Clallam County EDC and CRTC

FINAL REPORT

atelierjones, llc
architecture | ecodesign | planning

CRTC
BUILDING INNOVATION CENTER

EDC
CLALLAM ECONOMIC DEVELOPMENT COUNCIL

SEATTLE , WA
18 JUNE 2025



TEAM

Clallam County EDC
- Colleen McAleer

Impact Washington
- Roy Mann

atelierjones
- Susan Jones
- Meghan Doring
- Ian Maples
- Maia Marshall

CRTC Building Innovation Center
- Geoffrey Woods
- Dave Walters
- Mark O'Brien
- Erik Poulin
- Glenn Ellis

Washington State University
- Pouria Bahmani

Harriott Valentine Engineers
- James Harriott
- Jacob Wachtendonk

SugarPine Ennineering
- Aaron Lubrano

SCOPE

[a] Preparation of the design basis for panelized modular unit using cross-laminated timber. ..... pg. 4

[b] Code compliance report addressing all design requirements; a comprehensive document that outlines the essential criteria, standards and specifications that guide the design and construction of a project. pg.21

[c] Advising and collaborating on any required testing and data collection to support certification package. The CRTC will provide the required data as directed by the successful bid team for structural inputs and fire and thermal performance. ..... pg. 30

[d] Recruitment of the independent peer-review team analysis if required by the City of Seattle. pg.30

[e] High-efficiency MEP specification informed by the properties of the ACLT panelized building design, in compliance with Washington State Energy Code. pg.33

[f] Report advising how this Certification Package may be utilized for buildings between 320 SF and 1,200 SF and addressing whether any further requirements of the City of Seattle may be needed for the additional size structures within this range. pg.37

[g] Interface with the City of Seattle to obtain a non-binding conditional letter of acceptance (since site and foundation conditions will not be finalized) if the City is allowed to provide such. pg.41

Final Deliverable: Provide full architectural drawings and engineering data results to submit an Alternative Means and Methods approach for a modular detached Accessory Dwelling Unit to receive permitting in the City of Seattle. ..... Appendix A
..... Appendix B

[a] DESIGN BASIS



Th initial steps in the preparation of the design basis for panelized modular unit using cross-laminated timber required the team to define the project vision and goals as well as the constraints.

- Siting Constraints: The team analyzed current and future Seattle Land Use Codes, typical lot sizes, and optimized massing and dimensions for wide applicability beyond the Seattle market.

- Precedent Research: The team researched historic and contemporary small scale detached housing and accessory dwelling units in Seattle to help define the project goals. Looking at what is currently available and what may be missing in the current market helped shape the features of the design.

- Material and Structural Constraints: The team analyzed the preliminary test data (sections c & d) and the current Seattle Building Code to determine the limits of current and near-future CRTC manufacturing and current seismic and structural design standards. The design strives to meet both the requirements and the manufacturing capabilities of CRTC efficiently.

- Concept Design: Simultaneous to this research work, the design team created and shared sketches and preliminary concepts for team comments. These preliminary concepts led into design feedback loops that culminated in an in person meeting at the March 2024 International Mass Timber Conference in Portland where the team collectively selected the final concept design.

[a] DESIGN BASIS

PRECEDENT RESEARCH

BUNGALOW COURT COTTAGE

Seattle Workforce Housing
Seattle Washington
564 sf
Cottage Courts
1 Bed, 1 Bath

This community, according to the Seattle Historical Society, is a “rare surviving example” of Seattle’s take on the trend; and even as House Bill 1110 aims to proliferate -plexes, bungalow courts like this one probably won’t overtake the tightly packed townhouse anytime soon.



Exterior View- looking into the courtyard



Exterior View of Cottage



Interior Living Room

[a] DESIGN BASIS

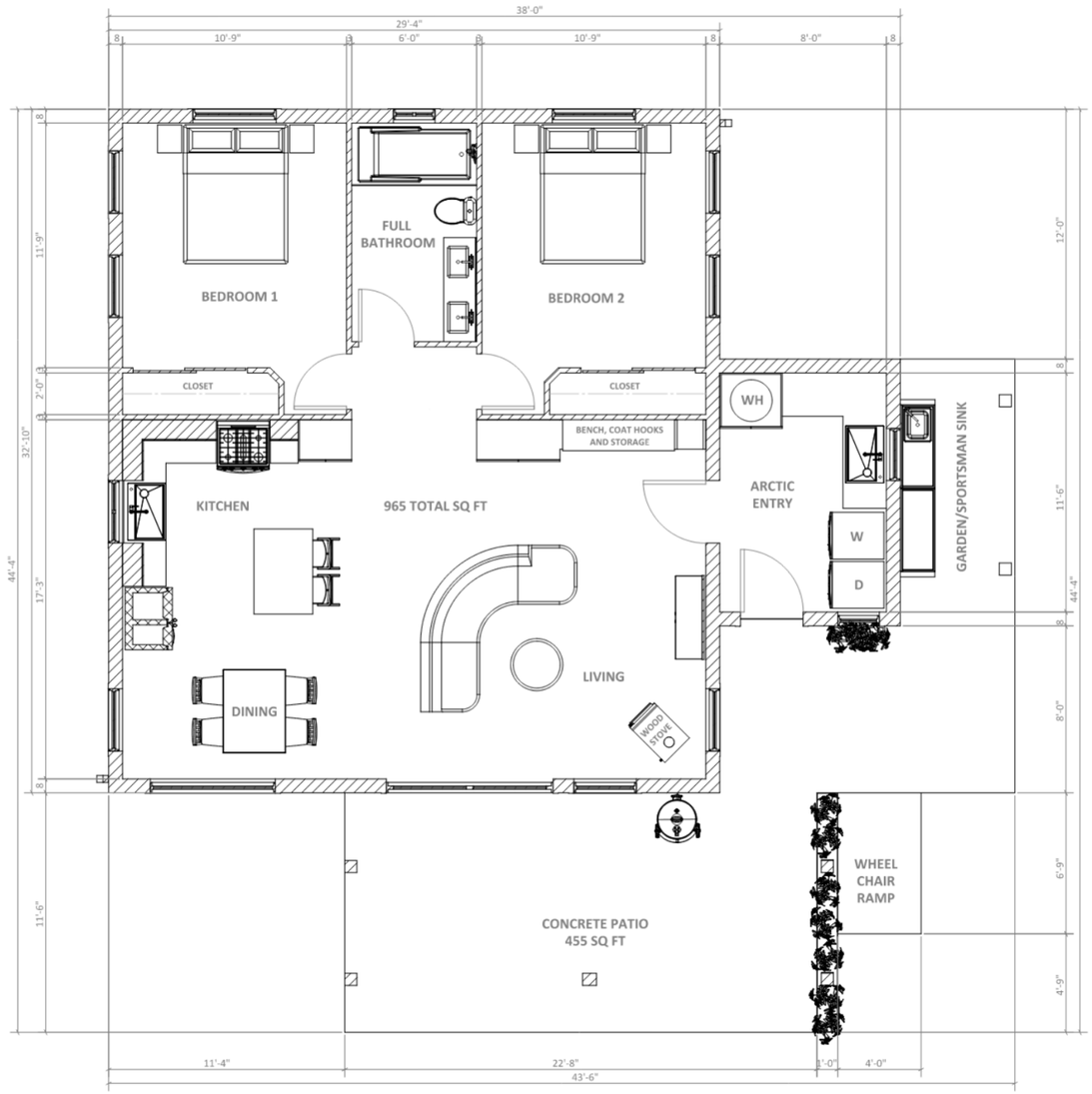
PRECEDENT RESEARCH

MAKAH TRIBAL HOUSE CONCEPT

Neah Bay, Washington
965 sf + 455 sf Lanai
2 Bed, 1 Bath

The Makah home was designed by the CRTC and Makah, recognizing livability in a remote location with harsh weather conditions, cost-effective design for panelized modular construction, and elimination of sheet-rock and cavity insulation. The Makah Home demonstrates that mass timber single-family housing is a solution that extends well beyond middle to high-end homes.





[a] DESIGN BASIS

PRECEDENT RESEARCH

GREEN CANOPY NODE CLT TOWNHOUSE

Spokane Valley, Washington
1200sqft
Prefabricated Building System
2 Bed, 1.5 Bath

A prefabricated building system that: Allows developers to deliver housing for reduced costs, reduced timeline, and can be manufactured at scale. Enables enough configuration to meet diversified project needs and be adaptable for modular or flat-pack delivery based on site requirements. Accelerates the net zero transition with a carbon negative building that integrates into the circular economy. Using new technologies to increase productivity, including standardizing building components, helps modernize housing and the associated workforce. Off-site manufacturing is a natural progression of sustainable development. Mass Timber is an ideal material for off-site manufacturing because of its precise manufacturing, engineered structural qualities, and carbon storage.





Interior Bedroom View



Interior Living Room View

[a] DESIGN BASIS

PRECEDENT RESEARCH



SEATTLE PRE-APPROVED DADU PLANS

Ahouse Studio
Seattle Washington
808-964sqft
DADU Pre-Approved
1-2 Bed, -1.5 Bath

“The Family” efficiently concentrates the bathrooms and kitchen in the center of the floor plan while leaving the rooms on either side open to flexible arrangements. The living room could become a bedroom, and the dining space could be a double-height living area. The location of the main entrance can be determined based on the preferred use of the ground floor spaces. The plan is also symmetrical, allowing for flexible positioning in a backyard in order to take advantage of ideal solar orientation and cross ventilation. The building footprint is minimized to reflect the scale of most Seattle backyards, and the steeply-pitched roof helps to minimize view blockage from surrounding buildings



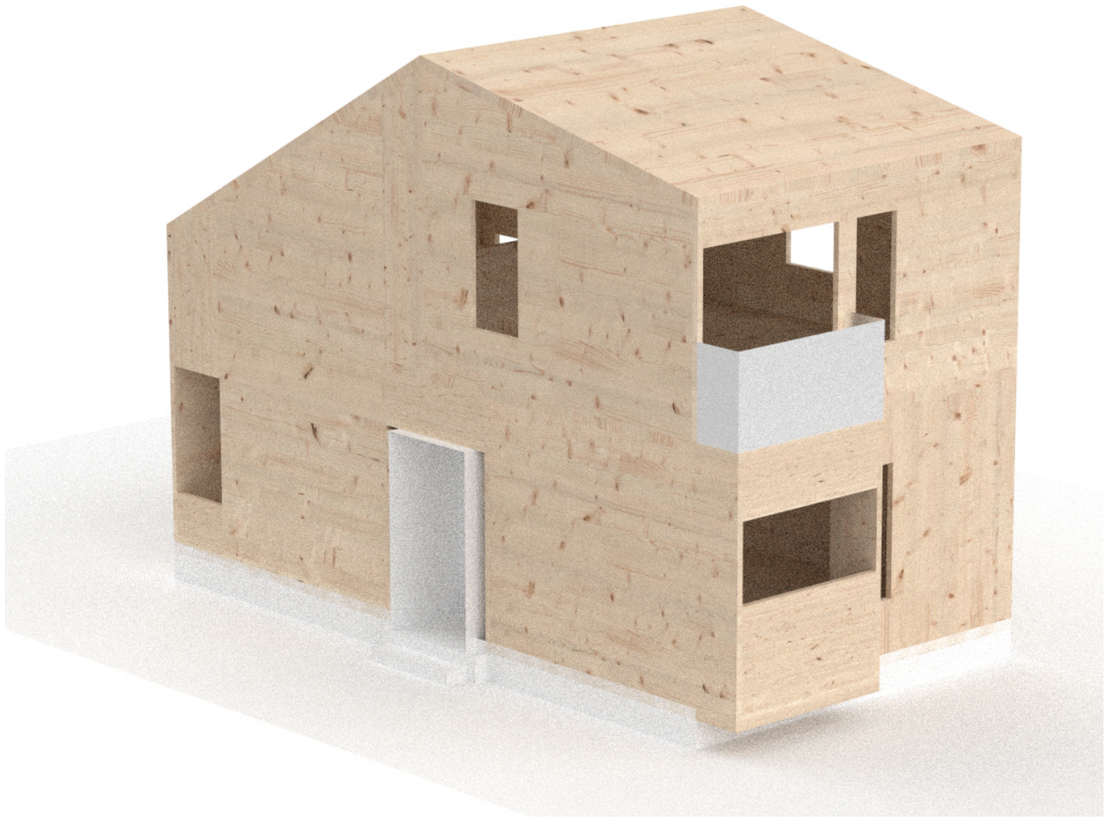
Interior Render View

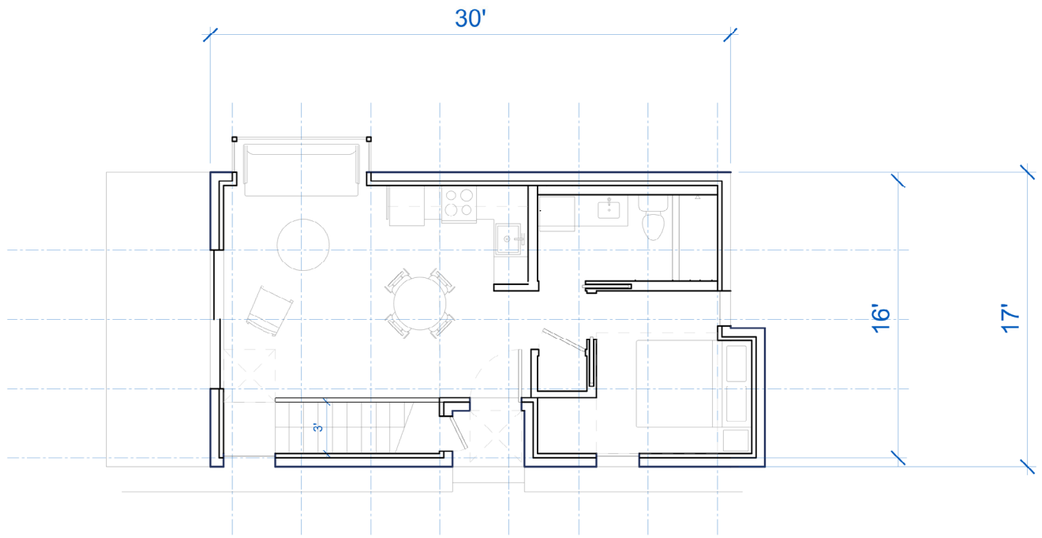


One Bedroom and Two Bedroom Floor Plans

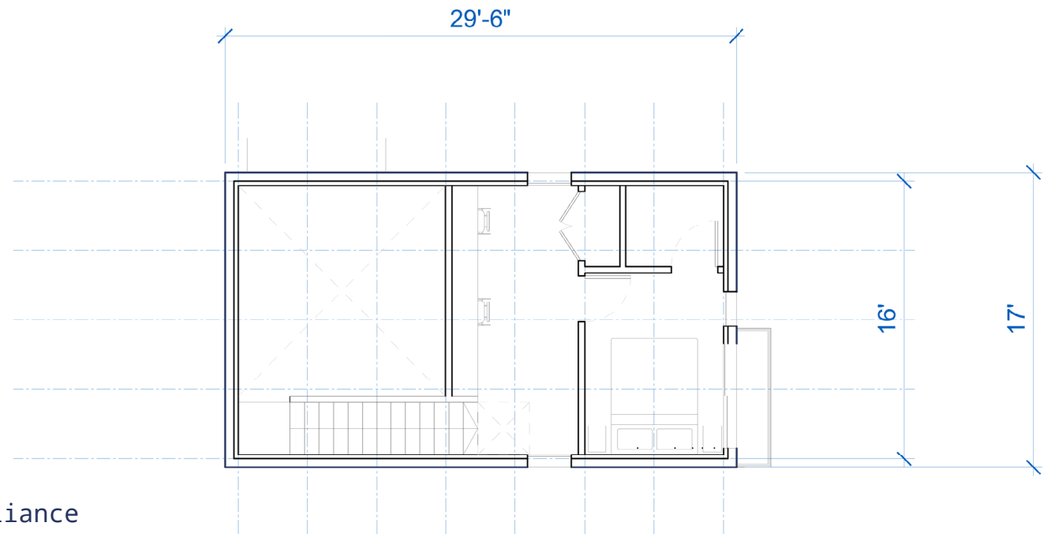
[a] DESIGN BASIS

CONCEPT 1.0, PRESENTED 2025.02.20





768 sf



The team generally liked this option. Some limitations were identified: (1) reliance on bay window setback exemptions is not ideal for maximum adaptability; (2) a more defined kitchen is desirable; (3) side entry limits how the unit can aggregate on-site.

