

INDOOR SPACE AS A HEALTH INTERVENTION OPPORTUNITY

FLOURISHING IN PLACE

Presented by Gayle Borst & Noralinda Ureste



MEET THE DESIGN TEAM

FLOURISH HERE RETREAT



GAYLE BORST
Natural Building
Architect



NORALINDA
URESTE
Owner / Developer



TODAY'S DISCUSSION

TOPIC OUTLINE

- + Review motivation and opportunity
 - + Enclosure strategies to mitigate building failure risks and maintain healthy indoor air quality.
 - + Describe how building with natural materials reduces chemical exposures and improves human health.
 - + Strategies for creating indoor air quality redundancy with robust mechanicals.
 - + Strategies for reducing chemical exposures from water, and promote human health.
-

QUESTION

How many of you have experienced allergies to pollen or dust?

How many of you have experienced watery eyes or itchy skin after using a cleaner or a solvent?

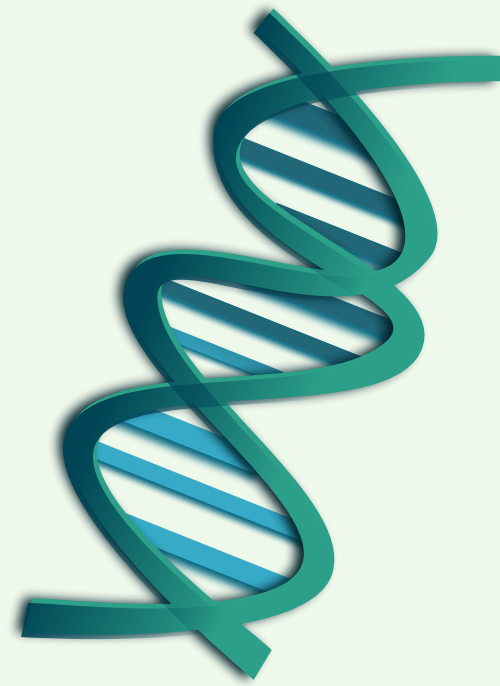


INSPIRATION

INDOOR SPACES AS A HEALTH INTERVENTION

- + Exposure to fresh paint and mold led to my Mom's MCS condition
- + Remediation helped, but very hard for her to leave her home and traveling was almost impossible
- + In 2017, after running an Airbnb for a couple years, we decided we would create safe, healthy spaces for travelers with chemical and mold sensitivity / intolerance
- + Lead to Building Biology, discovered FB groups with 1000's, building science, toxin education and discovery of chemical soup of our homes.

WHAT CAUSES CHEMICAL INTOLERANCE / MCS?



Genetics



Exposure



Lifestyle

MAIN HEALTH DRIVERS

1 IN 5

A SAMPLE OF 10,000 U.S.
RESIDENTS, FOUND OVERALL
PREVALENCE OF CHEMICAL
INTOLERANCE IN THE SAMPLE
AT JUST MORE THAN 20%

*Masri, S., Miller, C.S., Palmer, R.F. et al. Toxicant-induced loss of tolerance for chemicals, foods, and drugs: assessing patterns of exposure behind a global phenomenon. Environ Sci Eur 33, 65 (2021).

350,000

CHEMICALS & MIXTURES
REGISTERED ON THE GLOBAL
MARKET

*Wang, Zhanyun; Walker, Glen W.; Muir, Derek C. G.; Nagatani-Yoshida, Kakuko, Environmental Science & Technology (2020), 54 (5), 2575-2584CODEN: ESTHAG; ISSN:0013-936X.

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CHEMICALS OF CONCERN IN
BUILDING MATERIALS

*Lei Huang, Peter Fantke, Amelie Ritscher, Olivier Jolliet, Chemicals of concern in building materials: A high-throughput screening, Oct 2021, 0304-3894

BUT DOESN'T THE EPA REGULATE?

TSCA DOES NOT REQUIRE
COMPANIES TO PROVE THE
SAFETY OF CHEMICALS.
80% OF NEW CHEMICALS ARE
APPROVED IN 3 WEEKS.

*EWG 2014e

200

CHEMICALS THAT THE EPA
REQUIRED SAFETY TESTING

*EPA 2013b

9

CHEMICALS EPA HAS
BANNED

*TSCA Section 6

WHAT ARE THE POSSIBLE EFFECTS?

HEALTH EFFECTS

[STUDIES LINK](#)

- + Lung and eye irritants
- + Endocrine disruption
- + Disease: cardiovascular, metabolic
- + Learning and behavior disorders
- + Immunity reduction
- + Chronic inflammation that can lead to autoimmune conditions

ENVIRONMENTAL EFFECTS

[STUDIES LINK](#)

- + Air, water, and soil pollution
 - + Contaminate food and water supply
 - + Climate Change
 - + Ecology Disruption
 - + Disproportionally effects marginalized communities, low-income workers, people of color, and children
-

THE OPPORTUNITY

FOR HUMANS & ENVIRONMENT



After discovering how ecological and human health are intrinsically linked and how...

- little oversight there is over chemicals
- common design practices can be risky for human health
- our building materials and tap water can be a source for chemical exposure
- budget and schedule are put before occupant health

With that motivation, we had the opportunity to use the precautionary principle to make choices in the design, building material selection, MEPs and potable water to create an environment that would act as intervention for health.

