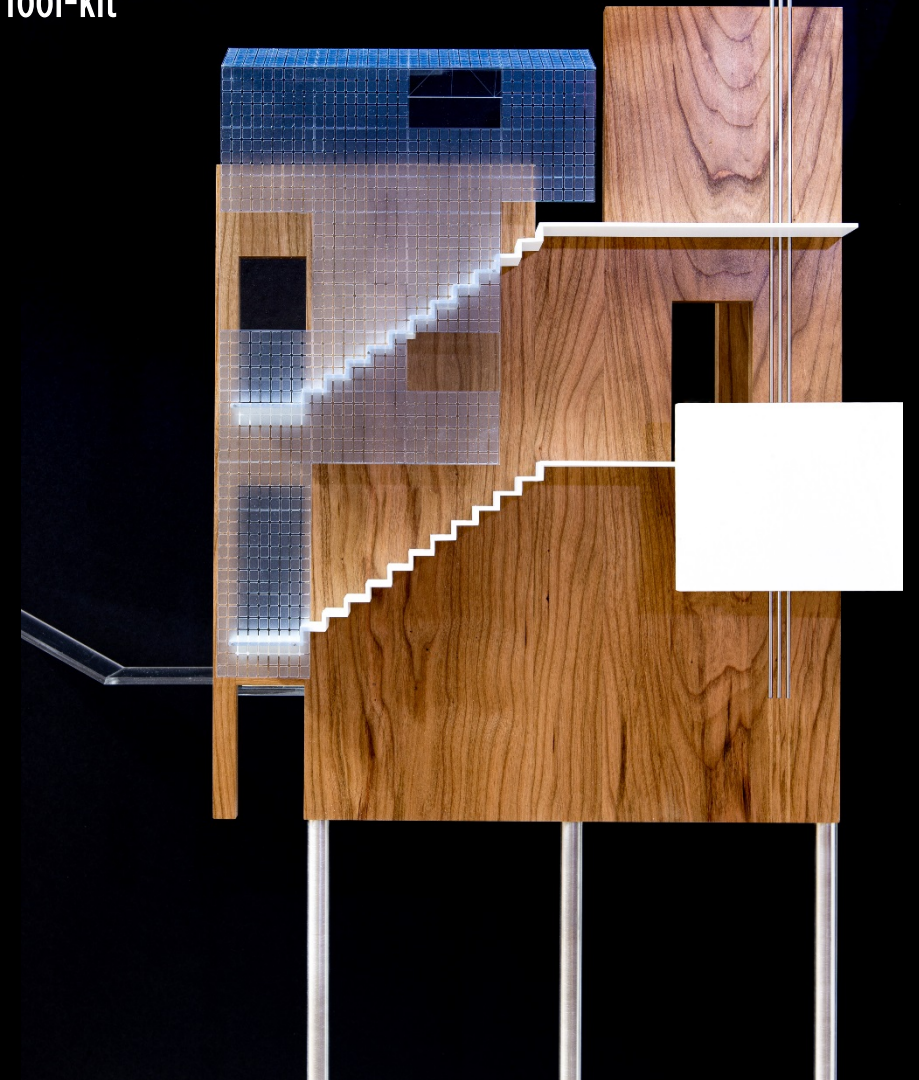
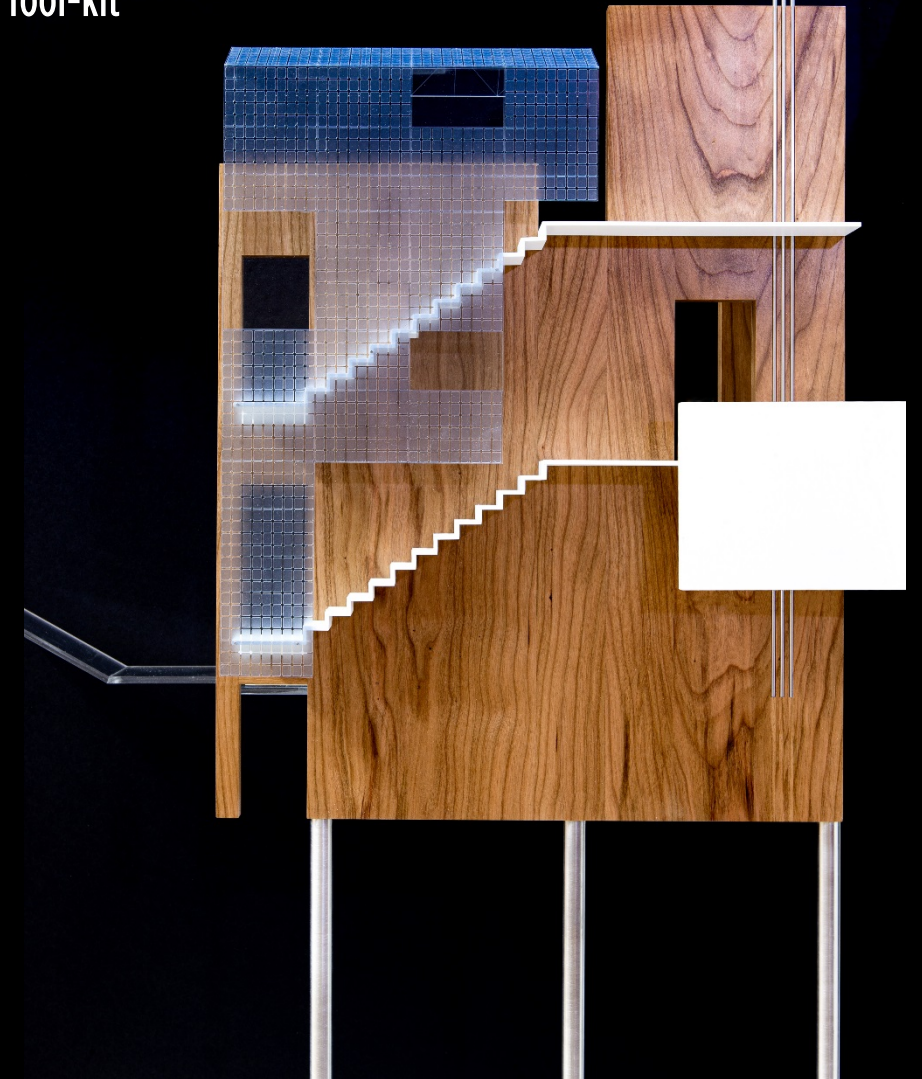


The BAAKFIL© Design Tool-kit



The BAAKFIL© Design Tool-kit



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Barry Johns Architect 2023

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The BAAKFIL® Design Tool-kit

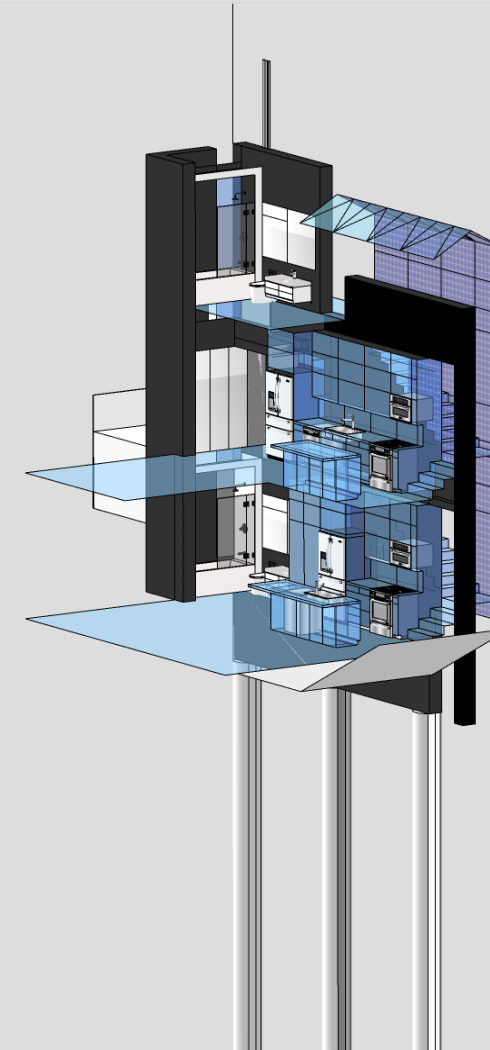
This publication is the **Design Tool-kit** component of a doctoral thesis by an Edmonton based architect. The dissertation addresses the housing crisis in Canada through an affordable and scalable densification agenda for urban neighborhoods, with its focus in Edmonton, Alberta.

The thesis comprises a new business model (*innovation of ways*) for a missing middle typology called **BAAKFIL** (*innovation of things*), as an alternative to *infill* - that promotes respectful densification by first retaining existing serviceable housing stock.

The business model brings a landowner into an investment partnership with a developer to jointly develop underused back yard space of a single family property to build something new; monetising one's asset without putting up any cash, without needing to move and without changing the character of a neighborhood streetscape. Land cost is removed from the developer proforma and new housing is instantly more affordable.

The **Design Tool-kit** offers a guideline to missing middle typologies, with examples that describe an ordered strategy as an idea-primer. Units are flexible yet provide defined circulation, stacked services, gracious living spaces and myriad configurations within a sustainable design framework. Architects, designers and builders can use this **Design Tool-kit** to influence the design of a project to bespoke levels in their own region. No two units need be the same - separating **BAAKFIL** from the commodified house building industry. The Tool-kit advances the principles of retention and gentle densification. It can also be used independently of the business model.

A video summary of **BAAKFIL** and the Design TOOL-KIT can be viewed at www.bjalstudio.ca



BAAKFIL Infrastructure Core

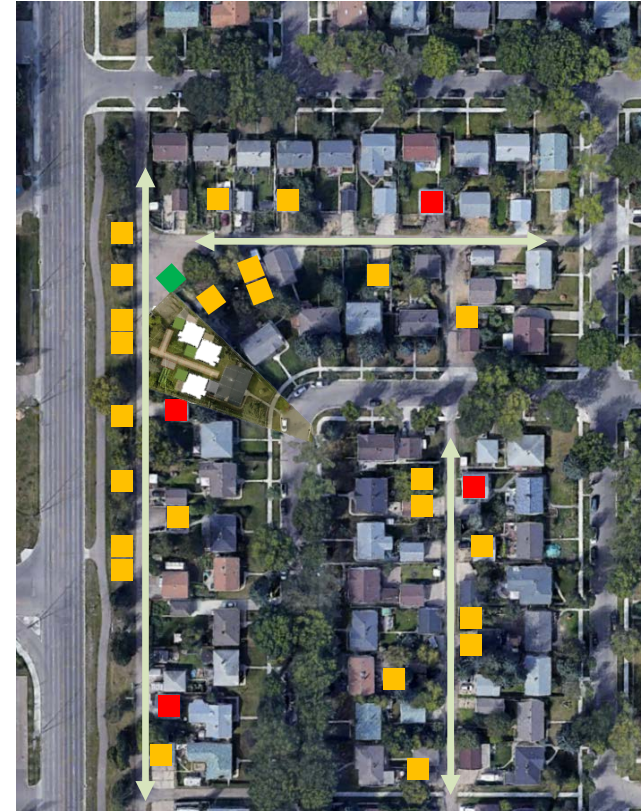
Background

Infill reduces sprawl by increasing density on single family urban lots. Its speculative deployment is however predicated on the demolition of serviceable housing stock with lots sold *at much higher land prices*; replaced by two skinny houses, often larger than the original house. With costs now beyond the \$1M price point in many Canadian cities - this unintended consequence *contributes* to the housing affordability crisis *plus* the erosion of mature neighborhoods. Restrictive, outdated zoning bylaws negate responsive planning and design while ignoring the needs of a changing demographic to an older population and smaller households. Respect for neighborhoods is lost by demolition and over scaled product; impacting the character of existing streetscapes.