atelierjones, llc
architecture | ecodesign | planning

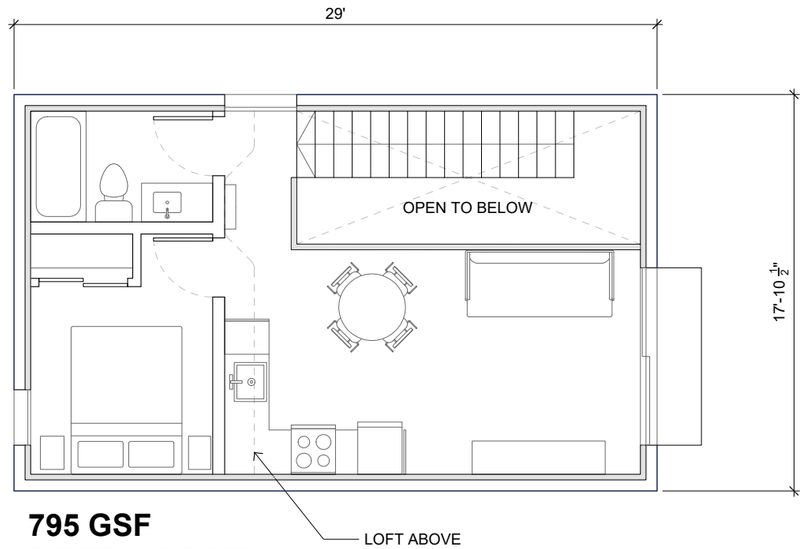
CRTC BUILDING INNOVATION CENTER

EDC CLALLAM ECONOMIC DEVELOPMENT COUNCIL

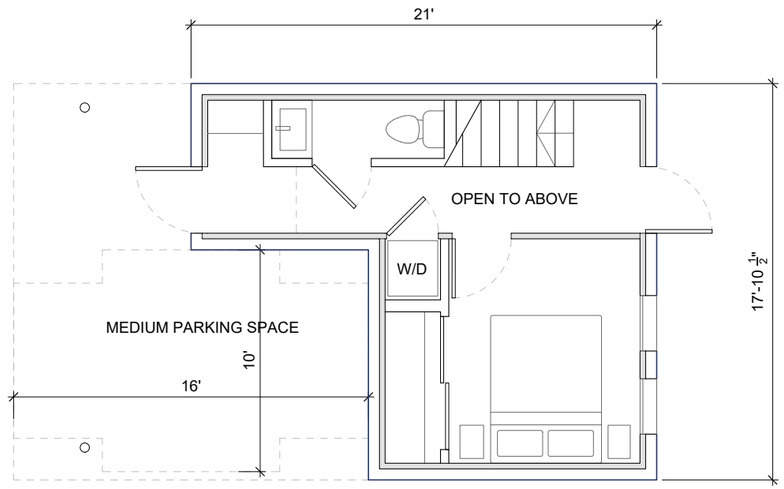
[a] DESIGN BASIS

CONCEPT 2.0, PRESENTED 2025.03.06





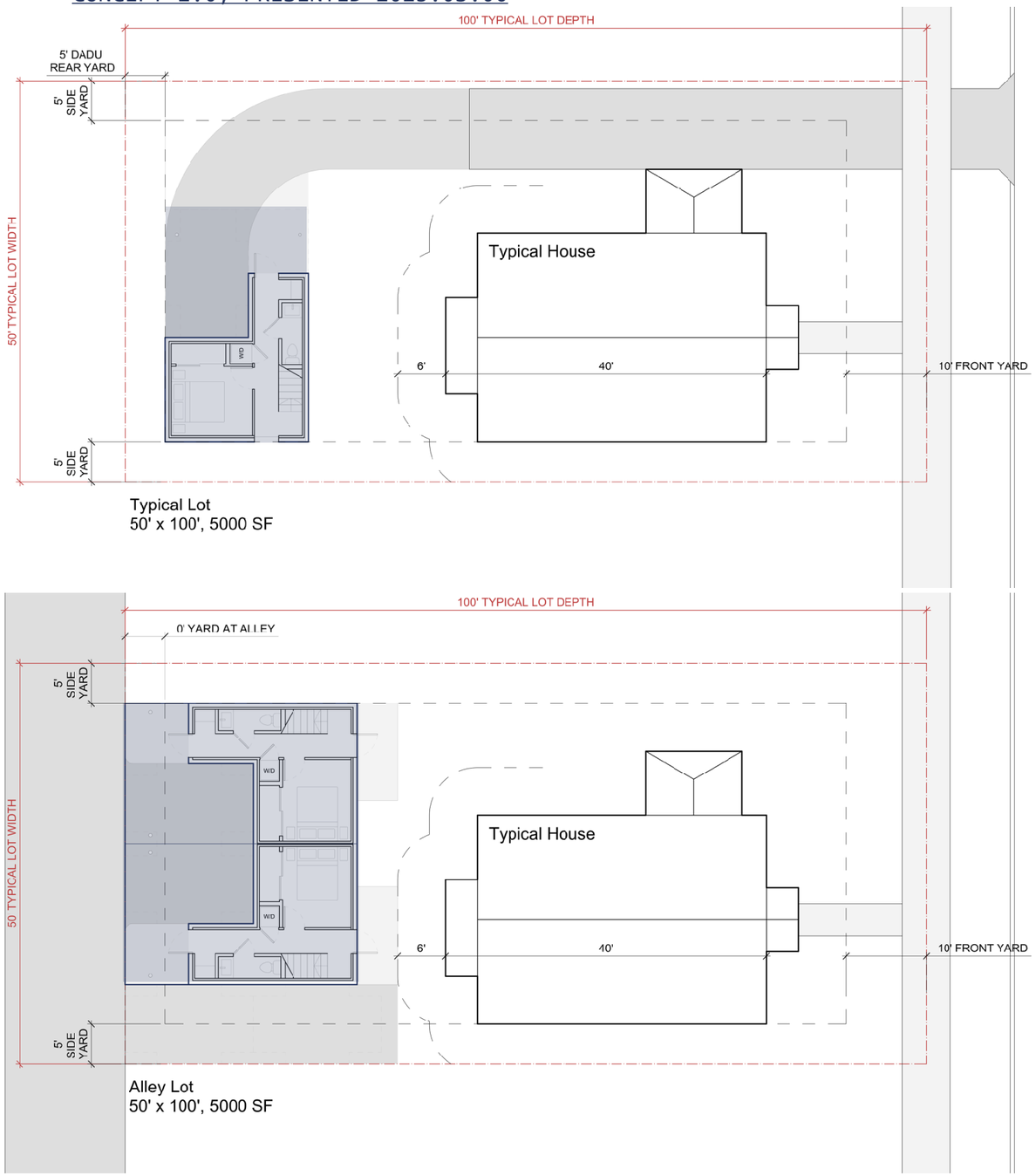
795 GSF
2 BED 1.5 BATH

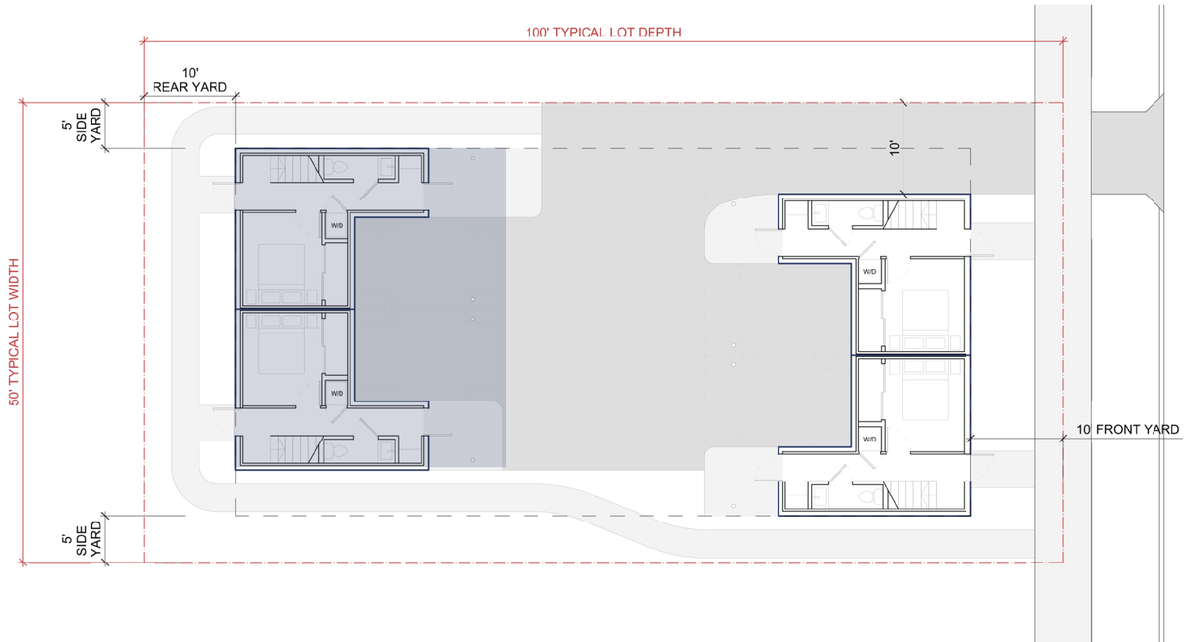


In an attempt to accommodate parking and exterior storage and “upside-down” plan was explored. The benefits of the plan are (1) that this plan can aggregate like a townhouse or row house; and (2) the vaulted roof adds an additional loft space.

[a] DESIGN BASIS

CONCEPT 2.0, PRESENTED 2025.03.06

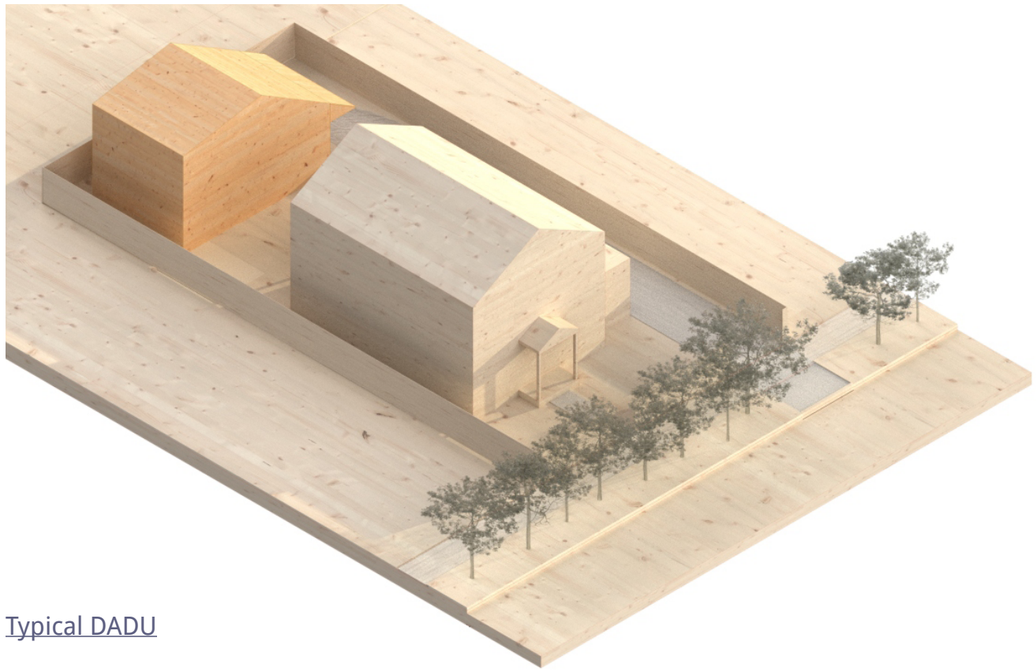




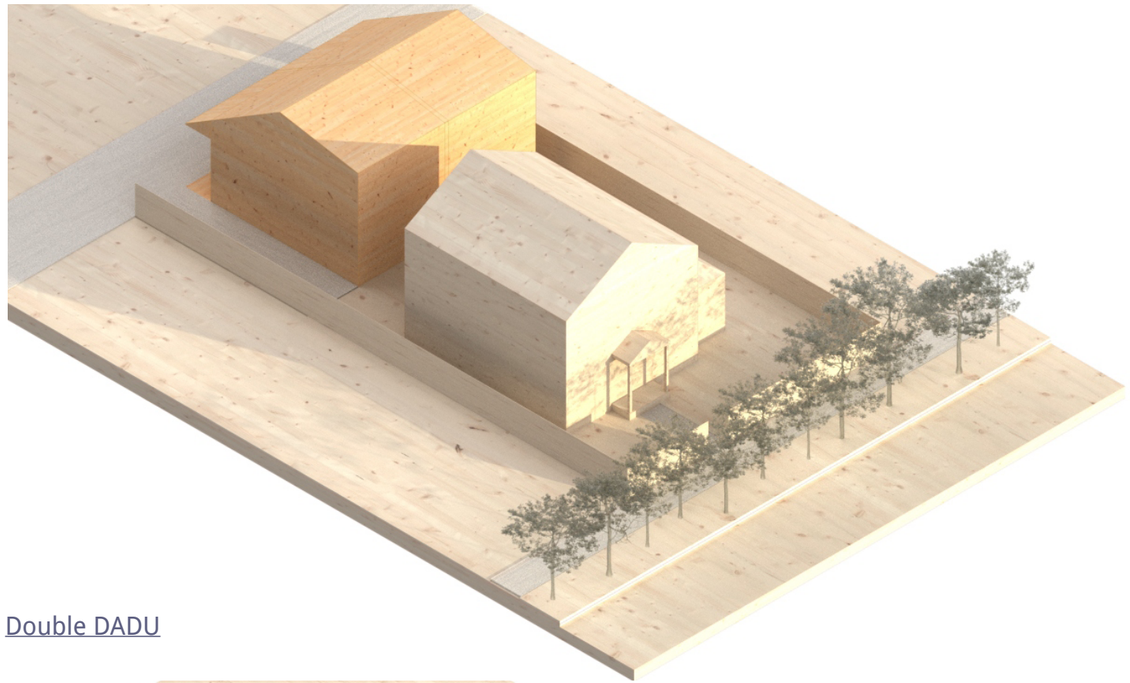
The downsides of accommodating the space required for parking and vehicle maneuvering are limitations on site application, footprint dimensions, and additional envelope area, therefore increasing cost.

[a] DESIGN BASIS

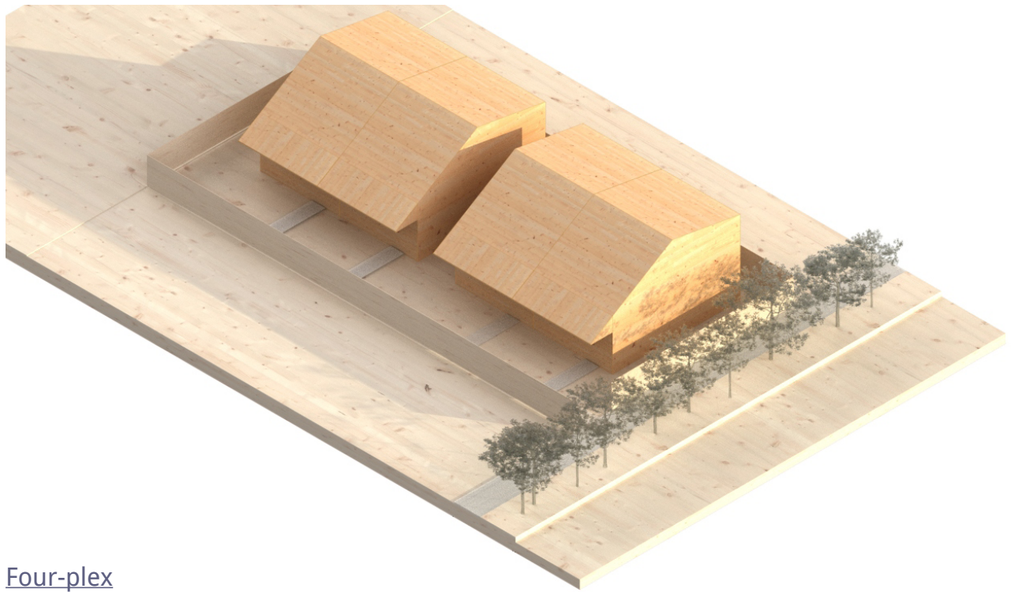
CONCEPT 3.0, PRESENTED 2025.03.21



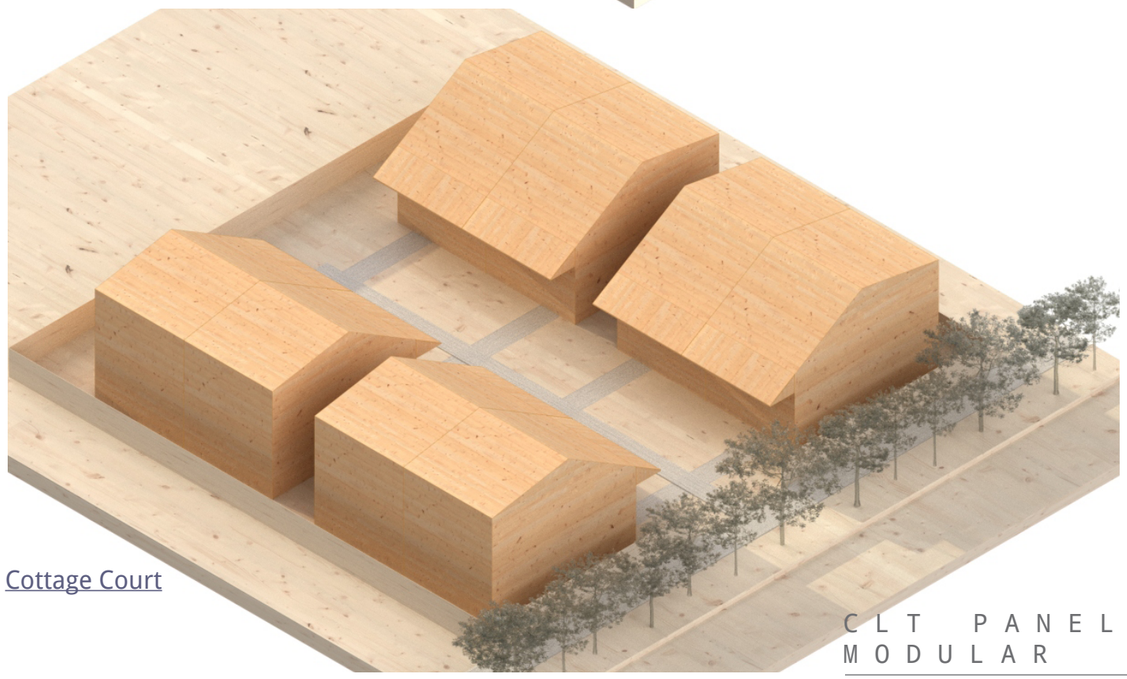
Typical DADU



Double DADU



Four-plex



Cottage Court

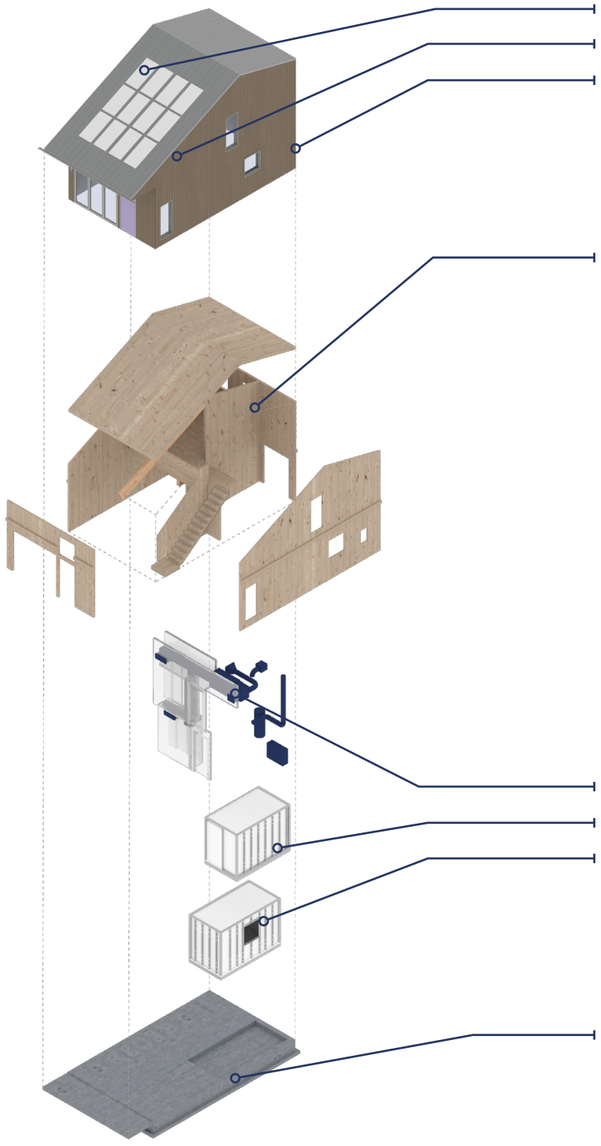
atelierjones, llc
architecture | ecodesign | planning

CRTC BUILDING INNOVATION CENTER

EDC CLALLAM ECONOMIC DEVELOPMENT COUNCIL

[a] DESIGN BASIS

HOUSE 1.0, PRESENTED 2025.04.22



[1] solar-ready,double rolled, standing seam roof
[2] thermally modified Western Hemlock rainscreen siding
[3] 4” mineral wool insulation

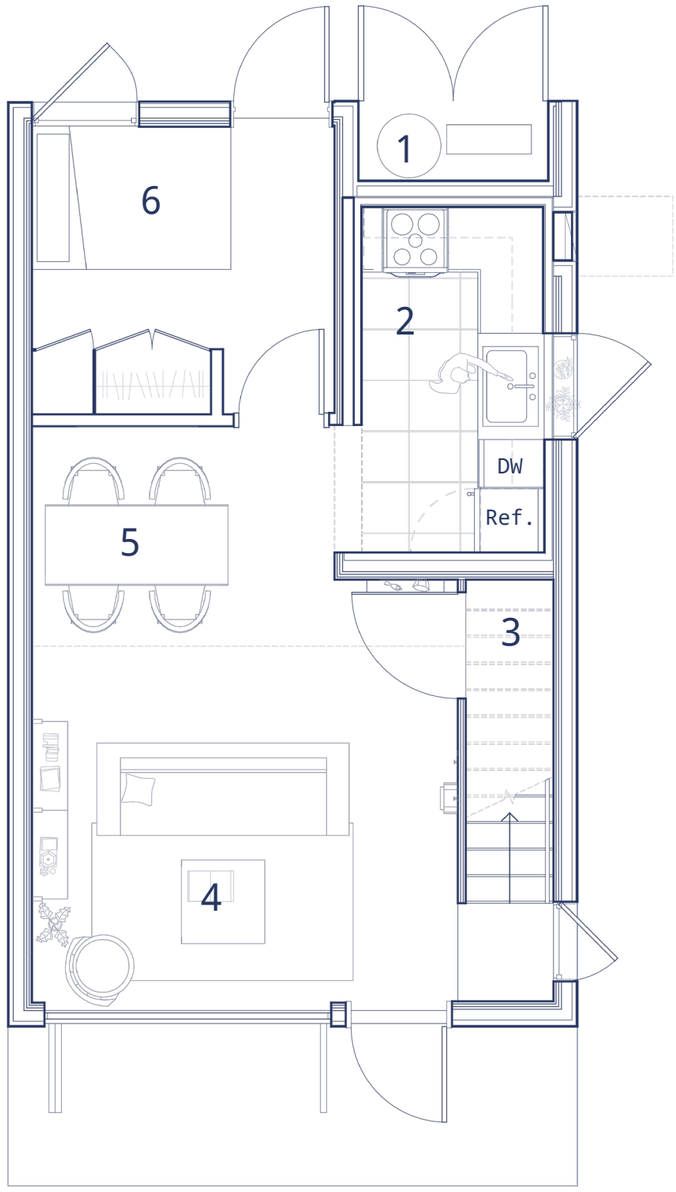
[4] Makah-sourced,thermally modified, Western Hemlock Cross Laminated Timber Panels

[5] non-structural, optional bedroom partitions and site-installed mechanical systems
[6] Modular Wet Core Bathroom
[7] Modular Wet Core Kitchen

