

HOMESTEADING

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MODERN SOCIETY

THESIS QUESTION

Can a family of four be self-sufficient on five acres of land?

PROJECT EMPHASIS

Design an affordable and self-sufficient single family house

Create an affordable and cohesive space for raising livestock

Provide a suitable and efficient space for growing food

GOALS OF THE THESIS PROJECT

Demonstrate that homesteading can be accomplished in a modern society.

Understand how to efficiently and affordably run a homestead.

Provide an alternative to the traditional way of providing for one's family.

Understand how to create efficient and self-sufficient housing.

Understand how to create a space suitable for growing food efficiently.



SITE INFORMATION

5.09 acres of land listed at \$21,600

Near the Heartland Trail (used for walking, biking, and horseback riding)

4 miles northeast of Park Rapids

Half is covered in trees, half is field

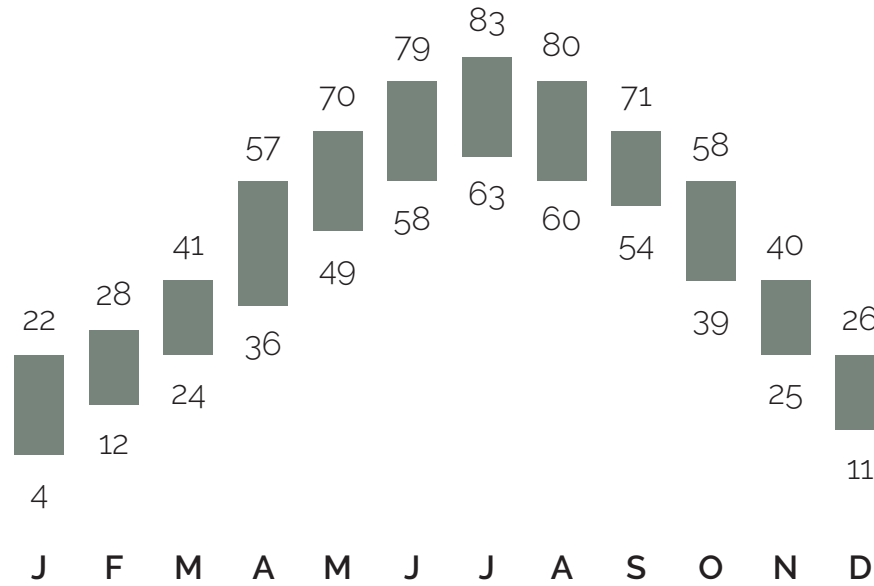
Growing zone 3



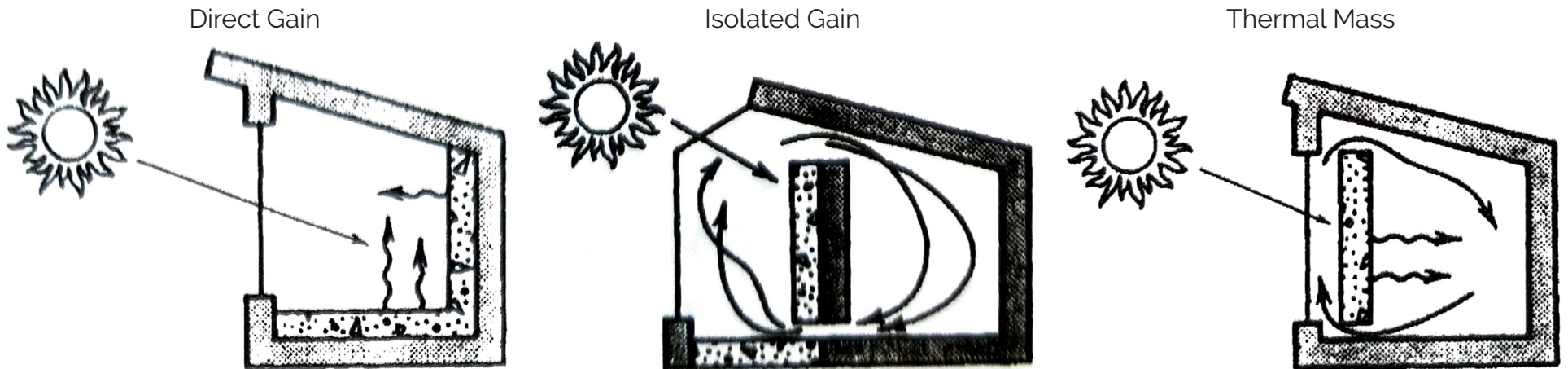
RESEARCH

PASSIVE HEATING

AVERAGE HIGH & LOW TEMPERATURE

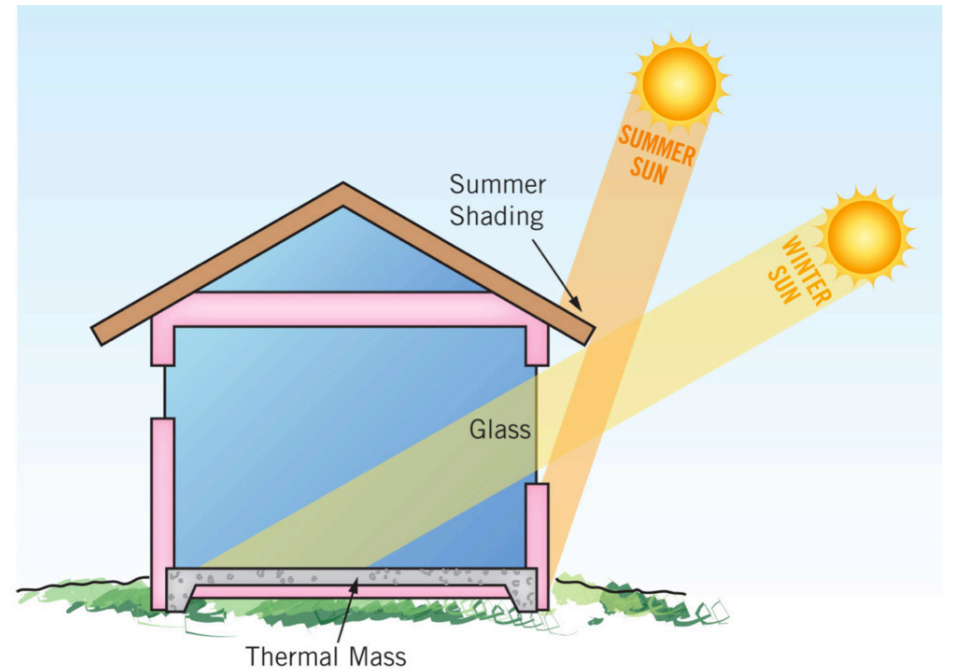
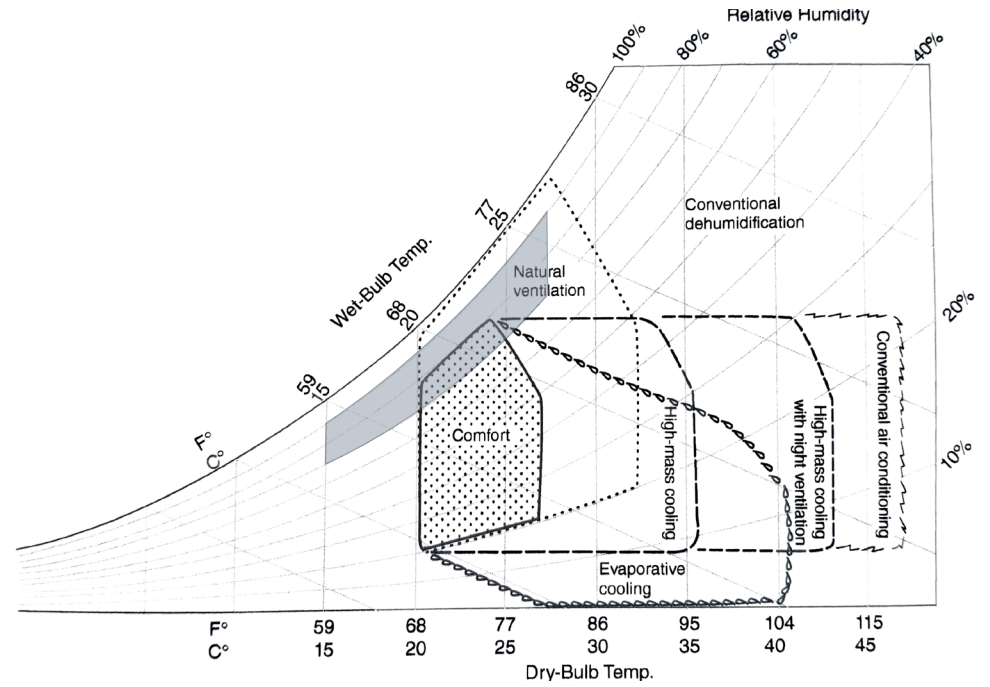
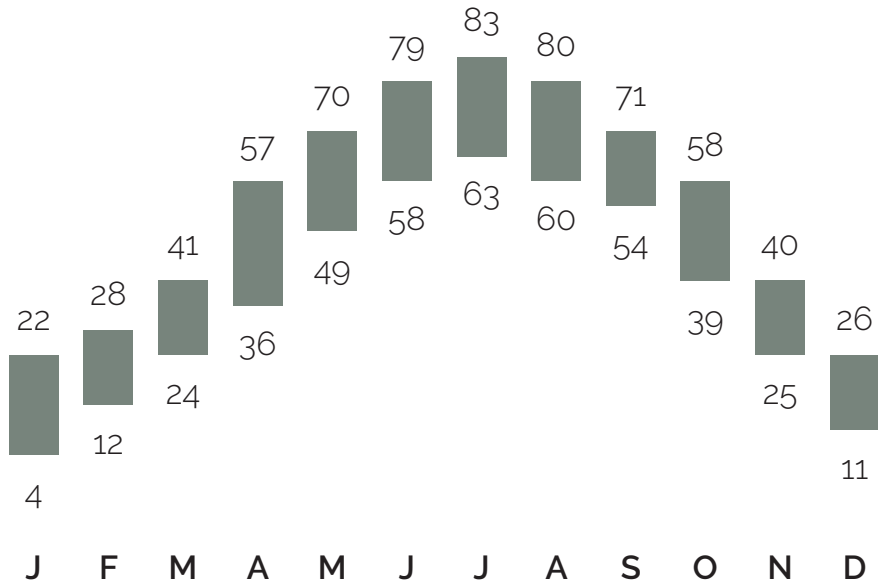


Passive heating options using solar energy:



PASSIVE COOLING

AVERAGE HIGH & LOW TEMPERATURE



BOTANICAL

Square Foot Gardening

Maximizes yield.

Keeps soil friable.

Reduces watering.

Reduces weeding.



Greenhouses

Hoop House / High Tunnel



Moderately extends the growing season

Easy to build

Requires an irrigation system

Conventional Greenhouse



Use heaters and solar energy to extend the growing season

Requires skilled construction

Requires an irrigation system

Cold Frame / Hot Bed



Easy to build

Protects plants from frost

Does not need an irrigation system

LIVESTOCK

General Care

Most animals do not need to be kept indoors or in a heated space as it may affect their natural cycles.

A shelter should be provided to protect livestock from wind, rain, and summer sun.

