 pts total in LT and EA reqd)						
Prereq 1	Minimum Energy Performance *ArlCo GBIP Alignment*	Required: **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 AND Option 1. ENERGY STAR MFHR Testing and Verification Protocols OR Option 2. Commissioning 1. In-Unit Duct 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 3. Include air barrier, compartmentalization sheet, and elements to be sealed. 4. Provide load calculations, system selection, and duct sizing calculations. GBIP Requirements - 24% energy cost savings (HERS 60), ENERGY STAR Score 75, aerosolized duct sealant of ventilation supply and exhaust, refrigerant leakage verification by CxA, on-site or off-site renewables.	Team	**Y**		MEP: - Review the Energy Star v3 checklists. Meet or exceed these requirements. - Provide load calculations, system selection, and duct sizing calculations. Architect: - Include air sealing and compartmentalization details in the drawings. SBP: - SBP will do a full energy model update/HERS model update at DDs. Will provide the team a list of EEOs to increase efficiency and energy cost savings if necessary, to meet target.
Prereq 2	Energy Metering *ArlCo GBIP Alignment*	Required: 1. Electric submeters in each Unit 2. Whole building gas meter or submeter in each Unit GBIP Requirements - whole building energy and water metering	MEP	**Y**		Include drawing details demonstrating the location of meters and metering strategy.
Prereq 3	Education of HomeOrr, Tenant or Building Manager	Required: 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 *ArlCo GBIP Alignment*	Required: Achieve savings from 1% (1pt) to 90% (29 pts). Over 65% earns project +1 EP Observed: Flats - 7.5 hsa points anticipated + 24% energy cost savings (17 pts) required / Multistory - hsa pionts anticipated + HERS 60 (14 pts) required	SBP	**24.5** **17**	**2** **7**	Target 24% energy cost savings (HERS 60 for THs). 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 *ArlCo GBIP Alignment*	Option 1. Electric and Water (1 pt): Meet one: - Units: permanent energy-monitoring system at 1-hr interval - Irrigation: irrigated area 1,000sf+ w/ submeter AND/OR **Option 2. Third Party Utility Reporting (1 pt):** 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) GBIP - share whole building energy usage data through Energy Star Portfolio Manager.	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. Energy Star Portfolio Manager can be used.

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	Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action
Credit 4 TH only	Active Solar Ready Design	Option 1. PV Ready (1 pt): Meet EPA's requirements for PV ready home Option 2. Solar Hot Water Ready (1 pt): Meet EPA's requirements for solar hot water ready home	Owner		**1**	Provide feedback as to whether EPA PV-ready guidelines can be implemented.
Credit 5 TH only	HVAC Start-up Credentialing	Use an HVAC contractor credentialed by an EPA-recognized HVAC Quality Installation Training and Oversight Organization (H-QUITO) The technician must complete the ENERGY STAR for Homes, version 3, HVAC system quality installation contractor checklist.	Owner		**1**	Provide feedback as to whether this requirement can be included in project requirements.
Materials and Resources						
Prereq 1	Certified Tropical Wood	Required: All wood is nontropical, reused/reclaimed, FSC	Architect	**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	Required: 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	Required: ENERGY STAR for Homes v3 Water Management System Checklist verified by Verification Team	SBP	**1**		**No Action Required** Construction Activity
Credit 2	Environmentally Preferable Products	**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) **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 For Option 2, earn 4 points to earn another +2 EP	Architect	**.5**	**1**	Local concrete aggregate expected. Include Spec 018113 in Project Manual or add notes to drawings.
Credit 3	Construction Waste Management	Required: - Divert at least 50% (1 pt) or 75% (2 pts) of construction waste from landfill (CIR 10479).	SBP	**2**		SBP to provide specification language.
Indoor Environmental Quality (min 3 pts rqd)						

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Credit		Requirement & Comments	Responsible Party	Yes	Maybe	Action
Prereq 1	Ventilation	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 2. Whole Unit mechanical ventilation that meets ASHRAE 62.2-2010 Sections 4-7 3. Non-Unit spaces met ASHRAE 62.1-2010 Sections 4-7 Discussed: DOAS to be provided for multifamily. Ventilation strategy for THs in discussion.	MEP	**Y**		1. Provide calculations verifying ventilation complies 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	Combustion Venting	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 Discussed: No in-unit combustion appliances currently planned.	MEP	**Y**		1. Include CO sensor in Units 2. Clarify whether any fireplaces will be installed
Prereq 3	Garage Pollutant Protection	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	MEP	**Y**		Provide mechanical drawings indicating all of the requirements within the parking garage spaces.
Prereq 4	Radon-Resistant Construction	Required: 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.	MEP	**Y**		**No Action Required.** Project is located in Zone 2.
Prereq 5	Air Filtering	Required: Recirculating Space Conditioning - MERV 8 filters OA Systems - MERV 6 filters	MEP	**Y**		Specify minimum MERV 8 filters on Unit HVAC systems and MERV 6 on OA systems
Prereq 6	Environmental Tobacco Smoke	Required: 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	Architect	**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".