Opportunities & Strategies

MATERIALS

Moisture Tolerant /
Regulating
Red List Free
Circular
Local
Natural

DESIGN

Vapor Open Envelope
Climate Appropriate
Roof
Easy to service
Easy to clean/maintain
Site appropriate
drainage
Open Building Strategy
Space for Mechanicals

MECHANICALS

Comfort
Filtration
Fresh Air
Dehumidification
Accessible for
maintenance

WATER

All water
captured onsite
for all needs
Resilient
Low
Contaminants
3 Stage Filtration
Black & Gray
water processed

Wish Lists

Design Wishlist

- One room wide envelope design will encourage cross breezes for guests who prefer no mechanical ventilation.
- Vapor permeable envelope - so that we work with nature rather than against
- Monolithic wall infilled with Hempcrete. FAQs about hempcrete: <https://hemptechglobal.com/page79/page79.html> An Israeli study conducted in October 2017 details the following about hempcrete: https://www.researchgate.net/profile/D_Pearlmutter/publication/320202326_A_life-cycle_energy_and_carbon_analysis_of_hemp-lime_bio-composite_building_materials/links/5ab1383d458515e9cebecd93c/A-life-cycle-energy-and-carbon-analysis-of-hemp-lime-bio-composite-building-materials.pdf?origin=publication_detail *The combined thermal resistance and heat storage capacity of building envelope materials based on HL(Hemp-Lime) suggest a potential for energy efficient performance, even in arid regions with extreme diurnal temperature fluctuations. Due to its hygroscopic properties, HL is also considered a 'breathable' material(vapor open) with a propensity to absorb excess water vapour from the air and prevent the accumulation of moisture and condensation resulting from such thermal instability [1]. In addition to these benefits, HL is considered to be non-toxic, low cost (mainly in certain countries where hemp cultivation and use is already part of the building industry), biodegradable/recyclable/reusable, resistant to extreme weather, low-maintenance compared to other 'green' building materials, adaptable to all climate zones, simple and fast method to implement on site for various applications, and compliant with European acoustic and fire resistance standards. As such, hemp-lime has been promoted as a sustainable building material whose utilization can pose a meaningful alternative to conventional construction.*
- No attic space, so that nothing is hidden or hard to get to when maintaining mechanical, electrical, plumbing. And for pest management.
- Ample mechanical room that is closed off from living spaces so that mechanicals and plumbing can be maintained, but are separate from living spaces.
- Utilities decoupled from wall system
- Metal roof (Galvalume) for rainwater capture. Also considering Ironstone porcelain tile, but worry that it will hold on to heat in the triple digit summer? Appreciate how easy it is to replace tile if there is ever damage.
- Preference for building materials are to use as many local, natural materials as we can.
- Air sealing - mostly done with plaster, wool - Gayle/Brad to figure this out
- Plaster walls - interior and exterior. No paint, to avoid unnecessary pollutants and petro-products.
- Minimal relief trim - to mitigate dust
- Wood windows and doors that are not treated with pesticides. Could they be made of local

DESIGN

10:36 AM Fri May 27 68%

Flourish Here Material Specs - Norwood

	A	B	C	D	E	F
1						
2	Flourish Here08/24/20					
3	Owner's Building Material Requirements					
4	Desirable					
5	Natural products that can return to the earth (Cork, Stone, Clay, Lime, Hemp, Str					
6	Natural wood verified to not contain biocides					
7	Gravel					
8						
9	Forbidden					
10	Added urea formaldehyde					
11	Plastics					
12	Biocides					
13	Fire retardants					
14	Foam insulation					
15	Engineered wood					
16						
17	Only if Unavoidable					
18	Man-made components (such as window gaskets, select sealants)					
19	products with low-levels of phenol formaldehyde					
20						
21	Acceptable					
22	Porcelain tile (Roof; Shower floor)					
23	Rockwool (Mark uses this)					
24	Gutex					
25	HempWool (Pack Deck sold a product that had no synthetic binders - don't know					
26	Cannagrow hempboard (instead of OSB)					
27	Accoya wood (Nora verify)					
28	Metal (may have coating that needs to be removed)					
29	Certain bamboo products (full scrutiny required)					
30	Wool (maybe)					
31	Linseed oil (with approval)					
32						
33						

MATERIALS

MATERIALS



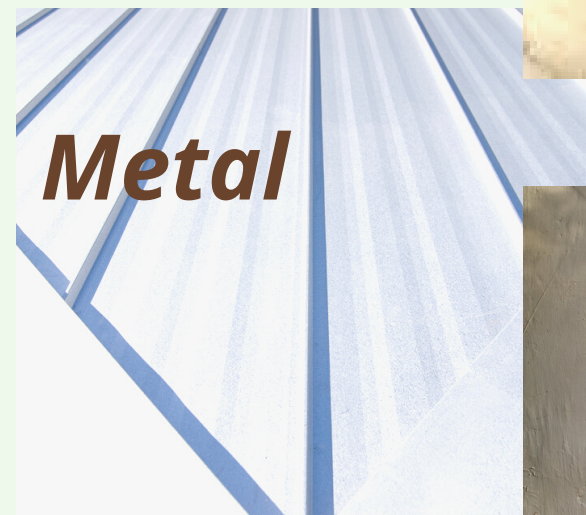
Wood



Clay



Hemp



Metal



Lime



Linoleum

MOISTURE TOLERANT / REGULATING

+ Hygroscopic abilities help to regulate moisture

RED LIST FREE

+ Natural materials

+ Prioritized eliminating carcinogens, endocrine disrupter, and VOCs

CIRCULAR

Most from renewable resources that can be recycled or composted, sequester carbon, and remove ozone from indoors

