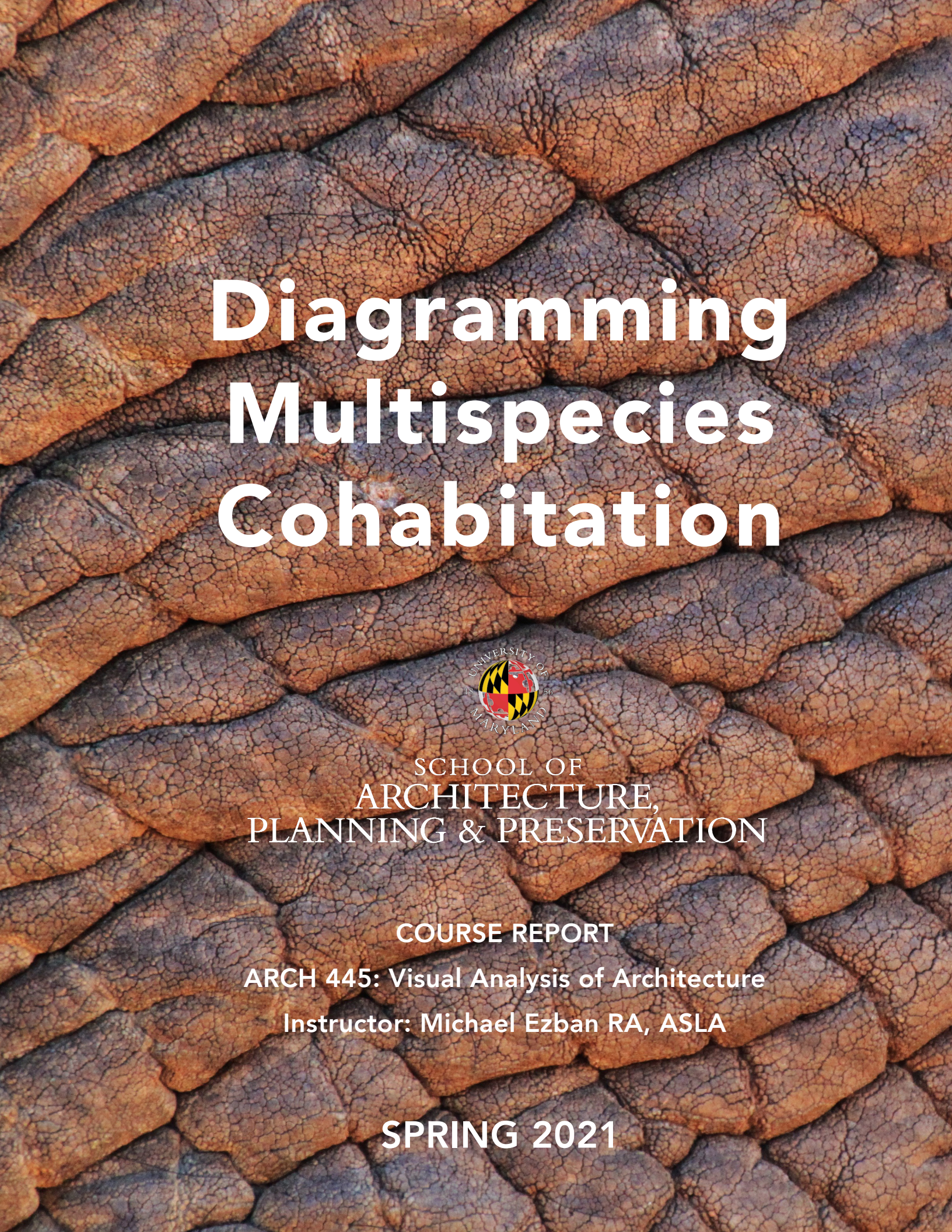

Diagramming Multispecies Cohabitation

UNIVERSITY OF MARYLAND

SCHOOL OF
ARCHITECTURE,
PLANNING & PRESERVATION

COURSE REPORT

ARCH 445: Visual Analysis of Architecture

Instructor: Michael Ezban RA, ASLA

SPRING 2021

Acknowledgements

This 3-credit course was taught by Michael Ezban, Clinical Assistant Professor of Architecture in Spring 2021. Many thanks to the 28 talented students enrolled in the course for the many hours of work they put into their projects:

Kim Koorey
Katherine McClure
Parker Callahan
Maha Alamri
Eleni Forakis
Frednel Creer
Meghan Reynolds
Caroline Connor
Andrew Chen
Naima Camara
Jihee Lee
Vasilia Roberts
Samanty Habib
Lauren McNamara
Kaitlyn Briller
Caleigh Crawford
Ethan Ratliff
Chad Loney
Abigail Bullock
Gavin Harrigan
Angelica Arias
Blake Bissen
Joseph Tannir
Alexandra Atienza
Alice Mulongo
Kaiyue Liu
Nichelle Rahming-Williams
Emily Kelly

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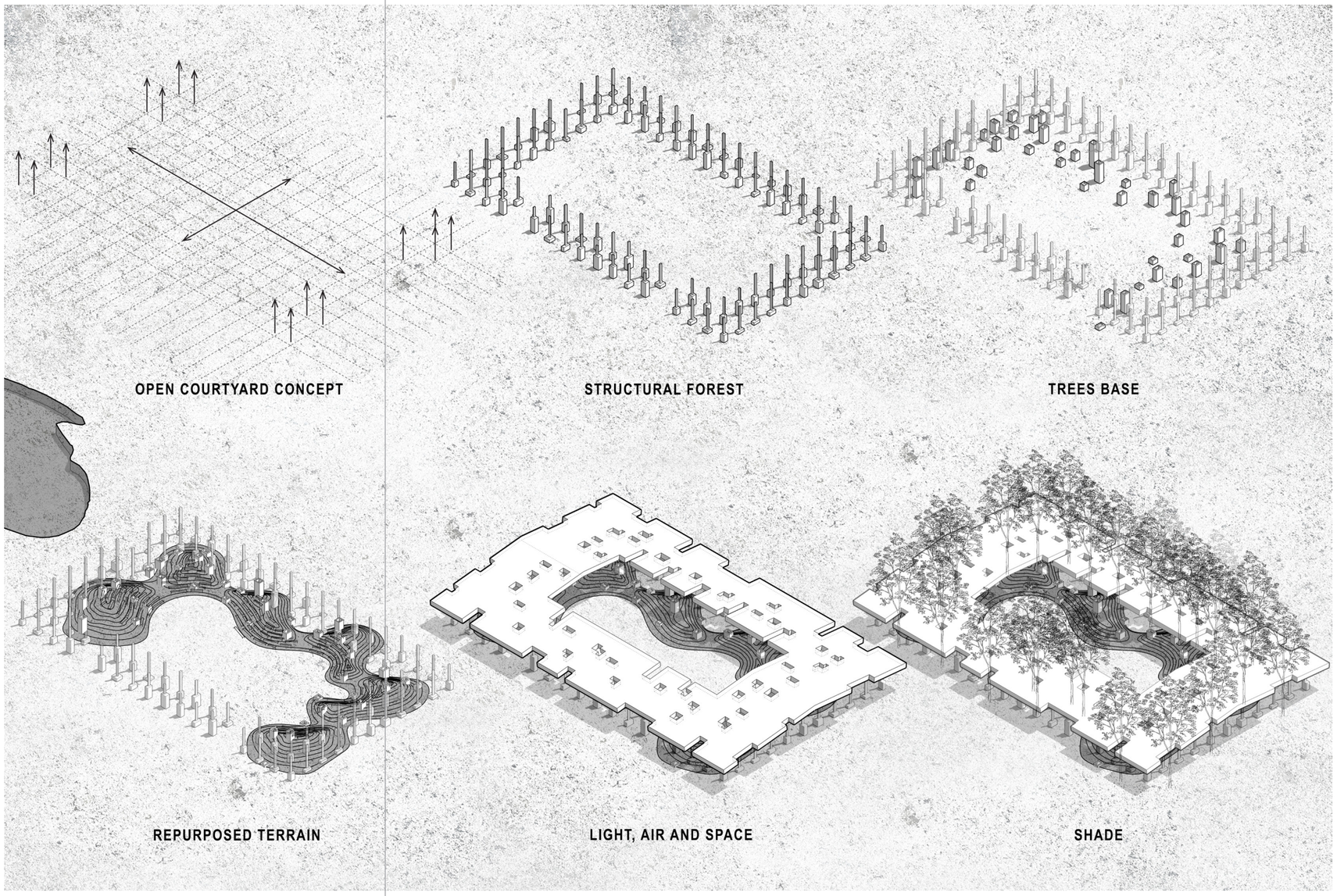
01
Course Summary

This course is focused on the construction of analytical diagrams and animations that describe multispecies architecture—buildings intended for mutualistic cohabitation by both humans and nonhuman animals.

Designing multispecies architecture is an act of inclusivity; it challenges latent and overt anthropocentric biases that exist in the design disciplines, and requires that architects seek and explore more-than-human perspectives and needs. This course asks students to attune to the functional and aesthetic decisions made by architects who have attempted to satisfy the needs of "clients" beyond the human.



by Alice Mulongo

The drawings produced by the students in this course describe entanglements between humans and nonhuman animals that shape, and are shaped by, architecture: koi ponds that provide a residence with evaporative cooling; a museum with corridors scaled to humans and elephants; stables where horses and humans can mingle on a planted roof; and more.

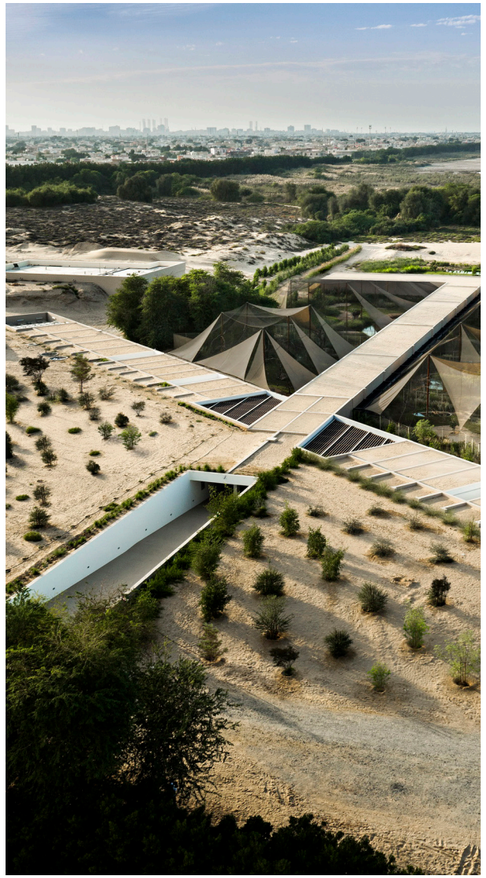
02
Multispecies Building Catalog

Each of the 28 students in this course spent the semester studying a single building, and 12 different buildings in total were studied. The buildings are geographically diverse and are located in 12 differrent countries, across 5 continents. They range in size—from a chicken coop to an elephant museum—and they are a mix of public, private, and commercial buildings.

Within the architecture, horses, birds, sheep, cows, fish, dogs, cats, bears, elephants, and humans move, sleep, eat, work, and socialize; through their individual lives, they express a diversity of ways of being.

Birds

Wasit Natural Reserve Center | UAE
X-Architects



Dog and Cat

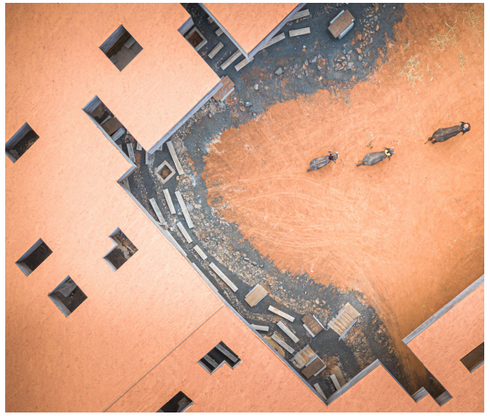
Canine and Feline Hotel | Portugal
Raulino Silva Arquitecto

Elephant

Elephant Museum | Thailand
Bangkok Project Studio

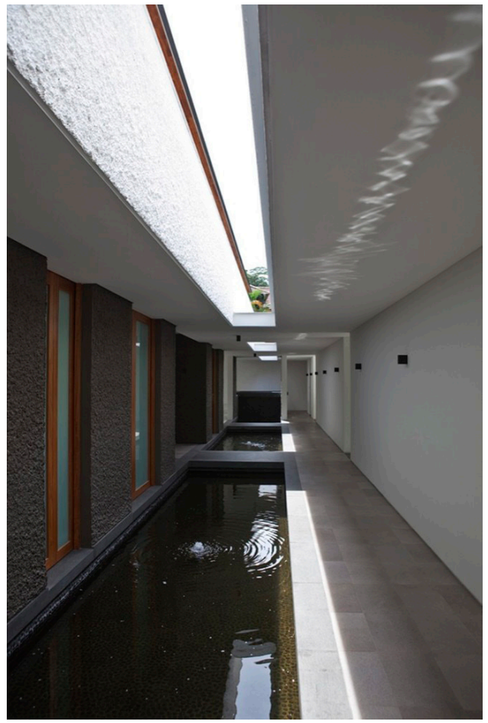
Elephant

The Cultural Courtyard | Thailand
Bangkok Project Studio



Fish

Water-Cooled House | Singapore
Wallflower Architecture + Design

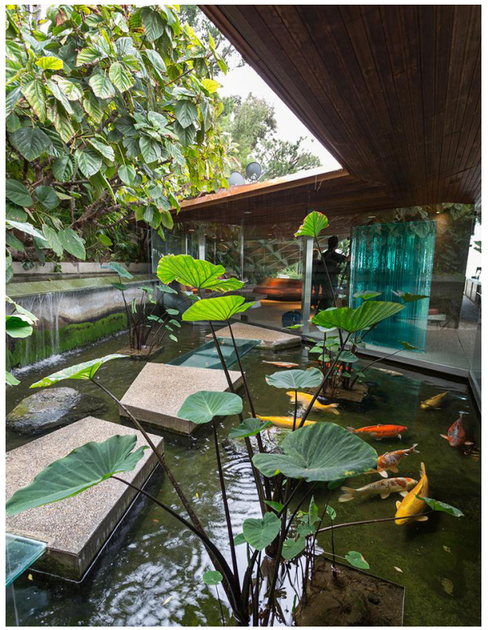


Fish

Koi Cafe | Vietnam
Farming Architects

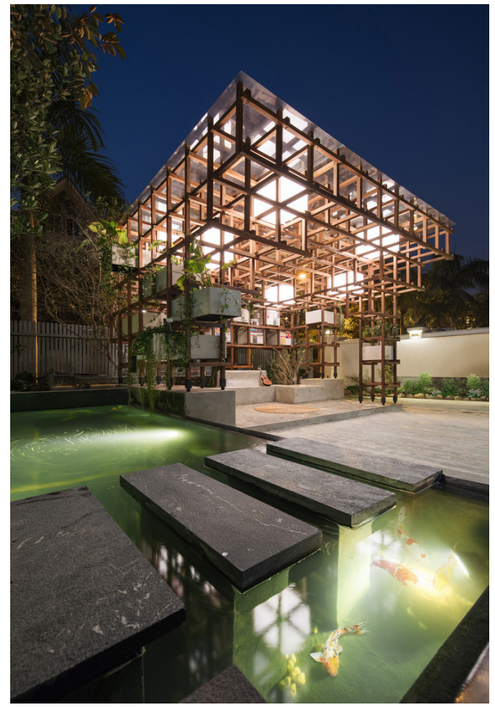
Fish

Sheats-Goldstein Residence | USA
John Lautner



Fish

VAC Library | Vietnam
Farming Architects

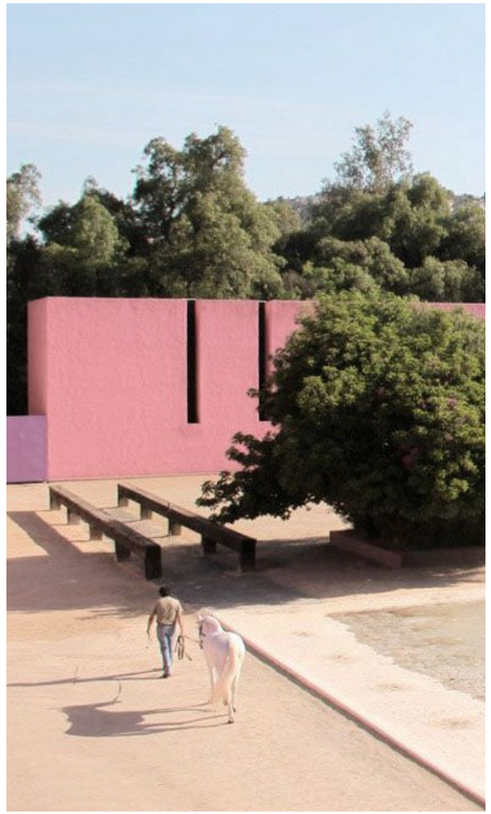


Horse

El Galeno Stables | Chile
Penafiel & Valdivieso Arquitectos

Horse

Cuadra San Cristobal | Mexico
Luis Barragán



Horse

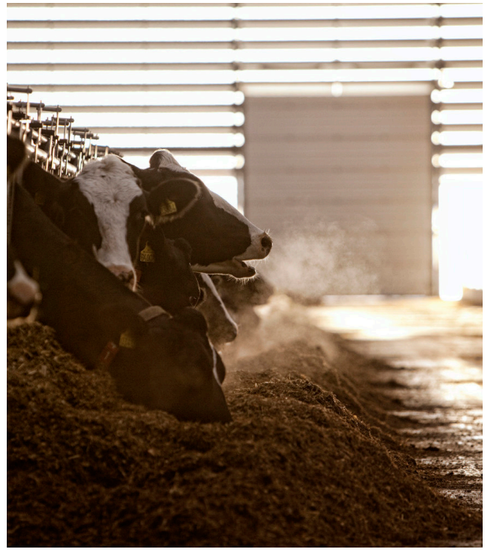
Figueras Polo Stables | Argentina
Estudio Ramos

Chicken

House of Chickens | Turkey
SO? Architecture and Ideas

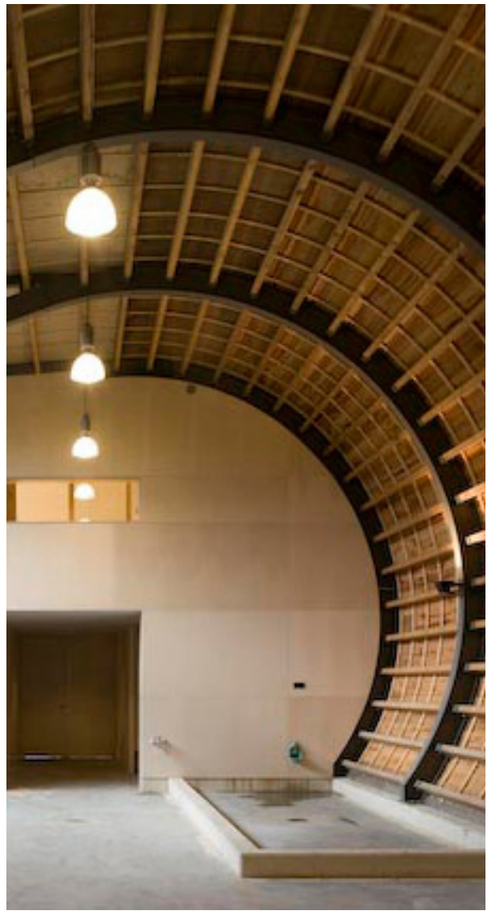
Cow

Vejlskovgaard Stable | Denmark
Lumo Architects



Sheep

Sheepstable | The Netherlands
70F Architecture



Sheep

Bargerveen Sheepfold Barn | The Netherlands
DAAD Architecten

Bear

Vietnam Bear Sanctuary | Vietnam
Atelier Cole

03
Drawing Types

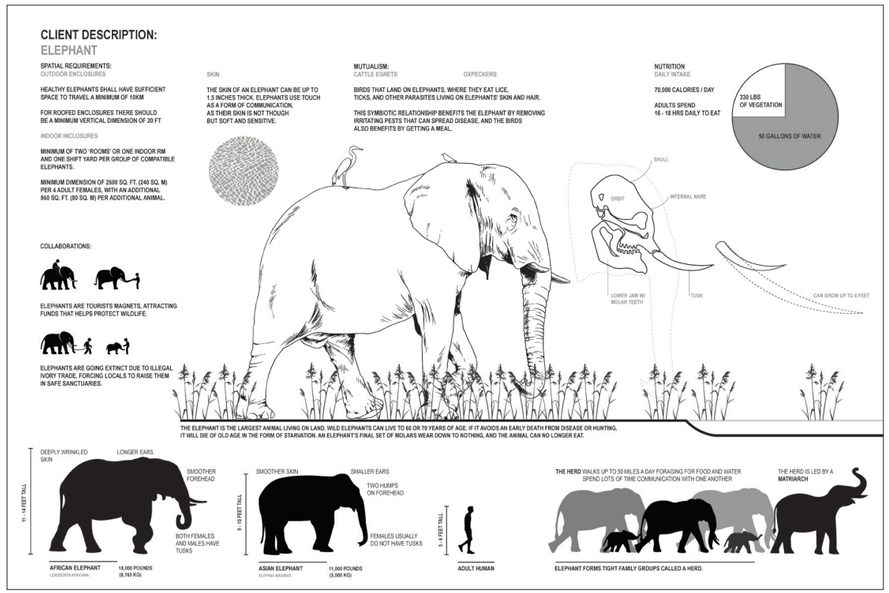
Students were asked to develop 12 different drawing types:

Nonhuman Species Research
Site Plan
Floor Plan
Building Circulation/ Daily Activity
Building and Site Program Zoning
Site Section
Building Section
Section Axonometric/ Perspective
Wall Section
Serial Section
Exploded Axonometric
Process Sequence Diagram

In addition, students were challenged to create an animation that would synthesize several of these drawings and create a new, dynamic representation of the building.

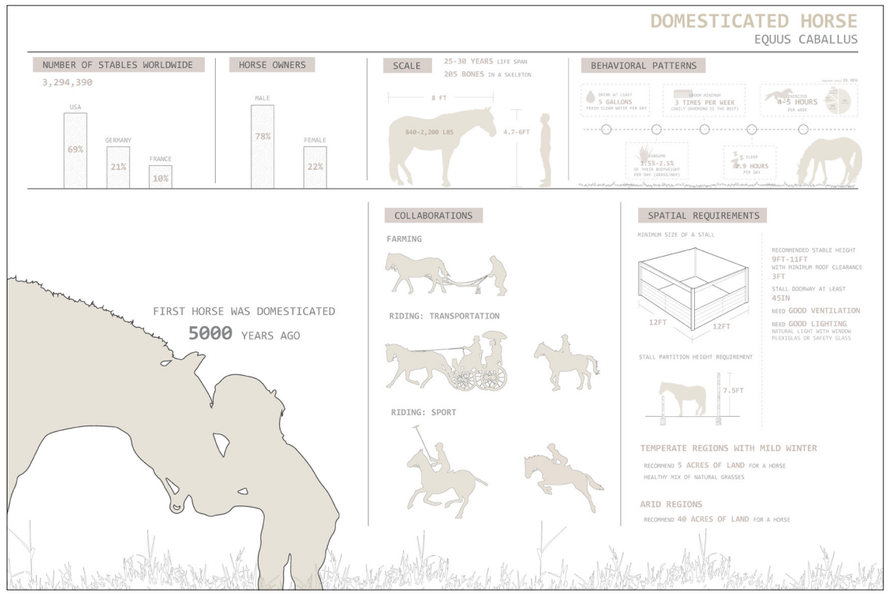
Nonhuman Species Research

The Cultural Courtyard | Thailand
Bangkok Project Studio



by Alice Mulongo

Figueras Polo Stables | Argentina
Estudio Ramos



by Jihee Lee

Site Plan

Elephant Museum | Thailand
Bangkok Project Studio

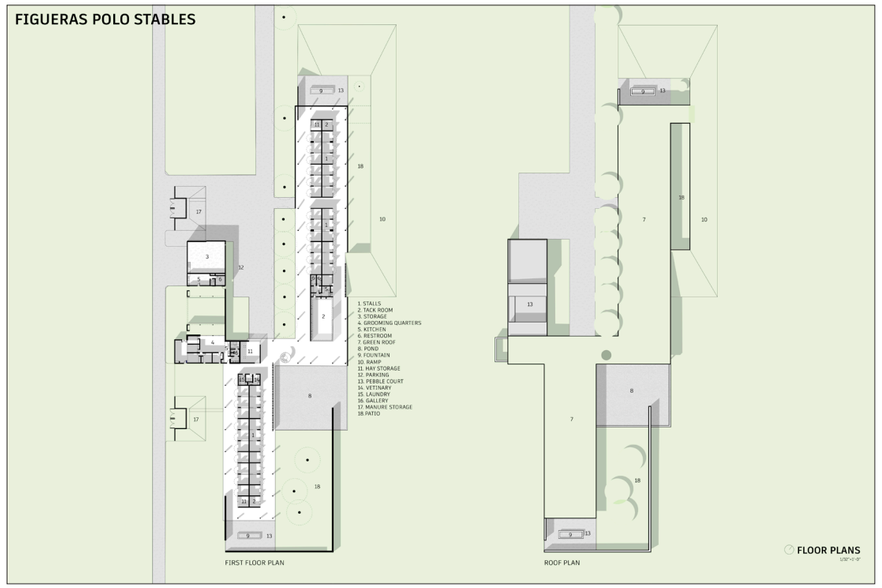
by Alexandra Atienza

House of Chickens | Turkey
SO? Architecture and Ideas

by Ethan Ratliff

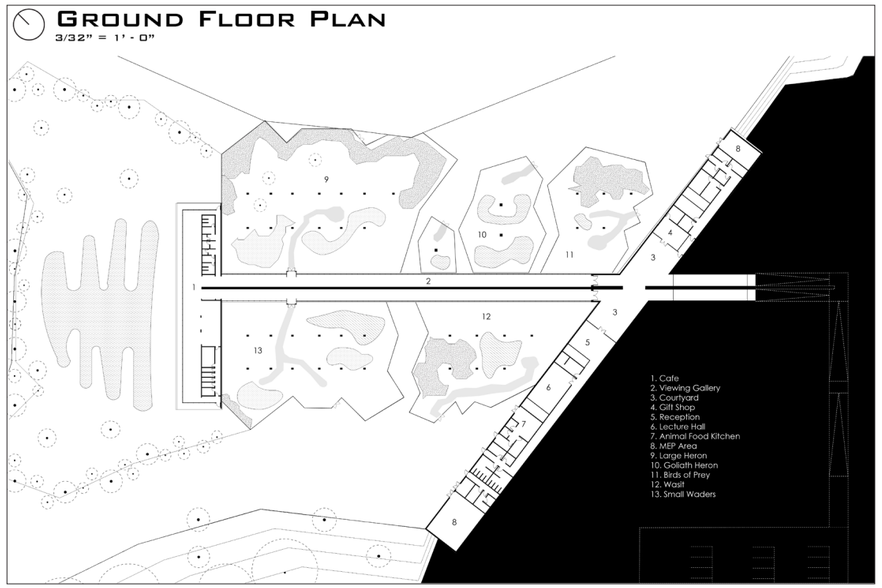
Floor Plans

Figueras Polo Stables | Argentina
Estudio Ramos



by Vasilea Roberts

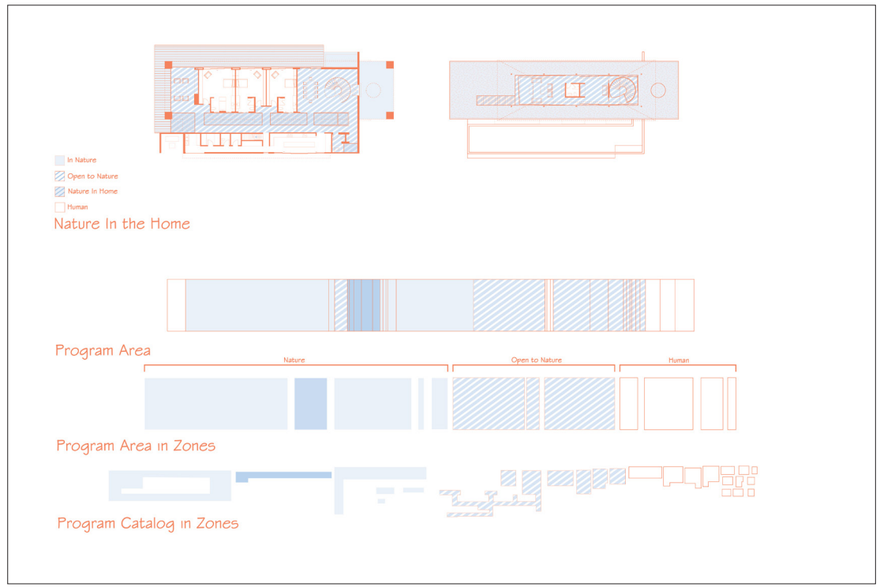
Wasit Natural Reserve Center | UAE
X-Architects