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2480 South Glebe Rd - Multifamily Flats & Multistory

LEED-Homes v4: Multifamily Midrise & Homes

August 15, 2024

Arlington 4.1 Submission

Scorecard

	Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action
Prereq 7	Compartmentalization *ArlCo GBIP Alignment*	Required: 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)	MEP	**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	**Option 1. Enhanced Local Exhaust (1 pt):** 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 Option 2. Enhanced Whole-House Ventilation (2 pts): 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.	MEP	**1 Multi**	**1 Flats**	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
Credit 3	Balancing of Heating and Cooling Distribution Systems	For Forced-Air Systems (up to 3 pts) **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** AND/OR Option 2. Supply-Air Flow Testing (1 pt): Supply airflow rates are within +/- 20% (or +/- 25 cfm) of Manual J calculations AND/OR Option 3. Pressure Balancing (1 pt): Pressure differential between bedroom and rest of Unit is < 3 Pa (transfer grilles)	MEP	**1**		**No Action Required** Average MF unit size is <1,200 sf. Advise of any changes. For THs, provide 2 thermostats if average unit size not < 1,200 sf.
Credit 5	Enhanced Combustion Venting	Option 1. No Fireplaces or Woodstoves (2 pts) OR 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	MEP	**1**	**1**	Clarify whether any fireplaces are planned.
Credit 6	Enhanced Garage Pollutant Protection	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 OR Option 2. Detached Garage or No Garage or Carport (1 pt): No garage or a detached garage has been constructed	MEP	**1**		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

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August 15, 2024

Arlington 4.1 Submission

Scorecard

	Credit	Requirement & Comments	Responsible Party	Yes	Maybe	Action
Credit 7	Low-Emitting Products	Required: Meet requirement for at least 90% of the following components (up to 3 pts): **- 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)	Architect	**1** **3**	**2** **O**	Include Specification 018113 to be provided by SBP. (SBP can review finish schedule).
Credit 8 MF only	No Environmental Tobacco Smoke	Required: Prohibit smoking in the entire building (including units).	Team	**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	Innovation in Design *ArlCo GBIP Alignment*	Whole Building LCA	Team	**1**		Conduct LCA kick-off and explore opportunities for reduced material impact. Consider material optimization opportunities and Include requirements in specifications for Contractor to follow.
Credit 2	v4.1 Credit Substitution Requested *ArlCo GBIP Alignment*	Electric Vehicles: Install electrical vehicle supply equipment (EVSE) in 5% (32 spaces) of all parking spaces. The EVSE must: - Provide a Level 2 charging capacity - Comply with J1772 - Be vehicle to grid connected and network connection. Or, provide EV infrastructure for 10% (63 spaces)of all parking spaces. GBIP requirement: Provide EV charging stations for 4% (24 spaces) of parking spaces and 15% (87 spaces) EV-ready infrastructure of parking spaces	Team	**1**		Show EV Charging Stations for at least 4% of parking spaces and EV-ready infrastructure for at least 15% of parking spaces. For Multistory, equip each home with EV charging capability.
Credit 3	Innovation in Design	Identify a credit **- EPDs (20 products)** - Enhanced Commissioning - Purchase Protected Land - Water Restoration Certificates - Material Ingredients (20 products)	Architect	**1**		Include Specification 018113 to be provided by SBP. (SBP can review finish schedule).
Credit 4	Innovation in Design	Identify a credit - EPDs (20 products) - Enhanced Commissioning - Purchase Protected Land - Water Restoration Certificates **- Material Ingredients (20 products)**	Architect	**1**		Include Specification 018113 to be provided by SBP. (SBP can review finish schedule).
Credit 5	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 (2 pts)	SBP		**1**	**No Action Required**
Credit 3	Regional Priority	Access to Transit (2 pts)	SBP	**1**		**No Action Required**
Credit 4	Regional Priority	Total Water Use (12), Rainwater Management (3), Construction Waste M. (3), Outdoor water use (4)	SBP		**1**	See credit requirements.