Interior spaces, such as a barn, should be well ventilated.

Livestock should have access to feed and water at all times, especially in cold weather.

Dual Purpose

Provide more than one resource (meat, eggs, milk, wool, hide) or skill (protection, herding, transportation).

Maximize efficiency when space is limited.

Rotational Grazing

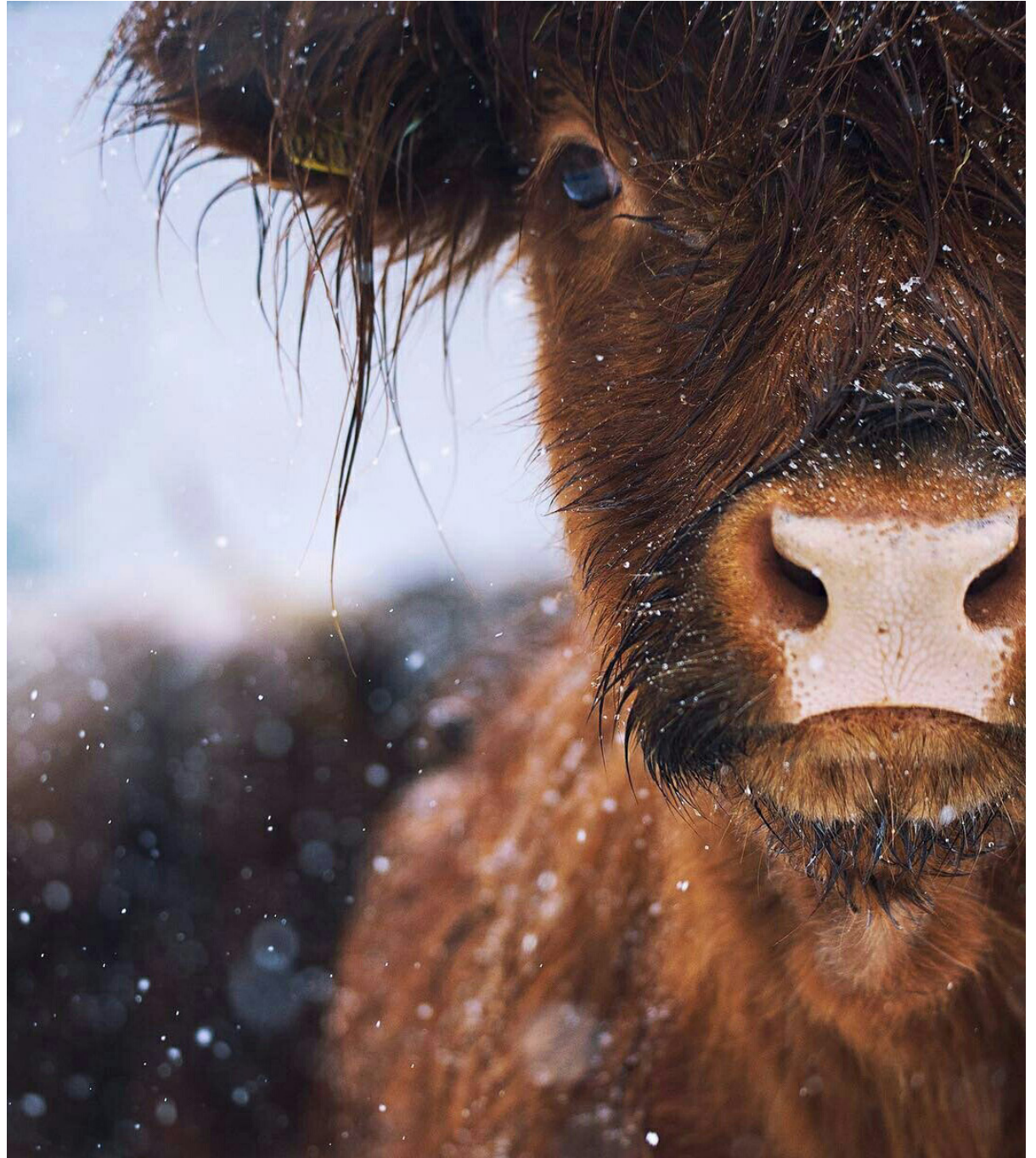
Increases pasture production.

Reduces waste.

Increases drought resistance.

Natural pest control.

Centralizes needs.



MAJOR PROJECT ELEMENTS

Residential House

Provides sleeping and living spaces for the family

Sustainable design to lower energy needs and costs

Pantry to store one year's worth of food harvested from the homestead

Livestock Barns

Stalls and pens for livestock

Storage spaces for feed and equipment

Milking stanchion

Sustainable design to lower energy needs and costs

High tunnel / Garden Spaces

Greenhouse to increase the growing season

Raised garden beds to provide a year worth of food

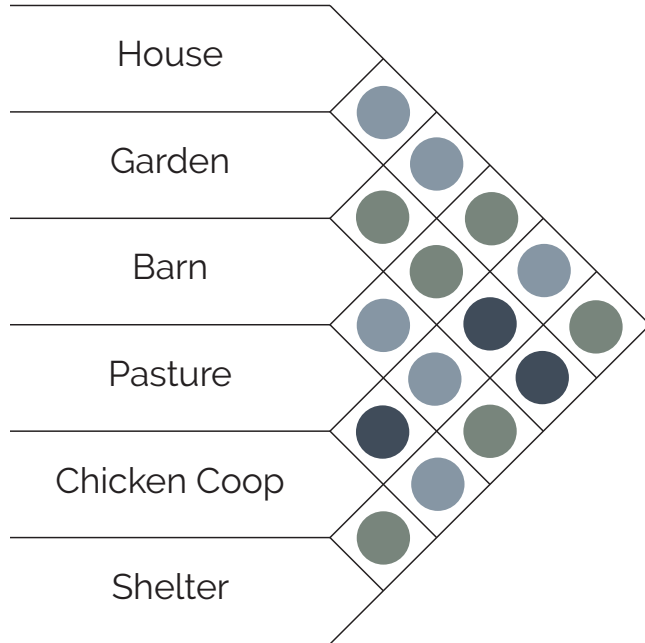
Irrigation system



PERFORMANCE CRITERIA

THE SITE

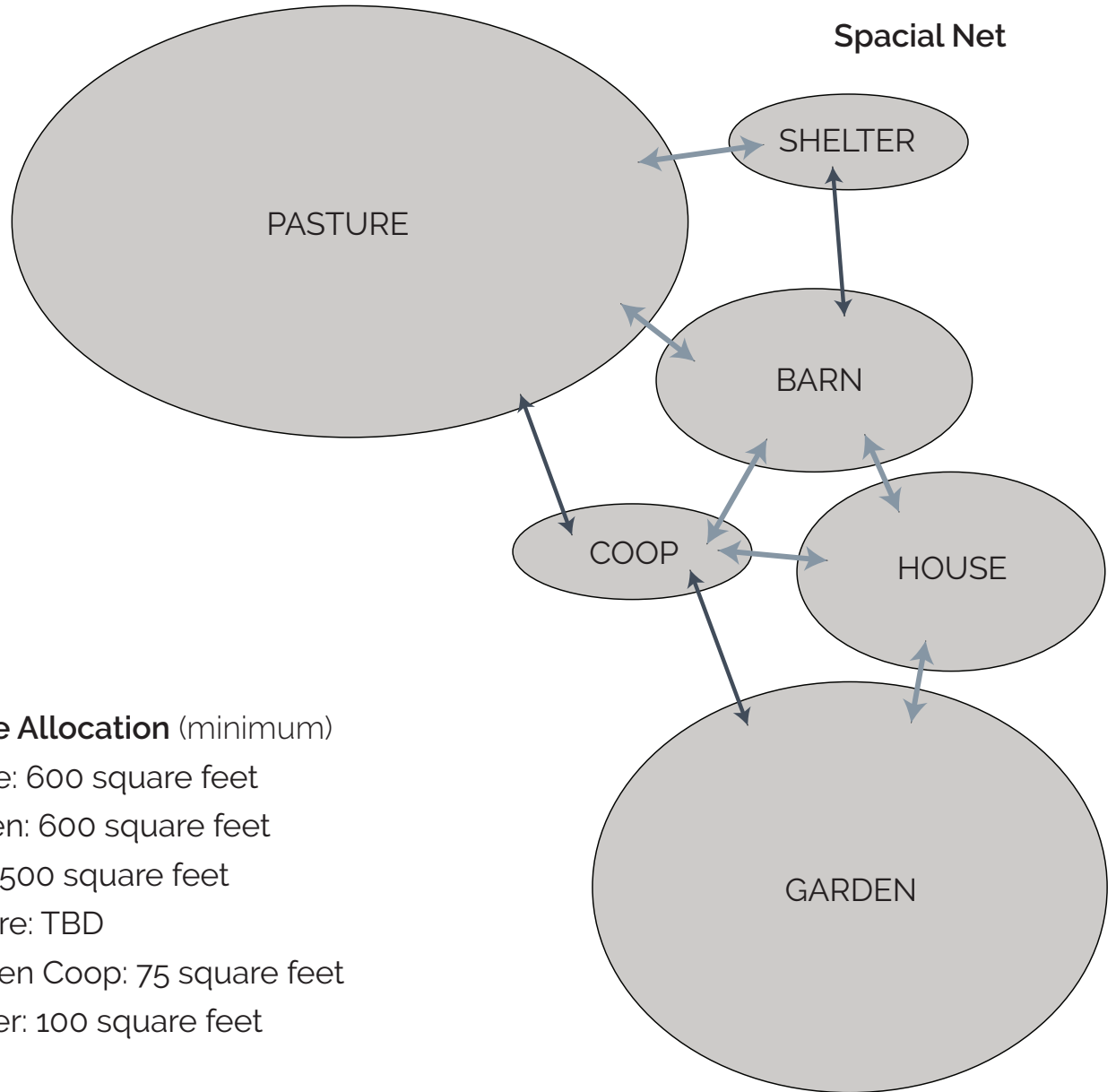
Adjacency Matrix



- ADJACENT
- NEARBY
- NOT ADJACENT

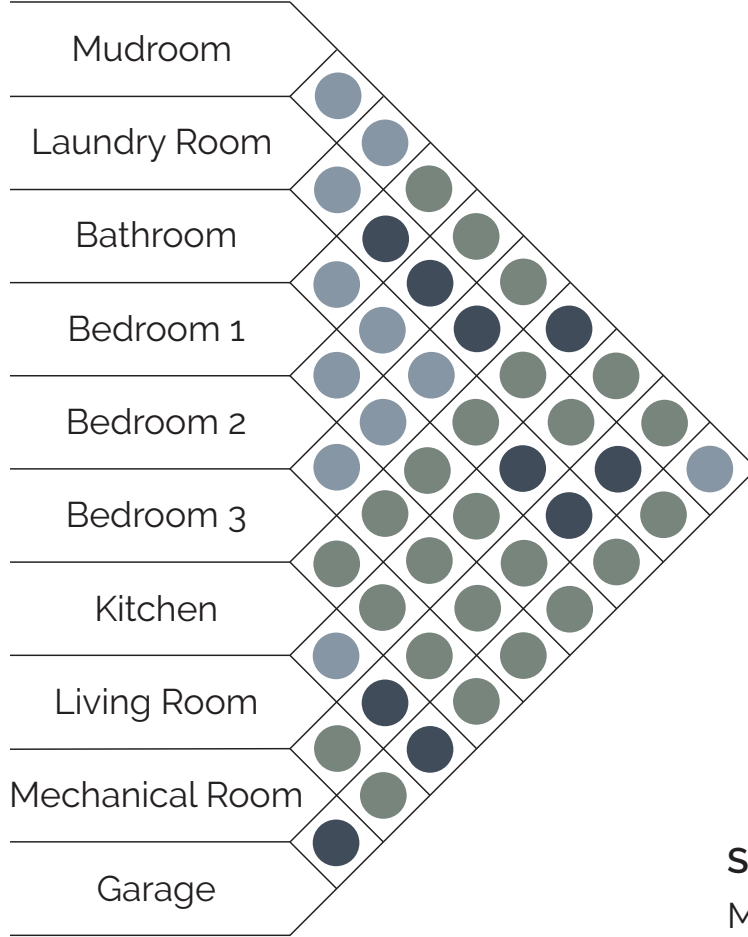
Space Allocation (minimum)