LOCAL

Reflect the color palette of Central Texas and reduce shipping costs (nominally and environmentally)



HIGHLAND HEMP HOUSE

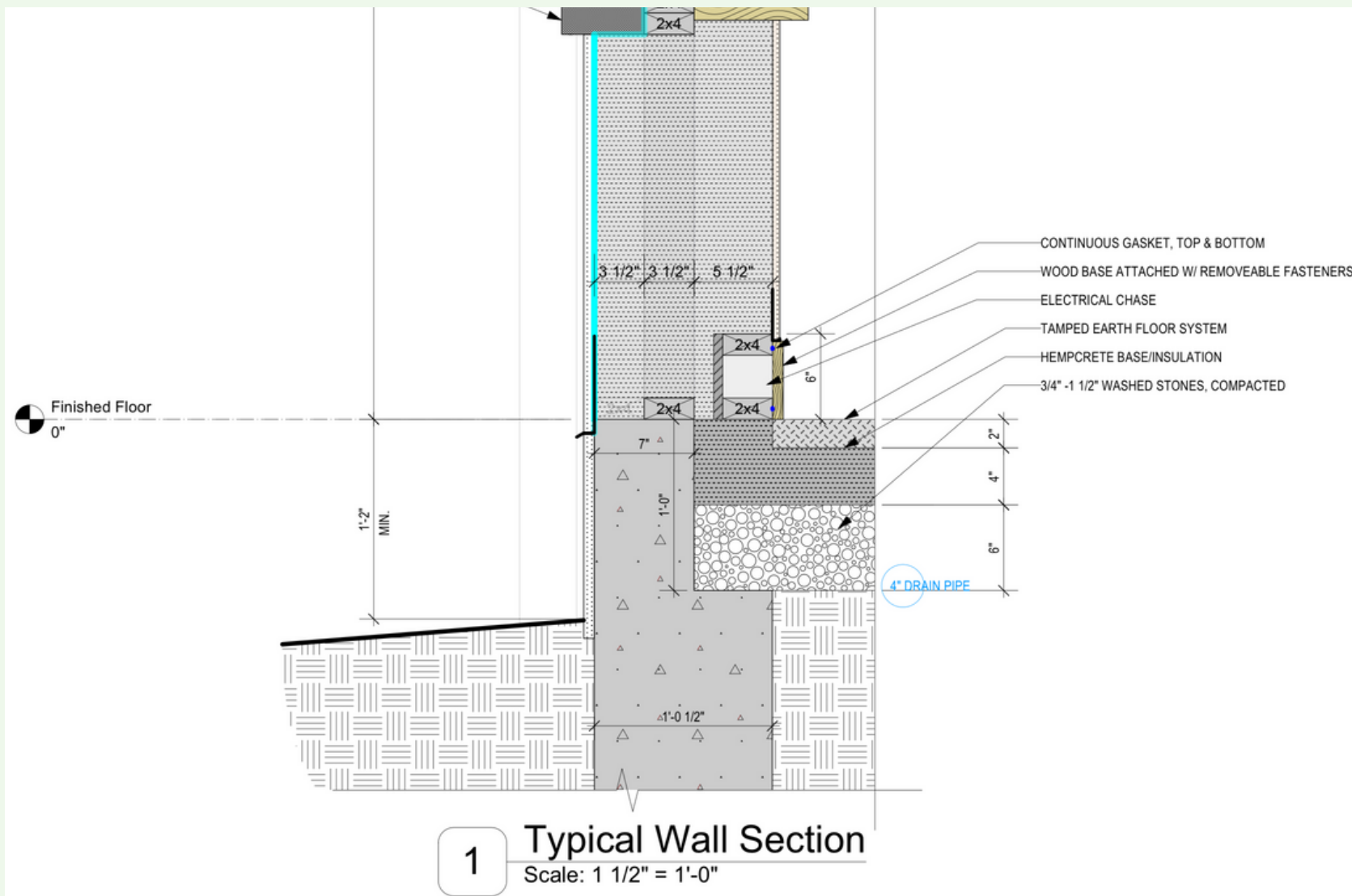
Bellingham, WA
Retrofit with Hemp / Lime in 2019

