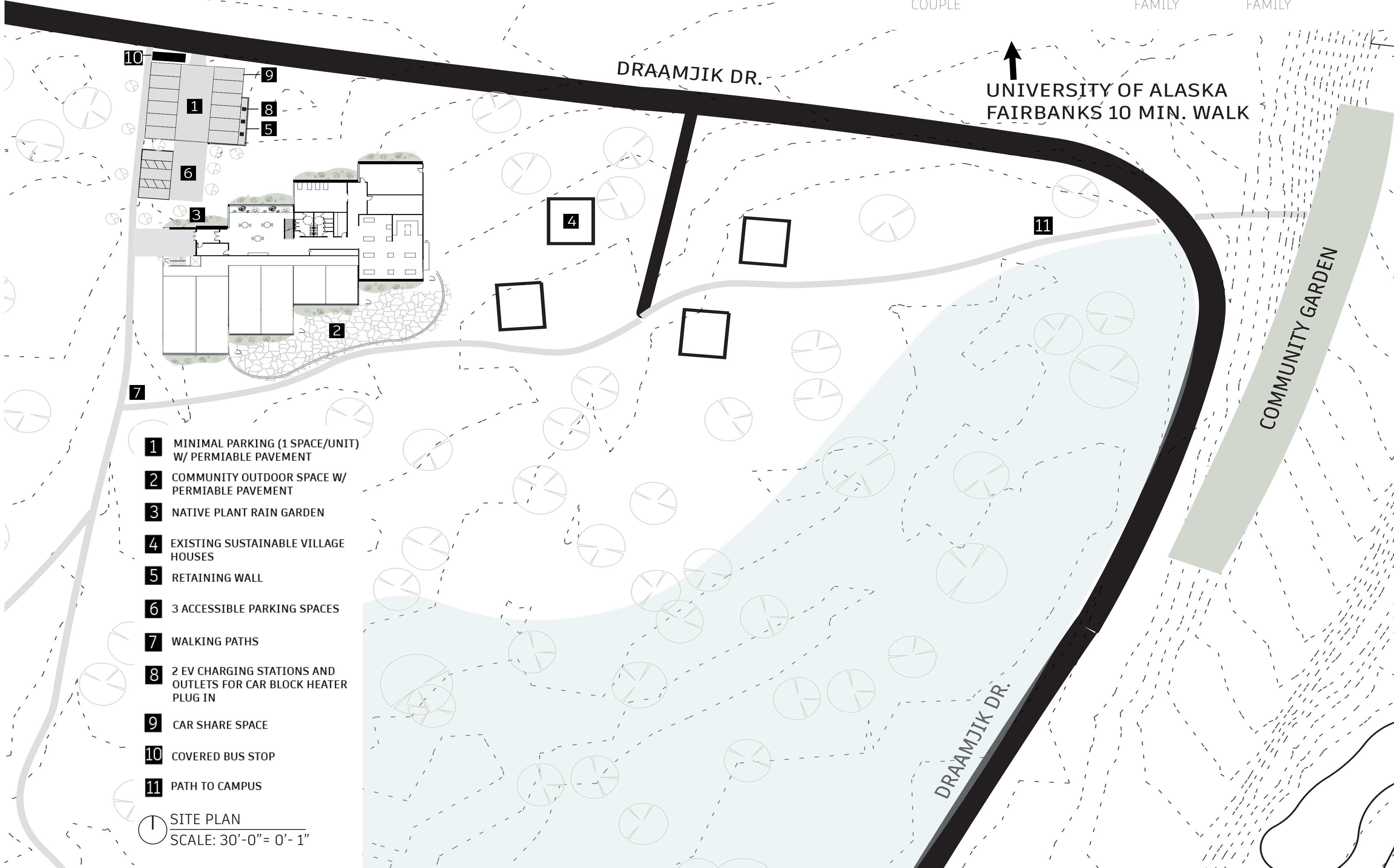
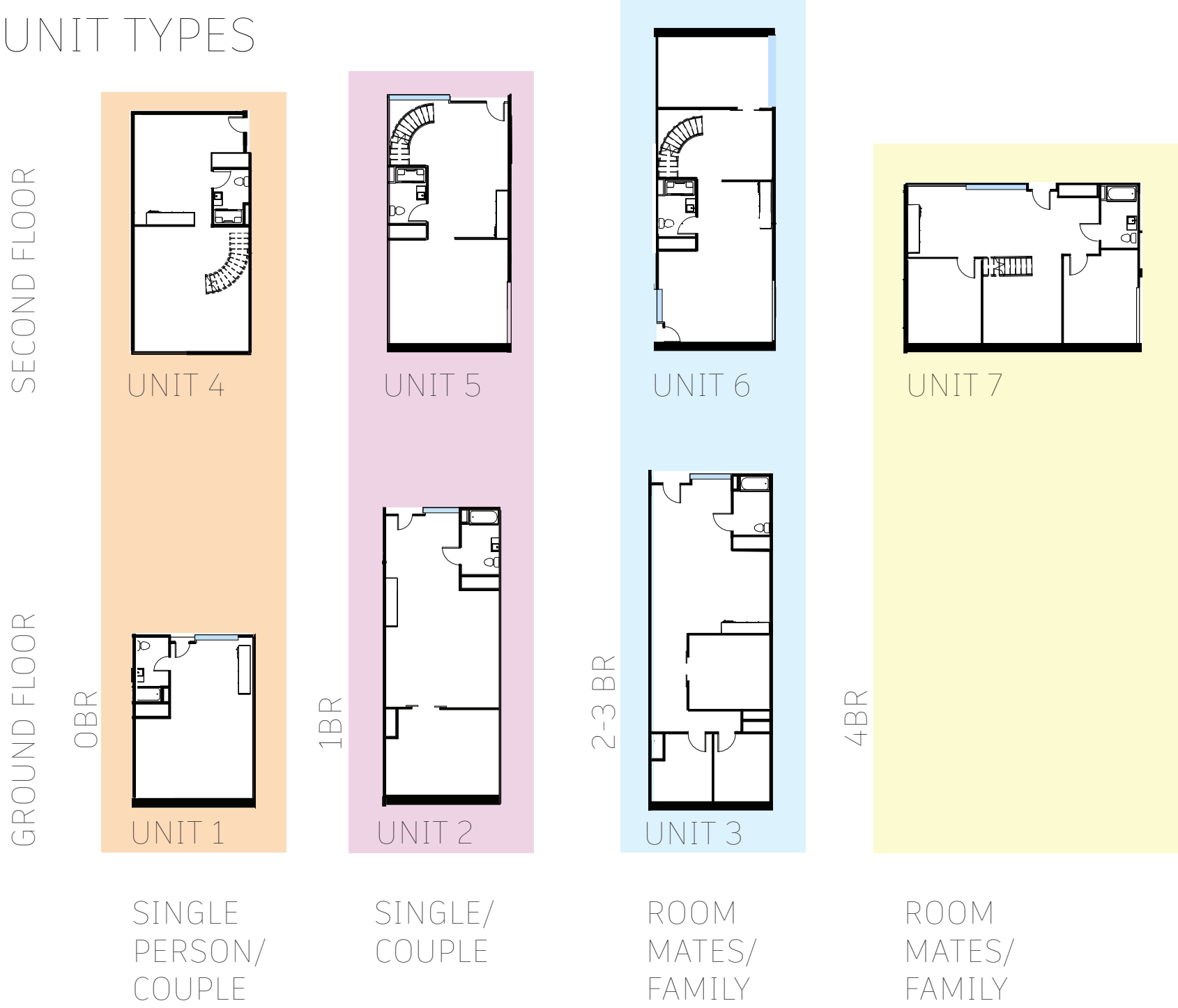