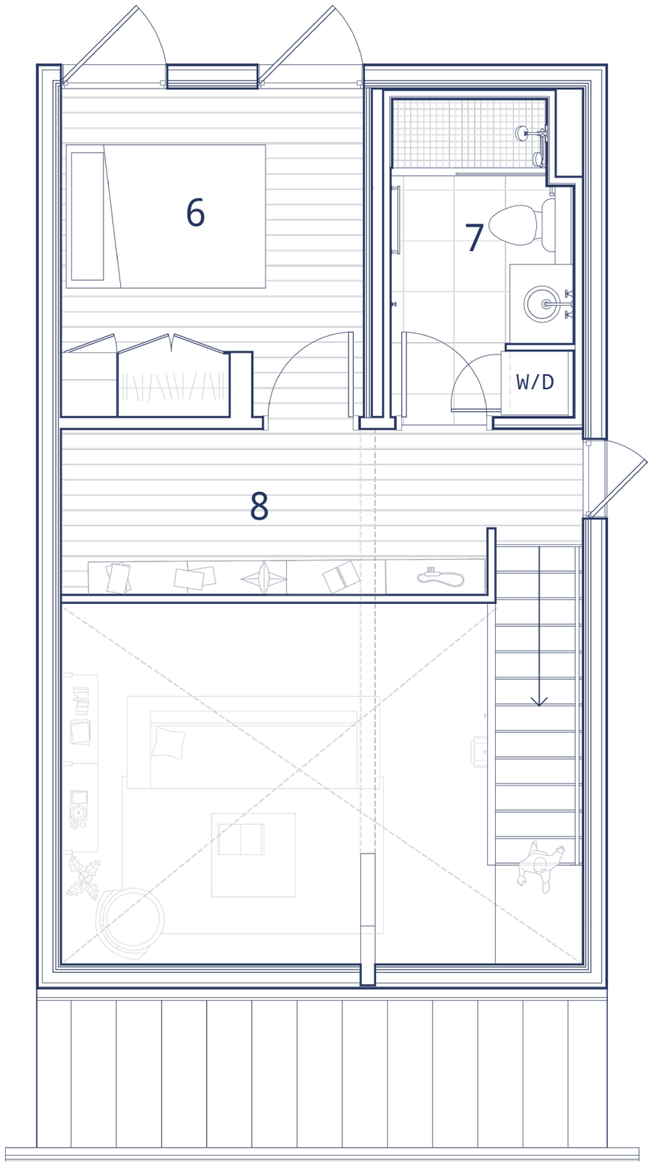
[8] insulated slab-on-grade foundations

[a] DESIGN BASIS

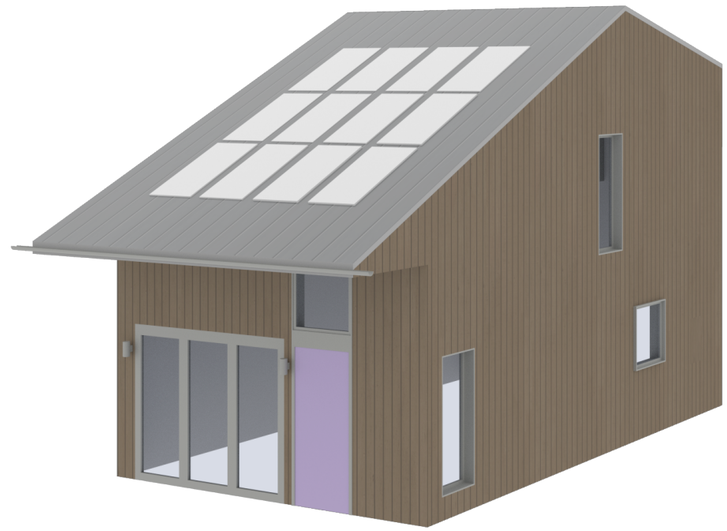
HOUSE 1.0, PLANS



Ground Level



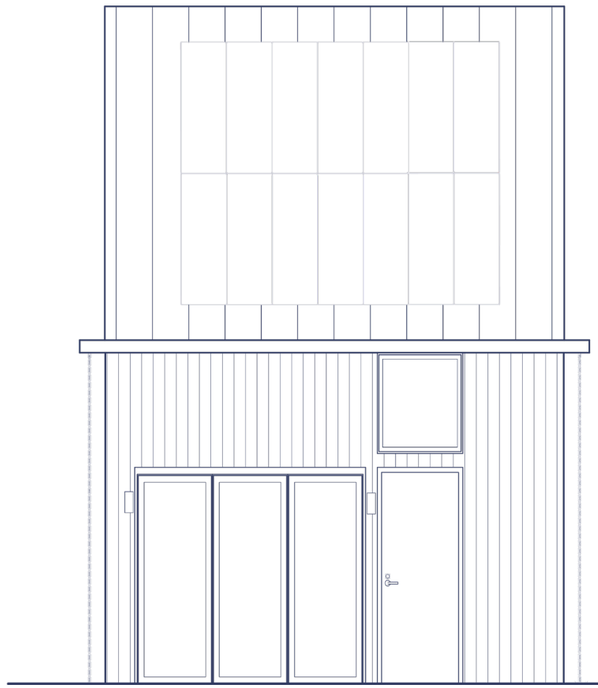
Second Level



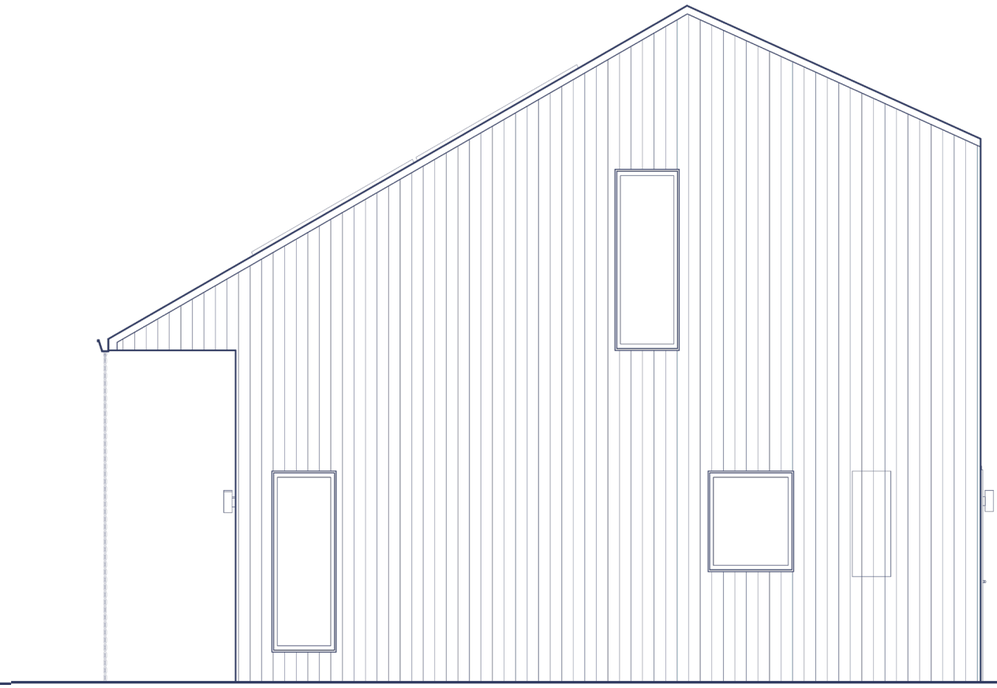
1 Mechanical Alcove
2 Kitchen Wet Core
3 Storage
4 Living
5 Dining
6 Bedroom
7 Bathroom Wet Core
8 Loft

[a] DESIGN BASIS

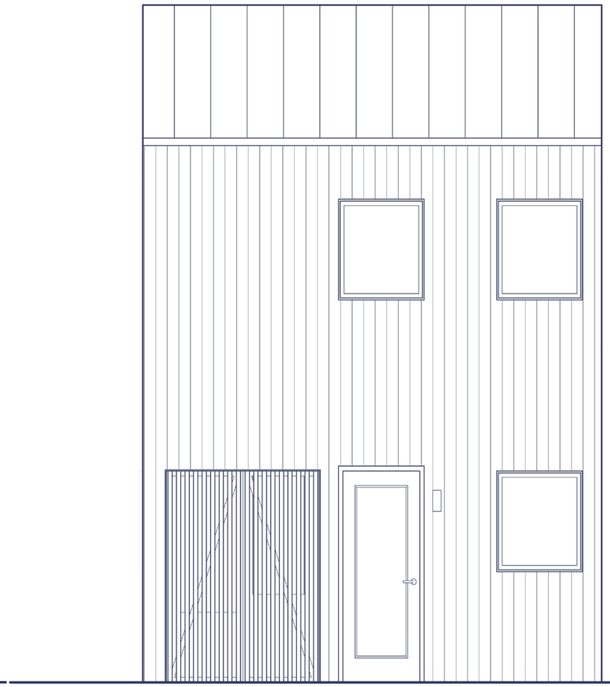
HOUSE 1.0, ELEVATIONS



Front Elevation



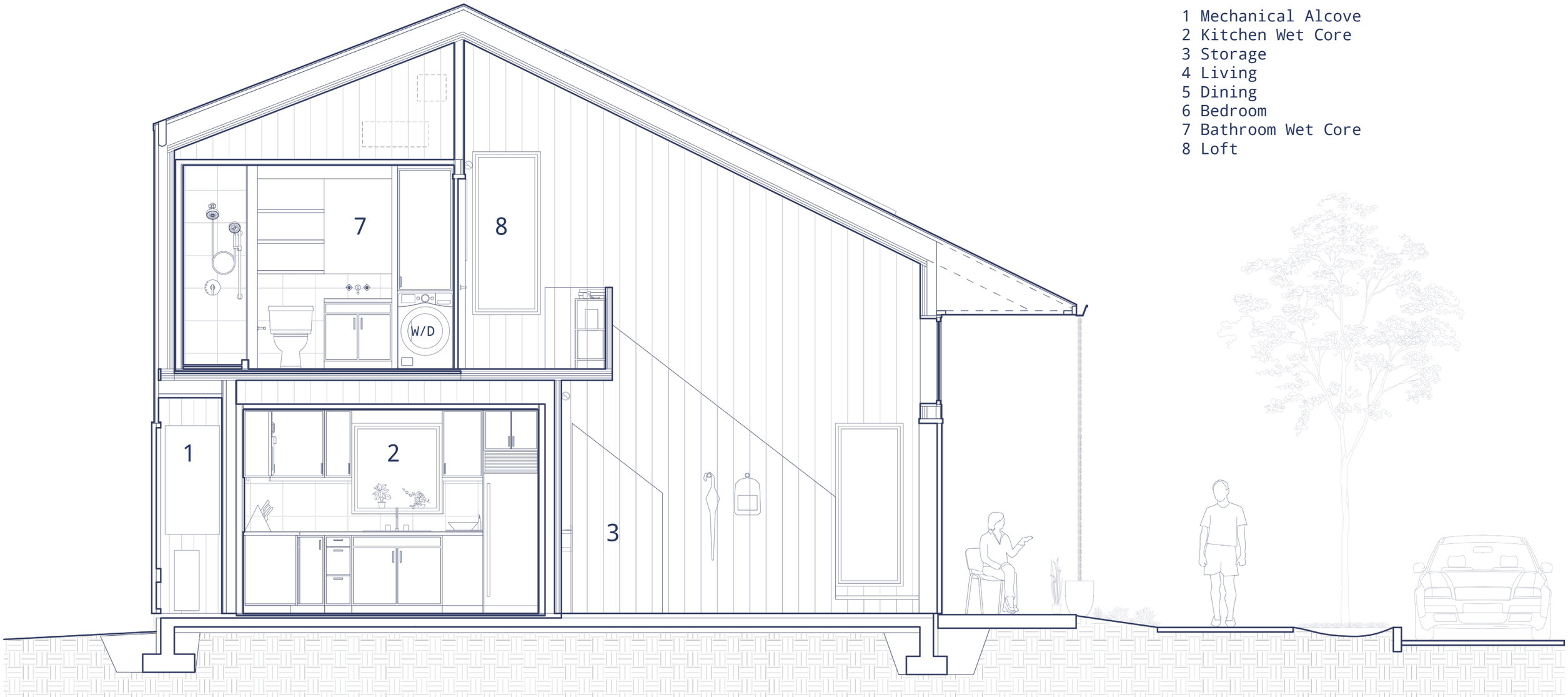
Side Elevation



Rear Elevation

[a] DESIGN BASIS

HOUSE 1.0, SECTIONS



1 Mechanical Alcove
2 Kitchen Wet Core
3 Storage
4 Living
5 Dining
6 Bedroom
7 Bathroom Wet Core
8 Loft

[a] DESIGN BASIS

HOUSE 1.0, BACKYARD COTTAGE



[a] DESIGN BASIS

HOUSE 1.0, LIVING SPACE



[a] DESIGN BASIS

HOUSE 1.0, LOFT



[a] DESIGN BASIS

HOUSE 1.0, DUPLEX IN A COTTAGE COURT



[b] CODE COMPLIANCE



Code compliance can be complex and multi-faceted. House 1.0 needed to navigate and balance evolving land use and building codes to ensure longevity of the design and wide scale applicability.

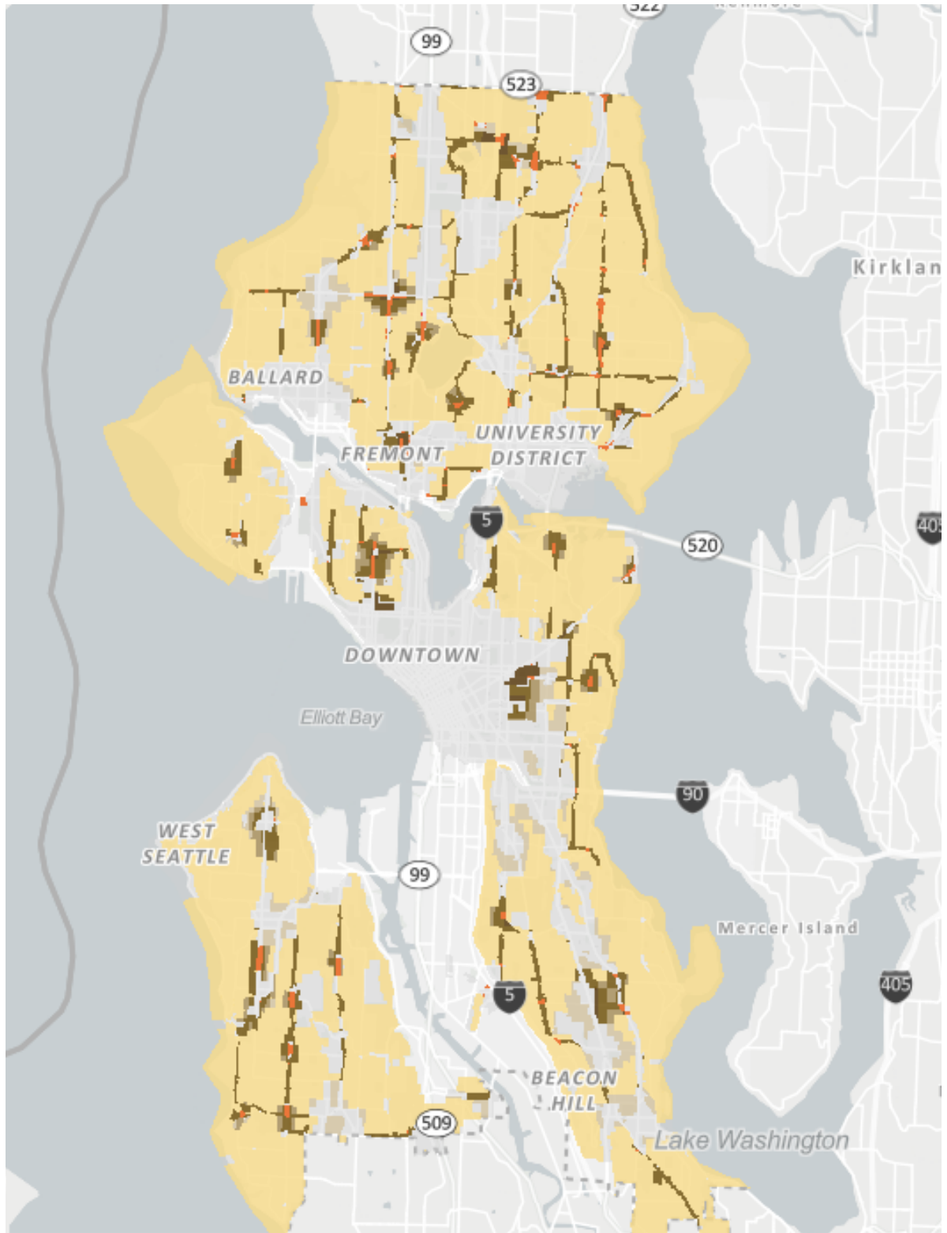
- Seattle Land Use Code currently defines Detached Accessory Dwelling Units (DADU's) as seperate structures on the same parcel as a primary residence. The units can be no larger than 1,000 square feet and to taller that 25 feet.

- The One Seattle Plan is new legislation, the first interim phase of which, is expected to come into effect in June 2025 to bring the City Land Use code into compliance with Washington State Law that bans Single Family Zoning. This change allows four to six units on any lot and removed the definition of a DADU from the code.

- The Structural design standards (NDS and SDPWS) referenced in the Seattle Residential Code are not the most recent versions of the standards and do not fully account for the use of cross laminated timber, as such the team required alternate means to utilize the material. See sections c, d, & g for more information.

[b] CODE COMPLIANCE

CURRENT LAND USE CODE

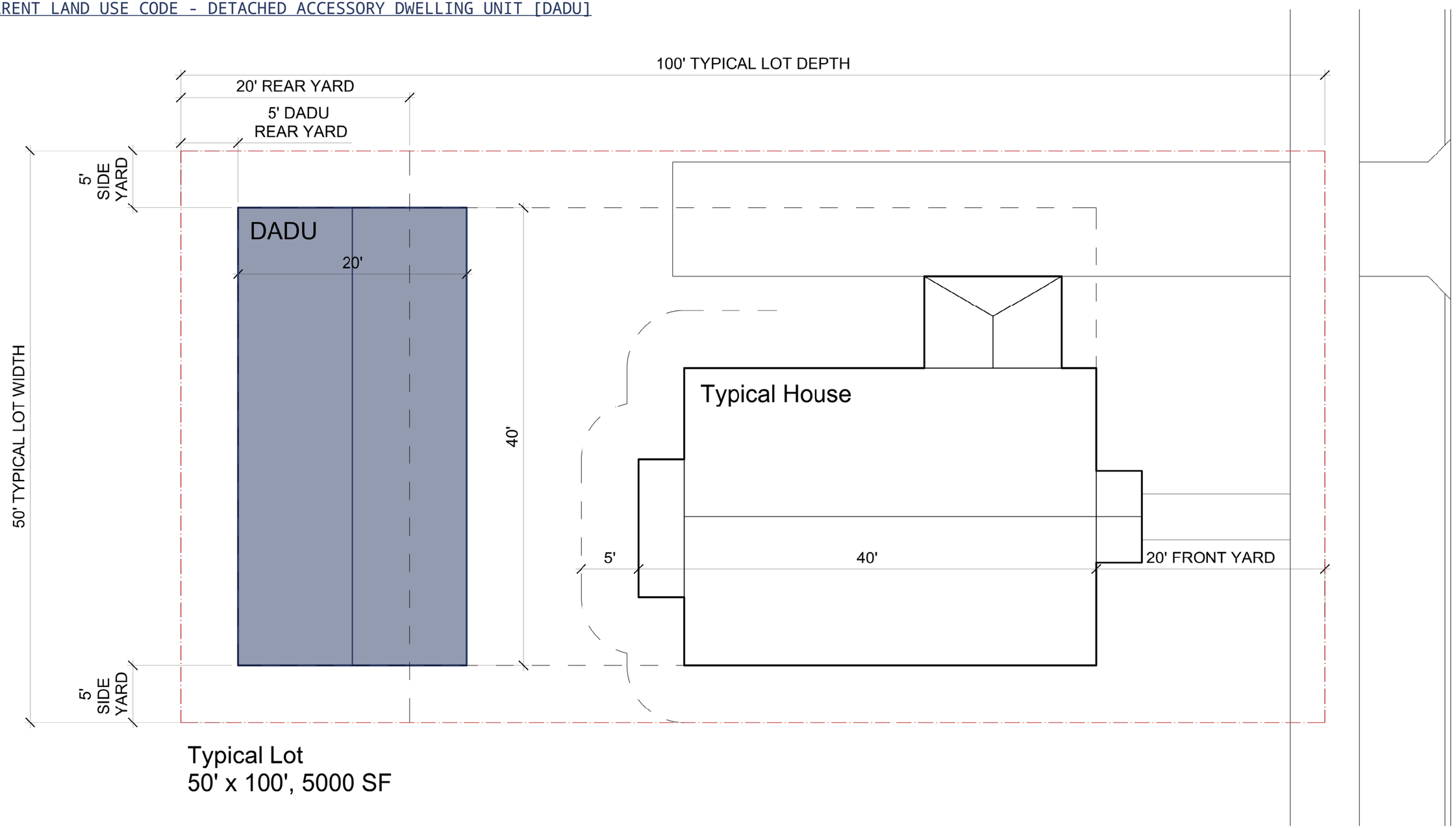


NEIGHBORHOOD RESIDENTIAL

CURRENT ZONING	Seattle Municipal Code Title 23.44 [NR1, NR2, NR3]
CURRENT PERMITTED USES SMC 23.44.041	Single Family Residential, Accessory Dwelling Units a lot with or proposed for a principal single-family dwelling unit may have up to two accessory dwelling units, No more than one accessory dwelling unit is a detached accessory dwelling unit
LOT COVERAGE SMC 23.44.010.C	35%, excluding decks <36” above grade and first 36” of eaves and gutters
FLOOR AREA SMC 23.44.041.B.1	ADU and DADU do not count toward FAR limits DADU max floor area: 1000 sf excluding: 250 sf of garage, exterior accessed storage, covered decks<25 sf, up to 35 sf of long-term bike storage, underground area <4’ above grade
HEIGHT SMC.23.44.012.A.3 SMC.23.44.041.C	18’ pitched roof +7’ shed roof +4’ green building certification +2’
YARDS SMC 23.44.014.B	Front 20’ Rear 25’ or 20% lot depth Side: 5’ exceptions: 1. uncovered porches <4’ above grade at min 3’ from lot line, width and depth <6’ within the required yard, limited to 1 per required yard; 2. covered unenclosed decks and patios, minimum 12ft clear of centerline of alley, min 5ft from rear lot line, min 5ft from side lot line, min 5ft from other structures, max 12ft high, no roof decks allowed; 3. projections including eaves, chimneys, bay windows up to 8ft wide and 2ft deep totaling , 30% of the facade length; 4. DADU may cover up to 60% of rear yard; 5. DADU 5ft minimum rear yard, 0ft yard at alley; 6. entrances facing side or rear lot lines minimum 10ft from lot line
SEPARATION SMC.23.44.041.C	min 5ft from principle structure including eaves and gutters
PARKING SMC 23.44.041.A.5	not required

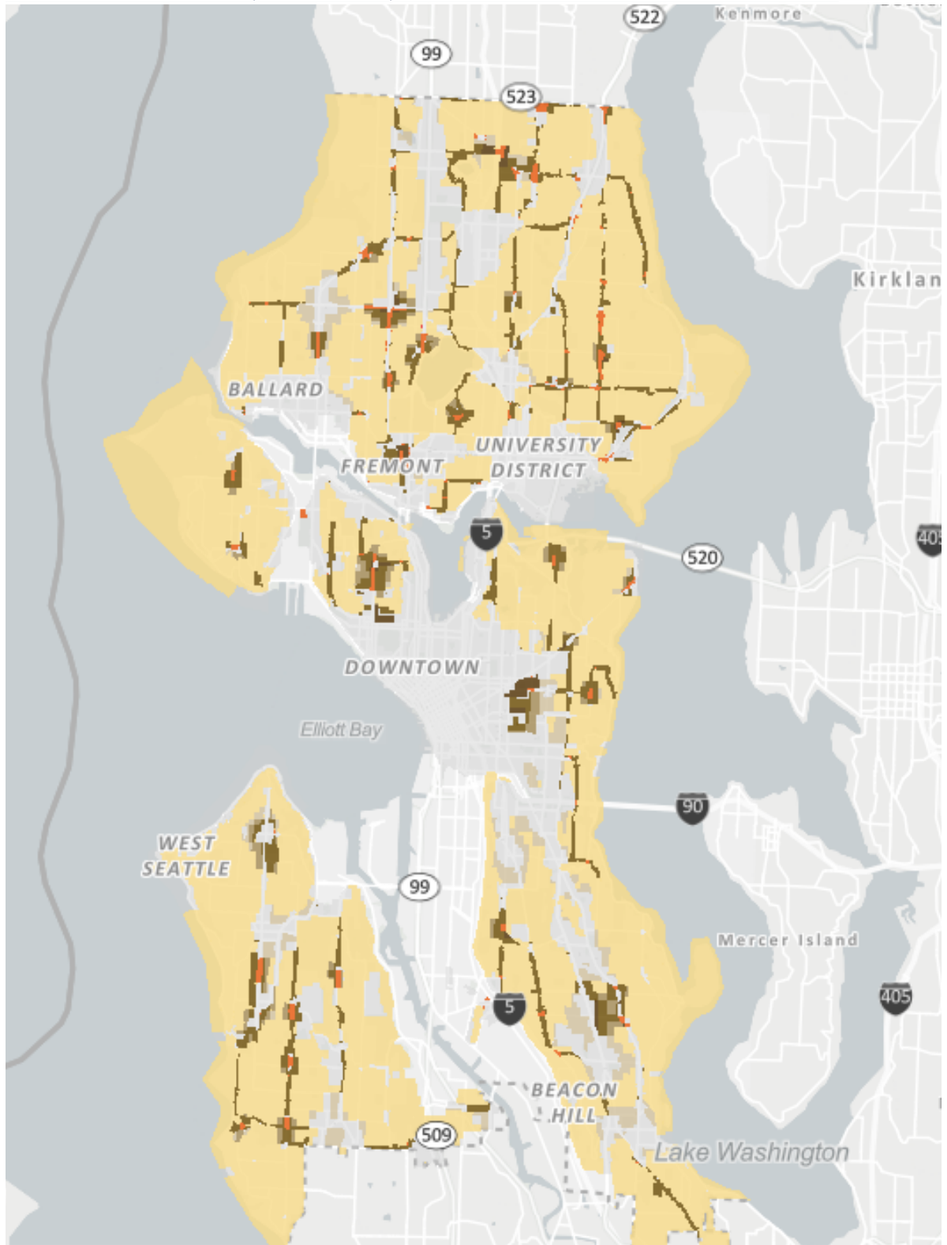
[b] CODE COMPLIANCE

CURRENT LAND USE CODE - DETACHED ACCESSORY DWELLING UNIT [DADU]