COEXIST SELF-BUILD

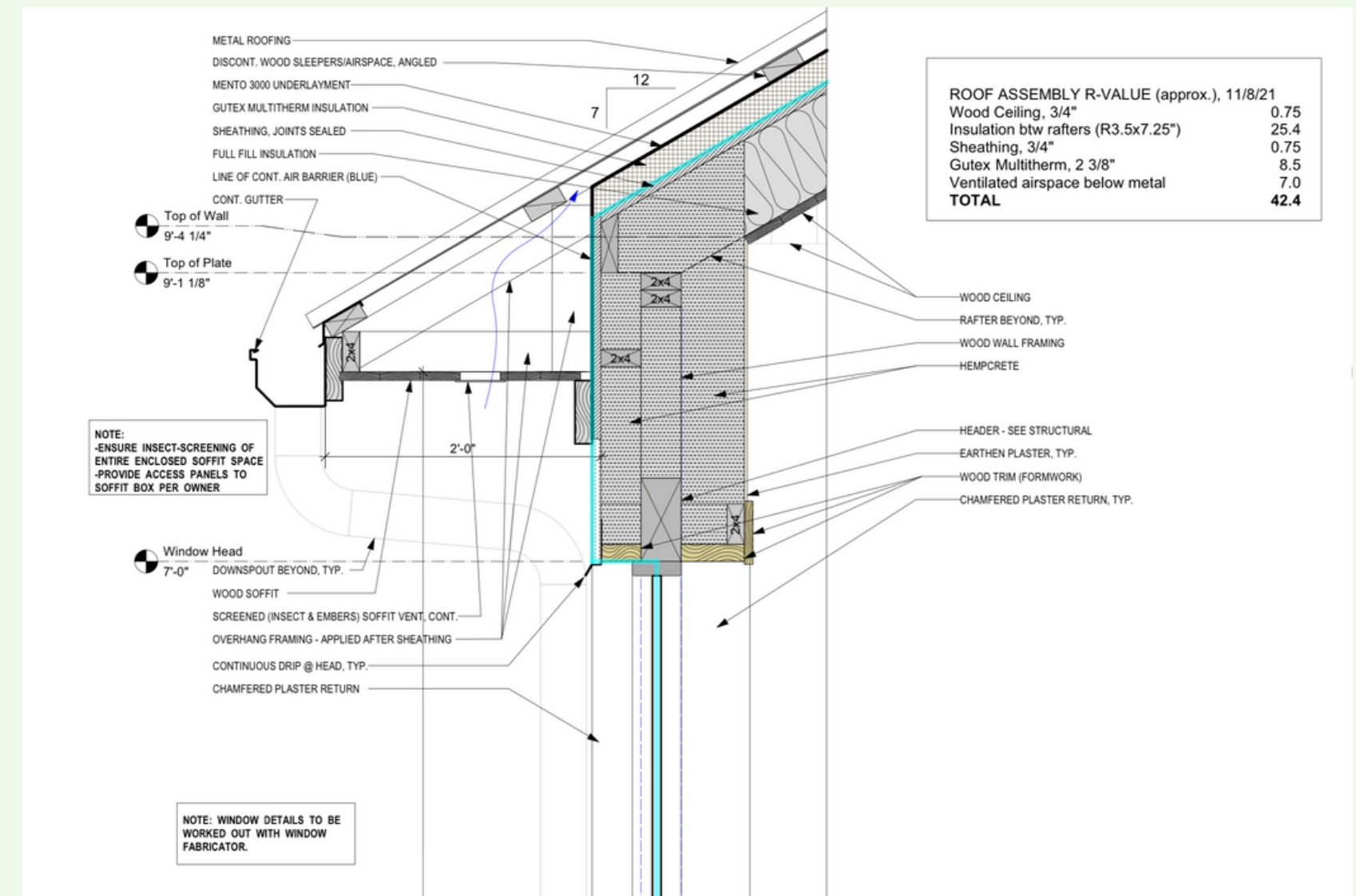
Brandon, PA
Architectural Digest named "the Best
Tiny House on the Market"