by Chad Looney

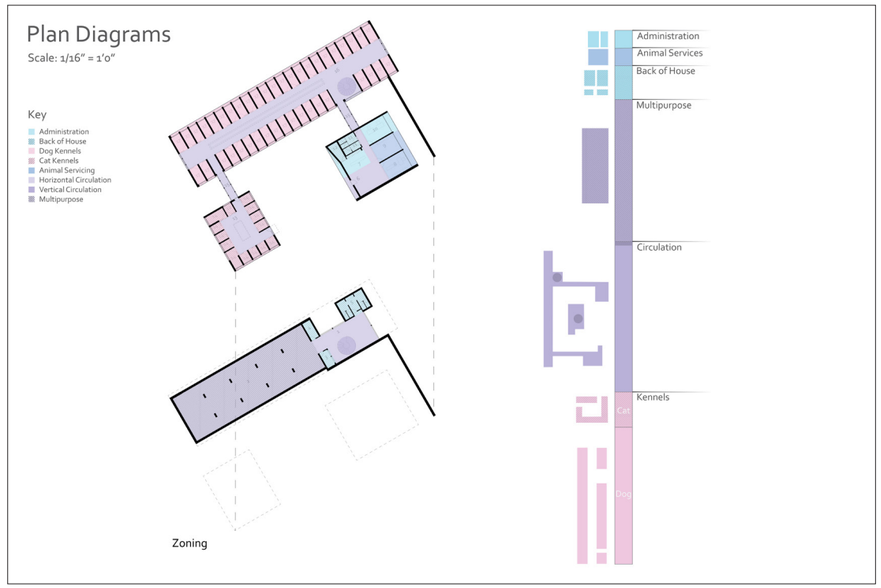
Building Zoning and Program Inventory

Water-Cooled House | Singapore
Wallflower Architecture + Design



by Limberly Koorey

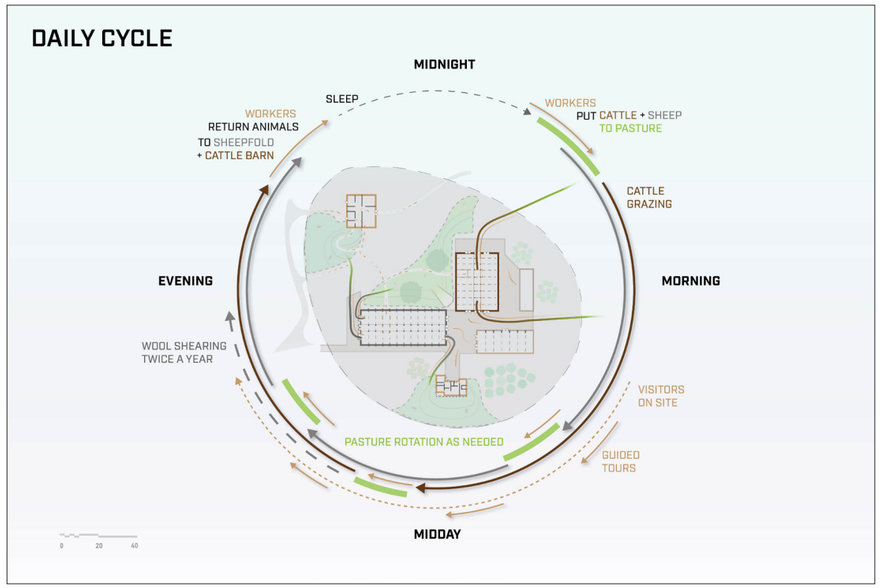
Canine and Feline Hotel | Portugal
Raulino Silva Arquitecto



by Emily Kelly

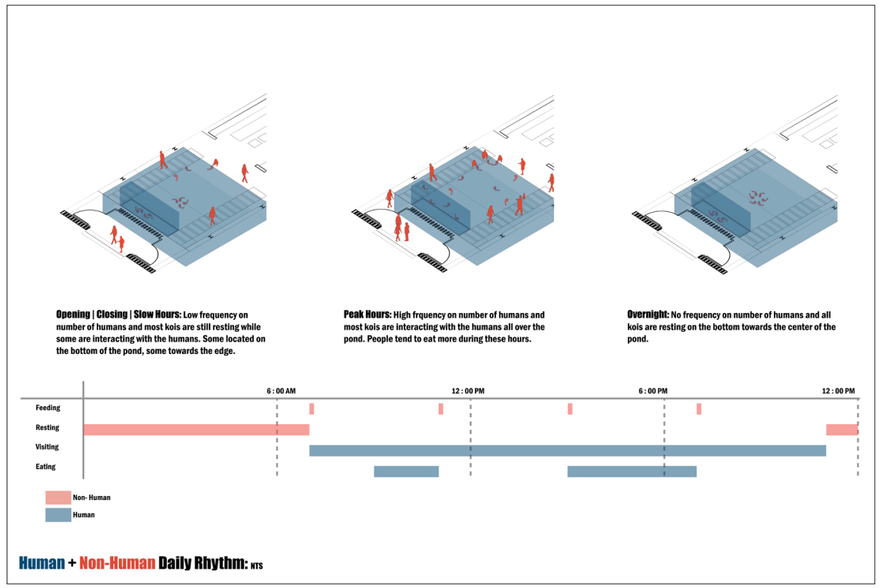
Circulation Diagram and Activity Rhythms

Bargerveen Sheepfold Barn | The Netherlands
DAAD Architecten



by Blake Bisson

Koi Cafe | Vietnam
Farming Architects



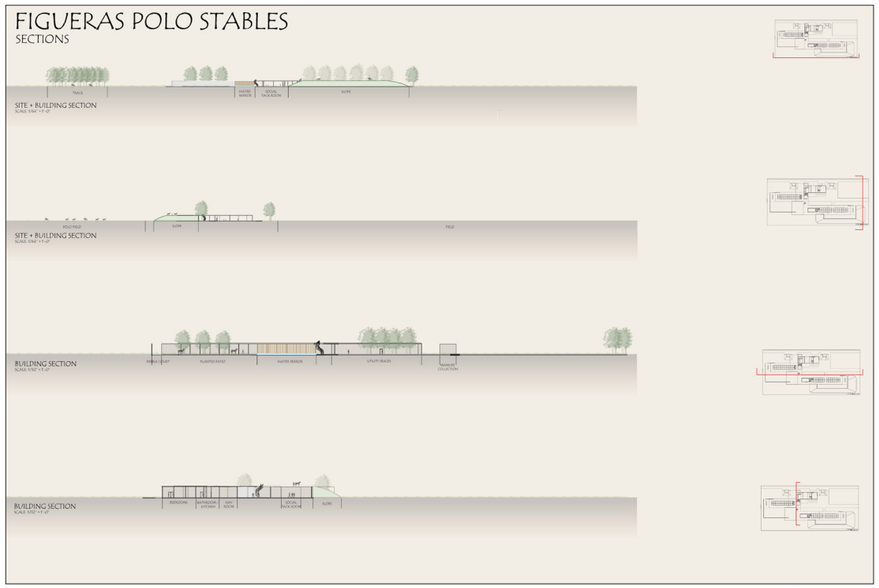
by Frednel Creer

Site Sections

Sheats-Goldstein Residence | USA
John Lautner

by Eleni Forakis

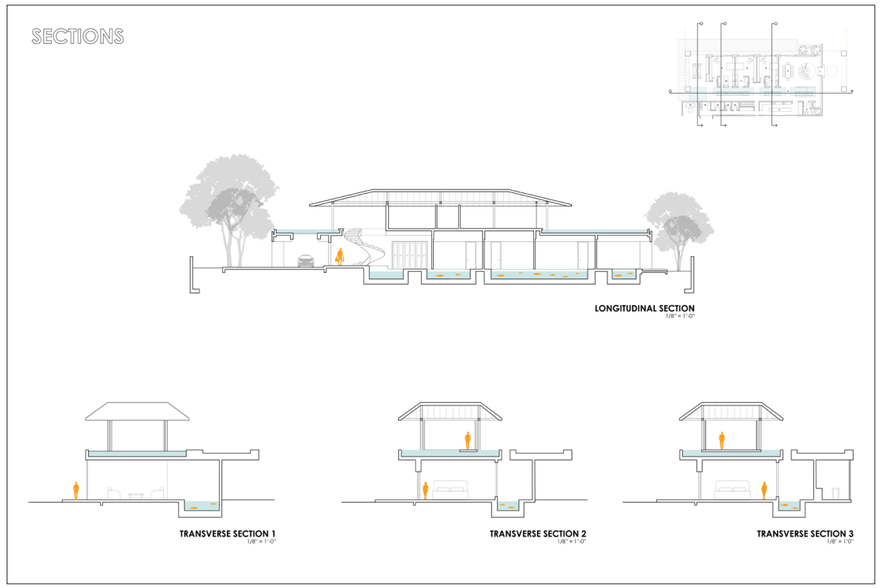
Figueras Polo Stables | Argentina
Estudio Ramos



by Samanty Habib

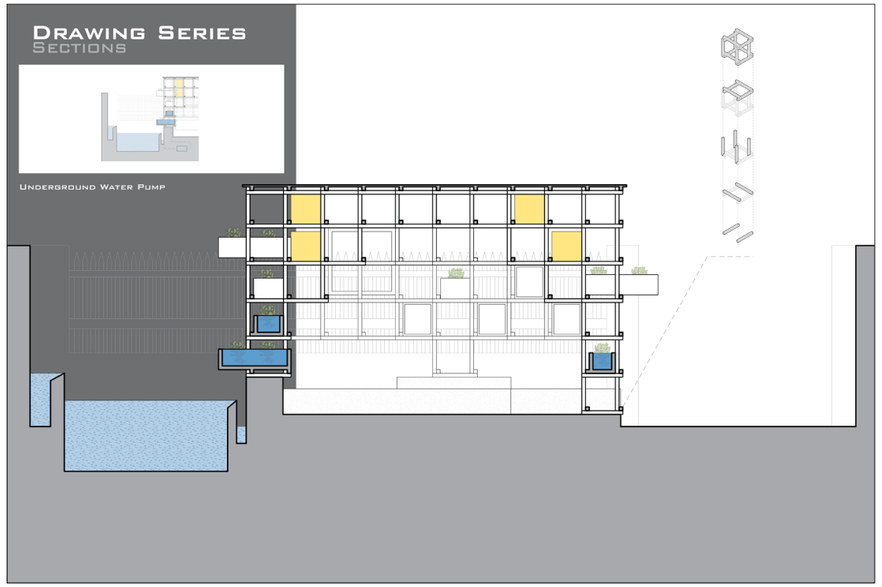
Building Sections

Water-Cooled House | Singapore
Wallflower Architecture + Design



by Samantha Jamero

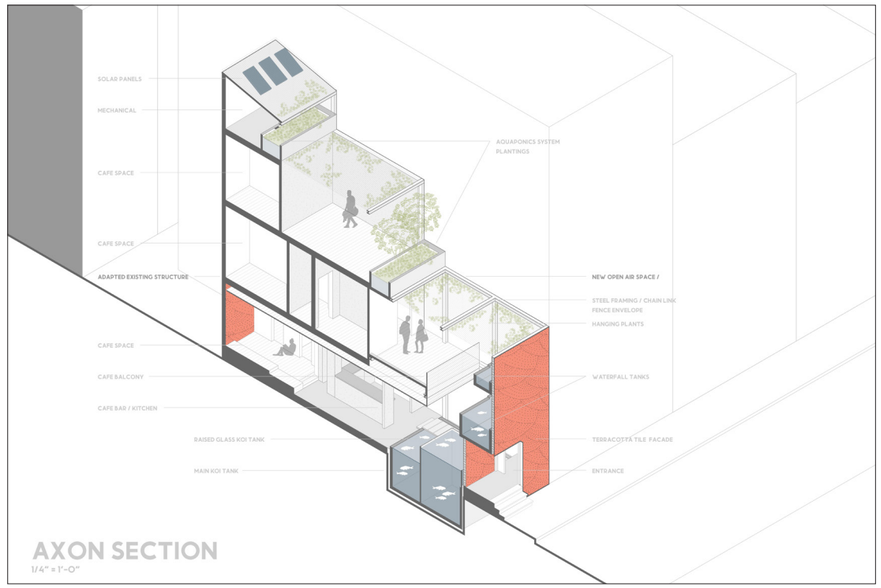
VAC Library | Vietnam
Farming Architects



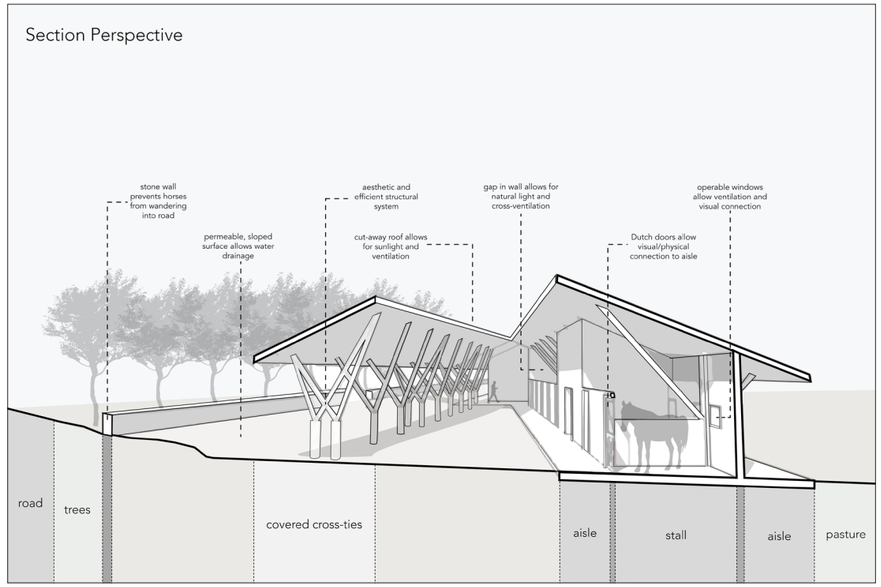
by Andrew Chen

Section Axonometric/ Perspective

Koi Cafe | Vietnam
Farming Architects



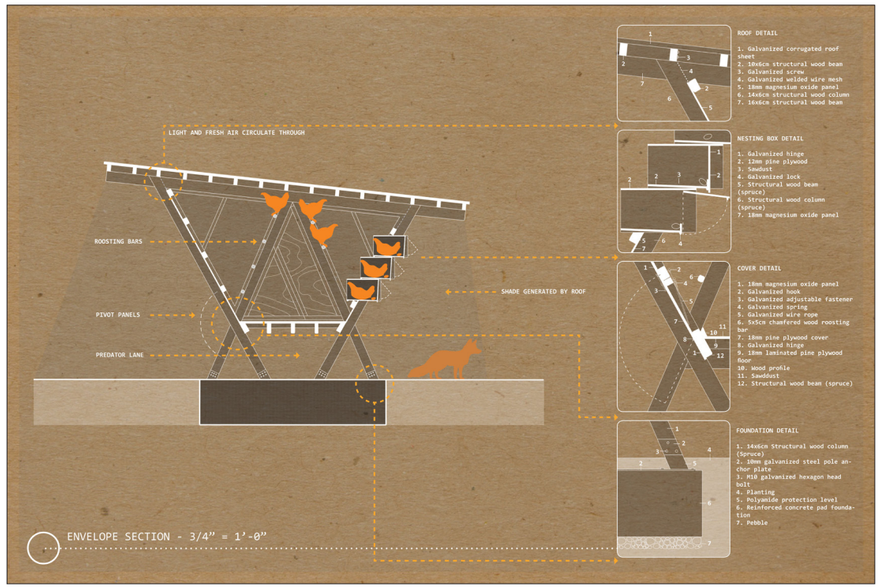
by Meghan Reynolds



by Kaitlyn Briller

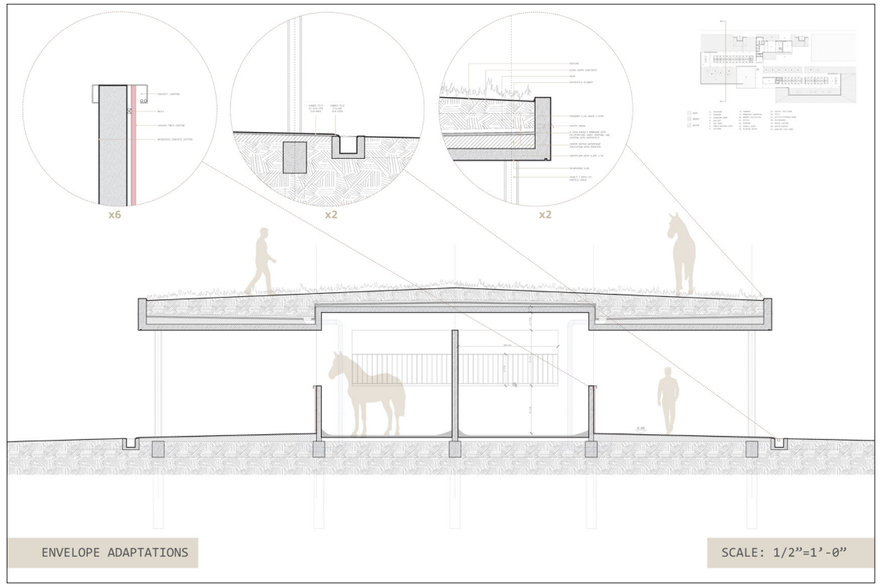
Wall Section and Details

House of Chickens | Turkey
SO? Architecture and Ideas



by Ethan Ratliff

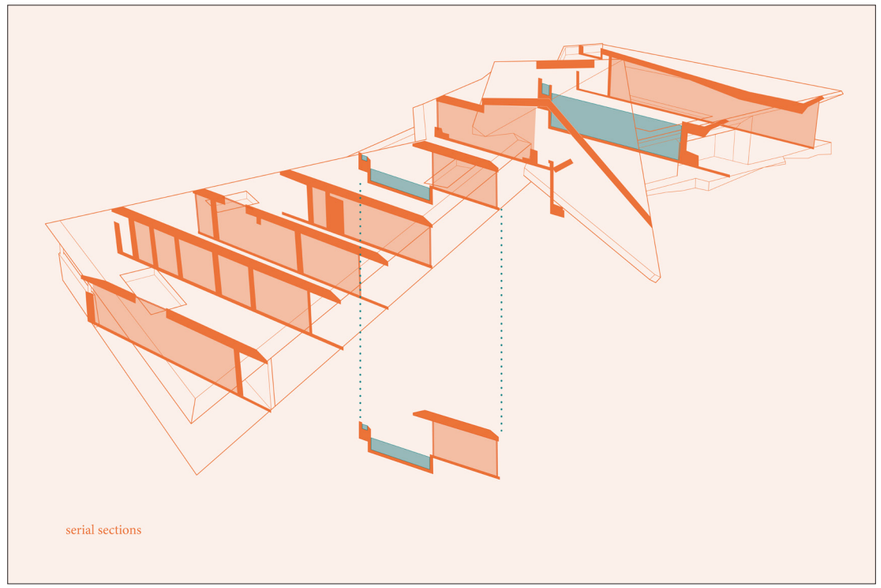
Figueras Polo Stables | Argentina
Estudio Ramos



by Jihee Lee

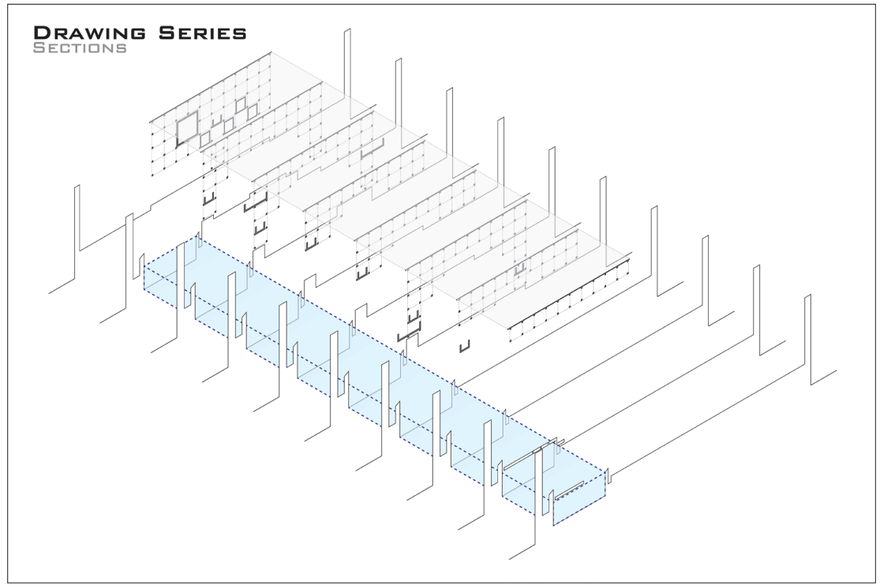
Serial Sections

Sheats-Goldstein Residence | USA
John Lautner



by Eleni Forakis

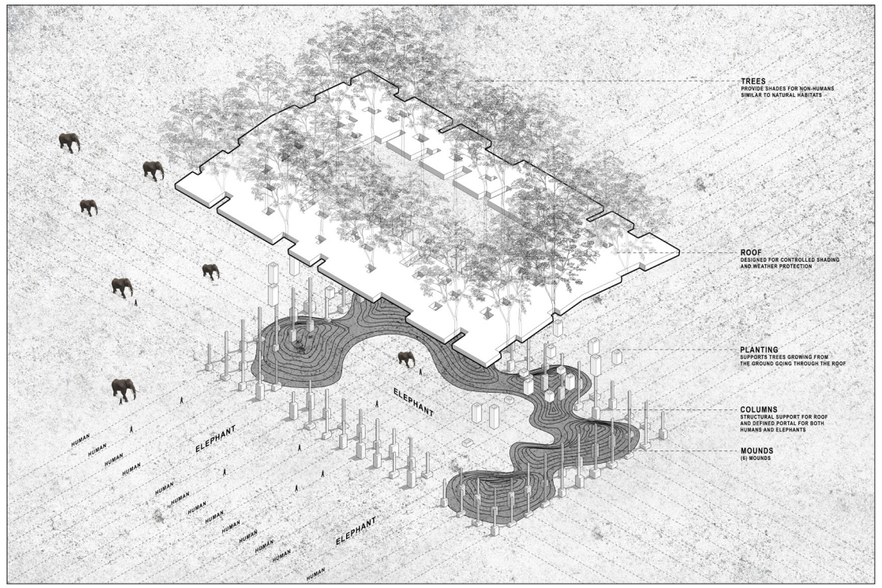
VAC Library | Vietnam
Farming Architects