- House: 600 square feet
- Garden: 600 square feet
- Barn: 500 square feet
- Pasture: TBD
- Chicken Coop: 75 square feet
- Shelter: 100 square feet

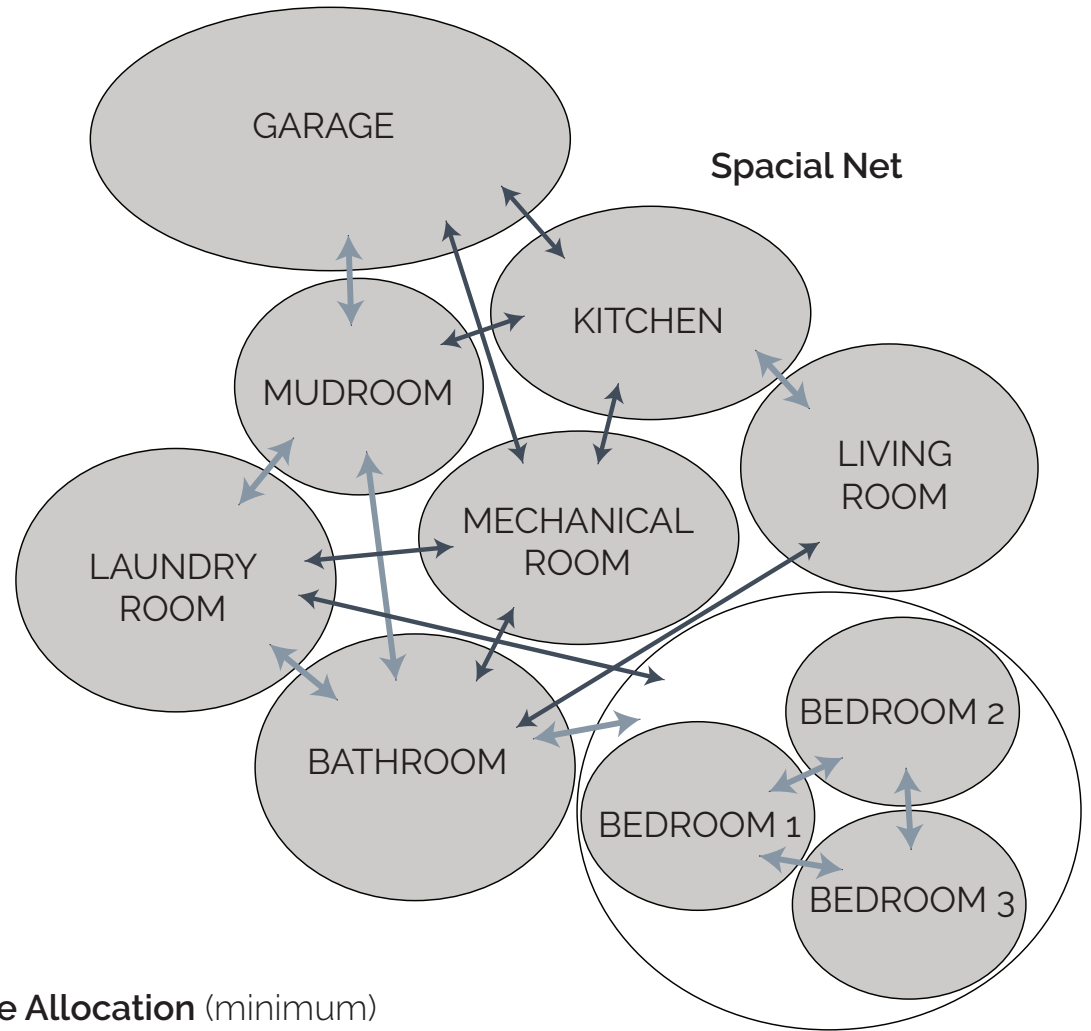


THE HOUSE

Adjacency Matrix



- ADJACENT
- NEARBY
- NOT ADJACENT



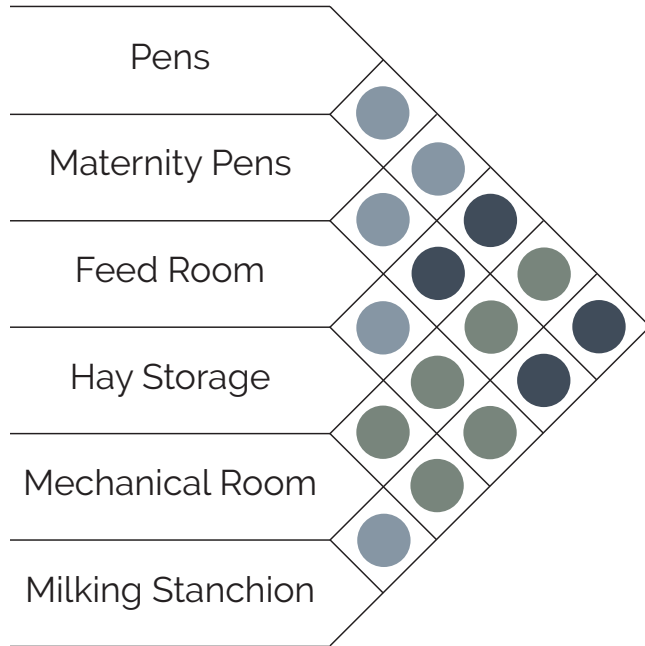
Space Allocation (minimum)

Mudroom: 25 square feet
 Laundry Room: 10 square feet
 Bathroom: 50 square feet
 Bedroom 1: 100 square feet
 Bedroom 2: 80 square feet

Garage: 288 square feet
 Bedroom 3: 80 square feet
 Kitchen: 80 square feet
 Living Room: 100 square feet
 Mechanical Room: 50 square feet

THE BARN

Adjacency Matrix



- ADJACENT
- NEARBY
- NOT ADJACENT

Space Allocation (minimum)