Design - Vapor Open Envelope



WALL & FLOOR



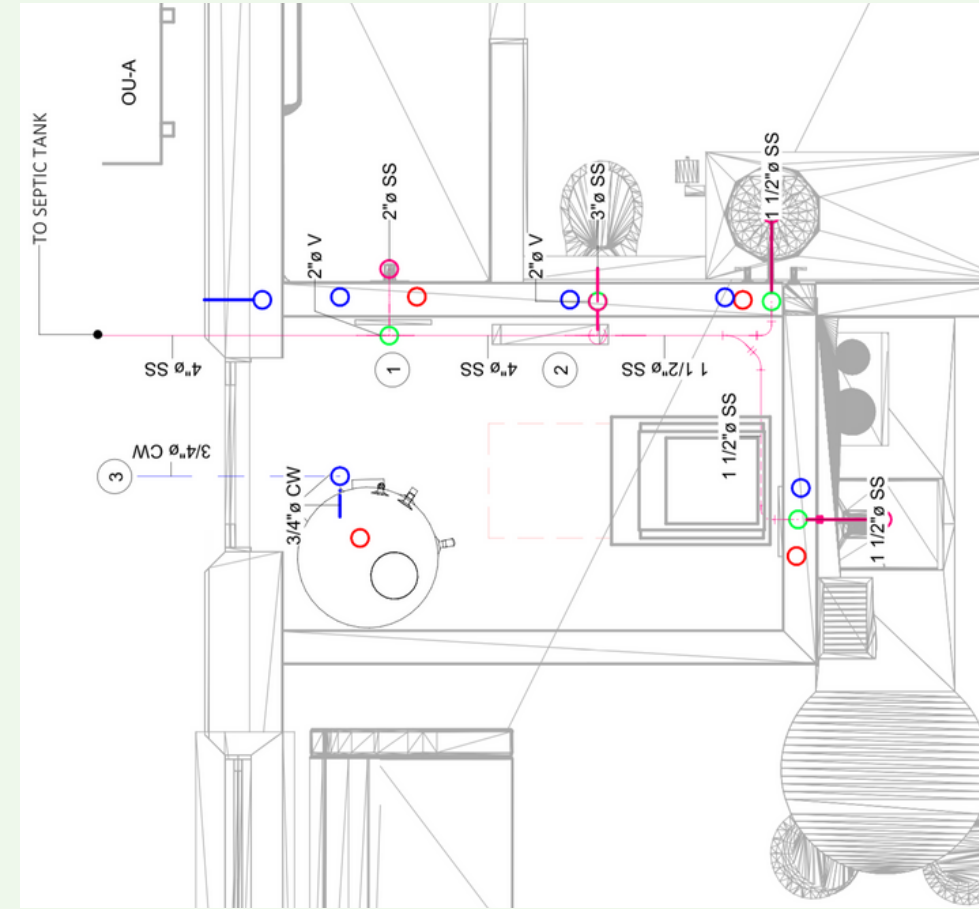
WALL & ROOF

Design - Low-Maintenance



EASY TO CLEAN

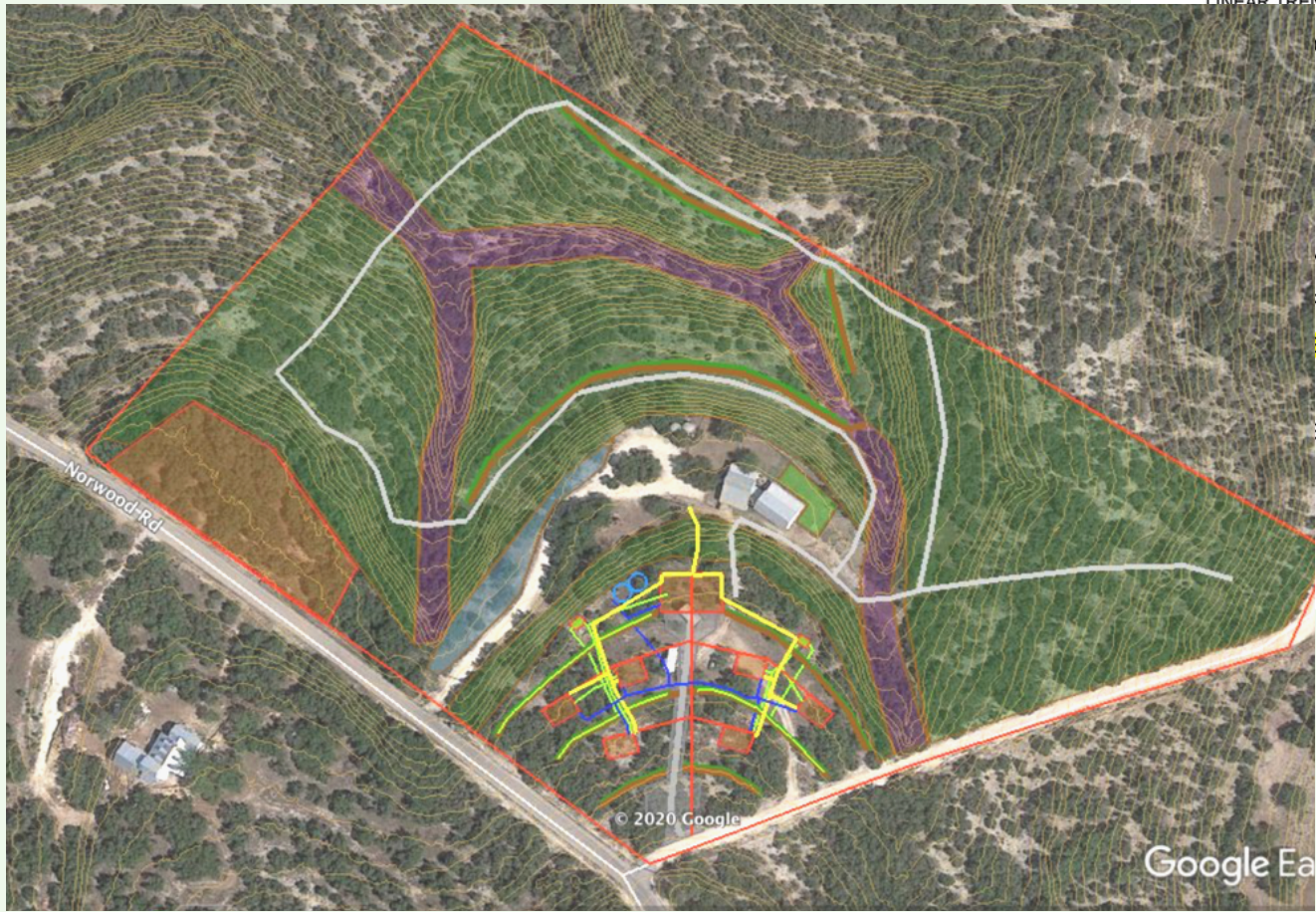
Minimal relief
Seamless floors
No dust catchers



