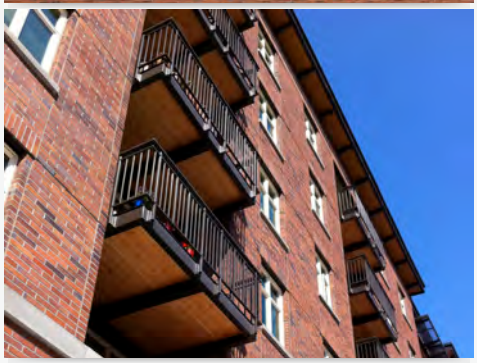


Pearl Family Housing (Ramona Apartments)

Pearl Family Housing provides 138 affordable rental units in Portland's Pearl District for families with children earning less than 60% of median family income. The building was designed to be at least 25% more efficient than a comparable building without energy efficiency measures. The building has an innovative ventilation and exhaust system. Fresh conditioned air is distributed directly into each apartment and the building has continuous exhaust vents in the kitchen and bathroom. A heat recovery system in the attic uses the heat from the exhaust to preheat the outdoor air in the winter. In conjunction with air source heat pumps, this system not only saves energy, but also provides higher indoor air quality for tenants. The complex also features "dashboard" devices in 20% of the apartments to provide real-time feedback to residents on the amount of electricity they're using. A 31,000 square foot ecoroof and a stormwater filter for the courtyard area treat 100% of the stormwater onsite.

Project Highlights

- **Energy dashboards for renters**
- **Ecoroof**
- **Massing model energy study**
- **Stormwater swale**
- **Reused building materials**

Portfolio Contents

Final Report

Project Website (External Link)

City of Portland Green Investment Fund

Grantee Final Report

PROJECT INFORMATION

Name of Primary Contact:	Ed McNamara				
Company or Organization:	Nurture 247 Limited Partnership				
Address:	P.O. Box 28356				
City, State & Zip:	Portland, OR 97228-8356				
Phone:	(503) 688-5376	Fax:	(503) 287-3272	E-mail:	ed@turtleislanddev.com

PROJECT DETAILS

Project Name:	The Ramona Apartments
Project Owner:	Nurture 247 Limited Partnership
Project Address:	1550 NW 14th Avenue
City, State, ZIP:	Portland, OR 97209
Date Project Started:	12/1/09 (start of construction)
Date of Completion:	March 11, 2011
Building Certifications:	LEED Gold (expected)

Design and Construction Team

Architect or Designer:	Ankrom Moisan Associated Architects
General Contractor:	Walsh Construction Company
Landscape Architect:	Viridian Environmental Design
Structural Engineer:	Miyamoto International
Civil Engineer:	Harper Houf Peterson Righellis
Mechanical Engineer:	PAE Consulting Engineers
Electrical Engineer:	Merit Electric
Interior Designer:	Ankrom Moisan Associated Architects
Green Building Consultant:	Green Building Services
Energy Modeler:	PAE Consulting Engineers
LEED Consultant:	Green Building Services
Additional:Commissiong	Interface Engineering

Building Details

If building has mixed use, please include the sq. ft of each type of use

Gross Floor Area: 230, 762 Gross SF

- 174,162 SF Residential
- 14,444 SF Community Facilities (PPS and Isobel's Clubhouse)
- 42,156 SF Parking garage

Building Type

☐ Single-family Residential
☒ Multi-family Residential
☐ Commercial
☐ Industrial
☐ Institutional
☒ Mixed-Use
☐ Other (describe):

Site Conditions (check all that apply)

☐ Previously Undeveloped Land
☒ Previously Developed Land
☒ Brownfield Site *(excavated soil had minor some contamination)*
☒ Preexisting Structure(s)

Project Type

☐ Renovation
☒ New Construction
☐ Addition

Project Costs

Land Acquisition:	$6,800,000.00
Demolition	$122,753.00
On-site Improvements:	$601,520.00
Off-site improvements	$768,295.00
Design Fees:	$1,891,985.00
Permits, SDCs:	$380,251.00
System Development Charges:	
Construction and Tenant Improvements:	$28,960,455.00
Green Technologies:	
Other Costs - financing, interest, legal, etc.:	$5,995,284.00
Total:	$45,520,543.00

Project Measure Matrix

In the following Matrix, as requested, please provide detailed information about all green products and materials identified in the Grant Agreement, Green Building Practices and Features.

Green Building Project Measure Matrix

Product/ brand or Measure by Category	Model #	Vendor	Cost				Efficiency/ Equipment Ratings or Capacity	Certifications	Incentives, Credits, rebates, grants, etc…
			Design	Material	Equipment	Labor			
Energy									
Energy Dashboards	TED 5000	Energy, Inc.		$10,272					
Massing Models	n/a	AMAA							
Water Efficiency									
Stormwater Management									
Ecoroof	n/a		$10,000	$239,173		$84,831			Partial funding from BES Ecoroof Program Grant
Courtyard	n/a	Costs included in multiple divisions. Breakout not available. Costs were partially offset by savings from eliminating mechanical filtration systems.							
BES flow meters		Flumes provided by BES, installed by contractor. Flow meters provided and installed by BES							
Materials and Resources									
Construction and Demolition Waste Recycling									

PROJECT HIGHLIGHTS

Financial Savings & Benefits

Can any soft or hard cost savings be identified from installation of green measures? Please provide actual cost savings.	The installation of the "green measures" funded by the GIF grant did not result in any hard or soft cost savings. The study we did of "massing models" helped us identify the most energy-efficient layouts and the most cost-efficient layouts. In that respect, that process allowed to build a better project at a lower cost than we might have done otherwise.
Can any operational cost savings from green measures be identified? Please provide actual or projected operational cost savings.	Stormwater: By treating 100% of the building's stormwater onsite we qualify for the City's full stormwater discount of 35% of the stormwater charges. For our site – at the current rate of $9.66/1,000 SF - our annual savings will be $1,623. Ecoroof – We expect that the ecoroof will have two possible financial benefits • lower maintenance costs and a longer life for the roof membrane, but we can't be sure of that or quantify any savings • increased efficiency for the PV panels by keeping the ambient temperature lower, but we also can't be sure of this or quantify any financial impact TEDs (energy "dashboards") - The building has not been open long enough for us to measure whether the presence of the TEDs leads to reduced energy use by the households that have one installed in their apartment. We will monitor this over the course of the next couple years.