Pens: TBD

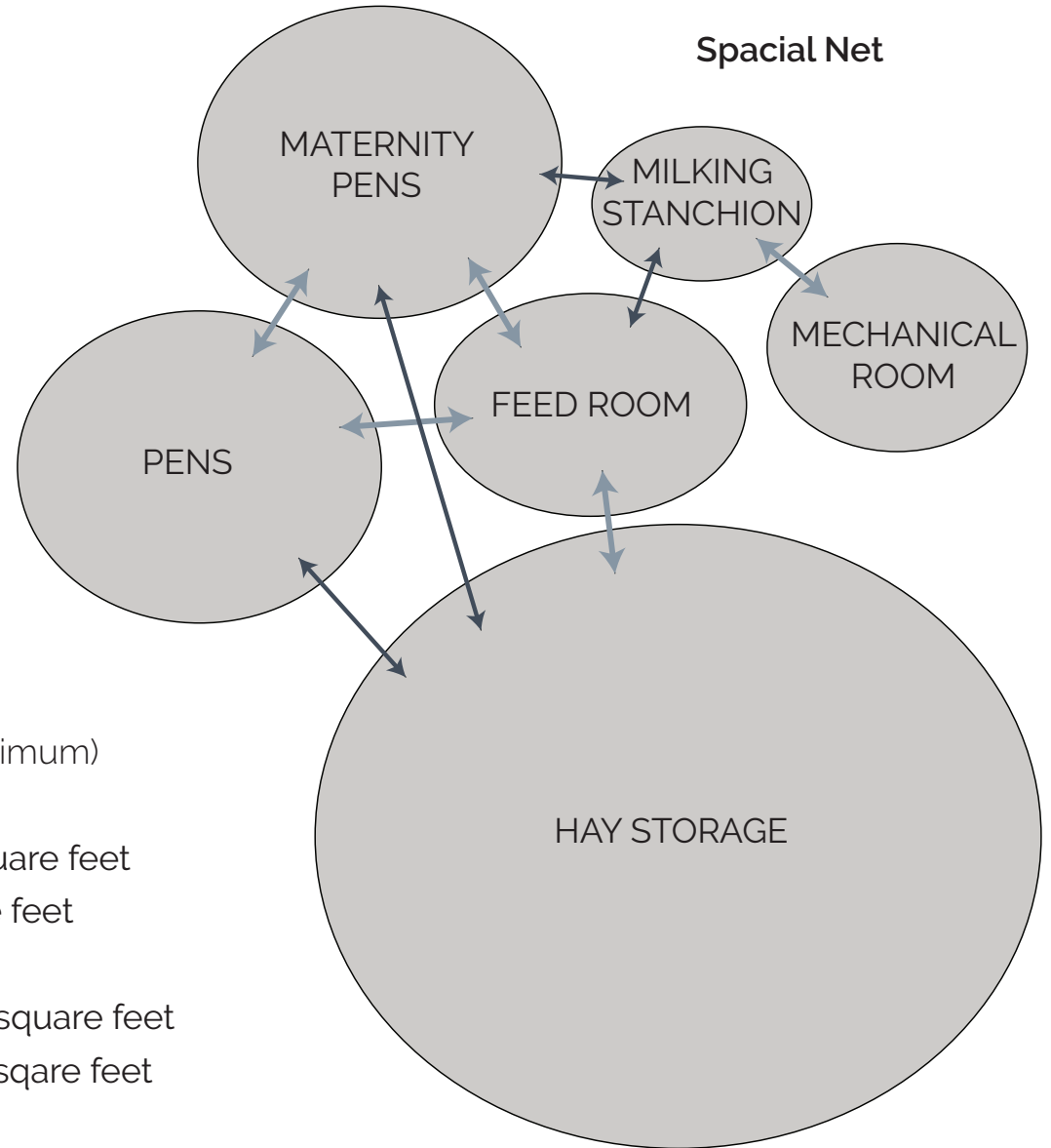
Maternity Pens: 60 square feet

Feed Room: 25 square feet

Hay Storage: TBD

Mechanical Room: 25 square feet

Milking Stanchion: 20 square feet

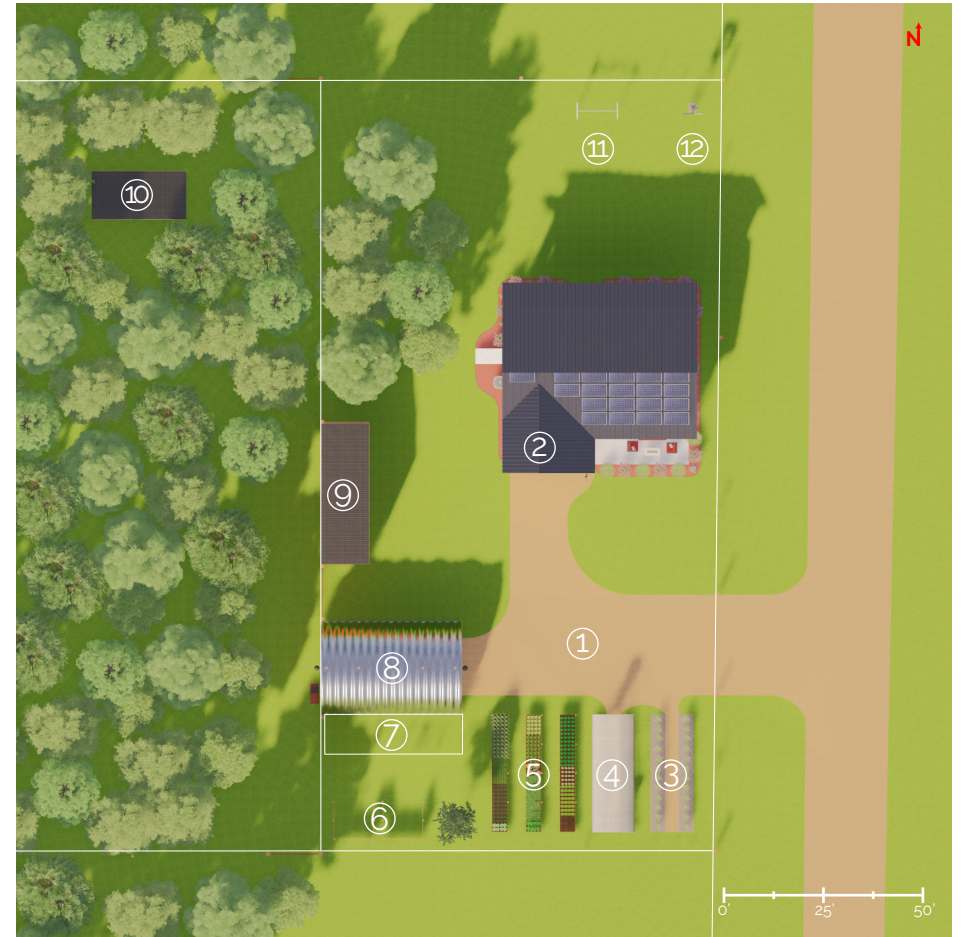




SITE PLAN



1. Sacrifice Pen
2. Rotation Pasture
3. Yard



1. Driveway
2. House
3. Berry Bushes
4. Hoop House
5. Raised Garden Beds
6. Compost Pits
7. Chicken Run
8. Barn
9. Hay & Storage Shed
10. Livestock Shelter
11. Cloths Line
12. Windmill

RENDERS

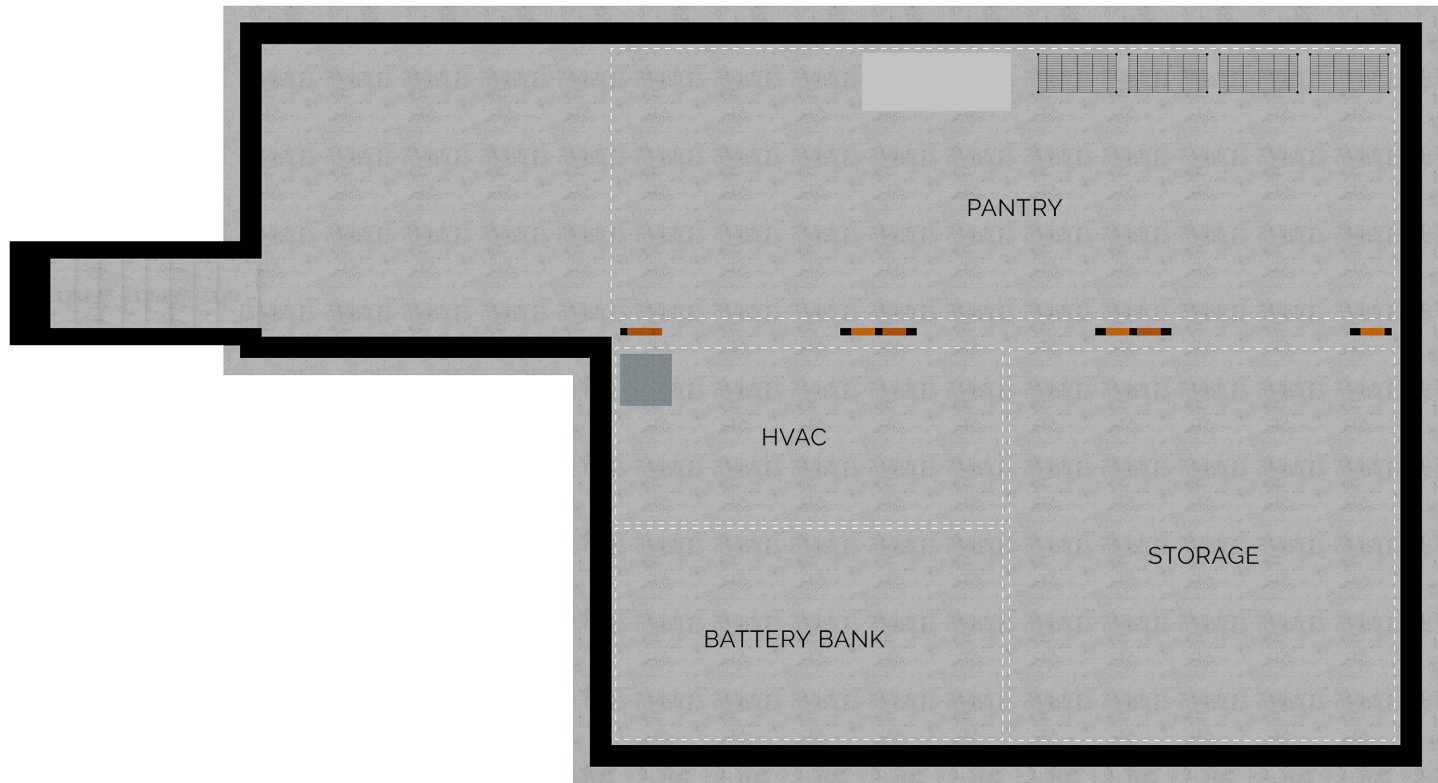


RESIDENTIAL HOUSE

PLANS



Main Level Plan



Cellar Plan

STRUCTURE

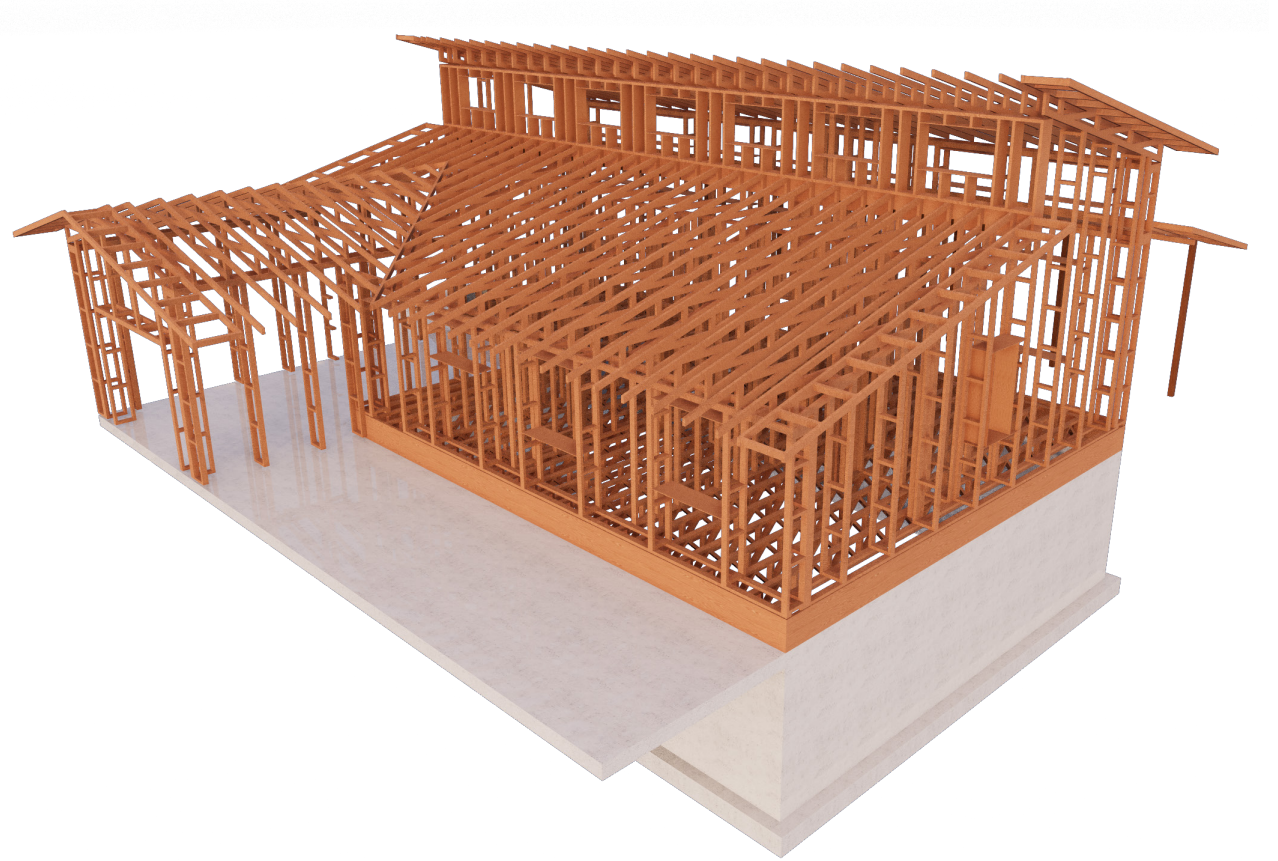
Buck & Beam Straw Bale Construction

Wood framing supports the weight of the roof (opposed to the straw bales carrying the load)

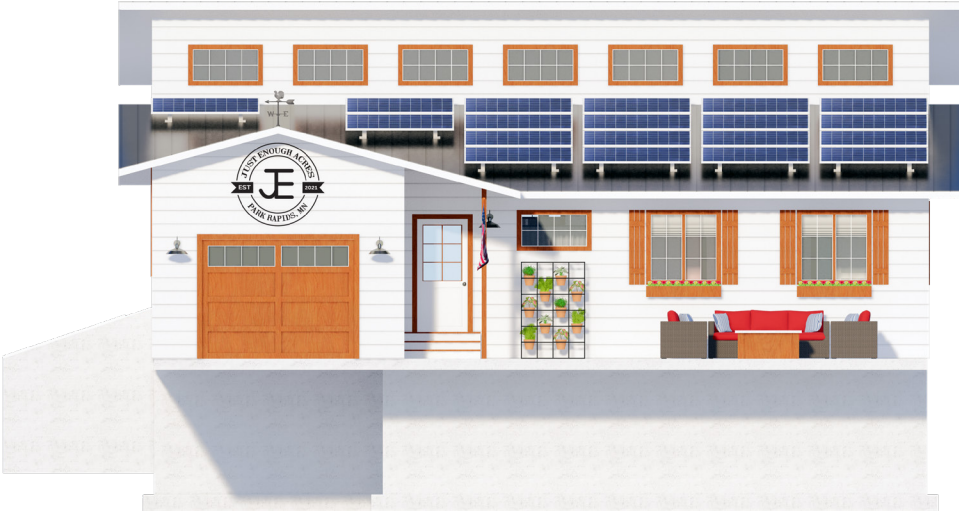
The wood framing is built first, then walls are infilled with straw bales