EASY TO SERVICE

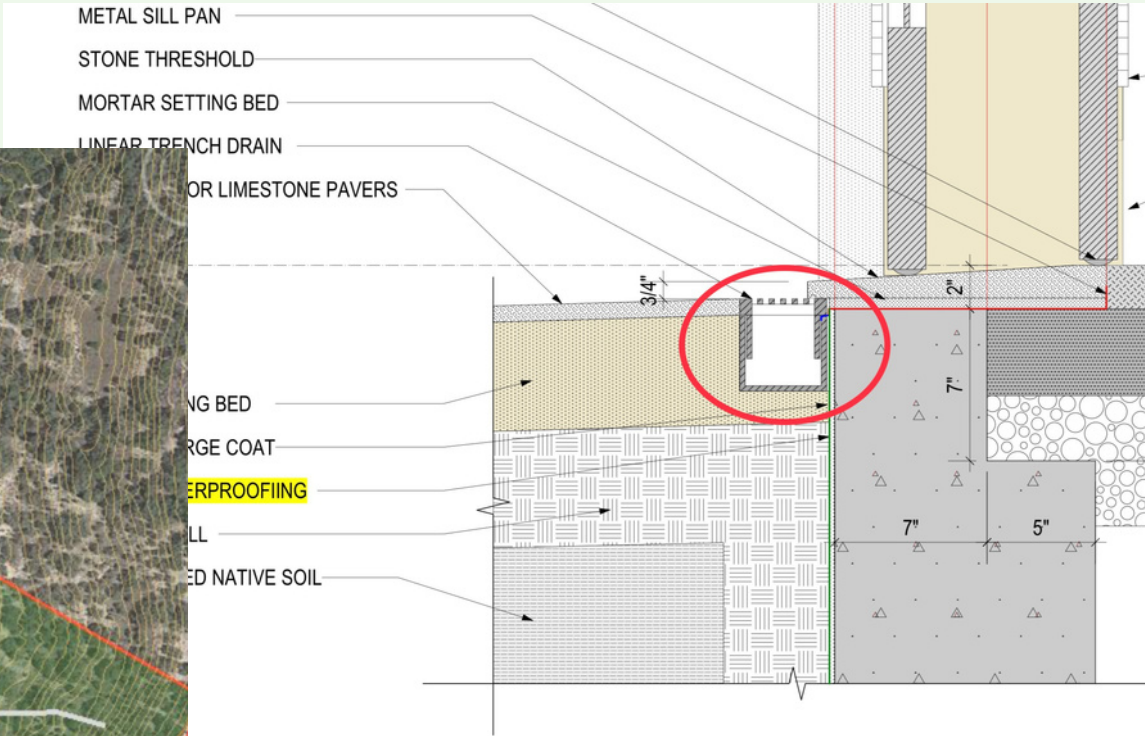
Through-Wall Plumbing
No hard to reach cavity / crevice