BAAKFIL incorporates the smaller household into an underused rear yard; retaining the existing house, leaving the streetscape unchanged. With removal of land cost, affordability is increased. Thousands of lots across the country can accommodate this approach; yielding a scalable model for gentle densification in mature Canadian neighborhoods .

BAAKFIL addresses 'city building' by increasing density and re-inventing the back alley - with sidewalks and commercial activity promoting neighborhood interaction and safety. Gently developed over 25 years alongside updated flexible *zoning*, this transformation engages key ideas about the resilient, 15 minute walkable city.

BAAKFIL is an acronym for **B**ack **A**lley **A**dvantage, **K**inship, **F**amily & **I**ntegrated **L**iving



BAAKFIL incentivizes aging in community, alley revitalization and neighborhood interaction while leaving neighborhood streetscapes unchanged.

Background

The BAAKFIL Tool-kit is a set of design principles:

An urban design strategy that backfills downsized residential options into underused backyards, creating a micro-community and multi-generational or inter-generational living opportunities.

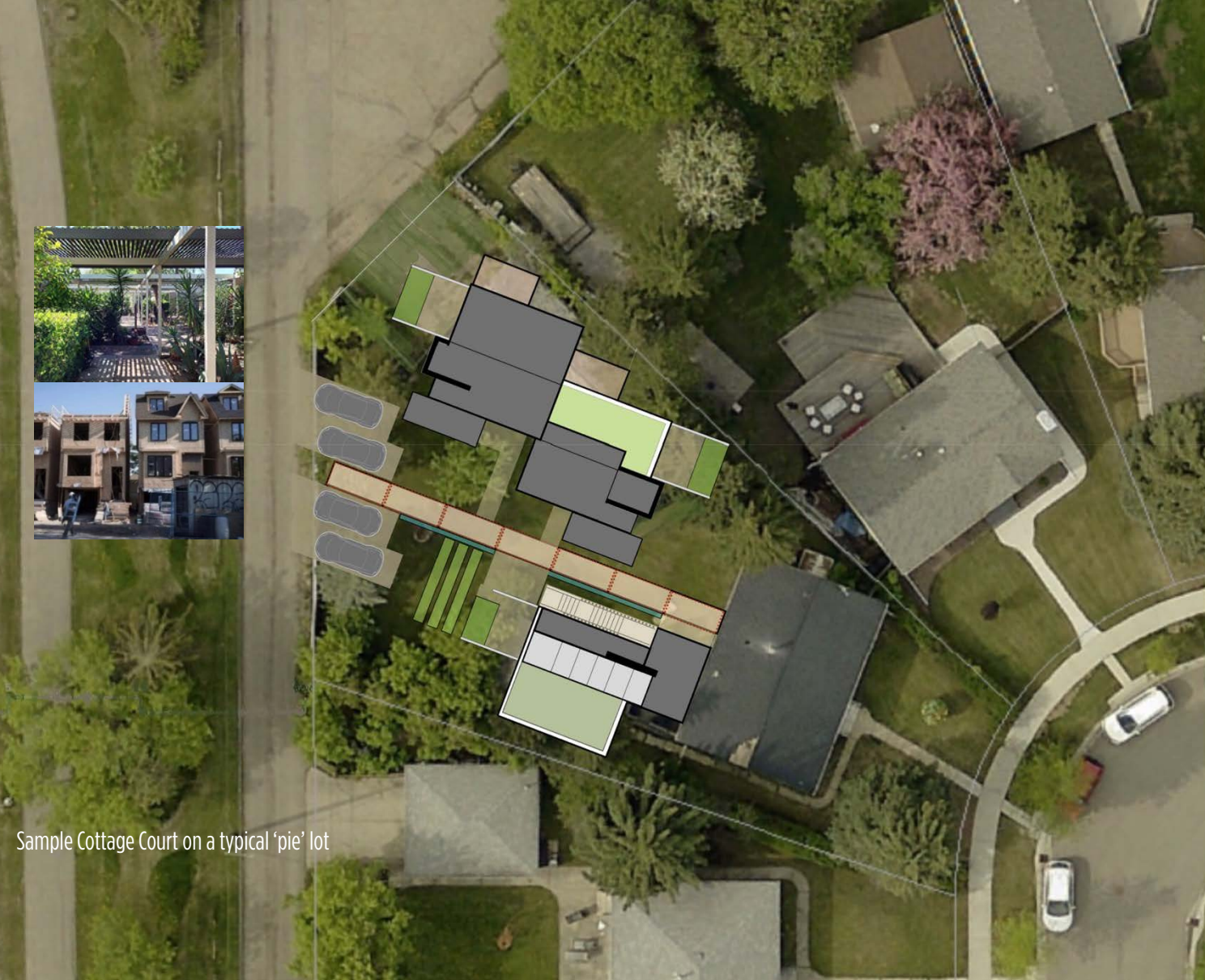
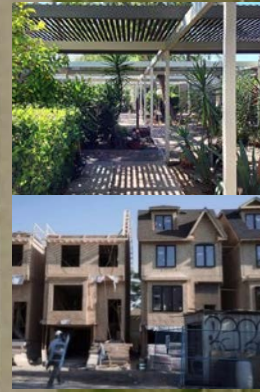
A set of spatial principles with a unique infrastructure core; the Tool-kit planning strategy is illustrated by examples that are ordered, flexible and scalable; adaptable to various socio-economic and site conditions.

The Tool-kit is not prescriptive. It is a generalization of possibilities - a catalyst for responsible site planning and multi-use design.

Architects, designers and builders can use the Tool-kit to inform their own work to meet the specific conditions of their communities across Canada.

This

Not This



Sample Cottage Court on a typical 'pie' lot

The Pinwheel Plan

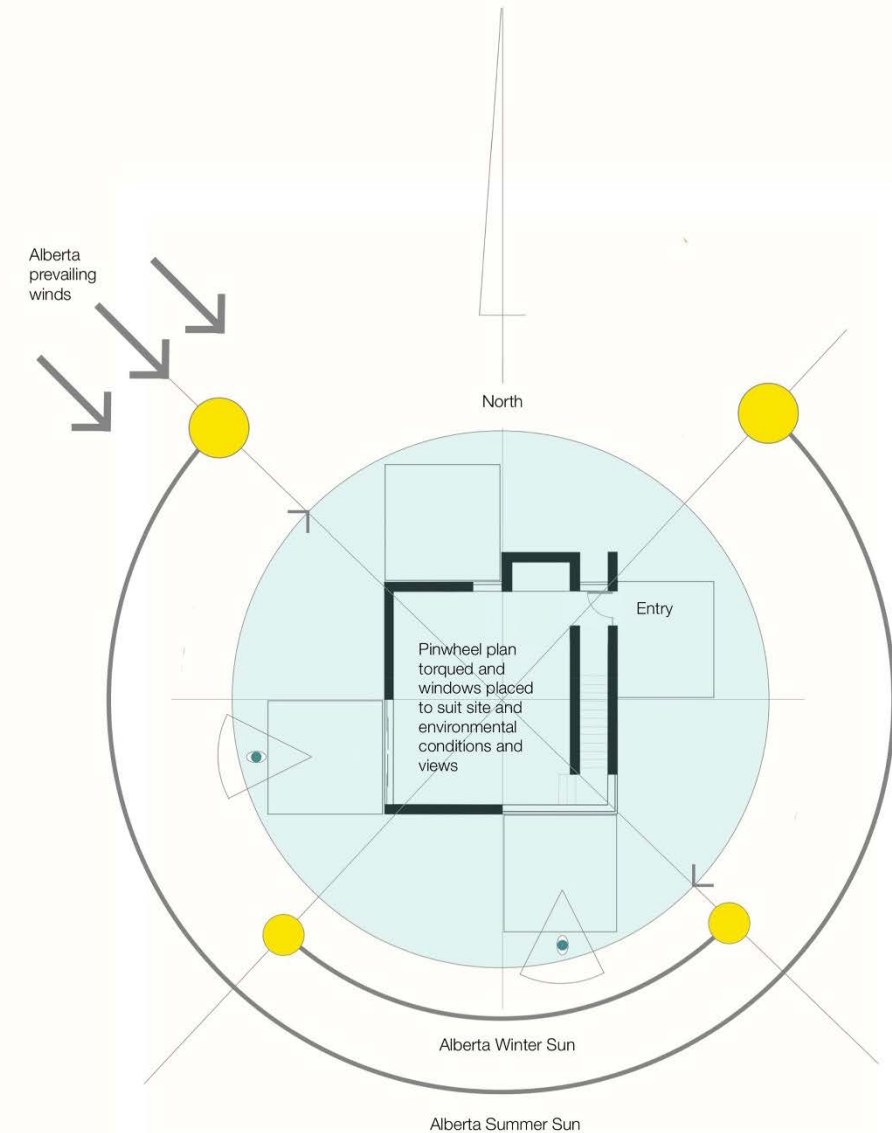
The Design Tool-kit is simple, predicated on building with conventional construction.

It is nevertheless poised to adapt broader technological advances – net zero, regeneration, mass customisation and prefabrication, mass timber, 3d printing, digital twin intelligent building software - as the industry catches up.

BAAKFIL flexibility begins with a compact 24' x 24' (7200mm x 7200mm) footprint - a foursquare 12 foot (3600mm) module that yields efficient room sizes, side by side on standard 30' – 50' lot widths.

Based on a pinwheel, plans can be modified or 'torqued' around the centre axis – to be oriented specifically to climate and site.

The footprint is a consistently ordered plan, but porches, doors, windows and deck locations can be positioned almost anywhere to prioritise rooms or spaces with access to views, wind protection or to capture the sun; depending upon site and program requirements.



The Pinwheel Plan

The planning module accommodates room expansion or contraction with different roof, window and wall configurations and materials. Porches, decks, patios, bay and extended window assemblies are all possible within this compact footprint.

BAAKFIL can align with personal taste or the character of a neighborhood.

A bespoke residence can be derived from simple principles, ensuring that **BAAKFIL** negates the predictable homogeneity of mass housing developments.