HAPPY WALLS



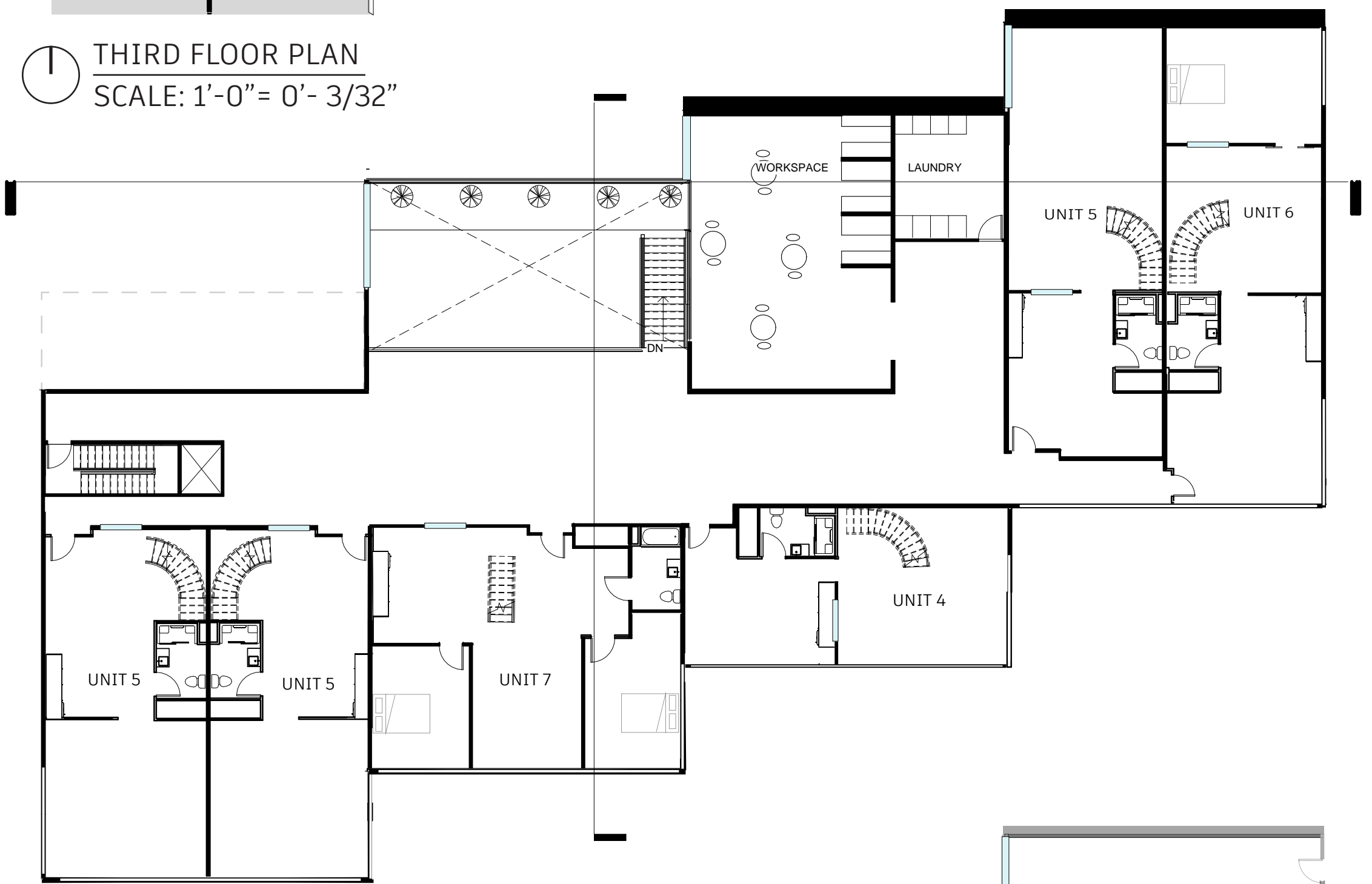
Happy Walls is a cooperative apartment complex for Graduate students attending the University of Fairbanks Alaska. The project prioritizes the psychological effects of light and light temperature. Inspired by happy lights, a common lamp used in Alaska during the dark winters, this building fills its arched community spaces with soft diffused light. To imitate the experience of sunshine filtering through windows, lights are placed between layers of ETFE. During the 21 hours of night in the winter months these walls glow and change color temperature as the sky would naturally do. The color temperature change benefits the residents' circadian rhythm and mood. As the lights are turned off and on the buildings facade takes on a variety of appearances. In the summer the happy walls bring in diffused natural sunlight.