Design - Drainage



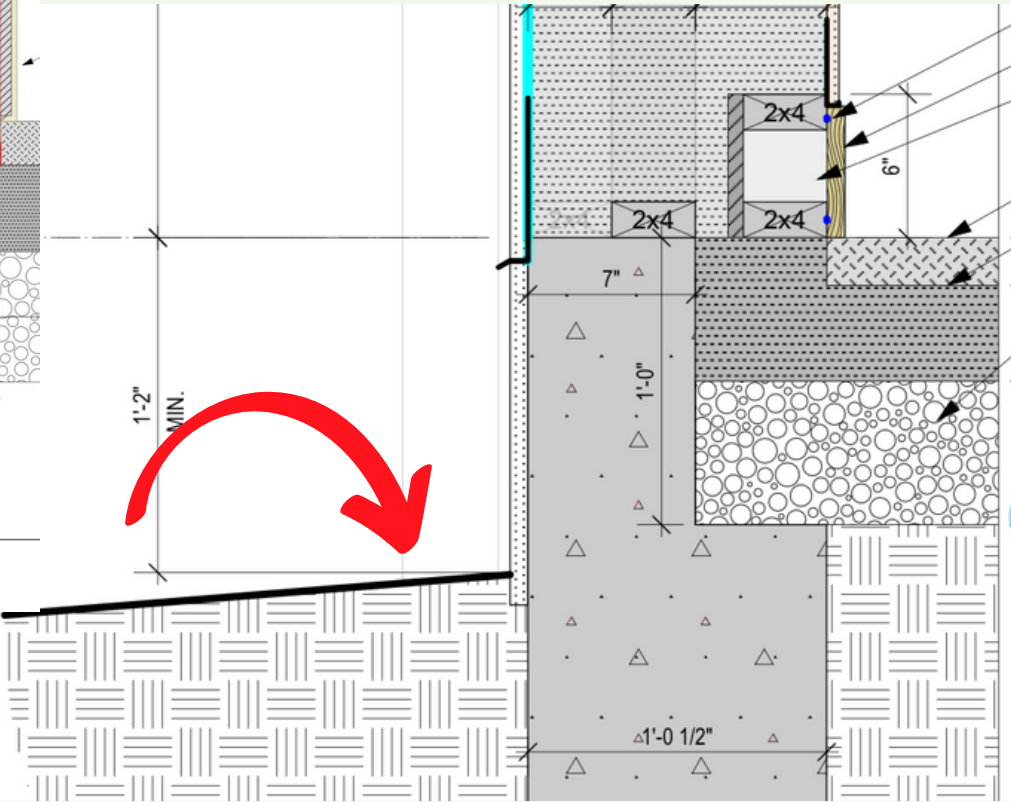
SITE

Used permaculture principles



BUILDING

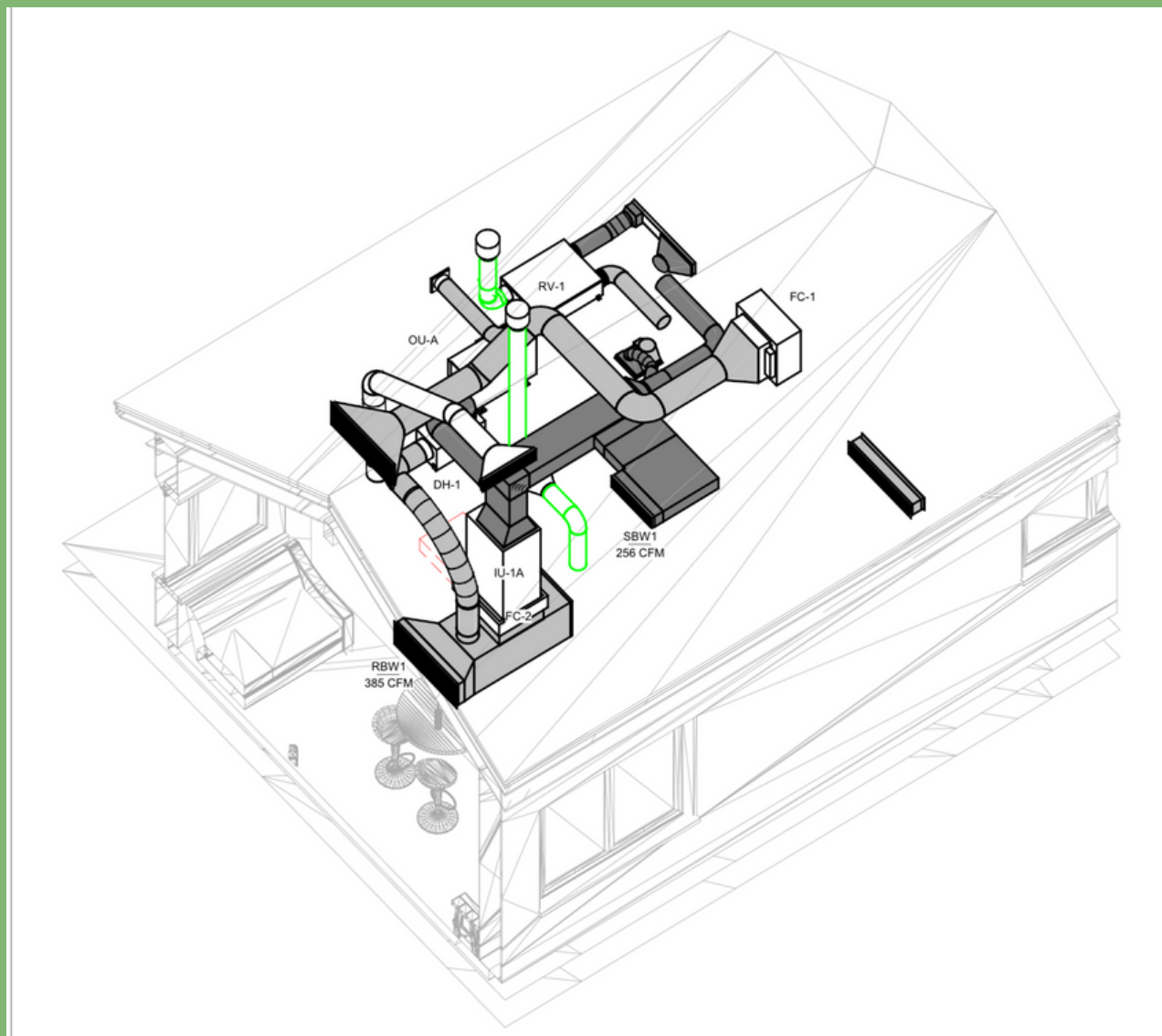
Linear Trench Drain



SLOPED PERIMETER

Hardscaped with gravel

MEP FOR IAQ REDUNDANCY



COMFORT

This is relative for each guest.