The 24 x 24 base planning module also adapts to derivative modules of:

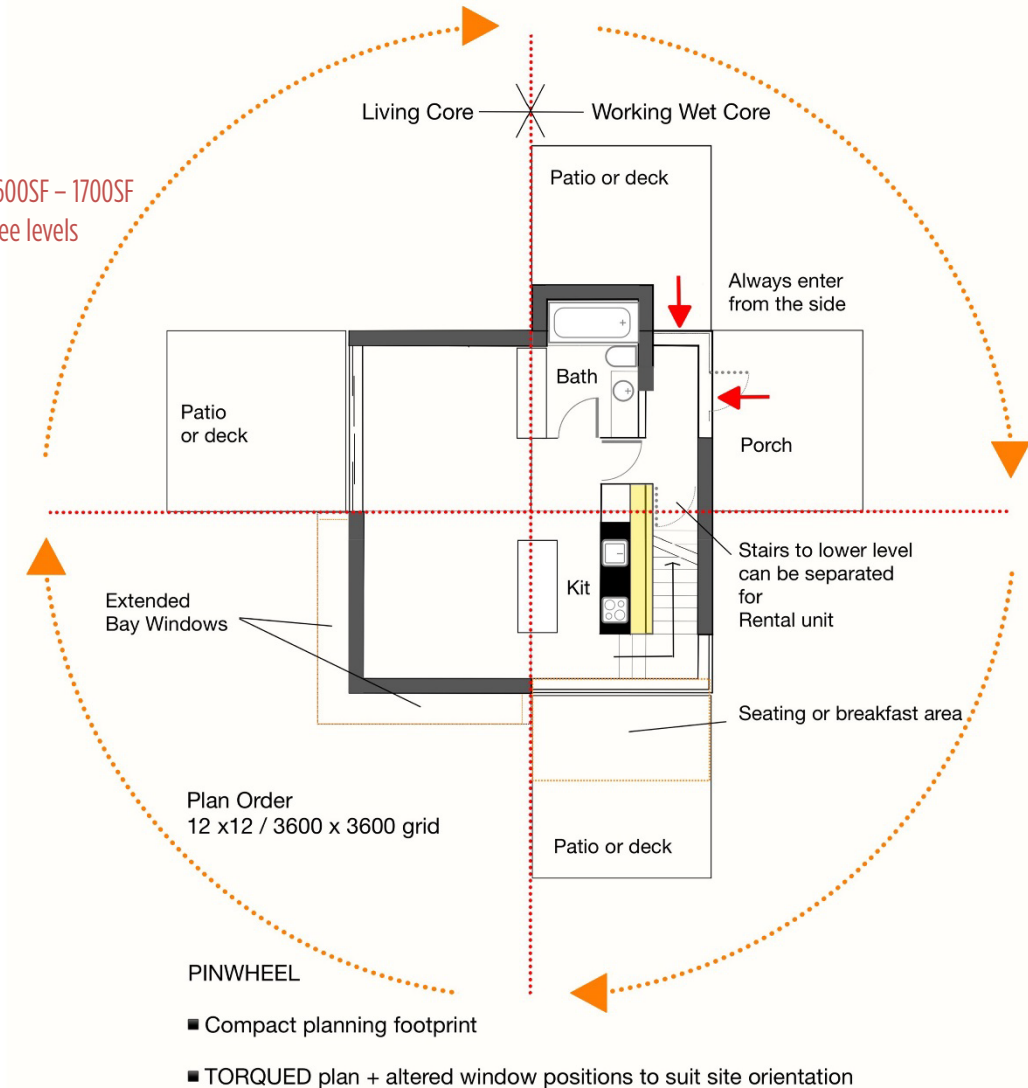
20 x 20 (6000mm x 6000mm)

22 x 22 (6600mm x 6600mm)

22 x 24 (6600mm x 7200mm)

These are equivalent to the footprint of standard double car garages that exist everywhere, often purchased as kits from home building suppliers. This building form is so common to neighborhoods across the country that community groups can quickly understand the unthreatening scale of a BAAKFIL proposal.

Units range from 600SF – 1700SF
on one, two or three levels

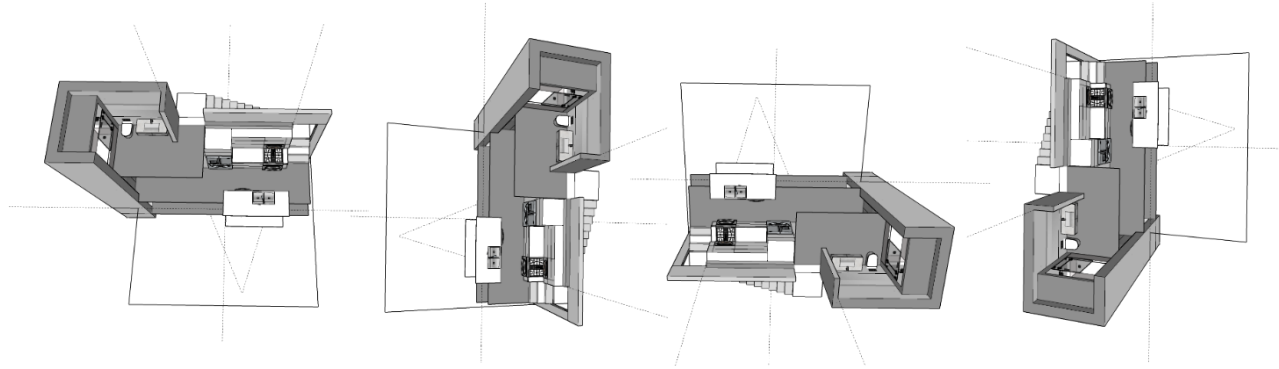


The Pinwheel Plan

Layouts with the infrastructure core can be simply

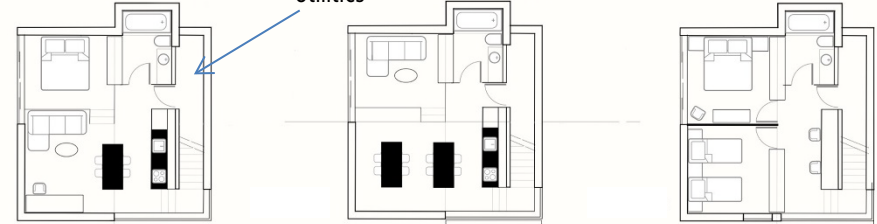


to respond to site and climate orientation.



Plan order

Utilities

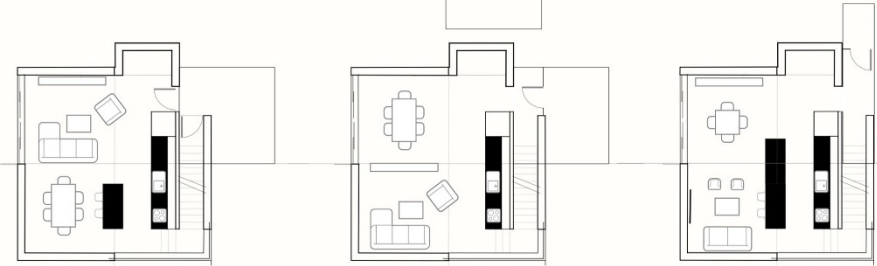


Lower Suite

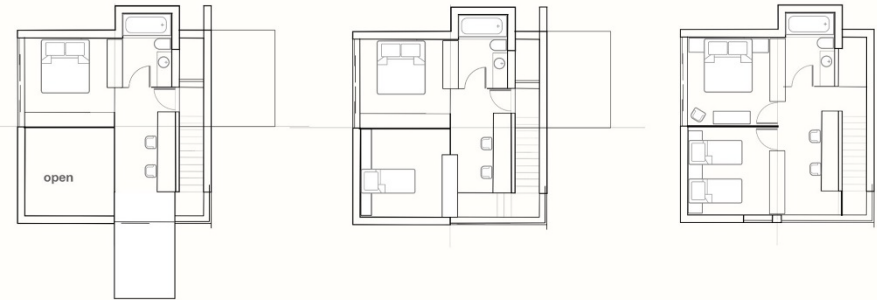
Studio

Bedrooms

Main



Upper Loft



The Infrastructure Core

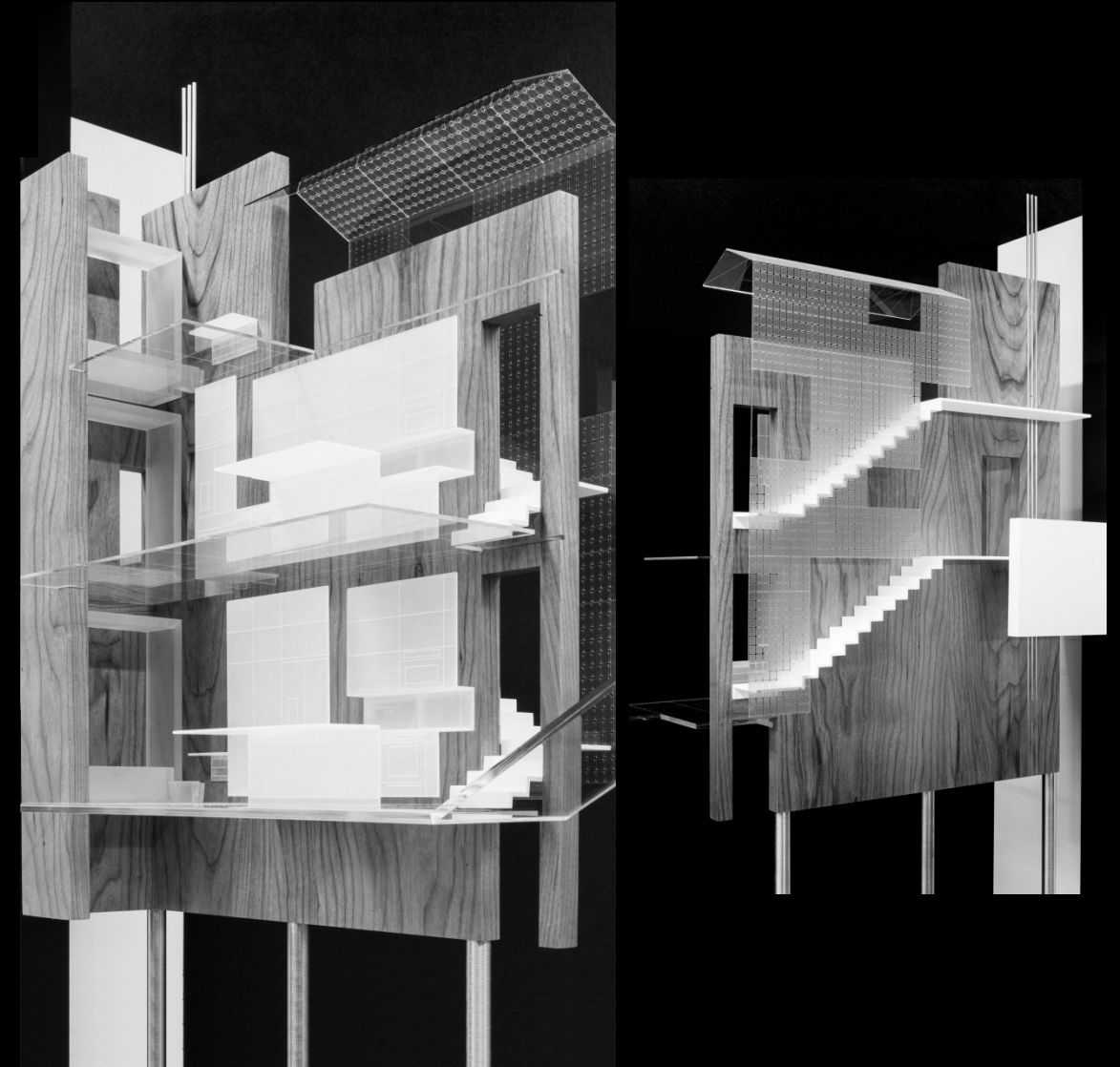
The backbone of BAAKFI, the infrastructure core is an integrated planning and service strategy influenced by Louis Kahn's original definition of servant and served space.