UNIT TYPES

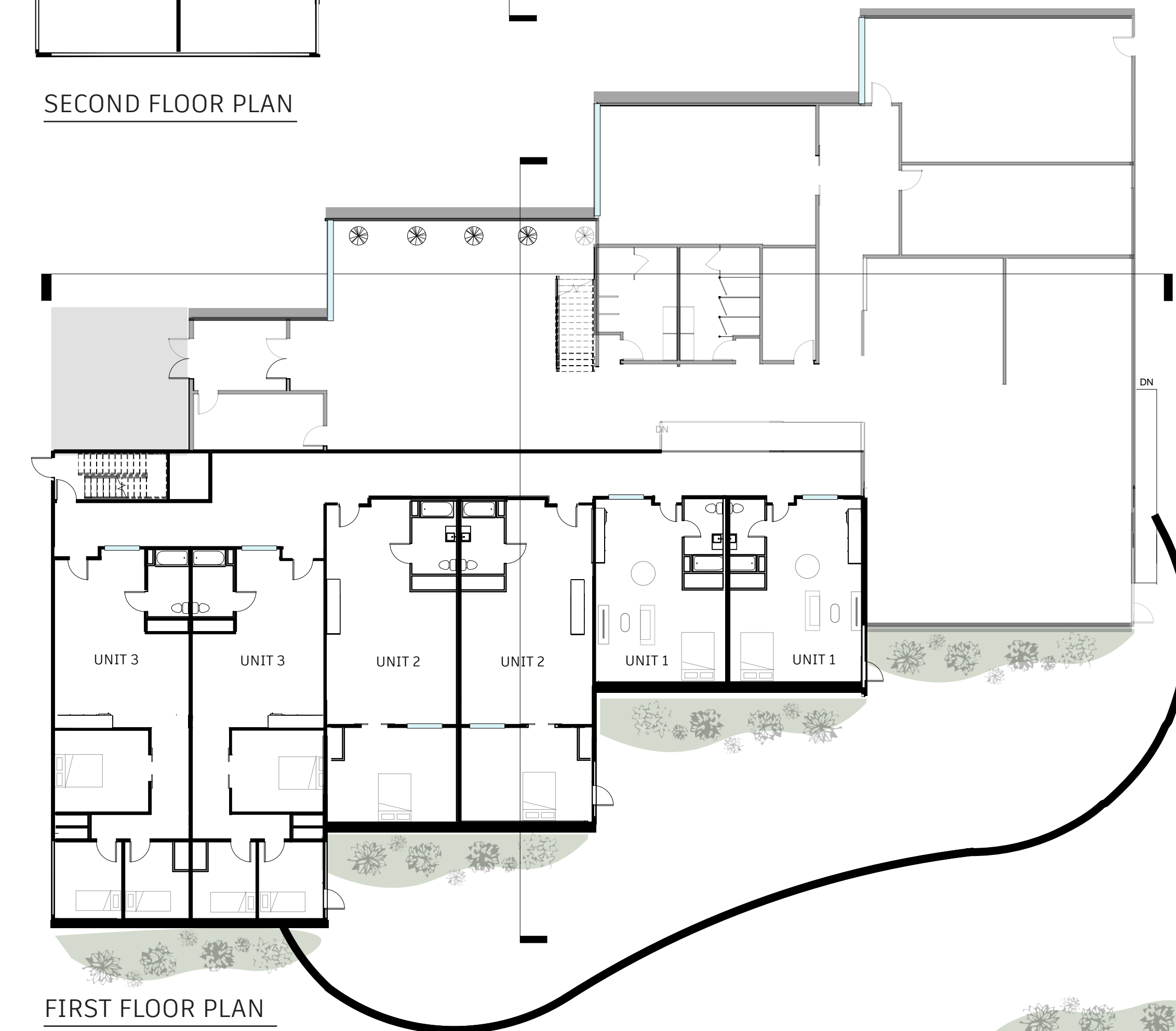




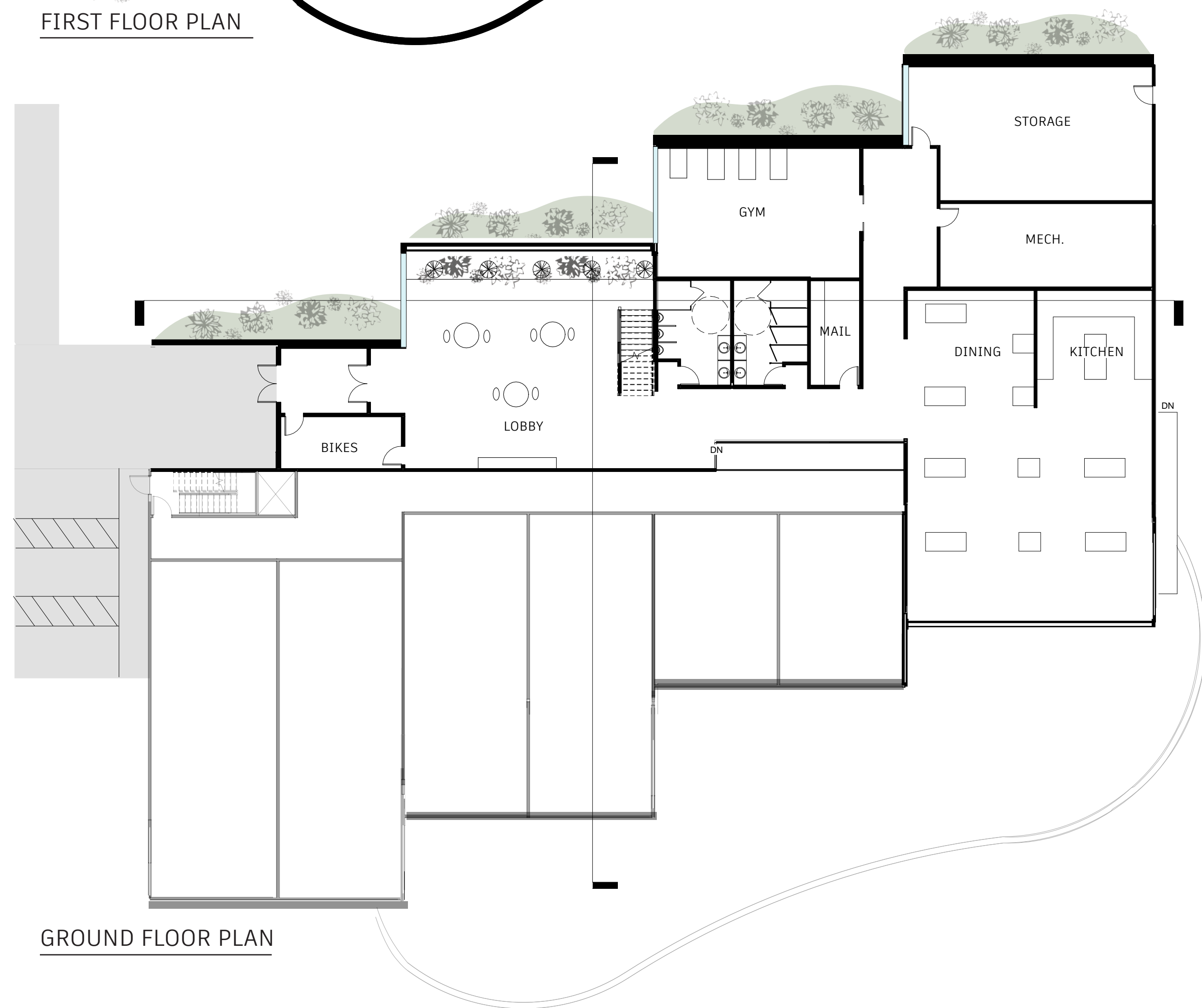
THIRD FLOOR PLAN
SCALE: 1'-0" = 0'- 3/32"