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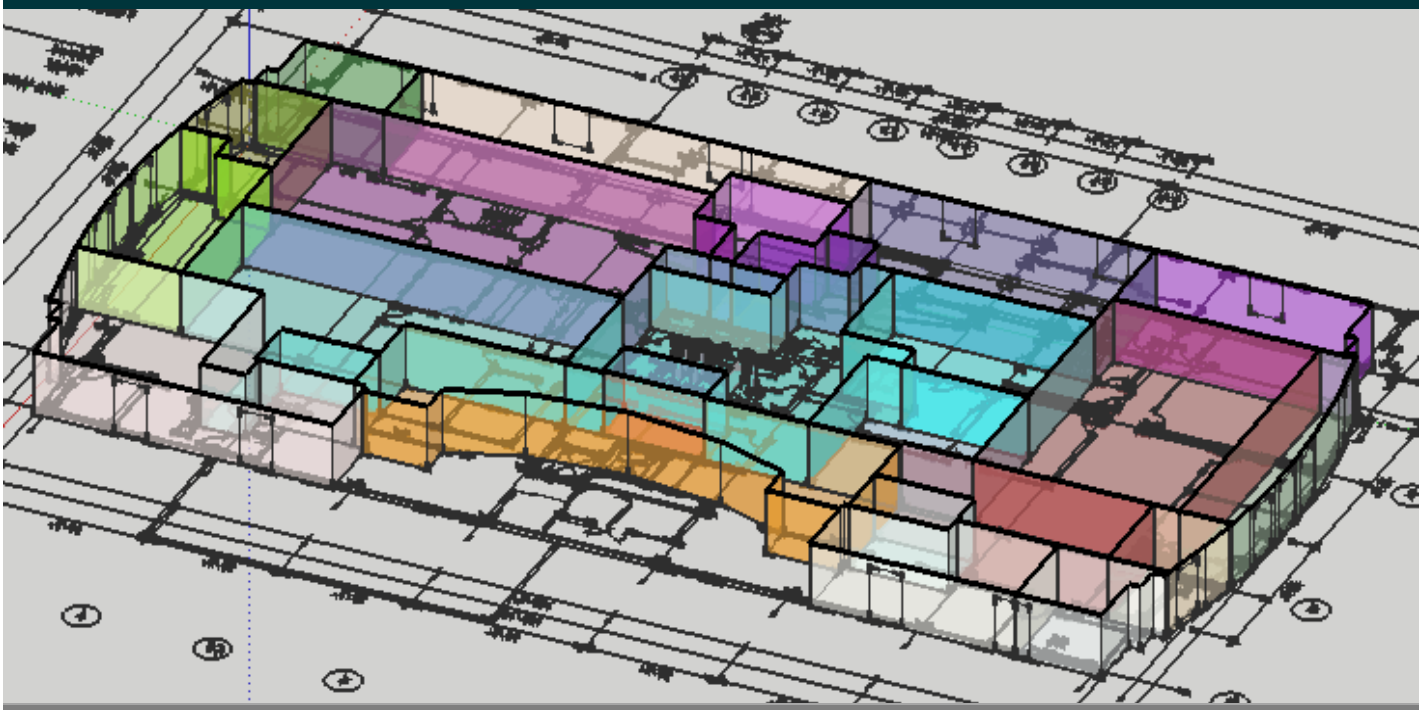

Energy Model Report

Preliminary Energy Performance Benchmarking

2480 S Glebe Road (Novel Arlington Ridge)

Arlington, Virginia

Report v3.0

November 1st, 2024

2701 Prosperity Avenue, Suite 100
Fairfax, Virginia 22031

www.sustainbldgs.com

Table of Contents

Disclaimer: This analysis is not intended to predict the absolute energy consumption of the proposed facility but rather it is intended to estimate order of magnitude savings for alternative systems and building options based on refined assumptions, building performance metrics and energy modeling expertise. Change in weather conditions, operational characteristics, end-user, miscellaneous electrical loads, controls alterations and other unpredictable metrics prevent the model from accurately predicting the actual annual energy consumption of any facility.

Purpose

Design Evaluation

Sustainable Building Partners, LLC (SBP) has developed comprehensive energy models for the proposed Novel Arlington Ridge property in Arlington, VA. The Multifamily Flats potion of the facility used whole building energy modeling developed with Energy Plus v22.1 via the Open Studio v3.4 interface. The Multistory portion uses unit modeling conducted with Ekotrope. SBP's modeling methodology is consistent with LEEDv4 and ASHRAE 90.1-2010 Appendix G modeling protocol and best practices.