The *Servant* space is a consolidated collection of:

- Stairs
- Kitchens (with variable sizes and layout) appliances and millwork
- Baths
- Storage
- Energy infrastructure
- Components can be prefabricated or customised
- Services can be stacked

The *Served* spaces – living, working, eating, sleeping can be open or enclosed with a module space width of 12'

The core elements - typically de-centralised in a builder residence - are concentrated, leading to economies of scale and services distribution. As a *parti*, the core enables flexible room layouts, exposure, design expression and cost effective construction, adaptable to changing technologies.

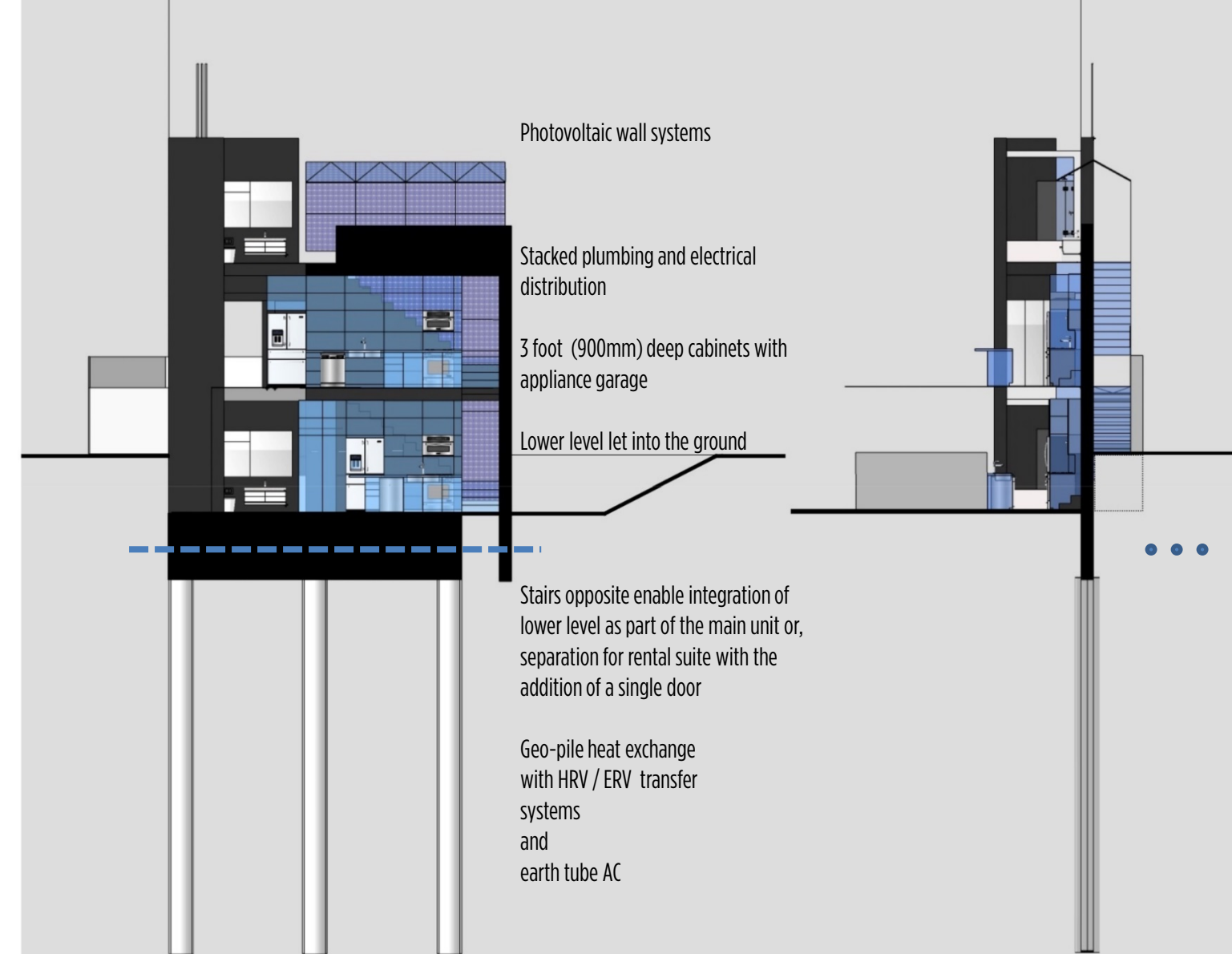


The Infrastructure Core

Services are stacked. Wet vertical services are placed on the inside wall, with horizontal services feeding from it through a floor or ceiling plenum.

BAAKFIL is net zero ready - the core can accommodate nature-based or technical innovations:

- Stacked plumbing, electrical and mechanical distribution reduces material quantities, bends and site coordination challenges, yielding economical construction with base materials.
- The natural insulating characteristics of the earth work at no cost, with the building perimeter let into the ground to reduce the exposure of the envelope to the elements.
- Earth tube cooling is a natural system derived from installing continuous lengths of plastic pipe below the frost line to enable outdoor air to be drawn through it into a structure via an in-line fan. The natural insulating characteristics of the earth mean that ambient temperatures averaging 55 degrees F naturally cool fresh air to eliminate the need for air conditioning.
- The use of solar panels as an add-on after market product, is being superseded by efficient and increasingly cost effective innovations, such as photovoltaic assemblies where energy can be harvested within skin and roof materials integrated with the building envelope.



The Infrastructure Core

- Heat pumps can be used with geo-pile foundations that are natural energy capture systems that use carrier fluid piping installed inside the reinforcing cage of a structural pile foundation. Heat can be extracted from or injected into the ground with earth assist to absorb heating and cooling loads. This can also include pre-heating domestic hot water prior to being distributed to a tank-less hot water system.
- The 12" (300mm) thickness of the core wall accommodates small, higher velocity ductwork in HRV/ERV heat recovery systems, reducing the extent of branch ductwork that often interferes with other services. Loft areas can in effect be ductless, with direct discharge or extraction .
- The core wall thickness enables standard two foot (600mm) counter depths to be increased to 3 feet (900mm) to provide deep pull out lower storage bins and appliance storage at the counter level. Increasing storage in compact spaces, appliance 'garages' are standard details in the practice and are used for kitchenware, glassware and appliances.
- Integration of doors with millwork eliminates cumbersome rough carpentry framing for closets and service rooms. Prefabricated panels or doors reduce cost and increase net usable area.



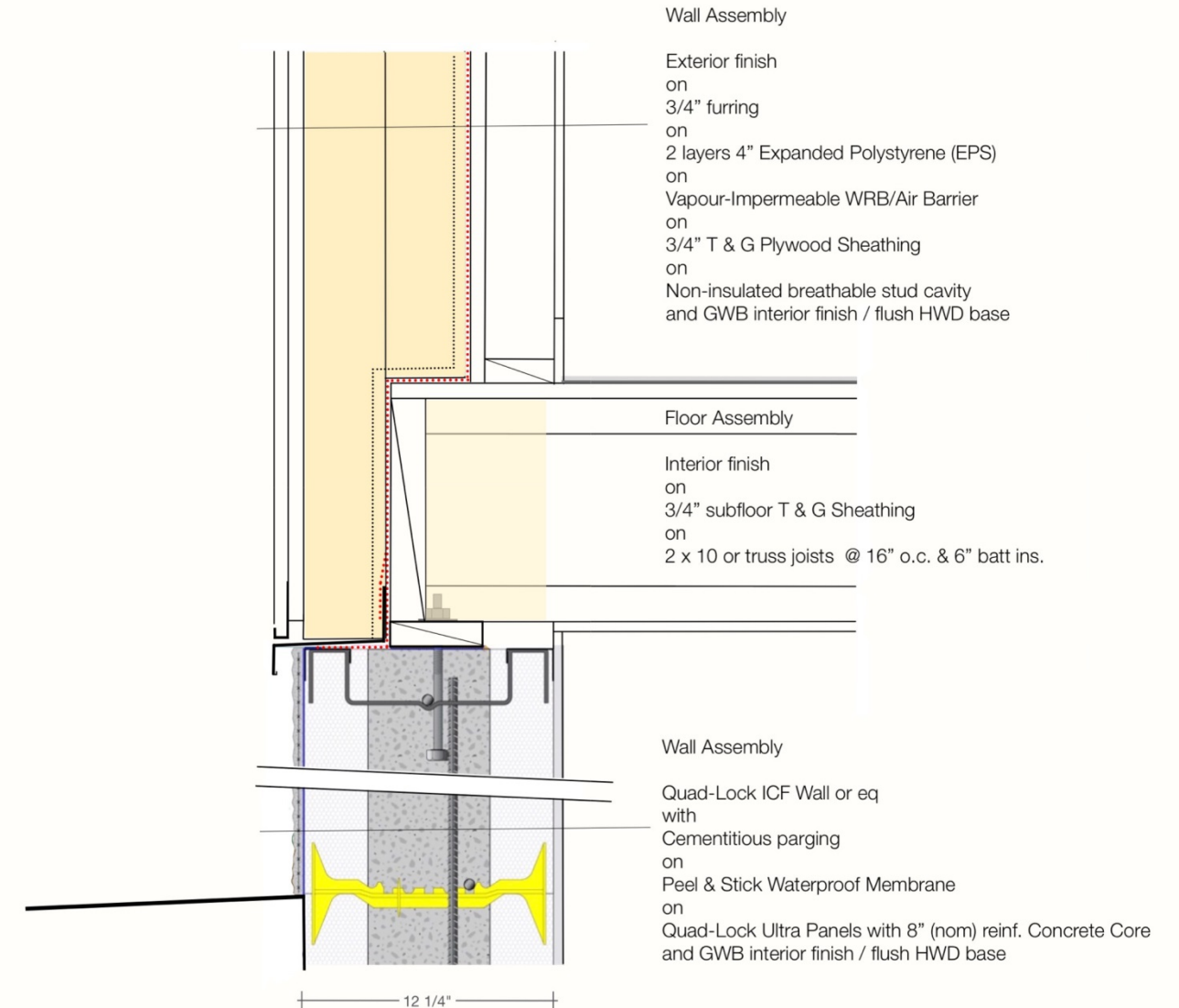
BAAKFIL Construction Adaptability

Material selection and design detailing is not limited with BAAKFIL.

Within a 12" (300mm) thick envelope (or more) higher R values with traditional or new products and finishes, can result in a net zero strategy using floor, wall and roof configurations best suited to the location where BAAKFIL is situated.