Environmental Benefits

Please be as specific as possible. Compare against code or a similar conventional building as relevant.

Modeled Energy Savings: *(Annual kWh or therms per sq foot)*	The energy model shows total gas and electric use of 5,392 MBtuyr. This is a savings of 35.5% from a baseline design using ASHRAE codes that shows total energy use of 8,355 MBtu/yr. This results in an EUI of 23.04 kBtu/SF/yr. According to Architecture 2030, the national average for multifamily buildings over 5 units is 49.5 kBtu/SF/yr (based on 2003 CBECS).
Estimated Annual Water Savings: *(Annual savings in gallons per person)*	Our LEED consultants show us having more than 30% water savings. The city of Portland estimates – based on our fixtures and our submeters – that the water use in the apartments at the Ramona will be 29.5 gallons per person per day. The average use in the U.S. – according to most sources – is 80-100 gallons per person per day. The Portland Water Bureau says the average use in Portland is 61 gallons per person per day. I don't know if there is reliable data for water use per person per day in multifamily buildings.
Construction and Demolition Waste Recycling: *(% recycled by weight or volume of total waste)*	79% of construction waste – measured by weight - was recycled. The concrete from the warehouse that was on the site was crushed and reused as structural fill, The wood beams were salvaged. Some were milled and used in the new building. The remaining beams were sold.
Estimated Annual Reduced Stormwater Runoff: *(% total permeable surface area of total site area)*	The site is 100% impermeable, but the ecoroof and courtyard stormwater facilities treat all of the site's stormwater runoff. BES can provide additional estimates of how much of that stormwater will be used by the plants, how much will evaporate, and how much will eventually get to the stormwater sewer system. In addition, we constructed a stormwater swale on NW Quimby that the city estimates will treat about ½ of the stormwater from that block (or about 4,000 to 5,000 SF of street and up to 2,000 SF of sidewalk).
Enhanced Habitat: *(% area of restored or new habitat of total site area)*	The previous building covered 100% of the site and the new building does the same. To some degree, the Ramona's ecoroof will enhance the habitat for local wildlife.
Other:	Indoor air quality – We designed an HVAC system that is energy-efficient and that we believe will provide much better than average indoor air quality.

	• All baths have an exhaust grill connected to a continuous exhaust fan that removes 30 CFM from the bathroom. • Exhaust air from continuous ventilation bath fans goes to a heat recovery unit to pre-heat incoming air. • Ducts were extended from the ventilation shaft into each kitchen to help remove moisture – and odors –from cooking. • Ventilation shafts were lined with sheet metal to prevent leakage and reduce the amount of energy needed to move air and the energy needed to condition make-up air. • Make-up air is supplied by 100% outside air and is delivered directly into each apartment by ductwork (rather than relying on pressurized hallways and undercut entry doors as is more common).

Community Benefits

Can any specific community benefits be identified? Examples include educational opportunities, public access or community benefit programs.	The Ramona will provide quite a bit of education and data about how buildings of this type operate. Already, the design team and the contractor are presenting our experience in seminars and are showing the building to new clients to demonstrate what can be achieved on our budget. We did a lot of analysis during design that we can share with others. We are doing as much as we can to collect data about the building and will work to disseminate that data to others in the design and development filed so they can make more informed choices. Some of this includes: • Our analysis of massing models • Our analysis of 12 different envelope models (each modeled with 3 different types of windows) to study cost-effective envelope design. Our contractor and envelope consultant already expanded this into a larger paper that they share and present. • Whole building pressurization testing. We made the building available for two days to a team funded by ASHRAE to assess the envelope air-tightness. Those results will be shared widely in the industry when their study is complete. • Total building energy use. We will monitor the actual building energy use compared to our models. • Apartment energy use. We will be reading meters every month for the next several years to track apartment energy use. In particular, we will track the differences, if any, that result from having an energy "dashboard" device in the apartment. • Water use. We will track water use per person per day and share the results. We have 1.28 GPF toilets in most apartments, but have installed 0.8/1.6 dual flush toilets on one floor so we can compare the difference those make in water use.

