



CITY OF  
**JOHN DAY**

## VIEW FROM NORTHWEST

Pad 'B' View, Pad 'A' Very Similar

THE RIDGE HOUSING MCD SERVICES SEDER ARCHITECTURE + URBAN DESIGN LLC ALQUIST LLC 3-15-22

### THE RIDGE 3-D PRINTED PROTOTYPE + DEVELOPMENT-SPECIFIC HOUSING DESIGN PHASE SUBMITTAL 3-15-22

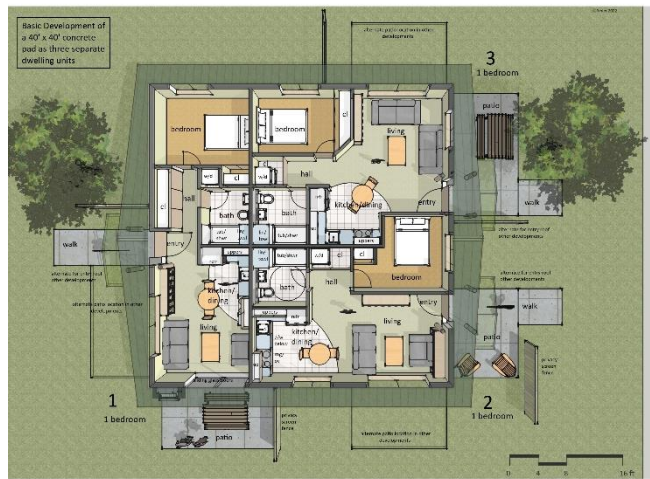
**Background:** Cities and Communities throughout the State of Oregon are in much need of new housing. While needs are for a variety of housing types: affordable, easily and efficiently constructed and readily-permitted housing based on certain repeatable systems and products is a particular need.

The chronic need for new housing is accentuated by both long term trends and recent events:

- Many communities experiencing little or no growth, nevertheless are seeing a continuing decline of aging (and sometimes, mis-used) housing stock, which needs to be replaced.
- Other areas experiencing growth and increased popularity, require more affordable housing for service workers, family wage earners, young people just starting careers, and others.
- The increased risk of wildfires to housing stock has been accentuated by climate change, coupled with the continued movement of rural community housing growth into the urban/rural interface. And very recently by catastrophic range and forest fires whose scope and ferocity has inflicted great structural & housing loss on entire neighborhoods and even whole towns.
- The pandemic has both emphasized the need for healthy facilities, and has seemed to increase the desire of a significant portion of the population to seek smaller and more rural places to reside, again increasing rural housing demand.



- Coupled with this, the internet and the ongoing extension of quality broadband width into rural communities has opened very real options for some to relocate to more rural areas while remaining employed or opening new internet-reliant businesses, often information and service based.



PAD 'A' PLAN-PERSPECTIVE



PAD 'B' PLAN-PERSPECTIVE

**The Ridge Housing:** The Ridge Housing seeks to address all of the above factors and “drivers” of new & replacement housing, through the design of modern affordable housing units, utilizing state of the art and efficient 3-d printing of most of the wall structures of the units. Very much guided by the maximum efficiencies during this period of rapidly emerging capabilities of 3-d printing, The Ridge designs will be of immediate use in creating new housing at The Ridge Development, a Mahogany Ridge Development project in John Day, Oregon. Further, by creating these housing prototypes utilizing a repeatable size, structure and components yet with enough options and variations, The Ridge Housing will be usable in other neighborhoods and communities without feeling repetitive.



In specific, The Ridge will utilize the most efficient 40 foot x 40 foot concrete pad size for single setup 3-d printing operation, to then construct 3-d printed walls in one continuous sequence, creating triplexes of combinations of 2 bedroom, 1 bedroom and studio apartments. Pads 'A' and 'B' will provide two and one bedroom and studio apartments. The 3-d printed 8" thick exterior walls will not only be double wythe and insulated but will be reinforced and serve as the bearing walls for pre-manufactured wood roof trusses. These gable end, 5 in 12 sloped trusses will be very efficient & replicable. Recommended fire resistant gyp sheathing at gable ends, with fire retardant-treated roof plywood and overhanging truss cord tails, cementitious trim boards coupled with the concrete 3-d walls, metal roofing and slab on grade/concrete footing construction will make The Ridge buildings very fire resistant...far above prescriptive codes.