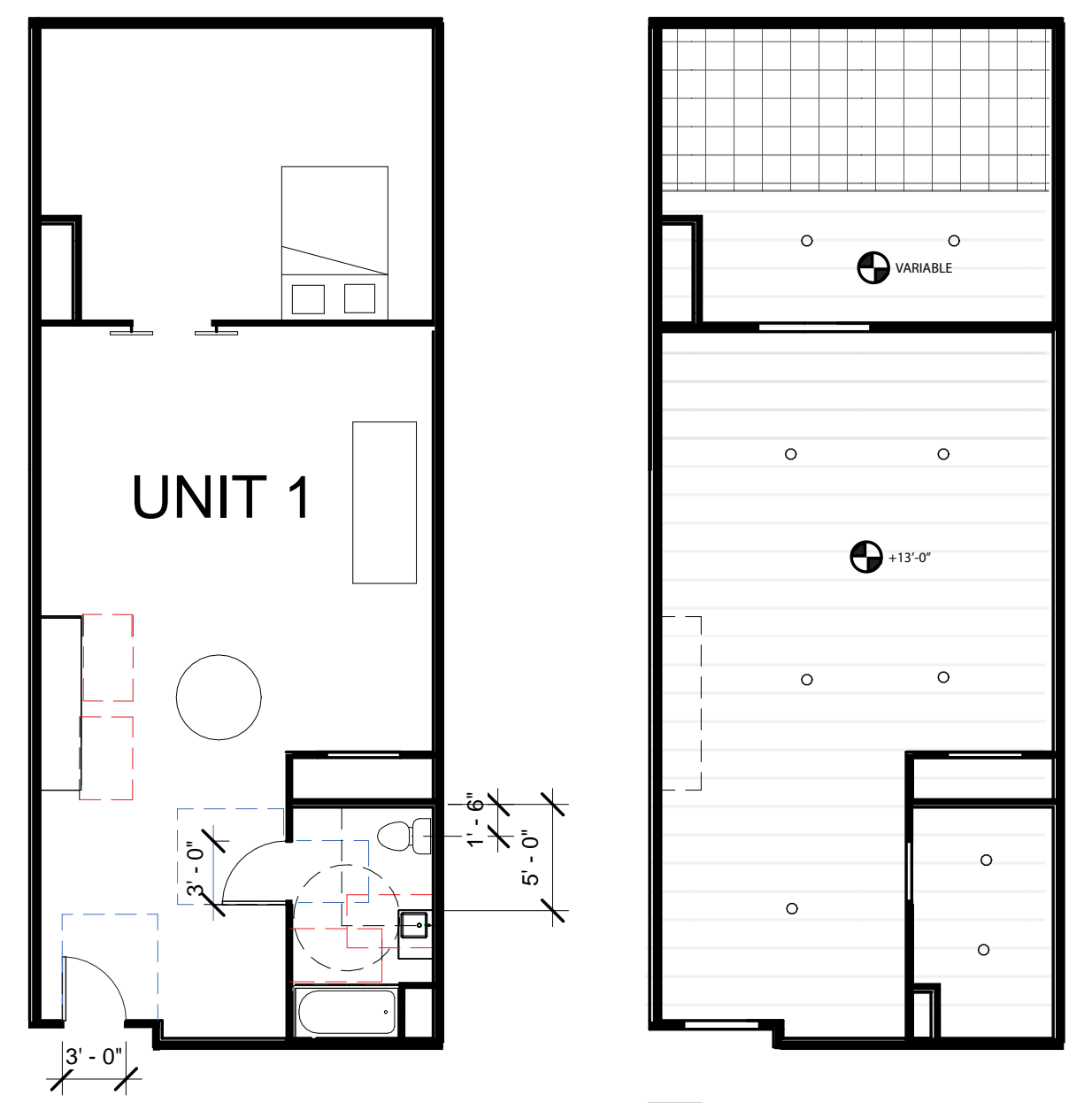
SECOND FLOOR PLAN



FIRST FLOOR PLAN



GROUND FLOOR PLAN

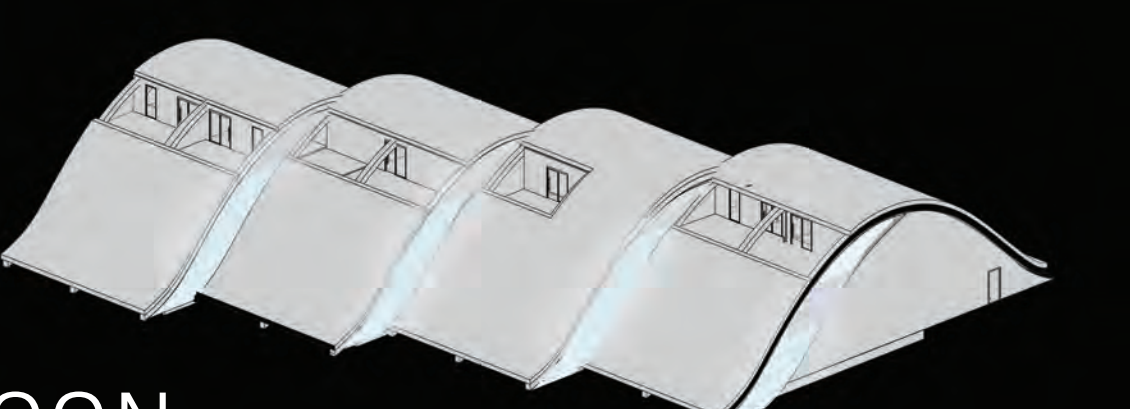
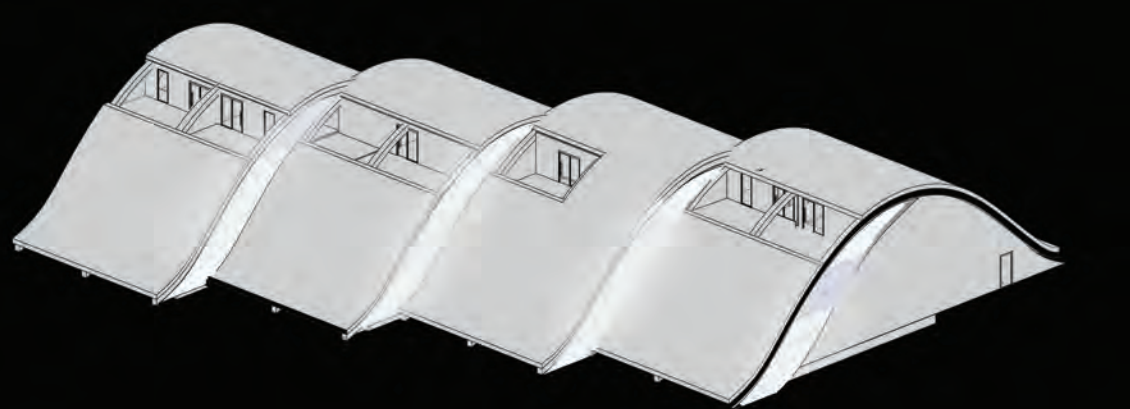
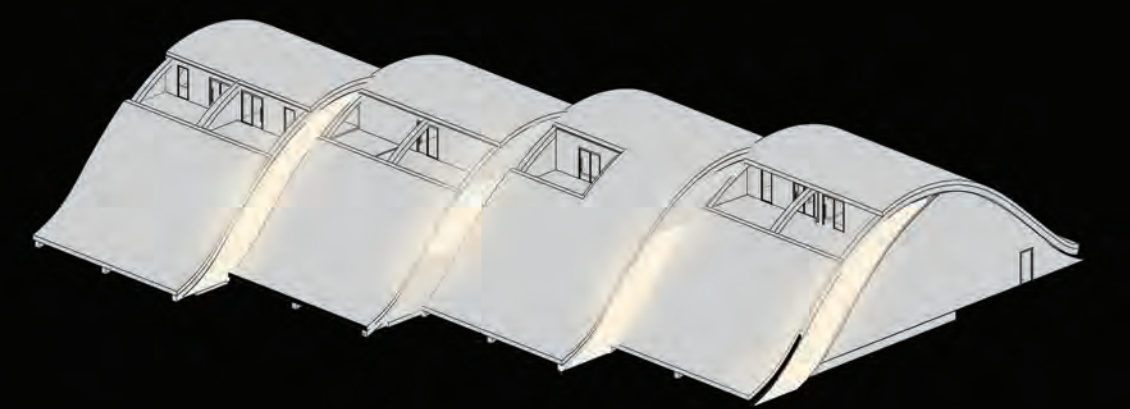