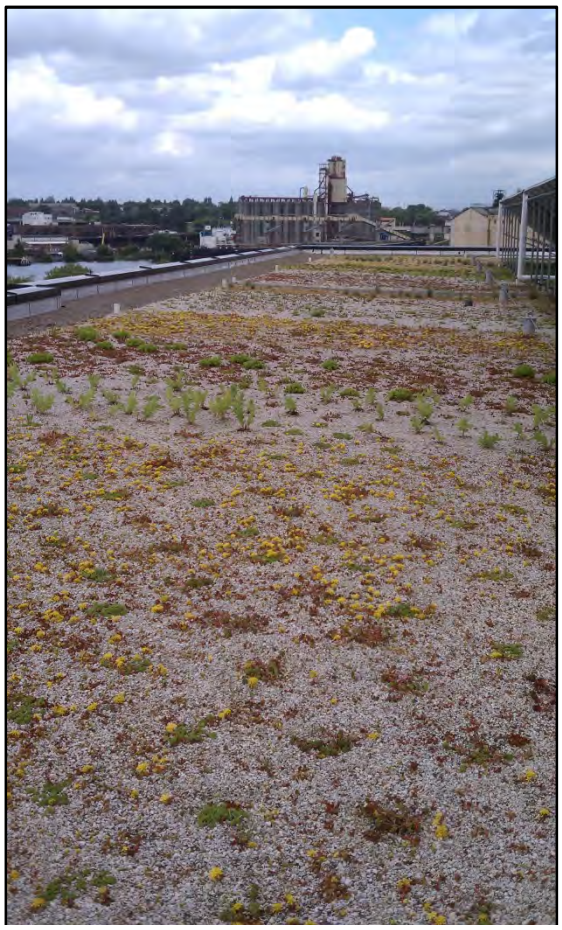
LESSONS LEARNED

Describe key outcomes from this project. How has the project changed from its original scope and why? Would you recommend the green technology or practice to other projects? Were there any policy, zoning or building code related issues that affected the project?	Key Outcomes 1) Energy Efficiency – We believe we have an extremely energy-efficiency that is built for a lower cost than many similar new buildings. 2) Indoor air quality – We believe we will provide above-average indoor air-quality. 3) Water efficiency – We believe the tenants will use much less water than many other Portlanders. Changes from Original Scope We made a number of large and small improvements from the original scope. We did not eliminate anything that was originally proposed. 1) We had a large contingency and did not need much of it for the excavation and foundation work so we were able to spend it on improvements, many of which we had already identified as priorities and had already bid as alternates. One large change added this way was the inclusion of a 30 kWh PV system on the roof. 2) We added a number of small energy efficiency measures identified as the result of more scrutiny from the design team and a review from the commissioning agent. These included such measures as different ballasts and lamping in the garage, additional insulation on hot water piping, additional occupancy sensors, and others. 3) We also made some improvements as a result of diagnostic work. After the building pressurization test, we added more sealant in a few attic locations, added a vestibule at the elevator lobby in the garage, and added more thresholds at doors which indirectly connect to the exterior. Recommendations about Green Technology My recommendation is to start with careful design of the building envelope. By designing that carefully, we are able to reduce the need for mechanical equipment for heating and cooling. Some of our approaches to that included: • Massing Study: We looked at 8 different ways to configure the building. We analyzed each for the ratio of skin to volume, the ratio of net rentable SF to gross SF, for geographic orientation, and for esthetics. • Envelope Study – We analyzed 12 different options for insulation, air barriers, and vapor barriers. We looked at all batt insulation, all rigid exterior insulation, and everything in between. • Window Study - After studying insulation options, we looked at each model with 3 different window types plugged into our formulas. Based on the R-values for the total wall assembly, we decided it made most sense to focus on good quality windows. In addition, we paid careful attention to the size of the windows. • Air barrier analysis – We conducted blower door tests on 36 apartments and also had a whole building pressurization test done. During the whole building testing, we also photographed the building with a thermal imaging camera.

IMAGES AND GRAPHICS

Please attach drawings and photos that describe the project and the green technology or practice.

Stormwater swale on NW Quimby St.



Early growth on Ramona ecoroof

Ecoroof with soil, PV panels and solar hot water panels

Courtyard with stormwater facilities

Appendix A: The Energy Detective (TED)

TEDs were installed in every apartment on the fourth floor to measure the amount of energy being used by all the systems (heating and cooling) and appliances (oven, fridge, etc.) in real time. A wireless display allows residents to view their current and cumulative (monthly) energy use in terms of both kilowatts and utility bill costs.

TEDs were installed on the fourth floor only so the apartments could be compared to the apartments above and below them, which have the same construction conditions (second and sixth floors are not perfectly comparable due to the effects of the podium concrete and roof).

The TED's wireless display contains the following screens to show the household's energy use:

- Real Time Use
- Recent Usage
- Month-to-Date
- Monthly Projection
- Voltage

Appendix B: Massing Studies

At the beginning of the design process, we first looked at 8 different possible shapes for the building. Those studies are attached on the following pages.