This method reduces settling issues

R-Value of 36



ELEVATIONS



South Elevation



East Elevation



North Elevation



West Elevation

SECTIONS



Transverse Section



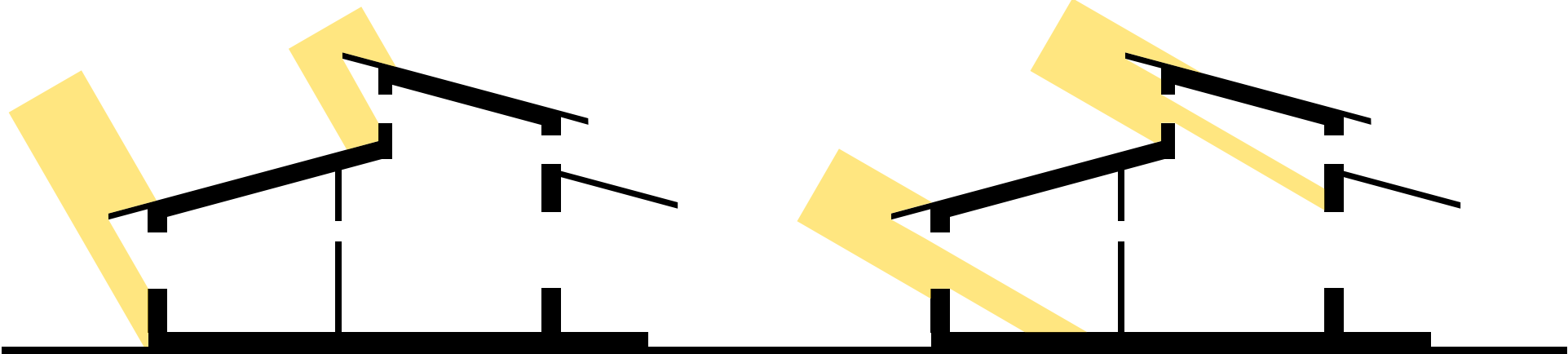
Longitudinal Section

HVAC SOLUTION

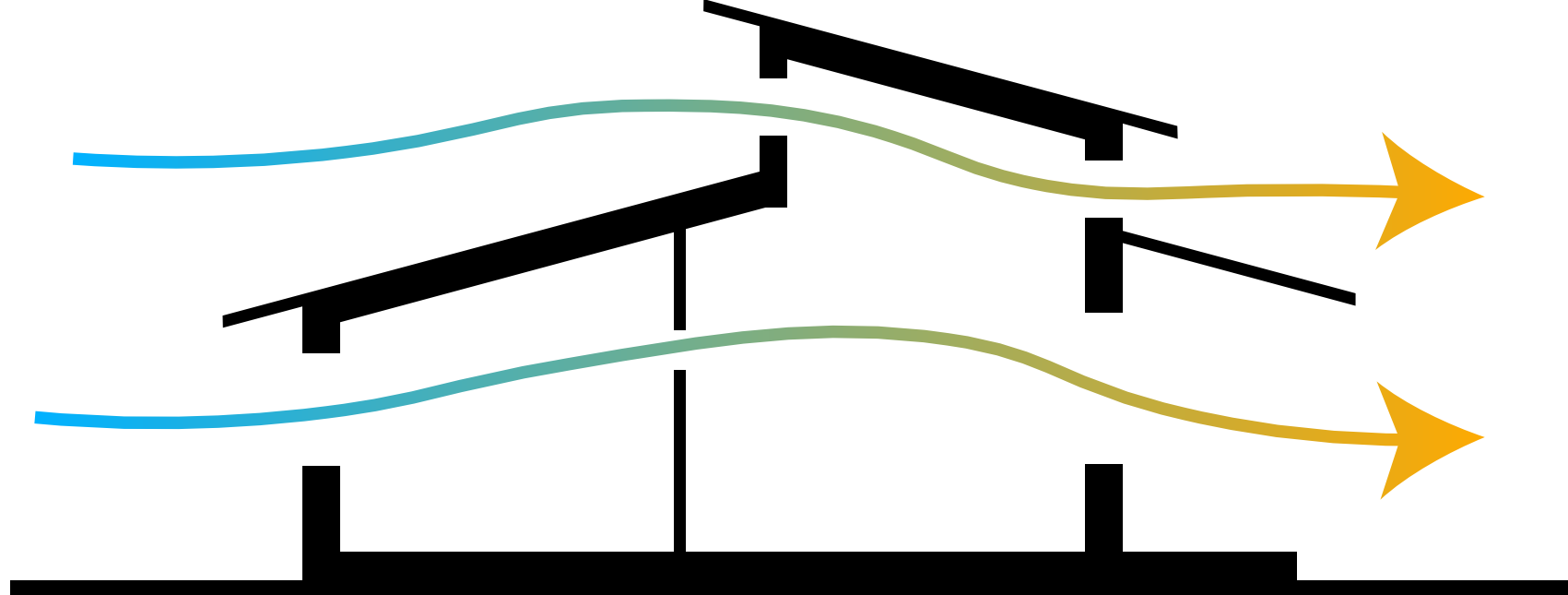
PASSIVE HEATING

Summer Sun - Higher than 60°, April to September

Winter Sun - Lower than 60°, September to April

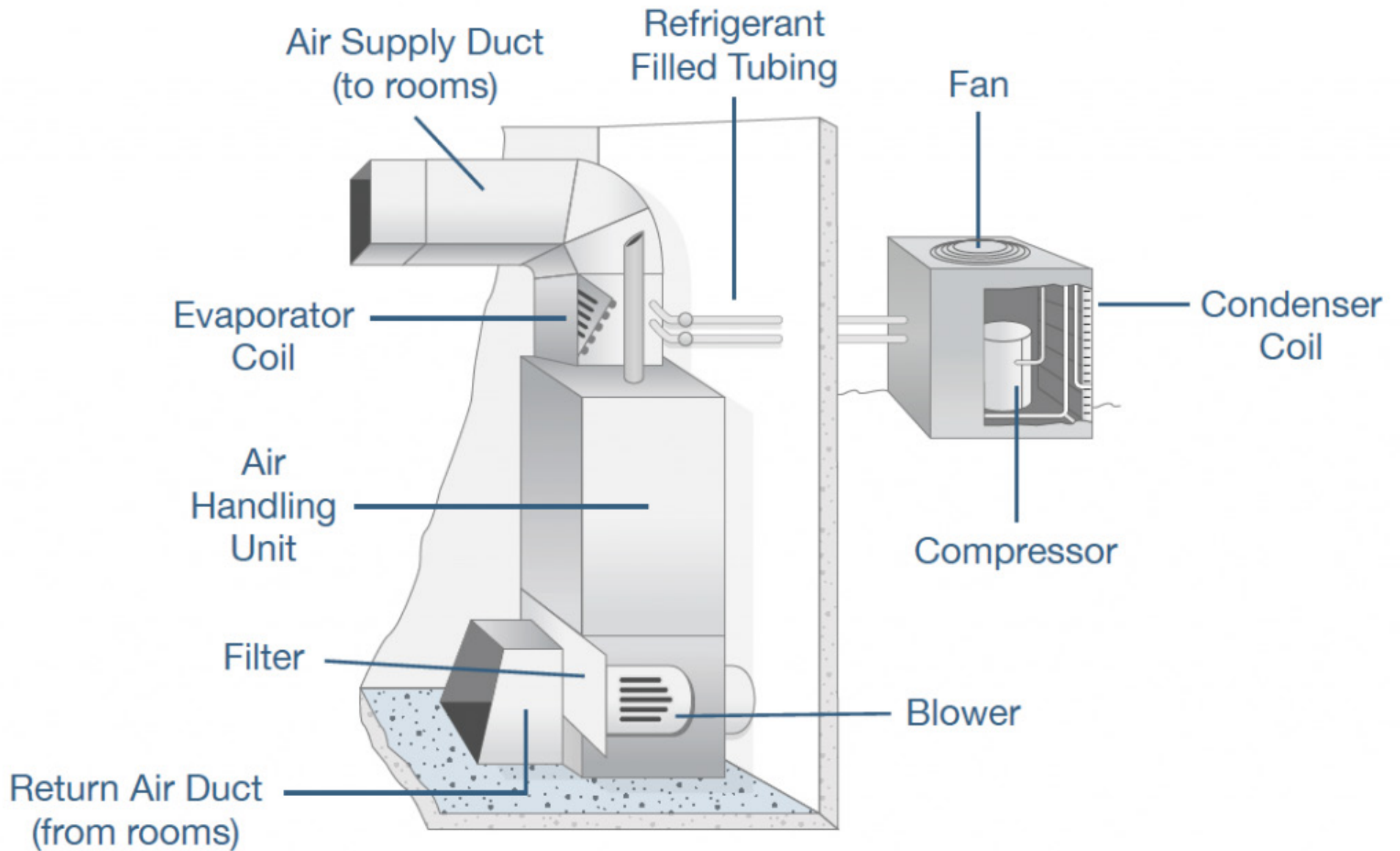


PASSIVE COOLING



ACTIVE SYSTEM

Package Unit - Air handling unit will be located in the cellar, and the compressor will be located on the west side of the house next to the exterior cellar door.