[b] CODE COMPLIANCE

ONE SEATTLE PLAN, HB 1110, EXPECTED ADOPTION 30.06.2025

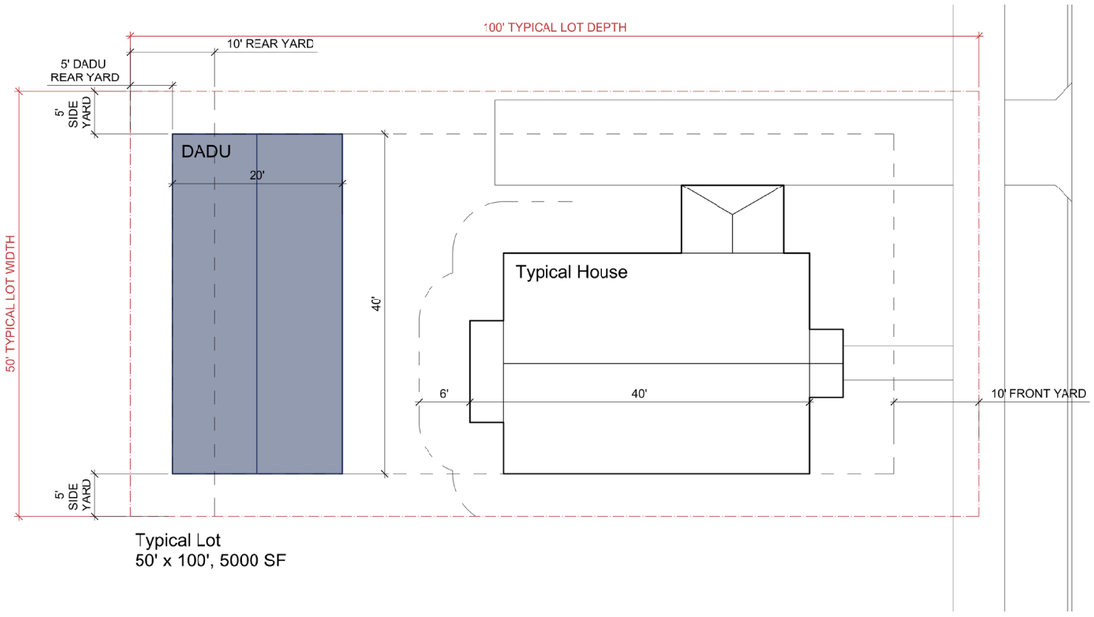


NEIGHBORHOOD RESIDENTIAL

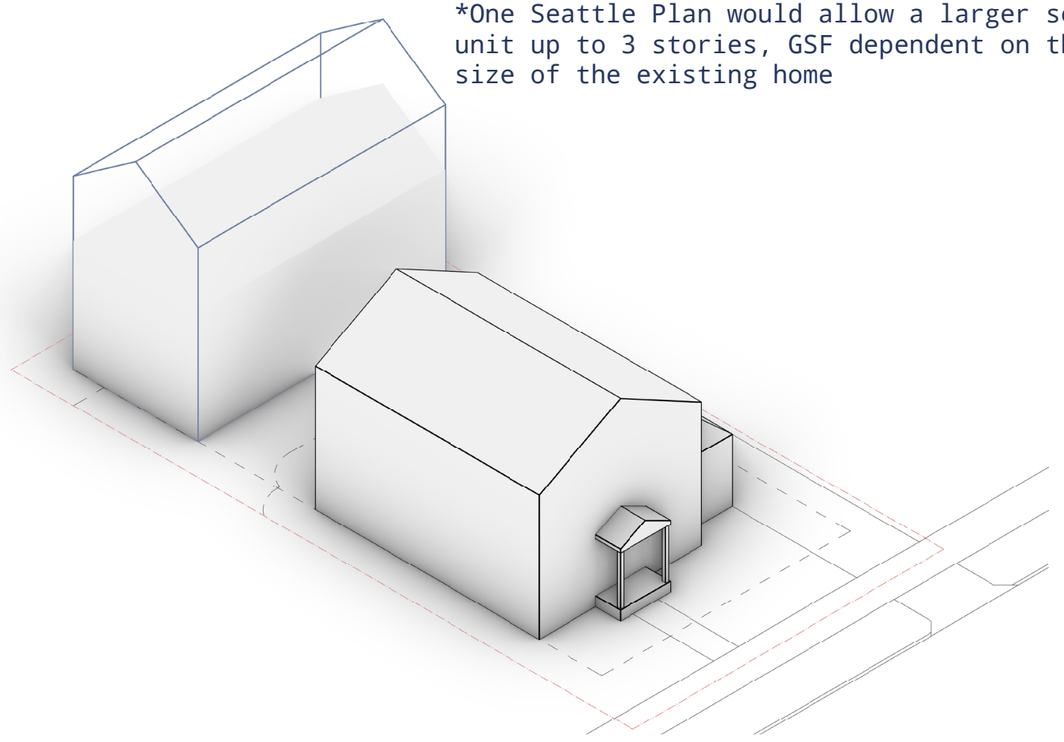
FUTURE ZONING	Neighborhood Residential
PERMITTED USES	up to 4 residential units, up to 6 units within 1/4 mile walk of major transit or if 2 units are affordable
LOT COVERAGE	50%
FLOOR AREA	0.6 FAR for one unit / lot 0.8 FAR for two units / lot 1.0 FAR for 3 units / lot 1.2 FAR for 4+ units per lot 1.4 FAR for 4+ stacked units
HEIGHT	3 stories +1 story for affordable housing
SETBACKS	Front 21’ Rear 10’ Side: 5’ Exceptions: 1. DADU 5ft minimum rear yard, 0ft yard at alley; 2. covered porches may extend up to 6 ft into setback, up to 100 sf per porch allowed in setback; bay windows and balconies may extend up to 2ft into setback, up to 8ft in width.
SEPARATION	min 6 ft between buildings
OPEN SPACE	20% of lot area minimum dimension for usable open space is 8ft, or if the open space includes a circulation pathway serving multiple buildings,11 feet; may be private or shared; at least half the open space must be at ground level, only half the open space not at ground level count towards the requirement.
PARKING	not required

[b] CODE COMPLIANCE

ONE SEATTLE PLAN - DETACHED ACCESSORY DWELLING UNIT [DADU]

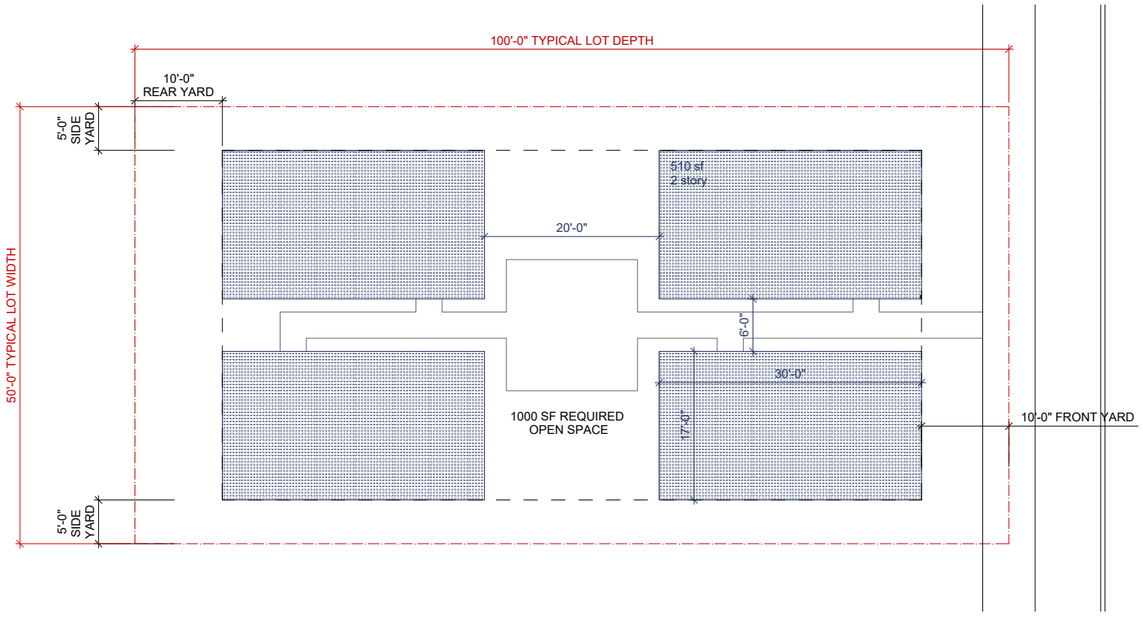


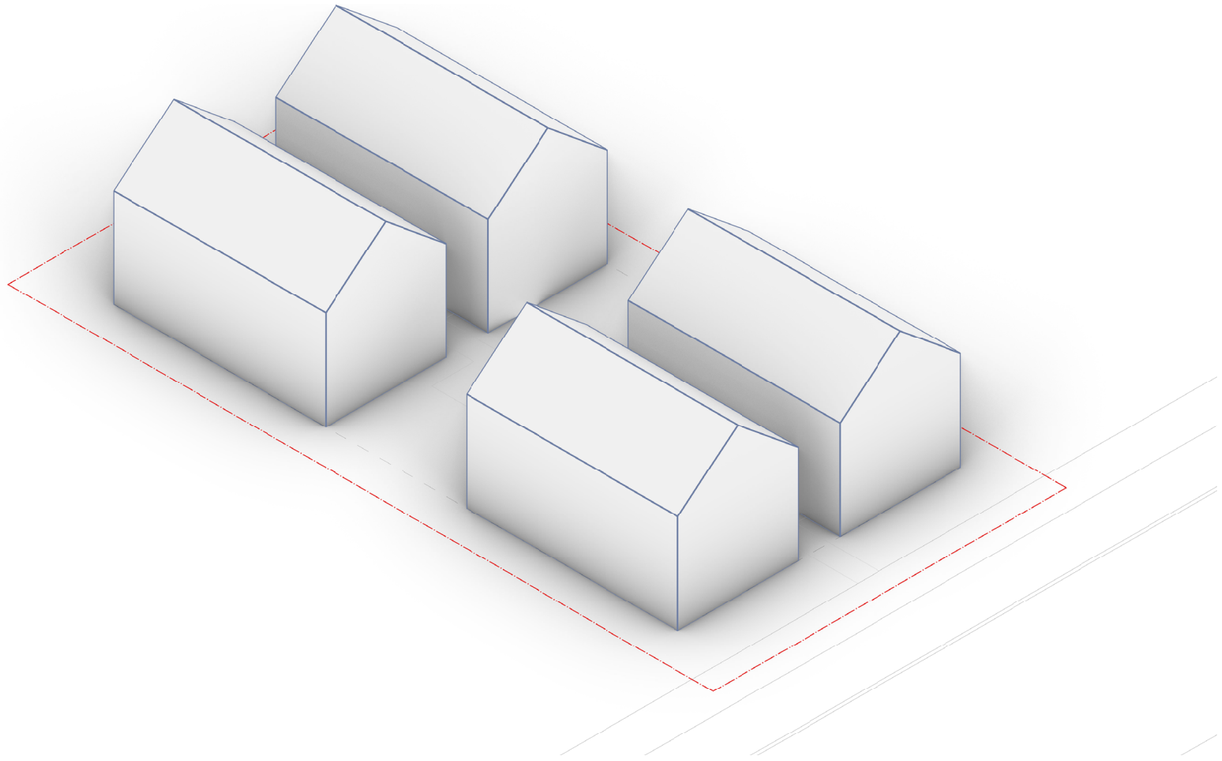
*One Seattle Plan would allow a larger second unit up to 3 stories, GSF dependent on the size of the existing home



[b] CODE COMPLIANCE

ONE SEATTLE PLAN - COTTAGE COURT

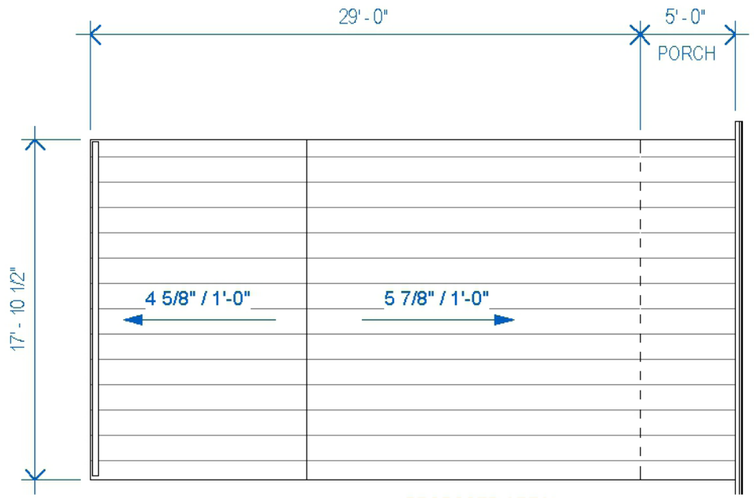




An illustration of the allowable density under the proposed zoning changes. The footprint and height are also compliant with current zoning limitations. Up to 6 units are allowed on lots within 1/4 mile of transit under the proposed zoning changes, height limitations of current zoning code may restrict the design. The smaller footprints are useful and applicable to smaller lots, down to the 3,200 SF minimum.

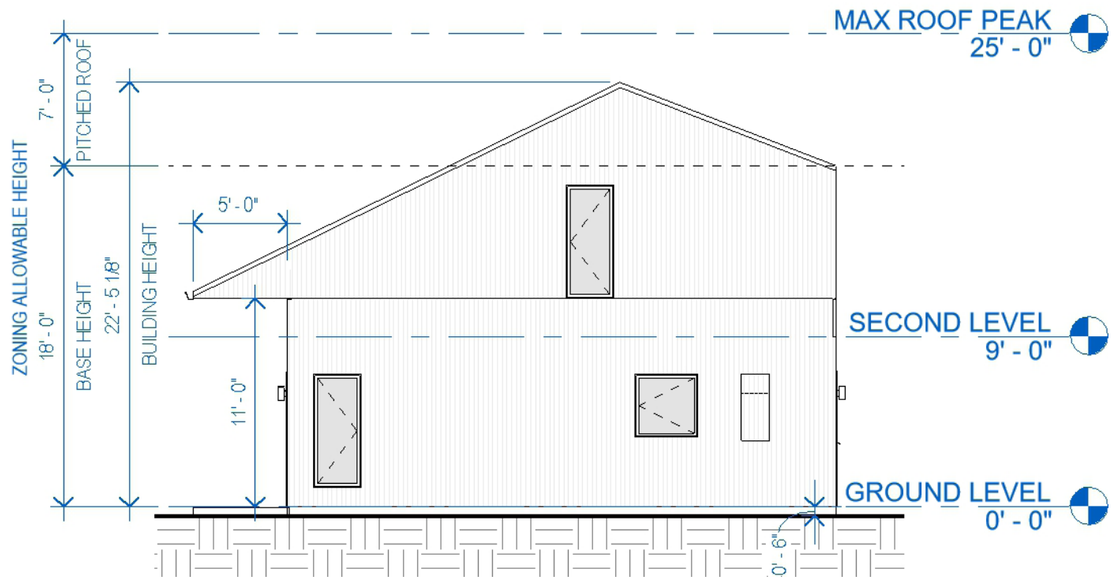
[b] CODE COMPLIANCE

HOUSE 1.0 - APPLICATION OF LAND USE CODE



PROPOSED AREA:	**814.21 GSF**
DADU ALLOWABLE AREA:	1,000 SF
LOT COVERAGE AREA:	606.88 SF
SETBACK EXEMPT COVERED PORCH AREA:	88.50 SF
TOTAL HEATED AREA:	703.29 SF

Allowable Area

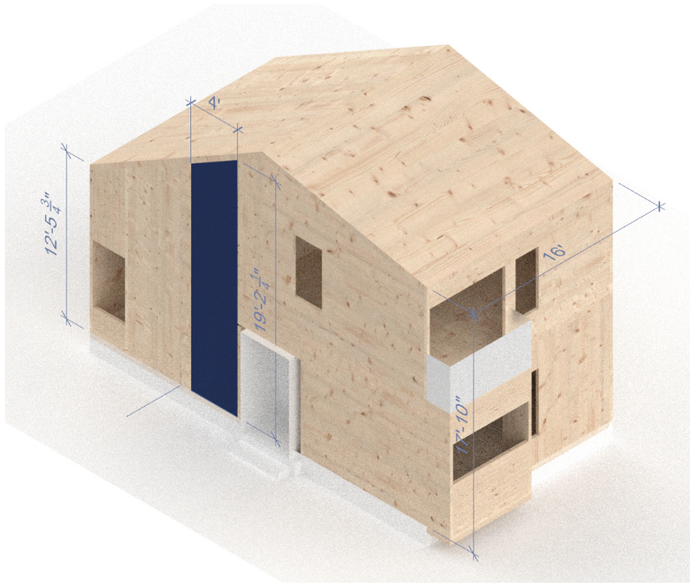


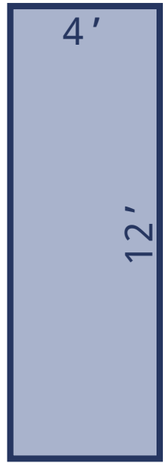
Allowable Height

Current Seattle Land Use restricts the allowable area and the allowable height of Detached Accessory Dwelling Units. The proposed design is compliant with the current code limitations.

[b] CODE COMPLIANCE

MATERIAL AND STRUCTURAL CONSTRAINTS

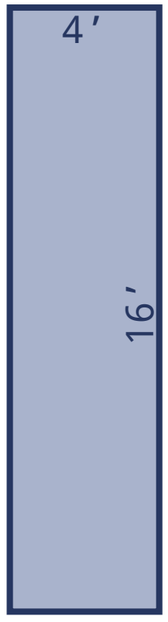




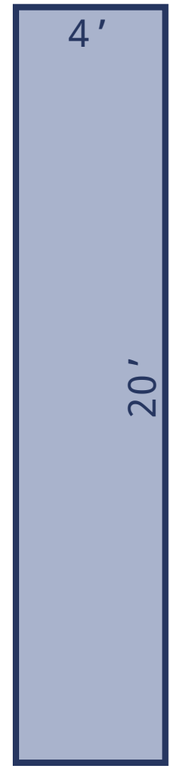
current limits of CRTC press

limits wall heights and floor and roof spans, requiring more beams

structural span is also limited to approximately 12’ due to vibration



ANSI/AWC 2021 Special Design Provisions for Wind and Seismic (SDPWS) Appendix B restrict CLT shear walls to an aspect ratio of 1:4. This limits shear wall height of a 4’ wide panel to 16’

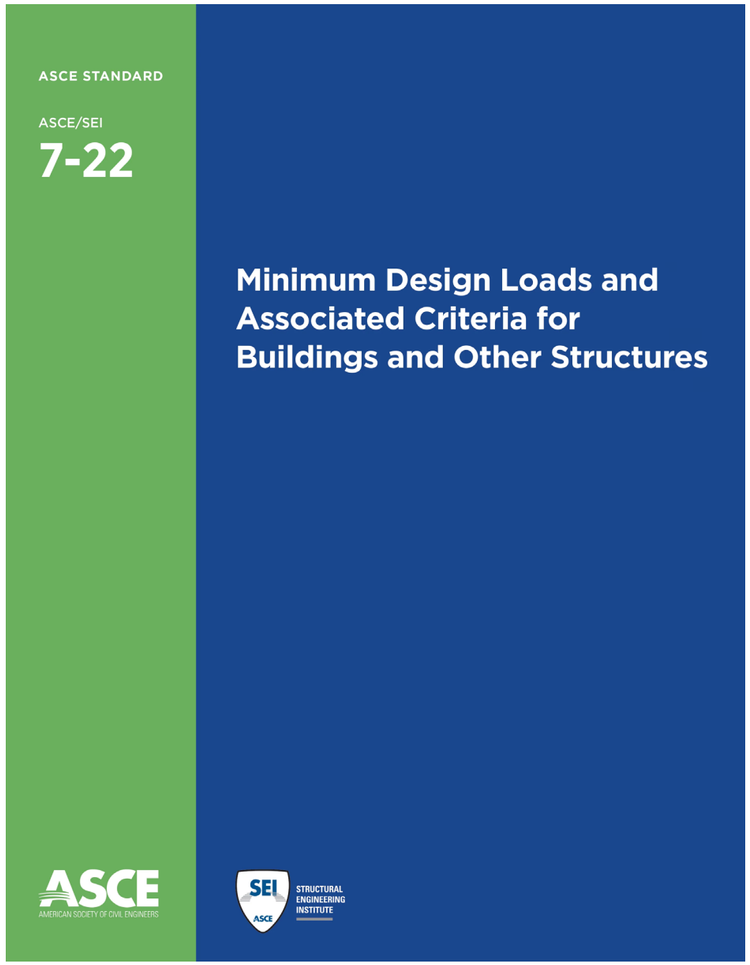


20’ panel length would allow for double height spaces and more design flexibility for floor plans and non-shear walls

Current Code limitations for the use of CLT shear walls limit design flexibility and can have large cost impacts. CLT shear walls must consist of panels of equal width with an aspect ratio between 1:2 and 1:4. This impacts the location and size of openings for doors and windows and the height of walls. Current code language does not account for sloped roofs, so some local code interpretation is required.