by Andrew Chen

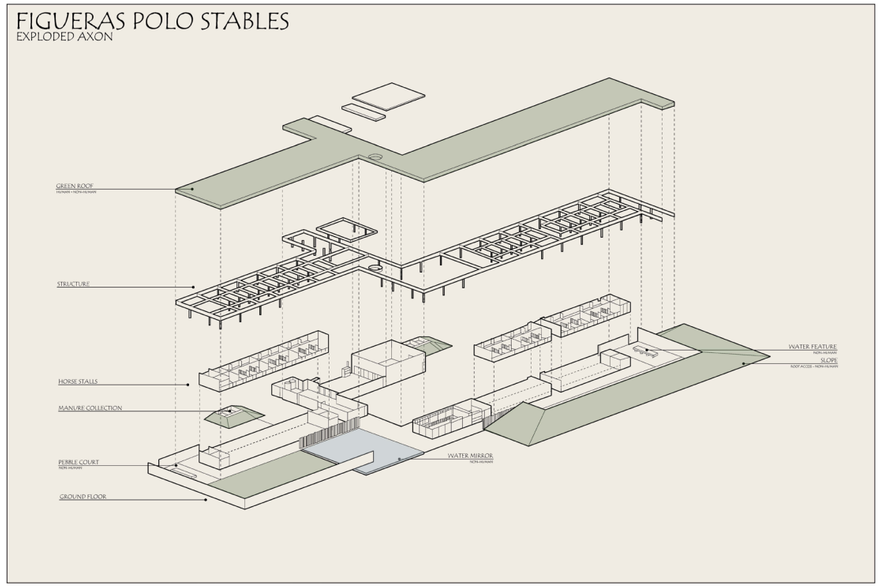
Exploded Axonometric

The Cultural Courtyard | Thailand
Bangkok Project Studio



by Alice Mulongo

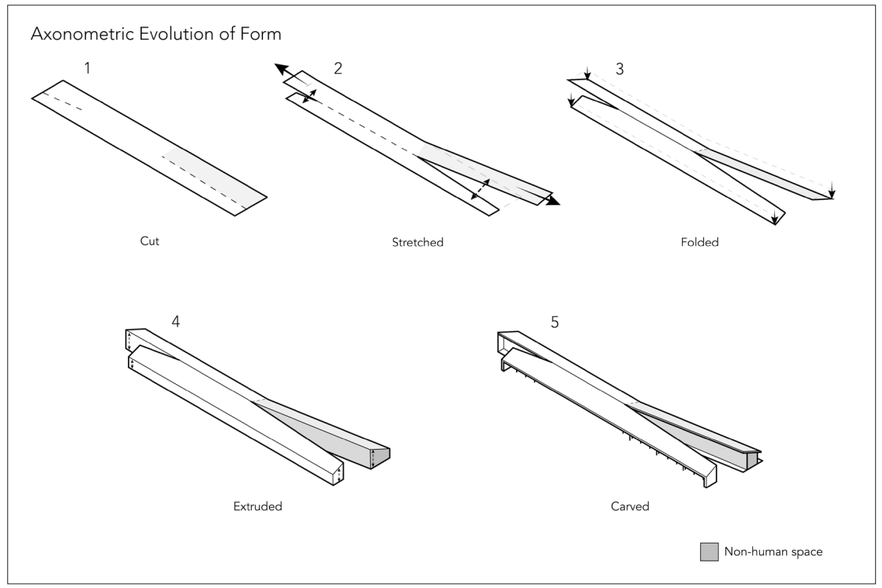
Figueras Polo Stables | Argentina
Estudio Ramos



by Samanty Habib

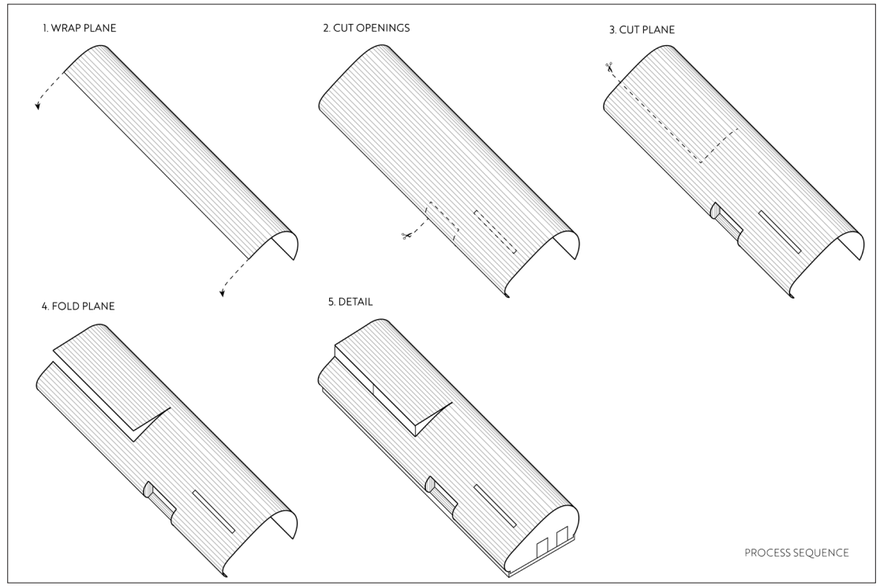
Process Sequence Diagram

El Galeno Stables | Chile
Penafiel & Valdivieso Arquitectos



by Kaitlyn Briller

Sheepstable | The Netherlands
70F Architecture



by Gavin Harrigan

Animation

House of Chickens | Turkey
SO? Architecture and Ideas

by Ethan Ratliff

04
Project Drawings

This section exhibits the work of six students, with each student working on a different case study project. The projects are:

Elephant Museum (Bangkok Project Studio)
by Alexandra Atienza

Figueras Polo Stables (Estudio Ramos)
by Vasilea Roberts

Bargerveen Sheepfold Barn (DAAD Architecten)
by Blake Bissen

The Cultural Courtyard (Bangkok Project Studio)
by Alice Mulongo

Koi Cafe (Farming Architects)
by Meghan Reynolds

House of Chickens (SO? Architecture and Ideas)
by Ethan Ratliff

ELEPHANT MUSEUM

Bangkok Project Studio | Surin Provice, Thailand | 17,750 sq. ft | 2020

Alexandra Rose E. Atienza
Professor Ezban
ARCH445 | Spring 2021

The Elephant Museum, designed by Bangkok Project Studio for Elephant World, represents the unique and important relationship between elephants and the Kui, the ethnic Thai people of the Surin province. In response to the destruction of the lush landscape due to decades of development, the local government initiated this project to give voices to the displaced Kui and 200+ elephants living around the site.

The building is composed of four quadrants of exhibition halls set only to the human scale. These quadrants are divided by four open-air corridors that are shared by both people and elephants. The thick, brick exterior walls of the museum curve up towards the intersection of the corridors at the center of the project. This gradual variation in height seamlessly opens the building up from the human scale at the entrance of the building, to the elephant scale at the intersection. Visitors are slowly transported into the world and scale of elephants with massive 25 feet brick walls at the center of the building. While the corridors are the only spaces where elephants can be found, the series of openings along these corridors allow glimpses of passing elephants and people from each exhibition hall. The different scales of interior and exterior spaces allow visitors to recall the importance of elephants to the Kui and to respect the spaces they both share.

ELEPHANTS

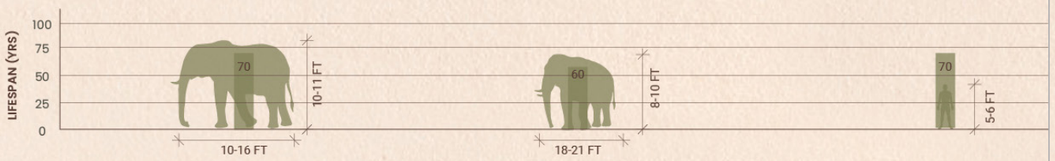
Elephantidae Family

ORIGINS:

ASIAN ELEPHANT
Elephas Maximus

AFRICAN ELEPHANT
Loxondonta Africana

SCALE & METRICS:



AFRICAN ELEPHANT
Weight: 4 - 6 tons

ASIAN ELEPHANTS
Weight: 3 - 5 tons

HUMAN
Weight: 100 - 300 Lbs.

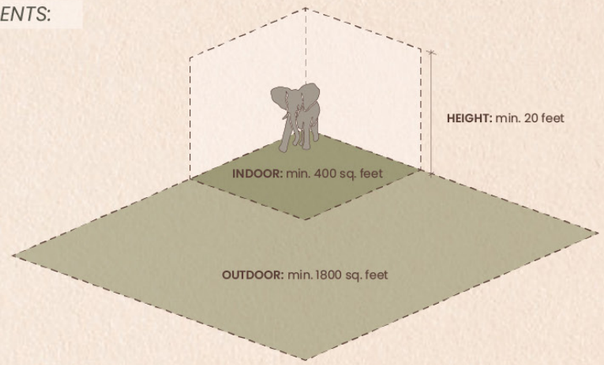
HUMANS & ELEPHANTS:

IVORY TRADE
Elephants are often illegally hunted for their tusks, which are made out of ivory.

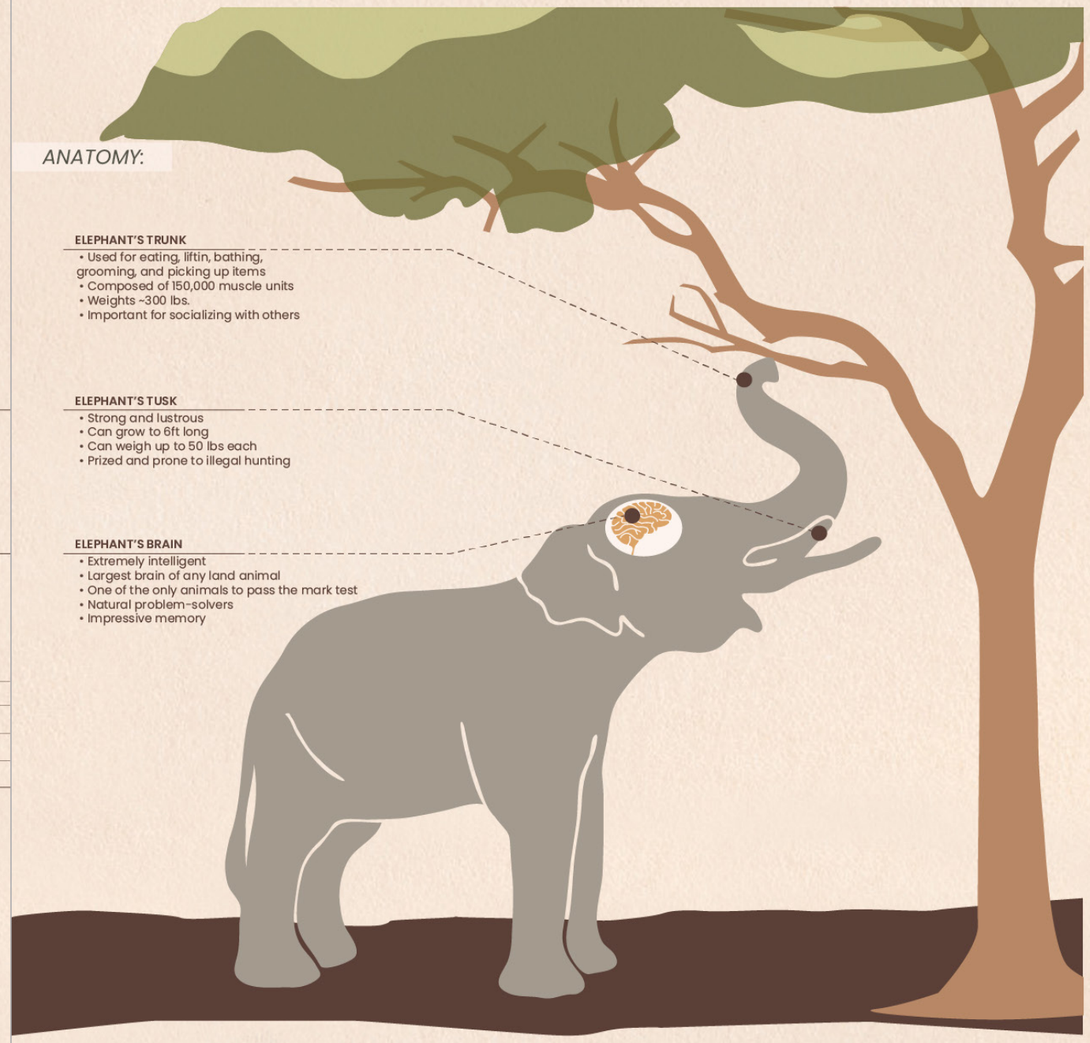
ENTERTAINMENT
Elephants are also used for entertainment such as circuses, zoos, rides, safaris, etc.

LABOR
An elephant's strong trunk is often used for lifting heavy objects

SPATIAL REQUIREMENTS:



ANATOMY:

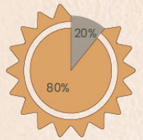


ELEPHANT'S TRUNK
- Used for eating, liftin, bathing, grooming, and picking up items
- Composed of 150,000 muscle units
- Weights ~300 lbs.
- Important for socializing with others

ELEPHANT'S TUSK
- Strong and lustrous
- Can grow to 6ft long
- Can weigh up to 50 lbs each
- Prized and prone to illegal hunting

ELEPHANT'S BRAIN
- Extremely intelligent
- Largest brain of any land animal
- One of the only animals to pass the mark test
- Natural problem-solvers
- Impressive memory

DAILY BEHAVIOR/PATTERNS:



DAILY PATTERNS:
DAYTIME (80%):
- 16-18 hrs feeding or moving to food/water source
- Bathing/cooling off

NIGHTIME (20%):
- 6-8 hrs resting

SOCIAL BEHAVIOR:
- Herds led by matriarch
- Females live in large herds (12-100 members)
- Males wander solo or in small groups and check in on herd

ELEPHANT'S DIET:
FOOD (220 LBS/DAY):
- Leaves
- Bark
- Twigs
- Fruit
- Flowers

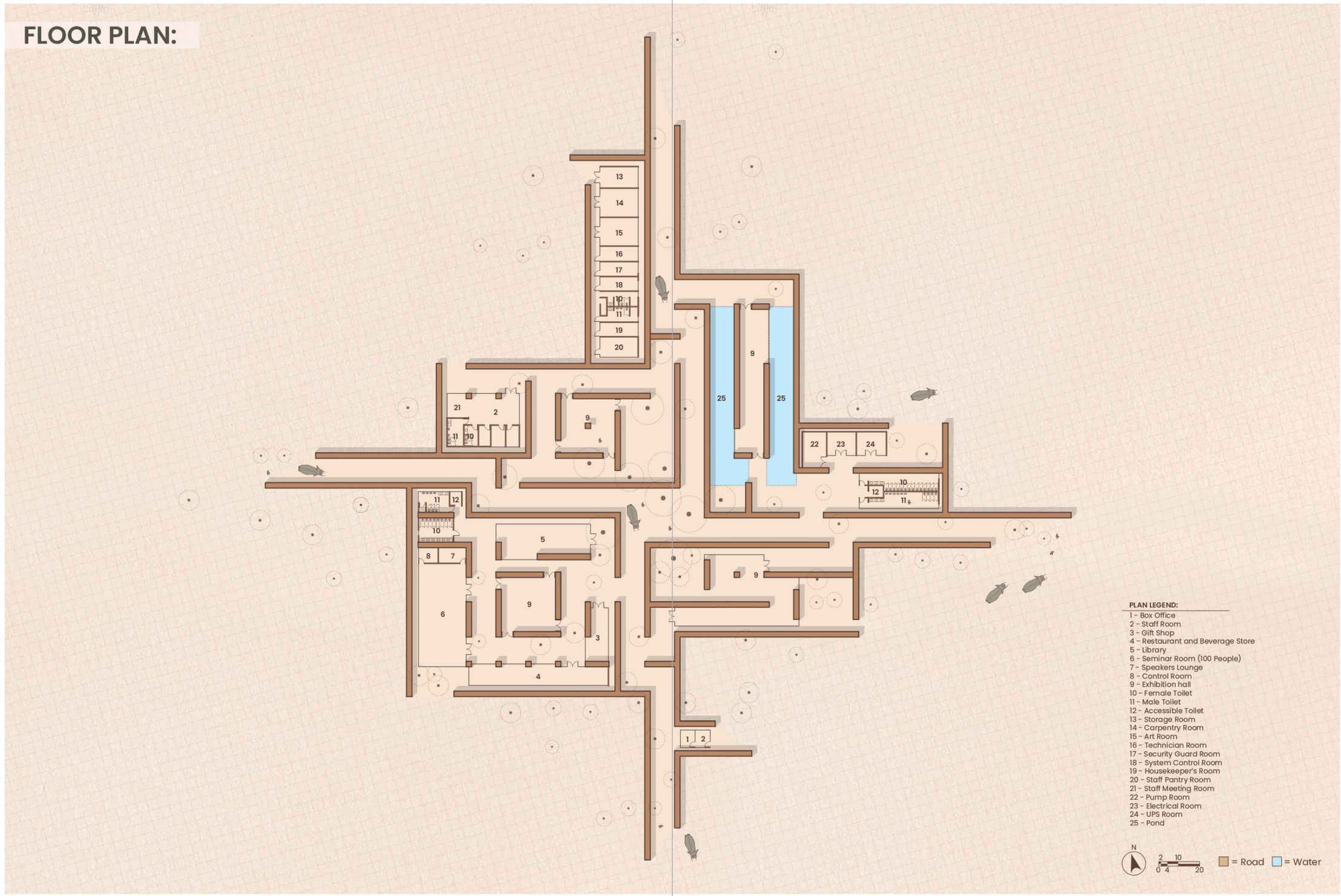
WATER (50 GALS/DAY)

SYMBIOTIC RELATIONSHIPS:
- **PARASITISM:** Endoparasites (organisms living inside the host) live on the skin of the elephant to lay eggs and form infections which harm the elephants
  - Mosquitos
  - Leeches
- **MUTUALISM:** Relationship in which the organism and the elephant benefit from each other (i.e. birds pick off prey from the elephants skin)
  - Egret birds
  - Piapiac birds

SITE PLAN:

1
2
2
3
4
5
5
5
5
5
5
5
SITE LEGEND:
1 - Elephant Museum
2 - Cultural Center
3 - Community Center
4 - Elephant Courtyard
5 - Resident's House
N
0 10 20 50
= Road
= Water

FLOOR PLAN: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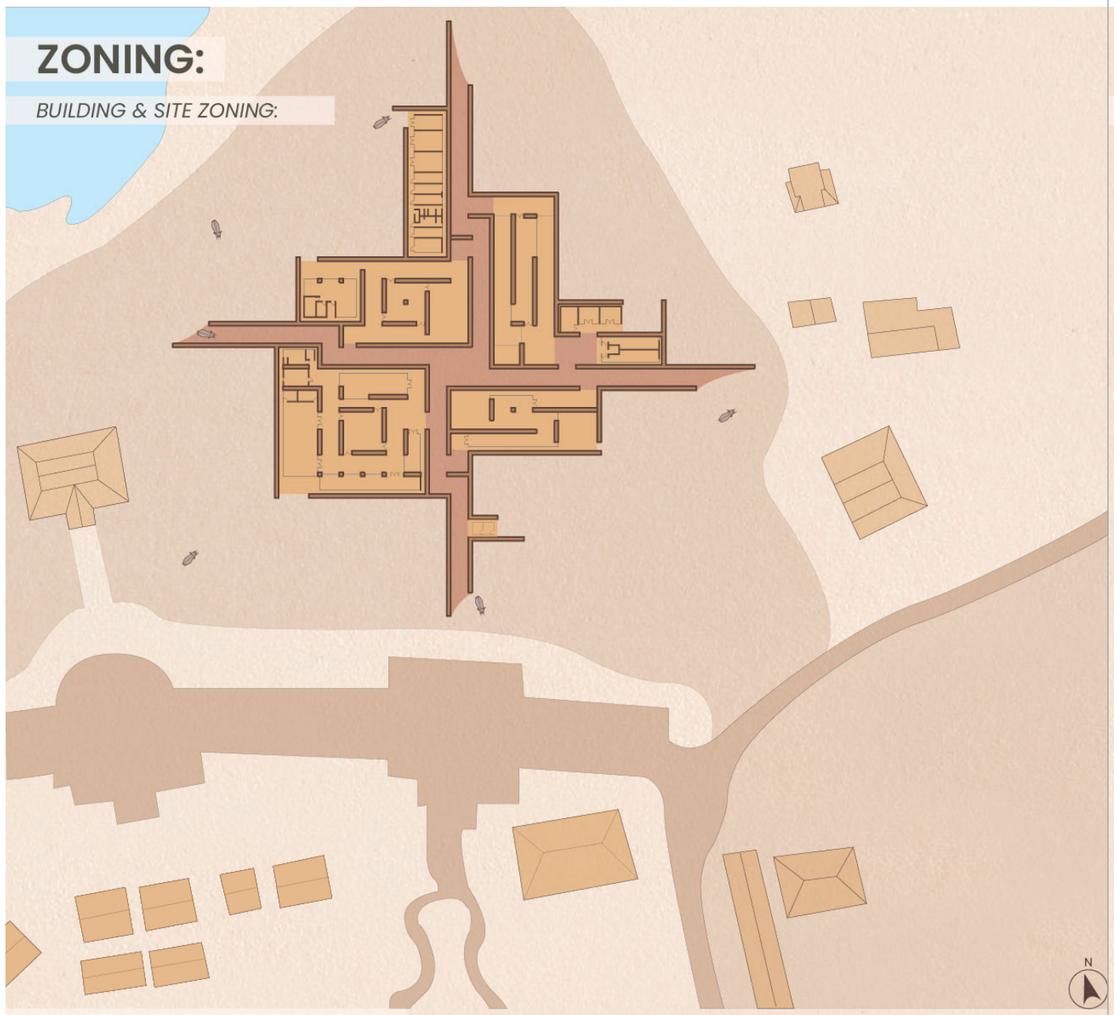
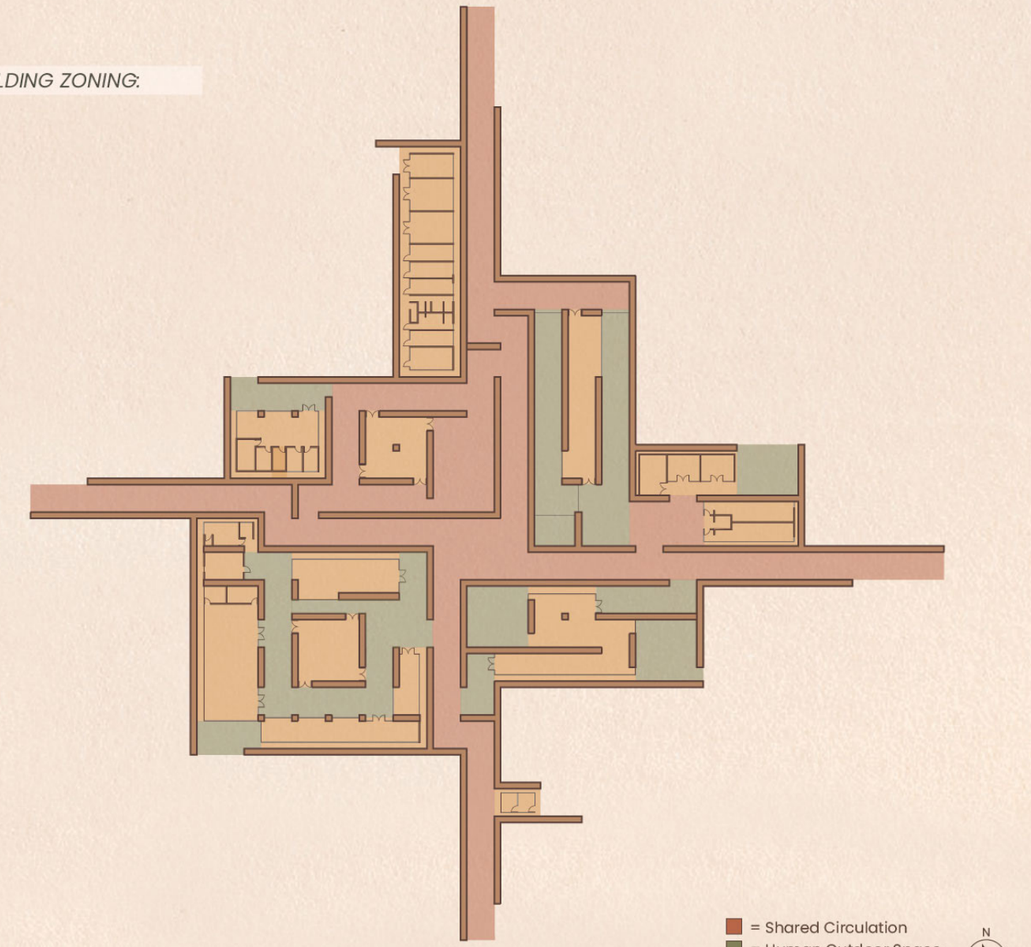
1
2
PLAN LEGEND:
1 - Box Office
2 - Staff Room
3 - Gift Shop
4 - Restaurant and Beverage Store
5 - Library
6 - Seminar Room (100 People)
7 - Speakers Lounge
8 - Control Room
9 - Exhibition hall
10 - Female Toilet
11 - Male Toilet
12 - Accessible Toilet
13 - Storage Room
14 - Carpentry Room
15 - Art Room
16 - Technician Room
17 - Security Guard Room
18 - System Control Room
19 - Housekeeper's Room
20 - Staff Pantry Room
21 - Staff Meeting Room
22 - Pump Room
23 - Electrical Room
24 - UPS Room
25 - Pond
N
0 2 4 10 20
= Road
= Water

ZONING:

BUILDING & SITE ZONING:

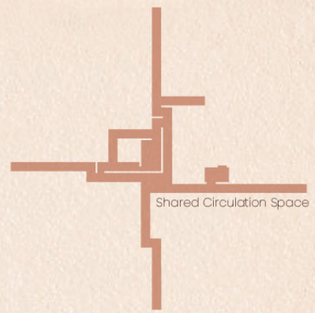


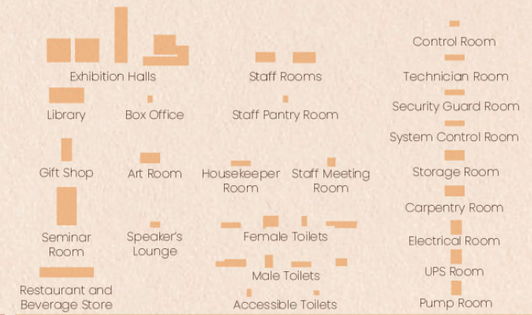
BUILDING ZONING:



PROGRAMMING:

PROGRAM AREA & CATALOG:





43,000 SQ FT
OUTDOOR AREA

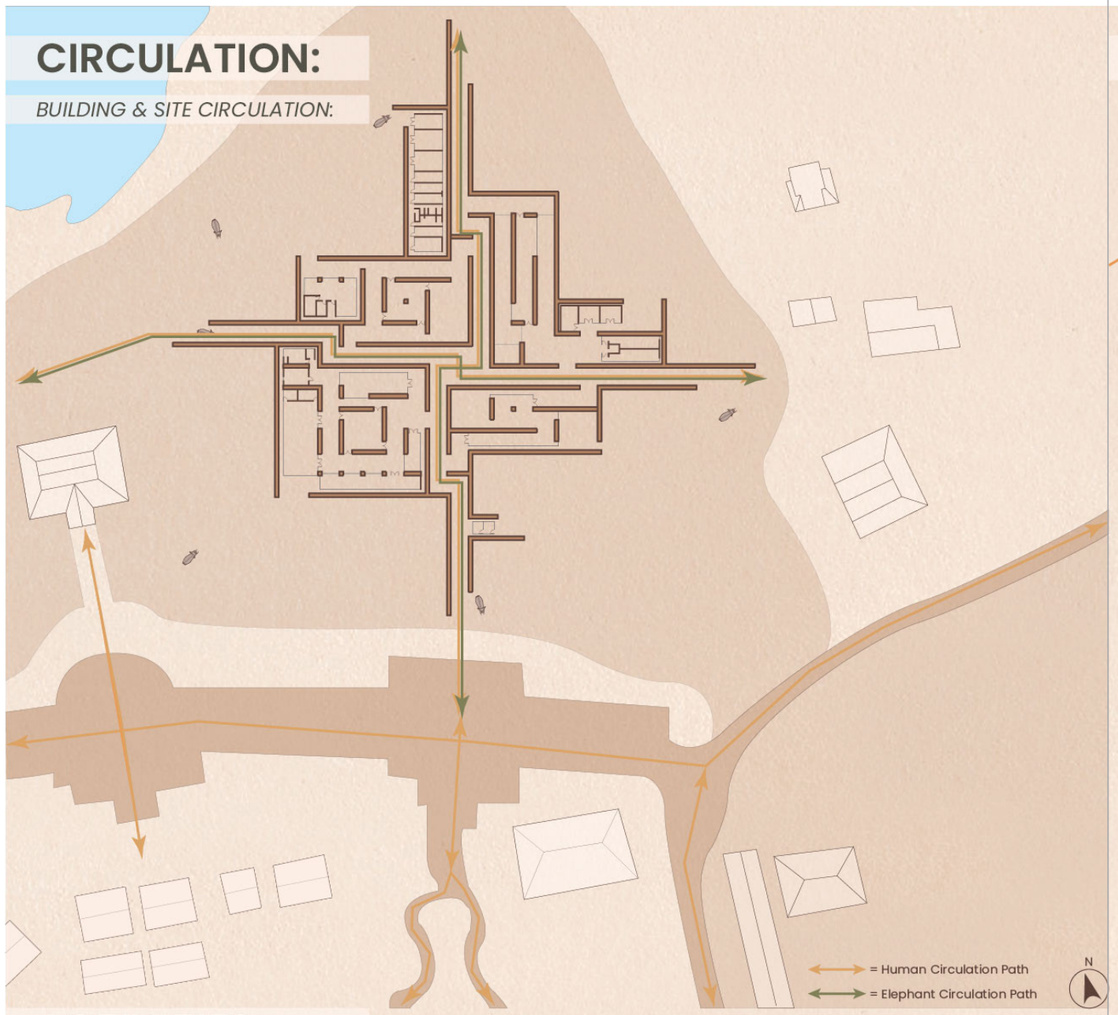
13,000 SQ FT
SHARED CIRCULATION

17,000 SQ FT
INDOOR AREA

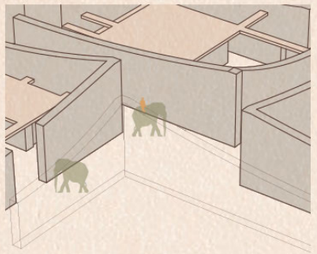
60,000 SQ FT
TOTAL AREA

CIRCULATION:

BUILDING & SITE CIRCULATION:

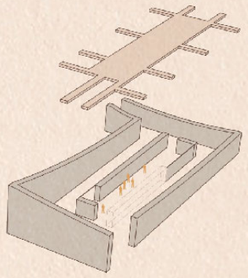


ACTIVITIES:



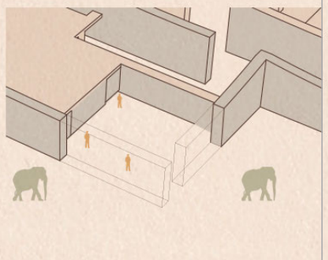
SHARED CIRCULATION SPACE:

Intersection of the main circulation paths:
Elephants can be seen roaming the main circulation paths. Humans can also be seen riding and guiding the elephants through the building.