ACCESSIBLE UNIT PLAN
SCALE: 1'-0" = 0'- 1/8"

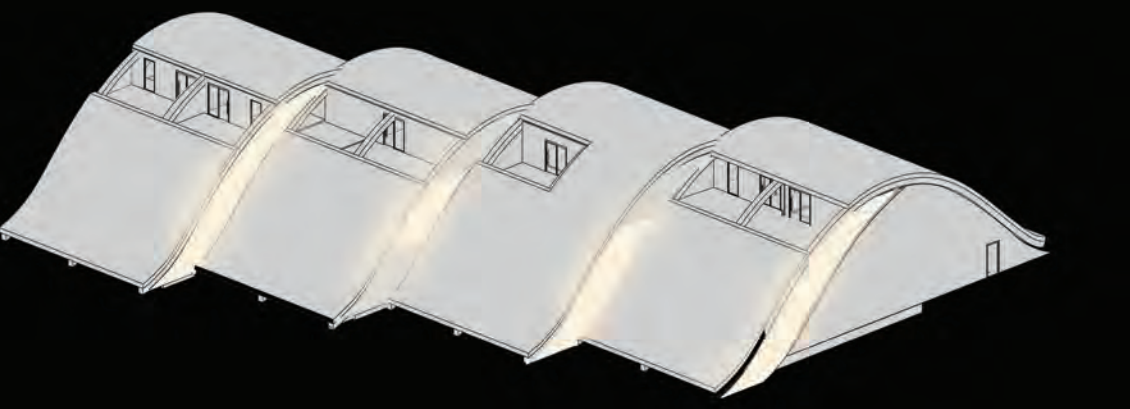
- CLT
- TRANSPARENT SOLAR PANELS
- 30"x 48" CLEAR
- DOOR CLEARANCE

WINTER HAPPY LIGHTS

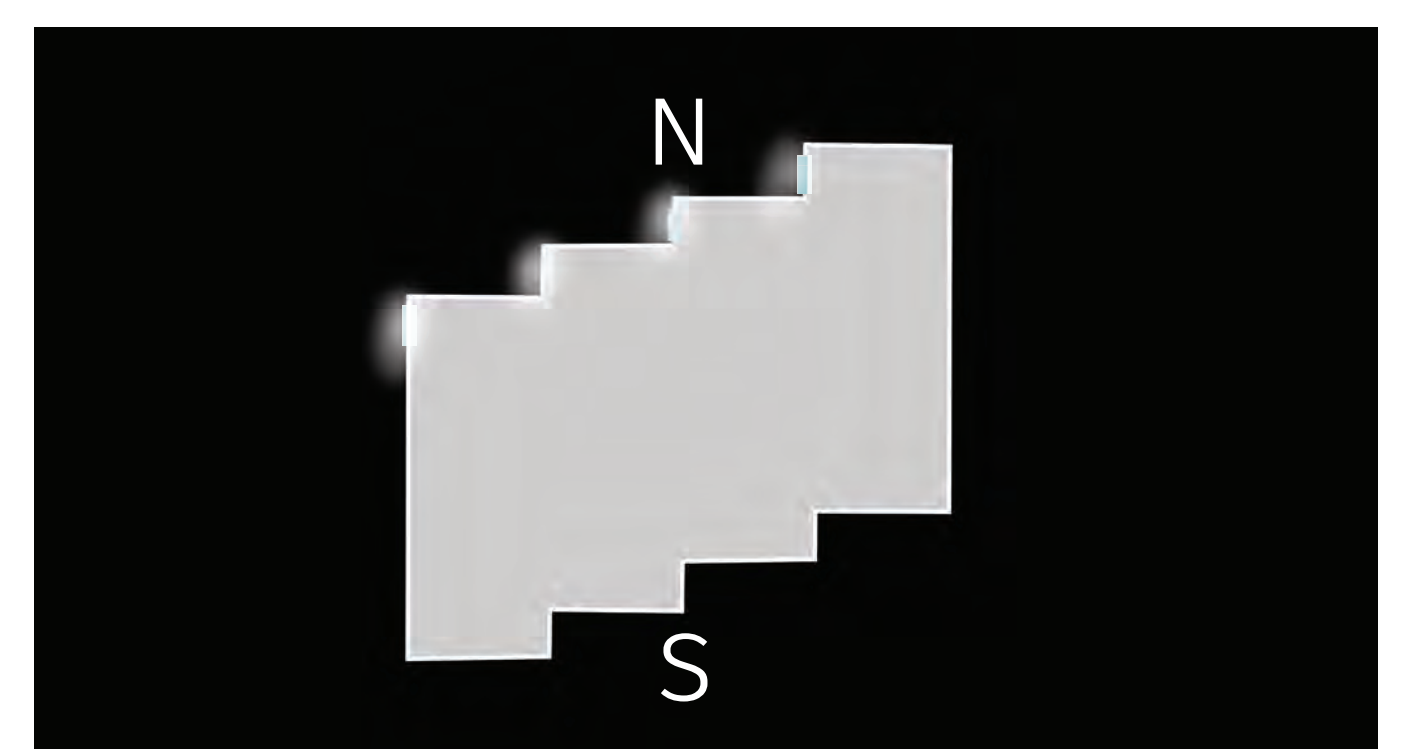
MORING 9AM



NOON

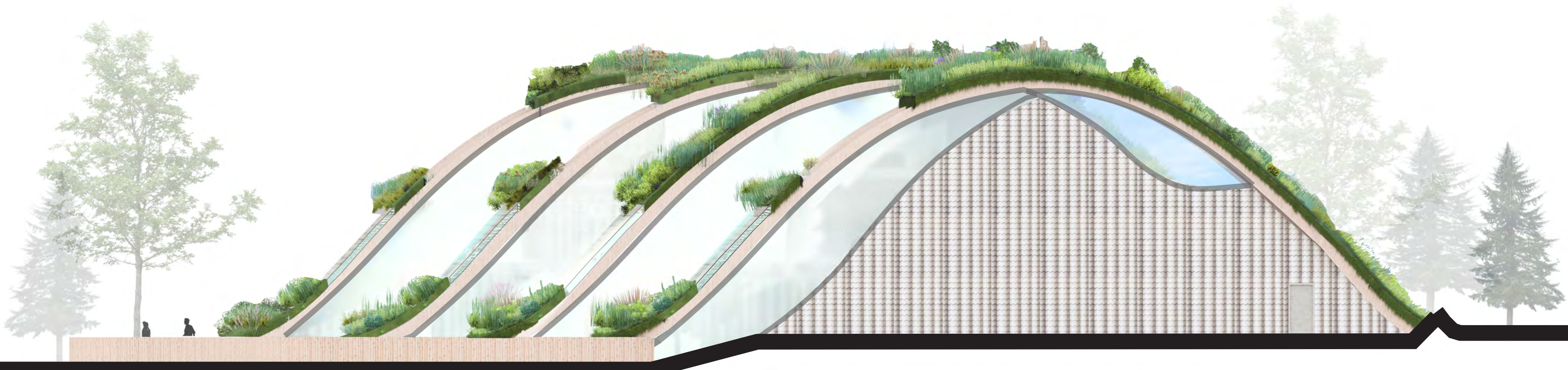


EVENING (9PM)