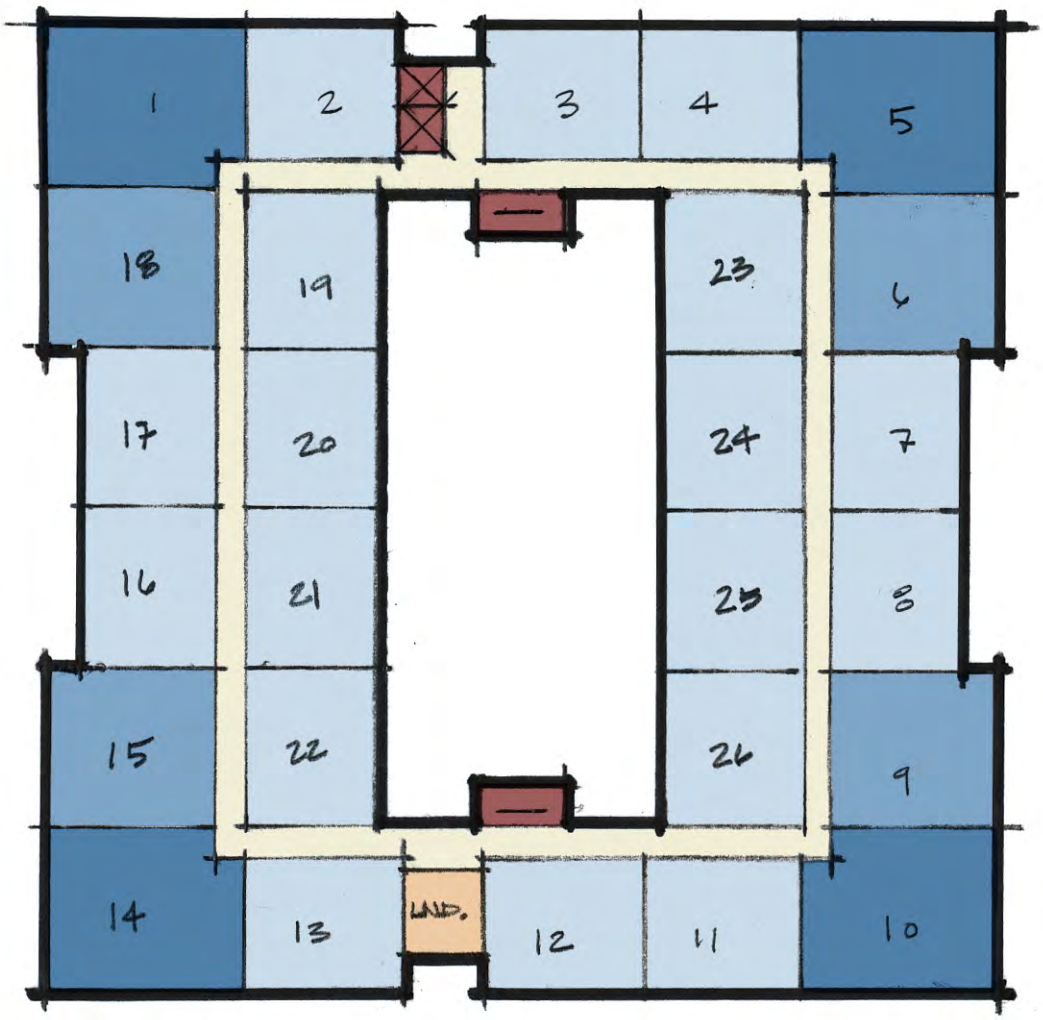
We assessed each shape for several factors. Since all of these were very informal sketches, the results are meant to be a way to compare each option rather than to be a precise calculation. Here is what we measured:

- Floor-to-Area Ratio (FAR) –
    - This is a measure of how much buildable area we can put on the site.
    - By building more area on the site, we can lower the land as a percentage of the development cost and lower the total development costs per SF.
    - There was some variation. The most dense plan provided about 14% more building area than the least dense.
- Efficiency –
    - We look at the percentage of the building's area that can be rented out. We want to build amenities that make the building livable and attractive, but we don't want to build space that doesn't generate income and also requires expenses to heat, light, cool, clean, etc.
    - The quick calculation here doesn't include many of the non-rentable areas - mechanical rooms, laundry, leasing offices, etc – but just measures the amount of hallway on each floor as a percentage of the total footprint of the floor.
    - Most of these options were in a very tight range. Except for one plan, there was only 1.7% variance between the high and the low.
- Ratio of floor SF to envelope SF –
    - The outside walls are expensive to build so we want to keep a higher ration of volume to "skin" as a way of building cost effectively.
    - The outside walls are where we lose or gain heat, the biggest user of energy in the building. Keeping a high ratio of volume to skin is also an energy-efficiency strategy.
- Solar orientation
    - We looked at the different solar orientation and the effects on heat and light
- Noise
    - Because of the nearby elevated freeway and the larger amount of traffic on NW 14th, we looked at the effect of the massing and orientation on noise.
- Appropriateness for site and functions
- Esthetics

RAMONA APARTMENTS
EARLY MASSING MODELS
SUMMARY STATISTICS

Option	Shape	GSF/Fl.	Total Bldg. SF	FAR (40,000 SF site)	Hall SF/Fl.	Efficiency	Envelope Area	Fl. Area/Skin Ratio
1	O	29,500	177,000	4.43	2,600	91.2%	13,160	2.24
2	C	31,000	186,000	4.65	1,950	93.7%	11,860	2.61
3	U	30,750	184,500	4.61	2,020	93.4%	11,800	2.61
4	Double Bar	27,750	166,500	4.16	1,440	94.8%	12,800	2.17
5	H	31,500	189,000	4.73	2,050	93.5%	11,900	2.65
6	Crab	27,800	166,800	4.17	1,950	93.0%	12,900	2.16
7	Double E	29,150	174,900	4.37	1,470	95.0%	13,500	2.16
8	L + Point	29,500	177,000	4.43	1,540	94.8%	12,300	2.40

RAMONA APARTMENTS - EARLY MASSING MODELS
OPTION 1



13th and Raleigh Family Housing		**'O' Plan**
Units/Floor		26 Units
SF/Floor		29,500 GSF
Efficiency	Elevators	2
	Stairs	2
	Corridor Length	520'
Floor Area : Skin Area Ratio		29,500 SF/(1,316 LF x 10'tall) = 2.24
Quality of Units		Good, Fewer types, No inside corners
Quality of Outdoor Space		One larger space, No differentiation for school and daycare use – possible covered area at Ground Floor breezeway
Appropriate to Site		Neutral: Treats all frontages equally, Good buffer from freeway noise
Precedents		Pearl Court, Lovejoy Station, 10th and Hoyt