HUMAN INDOOR SPACE:

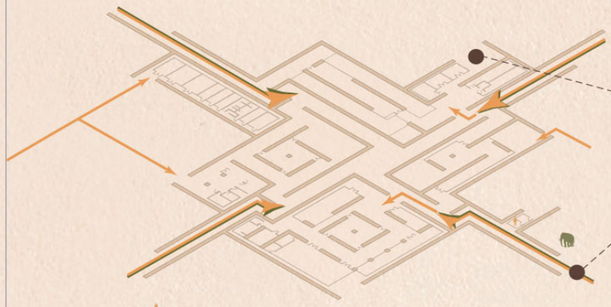
Spaces for learning:
These indoor spaces are solely for humans and are used to learn and study elephants. These spaces are the only spaces with a roof plane, indicating the human scale of the space.



HUMAN OUTDOOR SPACE:

Extension to human indoor spaces:
These spaces serve as additional space for the program of indoor spaces. Here humans can view elephants through small passageways.

DAILY RHYTHMS:

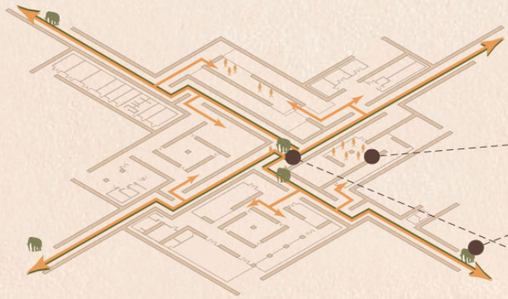


MORNING:

Staff open up the museum and fulfill daily tasks to prepare for museum guests.

Elephants are able to sleep, eat, socialize, etc. in their non-human spaces off-site before museum opens.

Humans socialize with, feed, and wash the elephants. They bring the elephants into the museum.

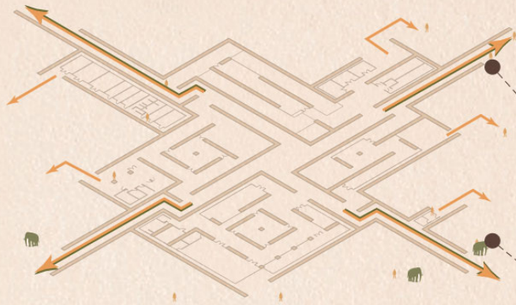


PEAK MUSEUM HOURS:

Staff entertains guests. Guests interact with human public spaces.

Roaming elephants are welcome to travel through the building.

Staff ride the elephants through the building. Guests interact with the elephants.



NIGHT:

Day-shift staff and guests go home.

Elephants are able to sleep, eat, and socialize, etc. in their non-human spaces off-site.

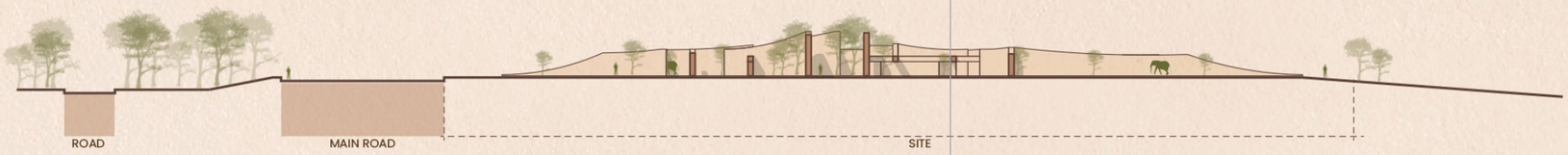
Staff remove elephants from building and back in their habitat.

= Human Circulation Path
= Elephant Circulation Path

MORNING ACTIVITY
PEAK MORNING ACTIVITY
MIDDAY ACTIVITY
PEAK AFTERNOON ACTIVITY
NIGHT ACTIVITY

HUMAN & ELEPHANT ACTIVITY
= Human
= Elephant
= Net Activity

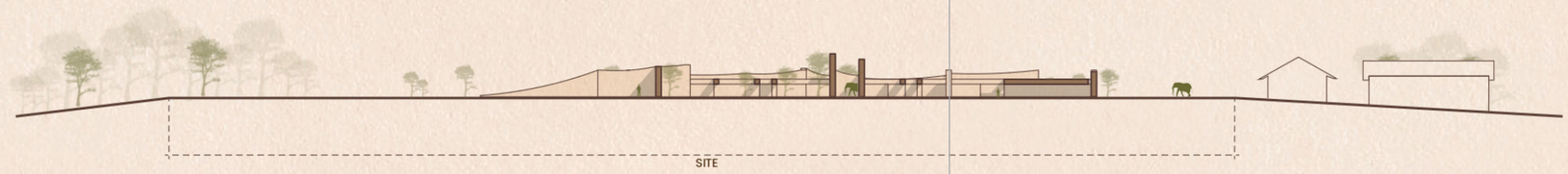
SITE SECTIONS:



NORTH-SOUTH SITE SECTION

4 20

0 10 50



EAST-WEST SITE SECTION

4 20

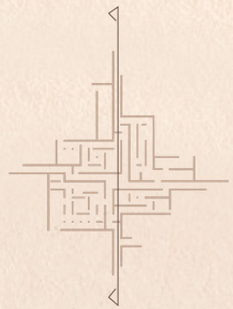
0 10 50

BUILDING SECTIONS:

NORTH-SOUTH BUILDING SECTION

2 10

0 4 20

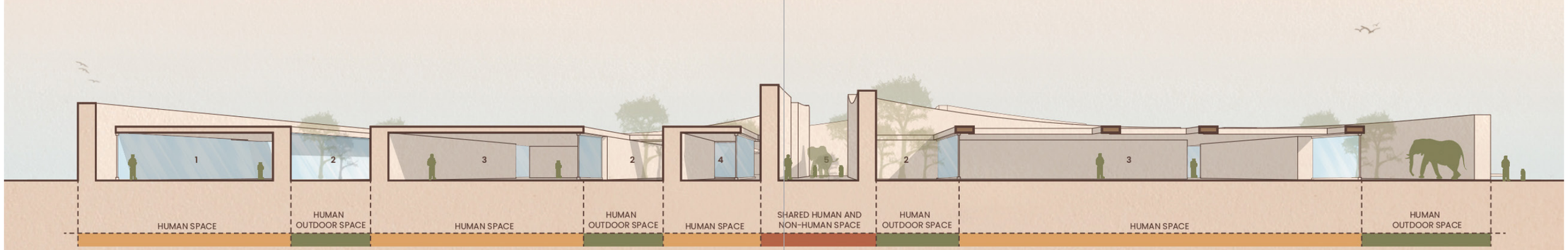


EAST-WEST BUILDING SECTION

2 10

0 4 20

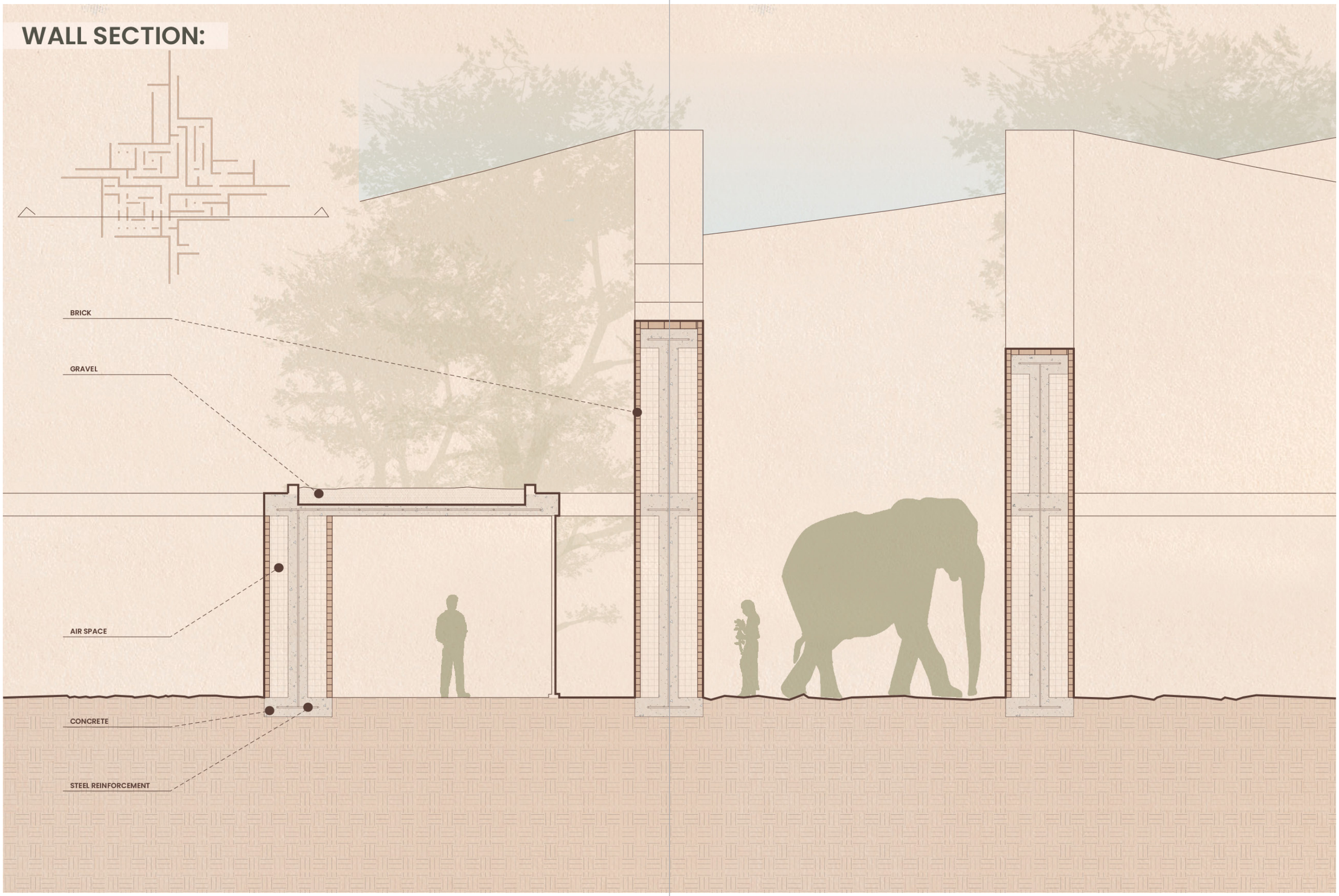
SECTION PERSPECTIVE:



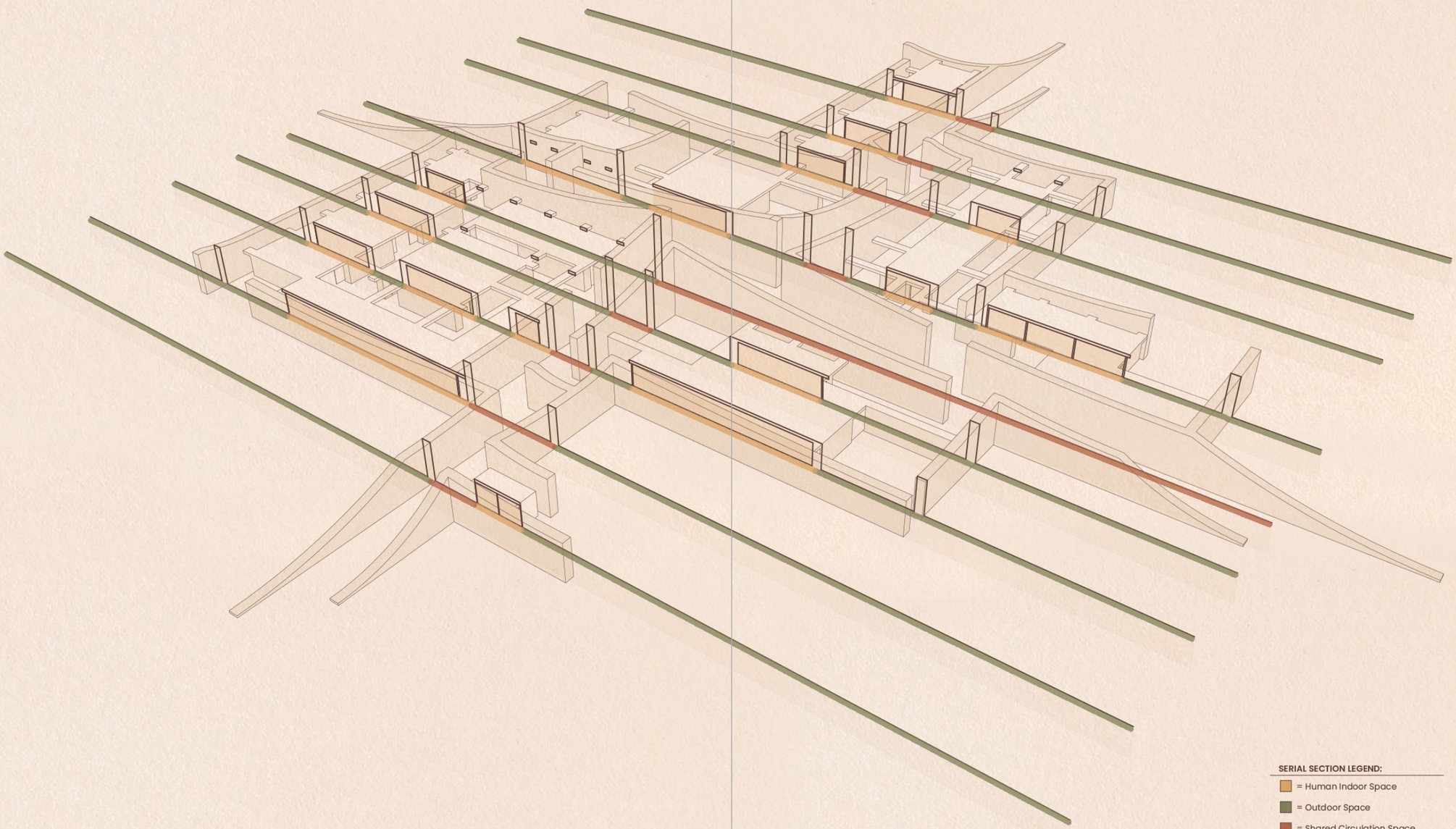
SECTION LEGEND:

1 - Seminar Room (100 People)
2 - Human Exterior Space
3 - Exhibition Hall
4 - Gift Shop
5 - Shared Circulation Space

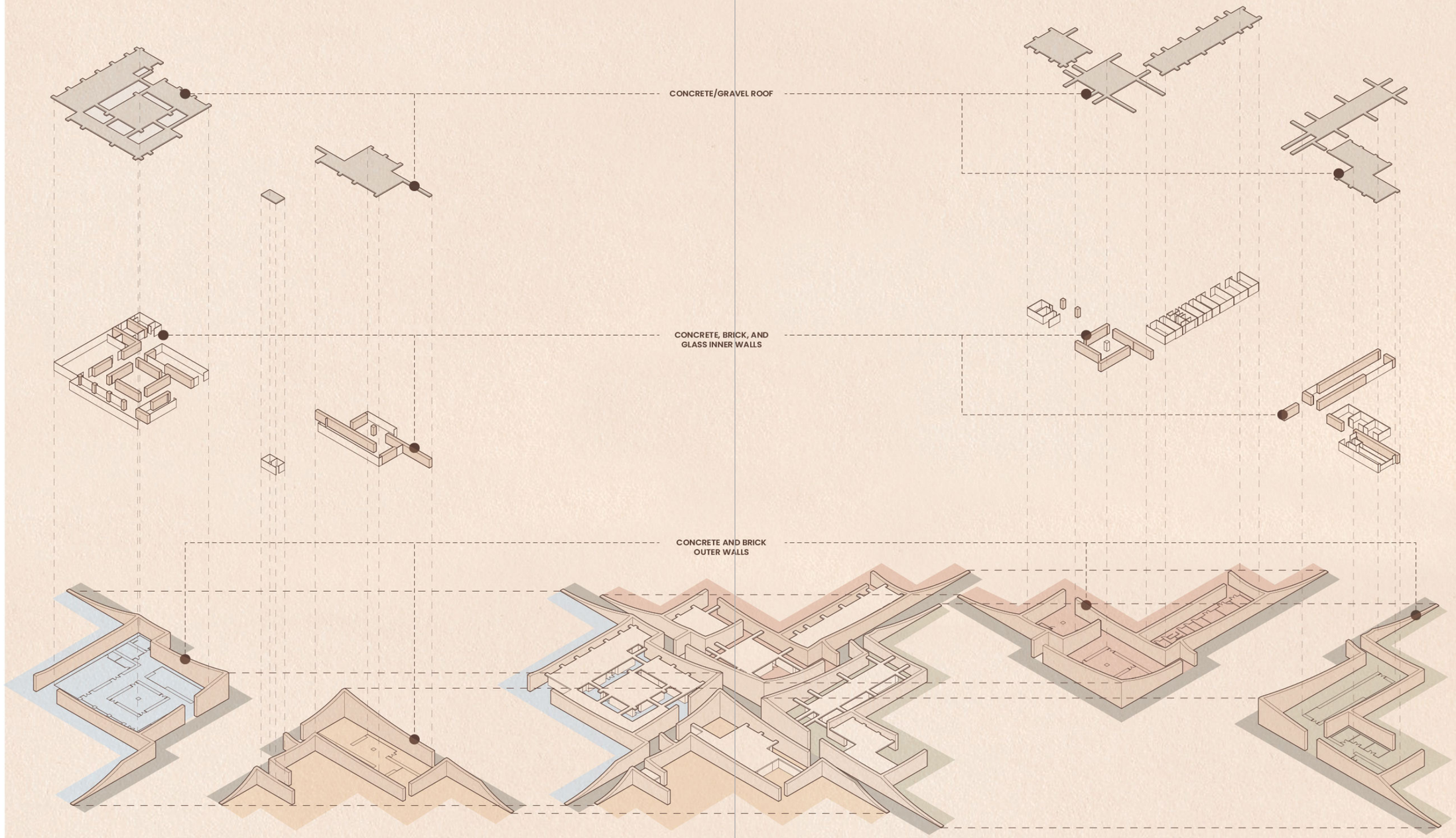
WALL SECTION:



SERIAL SECTIONS:

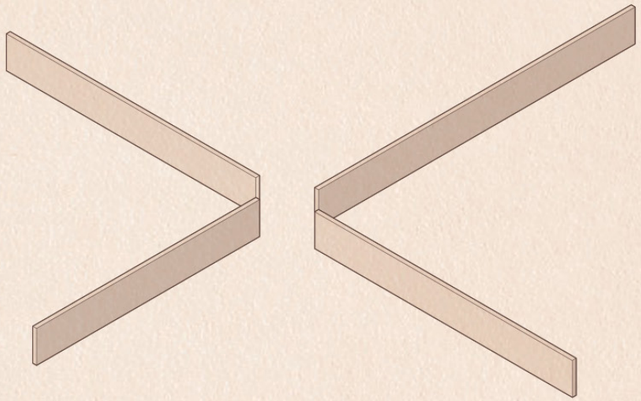


EXPLODED AXONOMETRIC:

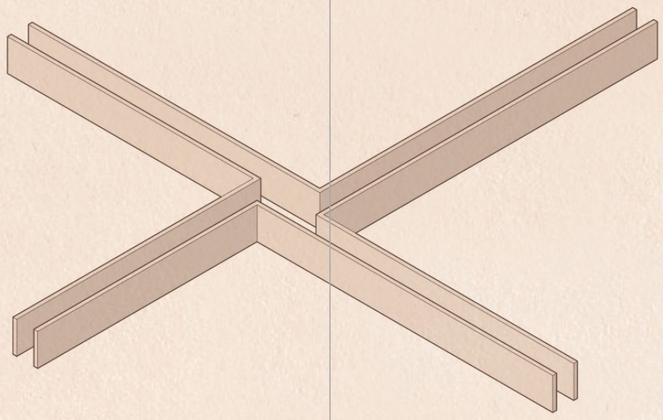


FULL BUILDING AXONOMETRIC

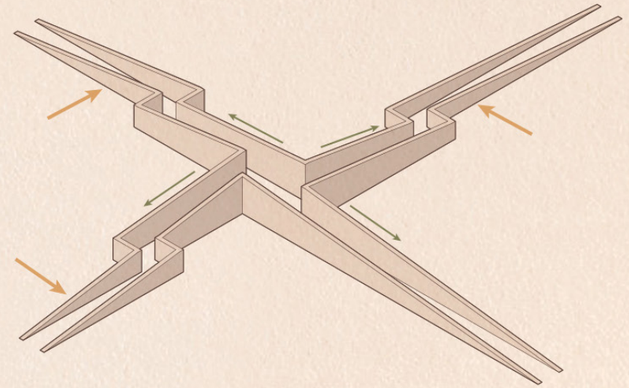
FLOOR PLAN:



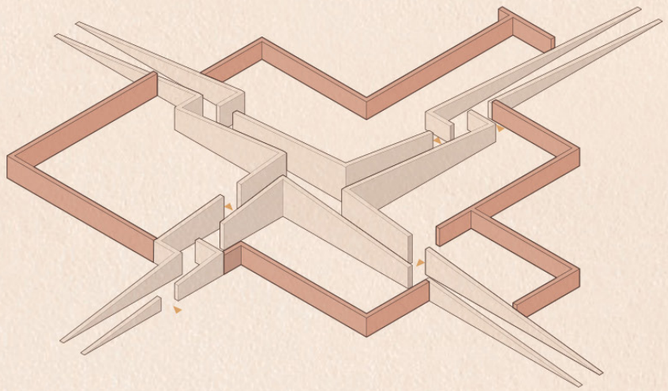
1 SPLIT SITE INTO 4 QUADRANTS
The site is split into four exhibition quadrants.



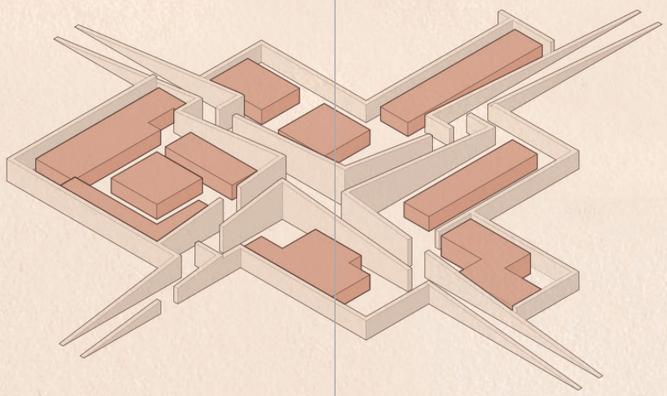
2 DUPLICATE AND SHIFT PLANES
Each plane is duplicated and shifted to create long shared-space passageways that intersect in the center.