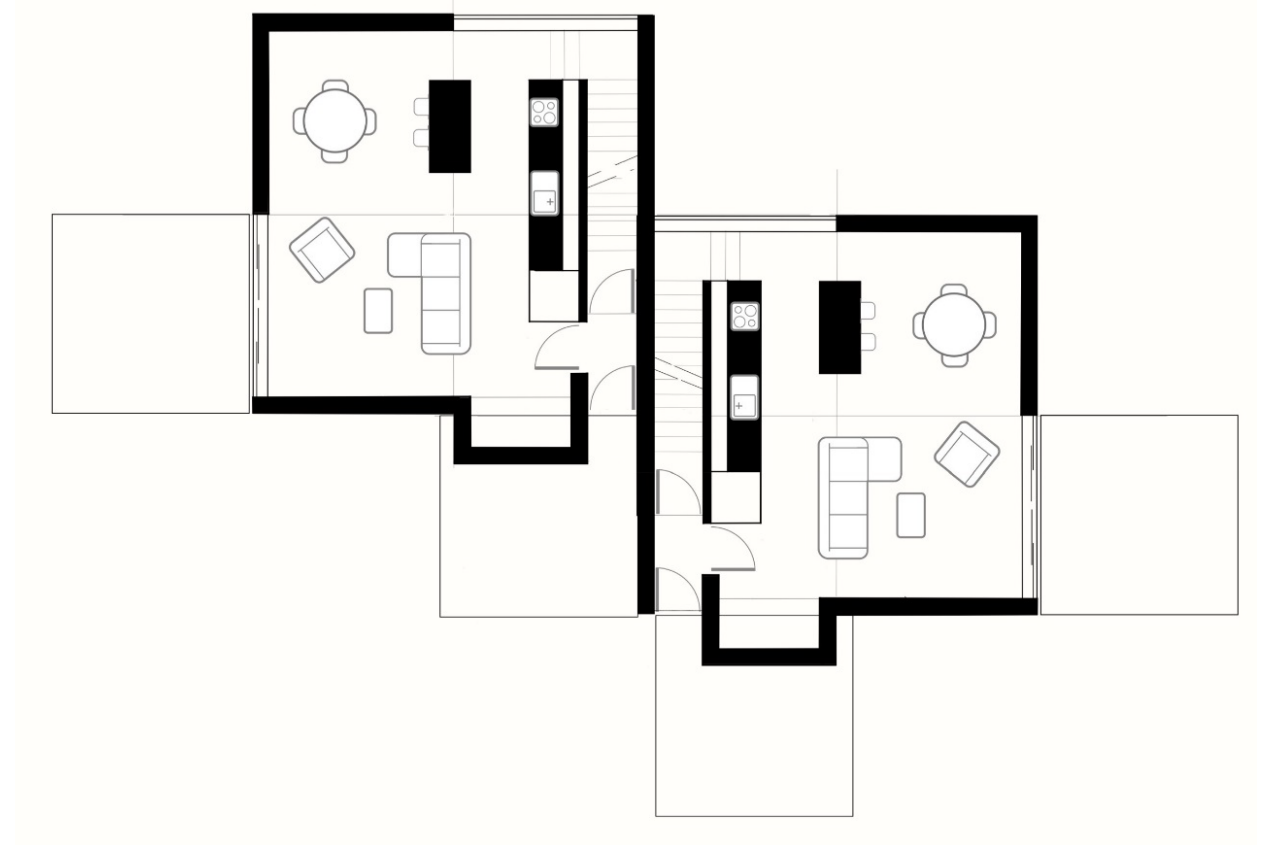
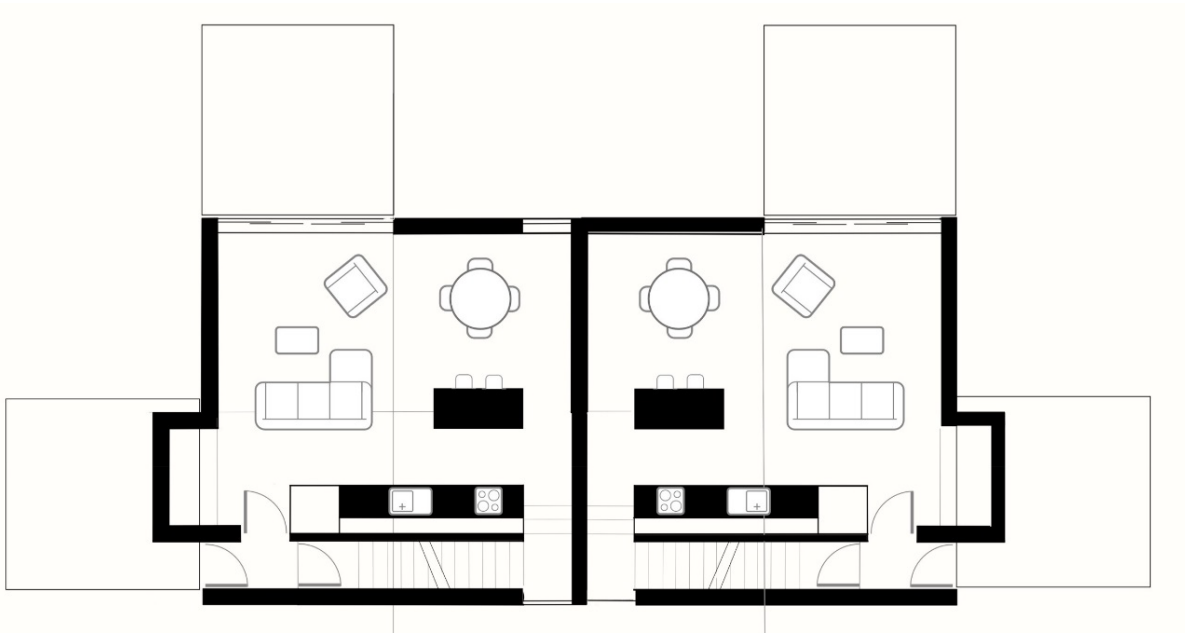
Within this flexible matrix, architects, designers and builders can adapt their work to enable innovations from 3D printing, prefabrication, mass customisation, proprietary building products, digital-twin intelligent building software, all pointing to net zero carbon buildings, when and where the market supports these initiatives.

BAAKFIL supports the NECB, BC Step Codes, Green Energy Futures, and other sustainable building performance metrics.



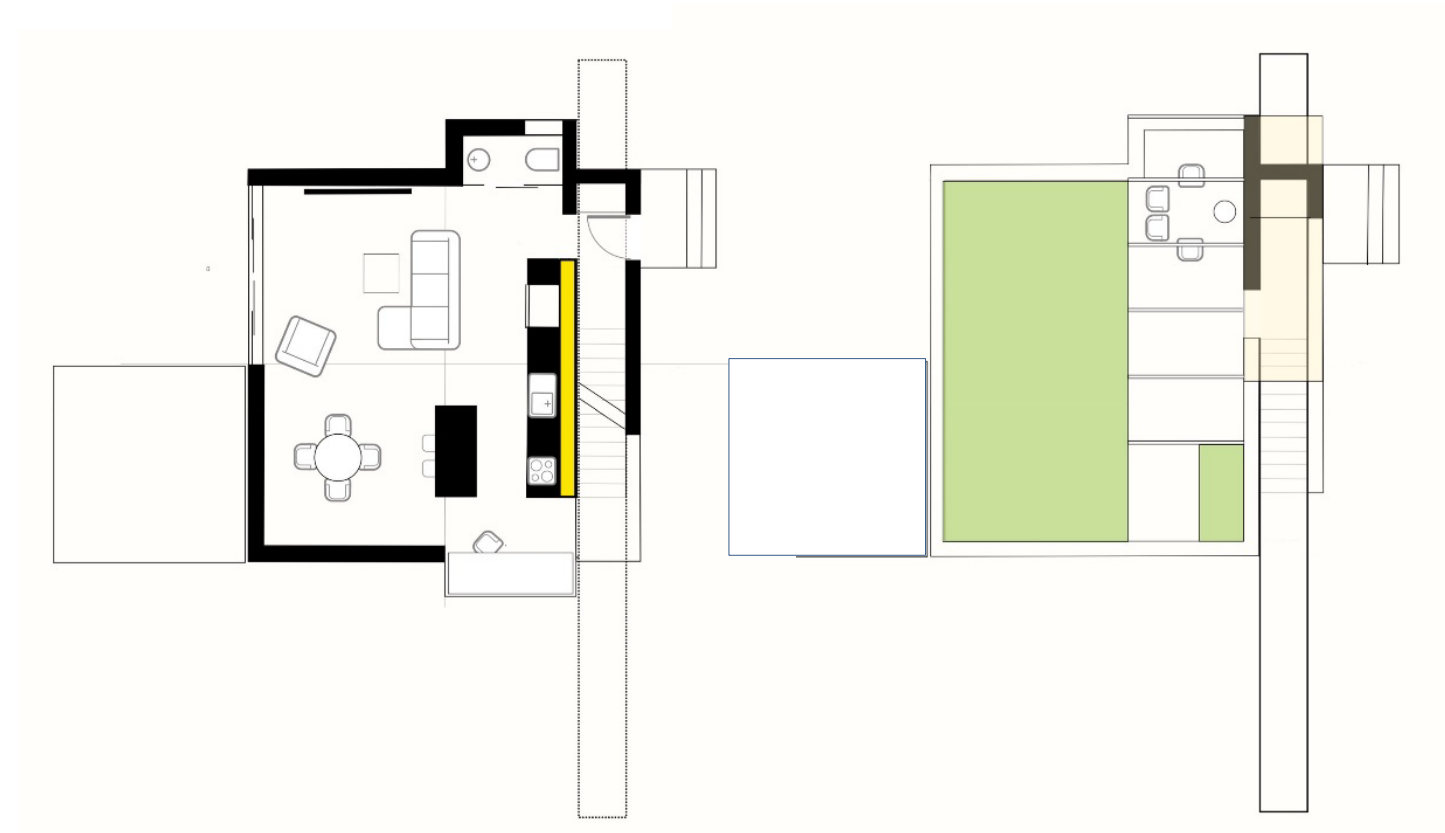
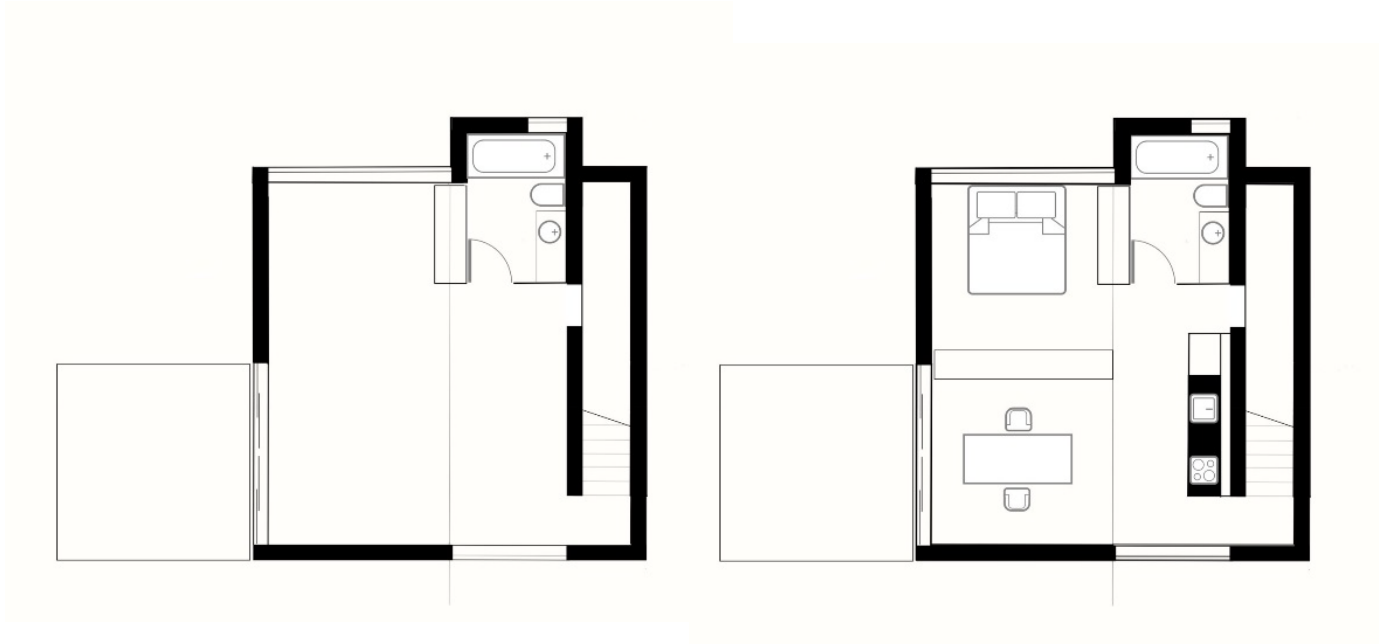
BAAKFIL Site Planning Adaptability

To enable flexibility and accommodate various sized lots, BAAKFIL units can be combined to create duplex and/or missing middle 'cottage court' typologies to increase density on larger properties such as corner, 'pie' or irregularly sized lots.