[b] CODE COMPLIANCE

HOUSE 1.0 - APPLICATION OF STRUCTURAL CODE



2021 Seattle Residential Code references ASCE 7-16 “Minimum Design Loads and Associated Criteria for Buildings and Other Structures” This standard does not account for CLT shear walls. In order to build with CLT walls in Seattle a code alteration to reference the more current ASCE 7-22 is required.



ANSI/ APA PRG-320 covers the manufacturing, qualification, and quality assurance requirements for cross-laminated timber. CLT is required to have this certification in order to be utilized as a structural material under and building code that references the International Building Code (IBC) or International Residential Code (IRC). In order to use non-certified CLT independent testing and a code alteration are required.

[c+d] TESTING AND REVIEW



To meet the outlined goals of the grant to [c] advise and collaborate on any required testing and data collection to support a certification package, and [d] recruitment/ advisement for any independent peer-review team analysis if required by SDCI, atelierjones,

• Reviewed the PRG-320 requirements to identify any potential areas that could be an issue in the path to certification due to the use of thermally-modified lumber, as well as finding the best arguement of equivalency-or-greater for seeking SDCI approval pre-PRG-320 certification.

• Reviewed available data from CRTC, including previous publications such as graduate degree theses, as well as an external literature review of white papers on thermally-modified lumber to better understand, discuss, and address any questions or concerns that may arise from SDCI review.

• Collaborated with CRTC to review testing and lumber grading certification advisement for PRG-320 to address any roadblocks that may arise from that with SDCI.

• Met with SDCI to review existing data and discuss future testing to propose a preferred permit pathway.

With this work the team was able to secure an ideal outcome with SDCI agreeing to approve upon review two Code Modification requests (AMMRs), for product approval and the formal CLT shear wall system per ASCE 7-22; and a Standard Plan review. Pending this approval, the DADUs will be pre-permitted for construction, with the exception of site-specific review.

atelierjones, llc
architecture | ecodesign | planning

CRTC
BUILDING INNOVATION CENTER

EDC
CLALLAM ECONOMIC DEVELOPMENT COUNCIL

[c+d] TESTING AND REVIEW

PRG-320 REVIEW

Shown here on the right is a synopsis of the PRG-320 analysis completed with a few of the special code areas that could have created potential road-bumps in the pursuit of SDCI approval.

For our work, the only areas that ended up needing focus was sections 7 and 8 for the qualification and mechanical testing of the panels so that SDCI could review for equivalency and approve the usage of the product and design.

However, beyond the scope of this grant, the CRTC is aware of, and already engaging the Pacific Lumber Inspection Bureau (PLIB) to obtain a certified grading of the themally-modified lumber, which atelierjones sat in on these conversations to familiarize with and understand possible issues that could arise.

Regarding the possibility of fire tests, the issue of fire testing of the panel (and/or adhesives used) did not arise with SDCI, however it is possible that a different AHJ in the future might inquire. The atelierjones team is aware of other academic grant proposals the CRTC is involved in that are already investigating related research on bonding performance and fire.

Finally, if a client sought to utilize the CRTC panels in a larger or alternate building type, testing the panels to obtain a fire-rating would be necessary, however we are aware the CRTC has (of-yet) no interest in scaling up to such projects.

PRG 320 RELEVANT AREAS FOR TMW

relevant areas for studying adoption of TMW panels

6.1.2 Sawn Lumber Laminations

a. Lumber species - Lumber of any softwood species or species combinations recognized by American Lumber Standards Committee (ALSC) under PS 20 or Canadian Lumber Standards Accreditation Board (CLSAB) under CSA O141 with a minimum published specific gravity of 0.35, as published in the National Design Specification for Wood Construction (NDS) in the U.S. and CSA O86 in Canada, shall be permitted.

b. Lumber grades - The minimum grade of lumber in the longitudinal layers of CLT shall be 1200f-1.2E MSR or visual grade No. 2. The minimum grade of lumber in the transverse layers of CLT shall be visual grade No. 3. Remanufactured lumber shall be considered as equivalent to solid-sawn lumber when qualified in accordance with Section 5.4 of ANSI A190.1 in the U.S. or SPS 1, 2, 4, or 6 in Canada. **Proprietary lumber grades meeting or exceeding the mechanical properties of the lumber grades specified above shall be permitted for use provided that they are qualified in accordance with the requirements of an *approved agency*.**

7.1.2 Custom CLT Grades and Layups

CLT grades and layups that are not listed in Annex A shall be considered as custom grades and layups. Custom CLT grades and layups shall be permitted when approved by an *approved agency* in accordance with the **qualification and mechanical test requirements specified in 8.4 and 8.5** [Mechanical Property Qualification including Moisture Conditioning, Flatwise Bending Properties, Flatwise Shear Properties, Edgewise Bending Properties, and Edgewise Shear Properties.]

8.4.1 Required Mechanical Property Qualification

The flatwise bending and flatwise shear properties of CLT grades at extreme depths in both major and minor strength direction shall be tested in accordance with 8.5.3 and 8.5.4 to confirm the design values shown in Table A2 for use in the U.S. or Table A4 for use in Canada, or the design values approved by an approved agency.

8.4.2 Optional Mechanical Property Qualification

When edgewise bending and edgewise shear properties are to be approved by an approved agency, qualification tests shall be conducted in accordance with 8.5.5 and 8.5.6, respectively.

8.5.1 Sampling

Test specimens, including the width of laminations, shall be representative of typical production and shall be sampled at the manufacturing facility by an approved agency using the layup intended for qualification. The sample size required for stiffness capactities shall be sufficient for estimating the population mean within 5% precision with 75% confidence, or 10 specimens, whichever is greater. In general, a sample size larger than 10 is needed when the coefficient of variation is greater than 13%. The sample size required for strength capacities shall be sufficient for estimating the characteristic value with 75% confidence in accordannce with ASTM D2915.

POTENTIAL FIRE TESTS

A major portion of the PRG 320 is **Annex B: Practice for Evaluating Elevated Temperature Performance of Adhesives Used in Cross-Laminated Timber Using the Compartment Fire Test (CFT) Method**.

This test exists to evaluate the elevated temperature performance of adhesives used in cross-laminated timber. Completed versions of this test have been used to determine industry standard accepted adhesives and the test is not mandatory for new panel qualification unless a different adhesive type is being proposed.

However, one unknown test variable of Thermally Modified Wood is understanding how standard adhesives maintain their bond in relation to the altered properties of the wood. It is not beyond the realm of possibility that a conservative reviewer approving the use of TMW CLT panels might require a full Annex B fire test to prove the altered wood composition does not affect the glues performance in a fire scenario.

Additional fire tests that could be necessary for approval would be the ASTM E119 for determing the fire-rating of a panel (as required by building code, dependant on final project design).

[c+d] TESTING AND REVIEW

TESTING DATA

The team began their study of testing with a literature review of existing research on thermal modification for wood and processed wood prodcuts to better comprehend what was the prevailing understanding of the technology as well as widely-agreed upon areas of data that were potentially missing or not fleshed-out enough, yet.

Prior to atelierjones being brought in for this grant, the CRTC had initiated previous rounds of TM CLT testing in 2023 and 2024. That research had shown promise that the premise of TM CLT could achieve the necessary mechanical properties as outlined in the PRG-320, however due predominately to the scale of testing and other factors such as location of production, the team determined that another round of testing would be necessary for SDCI approval, which prompted the testing done in 2025. This testing was on panels manufactured by the CRTC at their facility and at a scale of quantity that could guarentee statistical reliability for SDCI.

The values achieved in the latest testing show structural values akin to the standard V3 graded panel.

Of note for posterity: the lower values shown in the 2024 testing are due to the panels being stress-tested for shear testing prior to testing their mechanical properties, which is why the values are an outlier.

5. Comparison of mechanical properties of TM CLT panels produced at CRTC and WSU

The experimental test results were compared to the previous test results of TM CLT panels that were produced at WSU and CRTC facilities. The following is the information about the TM CLT panels that were tested at WSU since 2023. This is a preliminary report; the complete comparison will be provided in the final report.

Group A: TM CLT Panel manufactured at WSU in Summer of 2023 using Gen_1 TM Lumber treated at 180C (not treated at CRTC);
Group B: TM CLT Panels manufactured at CRTC in Summer/Fall 2024 using TM lumber treated at 180C at CRTC facility.
Group C: TM CLT Panels manufactured at CRTC in Summer 2025 using TM lumber treated at 180C at CRTC facility.

Flatwise Bending - Major Direction

	A: TM CLT - Made at WSU (Summer 2023)	B: TM CLT - Made at CRTC (shear wall tests) (Summer/Fall 2024)	C: TM CLT - Made at CRTC (Summer 2025)	Comparison: [CRTC CLT] / [WSU CLT]	
	13 specimens	*6 specimens*	*26 specimens*	B/A	C/A
	Ultimate Moment (lb-in/ft)				
Mean	107305	80035	107796	**0.75**	**1.00**
SDEV	20586	23600	25386	**1.15**	**1.23**
COV	0.19	0.29	0.24	**1.54**	**1.23**
	$(EI)_{Eff}$ lb-in^2 /ft × 10^6				
Mean	44.1	31.4	38.7	**0.71**	**0.88**
SDEV	5.1	3.1	2.4	**0.60**	**0.47**
COV	0.12	0.10	0.06	**0.85**	**0.54**

Flatwise Bending - Minor Direction

	A: TM CLT - Made at WSU (Summer 2023)	B: TM CLT - Made at CRTC (shear wall tests) (Summer/Fall 2024)	C: TM CLT - Made at CRTC (Summer 2025)	Comparison: [CRTC CLT] / [WSU CLT]	
	13 specimens	*6 specimens*	*12 specimens*	B/A	C/A
	Ultimate Moment (lb-in/ft)				
Mean	21853	-	26642	-	**1.22**
SDEV	4332	-	3152	-	**0.73**
COV	0.20	-	0.12	-	**0.60**
	$(EI)_{Eff}$ lb-in^2 /ft × 10^6				
Mean	3.04	-	3.97	-	**1.31**
SDEV	0.30	-	0.29	-	**0.98**
COV	0.10	-	0.07	-	**0.75**

Flatwise Shear - Major Direction

	A: TM CLT - Made at WSU (Summer 2023)	B: TM CLT - Made at CRTC (shear wall tests) (Summer/Fall 2024)	C: TM CLT - Made at CRTC (Summer 2025)	Comparison: [CRTC CLT] / [WSU CLT]	
	15 specimens	*6 specimens*	*50 specimens*	B/A	C/A
	Ultimate Shear (lb/ft)				
Mean	8148	-	8028	-	**0.99**
SDEV	624	-	1156	-	**1.85**
COV	0.08	-	0.14	-	**1.88**

[e] MEP DESIGN



Washington State Energy Codes are now some of the strictest in the country. Cross laminated timber structures lend themselves to passive house design principles and air-tight envelopes. The interior exposure of CLT requires exterior continuous insulation. The use of exterior continuous insulation allows building to be more efficient and reduces the required R-values of roofs, therefore reducing material usage and cost. Well insulated tight envelopes and small footprints mean these homes can use smaller mechanical equipment, further saving cost on one of the most expensive line items other than structure.

Building with interior exposed structural surfaces also requires careful consideration of systems and routing. The eam utilized the space above the bathroom ceiling and a small exterior alcove to conseal all the required mechanical equipment, exposing no outdoor units that can be noisy eyesores. The minimalist mechanical design utilizes the two site-build closet walls to get air supply and ventilation to the entire home without exposed wall mounted units.

All these strategies are neatly integrated into a bathroom and kitchen that are design to be optional modular wet cores that can be built off site with all the equipment pre-installed to be placed at the same time as the panels during construction. this approach can massively reduce cost and overall construction time and on-site labor and waste when deployed at scale.

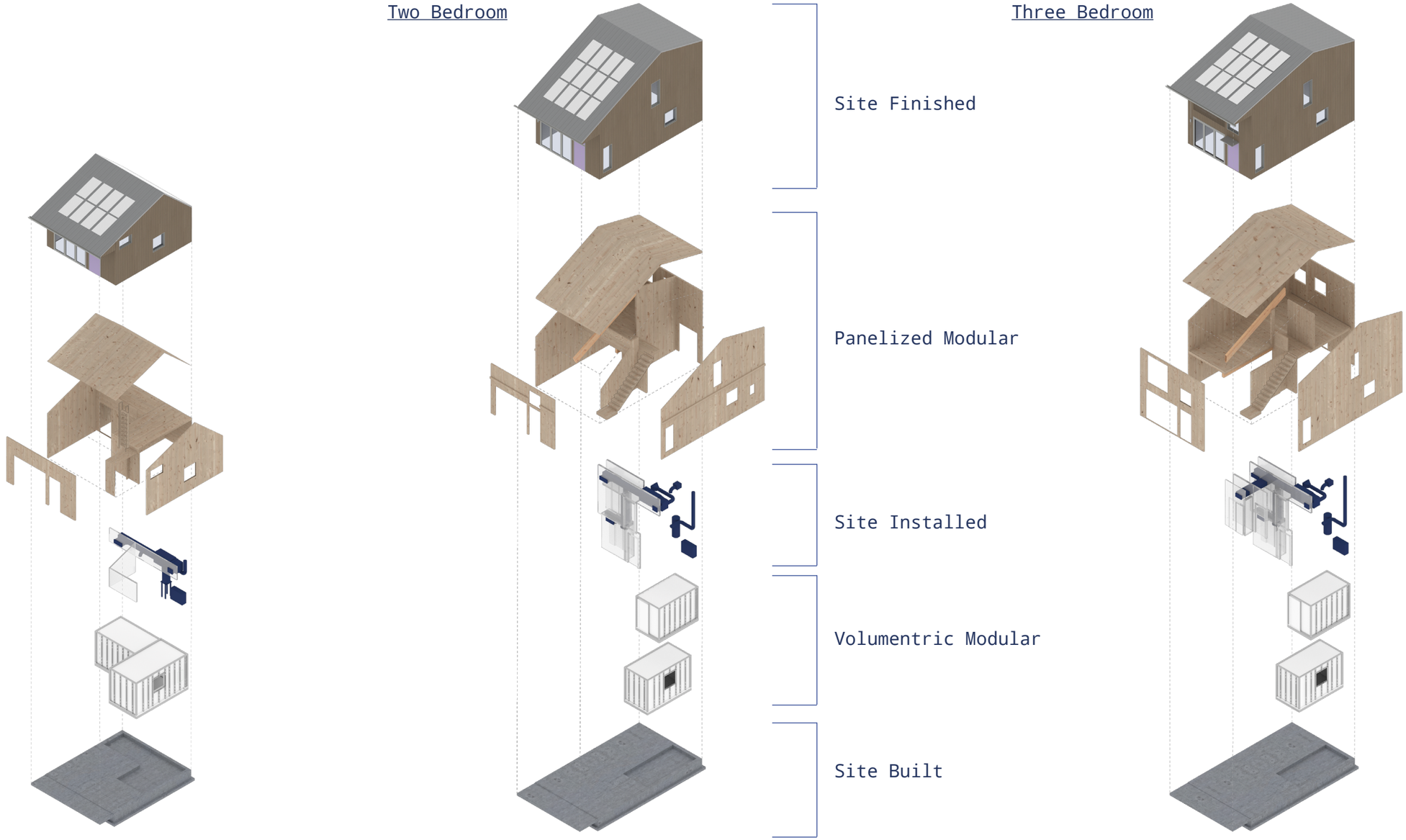
[e] MEP DESIGN

MODULAR WET CORES AND MECHANICAL ROUTING STRATEGIES

One Bedroom

Two Bedroom

Three Bedroom



Mechanical systems are integrated into the two modular wet cores with units ready to be mounted on site. A limited amount of duct work for ventilation and fresh air supply are integrated into the one or two site-built bedroom partitions and closets. This approach allows for maximum exposed wood with no exposed mechanical systems or mini-split wall cassettes.

WASHINGTON STATE ENERGY CODE COMPLIANCE FORMS

Project Information
Clallam County EDC CLT Home, Seattle, Washington

Contact Information

Messages / Results *

Review required for custom entries: - Doors- Overhead Glazing- Vertical Glazing- Flat/Vaulted Ceilings- Wall (abov
UA Reduction = 0.73, Proposed UA is better than baseline by 0%

Window area is 12% of floor area
-Ducts must be in conditioned space to select Option 4.1.
Whole House Mechanical Ventilation Airflow Rate: 52.5 CFM with Run Time Percent of 100%, Unbalanced, Not Distribute
Maximum allowable total measured duct leakage: 24 CFM25

* Results assume your inputs are complete and correct. Results do not constitute an approval. Analysis should be reviewed by your AHJ.

ANALYSIS SET UP

What code compliance pathway are you using?	U-Factor Compliance Path / Total UA Alternative
Project Building Type?	New Construction
Occupancy Type?	R3 Single family homes and duplexes
Code Version?	WSEC 2021
Classification:	Small Dwelling Unit -- 800 sq. ft.
Baseline Description:	Code Baseline - Baseline and proposed window areas are equal.
About Your Selection:	Up to 15 sf exempt window and 24 sf exempt door allowable

WSEC-R Rev: Oct. 2023, https://www.sbcc.wa.gov/sites/default/files/2023-12/O

RESULTS - Comparison of Baseline and Proposed Design

Component Performance, R occupancies	Baseline U *	Baseline Area	Baseline UA	Proposed Design U	Proposed Design Area	Proposed Design UA
Doors U =	0.300	112	33.7	0.370	112	41.5
Overhead Glazing U =	0.500	21	10.5	0.500	21	10.5
Vertical Glazing U =	0.300	94	28.2	0.370	94	34.8
Flat/Vaulted Ceilings U =	0.024	800	19.2	0.023	800	18.6
Wall (above grade) U =	0.056	1,381	77.3	0.045	1,381	62.8
Floors over Crawlspace U =	0.029	0	0.0		0	0.0
Slab on Grade F =	0.540	94	50.8	0.540	94	50.8
Below Grade Wall U =	N/A	0			0	0.0
Below Grade Slab F =	N/A	0			0	0.0

* Values from Table R402.1.2 (Oct 2023)

Baseline UA Total	219.7	Proposed UA Total	218.9
Required Credits	5.0	Proposed Credits	5.5 from Tables 406.2 and 406
		UA Percent Reduction	0.3%
		UA Reduction	0.7

If the Proposed UA ≤ the Target UA, and the Proposed Credits from Table 406 are ≥ those required in Section R406, then the home meets the WSEC.