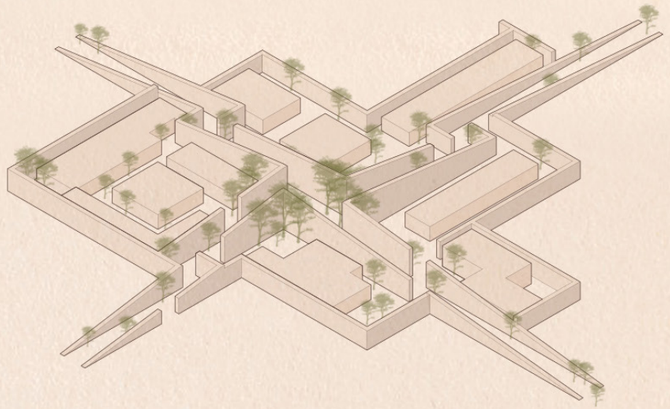
3 STAGGER PASSAGEWAYS AND SLOPE WALLS
Each passageway plane is sloped down away from the center to shift from human scale to elephant scale as one moves toward the center. The planes are then staggered to create instances of conceal and reveal.



4 SUBTRACT OPENINGS AND ADD EXTERIOR WALLS
Openings are subtracted from the passageways to create instances of interaction and connectivity between humans and non-humans. Exterior walls are added to frame each quadrant.



5 ADD INTERIOR SPACES WITHIN EACH QUADRANT
Interior masses for human spaces are added within each quadrant.



6 PLANT THE PASSAGEWAYS
Trees are planted along the shared passageways in increasing height as one moves toward the center. Trees in each quadrant are set to the human scale.

FIGUERAS POLO STABLES

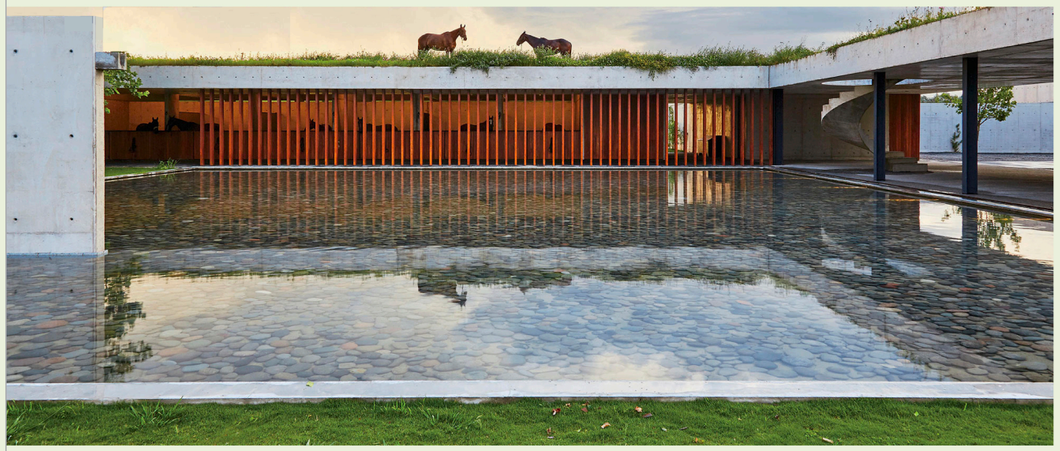
ESTUDIO RAMOS

2017

GENERAL RODRÍGUEZ, ARGENTINA

38,750 SQFT

Figueras Polo Stables is a stable for polo horses composed of two main parts with similar and different functions. Human and nonhuman spaces are intertwined in these large spaces to deepen the connections between the occupants. Both spaces include horse stables, but the area closest to the polo fields is more for social use as it overlooks the fields. The other volume focuses on grooming and health of horses. These two main volumes of space are surrounding by open circulation for the shared travel of humans and nonhumans. This long, open concept with freestanding walls creates various spaces and situations for all occupants. These parts are long and flat to match the consistently horizontal land that the stables are built on. And to reduce the building's impact on the land, the building is capped by a green roof with wild native grasses and there are planted earth slopes to access the green roof and view polo matches. Although the building is open, these earth slopes are used to conceal most of its parts and bring privacy to the stables. The open spaces including the planted patios and water pond are used for the intimate connection of the human and nonhuman.

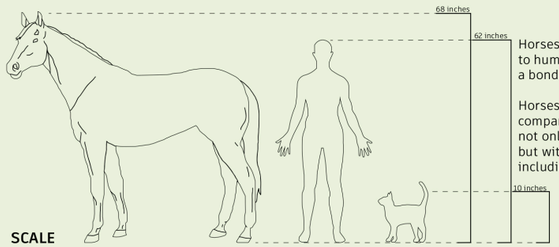


VASILEA ROBERTS
ARCH445
PROFESSOR EZBAN
SPRING 2021

PASTURE HORSES

EQUUS CABALLUS

Currently, most horses are companion and therapy animals, meaning humans greatly value their relationships. Many individuals treat them as pets or keep a stable of horses to teach others how to ride

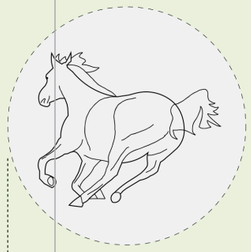


SCALE

Horses' instincts can be used to human advantage to create a bond between human and horse.

Horses are able to form companionship attachments not only to their own species, but with other animals as well, including humans

ACTIVITY



RUNNING

- *FIGHT/FLIGHT RESPONSE*
- *EXERCISE*
- *RIDING*
- *RACING*

SOCIALIZING

- *HERDS*
- *PREFER GROUPS*
- *COMPANIONSHIP*
- *VOCALIZATION*
- *MUTUAL GROOMING*
- *BODY LANGUAGE*
- *READ/SHOW EMOTION*

RELAXING

- *SLEEPING*
- *SUNBATHING*

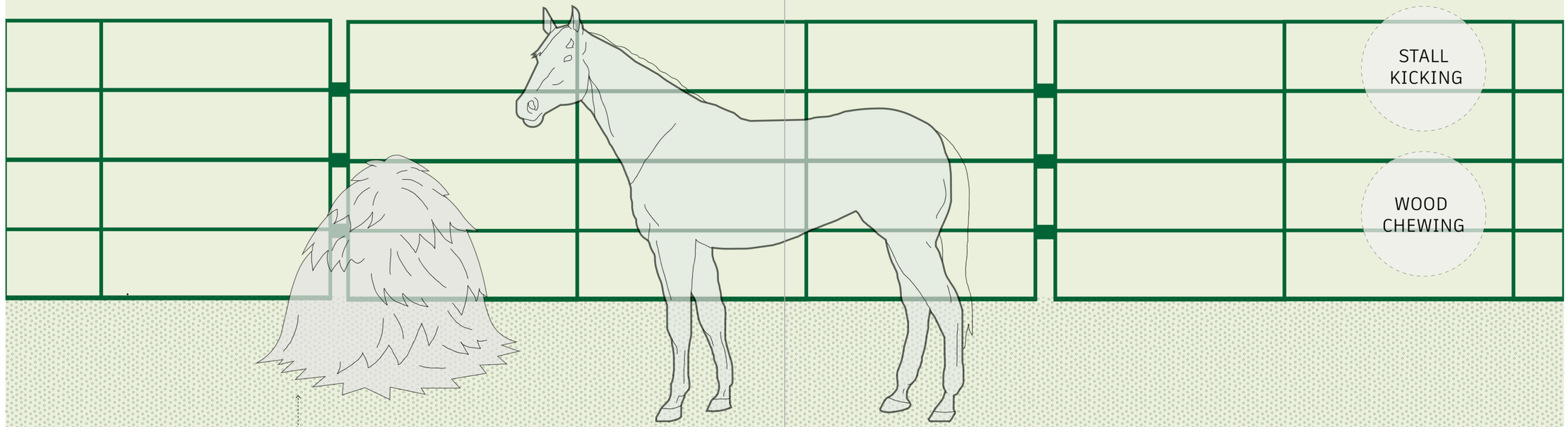
OTHER VICES

CRIBBING
when the horse bites onto a fixed surface

WEAVING
when the horse stands by the stall door and rhythmically shifts its weight back andforth on its front legs while swinging its head

STALL KICKING

WOOD CHEWING



DIET STAPLES

PASTURE GRASS

HAY

STALL REQUIREMENTS

- *Feed horses hay and/or grain morning and night*
- *Clean and refill water buckets morning and night*
- *Muck out stalls morning and night*
- *Replace fresh bedding*
- *Check and pick out hooves daily*

FOOTING

SHOVEL/RAKE

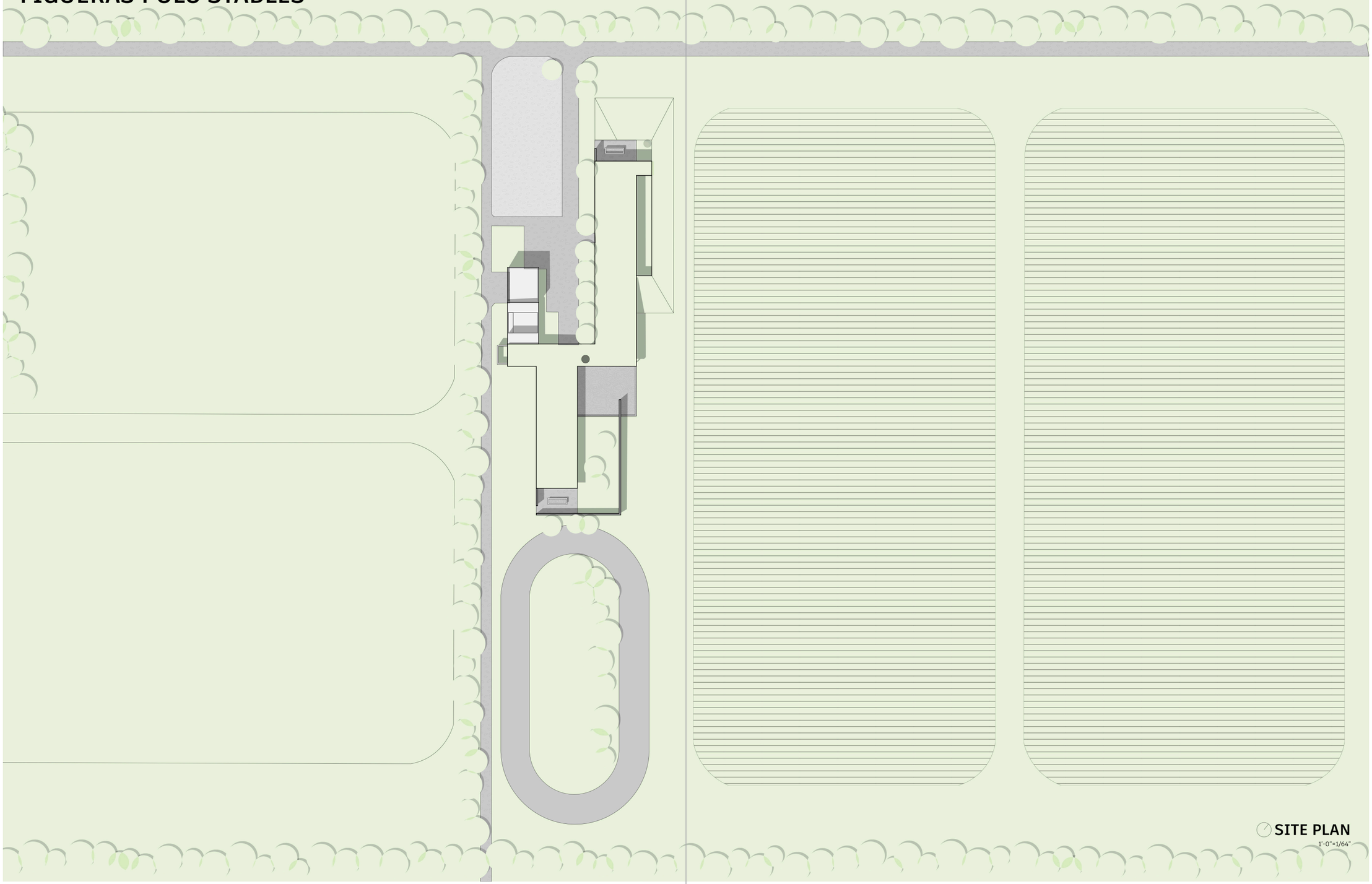
NUTRIENTS

FENCING

LAND
1.5-2 ACRES PER HORSE

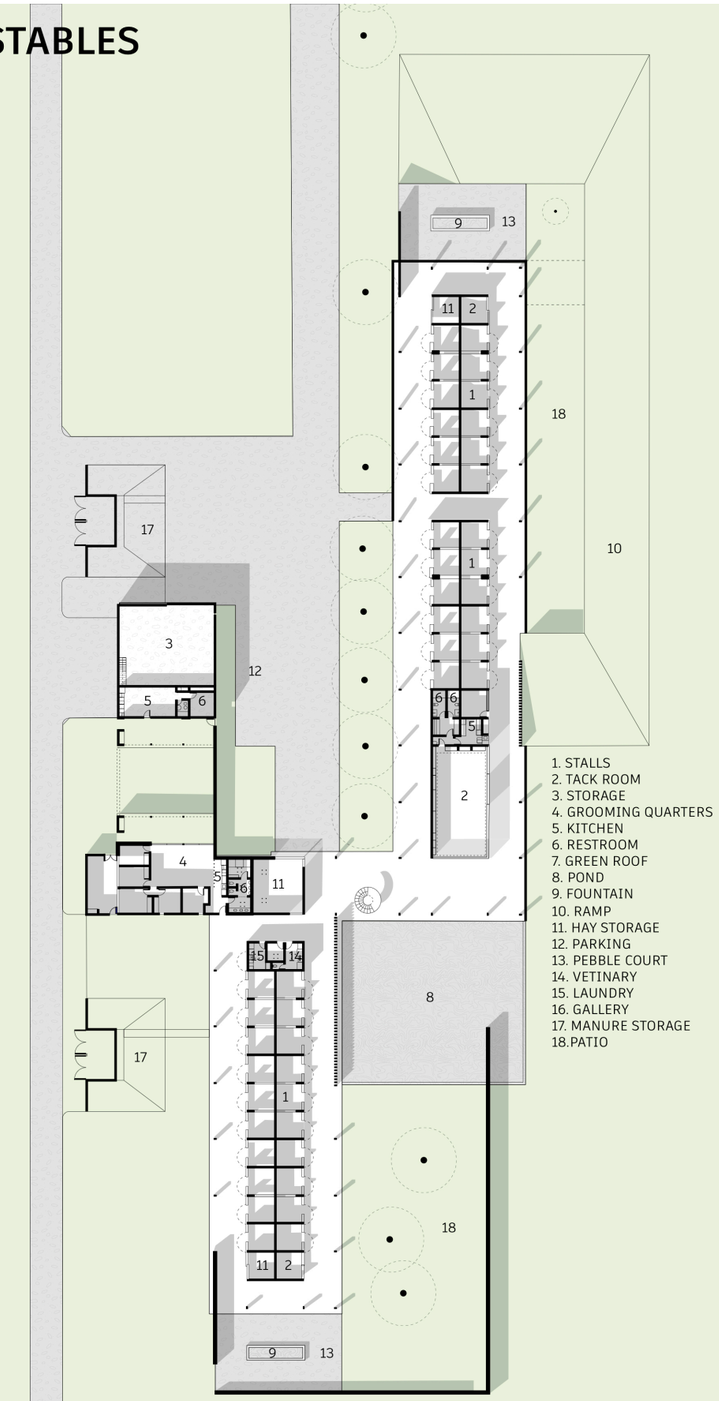
PEN
50-60 FT IN DIAMETER

FIGUERAS POLO STABLES

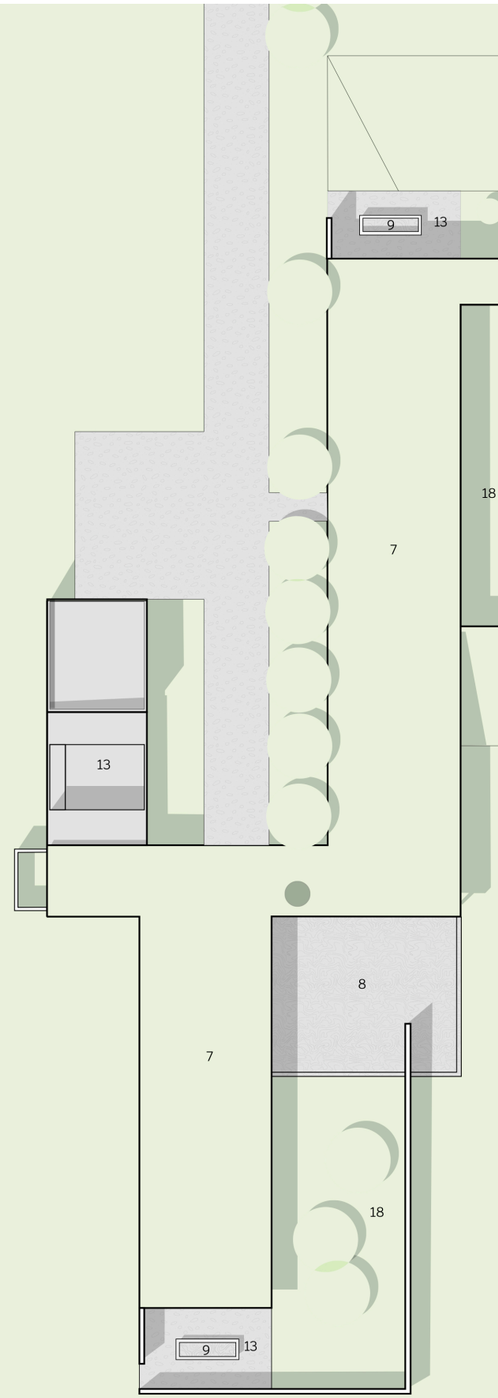


SITE PLAN
1'-0"=1/64"

FIGUERAS POLO STABLES



FIRST FLOOR PLAN



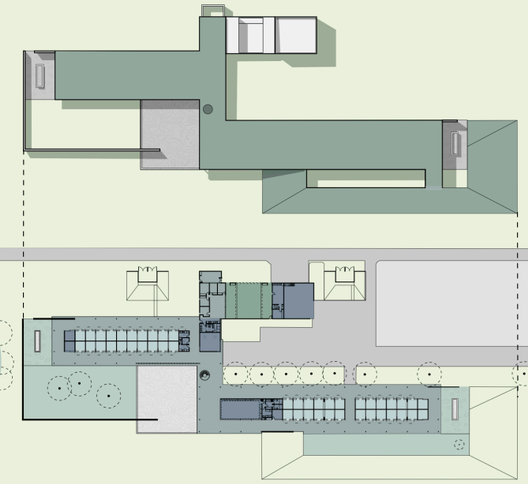
ROOF PLAN

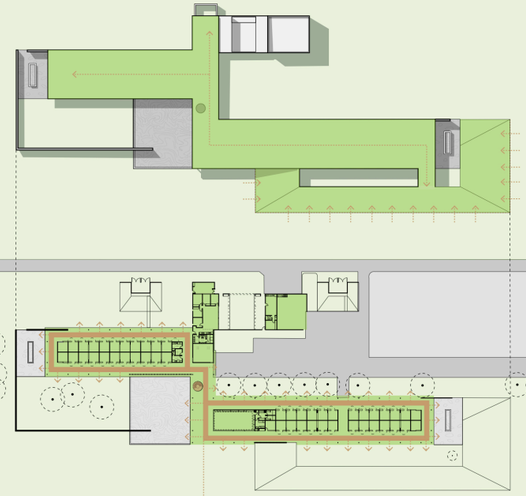
FLOOR PLANS

1/32"=1'-0"

FIGUERAS POLO STABLES

BUILDING + SITE ZONING





1. STALLS
2. TACK ROOM
3. STORAGE
4. GROOMING QUARTERS
5. KITCHEN
6. RESTROOM
7. GREEN ROOF
8. POND
9. FOUNTAIN
10. RAMP
11. HAY STORAGE
12. PARKING
13. PEBBLE COURT
14. VETINARY
15. LAUNDRY
16. GALLERY
17. MANURE STORAGE
18.PATIO

HUMAN
NON-HUMAN
SHARED

BUILDING ZONING

BUILDING + SITE CIRCULATION

1/8"=1'-0"

FIGUERAS POLO STABLES

TOTAL SQFT

RECREATION
PARKING
HORSE CARE
CIRCULATION
GREEN ROOF
STALLS
GRAZING
RACETRACK
POLO FIELDS

NONHUMAN
88.3%

SHARED
9.9%

HUMAN 1.8%

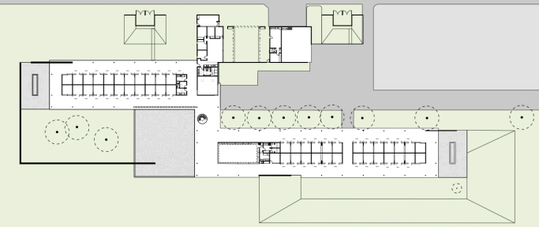
PROGRAM AREA

HUMAN
- RECREATION
- ESSENTIAL
- AMENITIES
- PARKING

SHARED
- NON-HUMAN CARE
- CIRCULATION
- GREEN ROOF

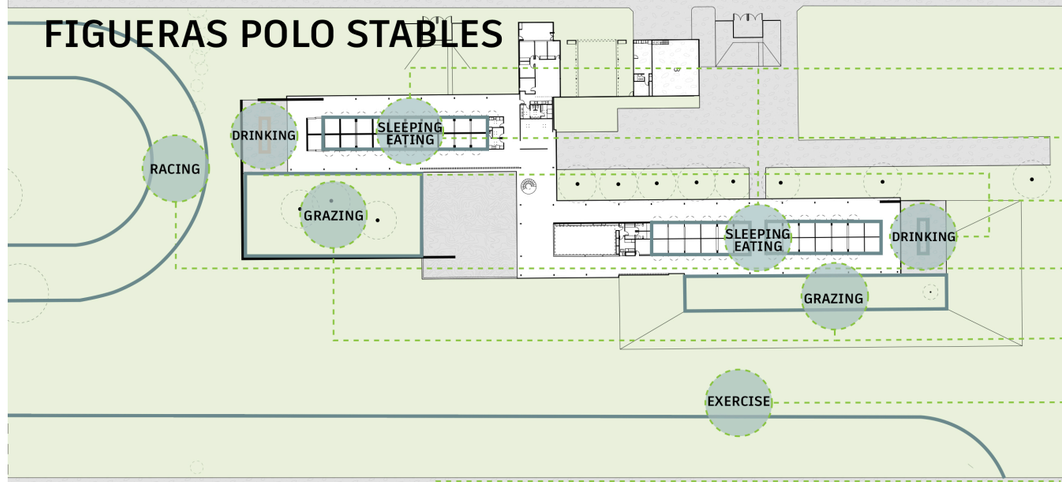
NONHUMAN
- POLO FIELDS
- RACETRACK
- GRAZING
- STALLS

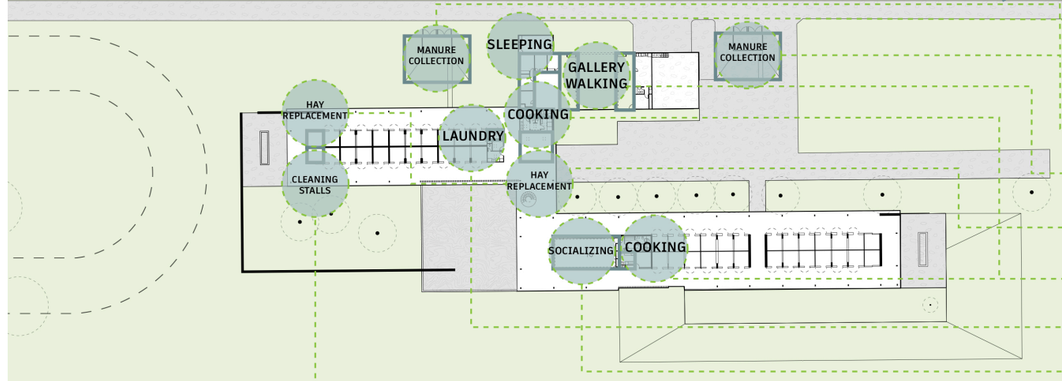
x2

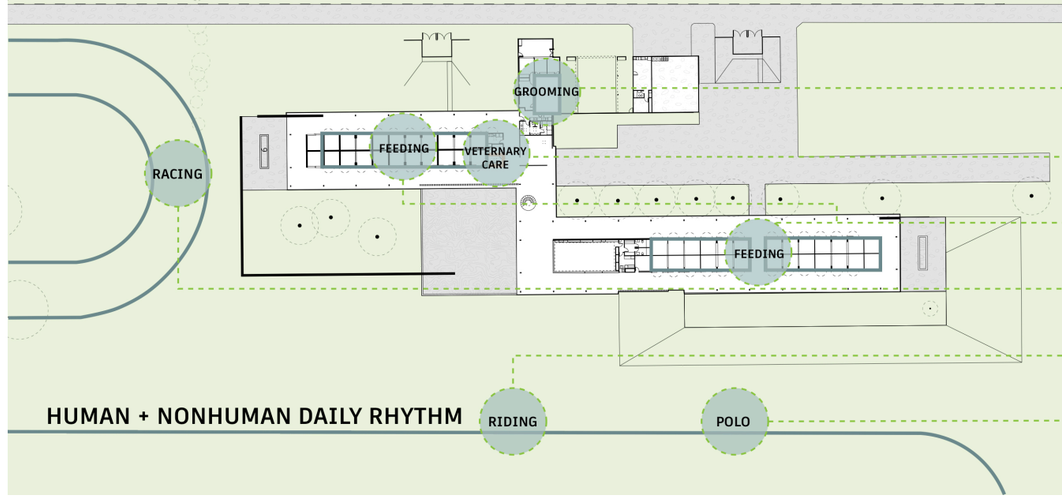


PROGRAM CATALOG

FIGUERAS POLO STABLES







HUMAN + NONHUMAN DAILY RHYTHM

	NONHUMAN	HUMAN	SHARED
SLEEPING	1-3 HOURS OF SLEEP/DAY	6-12 HOURS/DAY	
EATING	FED 3-4 TIMES/DAY		
DRINKING	5-10 GALLONS/DAY		
RACING			TRAINING EVERY DAY
GRAZING	GRAZE THROUGHOUT THE WHOLE DAY		
EXERCISE	2 HOURS/DAY		
MANURE COLLECTION		3 TIMES/DAY	
GALLERY WALKING			
HAY REPLACEMENT		2 TIMES/DAY	
COOKING		3 TIMES/DAY	
LAUNDRY			
SOCIALIZING			
CLEANING STALLS		2 TIMES/DAY	
GROOMING			3 TIMES/WEEK
VETERNARY CARE			2 TIMES/YEAR, AS NEEDED
FEEDING			3-4 TIMES PER DAY
RIDING			2 HOURS/DAY
PLAYING POLO			DAILY / WEEKLY