BAAKFIL Typology Adaptability

BAAKFIL accommodates flexible kitchen sizes, loft space, roof decks, roof porches and future expansion.



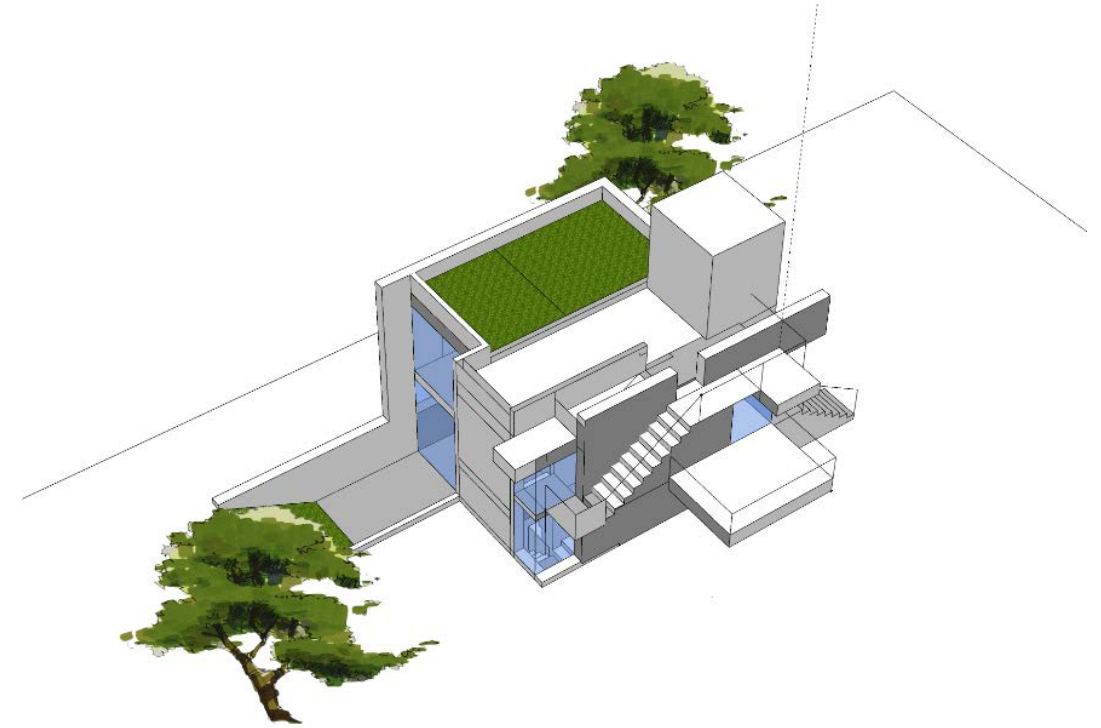
BAAKFIL Typology Adaptability

BAAKFIL accommodates amenity spaces and unit configurations over one, two or three levels.

With no basement, the lower level can be let into the ground where soils conditions allow and reduce scale while providing intimate, private patio and living spaces.



Co-joined Units



External or internal stairs and roof amenities

BAAKFIL Typology Adaptability

BAAKFIL accommodates amenity spaces and unit configurations over one, two or three levels.

With no basement, the lower level can be let into the ground where soils conditions allow and reduce scale while providing intimate, private patio and living spaces.



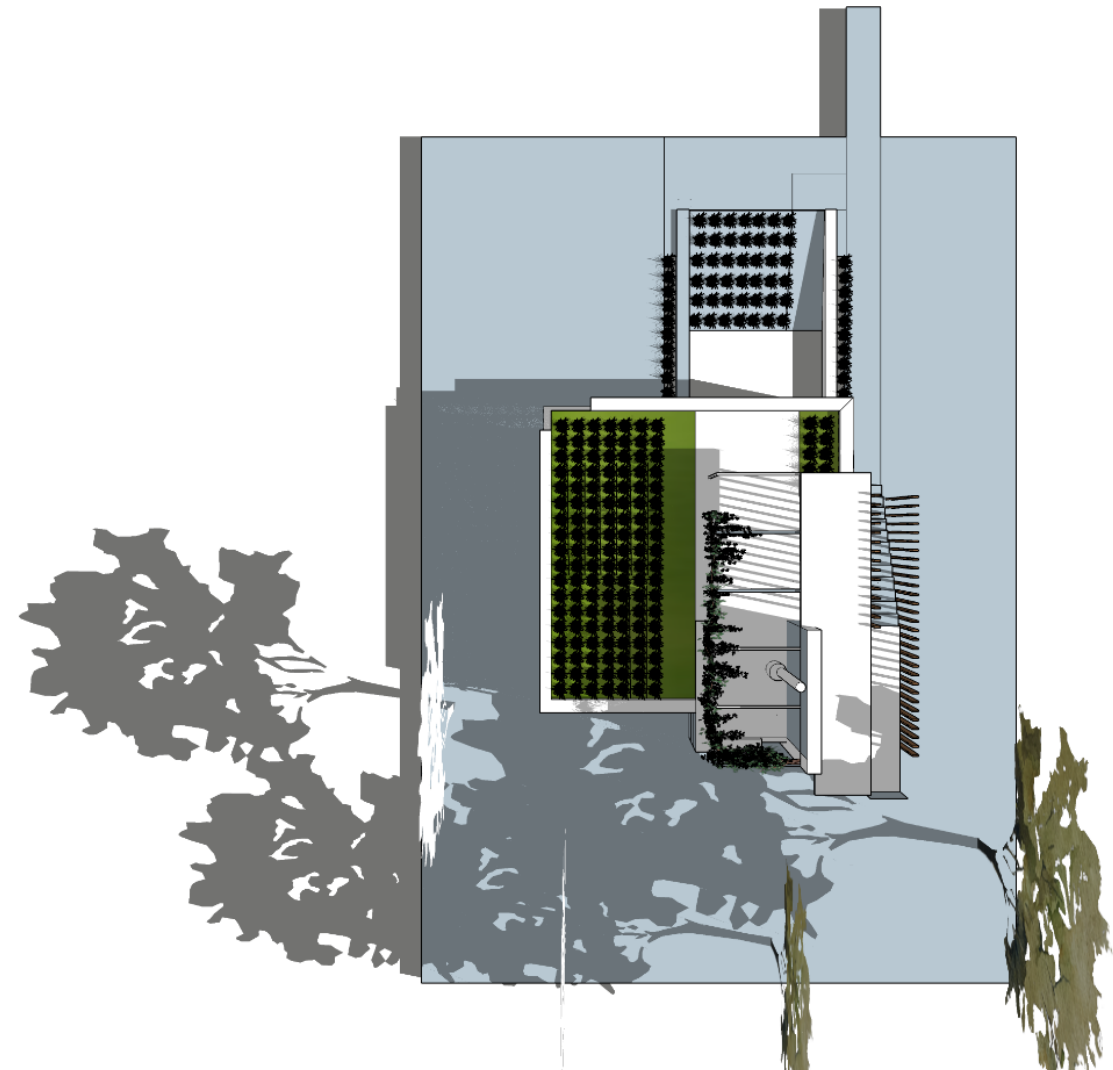
Single Unit with rentable lower level and common porch



Urban agriculture interior and exterior

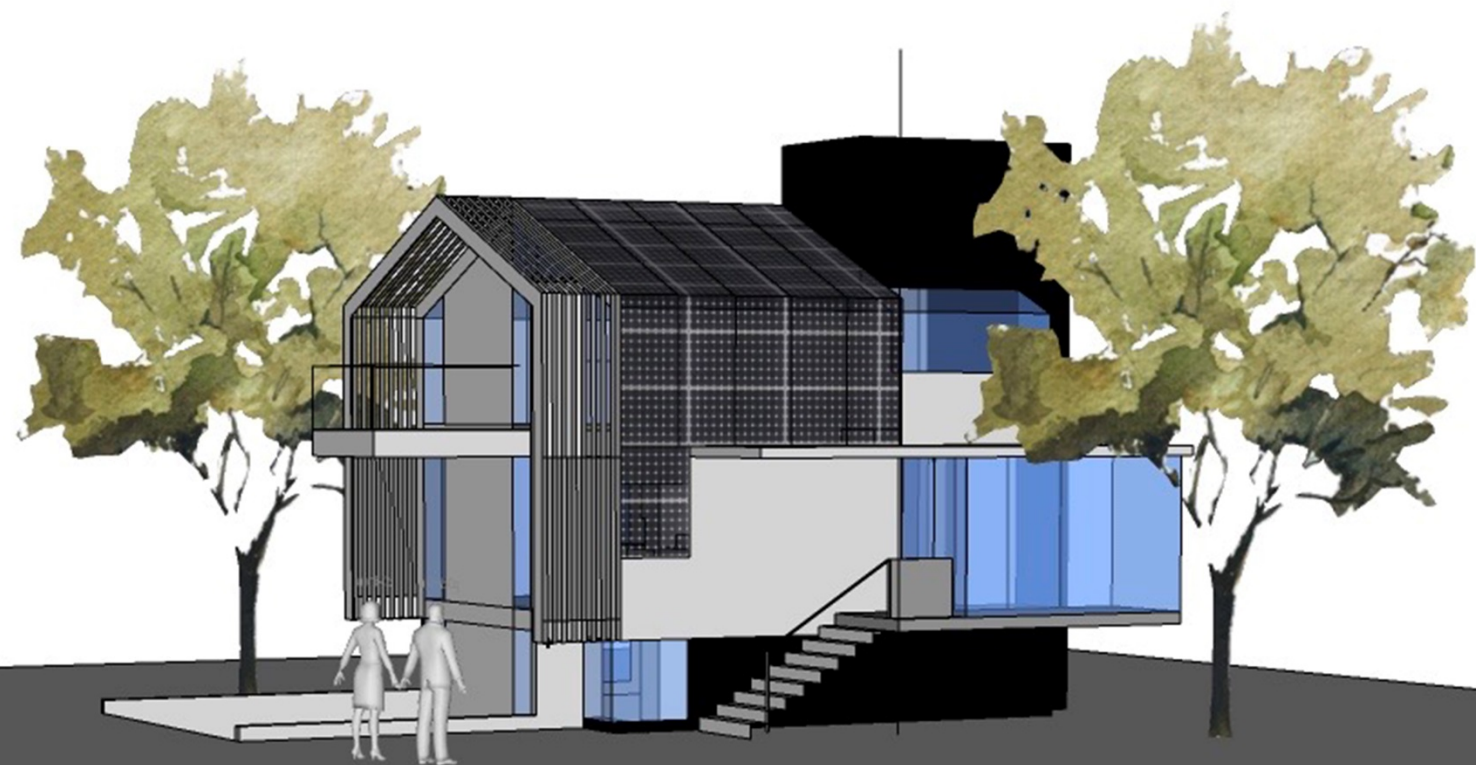
BAAKFIL Typology Adaptability

BAAKFIL accommodates roof deck amenities convertible to trellis patios, porches and internal expansion. This can be accommodated with single or two level units.