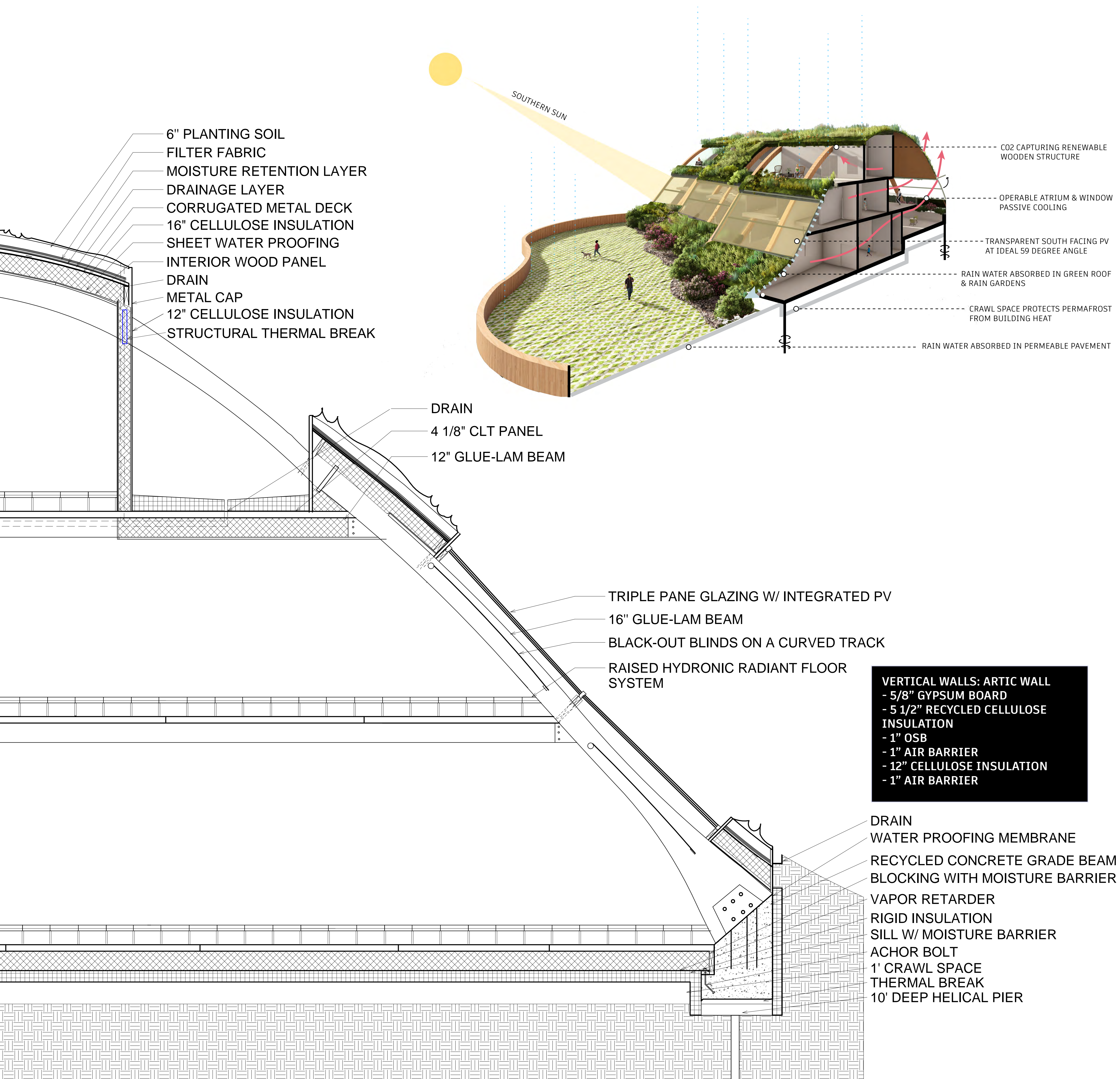




SOUTH ELEVATION
SCALE: 1'-0" = 0'- 3/32"



EAST ELEVATION
SCALE: 1'-0" = 0'- 3/32"





SECTION
SCALE: 1'-0"= 0'- 3/32"



SECTION
SCALE: 1'-0"= 0'- 3/32"



Location and Transportation

Sensitive Land Protection

The site is not on prime farmland, located in a flood plain, or a habitat of endangered species. There is a wetland nearby but the site is much more than 50 feet from it.

Surrounding Density and Diverse Uses

The building's main entry is within a half-mile radius of over eight use groups. The design includes paths connecting to existing walking paths and allowing residents to travel on foot easily.

Access to Quality Transit

A bus stop will be added to the site. The existing bus route currently stops at the University of Fairbanks Alaska, and could transport students from the cooperative to class and other locations in downtown Fairbanks. The planned bus stop is covered and placed less than ¼-miles from the apartment's entry.

Bicycle Facilities

An indoor bicycle storage room is included in the building design with space for one bike per unit (twelve bikes).

Reduced Parking Footprint

Dedicated parking is provided for a carshare vehicle. Local code does not require a minimum or maximum number of parking spaces. Parking is kept to a minimum by providing one space per unit (12 spaces) and three accessible spaces closer to the entry.

Electric Vehicles

Two parking spaces are provided on-site that include EV charging. The site has 15 parking spaces, 12 percent of the spaces are EV charging stations.

Sustainable Sites

Construction Activity

The site will be minimally disrupted during construction. Retaining walls will be used for erosion control near the parking lot and community outdoor space where the most difference in grade occurs.

Environmental Site Assessment

The site's unique topographic features such as grade changes have been documented and taken into account during the design of this project.

Site Assessment

A site assessment will be completed that includes hydrology, climate, vegetation, soils, human use, and human health effects.

Protect or Restore Habitat

The total site area is 434,500 sq. ft. and the building footprint, parking, and paved outdoor space is 21,250 sq. ft. Less than five percent of the site will be part of construction. The rest of the site will be preserved and protected from all development and construction activity. Over 25% of disturbed area will be restored. 10,000 sq. ft. of green roof composed of native species will be added to the building.