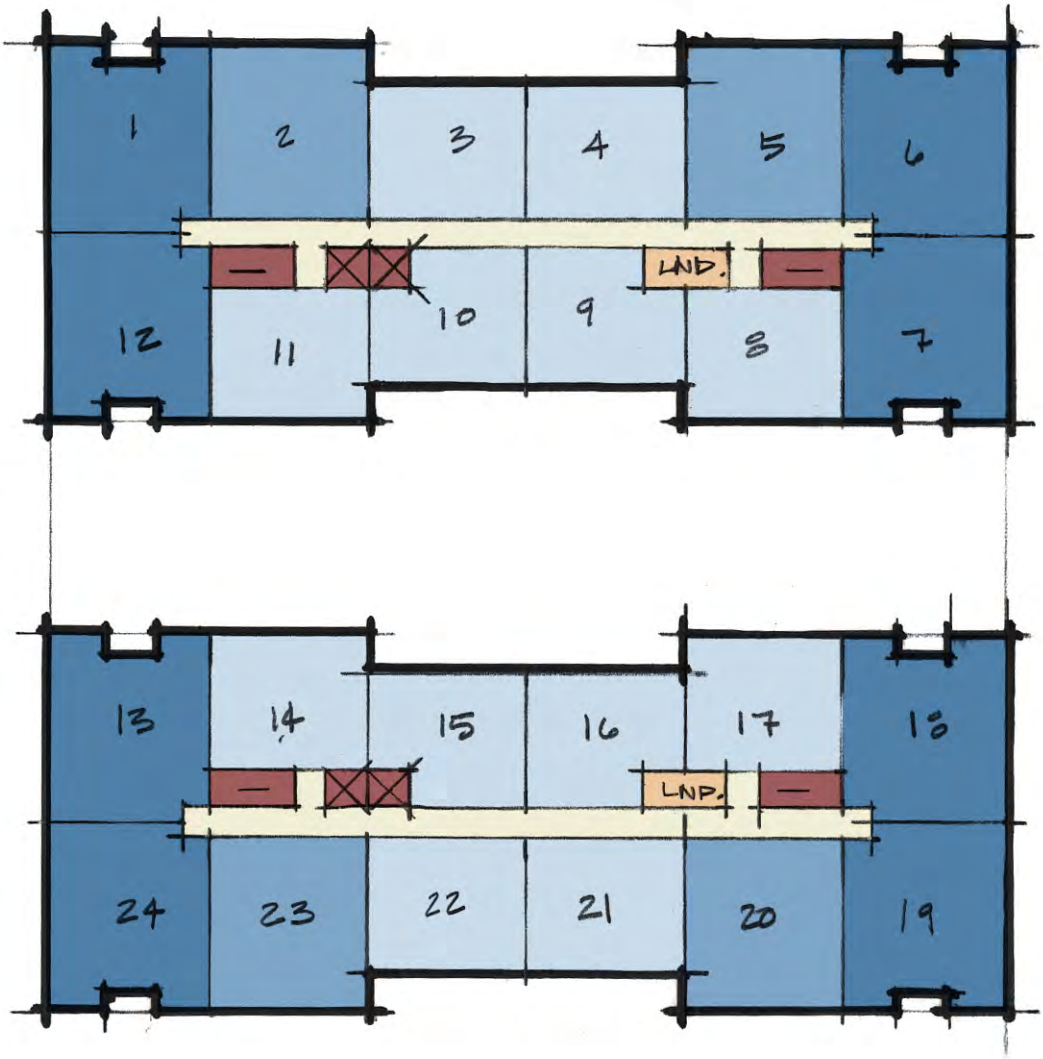
RAMONA APARTMENTS - EARLY MASSING MODELS
OPTION 2

13th and Raleigh Family Housing		**'C' Plan**
Units/Floor		24 Units
SF/Floor		31,000 GSF
Efficiency	Elevators	2
	Stairs	2 or 3
	Corridor Length	390'
Floor Area : Skin Area Ratio		31,000 SF/(1,186 LF x 10'tall) =2.6
Quality of Units		Fair, 7 types, 3 inside corners
Quality of Outdoor Space		2 Different outdoor spaces, plus transitional space, Possibility to differentiate for school and daycare use from common area. Not ideal for sun
Appropriate to Site		Better: 2- distinct frontages, Emphasis on 13th and Quimby, Good buffer from freeway noise
Precedents		Kearney Place

