1. The narrow site limited the south elevation to a width of only 5.5 metres.

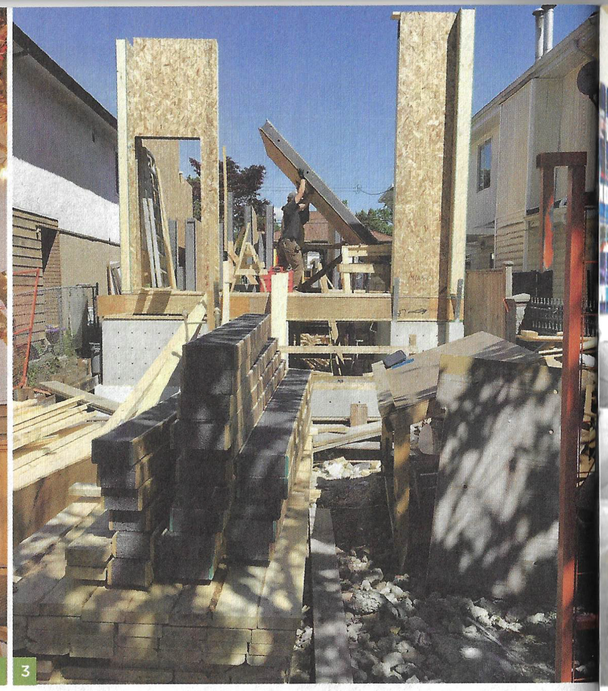
The Passive Narrowtive House

Infill project a model of gentle densification and adaptability to changing needs

By Nick Bray Architecture

"The Passive Narrowtive" is located on a narrow infill lot near the centre of Vancouver. The house is lived in by the architect's young family, with a tenant living in the garden suite below.

The intent was to demonstrate that a certified Passive House could be built on a small and challenging site, rethink housing design, and test innovative products and technologies.



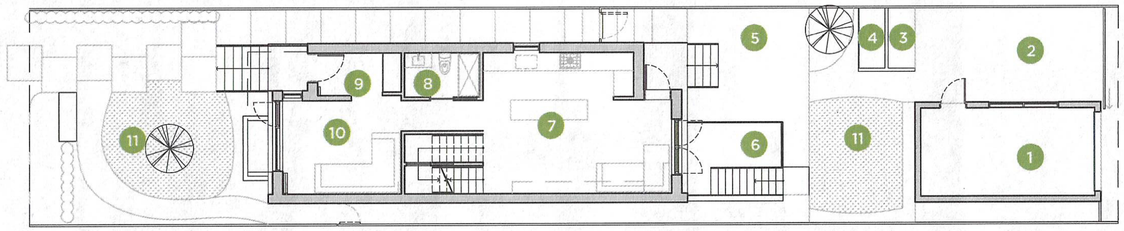
PROJECT CREDITS

OWNER/DEVELOPER/ARCHITECT Nick Bray Architecture Ltd
CONTRACTOR JDL Homes Vancouver / Black Thumb Contracting
STRUCTURAL ENGINEER Miskimmin Structural Engineering
COMMISSIONING AGENT Rudy Sawatzky
PHOTOS Martin Knowles Photo / Media

PROJECT PERFORMANCE

Total energy Intensity (base building and process energy) =
54.5 KWhr/m²/year

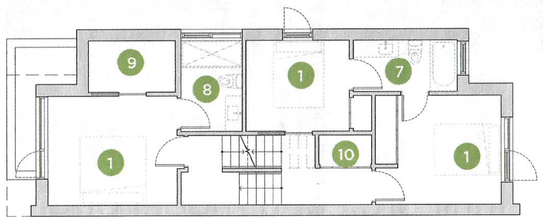
2. The north elevation with a stair leading to the basement apartment.
3. The above-grade walls built with pre-fabricated structural insulated panels. The air barrier used on the house, the NS-A250 barrier by **Naturaseal**, is an eco-friendly waterproof, vapour resistant, UV stable elastomeric coating that is cold-applied using a spray system.
4. The split-level design eliminates the need for a corridor on the second floor and enables the living area to have a 3.6-metre ceiling height.
5. The main floor kitchen and dining area.