Open Space

The community outdoor space is over 4,000 sq. ft. with connecting walking paths into the forested area.

Stormwater Management

Rainwater is managed with natural strategies. A green roof of native plants will absorb rain that falls on the roof. Any rain not absorbed in the roof is directed toward rain gardens of native plants at the base of each roof. All paved spaces (parking lot, outdoor space, and walking paths) are made of permeable pavement.

Heat Island Reduction

The roof is entirely solar panels and green roof. All pavement is permeable pavement with light-colored pavers and vegetation growing through and is shaded by surrounding trees.

Water Efficiency

Outdoor Water Use Reduction

Existing native grasses will be kept intact for the surrounding landscape. An intensive green roof uses only native plants that do not require irrigation. The same is done for the rain gardens.

Indoor Water Use Reduction

All applicable appliances will be watersense labeled and Energy Star certified. Water Metering is included in the plumbing system design.

Outdoor Water Use Reduction

Native species will be used for landscaping, rain gardens, and green roofs. They will not require any irrigation.

Indoor Water Use Reduction

Indoor water consumption will be reduced by 40% when compared to baseline, through the use of WaterSense-labeled and Energy Star certified appliances.

Water Metering

Meters will be used for indoor plumbing fixtures, domestic hot water, boilers, and process water. Irrigation is not necessary and will not require metering.

Energy and Atmosphere

Enhanced commissioning

In this project the commissioning authority will complete the LEED required list of tasks that ensure building systems are being tested and used efficiently.

Optimize Energy Performance

A 50% decrease in energy according to the ASHRAE Advanced Energy guide was achieved through the use of an efficient insulating building envelope, LED Lighting, and sustainable and efficient HVAC. ERV has an energy efficiency of up to 96% and radiant floor heating heats more effectively than other systems. As hot air rises from the floor it more efficiently heats the air at human height as opposed to ducted systems that heat from above and allow heat to be trapped at ceiling height.

Advanced Energy Metering

In order to track energy use and production of the project energy metering will be utilized. This will help determine ways in which to conserve energy. Hourly reports will help determine when energy consumption is highest and begin the process of decreasing it.

Renewable Energy

3,200 square feet of solar panels are installed on the southern face. The roof slopes at a 59-degree angle which is the prime angle for maximum solar radiation in Fairbanks Alaska. Each year the PV will produce 33,716 kWh of energy. This saves \$5056 on energy costs.

Enhanced Refrigerant Management

Only refrigerants with an ODP of zero and a GWP of less than 50 will be used in the project. Exact refrigerants are to be determined by a consultant as this credit is out of the scope of this project.

Materials and Resources

Building Life-Cycle Impact Reduction

A life cycle assessment was run on the structural materials including glulam beams, CLT floor panels, and concrete grade beams made of recycled material. The large majority of the structure is made of engineered wood because of the CO₂-capturing capabilities of wood. The wood structure had a negative global warming potential compared to a concrete structure which had a 100% global warming potential. The wooden structure also had a near-zero ozone depletion potential.

Environmental Product Declarations

Throughout the design of this project, materials have been chosen with sustainability of life cycle as priority. Structural materials are all wood or made of primarily recycled material. Helical piers were chosen for their necessary strength over concrete foundations. The foundation must end below permafrost which is 10 feet below grade. Helical piers are much thinner than concrete foundations and have slightly lower global warming potential. For insulating materials, much consideration was taken because of the unusual amount needed in this climate. Cellulose insulation was chosen and used whenever possible because it can be made of 85% recycled material.

Sourcing of Raw Materials

Raw materials used in this project include wood. The engineered wood makes up the majority of the structure and finished wood makes up a large portion of interior finishes, it is all certified by the Forest Stewardship Council.

Material Ingredients

Throughout the design and material selection of this project material ingredient makeup was of high priority. When unnatural materials are completely necessary in the case of the insulation and concrete grade beams; they will be made of mostly recycled material. As mentioned earlier the cellulose insulation is made of 85% recycled material and the concrete grade beams will be composed of 100% recycled aggregate and 100% recycled cement.

Construction and Demolition Waste Management

The use of engineered wood means that structural pieces will be manufactured off-site and fit together with no on-site cutting and adjustment needed, this will significantly decrease waste. At least 50% of the total construction/demolition material will be diverted from landfills, by being recycled or reused on-site.

Indoor Environmental Quality

Enhanced Indoor Air Quality Strategies

The design included a permanent rug system at least 10 feet long in the primary direction of travel to prevent dirt and particles from entering the building at exterior entrances. Natural ventilation occurs through the automated glazing in the atrium and through operable windows in the units. Mechanical ventilation occurs through an energy recovery ventilation system carried throughout the building.

Low-Emitting Materials

Insulation, paints, ceilings, furniture, interior adhesives, wood flooring, and wood ceiling elements are formaldehyde-free and do not emit VOCs.

Construction Indoor Air Quality Management Plan

During the construction phase of the project systems for air quality management will be in place. Natural ventilation will be used for a large portion of construction as construction must occur in the warmer months of Fairbanks Alaska. If needed additional mechanical measures will be taken.

Indoor Air Quality

A building flush-out will occur before occupants arrive. The flush-out will involve supplying 14,000 cubic feet of outdoor air per square foot of gross floor area while maintaining an internal temperature of 60 degrees Fahrenheit.

Thermal Comfort

The criteria of ASHRAE 55–2017 will be met with the hydronic radiant floor heating, an ERV system, and natural ventilation. Each unit will have control of their radiant floor system and group thermal comfort controls will be provided in community spaces.

Interior Lighting

All light fixtures have an illuminance of less than 7,000 candelas per square meter and a CRI of 90. These lights are all LED for their energy efficiency including happy wall lights. Lighting is dimmable in walls, community spaces, and units. Happy walls can be turned off and on as desired. All selected interior finishes offer a surface reflectance of 80% for ceilings and 55% for walls.

Daylight Demonstrate

To reinforce residents' circadian rhythm, southern-facing transparent glazing lets light into the units during the day. During the night in summer months when it is still bright out, mechanically operated blackout blinds can be lowered on a track behind the curved PV to create the feeling of night without compromising the PVs access to sunlight on the exterior. All units are south-facing and each unit has a view out of this transparent PV. The east and West facades of the building include triple pane glazing that allows views from the units and community space to the forested area around the site. The average SDA value for regularly occupied spaces is 90% and each regularly occupied space achieves a SDA of at least 60%.

Quality Views

The design fenestration allows for 75% of all regularly occupied spaces to have views to nature with a VLT above 40%. The majority of views happen On the South and East facades. Views include the northern lights and the Alaskan forested surroundings.

Acoustic Performance Design

Cellulose acoustical panels will be used for acoustic control. These panels are a sustainable alternative to the traditional fiberglass and synthetic acoustical panels. They are made of 65-75% recycled content. Each public space (IE. gym, study room, dining

space, and community kitchen) will include cellulose acoustic panels on 30 to 40 percent of the surface area of each room. The units will include acoustic panels in the walls between them. The raised floor radiant heating system has a built-in layer of acoustic material that will prevent sound transmission between floors. These measures will ensure that STC ratings reach at least 50 as required by code and LEED acoustic performance table 1.