FILTRATION

To filter Central Texas allergens, dust, smoke, degrading indoor environment

FRESH AIR

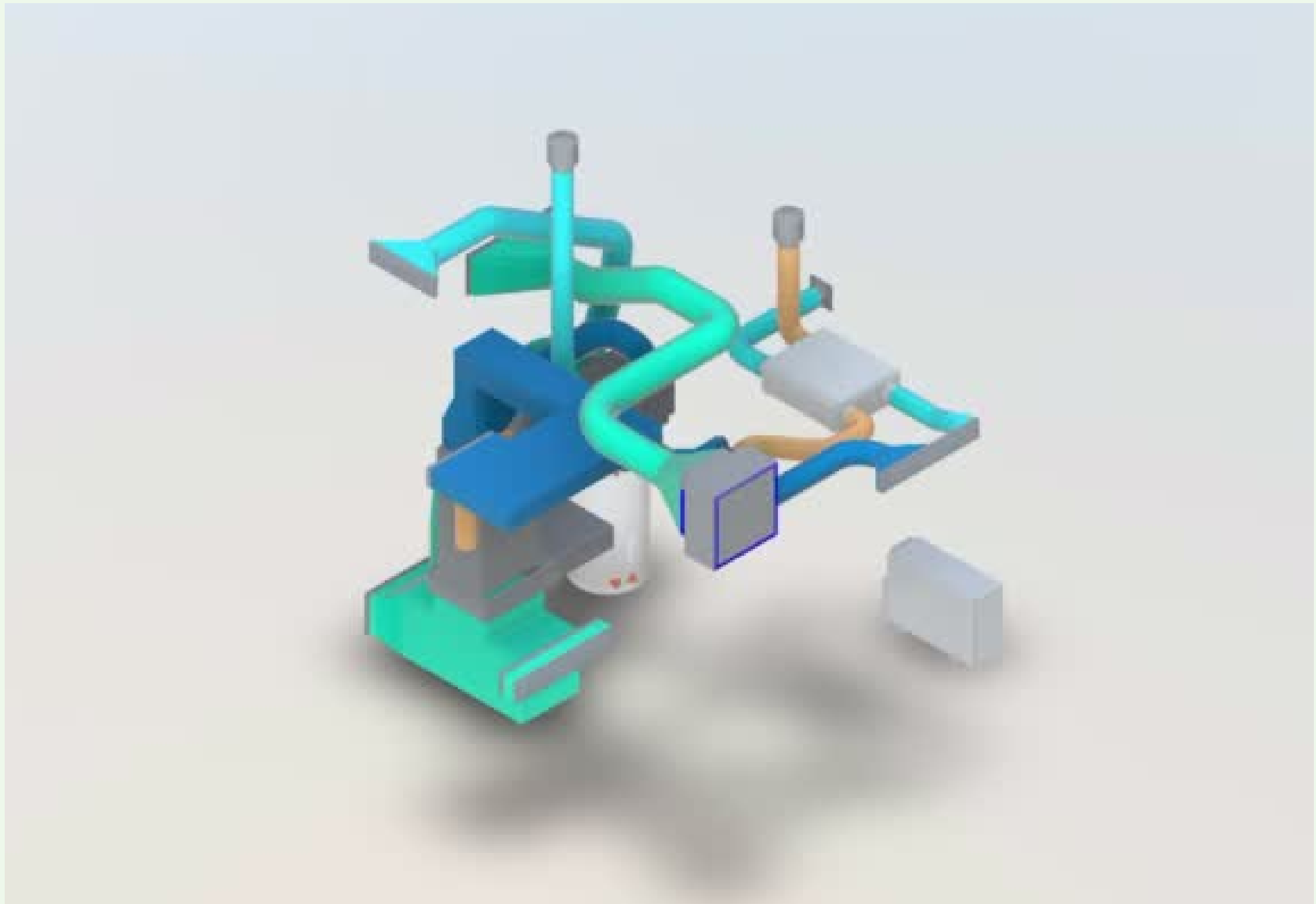
To maintain healthy CO2 levels for better sleep and brain function.

DEHUMIDIFICATION

To maintain optimal humidity levels for healthy IAQ.

ACCESSIBLE FOR MAINTENANCE

This adds to the resilience of our vacation rentals, can maintain with minimal guest disturbance.



RAINWATER HARVESTING



Filtration

LOW CONTAMINANTS

No fluoride, no chloramine, plastic free liner

3 STAGE FILTRATION

Sediment, carbon, UV

RESILIENT

Ferro-Cement tank has a 100 yr life

SITE COLLECTED & PROCESSED

Grey and Black water are processed onsite with anaerobic septic system,

DUAL PURPOSE

Will also serve as a star gazing or yoga platform.



Ferro-Cement Cistern

CHALLENGES

RURAL AREA

Travel time too long for contractors

SMALL PROJECT

Some materials not available, ie water pipes, quartz products, concrete without chemical additives

LONG LEAD TIMES

For materials and contractors; ie halogen-free electrical

SELF-BUILD / CONTRACTING

Hesitation to work with a novice

CREATING BALANCE AND PRIORITIZING

With materials and construction

SUMMARY

INDOOR SPACE AS A HEALTH INTERVENTION

PRECAUTIONARY PRINCIPLE

- health drivers for chemically intolerant are complex
- post-market regulation of chemicals

PUTTING HEALTH COMPROMISED FIRST

- materials that support IAQ and anchor moisture management
- site / climate appropriate design
- MEP for IAQ redundancy
- Rainwater capture with filtration for potable water, reducing chemical exposures

PRIORITIZE SUSTAINABILITY

- local, natural
 - circular
 - benefits human health
-

THANK YOU

QUESTIONS ?



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