RAMONA APARTMENTS - EARLY MASSING MODELS
OPTION 3

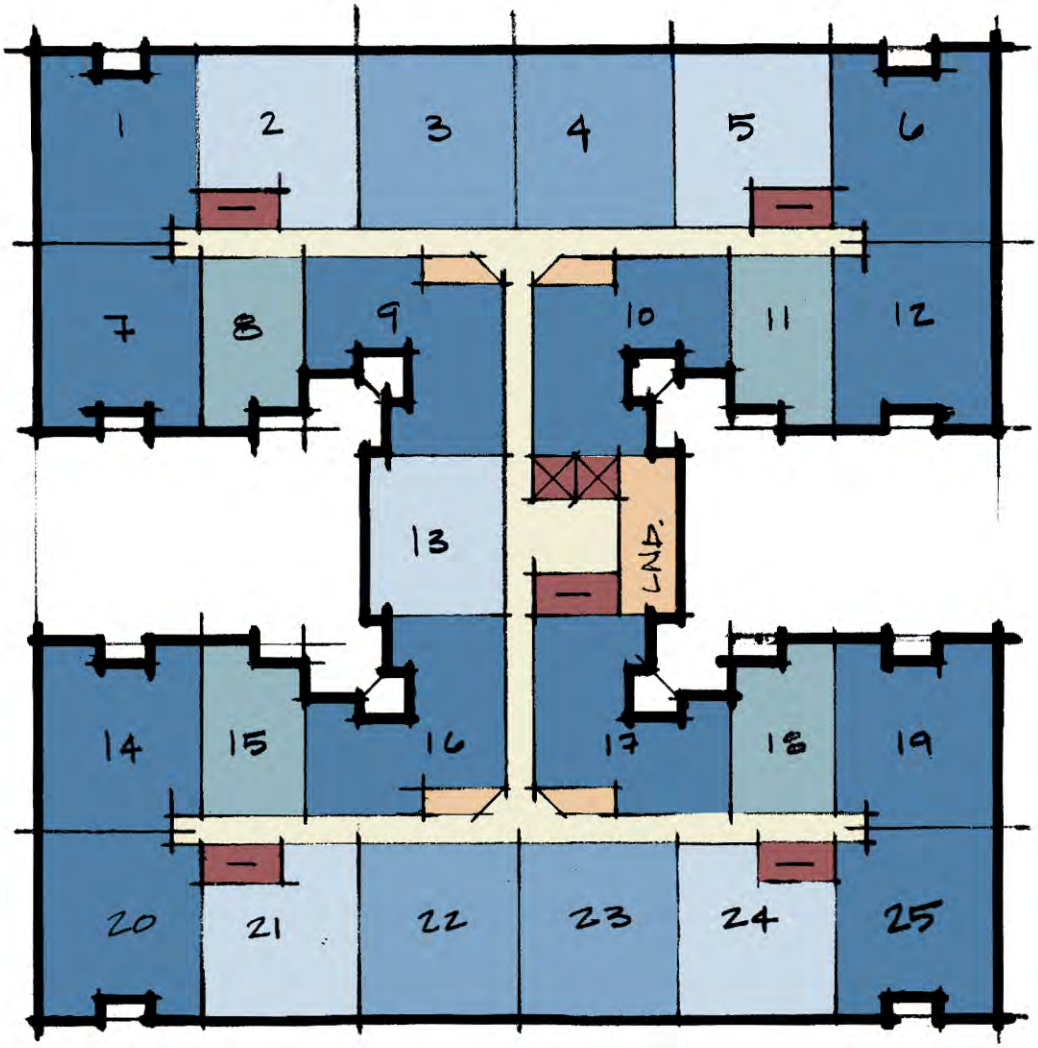
13th and Raleigh Family Housing		**'U' Plan**
Units/Floor		26 Units
SF/Floor		30,750 GSF
Efficiency	Elevators	2
	Stairs	3
	Corridor Length	404'
Floor Area : Skin Area Ratio		30,750 SF/(1,180 LF x 10'tall) = 2.6
Quality of Units		Good, 7 types, 2 inside corners
Quality of Outdoor Space		1 larger outdoor space with possibility to differentiate for school and daycare use from common area. Not ideal for sun
Appropriate to Site		Better: 2 to 3- distinct frontages, Emphasis on 13th, Good buffer from freeway noise
Precedents		Buckman Heights, Tanner Place, The Lexus, Block 49 (Tamarack)

RAMONA APARTMENTS - EARLY MASSING MODELS
OPTION 4



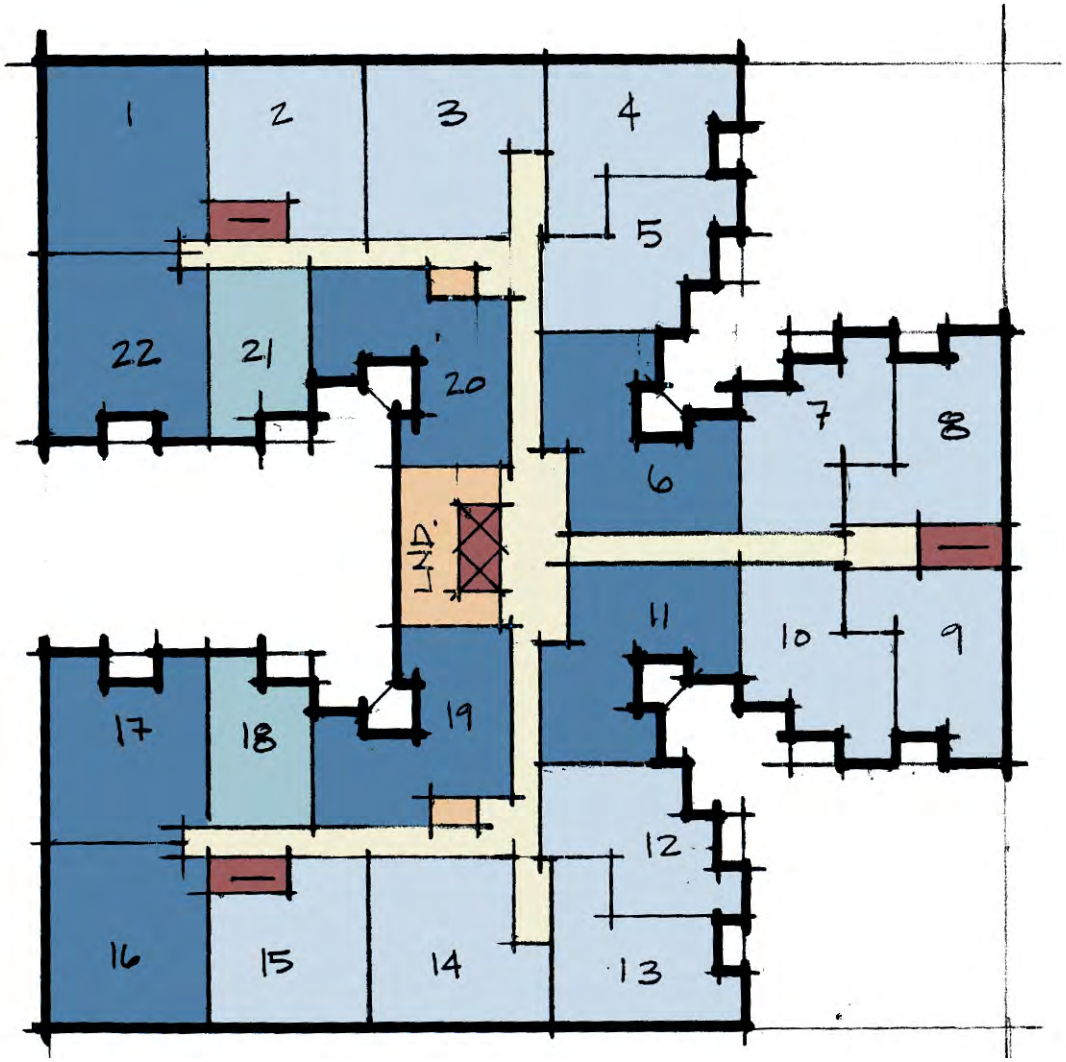
13th and Raleigh Family Housing		**'Double Bar' Plan**
Units/Floor		24 Units
SF/Floor		27,750 GSF
Efficiency	Elevators	4
	Stairs	4
	Corridor Length	288'
Floor Area : Skin Area Ratio		27,750 SF/(1,280 LF x 10'tall) =2.16
Quality of Units		Good, 3 types, No inside corners
Quality of Outdoor Space		One larger space but with transitional space at east and west ends. Possibility to differentiate school and daycare use from common area. Not ideal for sun
Appropriate to Site		Poor -Treats 13th and 14th equally, May bring in freeway noise from west
Precedents		Riverstone, Bridgeport, Sitka