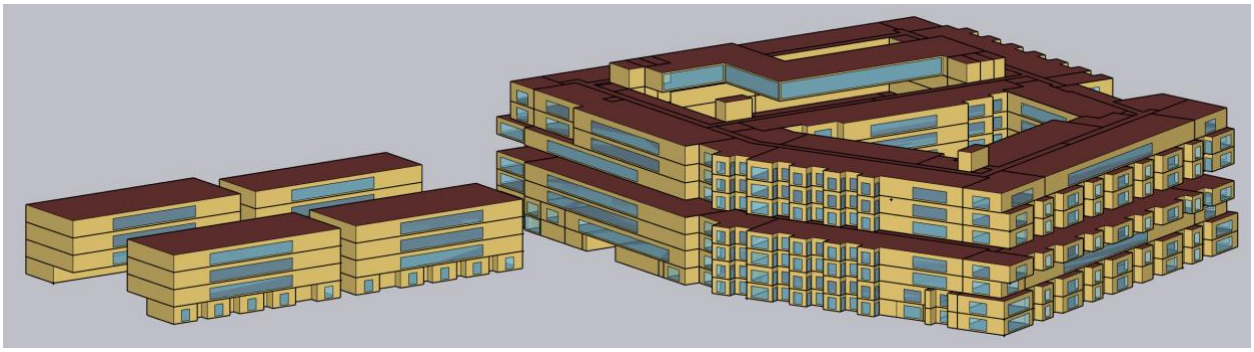

Figure 1: Energy Model Rendering of Novel Arlington Ridge Multifamily

Arlington County 4.1 Site Plan Conditions / GBIP

2020 GBIP Bonus Density: **0.25 FAR**

GBIP Energy Performance Requirements:

- Multifamily - Flats
  - **24% Energy Cost Savings** as compared to a LEED Baseline design (ASHRAE 90.1-2010 Appendix G)
  - **EnergyStar score of ≥75**
  - **Renewable Energy**
    - On-site Solar @ 2 W/sf
    - On-site Solar @1.5 W/sf + 12% Green Roof
    - Off-site Tier 2 purchase (10% offset for 10-years)
- Multifamily - Multistory
  - **HERS Index Target - 60**
  - **Renewable Energy**
    - On-site Solar @ 2 W/sf
    - On-site Solar @1.5 W/sf + 12% Green Roof
    - Off-site Tier 2 purchase (10% offset for 10-years)

Performance Disclaimer

This analysis is based on an early design information and 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 as is noted in ASHRAE 90.1-2010 Section G1.2 Note #2. This analysis is configured to only demonstrate compliance with the energy performance requirements of the Green Building Incentive Policy and is not intended to demonstrate compliance with the 2021 VECC. A separate VECC energy model analysis will be provided at the permit submission.

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.

Multifamily Flats

Table 1provides results of the whole-building energy modeling assessment for the multifamily and two-over-two portions of the facility. Note that operational performance is extremely sensitive to the operating hours of the facility which have been estimated for this analysis.

Table 1: Annual Energy & Performance Benchmarking – Multifamily & Stacked

Design	Description	Energy Cost Savings	Site EUI (kBtu/sf)	Source EUI (kBtu/sf)	Year 1 GHG(2) (Tons CO2e)	Energy Star Score
Baseline	**ASHRAE 90.1-2010 Appendix G**	**--**	**--**	**--**	**--**	**--**
GBIP Target	**Minimum required performance**	**≥24%**	**--**	**--**	**--**	**≥75**
Multifamily – Flats	7/19/2024 4.1 Submission Draft	**≥24%**	**30 - 35**	**95 - 100**	**1,500+**	**≥80**

Primary Design Features – Multifamily - Flats

- Split system heat pumps (≥15 SEER, ECMs)
- Decoupled ventilation – Electric Heat Pump DOAS
  - Corridor OA ≤0.20 CFM/sf
  - Variable speed compressors
  - Premium efficiency fan motors
  - DOAS discharge air temperature reset
- In-unit electric storage water heaters
- Interior & garage lighting power reductions
- EnergyStar appliances
- High performance enclosure

Throughout the early-design process the project team has worked to optimize overall energy performance and will continue this effort for the remainder of the design. Most design features are not fully developed at this point in design and will continue to evolve over the next few months.

Multifamily Multistory

Table 2 provides a summary of the current HERS benchmarking for the multistory facilities. These units are within reach of compliance (HERS 60) but the exact pathway is still being evaluated. Two potential compliance paths have been identified but multiple other options are currently being evaluated.