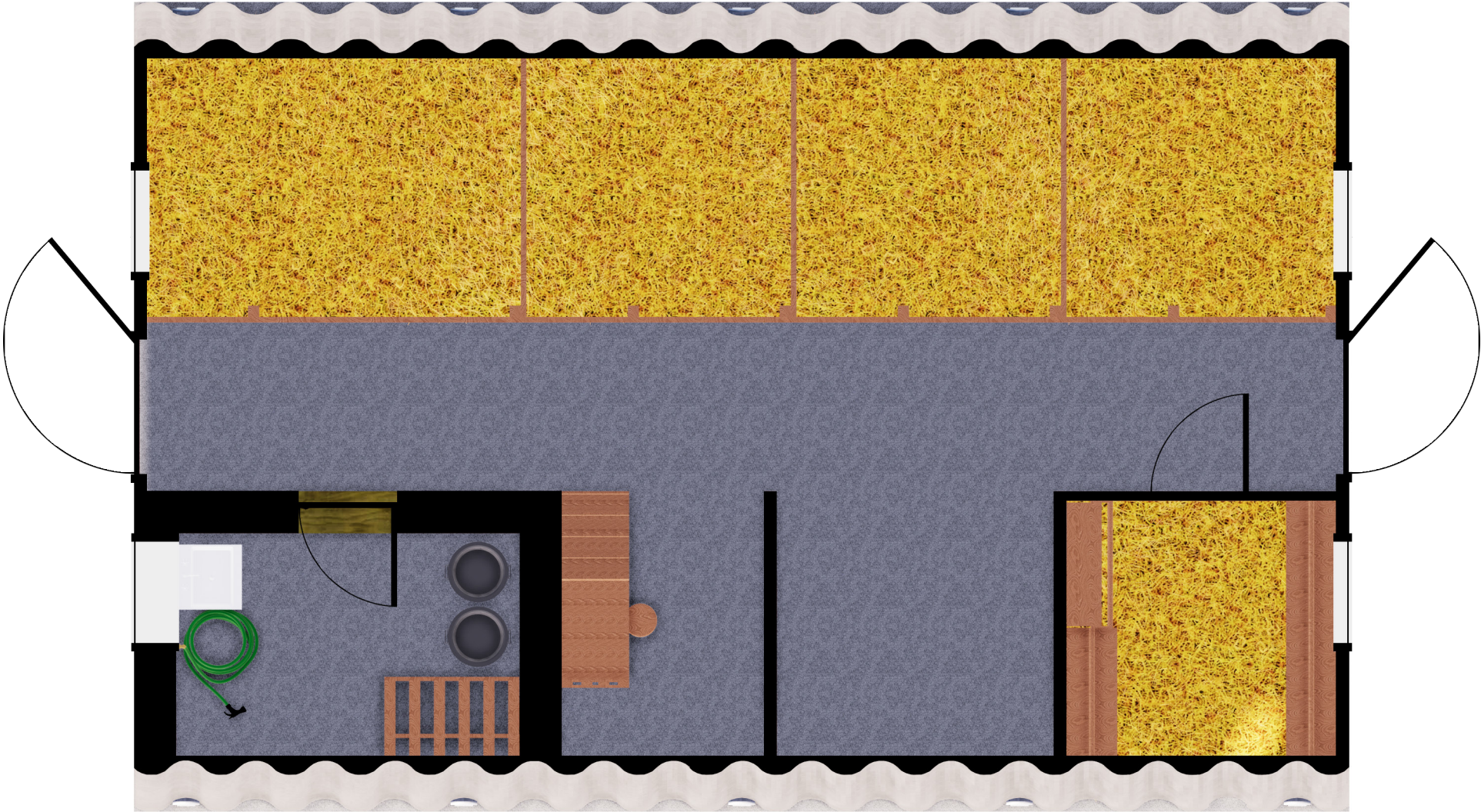


RENDERS



LIVESTOCK BARN

PLAN

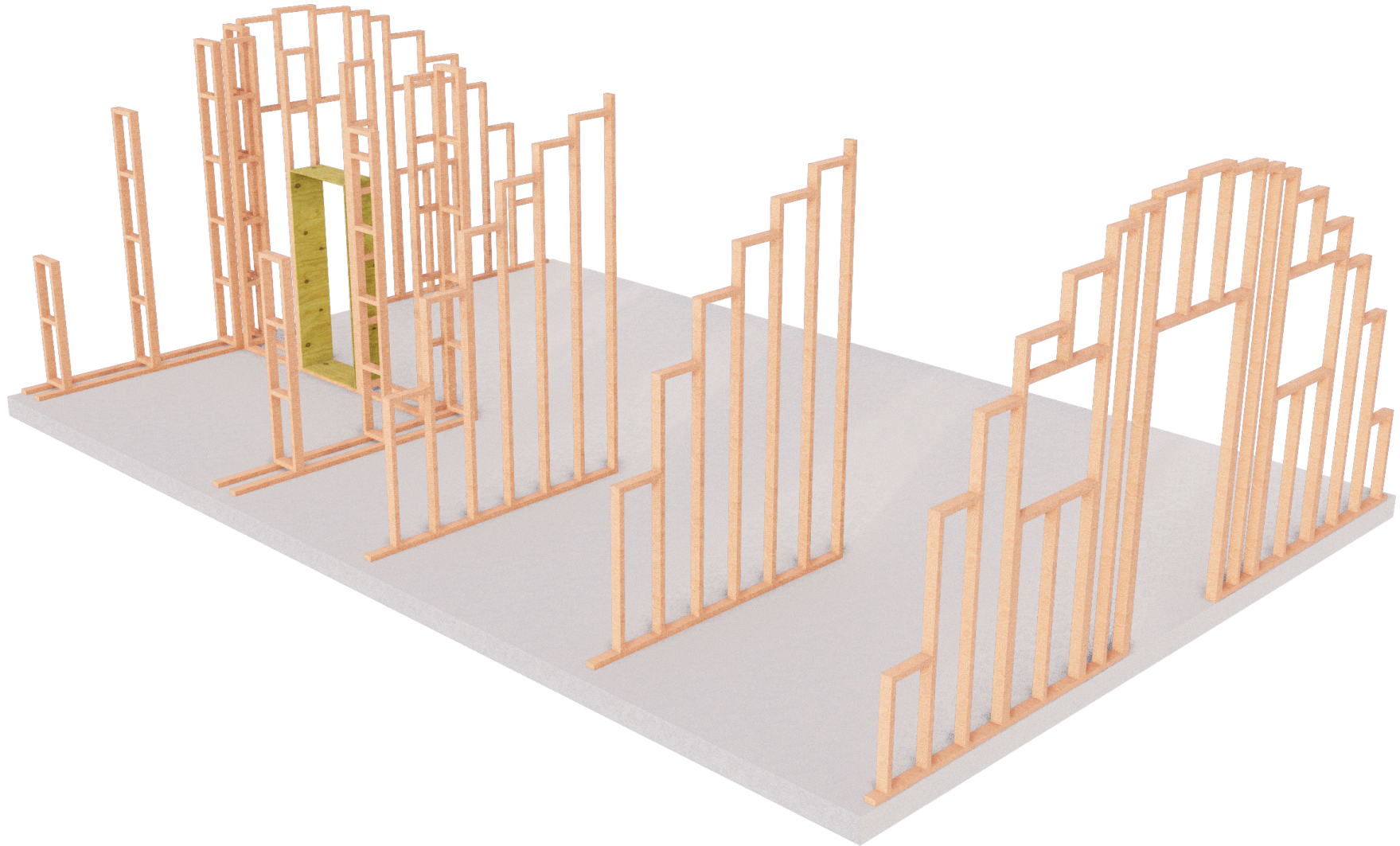


STRUCTURE

Quonset Hut - Double skin system to keep cool in summer months

Traditional Wood Framing - Used to construct the end walls, uninsulated

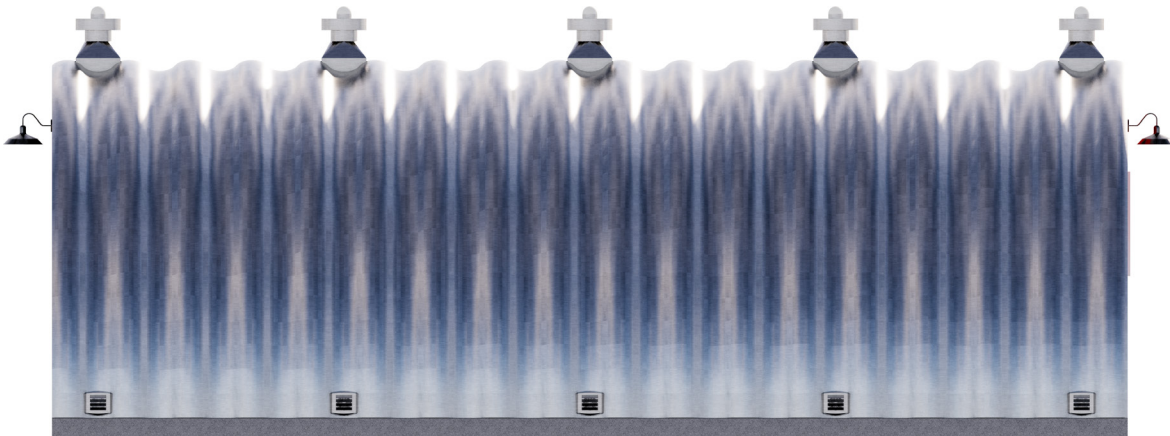
Buck & Beam Straw Bale Construction - Used to insulate the feed room, non load bearing