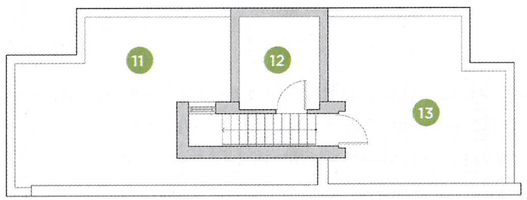
Site plan

1. One-car garage
2. Exterior parking
3. Garbage enclosure
4. Bike locker
5. Patio
6. Lightwell
7. Kitchen / dining
8. Powder room
9. Lobby
10. Living area
11. Lawn

Basement



Second floor



Roof

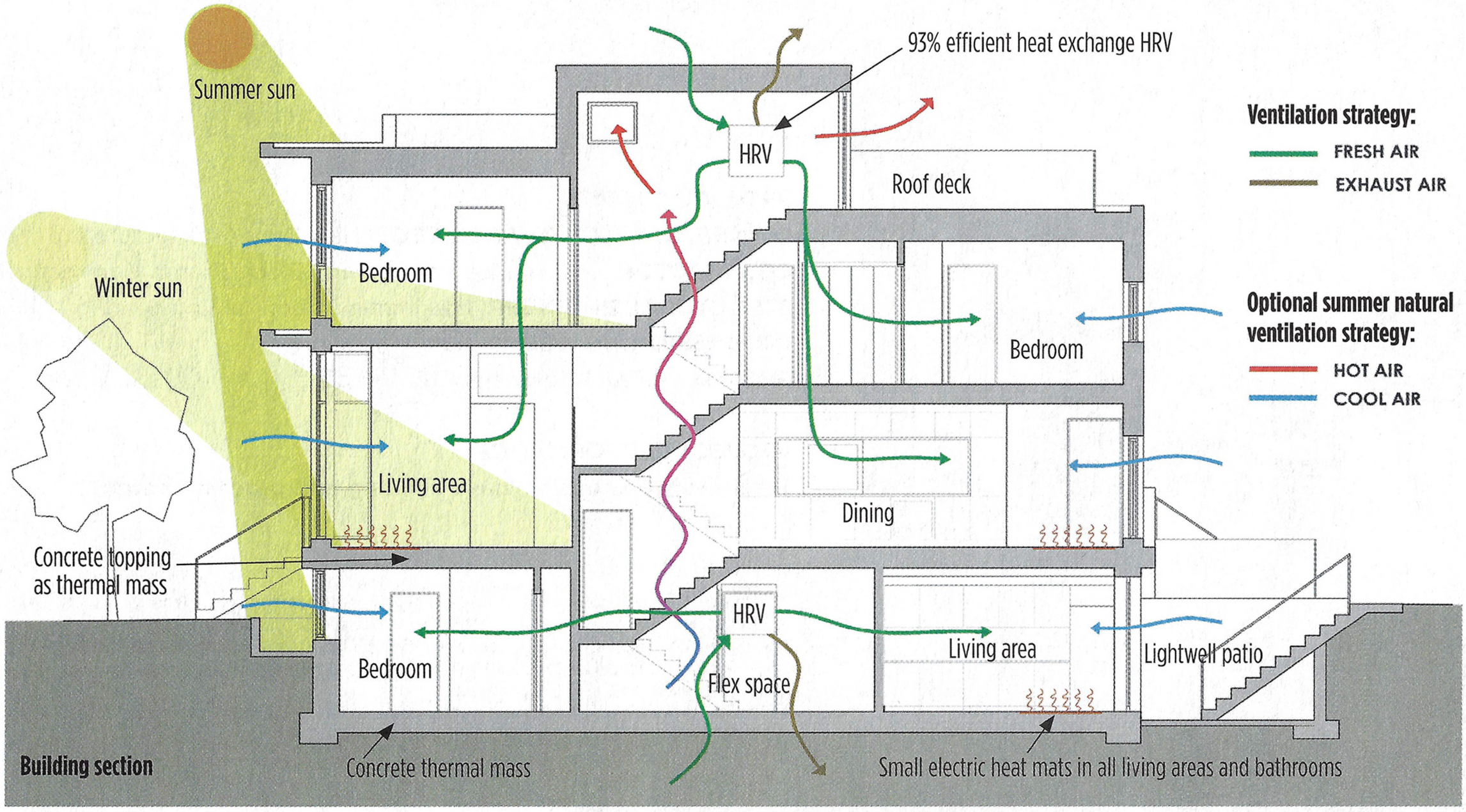
Floor plans

1. Bedroom
2. Flex bedroom
3. Living area
4. Patio
5. Laundry
6. Mechanical room
7. Bathroom
8. Ensuite
9. Closet
10. Laundry
11. Solar panels
12. Storage/mechanical
13. Roof deck