Table 2: Multistory - HERS Index

Design Element	Base Design		Compliance Path #1		Compliance Path #2	
	Worst Case (inside)	Worst Case (end)	Worst Case (inside)	Worst Case (end)	Worst Case (inside)	Worst Case (end)
Slab	R-10 (2/2)	R-10 (2/2)	R-10 (2/2)	R-10 (2/2)	R-10 (2/2)	R-10 (2/2)
Framed Floor	R-38	R-38	R-38	R-38	R-38	R-38
Rim Joist	R-21	R-21	R-21	R-21	R-21	R-21
AGW	R-21	R-21	R-21	R-21	R-21	R-21
Window U/SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC
Glass Door U/SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC	U-0.30 / 0.29 SHGC
Ceiling	R-38	R-38	R-38	R-38	R-38	R-38
Heating	18k 10 HSPF	18k 10 HSPF	18k 10 HSPF	18k 10 HSPF	18k 10 HSPF	18k 10 HSPF
Cooling	18k 18 SEER	18k 18 SEER	18k 18 SEER	18k 18 SEER	18k 18 SEER	18k 18 SEER
Water Heater	50gal / 0.93UEF	50gal / 0.93UEF	**50gal / 3.45UEF HP**	**50gal / 3.45UEF HP**	50gal / 0.93UEF	50gal / 0.93UEF
PV	None	None	None	None	None	None
Appliances	ENERGY STAR	ENERGY STAR	ENERGY STAR	ENERGY STAR	ENERGY STAR	ENERGY STAR
Lighting	ENERGY STAR Equiv	ENERGY STAR Equiv	ENERGY STAR Equiv	ENERGY STAR Equiv	ENERGY STAR Equiv	ENERGY STAR Equiv
Unit Air Sealing	5 ACH 50	5 ACH 50	5 ACH 50	5 ACH 50	**4.5 ACH 50**	**4.5 ACH 50**
Configuration	**BASE**		**HP DHW**		**Enhanced Air Sealing**	
ArlCo Target	**60**		**60**		**60**	
HERS Index	**61**	**60**	**<60 (w/ safety factor)**		**<60 (w/ safety factor)**	

Path to Electrification

The project team is actively evaluating the feasibility of specific electrification initiatives for the facility. The table below summarizes the primary systems that would typically use either gas or electric as the primary fuel.

Table 3: Electrification Strategies & Considerations (Multifamily - Flats)

System	Current Basis of Design	Primary Heating	All Electric?	Challenges & Limitations	Future-Proofing
Local HVAC	SSHP	Heat Pump	**Yes**	N/A (all electric)	N/A (all electric)
Ventilation HVAC (DOAS)	100% OA Rooftop Unit	Heat Pump with gas-backup	No	• Heat pumps required auxiliary heating • Electric-resistance auxiliary requires significant peak electric loads (kW) • Electric-resistance auxiliary yields HIGHER operating costs, source energy, and GHG emissions as compared to a gas backup.	• A gas-backup would likely yield lower short- and mid-term carbon emissions and would yield a substantial reduction in peak demand as compared to electric-resistance.
Domestic Hot Water	In-Unit Electric WHs	Electric-resistance (multifamily)	**Yes**	• In-unit HPWH is not a viable option for multifamily because of venting requirements & mech. closet area • Central HPWH is limited by first cost & available mechanical space	• Heat pumps would yield reduced site energy, source energy, and greenhouse gas emission both short- and long-term. Full feasibility is still being evaluated.
Unit Appliances	All Electric	--	**Yes**	N/A	• The feasibility of heat pump dryers & induction ranges is still being evaluated.

Table 4: Electrification Strategies & Considerations (Multifamily - Multistory)

System	Current Basis of Design	Primary Heating	All Electric?	Challenges & Limitations	Future-Proofing
Local HVAC	SSHP	Heat Pump	**Yes**	N/A (all electric)	N/A (all electric)
Ventilation HVAC (local)	Local	Heat Pump	**Yes**	• N/A	• N/A
Domestic Hot Water	In-Unit Electric WHs	Electric-resistance	**Yes**	• Current design is all electric but electric-resistance poses a short-term penalty in source energy and greenhouse gas emission as compared to both heat pumps and gas-fired systems.	• Heat pumps would yield reduced site energy, source energy, and greenhouse gas emission both short- and long-term. Full feasibility is still being evaluated.
Unit Appliances	All Electric	--	**Yes**	• N/A	• The feasibility of heat pump dryers & induction ranges is still being evaluated but not likely to be pursued due to significant cost limitations and concerns with the technology.