Table R406.2 Energy Equalization Credits

System No.	Full Description	Select System Type	Fuel Normalization Credits (406.2)	Energy Credits (406.3)	Total Credits (406.2 & 406.3)
4	For heating system using a heat pump that meets federal standards for the equipment listed in Table C403.3.2(2) or Table C403.3.2(9) OR Air to Water heat pump units that are configured to provide both heating and cooling and are rated in accordance with AHRI 550/590	Variable Refrigerant Heat Pump or Air-to-Water Heat Pump	3.0	2.5	5.5

Table R406.3 Energy Credits

Option No.	Category	Select Options	Energy Credits	Brief Description of Selected Options*
1	Efficient Building Envelope			
2	Air Leakage Control and Efficient Ventilation			
3.1 -3.10	High Efficiency HVAC	Option 3.6	1.0	Air source ducted Heat Pump w/ Min HSPF2 of 10 (HSPF of 11). If htg design temp is 23F or below,a cold climate variable capacity heat pump is required.
3.11	High Efficiency HVAC: Smart Thermostat	Option 3.11	0.5	Connected Energy Star Certified smart thermostat.
4	High Efficiency HVAC Distribution System	Option 4.1	0.5	Ducts/distribution system in conditioned space per R403.3.2 Electric resistance, hydronic, ductless and gas fired systems < 80% AFUE systems not permitted
5.1	Efficient Water Heating: Drain Heat Recovery	Not Selected	0.0	-
5.2	Efficient Water Heating: Compact Hot Water Distribution	Not Selected	0.0	-
5.3-5.8	Efficient Water Heating	Not Selected	0.0	-
6	Renewable Electric Energy - kWh	Not Selected	0.0	
7	Appliance Package	Option 7.1	0.5	All of: Energy Star rated, most efficient dishwasher, refrigerator, washinging machine and dryer.
	Energy Credits		2.5	

*Refer to WSEC 2015 Table R406.2 for complete option descriptions and requirements

THERMAL ENVELOPE DETAILS - Proposed Design

Conditioned Floor Area, Proposed Design	800 sq. ft
Classification	Small Dwelling Unit
Notes	CLT House and EPS exterior insulation

Exterior Doors

Plan ID	Component Description	Ref.	Door U	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
Exempt									0	0.0
d5	French/Glass Door	Custom	0.37	1	9	0	7	2	65	23.9
d6	Entry Door	Custom	0.37	2	3	4	7	2	48	17.7
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
									0	0.0
								Sum of Area and UA	112	41.5
								Exterior Doors Area Weighted U		0.370

Overhead Glazing

Plan ID	Component Description	Ref.	Glazing U	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
ws1-o	Custom skylight	Custom	0.50	1	3		7		21.0	11
									-	
									-	
									-	
								Sum of Area and UA	21.0	11
								Overhead Glazing Area Weighted U		0.500

Vertical Glazing Schedule — Rows to Show: 12

	Plan ID	Component Description	Ref.	Glazing U	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
	Exempt			-						-	-
1	w1-o	Operable Window (U-0.38)	Custom	0.37	4	2	6	4	0	40.0	14.80
2	w2	Operable Window (U-0.38)	Custom	0.37	2	2.00	6	6	0	30.0	11.10
3	w2-o	Fixed Window (U-0.38)	Custom	0.37	4	3	0	2	0	24.0	8.88
4										-	-
5										-	-
6										-	-
7										-	-
8										-	-
9										-	-
10										-	-
11										-	-
12										-	-
								Sum of Area and UA	94.0	34.8	
								Vertical Glazing Area Weighted U		0.370	
								Vertical Glazing and Doors Area Weighted U		0.370	

Flat/Vaulted Ceilings

Plan ID	Component Description	Ref.	Attic U	Area	UA
	3-PLY CLT 6" + 9" Mineral Wool	Custom	0.023	800	18.6
			Sum of Area and UA	800	18.6

Walls (Above Grade)

Plan ID	Component Description	Ref.	Wall U	Net Area	UA
e04	CLT 3-PLY 3" + 4" Mineral Wool	Custom	0.045	1,381	63
			Sum of Area and UA	1,381	63

Floor (over crawl or exterior)

Plan ID	Component Description	Ref.	Floor U	Area	UA
			Sum of Area and UA	0	0

Slab on Grade (less than 2 feet below grade)

Plan ID	Component Description	Ref.	Slab F	Slab Perim	FP
	R10 2' vertical (Code Baseline)	10-2	0.540	94	51
			Sum of Perimeter and FP	94	51

Below Grade Walls and Slabs

Plan ID	Component Description	Slab Depth	Ref.	Wall U	Wall Area	Wall UA	Slab F	Slab Perim	Slab UA
			Sum of Area, Length and UA	0	0.0			0	0

Links to Download Forms, Checklists and Other Resources — Link

Compliance Certificate	Compliance Certificate	Instructions
Insulation Certificate for Residential New Construction	Insulation Certificate	
Duct Testing Affadavits		
Existing Construction	Affidavit, Existing	
New Construction	Affidavit, New	
Prescriptive Checklist for 2018 WSEC	Prescriptive Checklist	
Alterations (Remodel) Worksheet	Worksheet	
EER SEER2 COP HSPF2 Converter	https://www.adicotengineering.com/eer-seer2-cop-hspf2-kwton-converter	

Ventilation Requirements

Conditioned Floor Area	800 sq. ft.
Number of Bedrooms	2
Run-Time Percent in Each 4-Hour Segment	100%
Is the system Balanced?	Unbalanced
Is the system Distributed?	Not Distributed
Ventilation Code Section	IRC, Chapter 15
Whole House Mechanical Ventilation Airflow Rate	53 CFM

HVAC Thermal Distribution System — Download RS-33 (2018) http://www.energy.wsu.edu/Documents/Duct%20Testing%20Standards%2

Is this a hydronic heating system?	No
Location of Ducts	Unconditioned Space
Location of Air Handler	Conditioned Space

Ducts must be in conditioned space to select Op

Is Duct Testing Required? Yes

Maximum Duct Leakage:

Is this a post-contruction test?	No
Is the air handler installed?	No
Maximum total measured duct leakage per square foot	0.03 CFM25 per sq. ft.
Maximum allowable total measured duct leakage	24 CFM25

MECHANICAL SPECIFICATIONS, SEE APPENDIX A

1. This project is a high-end luxury residence. Contractor shall perform services with the utmost care, attention to detail, and consideration of proper system performance prior to turnover.
2. Reasonable attempt has been made to coordinate the fitment of indicated systems with the plans and/or models provided by Others during the production of these plans. Plans do not contain all needed information and do not fully constrain all aspects of the construction. Therefore, as required by field conditions, the contractor shall make minor routing adjustments, provide larger soffits, add soffits, add furring, lower ceilings, modify trim, move fixtures, cut/reinforce structure, core-drill, and/or make other adjustments to accommodate all items indicated in these plans. These field adjustments are considered design-build work developed by the Contractor. Examples include:
   A. Depth and location of site utilities.
   B. Landscaping, patios, pavers.
   C. Door and window headers and king studs.
   D. Nonstructural framing and furring.
   E. Structural framing, shear walls, nailing, bracing.
   F. Joist spacing, shapes, blocking.
   G. Truss spacing, shapes, cross members.
   H. Beam and column shapes.
   I. Sheathing, strapping.
   J. Ceiling materials, thickness.
   K. Interiors, trim, faux objects, casework.
   L. Appliances, FF&E.
   M. Fireplaces, chimneys.
   N. Fire suppression piping, sprinklers, and devices.
   O. Attachments, brackets, hardware.
   P. Vibration controls.
   Q. Pipe and duct insulation.
   R. Plumbing and HVAC appurtenances.
   S. Electrical trays, boxes, conduits, wiring.
   T. Electrical appurtenances.
   U. Lighting fixtures.
   V. Fire alarm panels, wiring, and devices.
   W. Data, networking, security, controls, wiring, and devices.
3. Refer to Cover Sheet and Division 01 specifications for additional information about deferred submittals, codes, design-build details, seismic and wind criteria, submittals, closeout requirements, etc.
4. Fire Suppression and Fire Alarm designs shall be by design-build PE, or NICET licensed technicians. Contractor shall submit to Building Department as DEFERRED SUBMITTALS. Contractor shall include all fees for designing and permitting of these systems. Any related information shown on the MEP plans indicates design intent but is for general guidance only.
5. Mechanical controls, lighting controls, security, data, telecom, audio-visual, WiFi, access controls, and similar low-voltage (less than 50V) designs shall be by the Contractor. Contractor shall include all fees for designing and permitting of these systems. Any related information shown on the MEP plans indicates design intent but is for general guidance only.
6. Seismic Bracing and Attachments shall be designed by the Contractor. Contractor shall submit to Building Department as DEFERRED SUBMITTALS if requested by building department. Contractor shall include all fees for designing of these systems. Any related information shown on the MEP plans indicates design intent but is for general guidance only. Consult Structural Engineer for more information.
7. These notes accompany all other specification sections, manuals, and notes across all divisions. Subcontractors are bound with the general contractor to all parts of the construction contract. See specifications, plans and other divisions for additional information required for coordination. If a conflict is discovered, submit a request for interpretation.
8. These plans and their referenced specifications function together as design intent and depend upon all other parts of the design documents from all other parties (structure, civil, fire protection, data, etc). These plans and specifications must therefore be used in whole, and in conjunction with all other plans and specifications. No sheet, page or part may be used individually.
9. Architect shall have no responsibility for deviations from these plans and specifications, unless such deviations are authorized in advance, in writing, by the architect. If deviations are made without authorization, then the party who authorized or made the deviations assumes all responsibility for the deviations. In the case of a Contractor making deviations, then that contractor shall be the Designer of Record and in responsible charge of those deviations, including for all effects, costs, or delays related to them.
10. Unless otherwise specified in Division 01, Contractor shall include a 15% cost contingency for unforeseen conditions for each MEP trade (fire suppression, plumbing, HVAC, controls, etc.).
11. Coordinate with general (prime) contractor (GC) for what items are to be provided and connected by which subcontractor.
12. Do not scale mechanical drawings. Verify and coordinate light fixtures, conduits, framing, structure, furnishings, etc., in field and across other divisions prior to procurement or commencement of work. Architectural sheets and structural drawings shall govern all dimensions.
13. All contractors shall be licensed and experienced with the systems, performance levels, and construction types indicated in the plans and specifications prior to bidding.
14. All Contractors and Subcontractors shall be thoroughly knowledgeable in their part of the construction and shall perform in a responsible manner with customary construction sequence, shall recognize the priority of the construction documents, and shall notify the general contractor in writing of potential problems when the construction documents are unclear or inconsistent.
15. Subcontractors shall be responsible to notify the prime contractor of discrepancies or conflicts in the construction documents or as-built conditions discovered during bidding and/or prior to performing the work.
16. Items not indicated on the plans or specifications, including but not limited to some designs and details for fire suppression, plumbing, HVAC, hose bibbs, drains, bracing, hangers, attachments, controls, junctions, splices, and other items necessary for the project, shall be designed and provided by the licensed contractors installing their own work per State laws.
17. Locate no water pipes in exterior walls, overhangs, or in any area subject to freezing temperatures. Coordinate with GC and architect to provide furring and chases within the insulated building envelope. In rare cases where this cannot be avoided, then provide at least 20 W/ft heat trace cable and 2" foam insulation on the entire pipe. Coordinate with EC to provide circuits, connections, and controls to turn off heat trace when temperature is above 40 degF.
18. All equipment shall meet or exceed 2022 IECC Prescriptive and Mandatory efficiencies and requirements.
19. All products, devices, and materials shall be provided, braced, and installed to comply with IBC Chapter 16 seismic requirements. No equipment, device, or material shall contact any building component or other material during a seismic event.
20. Provide seismic bracing, hanger rods, hanger rod stiffeners, etc., to prevent more than 1" lateral motion of any pipe, or duct during a seismic event. Equipment shall remain attached and fully operational.
21. Ducts and pipes shall not be capable of impacting any adjacent item. Ducts and pipes shall not disconnect or compromise sealing during/after a seismic event.
22. Consult Structural Engineer for seismic zone information.
23. Bracing and support basis-of-design intent is Mason Industries OSHPD preapproval of manufacturer's certification "OPM" materials, means and methods. All parts of equipment supports and attachments that require design by the IBC and/or ASCE 7-16 are included as the basis-of-design.
24. All vibrating, suspended, or flexibly mounted equipment shall be connected with MC cable or liquid-tight PVC flexible conduit subject to NEC and other sections.
25. Examination of bidding documents:
   A. GC shall make the entire set of bid documents available to every subcontractor and vendor during the bidding period. Every subcontractor shall examine the bidding documents carefully, and not later than seven (7) days prior to bid submission, GC shall make written request to the owner for interpretation or correction of any discrepancies, ambiguities, inconsistencies, or errors therein which he may discover. The owner or architect will issue any interpretation or correction as an addendum. Only a written interpretation or correction by addendum shall be binding. No bidder shall rely upon interpretations or corrections given by any other method. If discrepancies, ambiguities, inconsistencies, or errors are not presented by the contractors in writing, contractor shall include in his bid, labor materials and methods of construction to provide the highest cost option in question. After award of contract, no allowance or extra compensation will be made on behalf of the contractor due to his failure to make the written requests described above.
   B. Failure to request clarification during the bid period of any inadequacy, omission, or conflict will not relieve the contractor of his responsibilities. The signing of the contract implicitly denotes that the contractor has a thorough comprehension of the full intent and scope of the construction contract drawings and specifications.
26. Provide base bid with basis-of-design or listed equivalent products. Make and model named on any schedule or note is the basis-of-design. Other manufacturers listed (if any) are considered equivalents subject to matching the features and specifications of the basis-of-design.
27. Manufacturers not listed by name are considered substitutions and must be submitted with a "substitution request" highlighting variances from the basis-of-design and indicating cost or schedule savings. Substitutions may require additional design fees to review and/or accommodate. Substitutions will be considered only after bid award and will be considered only if there is a proposed schedule or cost savings. Contractor assumes all responsibility for delays and costs incurred due to review and/or accommodation of substitutions.
28. Contractor is responsible for all coordination of equivalents and substitutions, in addition to review and/or redesign fees. Where contract documents permit selection from several equivalents, or where substitutions become authorized, coordinate clearance and interface requirements with all divisions.
   A. Provide necessary additional items so that selected or substituted item operates equivalent to the basis-of-design and properly fits in the space allocated for the basis-of-design.
   B. Provide all features which are standard on the basis-of-design plus any specified options.
   C. Be responsible for assuring that piping, conduit, duct, flue, and other service locations for equivalents or substitutions do not cause access, service, or operational difficulties any greater that would be encountered with the basis-of-design.
29. Work shall be performed in a workmanlike manner to the satisfaction of the architect and owner.
30. Materials, minor details, and/or equipment not scheduled on plans shall be identified by the subcontractor with sufficient time to allow selection, purchase, and delivery to maintain construction schedule.
31. All work of all trades shall meet or exceed the minimum materials, means and methods requirements of the applicable Building Codes, Mechanical Code, Plumbing Code, Fire Code, Fuel Gas Code, National Electrical Code, most current NFPA, all local ordinances and amendments and manufacturer's installation recommendations. Perform diligent review of these requirements prior to bidding. If a conflict between these publications and/or the construction documents exists, the most expensive requirement shall be included in base bid, and a written request for clarification shall be submitted.
32. Pay for and secure all required permits and inspections. Coordinate with GC. Provide all documentation to owner at project completion, prior to final pay application.
33. All materials and/or equipment shall be new and shall be handled and installed per manufacturer's specifications and recommendations.
34. Temporary heat/cool shall be furnished by the general contractor. Use of the permanent heating/cooling systems will not be allowed during construction.
35. Ductwork shall have openings sealed during construction to prevent the entry of dust and debris. Vacuum all grilles, diffusers, registers, and louvers prior to turnover.
36. See architectural reflected ceiling plans for all ceiling dimensions, device locations, ceiling types, penetrations, light fixtures, beams, and air device locations. Do not scale mechanical drawings. Align devices.
37. See architectural floor plans for flooring materials. Provide drains and penetrations compatible with floor assemblies and ratings. All drains must be installed so floors slope to drains. Coordinate finished floor and drain body elevations with GC prior to drain installation and floor finishing.
38. Coordinate and overlay civil, architectural, structural, mechanical, fire protection, electrical, landscaping, and interior design drawings prior to installation.
39. Locate, align, and cleanly fasten grilles, registers, diffusers, and louvers. Sequence the installation for concealed fastening, flashing, and mud-in frames. Modify framing, provide soffits, lower ceilings, provide headers, reinforce shear walls, cut and reinforce steel beams, drill and chip concrete, cut trim, and otherwise modify materials to accommodate devices. Coordinate this requirement to the GC at time of bid.
40. Order of installation, coordination, and physical location priority. Coordinate with GC to cut, drill, reinforce, and move framing to accommodate all items as necessary to accommodate this order of priority.
   1. Items indicated on Architectural sheet's RCP.
   2. Lighting.
   3. Equipment.
   4. Access to equipment.
   5. Structural beams and columns.
   6. Ductwork.
   7. Sprinkler heads.
   8. Electrical Panels.
   9. Sloped drain/waste piping 3" and larger.
   10. Other piping and conduit 3" and larger.
   11. Sloped drain/waste piping smaller than 3".
   12. Other piping and conduit smaller than 3".
   13. Floor joist alignment, cutting, drilling, reinforcement.
   14. Structural wall framing alignment, cutting, drilling, reinforcement.
   15. Non-structural wall framing.
   16. Ceiling and soffit framing.
41. Provide equipment to match electrical voltages, phase, breakers, controls, and capacities scheduled and/or available. Any deviation is considered a substitution subject to fees and terms above.
42. Refer to Civil Plans for existing and new aboveground and underground laterals, utilities, trenching, backfill, excavation, saw cutting, patching, concrete/paving, etc., as required.
43. Field-verify exact locations of existing and new aboveground and underground utilities, site piping, and raceways prior to trenching. Notify the architect immediately upon discovery of any discrepancy from the plans.
44. Submittals:
   A. PDF document, unless otherwise specified in Division 01.
   B. Submit all mechanical shop drawings and product data at one time. Submittals shall each be bound and indexed according to major system/type: dry HVAC, wet HVAC, plumbing, controls, fire protection, etc. Partial submittals will be rejected. Submittals shall include, but not be limited to: boilers, furnaces, pumps, fans, fixtures, insulation, diffusers, piping, valves, controls, and fire protection.
   C. Failure to submit, order, or release order for materials and/or equipment will not be accepted as a reason to substitute materials, equipment, or installation methods.
   D. Submit record documents (as-builts) to architect. Documents shall include all addenda, instructions, directives, approved change orders, alterations, re-routings, etc.
45. Warranties:
   A. Guarantee the installation against defects in materials and workmanship. Labor warranty shall be for a period of one year, superseded by Division 01, if any. Equipment and material warranties shall be the full duration of each mfr's factory warranty. Provide all documentation to owner at project completion, prior to final pay application.
   B. All warranties shall commence on the day of owner's acceptance. Defects shall be promptly remedied without cost to the owner.
46. Systems shall be complete, operable, and ready for continuous operation prior to final pay application and turnover to the owner.
47. Offset piping, ductwork, etc, as necessary to accommodate structure, beams, columns, and equipment. Record and submit all field changes.
48. Mount all operator controls (stats, dials, etc) so top-of-box is 48" AFF in "accessible" areas, 54" AFF in other areas. Provide boxes for all devices, mounting to drywall not allowed. Coordinate location and type/trim with wall finish. Avoid casework, moldings, trim, furniture, heat sources, sunlit and exterior walls. Notify architect of any conflicts prior to beginning box rough-in.
49. Provide 4" high concrete equipment pads beneath floor mounted mechanical equipment, in addition to any base assemblies required or recommended by the manufacturer.
50. Fire stopping requirement. Penetrations through rated walls and floors shall be sealed with a material capable of preventing the passage of flames and hot gasses when subjected to the requirements of the test standard specific for fire stops ASTM-E-814. Acceptable materials include: Dow Corning RTV fire stop foam for plastic pipe, metal conduit, and cable; 3M fire dam 150 caulk for bare pipe, metal conduit, and building construction gaps; 3M CP-25 caulk and FS-195 intumescent strips for insulated pipes, plastic pipe or conduit, and electrical cable. Submit UL Listed application data for each type of penetration encountered. Select and apply all fire-stopping materials in strict accordance with the mfr's written instructions and UL listings.
51. Roof Penetrations:
   A. Ducts, piping, and conduits penetrating through roof shall have roof flashing compatible with the roofing system. See architectural drawings.
   B. In the absence of roof information for base bids: Provide sheet lead type welded flashing for plumbing vents in built-up roofs, sealed tall cone with EPDM boot for pipe and conduit in EPDM membrane roofs, and curbed roof penetrations for all ducts. Installation shall be sealed with silicone or other engineered to be watertight.
   C. Do not locate any roof penetration in an ice barrier zone or near any eave or valley.
   D. Do not locate any VTR upslope of a valley which may cause snow to melt and drain to the valley.
   E. Locate roof penetrations within 2' of the roof peak otherwise provide snow splitter or cricket. Refer to plan diagrams.
52. Refer to all other drawings across all divisions for exact locations and additional requirements.
53. Support each air or refrigeration compressor, base mounted pump, air handling unit and fan by Mason Industries or equivalent spring type seismically restrained vibration isolators.
54. Systems shall be tested for proper operation. Perform at a minimum all code required tests or systems. If tests of work are defective, contractor shall make corrections necessary at no additional cost to owner.
55. Test-Adjust-Balance (TAB):
   A. Provide certified AABC TAB as part of base bid. Contractor shall be accredited by AABC. Balancing procedures shall be in accordance with AABC guidelines for proportional balance. Submit TAB report on standard AABC forms or equivalent forms with same data.
   B. Initiate TAB only after systems are installed, operational, and controlled.
   C. Measurements shall include: all motor amperage and voltage readings; motor and fan RPM; static pressure at inlet and outlet of all packaged equipment, fans, coils, and filters; pitot tube measurement of supply, exhaust, return, and outside air main ducts, at minimum outside air (OA),; velocity distribution across the face of filters; air inlet and outlets; water flow at all flow measurement stations; inlet and outlet pressure at pumps with flow calculated from the pump curve; water flow, temperature drop, and pressure drop at all coils.
   D. Adjust VFDs, ECMs, controls, valves, and programming as necessary. Fully coordinate with controls contractors.
   E. Provide belts and sheaves as required for drive changes to adjust fan speed.
   F. Adjust flows to within 10% of listed quantity. If any flow is more than 10% low, investigate cause, attempt to rectify and notify architect of cause. Submittal of balance report with less than required flows without explanation is cause for rejection.
   G. Where room air pressure relationship is required to be maintained as shown by a differential of supply and exhaust/return or by note, adjust supply to within 10% and then adjust exhaust/return to provide the indicated pressure differential at both conditions: minimum OA, 100%OA.
56. Pipe materials:
   A. All pipes, fittings, and plumbing fixtures in contact with the potable water system shall be listed as NSF-61 lead-free.
   B. Domestic hot and cold piping inside building: Buried lines, Type "K" soft annealed copper water tube, single length to avoid fittings, (wrought copper fittings where unavoidable) and 1100°F solder. Non-buried lines, Type "L" hard copper water tube, wrought copper fittings and no lead 95-5 solder.
   C. SUBMIT COST SAVINGS PROPOSAL: Domestic hot and cold piping inside building in fully concealed locations may be PEX tubing with compatible fittings, all from a single manufacturer. Materials must be NSF-PW listed and comply with UPC requirements for potable water distribution. The entire piping system must be flushed prior to turnover, per State Requirements. All tubing shall be complete runs without splices or unnecessary fittings. All changes in direction shall use sweeps to reduce pressure drops, and at fixtures shall be anchored to framing using the tubing manufacturer's anchoring devices and transition fittings. PEX shall be guaranteed by the manufacturer not to leach VOCs, BPA, toluene, estrogens, MTBE, or other harmful chemicals into any potable water supply, including when used in hot and recirculating hot water up to 140 degF.
   D. Drain, Waste, and Vent piping inside building:
      1. Pressurized piping below ground or slab: Schedule 40 PVC pressure pipe with solvent welded fittings.
      2. Pressurized piping above ground: Schedule 40 galvanized steel pipe with wrought iron or groove-joint fittings.
      3. Gravity piping below ground or slab: Wrought or cast-iron soil pipe with heavy duty 304 stainless steel clamps, Husky or equivalent. Or Schedule 40 solid-core PVC DWV pipe with solvent welded DWV fittings.
      4. Waste piping above ground (Concealed): Standard weight cast iron soil pipe, no hub with standard clamps, Husky or equivalent. Up through 2-1/2" may be standard weight, galvanized steel pipe with black, wrought iron drain fittings, or DWV copper tube with DWV fittings and 95-5 no lead solder.
      5. Vent piping above ground (Concealed): Standard weight cast iron soil pipe, no hub with standard clamps, Husky or equivalent. Up through 2-1/2" may be standard weight, galvanized steel pipe with black, wrought iron drain fittings, or DWV copper tube with DWV fittings and 95-5 no lead solder.
      6. Gravity Waste and Vent piping above ground (Exposed): Standard weight cast iron soil pipe, no hub with standard clamps, Husky or equivalent. Up through 2-1/2" may be standard weight, galvanized steel pipe with black, wrought iron drain fittings, or DWV copper tube with DWV fittings and 95-5 no lead solder.
   E. Sanitary Sewer service laterals: Comply with utility provider's requirements. REFER TO CIVIL PLANS. In the absence of civil plans assume for base bid Schedule 40 solid-core PVC or DR7 PE with compatible DWV solvent welded or mechanical fittings.
   F. Water service laterals: Comply with utility provider's requirements. REFER TO CIVIL PLANS. In the absence of civil plans assume for base bid Schedule C900 PVC with compatible mechanical fittings.
   G. Transitions between dissimilar waste pipe materials: No hub fittings with standard clamps, Husky or equivalent.
   H. Plumbing supply stop valves: Quarter-turn, chromed, lead-free brass.
   I. Copper pipe valves and specialties
      1. Gate valves: bronze, class 125, 200 lb. WOG.
      2. Ball valves: bronze, class 125, 600 lb. WOG. Full port.
      3. Check valves: bronze, class 125, 200 lb. WOG.
      4. Balancing valves: 125 psi w.p. for 250-degree Fahrenheit service tight shutoff, tour and Anderson, Armstrong, Gerand, or Flowset, Bell and Gossett circuit setter.
      5. Dielectric unions and flanges: Designed for connection of steel to copper piping, with plastic nonconductive insulator or flange preventing copper to steel contact.
      6. Domestic water components to be NSF 61 "low lead" compliant.
   J. Drain and receptor piping:
      1. Combustion Condensate (Concealed or Buried): Schedule 40 solid-wall PVC pipe with solvent welded DWV fittings. Provide neutralization systems as recommended by combustion appliance manufacturer. Connect to plastic waste system, or for cast iron downstream of nearest regularly used fixture.
      2. Combustion Condensate (Exposed): Type L copper tube with DWV wrot copper fittings and 95-5 no lead solder. Provide neutralization systems as recommended by combustion appliance manufacturer. Connect to plastic waste system, or for cast iron downstream of nearest regularly used fixture.
      3. Non-combustion Drains (Concealed or Buried): Schedule 40 solid-wall PVC pipe with solvent welded DWV fittings. Connect to nearest sink tailpiece or use trapped air gap fitting.
      4. Non-combustion Drains (Exposed): Type L copper tube with DWV wrot copper fittings and 95-5 no lead solder. Connect to nearest sink tailpiece or use trapped air gap fitting.
   K. Refrigeration piping—Type "L", ACR grade copper, cleaned, dehydrated, and capped at the factory. Use wrought copper fittings and hard solder having a minimum melting point of 1100 degree F for buried lines, 95-5 solder for non-buried lines. Valves and specialties shall be standard brass or bronze valves for refrigeration service. Buried pipe shall be surrounded by 4" clean sand.
   L. Site energy distribution piping (buried): Flexible, factory closed-cell insulated and PE-jacketed Oxygen diffusion barrier PEX piping system. Rehau InsulPEX or Uponor EcoFlex. Use factory fittings, joints, transitions, and fitting insulating systems. Trench and burial per manufacturer's requirements.
   M. Site Potable Water piping (buried): Flexible, factory closed-cell insulated, and PE-jacketed NSF listed PEX piping system. Rehau InsulPEX or Uponor EcoFlex. Use factory fittings, joints, transitions, and fitting insulating systems. Trench and burial per manufacturer's requirements.
   N. Pipe Insulation and Jacketing:
      1. Domestic hot water piping shall be insulated in compliance with UPC L501.2. Pipe insulation shall be thermal conductivity k=0.22-0.28, 1" thickness for pipe size 1" and smaller, 1.5" thickness for pipe sizes 1¼" and larger per Title 24, Part 6, Section 120.3, fiberglass preformed pipe insulation with factory-applied white, all service jacket (ASJ) and SSL.
      2. Refrigerant Pipe insulation:
         a. Fluid temperature of 40-60°F: insulation shall be thermal conductivity k=0.22-0.27, 0.75" thick for pipe size less than1¼" and smaller, 1" thickness for pipe sizes 1½" and larger, elastomeric preformed pipe insulation.
         b. Fluid temperature of below 40°F: insulation shall be thermal conductivity k=0.22-0.27, 1" thickness for pipe sizes smaller than 1", 1.5" thickness for pipe sizes 1" and larger, elastomeric preformed pipe insulation.
      3. Exterior water piping: 2" thick elastomeric preformed pipe insulation with 2" lapped and sealed seams. Provide corrugated aluminum manufactured pipe jacket with 4" overlapped seams. Install additional G90 sheetmetal jacket in any place pipe is subject to snow/ice impact, foot traffic, or other hazards.
      4. All materials shall have a smoke developed rating of 50 or less and a flame spread rating of 25 or less.
   O. Water Hammer Arresters: Constructed with a piston in a sealed copper tube chamber and approved for installation within walls without access panels. Sioux chief or equivalent. Bellows type not acceptable.
57. Piping execution:
   A. Support pipe with rod and clevis, ring hangers, trapeze, or clamps. No "plumber's tape" or strapping allowed for pipes larger than ½". All hangers shall be sized for O.D. of insulation, if any.
   B. Pipe insulation shall pass uninterrupted through hangers. 2" and larger: install cellular glass or calcium silicate inserts where pipes pass through hangers. 1.5" or smaller: 20ga sheetmetal saddles.
   C. Vapor barriers shall be continuous and sealed with non-breathing mastic on cold piping. All raw edges of insulation shall be neatly trimmed and sealed with mastic.
   D. Isolate bare copper pipes from hangers with Vibrasorb or equivalent, copper coated hangers are not sufficient, wrapping pipe with tape not allowed.
   E. Provide a dielectric union at each connection between dissimilar metals. Do not directly connect steel to copper, brass, or bronze in any wet system.
   F. Refer to plumbing fixture connections schedule for pipe sizes to individual plumbing fixtures.
   G. Provide exposed supply stop valves at every lavatory, sink, and toilet with flexible connections. Provide ball shutoff valves hard-piped in a wall access panel serving each wall-mounted faucet.
   H. Level or grade and valve all water piping with 3/4" hose end valves to permit complete drainage of the system.
   I. Vent all high points in equipment rooms as necessary with automatic air vents piped to convenient drain. All high points in system outside of equipment rooms with combination automatic/manual air vents as required to relieve air in the system.
   J. Provide plastic grommets on all piping passing through beams, joists, and studs.
   K. All floor drains and floor sinks connected to the sanitary sewer system shall be equipped with trap primers.
      1. Provide trap primers with ASSE listed backflow preventers and connect to the nearest cold water piping adjacent to a flushing fixture.
      2. Provide electronic trap primers for any areas where the nearest adjacent flushing fixtures are not within a reasonable distance or structural obstructions prevent gravity sloping of trap primer lines. Added cost of electric power for electronic trap primers shall be borne by plumbing contractor.
      3. Install all trap primer valves and associated systems in accordance with manufacturer's instructions.
   L. Provide water hammer arresters at all domestic hot and cold-water branches serving fixtures and equipment with quick closing valves. Such fixtures and equipment include flush valve water closets, dishwashers, ice machines, and clothes washers.
   M. Insulate all domestic cold water, domestic hot water, domestic hot water recirculation, stormwater, and overflow piping with preformed fiberglass (mineral fiber) pipe insulation. Secure and apply SSL, sealants, and jackets per manufacturer's instructions.
   N. Insulate all fittings with pre-formed fiberglass or glass fiber blanket insulation and factory-formed PVC covers.
58. Duct materials:
   A. Rectangular duct: G60 galvanized sheet steel; lock forming quality; constructed to the latest edition of SMACNA "HVAC duct construction standards"; +/- 1" w.c. pressure classification, seal class "B"; with galvanized steel fasteners, anchors, angles, straps, etc.
   B. Round duct: spiral seam, G60 galvanized steel. Die stamped or 5 gore elbows. "snap-lock", longitudinal seam duct, or adjustable fittings are acceptable on individual grille/diffuser runouts only.
   C. Flexible connection: equivalent to Ventfab, fireproof glass cloth, 10" w.c. rated. Install at every fan or air handling device 0.5hp or larger.
   D. Provide diffuser neck size same as duct size.
   E. Unless plans indicate otherwise, all changes in direction shall be made with radius elbows with radius to centerline equal to 1.5 duct width.
      1. Where required for space constraints, provide square throat elbows with single width (non-airfoil) turning vanes.
      2. For duct depths of 36" or less, provide manufactured single width (non-airfoil) turning vanes, with spacing in accordance with SMACNA duct construction standards for "standard spacing". Use double thickness blades for duct depths greater than 36". Use no trailing edges.
59. Duct insulation:
   A. No insulation required on exposed, spiral ductwork in directly conditioned areas.
   B. Externally wrap all round supply air ducts with flexible glass fiber, ANSI/ASTM C612; 0.002-inch foil scrim facing. Min R-value of 8 in unconditioned areas and min R-value of 4.2 in all other areas. For duct wrap, installed thickness shall be assumed to be 75 percent (25 percent compression) of nominal thickness.
   C. Line all supply, outside air, return air ducts, and exhaust air risers in unconditioned areas with 2", 1.5 pcf, black matte coated insulating duct liner, min. R-value = 8. Line all other ductwork with 1", 1.5 pcf, black matte coated insulating duct liner, min R-value = 4.2. Material shall meet all requirements of NFPA-90. Install with adhesive and welded pins in accordance with SMACNA "HVAC duct construction standards".
   D. Indoor Duct Liner:
      1. Listings: ASTM C1071, NFPA 90A, NFPA 90B, UL 723, ASTM E84, NFPA 255.
      2. Max. Flame Spread Index: 25. Max Smoke Developed Index: 50.
      3. Limited Combustible: NFPA 259; < 3,500 Btu/lb. Temperature: ASTM C411; Max. 250°F.
      4. Air Velocity: ASTM C1071, UL181; Max. 6,000 fpm.
      5. Water Vapor Absorption: ASTM C1104; < 3% by weight
      6. Corrosiveness: ASTM C665; Pass.
      7. Bacteria Resistance: ASTM G22; No Growth.
      8. Fungi Resistance: ASTM C1338, ASTM G21; Pass, No Growth
      9. Water Repellency Rating > 4 (INDA IST 80.6-92)
      10. Manufacturing: ISO 9001:2000, ISO 14001:2004 or higher.
      11. Minimum R-Value of 4.2 and a NRC of .70.
      12. Basis-of-Design Product: Subject to compliance with requirements, provide CertainTeed ToughGard R or T Textile Duct Liner, Type 200, 1" thick, or comparable product by one of the following: Johns Manville, Owens Corning.
      13. Unless otherwise noted on plans, duct lining for acoustic lining only shall be 1" thick.
   E. Duct Liner Execution:
      1. Apply duct liner instead of mineral fiber blanket for all insulated rectangular ducts in areas exposed to public view.
      2. Apply duct liner to inside of round ducts in areas sensitive to sound transmission. Use liner material designed for round ducts.
      3. Use adhesive conforming to ASTM C 916, with liner adhered to the duct with 90 percent minimum coverage.
      4. Use metal weld-pins in addition to adhesive. Pin placement per manufacturer's data sheet.
      5. Shop or field cuts shall be liberally coated with manufacturer's edge seal product.
      6. When velocity exceeds 4000 fpm, use metal nosing on every leading edge.
60. Ductwork execution:
   A. Seal all duct seams (non-gasketed flanges, fittings, longitudinal and transverse seams, etc.) airtight with United McGill "Uni-Grip" UL Listed, water based, non-hardening, elastic sealant or equivalent. Tape not allowed.
   B. Provide 1/4" galvanized mesh screen on all combustion air ducts or openings, and all open-end return, transfer, and exhaust ducts. 1/8" mesh for all exterior WUI penetrations.
   C. Ductwork dimensions on plans are sheet metal dimensions. Duct liner has been accounted for.
61. Equipment labels: label all piping and equipment. Provide full band or strip type markers and flow arrows on piping. Provide engraved plastic valve tags with description or valve number and attach with standard chain or s-hooks. Provide flagging tape or labels with zone listed on air balance dampers. Provide engraved plastic sign on or near specified equipment. Glue, rivet, or screw tags to equipment, but do not damage equipment.
62. All products and systems shall be UL Listed and installed to comply with their UL listings.
63. All wiring shall be in listed, metallic (EMT) raceways.
   A. Controls under 50 Volts: Raceways by EC, wiring by MC. MC responsible to coordinate this requirement to the EC and GC for base bid.
   B. All systems over 50 Volts: Raceways and wiring by EC.
64. Refer to the submitted and approved IECC energy compliance report, hereby incorporated by reference.
65. The controls for the whole-building exhaust system shall be clearly labeled with the following instructions: "To maintain minimum levels of outside air ventilation required for good health, the fan control should be on at all times when the building is occupied, unless there is severe outdoor air contamination."