HOURS

EARLY
- STALL CLEANING
- EATING / DRINKING
- RIDING / EXERCISE
- GRAZING

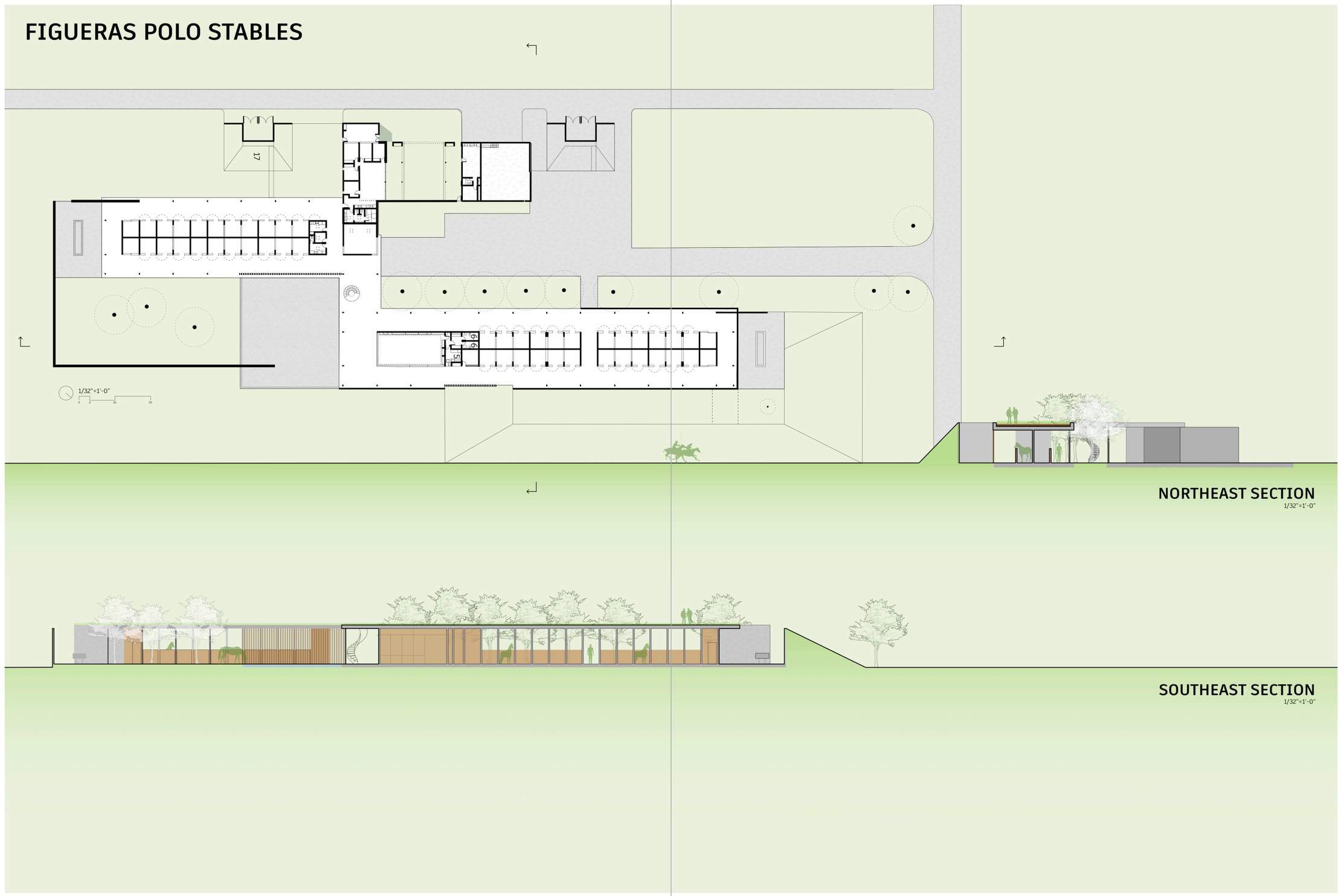
MIDDAY
- EATING / DRINKING
- EXERCISE / RIDING
- GROOMING
- GRAZING

NIGHT
- EATING / DRINKING
- STALL CLEANING
- GRAZING

BASIC DAY

FIGUERAS POLO STABLES

FIGUERAS POLO STABLES



NORTHEAST SECTION
1/32"=1'-0"

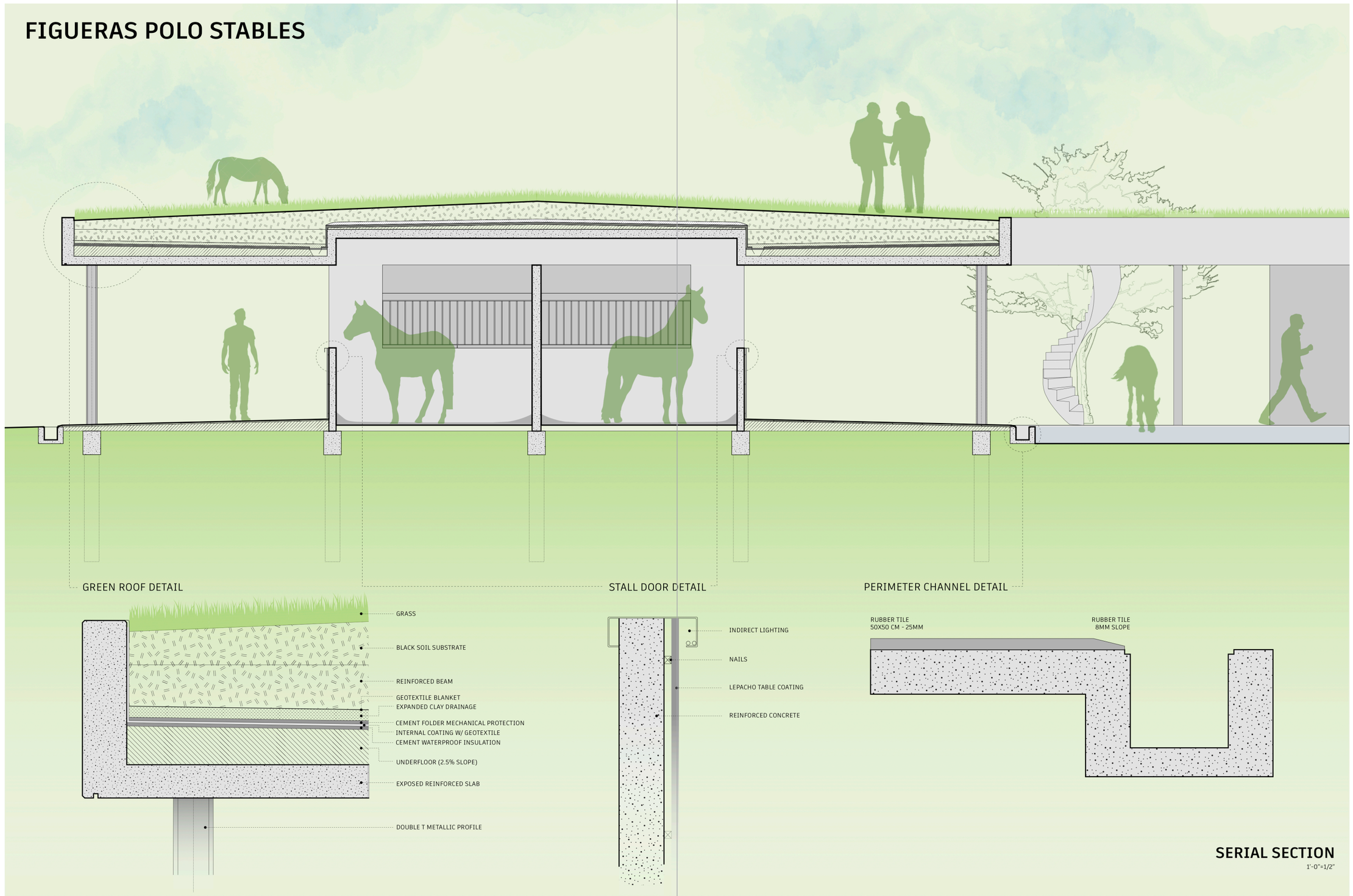
SOUTHEAST SECTION
1/32"=1'-0"

FIGUERAS POLO STABLES

SECTION PERSPECTIVE

1'-0"=1/8"

FIGUERAS POLO STABLES



GREEN ROOF DETAIL

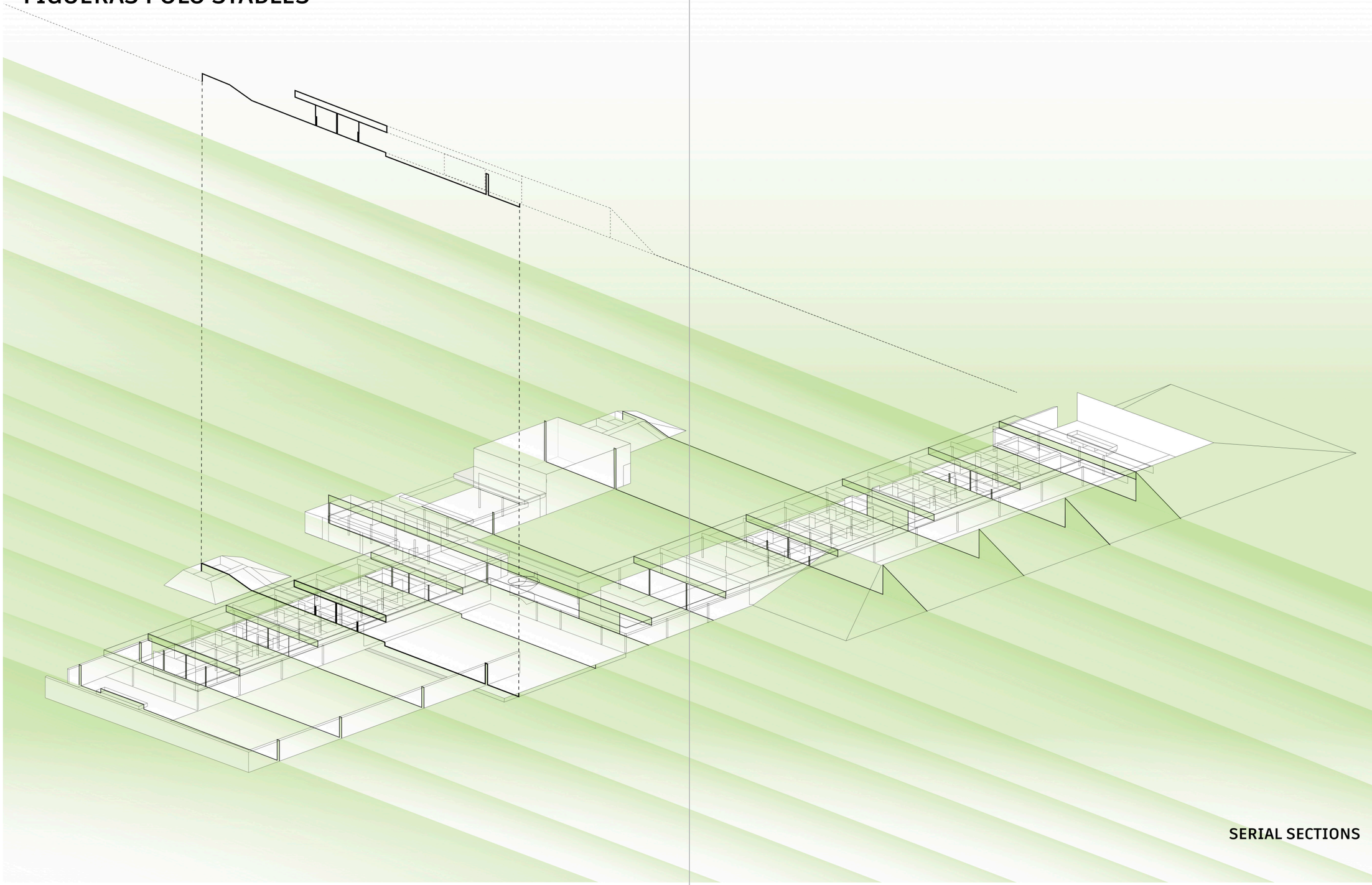
STALL DOOR DETAIL

PERIMETER CHANNEL DETAIL

SERIAL SECTION

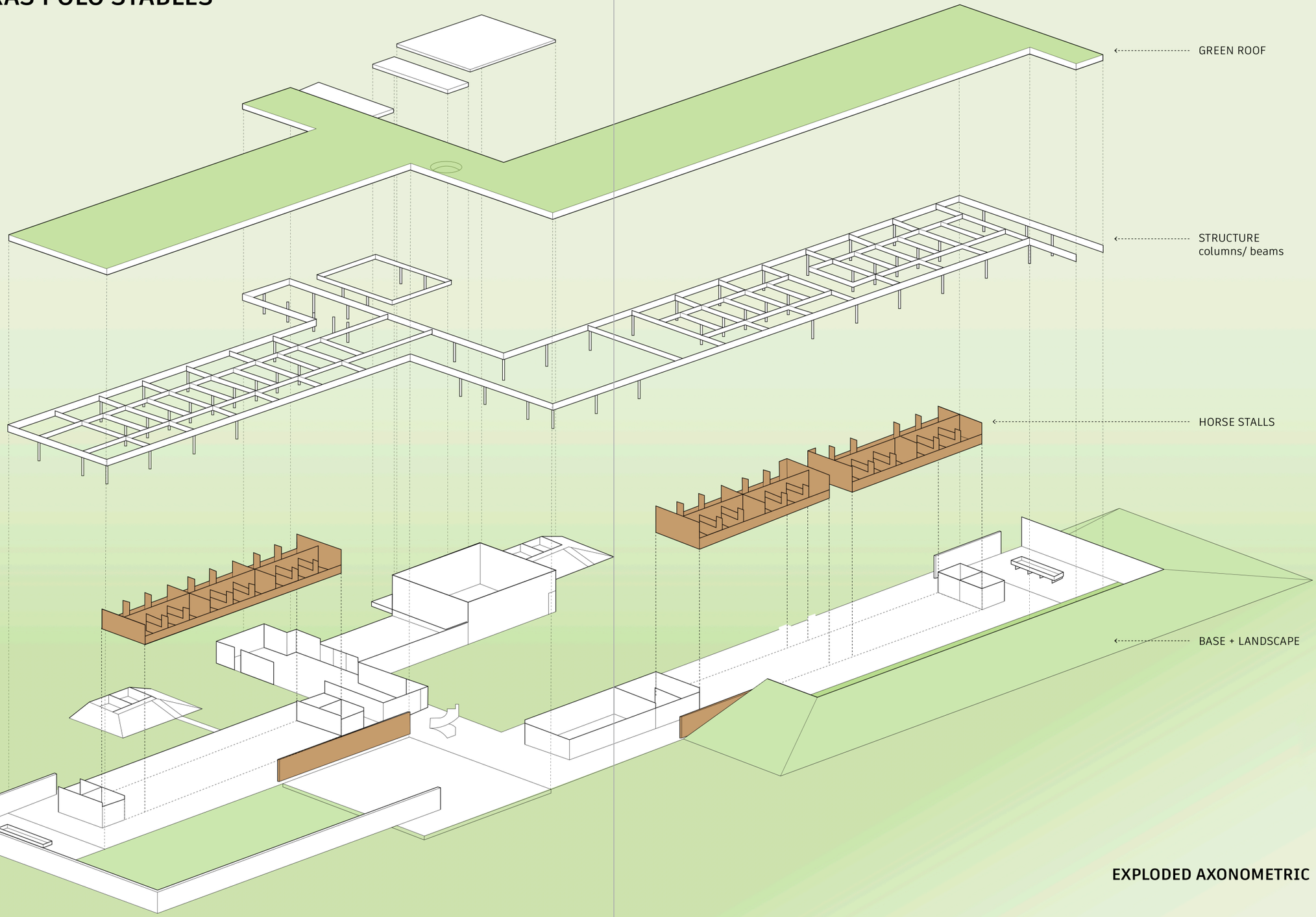
1'-0"=1/2"

FIGUERAS POLO STABLES



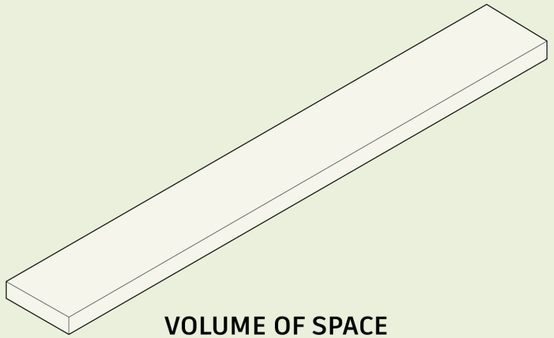
SERIAL SECTIONS

FIGUERAS POLO STABLES

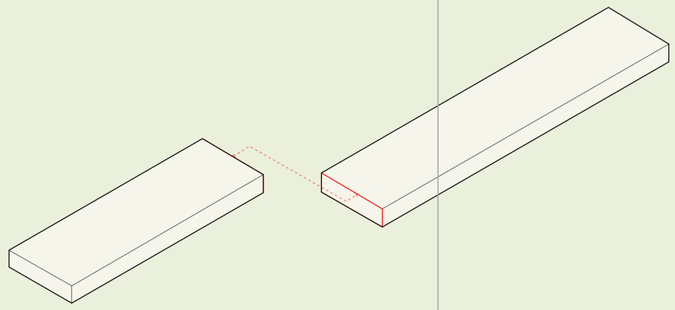


EXPLODED AXONOMETRIC

FIGUERAS POLO STABLES

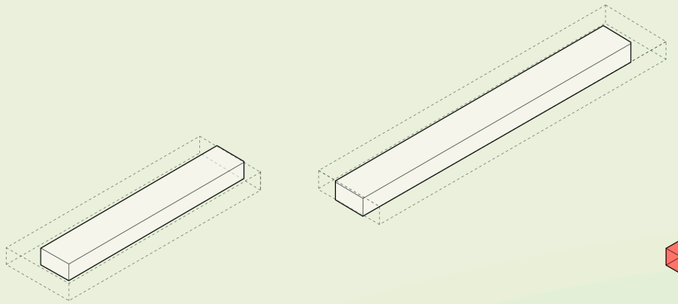


VOLUME OF SPACE

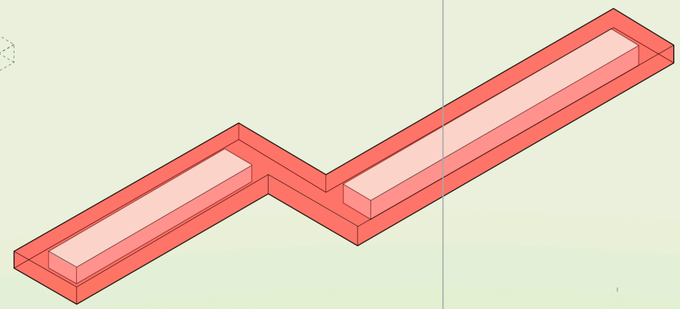


SHEAR AND TRANSLATE

A BAR OF HUMAN / NON-HUMAN SPACE IS CUT AND OFFSET, BREAKING THE BUILDING INTO TWO MAIN PARTS.

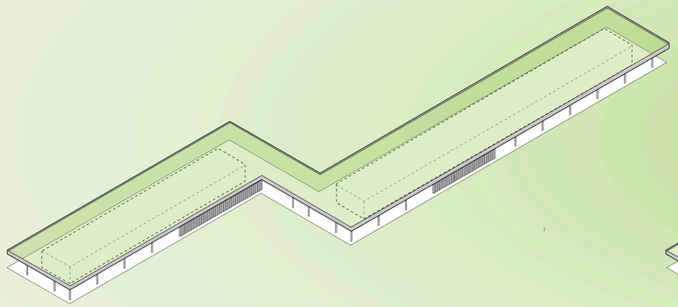


ERODE SPACE

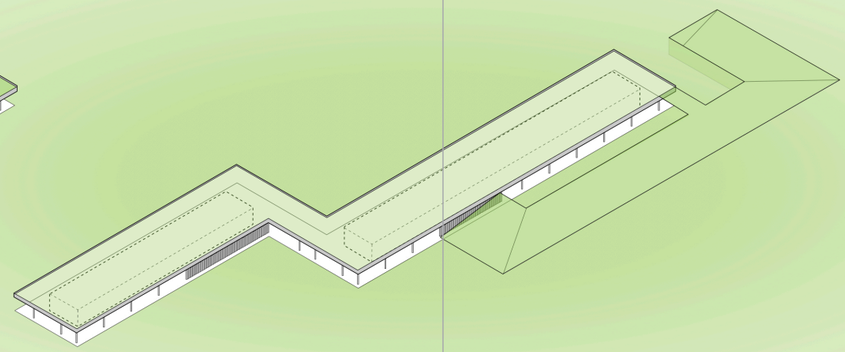


SURROUND SPACE WITH CIRCULATION

THE MAIN SPACE IS SHRUNK TO THE PROPER SIZE OF HORSE STALLS IN ORDER TO BE SURROUNDED BY CIRCULATION FOR THE HUMAN / NON-HUMAN OCCUPANTS.



CAP BUILDING WITH LANDSCAPE



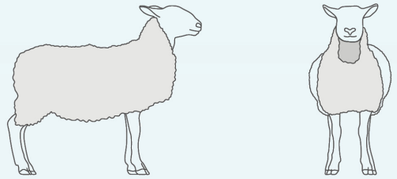
CONNECT BUILDING TO LANDSCAPE

THE BUILDING IS CAPPED BY A GREEN ROOF THAT IS THEN CONNECTED TO THE LANDSCAPE BY A BRIDGE AND SLOPE TO MATCH THE TOPOGRAPHY CHANGE AND CREATE ACCESSIBILITY TO THE ROOF.

PROCESS SEQUENCE

Sheepfold Bargerveen Barn

DAAD Architecten



Located in Weiteveen, The Netherlands

Completed in September 2018

41,150 Square Feet

Sheepfold Bargerveen houses 1,000 sheep and 80 cattle on a Dutch high peat reserve. Two wooden truss structures are arranged perpendicular to each other housing non-humans and framing pasture between them. Contours in the landscape allow for non-humans to be protected during flooding which is essential to preserve the peat in the area. Non-human grazing space is efficiently located adjacent to indoor housing and the curved fencing facilitates shepherding by funneling sheep to the building entrance. A two-story pitched roof provides plentiful space beneath for human and non-human comfort. Non-human interior space is bisected by a longitudinal circulatory axis and services like heat, water, and feed are placed near the perimeter of the interior space. Apertures in the roof permit passive ventilation and daylighting through vents and skylights. Humans are largely separated from non-human spaces except for select movement pathways through the pasture that culminate by ascending to a view over the non-humans from atop a balcony in their interior barn space. Humans can move through the middle of the non-human structures, but otherwise human movement is mostly in a cirulatory ring around the central non-human zone with public movement facing the contoured landscape and service movement behind by storage spaces.