Opportunities for Renewable Energy

On-Site Solar Feasibility

The project team is actively evaluating the feasibility of an on-site rooftop solar array in the context of the GBIP Prerequisites and Extras. Table 5 summarizes the GBIP requirements:

Table 5: GBIP On-site Solar Requirements (1)

Requirement	Description	Solar Array Capacity (kW)	
		Flats	Multistory
Prerequisite i	2.0 W/sf On-site Solar	140	44
Prerequisite ii	1.5 W/sf On-Site Solar 12% Green Roof area	105	33
Extra i	4.0 W/sf On-Site Solar	280	89
Extra ii	3.5 W/sf On-Site Solar 12% Green Roof area	245	78

(1) Roof Areas: MF Tower: ~70,000 GSF, Multistory: 22,200 GSF/each)

SBP has created hypothetical design scenarios using Helioscope (see Table 6) to better understand the maximum array size that could be accommodated on this roof surface. This is a preliminary feasible study only and further analysis is required to very full feasibility. The design is limited by the following factors:

- IFC setbacks & pathways (likely 4') – limits usable roof area
- Maintenance access pathways – limits usable roof area
- Green roof – expanded row spacing is usually necessary to ensure adequate stormwater management
- HVAC Equipment – limits usable roof area
- DOAS maintenance setbacks/access – limits usable roof area
- PH Screenwalls – significant shading on roof surface
- Adjacent buildings – creates shaded areas that are not suitable for on-site solar

Table 6: Rooftop Solar Feasibility – Maximum Hypothetical Design (1)

Facility	Solar Capacity (kW)		Annual Energy Generation	GBIP Prerequisites		GBIP Extras	
	Horizontally Mounted	Vertically Mounted		i	ii	i	ii
Multifamily (max design)	**~300 kW (3.5 W/sf)**	0	400 MWH/yr (~8% offset)	**Feasible**	**Feasible**	**NOT FEASIBLE**	**FEASIBLE BUT UNLIKELY**
Multistory	*This will be evaluated when a more refined roof plan is available and when additional electrical infrastructure is defined so that the allocation of the solar array can be determined.*						

(1) All estimate assume the following:
- Optimal orientation, 15° tilt, 3' row spacing
- Silfab SIL-400 module (or similar)
- SolarEdge SE25k (or similar)
- SolarEdge P800 Optimizers (or similar)

Off-Site Renewable Energy

Ownership has the option of procuring off-site renewable energy purchases in place of an on-site solar installation. This pathway requires the project to achieve 1-Point under the LEED v4.1 Renewable Energy credit using the **Tier 2 path**. This equates to an offset of **20% of the buildings energy for a period of 10-year** (or equivalent prorated purchase).

Table 7: Off-site Renewable – GBIP Requirements

Facility	Annual Offset (MWh/REC)	
	MWh/yr @ 10-yrs	MWh/total (10-yr)
Flats	**950**	**9,500**
Multistory	**145**	**1,450**

Tier 2:
- Renewable electricity produced within the last 5 yrs or contracted to be operational within two years
- Green-e certification or equivalent for one-time purchase

Energy Efficiency Opportunities

The following is a list of specific load reduction and energy savings strategies that are currently being evaluated for the project. Many of these items cannot be confirmed or implemented at this phase of design but will be considered as the design progresses.

Table 8: Energy Efficiency Opportunities

Measure	Considerations/Status	Energy Impact (1)	First Cost Impact	General Feasibility (1)
Enclosure Optimization – Increased Insulation	Additional cavity and/or batt insulation as allowed by current enclosure structure. This will be evaluated when more enclosure details become available.	Low	High	Low
Enclosure Optimization – Reduced Thermal Bridging	These systems are cost prohibitive but will be evaluated when additional enclosure details are developed.	Low	Moderate	Low
Enclosure Optimization – Window Performance	Thermally broken aluminum frames are in the BOD, and improvements will be evaluated with the manufacturer.	Low	Moderate	**INCLUDED**
Lighting Power Reductions	See 'Design Target in Table 11. Dwelling unit lighting is largely unregulated, but the team will consider high-efficacy fixtures throughout (>60 lm/W)	Moderate	Low	**INCLUDED**
Lighting Power Controls	Corridor occupancy sensors are being evaluated	Moderate	Low	**INCLUDED**
Heat Pump Dryers	These are cost prohibitive but will be evaluated as part of the appliance package selections	Moderate	Moderate	Moderate
Elevators with VVVF/Regenerative Drives	Elevators have not yet been selection, but a high performance option will be evaluated	Low	Moderate	**INCLUDED**
Ventilation Energy Recovery	Vertical exhaust ducting is extremely challenging in a wood-framed building but will be evaluated. Additional energy recovery systems are cost prohibitive.	High	High	Low
Advanced DOAS Controls	Discharge temperature reset controls will be considered as the sequence of operation is developed	Moderate	Low	**INCLUDED**
Corridor Ventilation Optimization	This entails limiting corridor ventilation/pressurization to ≤0.18 CFM/sf. This value is entirely driven by building air-balancing and will be evaluated later in design	High	Low	Moderate
Heat Pump DOAS (all electric)	DOAS with heat pump as primary heat source. This is the current BOD.	Moderate	Moderate	**INCLUDED**
High Efficiency SSHPs	Unit heat pumps rated at ≥18 SEER/ 10 HSPF and/or equipped with low-ambient operation. This would likely required inverter compressors & ECMs.	Moderate	High	Moderate
Heat Pump Water Heaters (all electric DHW)	In-unit or central air-to-water heat pumps for primary domestic hot water. Likely requires an electric-resistance backup system.	High	High	Low
Premium Low Flow Fixtures	Low flow plumbing fixtures as follows: Showers – 1.5 GPM, Lav Faucets – 0.5 GPM	Low	Low	Moderate