Each unit will have its own distinct and separate entry from the exterior as well as its own patio, for a very identifiable and "socially distanced" livability as and when this may be expeditious...and for the general sense of "ownership" of apartment and adjacent outdoor space. Sliding glass doors to patios and operable windows for almost all openings, coupled with two to three sides of exterior wall/window exposure for each of the three triplex units in a pad, will afford much natural light, views and cross-ventilation. Windows will essentially allow views in all directions from each pad as a whole, for security and surveillance as well as capturing views and light. A goal is to utilize a 9 foot plate height/ceiling elevation and an 8 foot head height at exterior openings for much natural light, while still accommodating full required 3-d constructed headers over openings.

The three units in each of the two pad types adjoin each other at (mostly) solid concrete 3-d printed walls, not only insuring sound isolation but also, fire safety between residences. All wet areas and rooms of greatest systems support needs (i.e. Kitchens, bathrooms and stacked washer/dryers) are within the core and common areas of the building pads, for efficiency and construction cost savings as well as protection from freezing.

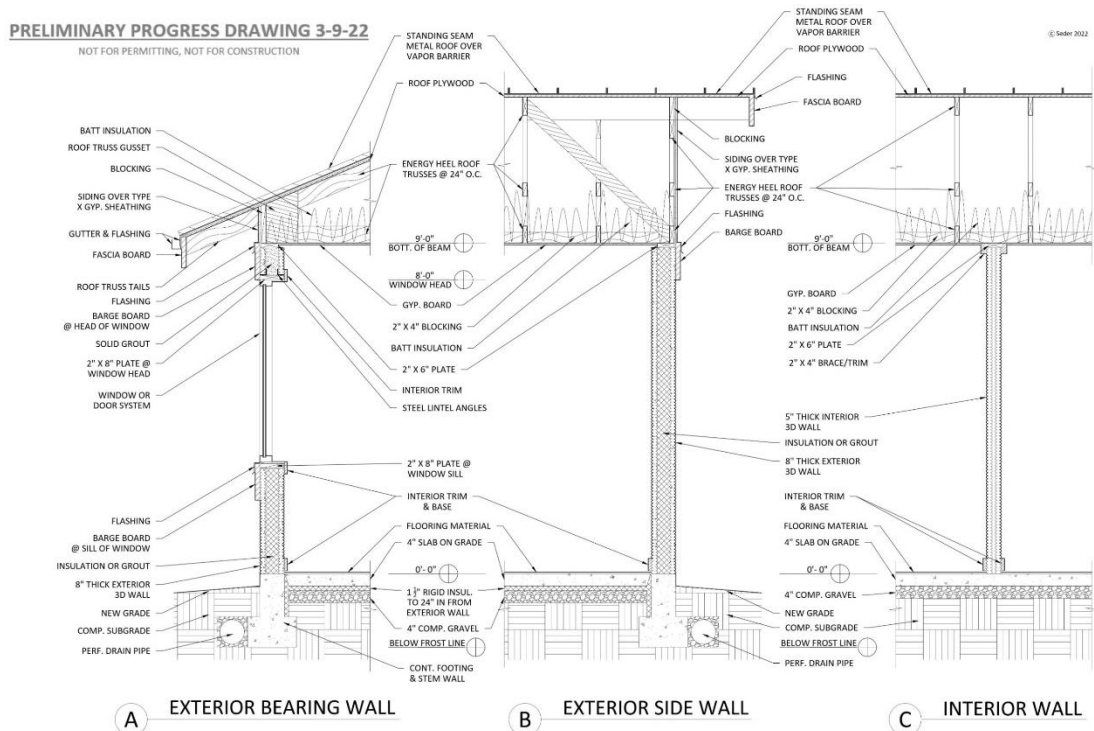
Kitchens and Bathrooms are designed to utilize repeating cabinetry, equipment and appliances, in standard and readily available models and sizes. Closet doors will generally have openable upper door faces above the lower 6'-8" closet doors, to utilize the full 9 foot height for valuable storage including readily and less often accessed items.

The primary living areas of Living/Dining/Kitchen in all units and types will be very open-plan, not only facilitating a variety of options for furnishings and arrangements, but also saving considerable space in these small units averaging 533 gross square feet each (including all walls, counters, etc.). A general feeling of openness, without extensive hallways or other single use circulation areas is important in achieving high degrees of livability and flexibility. For instance, dining can either be close in and part of the kitchen, or positioned elsewhere in the general living area. A study or desk...even home office, is possible in the main living areas of all units, as well as bookshelves, TV's, screens and entertainment centers, and sofas, chairs and sectionals. A resident-provided piece can easily create an island kitchen and additional kitchen work area.