[f] ADDITIONAL APPLICATIONS



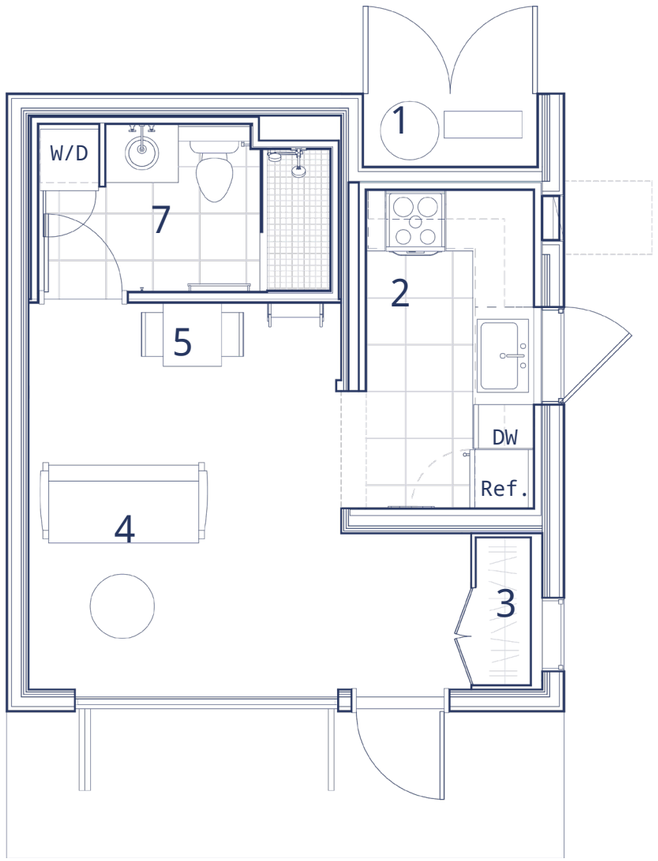
Looking towards future applications both in Seattle and across Washington State, the team created additional designs using the same systems and components to create one-bedroom and three-bedroom variations on the House 1.0 concept design.

The one-bedroom option is a quintessential backyard cottage that can be used as a multi-generational living space, backyard office, or studio. 400 square feet of well proportioned living space utilizes the same wet cores with a bonus loft space above to take advantage to the vaulted roof space building with panelized cross laminated timber allows.

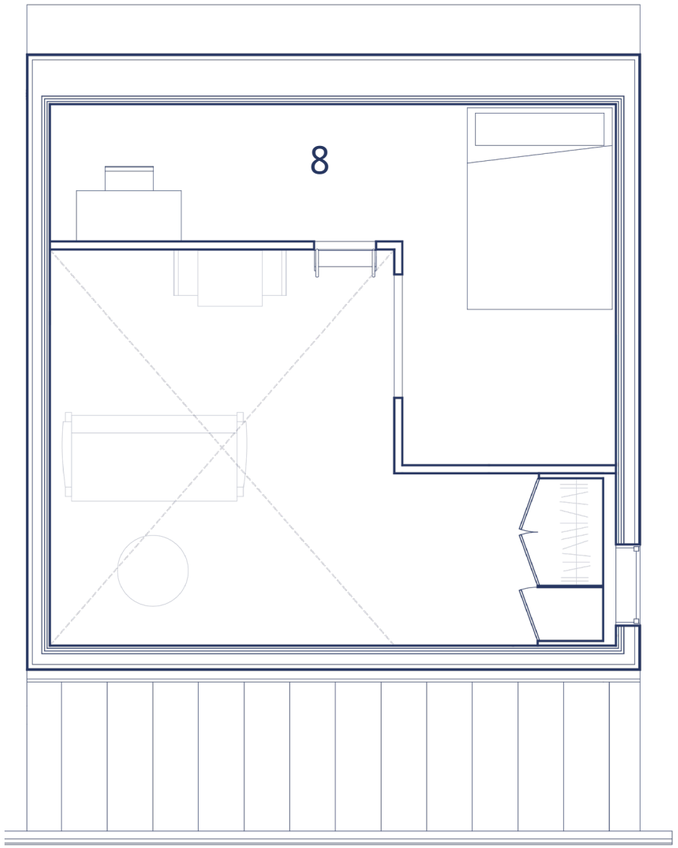
The three-bedroom home utilizes the same plan as the two-bedroom home, capitalizing on manufacturing efficiencies of repetition and scale. The additional bedroom over the living space offers a juliette balcony undet the generous front porch.

[f] ADDITIONAL APPLICATIONS

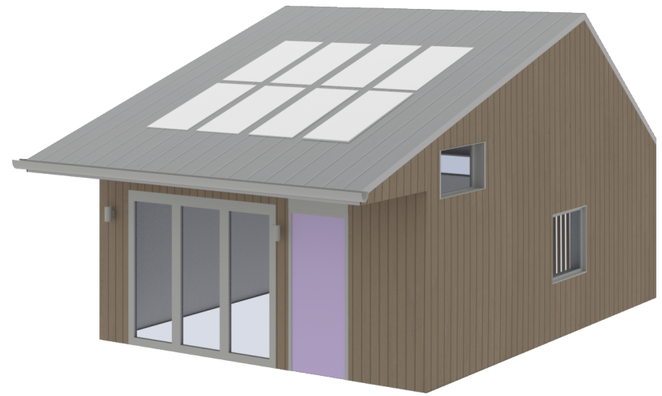
1-BEDROOM PLAN VARIATION FOR FUTURE DEVELOPMENT



Ground Level



Loft Level



1 Mechanical Alcove
2 Kitchen Wet Core
3 Storage
4 Living
5 Dining
7 Bathroom Wet Core
8 Loft

402 GSF + 120 SF SLEEPING LOFT

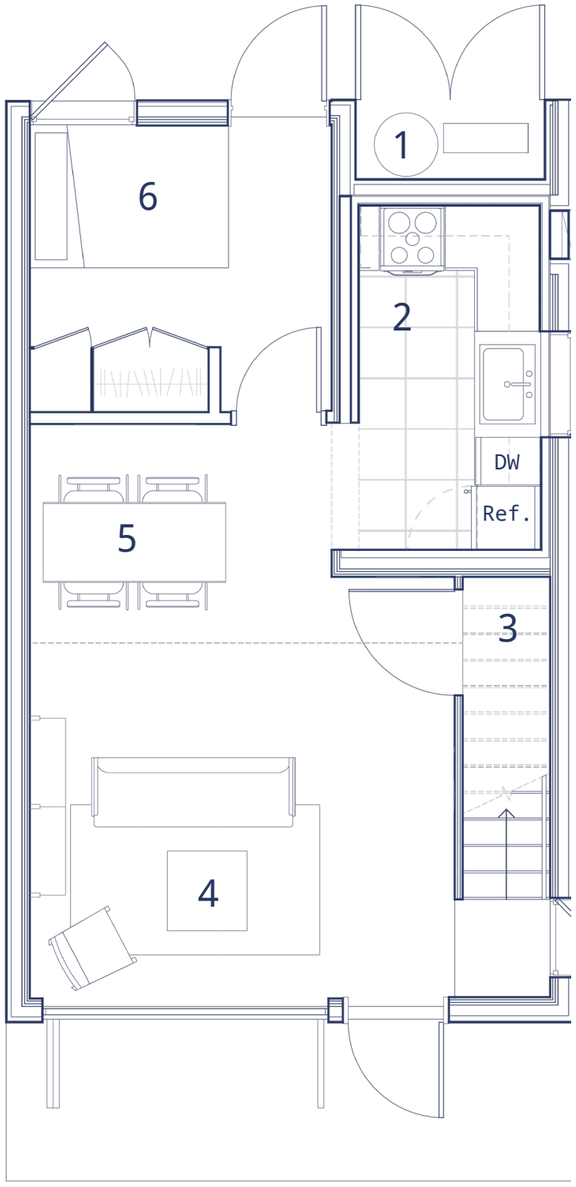
atelierjones, llc
architecture | ecodesign | planning