Blake Bissen - University of Maryland College Park

ARCH 445 - Professor Michael Ezban - Spring 2021

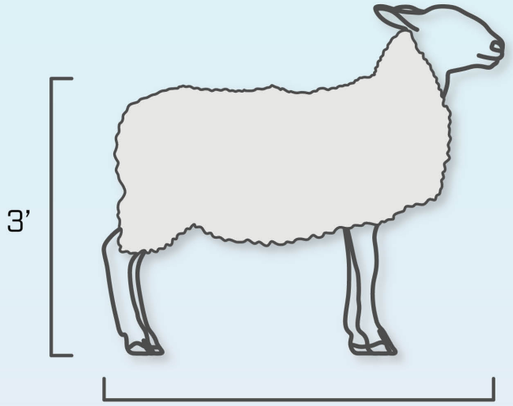
SHEEP

Ovis aries

LAMB
< 1 Year Old

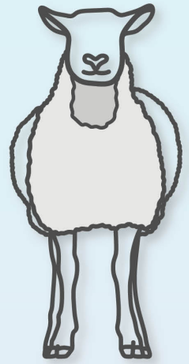
EWE
Female Sheep

RAM
Male Sheep



AVERAGE HEIGHT & LENGTH

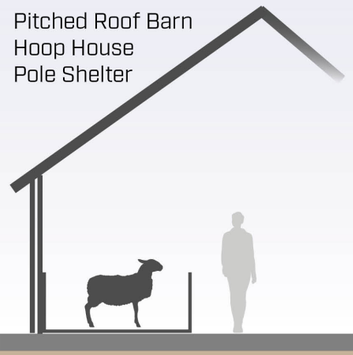
Sheep reach maturity at 8 months
10 - 12 Year lifespan
5 Month gestation period

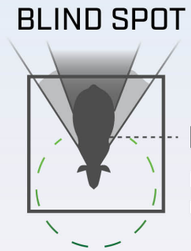


100 - 300 LBS
AVERAGE WEIGHT

HOUSING TYPES

Pitched Roof Barn
Hoop House
Pole Shelter





BLIND SPOT

POINT OF BALANCE

Position when the herder prompts movement

300° FIELD OF VIEW

Excellent peripheral vision means sheep can be easily startled

Ewes can produce 1/2 Gallon of milk / day

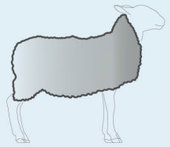
HAY

GRAINS

GRASS

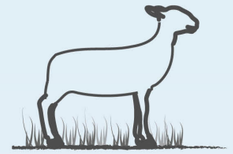
SHEARING

Once or twice a year wool is harvested



GRAZING

Sheep eat about 2-5 LBS of food each day



PROCESSING

Sheep products include foods, textiles, candles, and cosmetics

RENEWAL

Wool grows to back every five months

DISTRIBUTION

Lamb, Mutton, Wool, and Milk are primary sheep products

PEN SPACE DENSITY
20 SF / SHEEP

Sheep may be held in individual pens of 20SF temporarily. Sheep do not need shelter on a permanent basis

DOGS AS SHEPHERDS

Sheep are herded similarly to cattle but more carefully due to vision and behavioral differences

SHEEP FLOCK TOGETHER

Sheep are social, communicating with visual cues and noises. Groups of more than 5 will flock and move together, especially when frightened

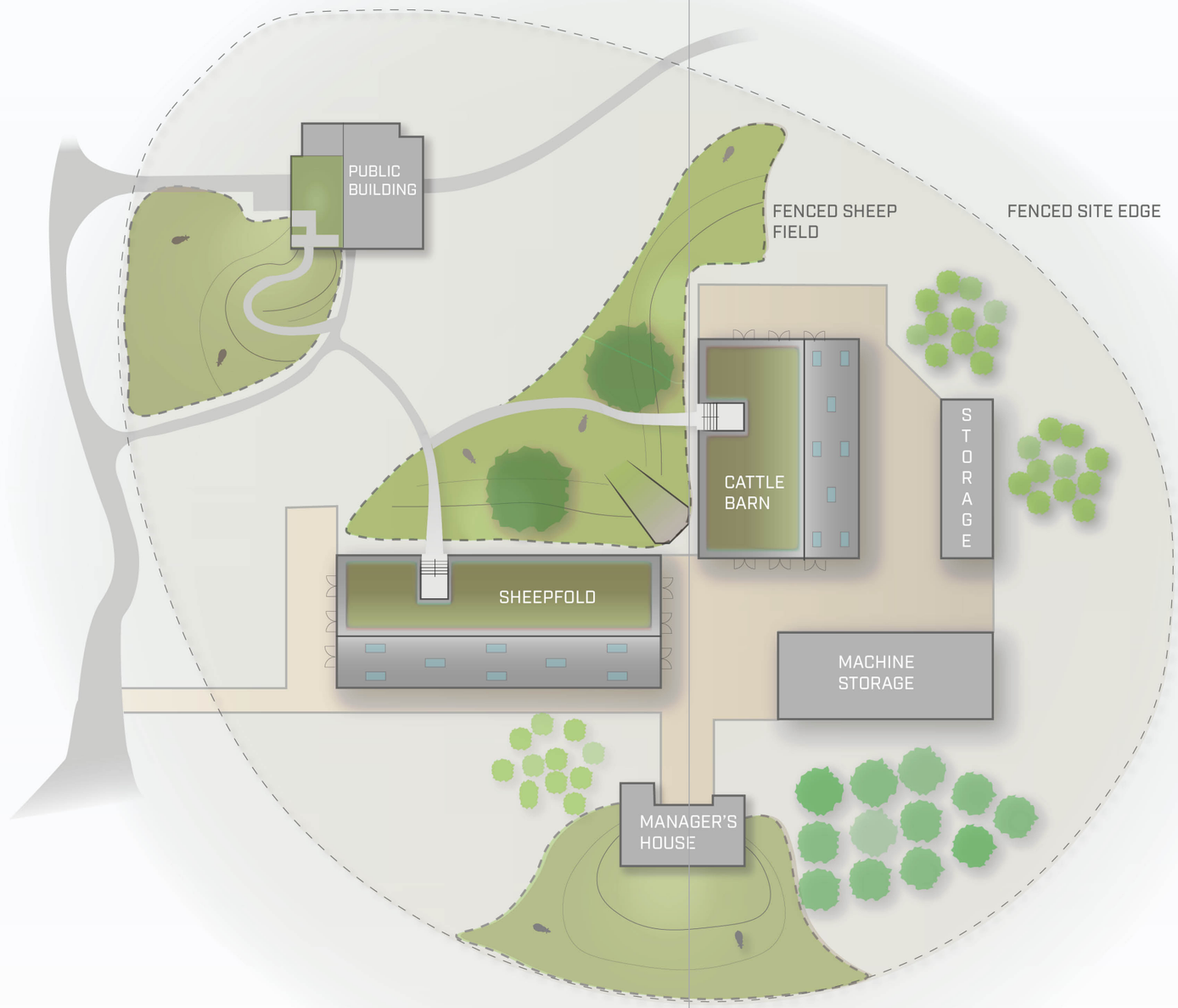
SUSTAINABLE GRAZING DENSITY
6 SHEEP / ACRE

Varies from 3 - 12+ depending on the climate and soil

SHELTER FROM HEAT

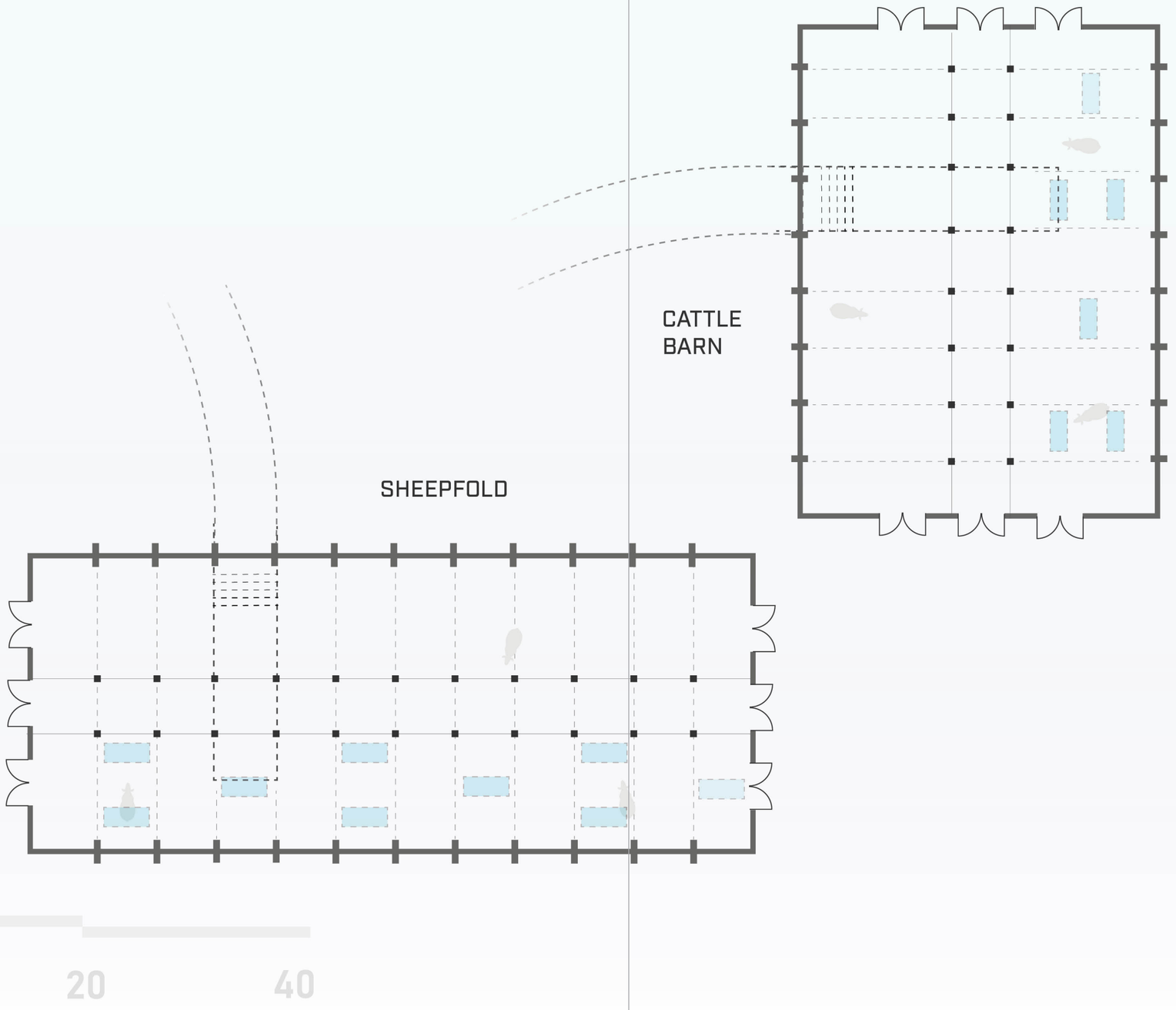
Is more important than shelter from rain, therefore trees can provide adeuate shelter in many climates

SITE PLAN

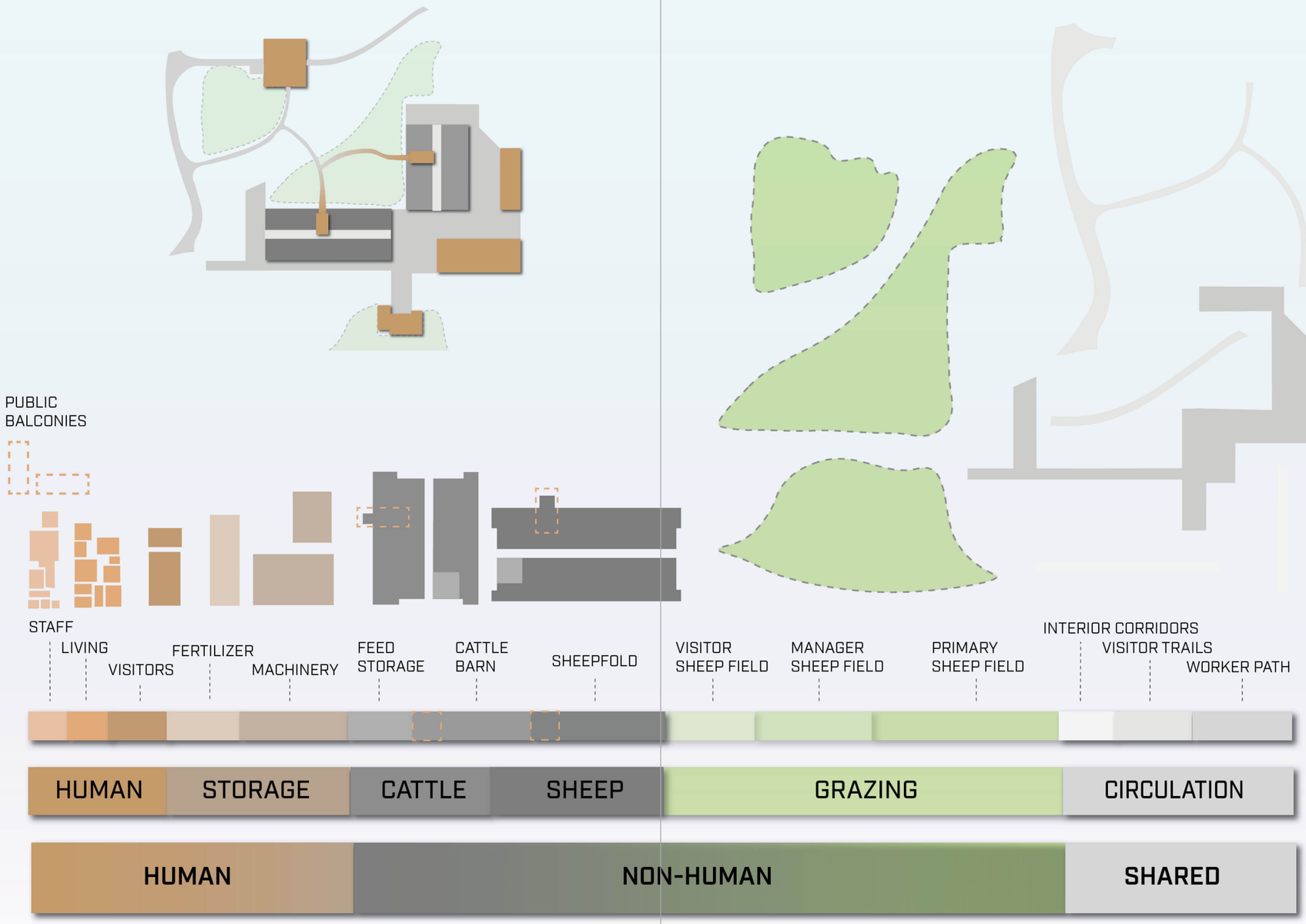


0 20 40

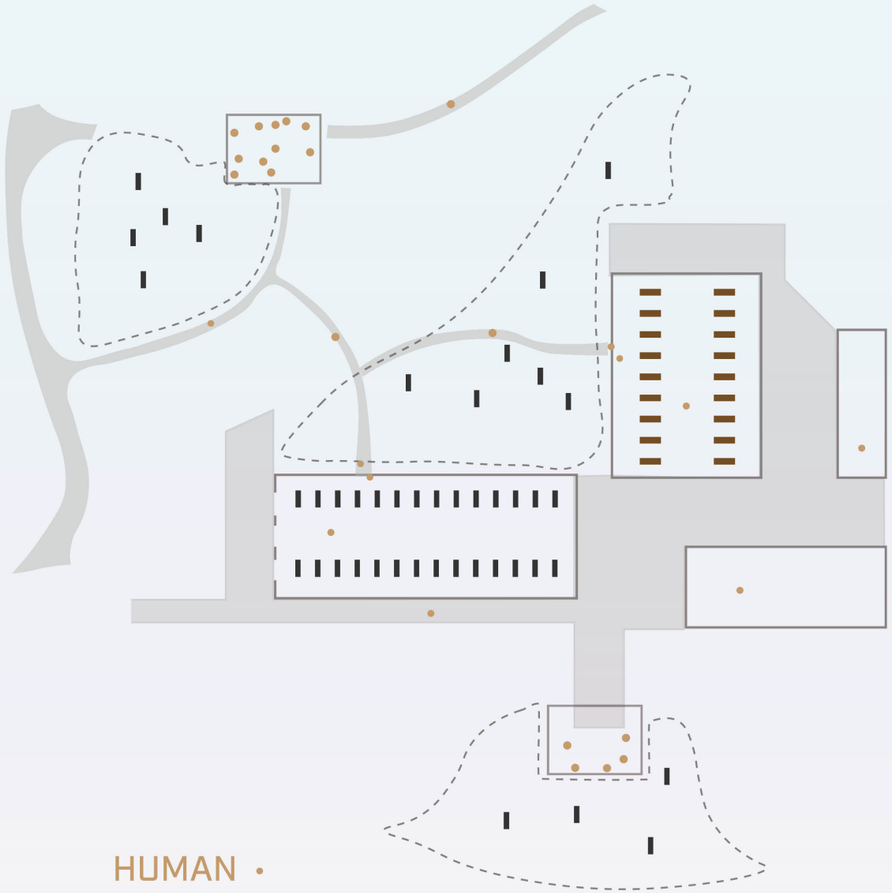
SHEEPFOLD PLANS

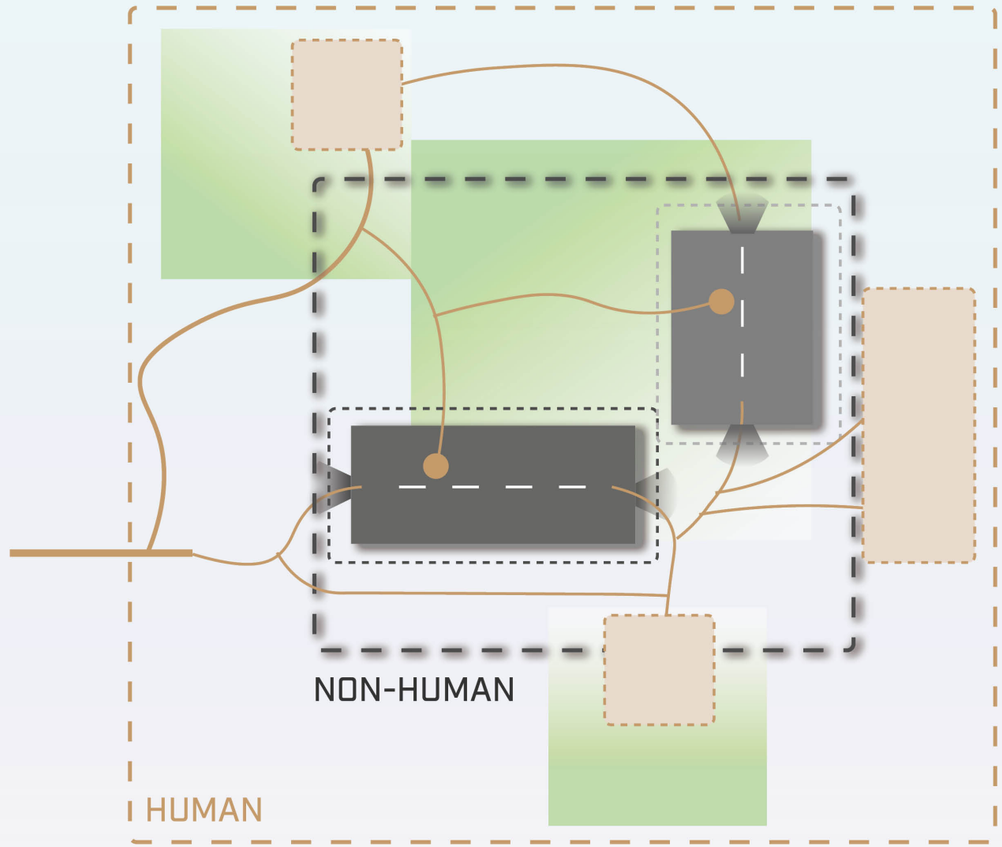


USE ZONING


PUBLIC
BALCONIES
STAFF
LIVING
VISITORS
FERTILIZER
MACHINERY
FEED STORAGE
CATTLE BARN
SHEEPFOLD
VISITOR SHEEP FIELD
MANAGER SHEEP FIELD
PRIMARY SHEEP FIELD
INTERIOR CORRIDORS
VISITOR TRAILS
WORKER PATH
HUMAN
STORAGE
CATTLE
SHEEP
GRAZING
CIRCULATION
HUMAN
NON-HUMAN
SHARED

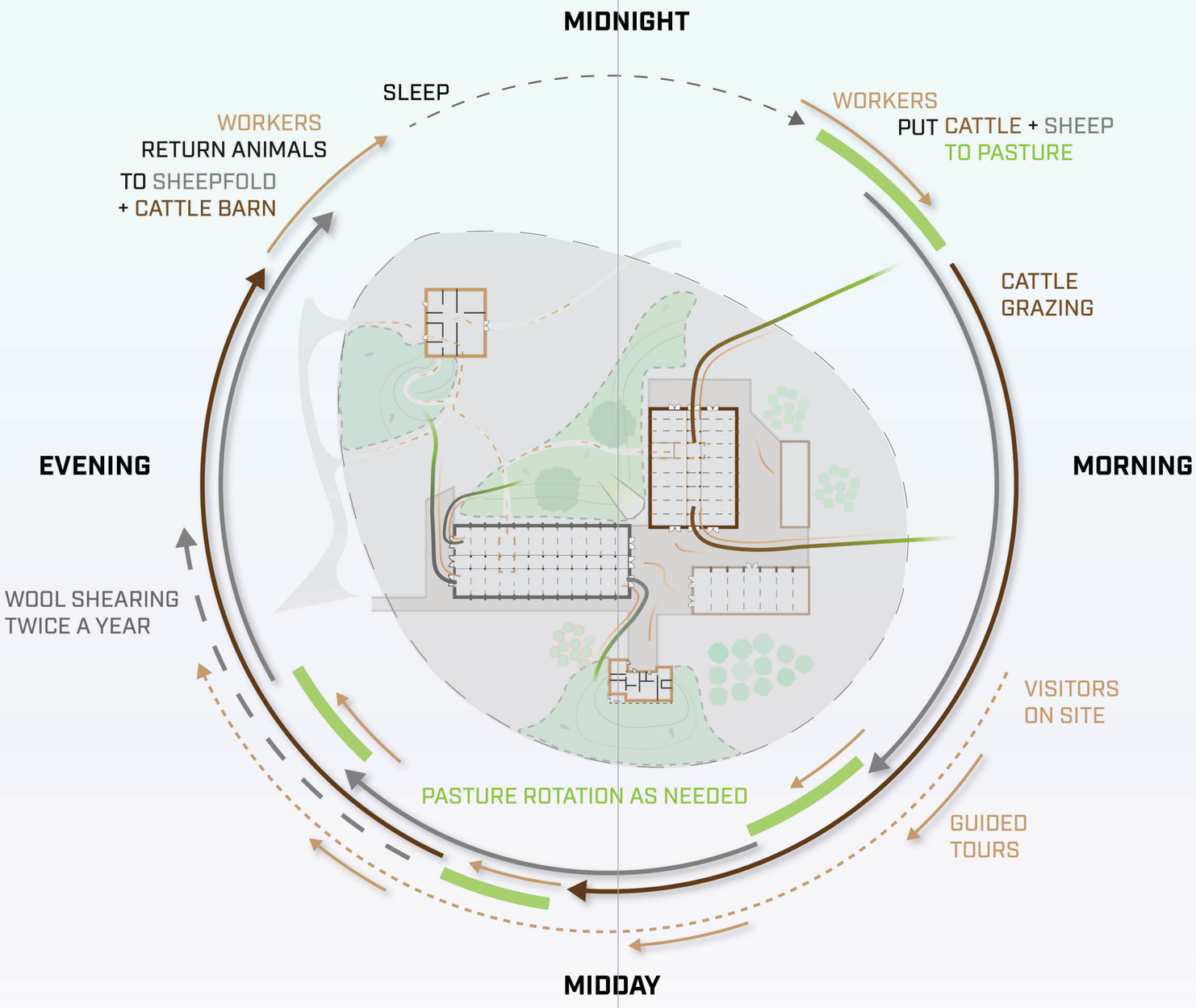
DENSITY AND CIRCULATION



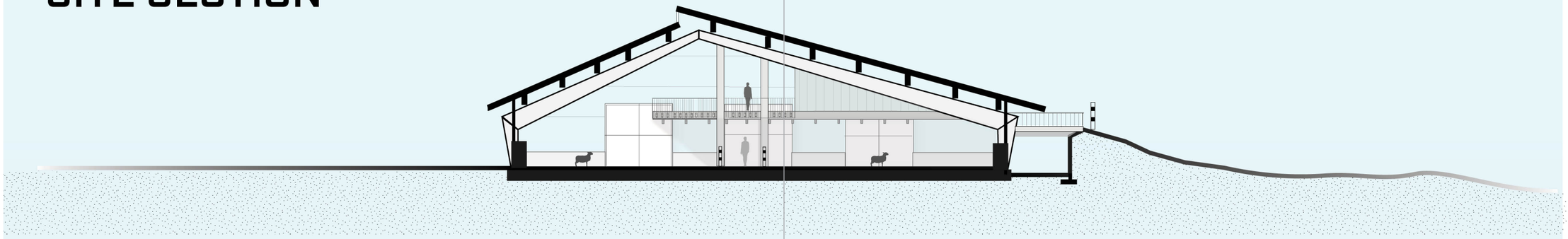


CIRCULATION

DAILY CYCLE


MIDNIGHT
SLEEP
WORKERS
RETURN ANIMALS
TO SHEEPFOLD
+ CATTLE BARN
WORKERS
PUT CATTLE + SHEEP
TO PASTURE
CATTLE
GRAZING
EVENING
MORNING
WOOL SHEARING
TWICE A YEAR
VISITORS
ON SITE
PASTURE ROTATION AS NEEDED
GUIDED
TOURS
MIDDAY
0
20
40