The size and orientation of the site presented unique challenges, being long and narrow with the south elevation limited to a width of only 5.5 metres. More critically, its location in a peat bog with a high water table, required an innovative, low-impact foundation system to maintain the natural hydrology and comply with new environmental regulations. The house sits on a grid of beams spanning between 46-12m deep piles, its basement waterproofed with a durable, high quality tanking membrane.

The original one-bedroom house was beyond repair and was deconstructed, with over 90% of materials recycled. The elongated plan of the new house, with a depth of 14.6 metres, resulted in a high surface to volume ratio and hence a less than ideal form factor for the Passive House energy modelling. The narrow south-facing elevation was designed with large windows and deep solar-shading canopies to provide sufficient natural light, winter-solar-gain, and to prevent overheating in summer.

Space-efficiency was a critical design objective, the main consideration being to minimize the environmental impact of the building over its anticipated 100-year service life. The 246m² home contains five spacious bedrooms and five bathrooms.



Building section

The split-level design eliminates the need for a corridor on the second floor as the staircase provides access from the front to back of the house. It also enables the living area to have a 3.6 metre ceiling height. The roof-top garden provides more outdoor living space with views of the north-shore mountains, making the most of the small site.

Materials and products were assessed based on their environmental impact and longevity. Being a narrow site, wall assemblies were chosen based on their high R-value per centimetre. Walls are R55, the roof is R101 and the airtightness of the building envelope is 0.3 air changes per hour. Insulated concrete forms (ICF) were used for the basement walls, with Helix® Micro Rebar™ replacing conventional rebar, reducing steel content. Above grade walls are pre-fabricated SIP (Structural Insulated Panel) construction with graphite-infused insulation and waterproofing-impregnation for longevity.

Locally sourced, low embodied-carbon and zero or low-VOC products were used wherever possible, and high embodied carbon products were avoided. Aluminum-clad wood frame windows were used, XPS insulation avoided and Naturaseal, a zero VOC, spray-on air-barrier membrane made from recycled materials, was used for the first time in BC.

6. The high water table required a low-impact foundation system, using insulated concrete forms, to maintain the natural hydrology.
7. Large glazed doors bring natural light into the basement apartment. The high performance triple-glazed wood windows and doors, and the HRV ventilation system, were supplied by **Vetta Building Technologies**.
8. The roof-top terrace provides more outdoor living space, making the most of the small site.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Winter heating is provided by small electric, under concrete/tile floor heat-matts act as a thermal flywheel to maintain a constant temperature. A highly efficient heat pump system provides hot water for both homes, while 8-solar panels supply electricity (kwhr varies significantly with weather). Apps provide detailed data on power generation and usage. Two 93% efficient HRV's provide constant fresh air throughout the home without significant heat-loss.

An optional summertime natural ventilation strategy coupled with solar shading draws in fresh air through tilt & turn windows, and through the stack-effect, rises up through the staircase, exhausting through a skylight door at the roof-deck. Large windows, tall ceilings and an open-tread staircase allow natural light to penetrate deep into the home.

The building is designed to be adaptable, and can change with the needs of a growing and/or aging family. Currently setup as a three-bedroom home over a two-bedroom suite, it can easily be modified into a four-bedroom home over a one-bedroom suite, or a large four-bedroom home with a family room or office. The main-level powder-room is pre-plumbed for a future accessible shower.

The motivation for the project, beyond creating a modern, bright, high-performance family home, was to provide an educational opportunity for the project team and for the construction industry as a whole. At the neighbourhood level, it is hoped that the success of the innovative foundation system will encourage others in the community to pursue this kind of 'gentle' densification, in a city where housing affordability is at crisis levels.

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