(1) Assessment of general impact on building energy performance. In general, 'Low' impact items yield <1% impact on total building energy, 'high' impact items yield ≥3% impact on total energy.
(2) Qualitative assessment of the likelihood of implementation given design and cost limitations.

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 10: General Project Parameters

Project Types	Multifamily - Flats
Modeling Software	EnergyPlus v22.1 / OpenStudio v3.4
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	Multifamily – Flats: 8 Floors Multistory: Varies
Building Area (GSF)	Multifamily – Flats: 539,908 GSF excluding parking Multistory: 81,433 GSF
Dwelling Units	Multifamily – Flats: 494 Units (ST x 14, 1BR x 364, 2BR x 107, 3BR x 9) Multistory: 37 Units
Electric Utility Rates	EIA – Residential: $0.1334/kWh (2022 VA avg.) EIA – Commercial: $0.0966/kWh (2022 VA avg.)
Gas Utility Rates	EIA – Commercial: $1.1118/therm (2022 VA avg.)

Exterior Opaque Constructions

All assemblies have been estimated in accordance with ASHRAE RP-1365, 2017 DC Energy Code, and ASHRAE 90.1 Appendix A.

Table 11: Opaque Envelope Performance Summary

Assembly Type	Description*	Proposed Performance*
Exterior Walls - Typical Wood Frame	R-20 Batt Between Wood Framing	U-0.060
Exterior Walls - Typical Metal Frame	R-7.5 CI + R-13 Batt Between Metal Framing	U-0.065
Typical Roof	R-30 Continuous Insulation	U-0.032

**All assembly details and performances have been estimated*

Window Assemblies

All performance has been estimated based on typical performance values.

Window Area:
Multifamily - Flats: ~30% Window-to-Wall Ratio

Basis of Design:
TBD

Table 12: Window Assembly Performance (frame+glass)

Window	U-value	SHGC
Residential Vinyl Window (VPI or similar)	0.30	≤0.35
Aluminum (Fixed/Operable)	0.42	≤0.40

Lighting Systems

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

Table 13: Lighting Summary

Space Type	LEED Baseline [1] (W/sf)	ASHRAE 90.1-2016[2] (W/sf)	Lighting Power Targets (W/sf)	
			Tier #1	Tier #2
Corridor	0.66	0.66	**0.50**	**0.45**
Storage	0.63	0.46	**0.40**	**0.35**
Lobby	0.90	1.00	**0.70**	**0.60**
Stairs	0.69	0.58	**0.45**	**0.35**
MEP	0.95	0.43	**0.40**	**0.35**
Parking	0.19	0.14	**0.12**	**0.08**
Dwelling Units	--	≥55 lm/W	All fixtures ≥60 lumens/Watt	
All/General	--	--	All linear strip LEDs ≤4 W/LF	

[1] This represents the basis of comparison for the Arlington V4.1 analysis and the current model assumptions
[2] Minimum prescriptive lighting for local energy code (provided for reference only)

Equipment & Appliances

Table 14: Process & Equipment Summary

Component	Description
Dwelling Unit Appliances	• Fridge: EnergyStar (required for GBIP) • Dishwasher: EnergyStar (required for GBIP) • Clothes Washer: EnergyStar (required for GBIP) • Dryer: Electric, EnergyStar (required for GBIP) • Range: Electric, standard
Misc. Plug Loads	Modeled in accordance with LEED Multifamily Midrise Guidelines
Elevators	MRL Gearless Traction
Garage Ventilation	• 0.75 CFM/sf • DCV with VFD Controls

Domestic Hot Water System

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

Table 15: DHW Summary – Flats & Multistory

Component	Description
Water Heater Type	In unit electric storage water heaters
Configuration	In-unit
Demand	Estimated Low Flow Fixtures • Showers – 1.50 GPM • Kitchen Faucets – 1.50 GPM • Lavatory Faucets – 1.50 GPM
Storage Capacity	4.5 kW, 40-gallons (per heater)
Efficiency	0.95 EF