ELEVATIONS

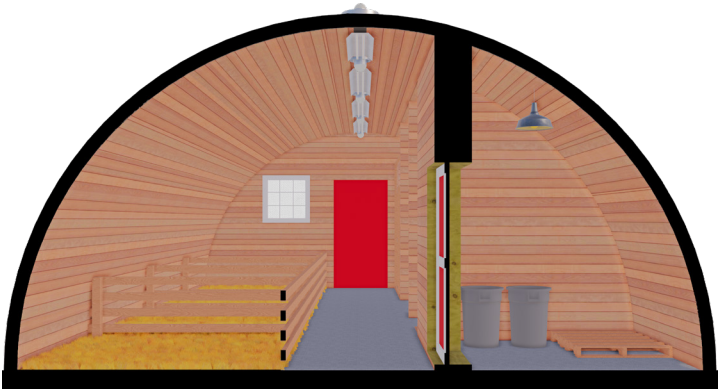


Front Elevation

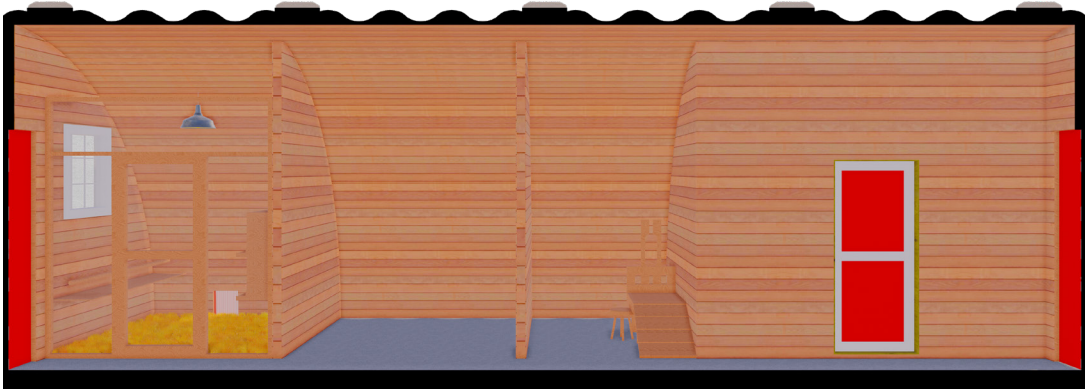


Side Elevation

SECTIONS

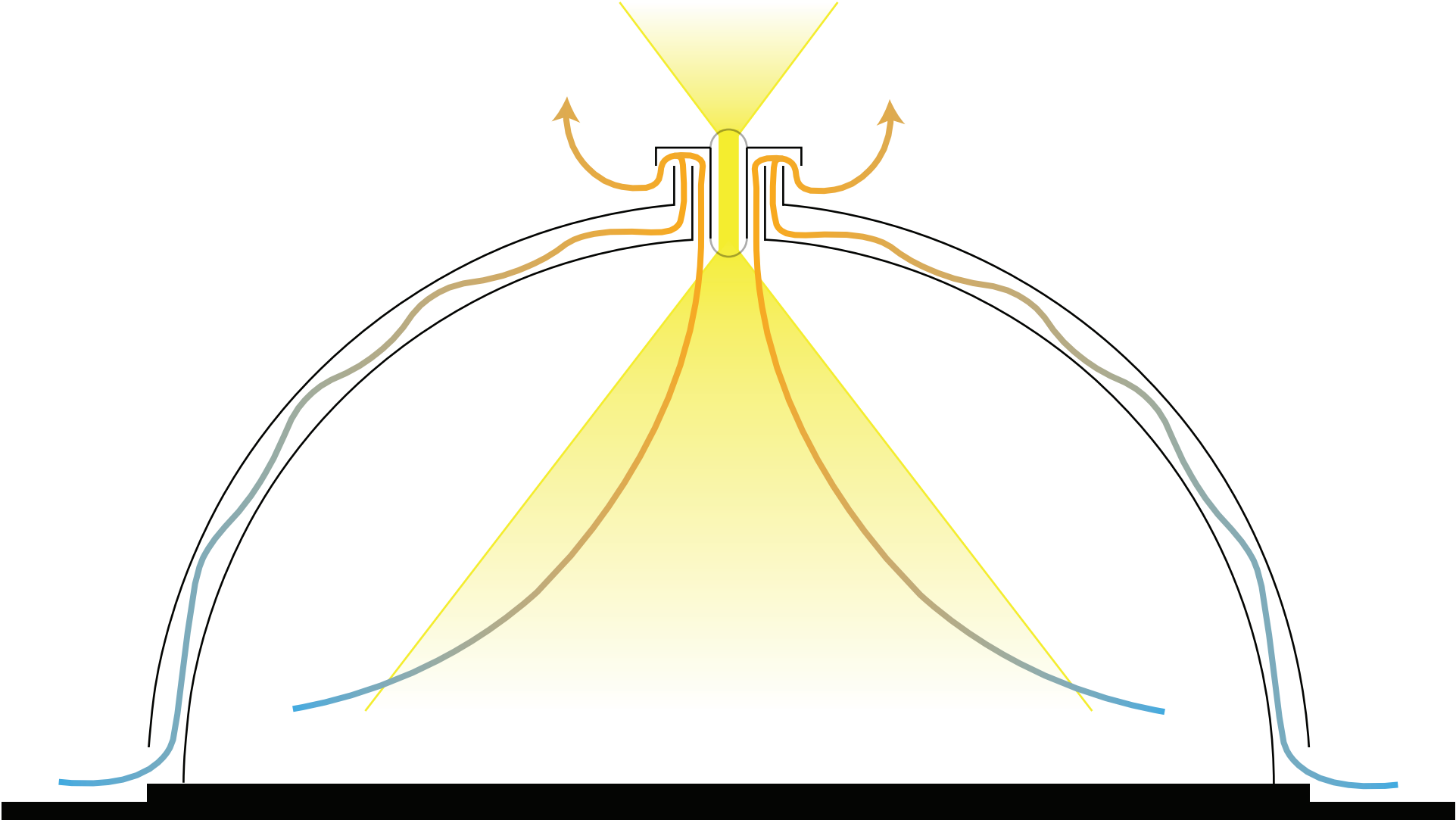


Transverse Section



Longitudinal Section

PASSIVE COOLING & DAYLIGHTING SYSTEM

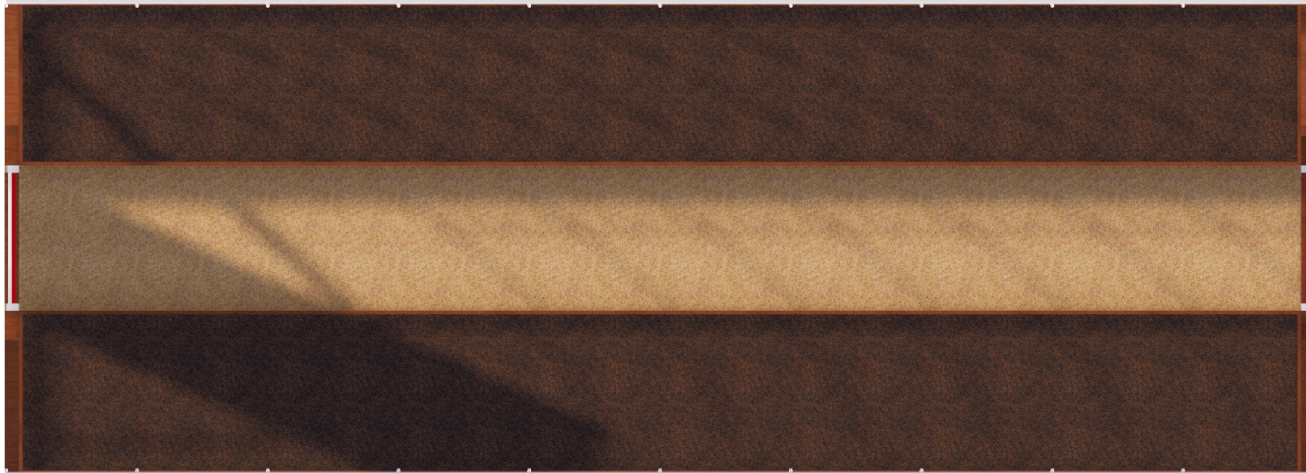


RENDERS

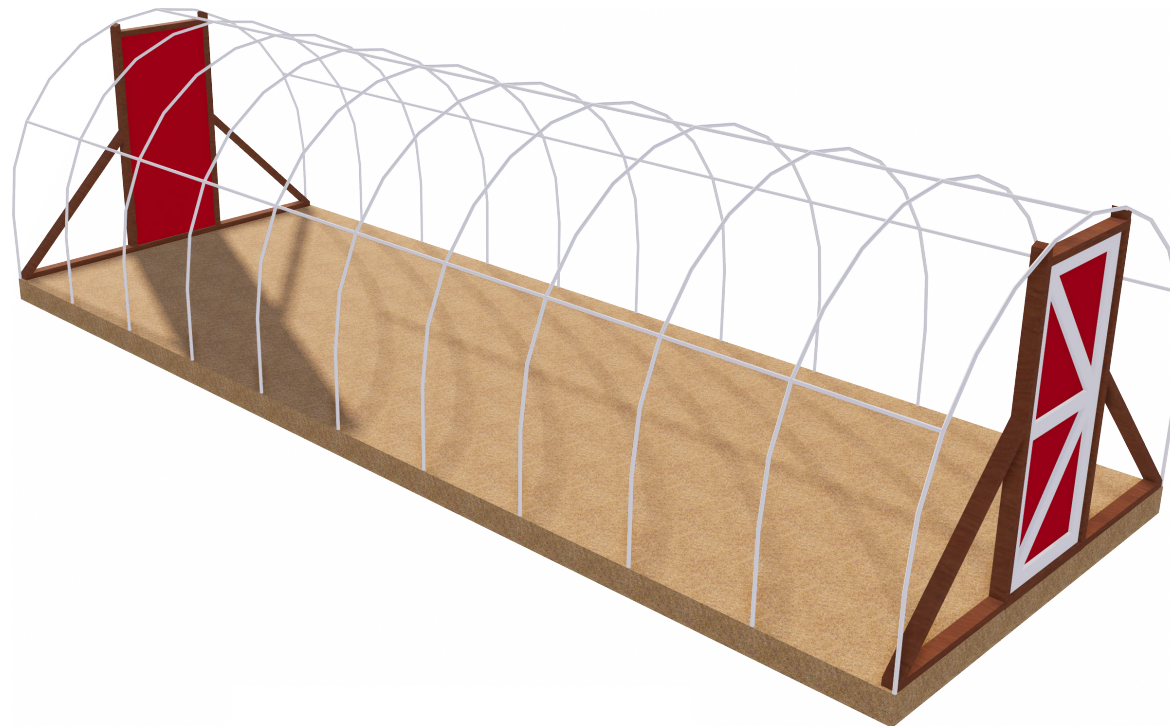


HIGH TUNNEL / GARDEN SPACES

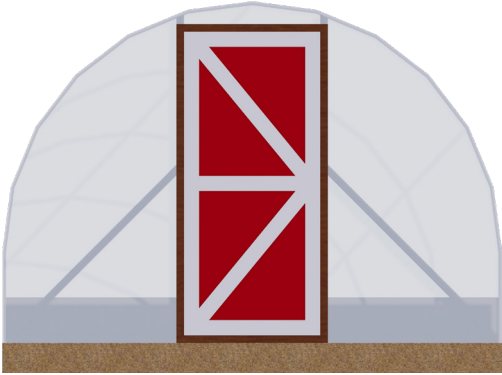
PLAN



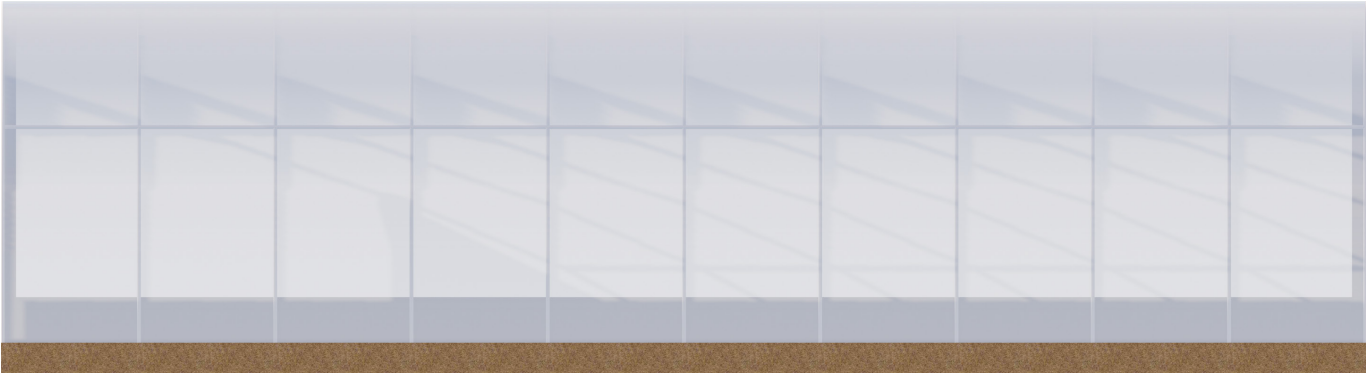
STRUCTURE



ELEVATIONS

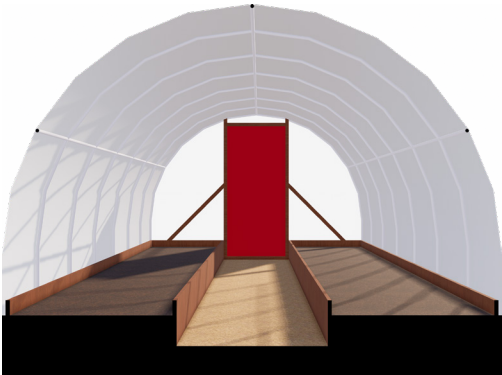


Front Elevation

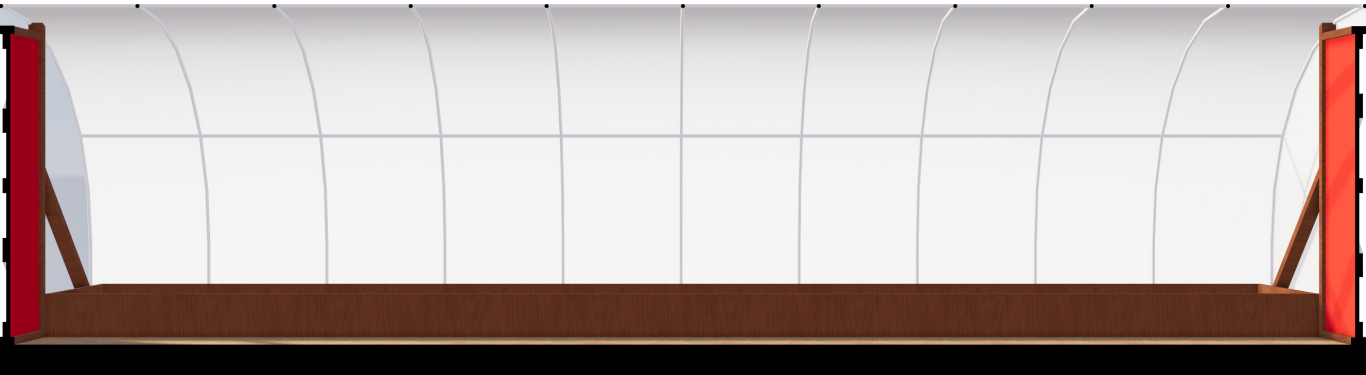


Side Elevation

SECTIONS



Transverse Section



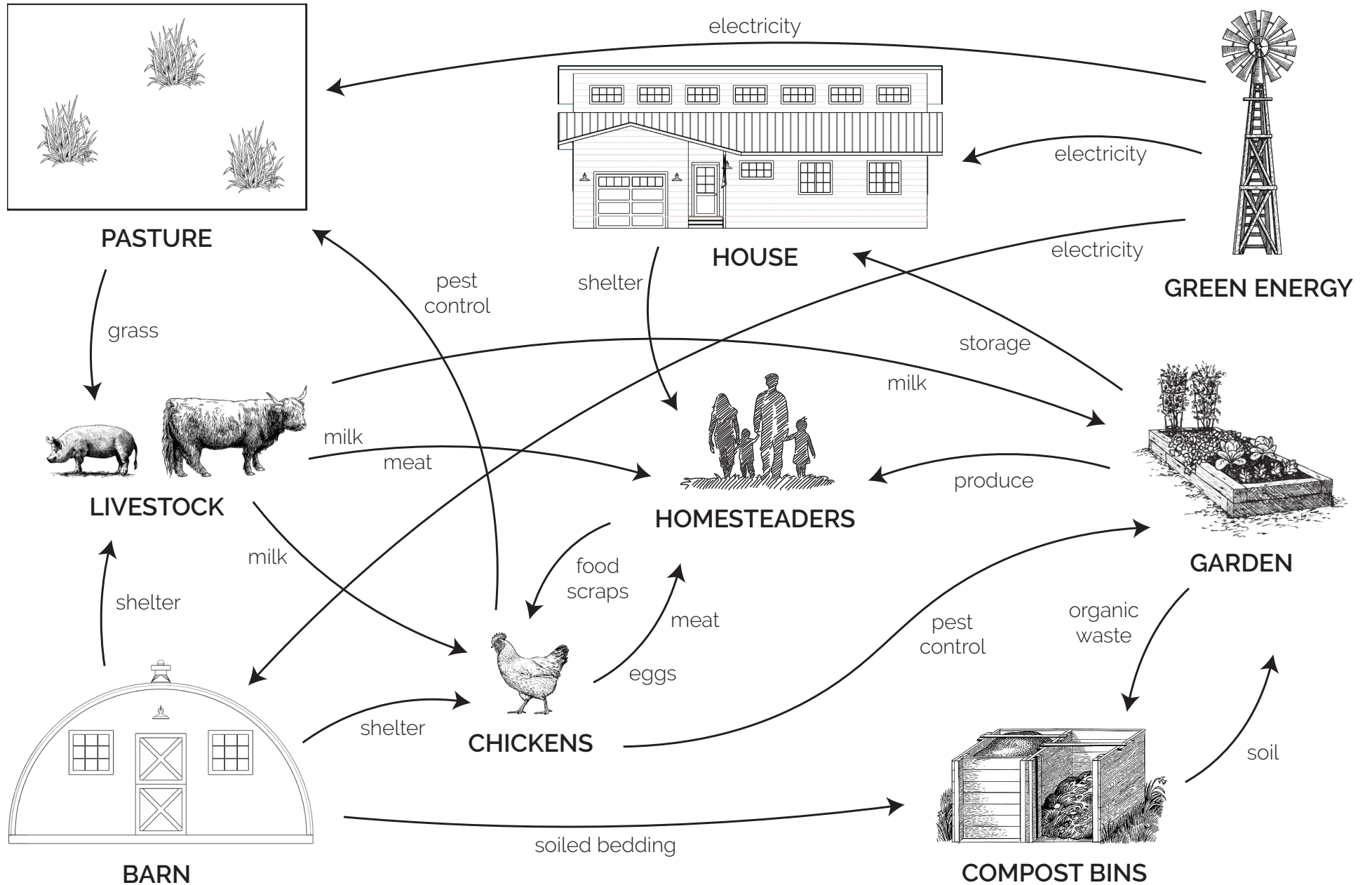
Longitudinal Section

RENDERS



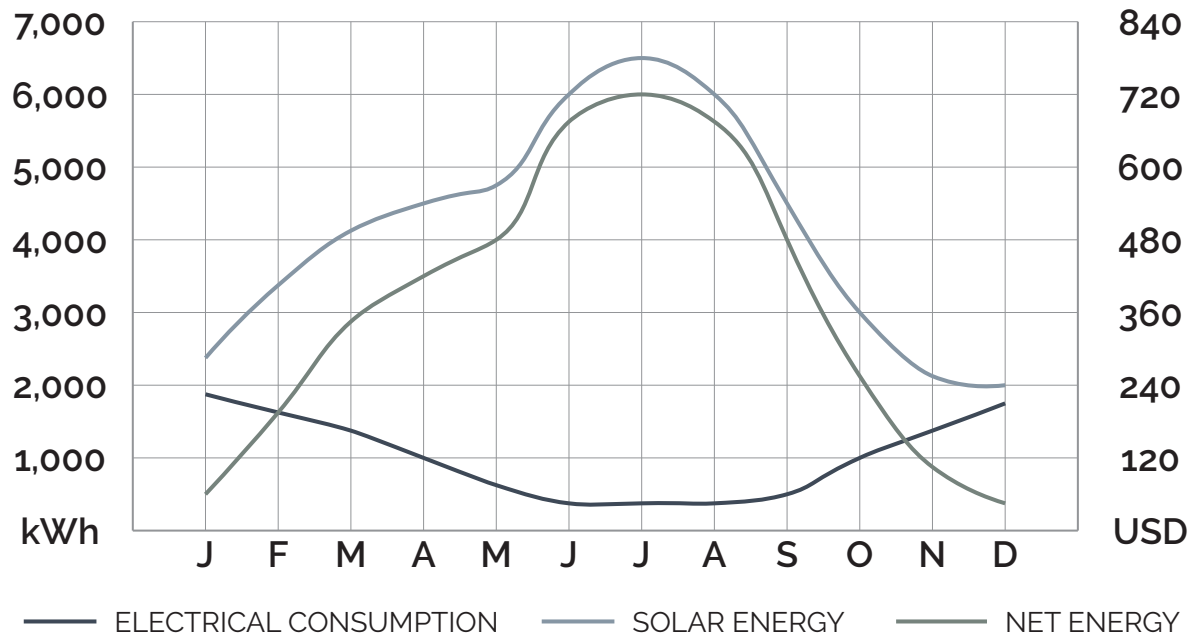
ANALYSIS

RESOURCE FLOWCHART



ENERGY CALCULATIONS

MONTH	ELECTRICITY CONSUMPTION	SOLAR ENERGY	NET ENERGY	BALANCE
January	-1,888 kWh	+2,341 kWh	+453 kWh	+\$54.36
February	-1,673 kWh	+3,331 kWh	+1,658 kWh	+\$198.96
March	-1,356 kWh	+4,166 kWh	+2,810 kWh	+\$337.20
April	-1,015 kWh	+4,512 kWh	+3,497 kWh	+\$419.64
May	-662 kWh	+4,702 kWh	+4,040 kWh	+\$484.80
June	-411 kWh	+6,038 kWh	+5,627 kWh	+\$675.24
July	-429 kWh	+6,468 kWh	+6,039 kWh	+\$724.68
August	-409 kWh	+6,061 kWh	+5,652 kWh	+\$678.24
September	-587 kWh	+4,531 kWh	+3,944 kWh	+\$473.28
October	-982 kWh	+3,085 kWh	+2,103 kWh	+\$252.36
November	-1,311 kWh	+2,150 kWh	+839 kWh	+\$100.68
December	-1,733 kWh	+2,053 kWh	+320 kWh	+\$38.40
YEARLY	-12,456 kWh	+49,438 kWh	+36,982 kWh	+\$4,437.84