Each unit in each of the two Pad types of The Ridge will feel and be different than the others based on the particulars of efficient design and space utilization and the varied exposures. The triplex and corner utilization of each pad contributes to the natural differences in unit layouts, even between the one

bedroom types (3 types in total, not including “mirrored” i.e flipped pads), and the studio types (2 in total, again not including mirrored pads). Mirrored pads essentially double the unit types for all units.

While different developments uses of The Ridge housing may and will have differing accessibility requirements and challenges, The Ridge pads and units within are designed to allow certain 2 bedroom, 1 bedroom and studio units to be accessible and “visitable.”



## TYPICAL WALL SECTIONS

**Structural Systems and Considerations:** The housing buildings will be one-story and approximately 40’ x 40’ in plan. The proposed structural system for the buildings consists of 3D printed concrete walls at the exterior load bearing walls and at some interior non-load bearing walls. Prefabricated wood roof trusses will span from exterior wall to exterior wall without interior supports.

The exterior 3D walls will be 8” thick and consist of a 2” exterior wythe, a 4” void space, and a 2” interior wythe. The void space will be filled with insulation or grouted cells with vertical rebar where required by design. Vertical rebar will be located at all window and door jambs and approximately 4 feet on center at continuous walls. Horizontal ladder/truss reinforcement will be located at 16” on center and tie the exterior and interior wythes together, along with the grouted cells. The 3D printed walls will be designed similar to a partially grouted CMU wall. The walls will be designed for gravity as well as lateral loads. The minimum concrete strength used will be  $f'c=5000$  psi. A continuous horizontal bond beam will be located at the top of the exterior walls to support the roof trusses and provide a means to anchor the roof to the walls.

The exterior 3D printed walls will be supported at grade by an 8” thick conventional reinforced concrete stem wall on top of a continuous concrete spread footing. The 3D walls will be tied to the stem walls by rebar dowels at the locations of the grouted cells. The floor will be a 4” concrete slab on grade.





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## SECTION - PERSPECTIVE

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**Building Systems and Considerations:** As on the exterior, it is anticipated that much of the interior will feature the 3-d printed walls left exposed as the natural aesthetic. Flooring may be any variety or combination of exposed, possibly stained concrete, carpeting with resilient flooring at kitchens & bathrooms. Ceilings, directly attached to the bottom of the roof trusses, will be painted gypsum board. Cabinetry will be durable laminate surfaces and possibly, integral color countertops and open shelving at upper kitchen cabinets. A towel & linen storage cabinet at most bathrooms will provide storage and naturally extend outward to form an open lav counter with open knee space underneath.

Stacked washer/dryers in each unit will save on valuable floor space. Tub-showers will have fiberglass or other surrounds. An on-demand water heating system is being contemplated, saving more space over a standard tank system. Lighting will be LED to the extent possible. Plumbing fixtures will be durable and low-flow where appropriate, for water savings. Each unit will have its own electrical panel and be separately metered.

**Construction and Project Costs:** These are in the process of being established, including 3-d wall systems and extents, as well as other manufactured and site-produced elements. The promise of very speedy construction is also being factored in, as a more costly material or system that can be significantly faster to produce and install can in overall analysis be cost saving.



**Summary:** The Ridge Housing is an ambitious, broad-based and supported effort to make rapid and considerable headway in alleviating Oregon’s chronic shortage of low scale affordable housing, particularly in rural communities. The “partnering” alliance that has recently been achieved between the Cities of John Day, Burns/Hines and Lakeview and their respective counties (Grant, Harney and Lake, respectively) promises considerable use and advantage from a replicable affordable housing type.

The digital 3-d printing, a rapidly emerging technology, has the promise of both accelerating and economizing the provision of new housing, while at the same time offering considerable advantages of strength and durability, fire resistance and time savings during construction. Other key components, being standard and readily available will further support the efficient construction, outfitting and opening of much needed new housing of this type.

At the same time, through non-structural and easy to achieve variations including optional “add on” elements as well as options in positioning of outdoor space and even the ability to apply the same roof structure in either of two directions (due to the pads being square), can create attractive and interesting developments and even whole neighborhoods, balancing efficient production and construction with appropriate variation and individuality of apartments and outdoor and entry spaces.