Base Building HVAC Narrative

Table 16: HVAC Basis of Design – Multifamily Flats

Design Component	Description
Primary System	Split System Heat Pumps • 15 SEER/ 8.2 HSPF • Cont. Vol, Cycling, ECM Motors • Local thermostats control system operation.
Ventilation System	100% Dedicated Outside Air Unit • Air-source Heat Pump • Heat pump • Electric auxiliary • Hot gas reheat • Discharge air temperature reset
Ventilation Rates	• Dwelling Units – ASHRAE 62.2 • Common – ASHRAE 62.1 • Corridors – 0.20 CFM/sf (*decoupled from space conditioning*)

Table 16: HVAC Basis of Design – Multifamily Multistory

Design Component	Description
Primary System	Split System Heat Pumps • 18 SEER / 9.5 HSPF • Variable speed compressors • Cont. Vol, Cycling, ECM Motors • Local thermostats control system operation.
Ventilation System	Local ventilation • Ventilation control system (Aprilaire 8144NC or similar) • Inline booster fan to allow for decoupling from SSHPs
Ventilation Rates	• Dwelling Units – ASHRAE 62.2

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 (Multifamily – Flats)

	Electricity Energy Use [kWh]	Electricity Demand [W]	Natural Gas Energy Use [therm]	Natural Gas Demand [Btu/h]
Heating -- General	332496.63	435512.20	62.55	1306282.19
Cooling -- General	548407.14	447907.86	0.00	0.00
Interior Lighting -- General	392170.82	50455.28	0.00	0.00
Interior Lighting -- Unit Lighting	315231.19	80090.28	0.00	0.00
Interior Lighting -- 2x2 Lighting	7149.23	1816.39	0.00	0.00
Exterior Lighting -- Elevators	150278.88	54532.80	0.00	0.00
Exterior Lighting -- Exterior Lights	21780.02	5000.00	0.00	0.00
Exterior Lighting -- Garage Fans	66409.61	21660.00	0.00	0.00
Exterior Lighting -- Garage Lighting	138390.59	15798.00	0.00	0.00
Interior Equipment -- General	1426309.61	326566.72	0.00	0.00
Interior Equipment -- 2x2 General Eqp	24286.81	5736.13	0.00	0.00
Exterior Equipment -- Not Subdivided	0.00	0.00	0.00	0.00
Fans -- Ventilation (simple)	0.00	0.00	0.00	0.00
Fans -- General	347913.35	39716.10	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	972720.58	485142.78	0.00	0.00
Refrigeration -- Not Subdivided	0.00	0.00	0.00	0.00
Generators -- General	0.00	0.00	0.00	0.00

ASHRAE Baseline Building Output Reports

EAp2-4/5. Performance Rating Method Compliance (Multifamily – Flats)

	Electricity Energy Use [kWh]	Electricity Demand [W]	Natural Gas Energy Use [therm]	Natural Gas Demand [Btu/h]
Heating -- General	0.00	0.00	28948.31	4152744.89
Heating -- Boiler Parasitic	0.00	0.00	0.00	0.00
Cooling -- General	863233.65	619539.38	0.00	0.00
Interior Lighting -- 2x2 Lighting	7149.23	1816.39	0.00	0.00
Interior Lighting -- General	583177.13	74716.30	0.00	0.00
Interior Lighting -- Unit Lighting	315231.19	80090.28	0.00	0.00
Exterior Lighting -- Elevators	150278.88	54532.80	0.00	0.00
Exterior Lighting -- Exterior Lights	21780.02	5000.00	0.00	0.00
Exterior Lighting -- Garage Fans	88546.15	28880.00	0.00	0.00
Exterior Lighting -- Garage Lighting	328675.46	37520.00	0.00	0.00
Interior Equipment -- 2x2 General Eqp	25315.67	5979.13	0.00	0.00
Interior Equipment -- General	1510536.64	346459.72	0.00	0.00
Exterior Equipment -- Not Subdivided	0.00	0.00	0.00	0.00
Fans -- General	957215.47	109271.09	0.00	0.00
Pumps -- General	19358.42	5271.63	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	1397628.74	535190.48	0.00	0.00
Refrigeration -- Not Subdivided	0.00	0.00	0.00	0.00
Generators -- General	0.00	0.00	0.00	0.00

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
GHG	Green House Gas
HP	Heat Pump OR Horsepower
HSPF	Heating Seasonal Performance Factor
HW	Hot Water
IEER	Integrated Energy Efficiency Ratio
LED	Light Emitting Diode
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
SSHP	Split System Heat Pump
VAV	Variable Air Volume
VFD	Variable Frequency Drive
VRF	Variable Refrigeration Flow
VRV	Variable Refrigeration Volume
VSD	Variable Speed Drive
VT	Visible Transmittance