BAAKFIL Typology Adaptability

BAAKFIL is net zero ready as it can accommodate numerous technologies such as photovoltaics, ge-piles, earth tube AC and HRV / ERV systems.



BAAKFIL Typology Adaptability Universality

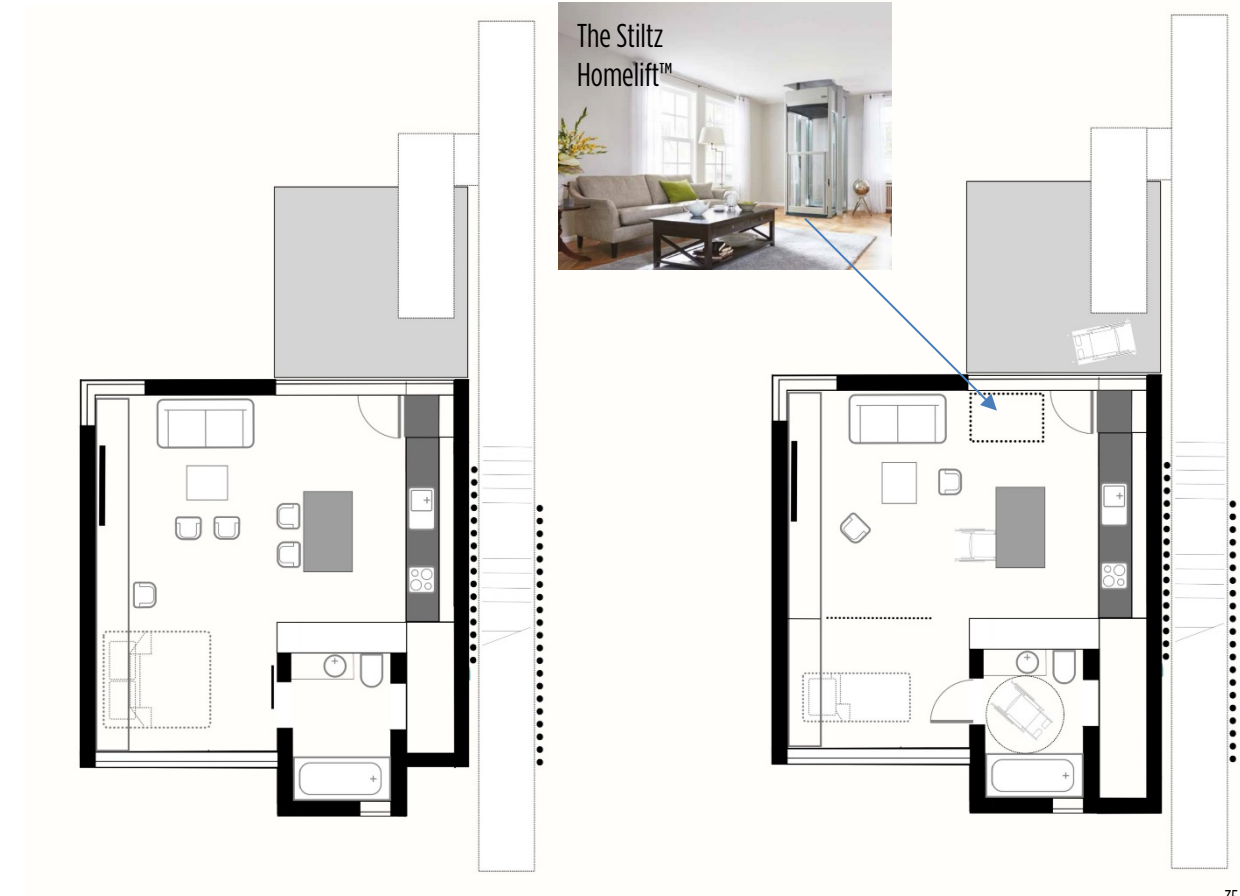
The 2021 Canadian Census validates the predictions of the 2016 Census. Canada is now officially an aged population. The baby boomer generation is rapidly becoming older, retiring, downsizing and increasingly infirmed.

- 19% of the population is 65 or older
- 22% of the population is between 55 - 64.

Universal design and living for seniors to thrive, by aging in community without being institutionalised is forecast to be a growth industry in the housing market.

BAAKFIL can become a leader in this area.

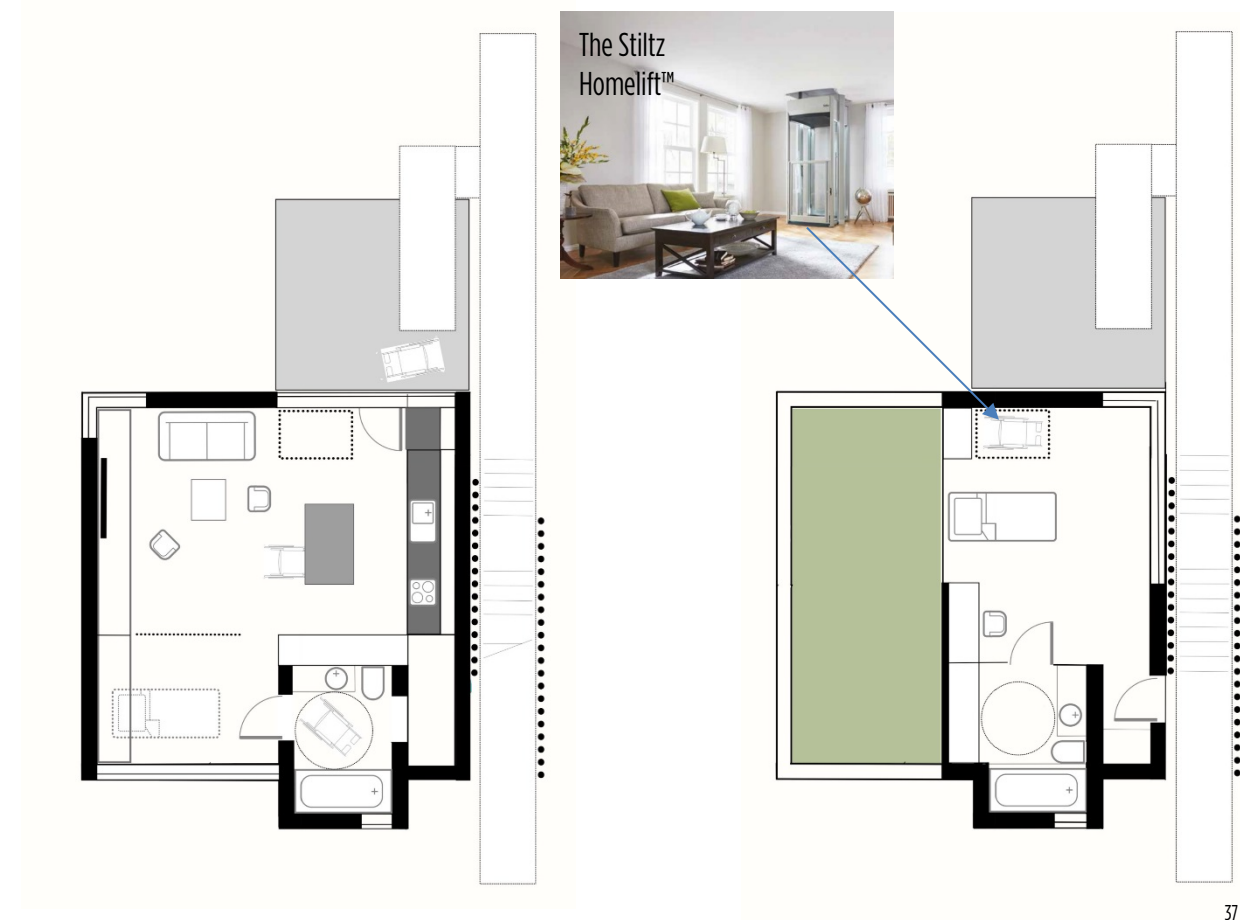
Layouts can be designed to incorporate future universal access with ramps, lifts and accessories. Unit designs can enable independent living, hobbies, co-dependent living, live-in health care or part-time health care, all within a multi-generational or inter-generational context next to family.



BAAKFIL Typology Adaptability Universality

The generic BAAKFIL universal unit can be a self contained single storey (per previous page) with an external stair and roof deck for able bodied and independent persons.