RAMONA APARTMENTS - EARLY MASSING MODELS
OPTION 5



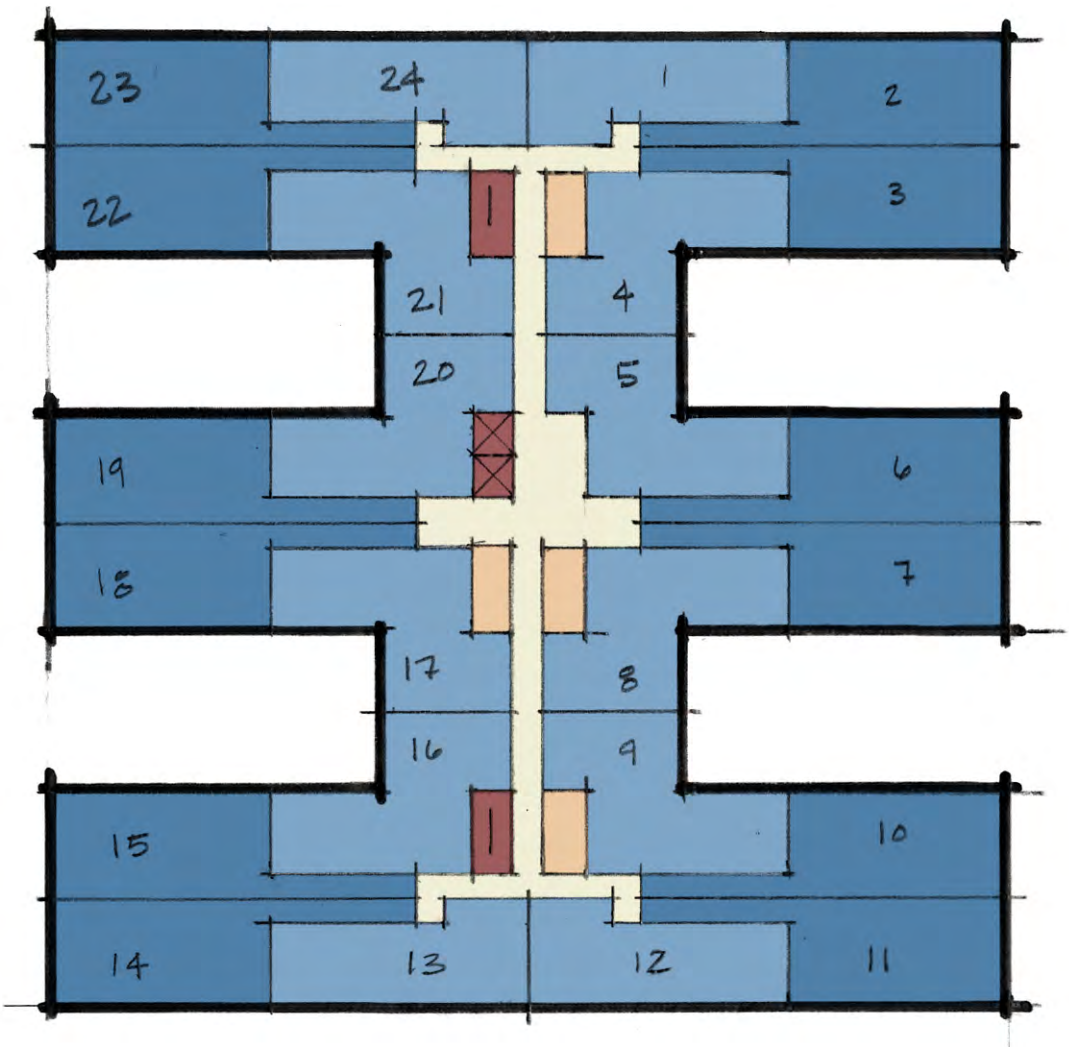
13th and Raleigh Family Housing		**'H' Plan**
Units/Floor		25 Units
SF/Floor		31,500 GSF
Efficiency	Elevators	2
	Stairs	5
	Corridor Length	410'
Floor Area : Skin Area Ratio		31,500 SF/(1,190 LF x 10'tall) = 2.6
Quality of Units		Fair, 5 types, 4 inside corners
Quality of Outdoor Space		2 distinct outdoor spaces. Possibility to differentiate school and daycare use from common area. Not ideal for sun
Appropriate to Site		Poor -Treats 13th and 14th equally, May bring in freeway noise to west courtyard
Precedents		Pittock Building