CHORE SCHEDULE

TASK	LOCATION	SEASON	REPETITION	DURATION
Feed Chickens	Barn	Year Round	Daily	2 min
Water Chickens	Barn	Year Round	Daily	2 min
Collect Eggs	Barn	Year Round	Daily	1 min
Milk Cow	Barn	Year Round	Bidaily	30 min
Fill Stock Tank	Barn	Winter	Daily	5 min
Feed Pigs	Barn	Year Round	Daily	4 min
Weed Garden	Garden	Summer	Weekly	90 min
Clean Stock Tank	Barn	Summer	Weekly	10 min
Clean Coop	Barn	Year Round	Biweekly	15 min
Hay	Sacrifice Pen	Winter	Biweekly	15 min
Hay	Sacrifice Pen	Summer	Monthly	15 min
Canning/Freezing	House	Fall	Yearly	na

TOTAL PRODUCTION

PRODUCT	SOURCE	YEARLY PRODUCTION	WEEKLY PRODUCTION
Eggs	Chickens (16-18)	3,500 eggs	48 eggs
Poultry	Meat Birds (25)	125 lbs	2 lbs
Milk	Cow (1 Highlander)	730 gal	14 gal
Beef	Cow (1 Highlander)	220 lbs	4 lbs
Pork	Pig (1)	175 lbs	3 lbs
Produce	Garden	587 lbs	11 lbs
Electricity	Solar Panel (342 sf)	54,852 kWh	1,055 kWh

EXPENSES

PRODUCT	COST
Hay	-\$1,200
Pig Feed	-\$750
Chicken Feed	-\$400
Meat Bird (Chicks)	-\$75
Straw	-\$200
TOTAL	-\$2,625

CONSTRUCTION COST

DESCRIPTION	COST
Site	-\$21,600
House	-\$170,000
Barn	-\$15,000
High Tunnel	-\$1,000
Hay Shed	-\$4,000
TOTAL	-\$211,600

CONCLUSION

Just Enough Acres provides:

A sustainable house that is affordable and provides privacy for all members.

An efficient barn for caring for livestock.

A garden space to provide a year's worth of food for the homesteader.

Just Enough Acres meets all of the project goals while making a profit of an estimated \$1,800 a year.