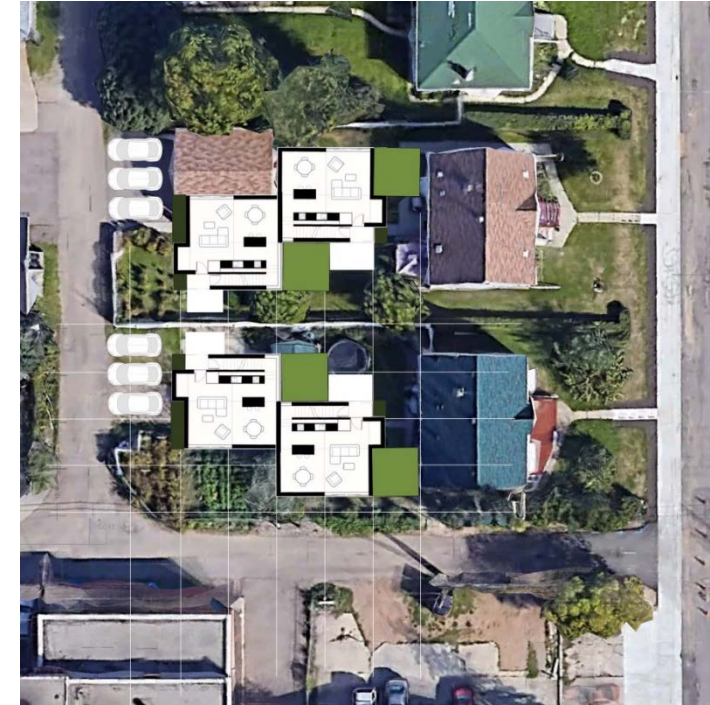
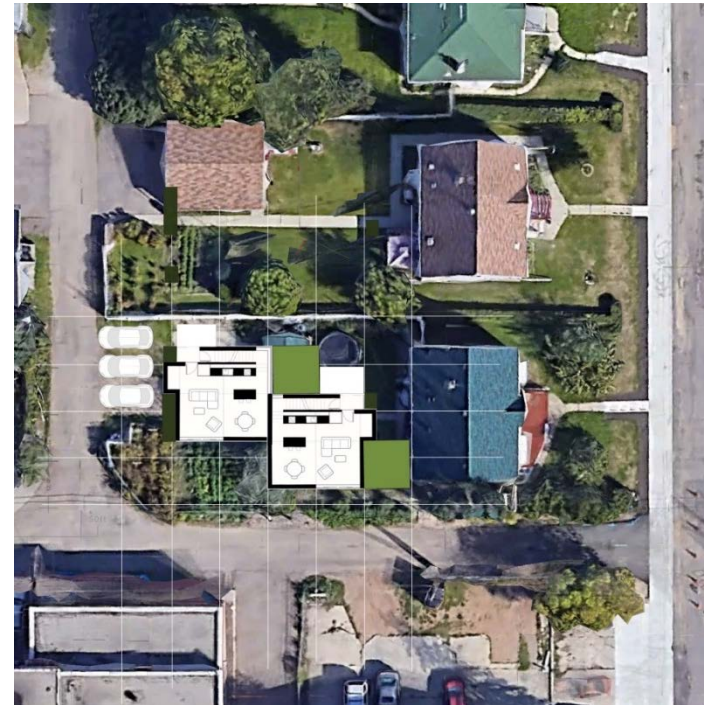
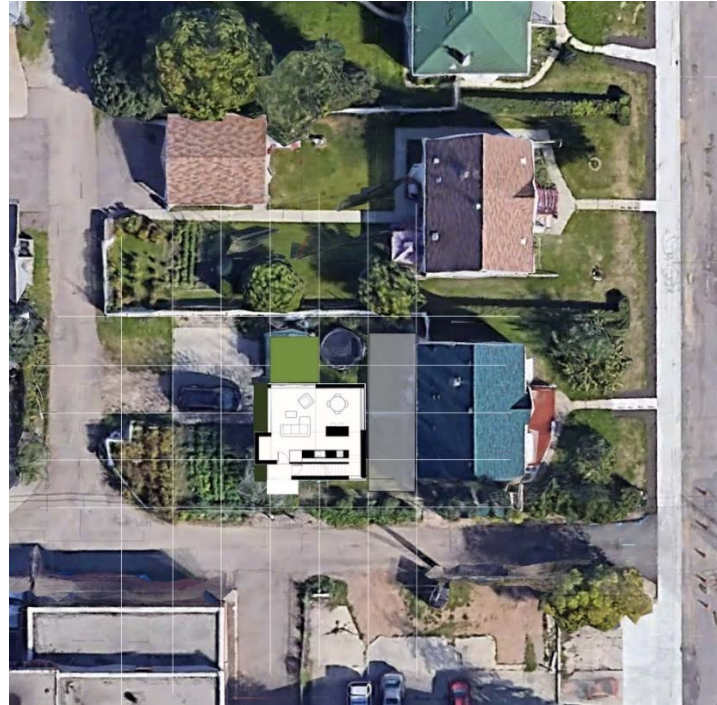
The roof deck can be developed into a second floor bedroom or studio for the occupant or his or her health care resident in the future with an internal lift connecting both levels. The lift can home base at the second level leaving the floor area of the main living floor unimpeded.



BAAKFIL Typology Adaptability Cottage Court / Corner lots

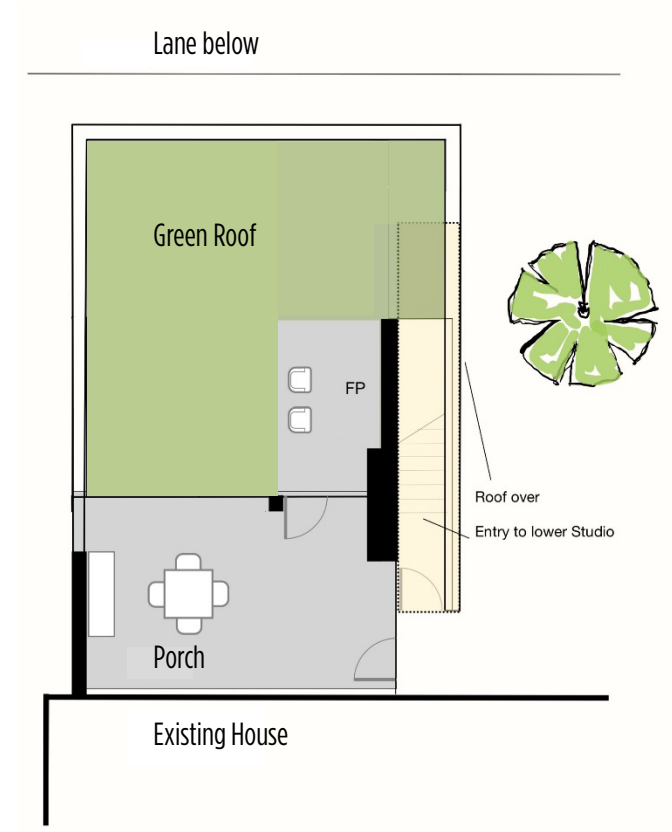
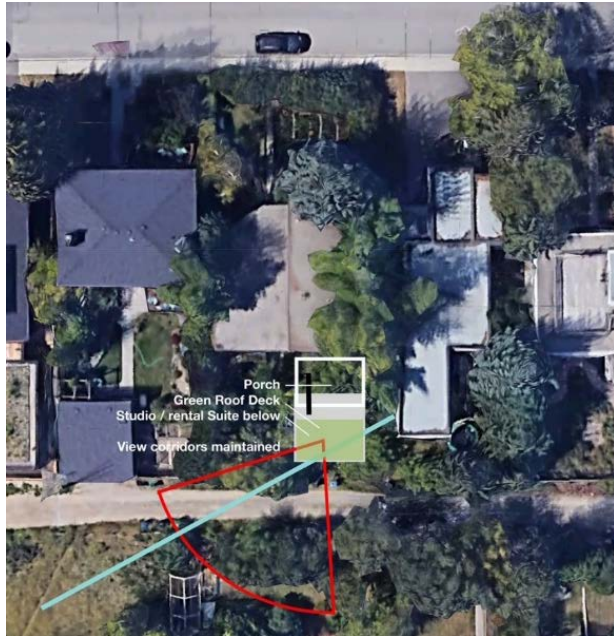
BAAKFIL accommodates corner lots
in addition to internal and pie lots.

Larger developments are also possible with
neighbors partnering together.



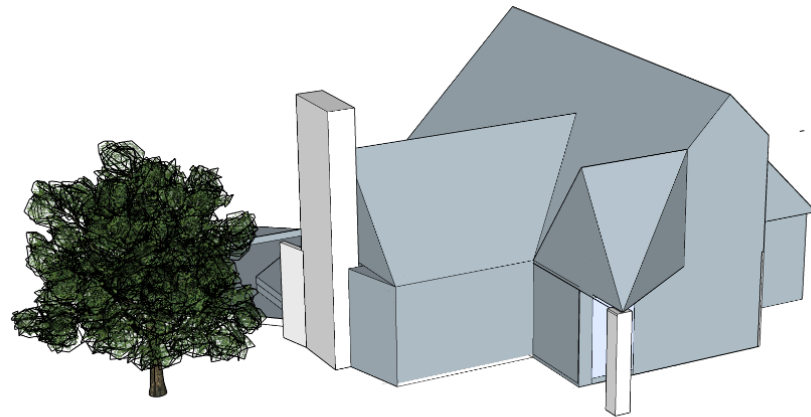
BAAKFIL Typology Adaptability Hillside Studio

BAAKFIL accommodates sloped sites.



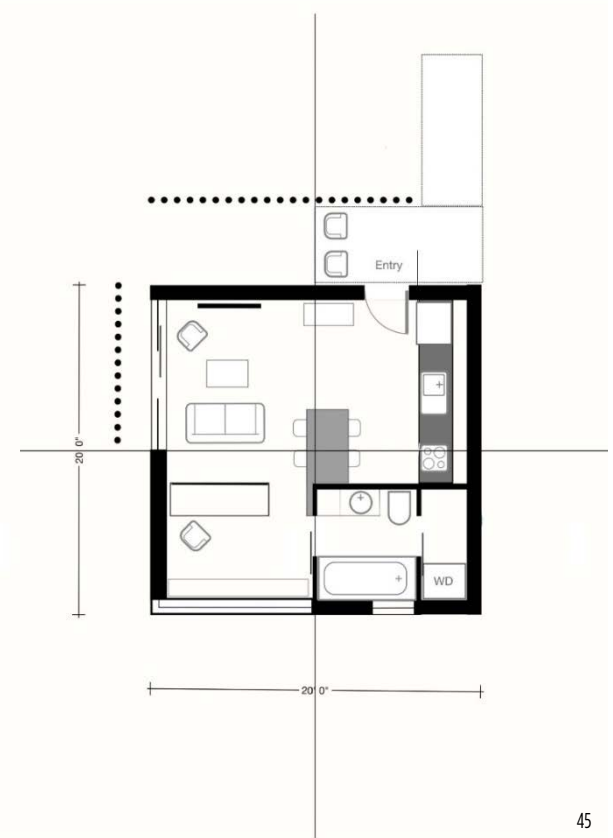
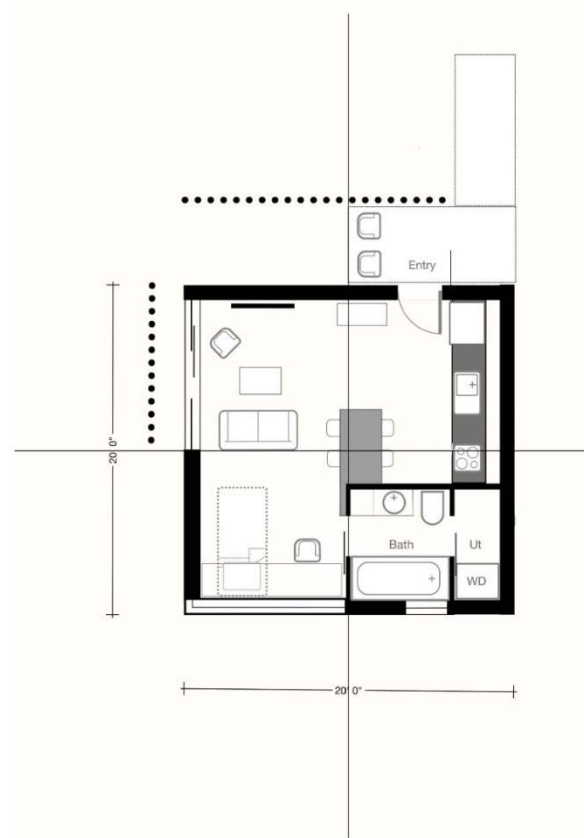
BAAKFiL Typology Adaptability
House renovations

BAAKFiL accommodates additions and renovations to existing residential units.



BAAKFIL Typology Adaptability Smaller Footprint

BAAKFIL accommodates a smaller footprint such as 20 x 20 (6000mm x 6000mm) or 22 x 22 (6600mm x 6600mm) on a single level.



BAAKFIL Typology Adaptability The 2 Car Garage

BAAKFIL accommodates *existing* 2 car garages, when foundations and building shell can be retained or upgraded.