RAMONA APARTMENTS - EARLY MASSING MODELS
OPTION 6



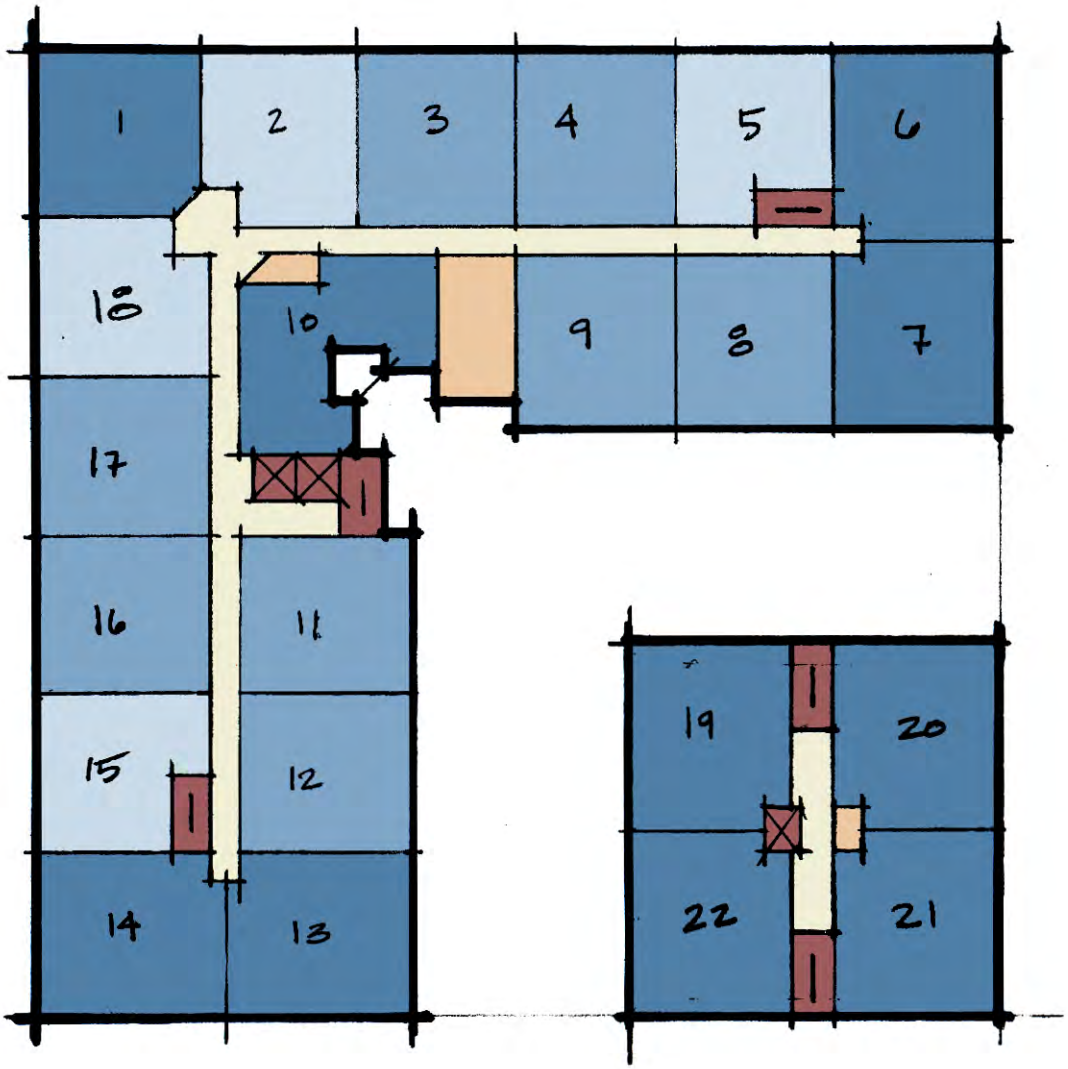
13th and Raleigh Family Housing		**'Crab' Plan**
Units/Floor		22 Units
SF/Floor		27,800 GSF
Efficiency	Elevators	2
	Stairs	3
	Corridor Length	390'
Floor Area : Skin Area Ratio		27,800 SF/(1,290 LF x 10'tall) =2.15
Quality of Units		Fair to Poor, 7 types, 4 inside corners that are too crammed
Quality of Outdoor Space		3 medium sized spaces, Possibility to differentiate school and daycare use from common area. Range of solar conditions.
Appropriate to Site		Fair – 3 different frontages, Strong axial plan not relating to context, May bring in freeway noise from west
Precedents		

RAMONA APARTMENTS - EARLY MASSING MODELS
OPTION 7



13th and Raleigh Family Housing		**'Double E' Plan**
Units/Floor		24 Units
SF/Floor		29,150 GSF
Efficiency	Elevators	2
	Stairs	2
	Corridor Length	294'
Floor Area : Skin Area Ratio		29,150 SF/(1,350 LF x 10'tall) = 2.16
Quality of Units		Possibility to be Good: unusual long thin units, long corridors inside end units, 3 types, 8 inside corners
Quality of Outdoor Space		4 decentralized smaller spaces: In scale with historic courtyard apartments. Will feel tight and urban. Possibility to differentiate school and daycare use. Not ideal for sun
Appropriate to Site		Fair – 2 different frontages, Treats 13th and 14th equally, May bring in freeway noise from west
Precedents		Smaller ¼ block courtyard apartment buildings such as The Rex Arms and Rose Friend Apartments. Similar in form to the Multnomah Hotel

RAMONA APARTMENTS - EARLY MASSING MODELS
OPTION 8



13th and Raleigh Family Housing		**'L' + 'Point' Plan**
Units/Floor		22 Units
SF/Floor		29,500 GSF
Efficiency	Elevators	3
	Stairs	5
	Corridor Length	308'
Floor Area : Skin Area Ratio		29,500 SF/(1,230 LF x 10'tall) =2.40
Quality of Units		Good, 7 types, 1 inside corner
Quality of Outdoor Space		1 larger 'L' shaped space with possibility for differentiation of school and daycare use – Better Solar orientation
Appropriate to Site		Good – 2 different frontages, Ideal boundary from freeway noise
Precedents		Initial Sitka parti