The cooperative apartment complex of The University of Alaska Fairbanks is an addition to the existing sustainable village. Fairbanks Alaska experiences extreme cold averaging -10 degrees Fahrenheit in January. In the summer, temperatures do not rise above 70 degrees Fahrenheit. In addition to the cold, the winter months are dark with only 3 hours of sunlight and 21 hours of darkness.

The complex includes twelve units and is meant for graduate students attending the University. The design includes seven unit types, each meant to serve a single, couple, roommate, or family living situation. The ground floor units all include one level with access to the community outdoor space. The units on the second floor all include a loft space above with a balcony.

The project prioritizes the psychological effects of light and light temperature. The concept is inspired by happy lights, a common lamp used in Alaska during the dark winters to improve mood and energy when deprived of sunlight. This building fills its arched community spaces with soft diffused light. To imitate the experience of sunshine filtering through windows, lights are placed between layers of ETFE. During the 21 hours of night in the winter months these walls glow and change color temperature as the sky would naturally do. This change in color temperature benefits the residents' circadian rhythm and mood. As these lights are turned off and on, the building's facade takes on a variety of appearances.

In the summer the happy walls bring in diffused natural sunlight. During this time when sunlight is abundant, Fairbanks experiences 17 hours of it in May. During these months transparent solar panels let light into the units. At night when light is unwanted automated blackout curtains on a track will cover the curved PV from the interior, leaving the PV open to solar radiation on the exterior. During this time the building's PV will create the most energy. Each year the 3,200 sq. ft. of panels will create 33,716 kWh of energy. This in turn saves the

building and its residents \$5,056. This means that it would take approximately 18 years for the solar panels to pay themselves off. This transparent PV is also angled upward which allows residents a great view of the northern lights past the tree line.

The curved form was designed to maximize southern solar radiation. Ideal panel angle is 59 degrees towards the south in Fairbanks. The form also allows prevailing winds to flow over it decreasing wind load and creating more thermal comfort on the ground. A green roof combined with its cascading shape allows it to blend into its natural surroundings. Rainwater is directed from the green roof of native plants to the rain gardens below. The parking lot and outdoor space both utilize permeable pavement to allow rainwater to be absorbed by the earth.

In the community of Fairbanks Alaska, outdoor time is important year-round. Southern facing balconies are cut out of the form on the second floor to allow time in the southern sun when it is available. The form is made up of four repeated slices that glide past each other to reveal triple pane glazing on the East to provide sunrise light and views for the units. On the Western side, this glide reveals the happy walls bringing color temperature-changing light into the community spaces. Happy lights are introduced to the units near each one's front door and can be turned off when wanted.

The structure of the building consists of curved Glulam beams that span the entire form and are spaced every 20 feet. Horizontal Glulam beams carry 20' x 10' CLT floors. The natural materials are sustainable and are left exposed to create a natural and warm feeling in units. ETFE is used for the happy walls for its higher insulating quality. Helical piers are used in place of a high CO₂ producing concrete foundation. The piers must be at least 10 feet deep to anchor below the permafrost.

When combined these design choices create a natural, warm, and welcoming home for residents through a sustainable approach. The building will mimic sunlight when it is scarce and control it when it is abundant to create a circadian rhythm-balancing home.



LEED v4.1 BD+C Project Checklist

Project Name: Happy Walls
Date: April 26, 2024

Y ? N

☒ ☐ ☐ Credit Integrative Process

1

8	0	24	Location and Transportation	16
0	0	16	Credit LEED for Neighborhood Development Location	16
1	0	0	Credit Sensitive Land Protection	1
0	0	2	Credit High Priority Site and Equitable Development	2
2	0	3	Credit Surrounding Density and Diverse Uses	5
2	0	3	Credit Access to Quality Transit	5
1	0	0	Credit Bicycle Facilities	1
1	0	0	Credit Reduced Parking Footprint	1
1	0	0	Credit Electric Vehicles	1

9	0	1	Sustainable Sites	10
Y			Prereq Construction Activity Pollution Prevention	Required
1	0	0	Credit Site Assessment	1
2	0	0	Credit Protect or Restore Habitat	2
1	0	0	Credit Open Space	1
3	0	0	Credit Rainwater Management	3
2	0	0	Credit Heat Island Reduction	2
0	0	1	Credit Light Pollution Reduction	1

7	0	4	Water Efficiency	11
Y			Prereq Outdoor Water Use Reduction	Required
Y			Prereq Indoor Water Use Reduction	Required
Y			Prereq Building-Level Water Metering	Required
2	0	0	Credit Outdoor Water Use Reduction	2
4	0	2	Credit Indoor Water Use Reduction	6
0	0	2	Credit Optimize Process Water Use	2
1	0	0	Credit Water Metering	1

24	9	2	Energy and Atmosphere	33
Y			Prereq Fundamental Commissioning and Verification	Required
Y			Prereq Minimum Energy Performance	Required
Y			Prereq Building-Level Energy Metering	Required
Y			Prereq Fundamental Refrigerant Management	Required
6	0	0	Credit Enhanced Commissioning	6
9	9	0	Credit Optimize Energy Performance	18
1	0	0	Credit Advanced Energy Metering	1
0	0	2	Credit Grid Harmonization	2
5	0	0	Credit Renewable Energy	5
3	0	0	Credit Enhanced Refrigerant Management	1

10	2	0	Materials and Resources	13
Y			Prereq Storage and Collection of Recyclables	Required
2	2	0	Credit Building Life-Cycle Impact Reduction	5
2	0	0	Credit Environmental Product Declarations	2
2	0	0	Credit Sourcing of Raw Materials	2
2	0	0	Credit Material Ingredients	2
2	0	0	Credit Construction and Demolition Waste Management	2

15	1	0	Indoor Environmental Quality	16
Y			Prereq Minimum Indoor Air Quality Performance	Required
Y			Prereq Environmental Tobacco Smoke Control	Required
2	0	0	Credit Enhanced Indoor Air Quality Strategies	2
3	0	0	Credit Low-Emitting Materials	3
1	0	0	Credit Construction Indoor Air Quality Management Plan	1
2	0	0	Credit Indoor Air Quality Assessment	2
1	0	0	Credit Thermal Comfort	1
1	1	0	Credit Interior Lighting	2
3	0	0	Credit Daylight	3
1	0	0	Credit Quality Views	1
1	0	0	Credit Acoustic Performance	1

0	0	0	Innovation	6
			Credit Innovation	5
1			Credit LEED Accredited Professional	1

4	0	0	Regional Priority	4
1	0	0	Credit Regional Priority: Specific Credit	1
1	0	0	Credit Regional Priority: Specific Credit	1
1	0	0	Credit Regional Priority: Specific Credit	1
1	0	0	Credit Regional Priority: Specific Credit	1

78	12	31	TOTALS	Possible Points: 110
ed: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum 80				