CRTC BUILDING INNOVATION CENTER

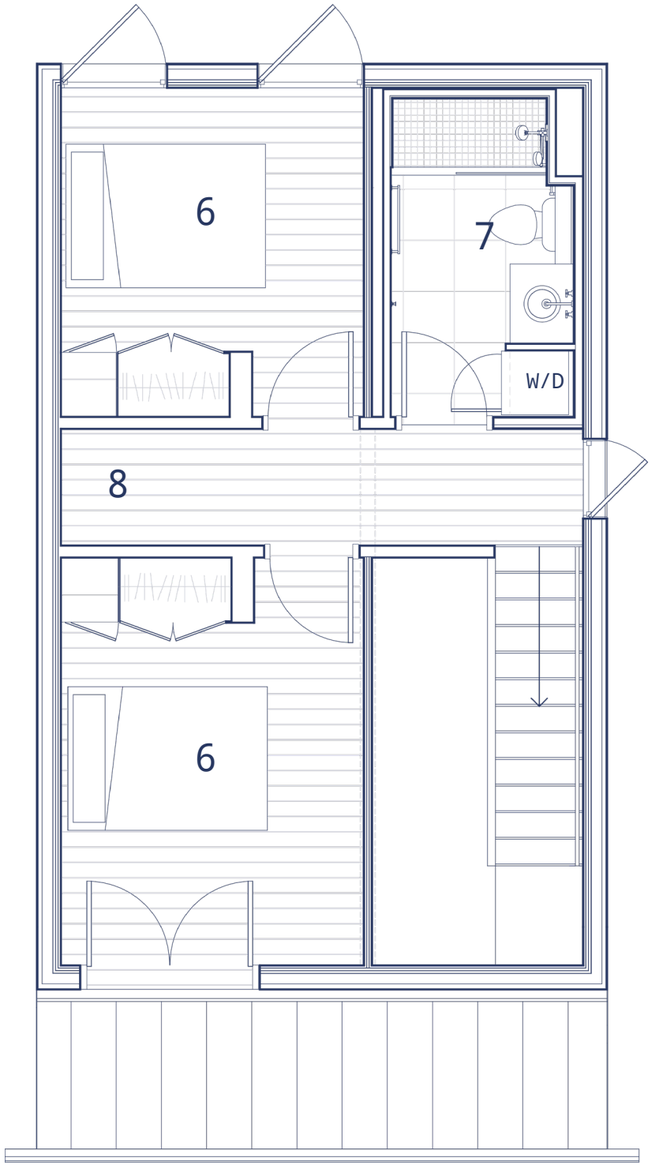
EDC CLALLAM ECONOMIC DEVELOPMENT COUNCIL

[f] ADDITIONAL APPLICATIONS

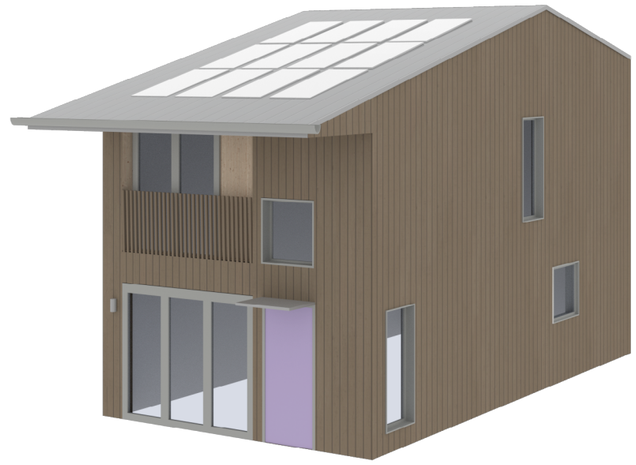
3-BEDROOM PLAN VARIATION FOR FUTURE DEVELOPMENT



Ground Level
937 GSF



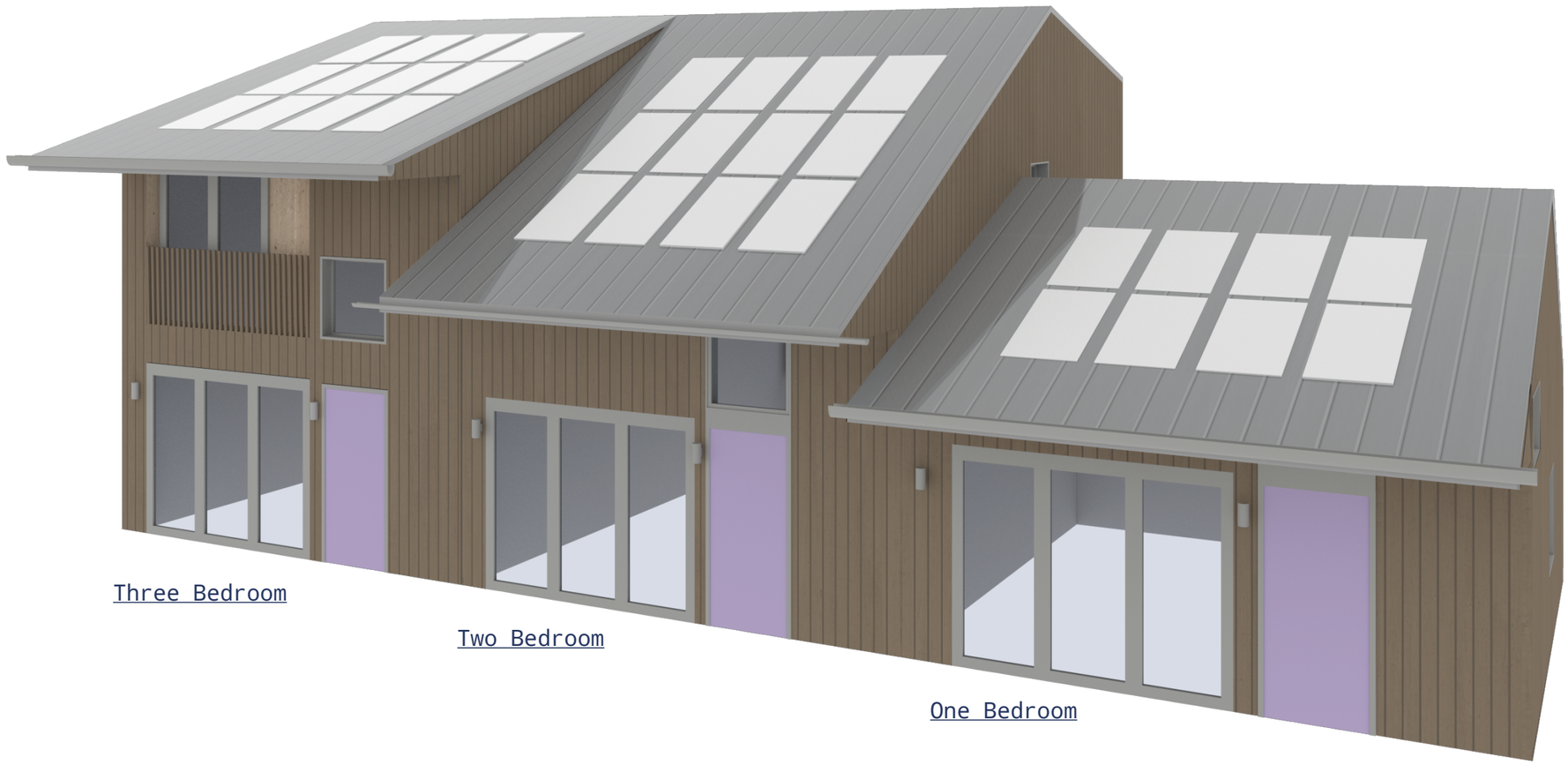
Second Level



1 Mechanical Alcove
2 Kitchen Wet Core
3 Storage
4 Living
5 Dining
6 Bedroom
7 Bathroom Wet Core
8 Loft

[f] ADDITIONAL APPLICATIONS

PLAN VARIATIONS FOR FUTURE DEVELOPMENT



Three Bedroom

Two Bedroom

One Bedroom

[g] SEATTLE APPROVAL



The team of atelierjones, HVE, and CRTC met with an informal SDCI team on 31 MAR 2025, comprised of two senior structural plan reviewers in Roussi Roussev and Dennis Pradere, as well as their Technical Code Manager Nathalie Boeholt; the meeting began with Geoffrey, representing the CRTC, speaking about who the CRTC is, where they are located (and why), and why they are producing this product. Susan, representing atelierjones, then spoke about the grant and the pursuant outcome of a permit in some capacity allowing for construction utilizing the TM panel, despite not yet being PRG-320 certified. Jim, representing HVE, then spoke about the existing test data and their confidence in the structural capacities of the panel (at this time, the new 2025 tests had not yet been initiated, so the team did not share the data with SDCI).

Following this meeting, SDCI agreed that with the forthcoming testing to be reviewed alongside the permit drawings, then pending that approval SDCI would grant two Code Modification Requests (AMMRs) allowing for the DADUs with CRTC TM-CLT to be built. This “standard plan” review means that the DADUs will be pre-permitted for construction, with the exception of site-specific review.

Seattle Department of Construction and Inspections

Tip 310

Seattle Permits

— part of a multi-departmental City of Seattle series on getting a permit

Standard Plans

Updated July 28, 2022

This Tip is intended to provide an overview of standard plans, including limitations and design options. This Tip also provides an overview of the application process when you are using a standard plan.

A **standard plan** is a set of construction plans that have been pre-approved because they comply with applicable building and energy codes. Standard plans are intended for use on two or more sites. The advantages of a standard plan include:

- Construction requirements are known prior to submittal
- Once the standard plan is established, you can have reduced permit fees
- A faster plan review process

Note: Approved standard plans remain valid until new relevant codes are adopted; they do not have the standard expiration date of 18 months after approval as building permits do. Whenever the City makes revisions to the Seattle Residential Code (SRC), Seattle Building Code (SBC), or Seattle Energy Code (SEC), we will require a new standard plan application and approval process.

LIMITATIONS

Standard plans are generally limited to new construction of:

- Detached one- and two-family dwellings three stories or less (SRC)
- Multiple single-family dwellings (townhouses) three stories or less (SRC)
- Accessory structures such as detached garages, small pole buildings, etc.
- Accessory swimming pools
- Detached Accessory Dwelling Units (DADUs) that are accessory to a single-family residence
- Other project types may be approved for standard plans on a case-by-case basis. For further information, contact an Engineering & Technical Codes Manager. You can find their contact information at **www.seattle.gov/sdci/about-us/contact-us/contact-us---director-and-managers**

ESTABLISHING A STANDARD PLAN

A standard plan may be established by three paths:

1. You may apply to establish a standard plan before having selected a specific site where you want to use your plan. SDCI will conduct two complete reviews of your application. You generally will need to use the standard plan at least four times for this submittal option to be cost effective.
2. You may apply for a site-specific permit and to establish a standard plan concurrently. SDCI will conduct two complete reviews of your application.
3. You may use a plan previously approved under the current code, by SDCI, as a basis towards establishing a standard plan. Your second application may include a site-specific construction component that will receive a second complete review by SDCI.

DESIGN OPTIONS

You may include design options within the context of the standard plan. The scope and number of these options must be reasonable and could include plan reversals, alternate roof lines, bay window options, and variations in foundation wall heights or other similar alternatives without significant structural changes. You must include any required structural changes, including the lateral load resisting system, in each option. SDCI will discuss specific approval of the options with you. Our approval is somewhat dependent on the clarity with which you present the options on the plans.

www.seattle.gov/sdci

Seattle Department of Construction & Inspections

700 5th Avenue, Suite 2000
P.O. Box 34019
Seattle, WA 98124-4019
(206) 684-8600

Printed on totally chlorine free paper made with 100% post-consumer fiber

Seattle Department of Construction & Inspections

Code Modification or Alternate Request

Date Requested: _____

Contact Information:

Name: _____

Mailing Address: _____

_____

_____

Phone Number: _____

E-mail Address _____

Relationship to Project:

- ☐ Owner
- ☐ Design Professional
- ☐ Contractor

Project Information:

Record #: _____

Address: _____

Code Edition: _____

Structure Information:

Project Description:

Occupancy Group(s)/ Character:

Type of Construction: _____

Number of Stories: _____

Basements/ Mezzanines: _____

Sprinkler Location: _____

Code Modification Request:

Ref. SBC 104.4. A code modification is a waiver of a code requirement and is intended to provide flexibility to the building official where there are practical difficulties meeting specific code requirements so long as the intent of the code is accomplished.

The requestor is expected to demonstrate:

1. *There are practical difficulties involved in strictly conforming to the provisions of the code; and*
2. *The modification conforms with the intent and purpose of the code; and*
3. *Together with other safety features of the building or other relevant circumstances, the modification will provide a reasonable level of strength, effectiveness, fire resistance, durability, safety, accessibility, and sanitation.*

When engaged for the project, the registered design professional in responsible charge shall submit the request for a code modification under their seal and signature, including a statement that in their professional opinion, the proposal is in conformance with the intent and purpose of the code and the modification will provide a reasonable level of strength, effectiveness, fire resistance, durability, safety, accessibility, and sanitation.

Please attach plans showing your proposal.

Code Alternate Request:

Ref. SBC 104.5. A code alternate is intended to provide for introduction of alternate materials, systems, and methods for which the code did not anticipate, provisional upon the alternate complying with the code and providing an equivalent solution. Essentially, a code alternate is intended to meet a performance standard rather than a prescriptive standard.

The requestor is expected to demonstrate that the alternate does not conflict with the code and together with other safety features of the building or other relevant circumstances, will provide an equivalent level of strength, effectiveness, fire resistance, durability, safety, accessibility, and sanitation.

When engaged for the project, the registered design professional in responsible charge shall submit the request for a code alternate under their seal and signature, including a statement that in their professional opinion, the alternate is equivalent to the code provisions.

Please attach plans showing your proposal.

700 Fifth Avenue, Suite 2000 | PO Box 34019 | Seattle, WA 98124-4019 | 206-684-8600 | seattle.gov/sdci

[g] SEATTLE APPROVAL

NON-BINDING APPROVAL

atelierjones llc

Roussi Roussev Approved
Digitally signed by Roussi Roussev
Date: 2025.04.21 17:45:56-07'00'

ACLT DADU – SDCI Permit Path Meeting

atelierjones llc
13:00 | Monday, 31st March, 2025

Susan Jones (aj)
Meghan Doring(aj)
Ian Maples (aj)
Geoffrey Wood (CRTC)
Erik Poulin (CRTC)
Glenn Ellis (CRTC)

Jim Harriet (HVE)
Jacob Watchtendonk (HVE)
Nathalie Boeholt (SDCI)
Roussi Roussev (SDCI)
Dennis Pradere (SDCI)

Topics:

13:00 **Introductions**
Brief introductions were given, for those who had not yet met the SDCI members, they were represented by Roussi and Dennis as Senior Structural Plan Engineers. Nathalie also has a structural engineering background and serves as the Technical Code Manager for SDCI structural reviewers, helping to advise on such products as these, the thermally-modified wood materials.

13:05 **CRTC Innovative CLT Panel**
Geoff provided background history on who the CRTC is, why they are located where they are, and why they are producing this product.

13:15 **Clallam County EDC Grant for CRTC**
Susan spoke about the EDC Grant providing funding to bring in the project team to help take the ACLT from Clallam County and introduce it to the Seattle market. This grant funding runs through June, which is one reason why the team is approaching SDCI for review prior to having obtained their PRG-320 certification.

Nathalie asked what the expected timing on that certification was and Erik's response was that he expected it to be another 1.5yrs or so away. He elaborated that this timeline was impacted by the need to first seek species qualification for thermally-modified western hemlock, which they have begun the process of with the PLIB already.

13:25 **Status of Testing and Performance**
Nathalie was curious about more information as to what thermal modification does and how it works, and was there a reduction in structural capacity as Geoff had previously alluded to? Erik elaborated that the test in reference was a comparison between modified and unmodified Western Hemlock for fastener bearing capacity and showed roughly a 5% loss, so fairly minimal.

1501 East Madison Street
Suite 250
Seattle, WA 98122
www.atelierjones.com

atelierjones llc

The team shared one of the results from the WSU testing reports that showcased the ACLT against two existing PRG320 grade benchmarks for comparison:

	Bending Strength FbS (lbf-ft/ft)	Bending Stiffness EI (10^6 lbf-in^2/ft)	Shear Siffness GA (10^6 lbf/ft)
PRG 320 V1 Layup	2090	108	0.53
PRG 320 V2 Layup	2030	95	0.46
Gen1 Experimental Results	2800	105	0.54
Gen 1 Analytically Derived	2592	120	0.63

Other tests mentioned by Erik as having been studied were: lumber, connections, shear, bondline, as well as flatwise and edgewise bending and shear in major and minor directions. In other words, the PRG-320 testing criteria.

13:45 **Next Steps and Discussion**
Having reviewed some of the testing, the SDCI team asked about intent of application; what scale and volume is the team hoping to produce at? The response was likely 10-20 units in the near term, over the next couple of years. SDCI asked if it would be acceptable to limit an approved plan (in whatever version or variation) to a certain time range or quantity, the team said yes.

Nathalie was clear that the DADU preapproved plan program is finished and that program will not be reopened, the next option is the Standard Plan, which she was unclear about applying an AMMR to, but would discuss it with her counterparts and return with an answer within the next week or so.

In the meantime, SDCI was comfortable, and preferred, that the design team wait to send over test report data until it was time to submit it alongside a Standard Plan application, so that the time could be charged appropriately to a project. This was ideal for Erik, as that would align with receiving a new round of test report data near the end of May, around when the architecture and engineering team would be ready to submit a permit for the building design.

Susan asked to clarify if the team should set up a pre-submittal conference and begin a permit number with the SDCI portal, and Nathalie said no, it was ok to continue as is for now.

1501 East Madison Street
Suite 250
Seattle, WA 98122
www.atelieriones.com

Outlook

RE: Inquiry on SDCI Permit Path for Innovative CLT

Organizer	Roussev, Roussi <Roussi.Roussev@seattle.gov>
Meeting time	This event occurred 2 months ago (Mon 3/31/2025 1:00 PM - 2:00 PM)
Location	Microsoft Teams Meeting
My response	Not yet responded
Required attendees	Roussev, Roussi, Boeholt, Nathalie, Pradere, Dennis, Meghan Doring
Optional attendees	Glenn Ellis Jr., Susan Jones, James Harriott, Geoff Wood, Jacob Wachtendonk
Message sent	Mon 4/21/2025 6:00 PM

1 attachment (173 KB)
approved 2025-03-31 SDCI Meeting Notes.pdf;

Hi Meghan and team,
Here are the approved meeting notes for your records.

After a wider discussion with our superiors here, SDCI is confirming the discussed approach as acceptable: review and approval of two Code Modification requests (AMMRs), for product approval and the formal CLT shear wall system per ASCE 7-22; and a Standard Plan review.

The standard plans will be review most probably by both Dennis and myself (two parallel reviews are required, see Tip 310) - please let me know by email when you submit so we can assign accordingly.

Please do not hesitate to reach out to me with any questions or requests.

Thank you,
Roussi

Roussi Roussev, P.E. (he/him/his)
Senior Structural Plans Engineer
Seattle Department of Construction and Inspections
O: 206.615.0976 I roussi.roussev@seattle.gov Book time to meet with me
Facebook I X I Blog

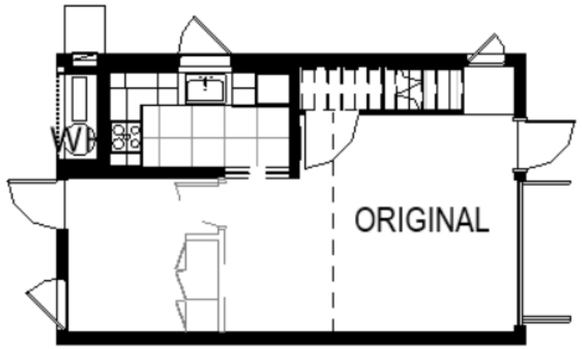
Helping people build a safe, livable, and inclusive Seattle.

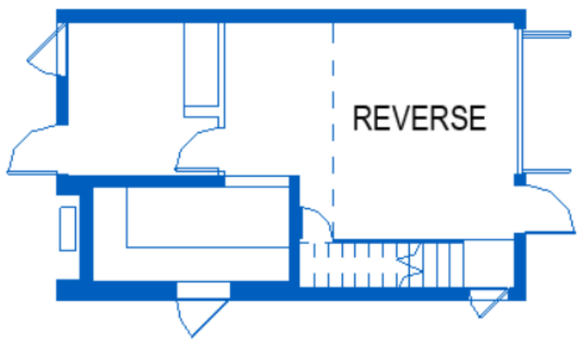
SDCI offers most services online through our Virtual Applicant Services Center. For customers who need language assistance or technical assistance accessing the Virtual ASC, we have an SDCI information desk on the 4th floor of the Seattle Municipal Tower. We offer limited access to our offices for scheduled public meetings.

[g] SEATTLE APPROVAL

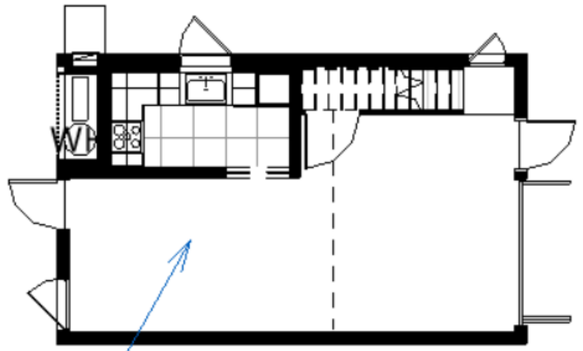
STANDARD PLAN DESIGN OPTIONS

1. PLAN REVERSAL

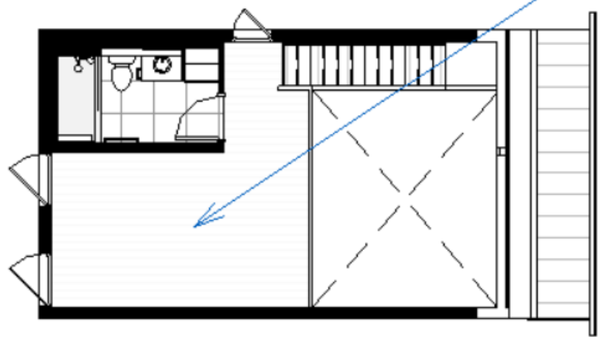




3. OPEN PLAN



OMIT BEDROOM PARTITIONS



APPENDIX

Appendix A: Permit Submittal Drawing Set to be submitted to Seattle Department of Construction and Inspections as a Standard Plan.

Appendix B: Structural Calculations and Alternate Means and Methods Request including Washington State University Structural Testing Data Results as submitted to Seattle Department of Construction and Inspections.

atelierjones, llc
architecture | ecodesign | planning

CRTC
BUILDING INNOVATION CENTER

EDC
CLALLAM ECONOMIC DEVELOPMENT COUNCIL