SITE SECTION

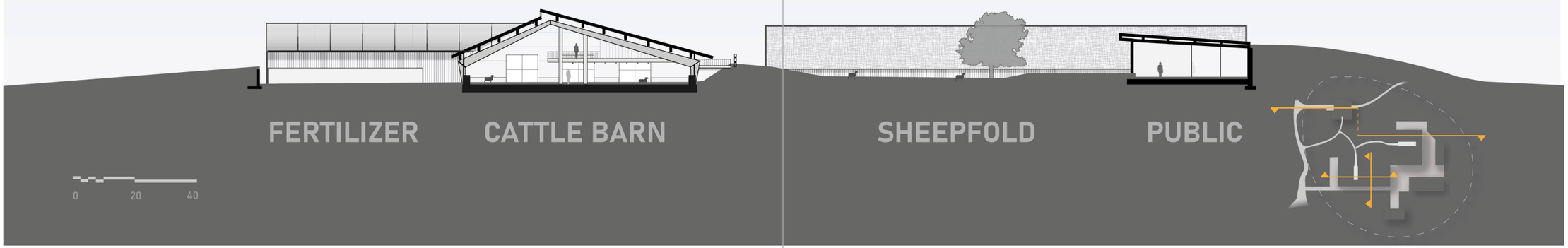


0 20 40

SHEEPFOLD TRANSVERSE SECTION

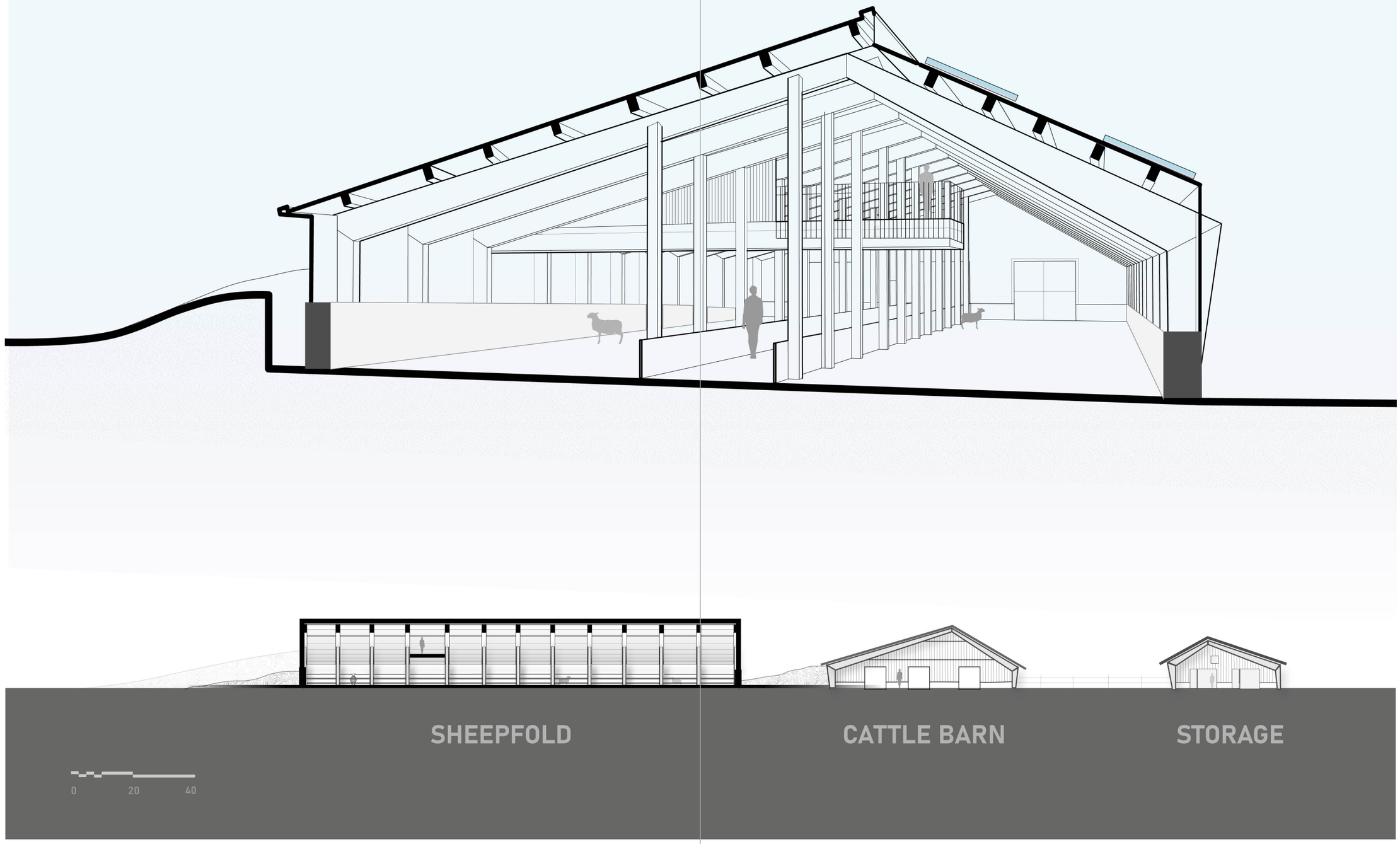
0 20 40

SHEEPFOLD LONGITUDINAL SECTION

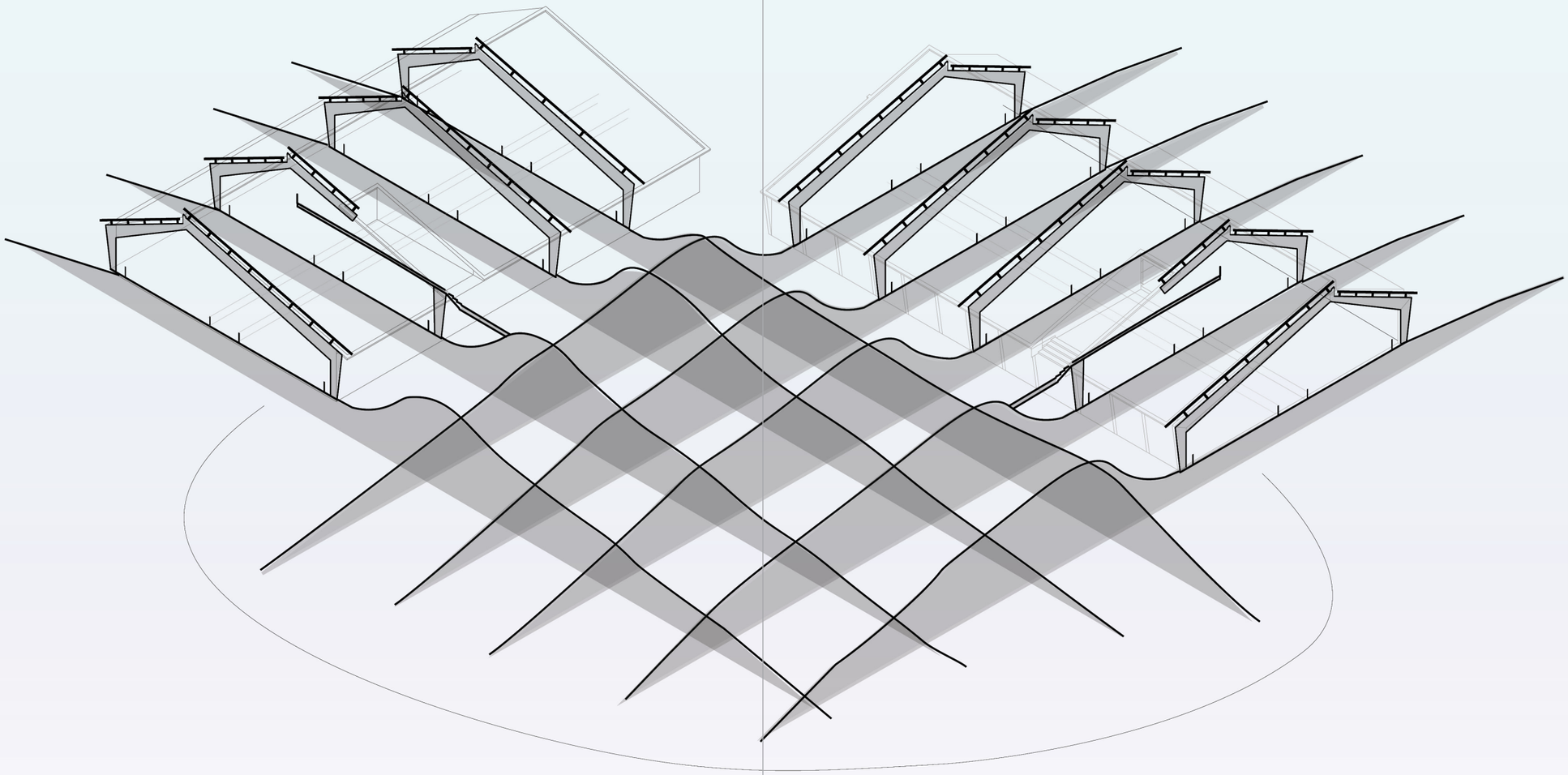


0 20 40

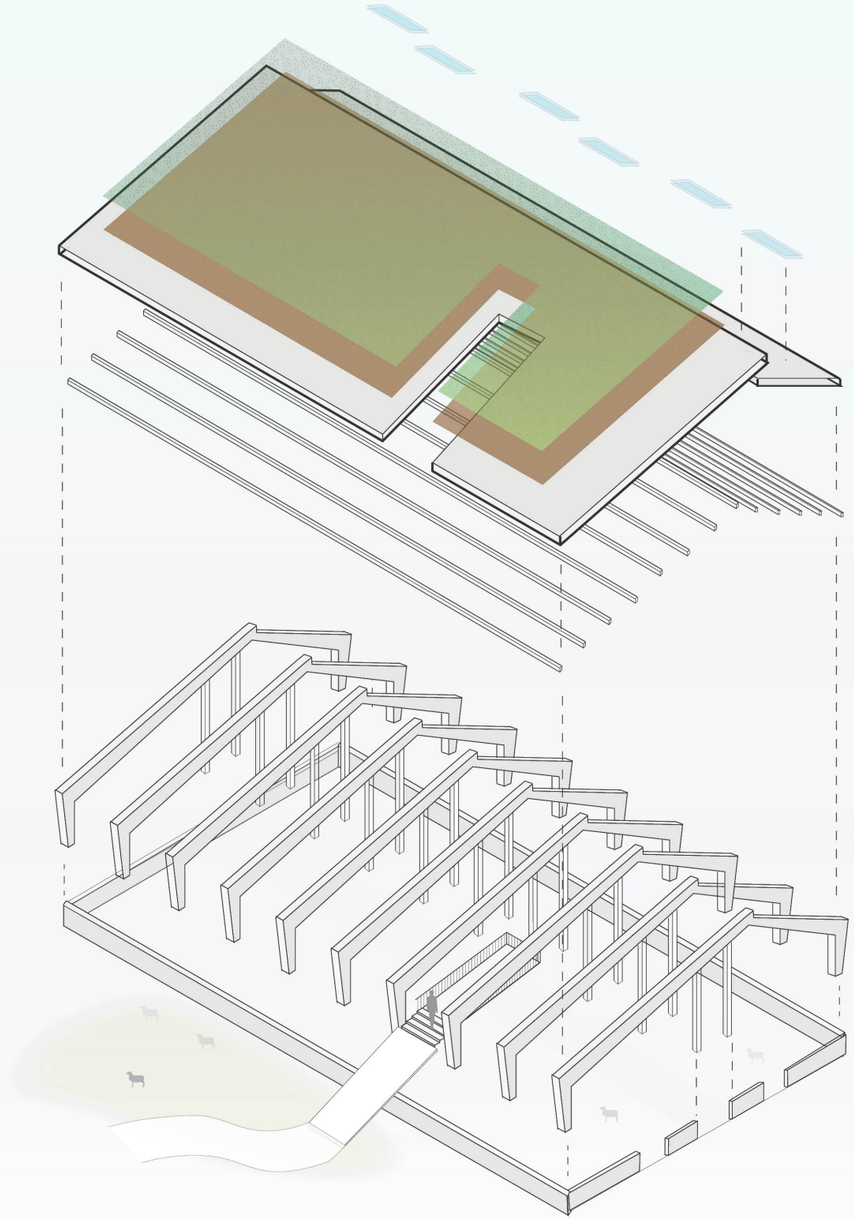
SECTION-PERSPECTIVE



SERIAL SECTION



EXPLODED AXONOMETRIC



SKYLIGHTS

Punched skylights flood the sheepfold with light from the pitched roof above

GREEN ROOF

An extensive green roof insulates and connects to the landscape

GROWTH MEDIUM

A shallow growth medium supports an extensive green roof

ROOFING

Aluminum roofing

MASS TIMBER GIRDERS

Cross-laminated-timber girders

CROSS-LAMINATED-TIMBER TRUSSES

CLT trusses extend out from the exterior and taper as they ascend inward

MASS TIMBER POSTS

A loggia of mass timber columns defines the interior walkway and spaces

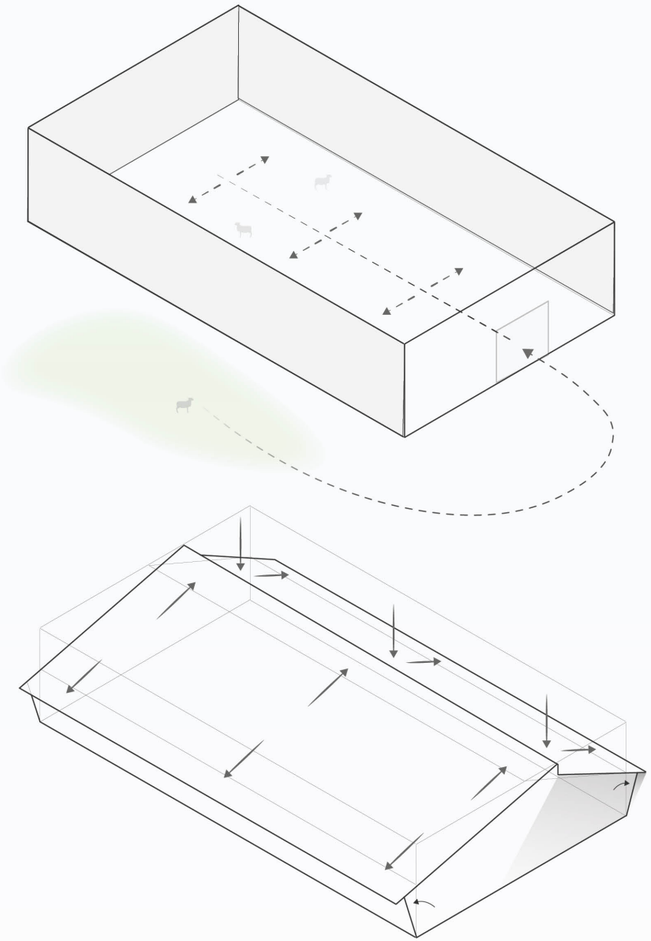
CONCRETE FOUNDATION + WALLS

Edges are defined and supported by a 4’ concrete wall atop a foundation slab

PROCESS SEQUENCE

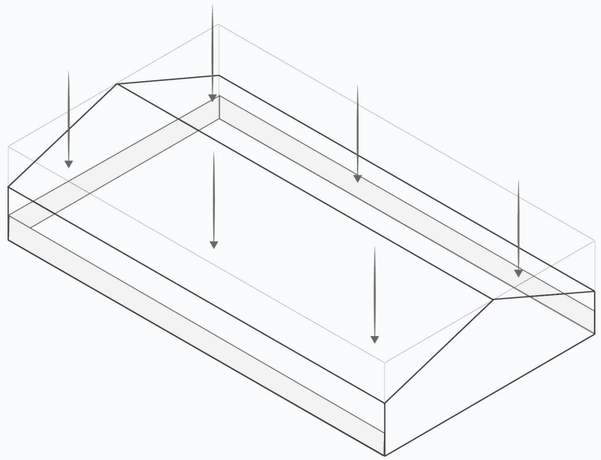
DIVIDE

Sheep are funneled from their field to a rectangular volume bisected into two distinct non-human spaces by a central longitudinal circulatory axis



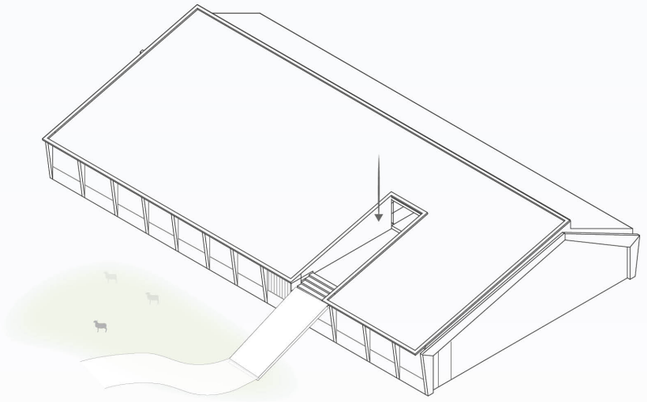
STRETCH

The roof plane overhangs, lifts, and drops to provide shade and admit clerestory light. This stretching also facilitates natural ventilation in the spaces where planes slip beyond



FLATTEN

The traditional pitched roof barn motif is flattened, with a shallow slope supporting an extensive green roof



CARVE

The non-human and human realms are bridged by a void that permits entry, fresh air, and light

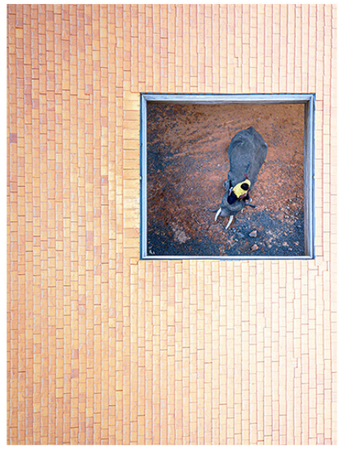
THE CULTURAL COURTYARD

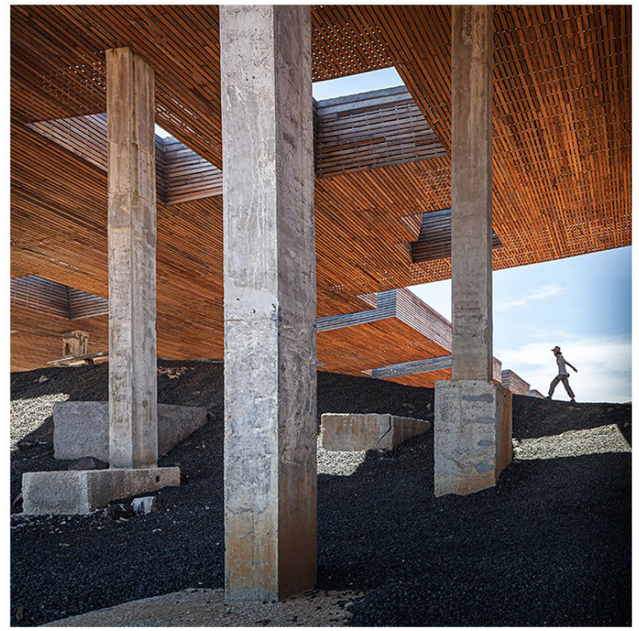
Bangkok Project Studio Surin, North-Eastern Thailand 8,130 sqm / 87,511 sqf 2020

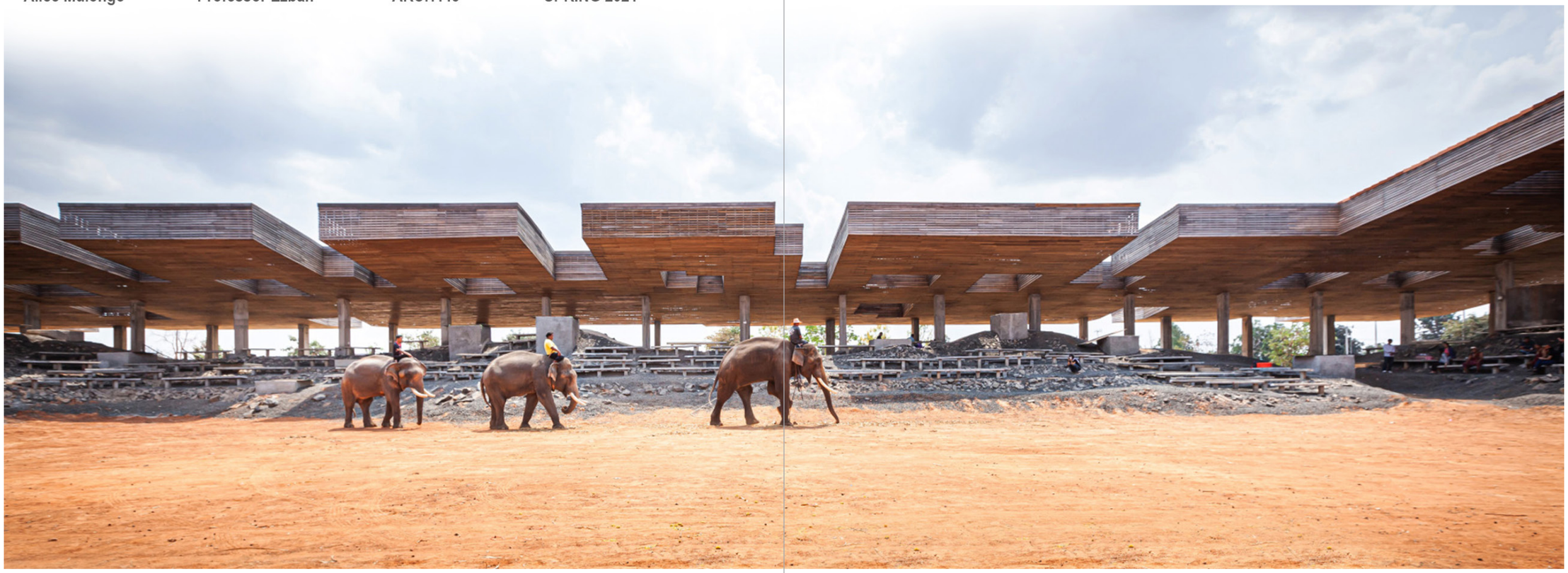
Surin's forest has been devastated for commercial uses for the past 50 years. Severe droughts, food shortages, and medicinal plant shortages befell the kui and their elephants, who had depended entirely on the forest for their survival. Many elephants were put to work in camps, many of which were under inhumane conditions. The governmental initiative with Elephant World aims to return the kui and their elephants to their homeland in a secure and stable climate.

The project, called the "cultural courtyard," is partly covered by a massive roof that measures 70 x 100 meters and acts as a large open area for both humans and elephants to use for entertainment, cultural activities, and religious ceremonies. A rainwater storage pond was dug next to the courtyard to provide water for the site's 200 elephants. The excavated soil was then used to create six mounds that encircle the courtyard on three sides. The various shaped mounds, reinforced with basalt rocks, resemble the rolling earth on which elephants roll around to shield themselves from insects and keep cool.

Alice Mulongo Professor Ezban ARCH445 SPRING 2021







CLIENT DESCRIPTION:
ELEPHANT

SPATIAL REQUIREMENTS:
OUTDOOR ENCLOSURES

HEALTHY ELEPHANTS SHALL HAVE SUFFICIENT SPACE TO TRAVEL A MINIMUM OF 10KM

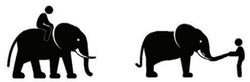
FOR ROOFED ENCLOSURES THERE SHOULD BE A MINIMUM VERTICAL DIMENSION OF 20 FT

INDOOR INCLOSURES

MINIMUM OF TWO 'ROOMS' OR ONE INDOOR RM AND ONE SHIFT YARD PER GROUP OF COMPATIBLE ELEPHANTS.

MINIMUM DIMENSION OF 2600 SQ. FT. (240 SQ. M) PER 4 ADULT FEMALES, WITH AN ADDITIONAL 860 SQ. FT. (80 SQ. M) PER ADDITIONAL ANIMAL.

COLLABORATIONS:



ELEPHANTS ARE TOURISTS MAGNETS, ATTRACTING FUNDS THAT HELPS PROTECT WILDLIFE.

ELEPHANTS ARE GOING EXTINCT DUE TO ILLEGAL IVORY TRADE, FORCING LOCALS TO RAISE THEM IN SAFE SANCTUARIES.

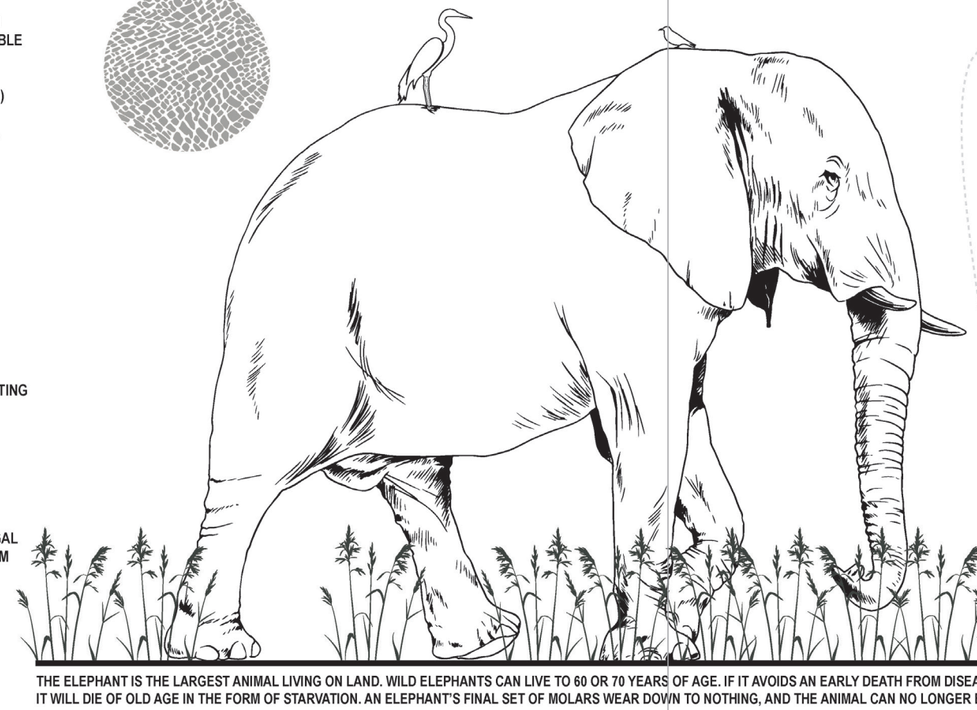
SKIN

THE SKIN OF AN ELEPHANT CAN BE UP TO 1.5 INCHES THICK. ELEPHANTS USE TOUCH AS A FORM OF COMMUNICATION, AS THEIR SKIN IS NOT THOUGH BUT SOFT AND SENSITIVE.

MUTUALISM:
CATTLE EGRETS OXPECKERS

BIRDS THAT LAND ON ELEPHANTS, WHERE THEY EAT LICE, TICKS, AND OTHER PARASITES LIVING ON ELEPHANTS' SKIN AND HAIR.

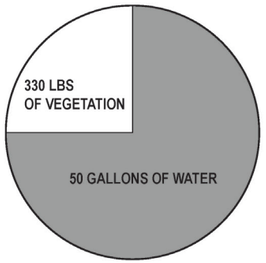
THIS SYMBIOTIC RELATIONSHIP BENEFITS THE ELEPHANT BY REMOVING IRRITATING PESTS THAT CAN SPREAD DISEASE, AND THE BIRDS ALSO BENEFITS BY GETTING A MEAL.

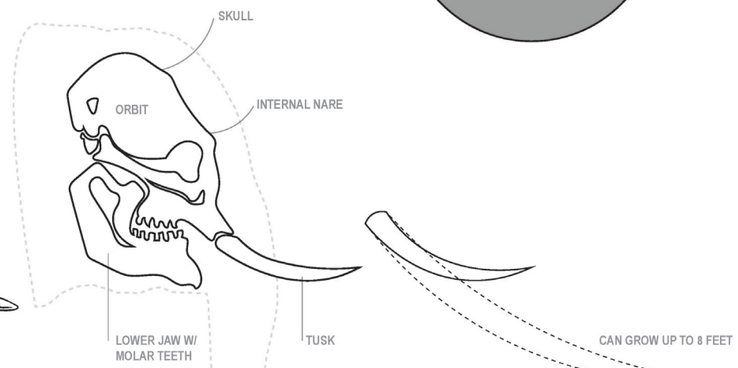


NUTRITION
DAILY INTAKE

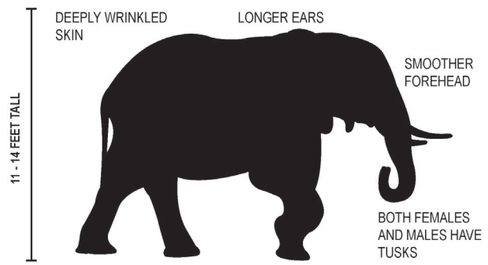
70,000 CALORIES / DAY

ADULTS SPEND
16 - 18 HRS DAILY TO EAT

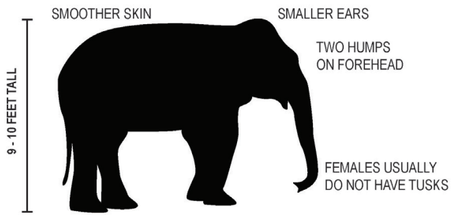




THE ELEPHANT IS THE LARGEST ANIMAL LIVING ON LAND. WILD ELEPHANTS CAN LIVE TO 60 OR 70 YEARS OF AGE. IF IT AVOIDS AN EARLY DEATH FROM DISEASE OR HUNTING, IT WILL DIE OF OLD AGE IN THE FORM OF STARVATION. AN ELEPHANT'S FINAL SET OF MOLARS WEAR DOWN TO NOTHING, AND THE ANIMAL CAN NO LONGER EAT.



AFRICAN ELEPHANT
LOXODONTA AFRICANA
18,000 POUNDS (8,165 KG)

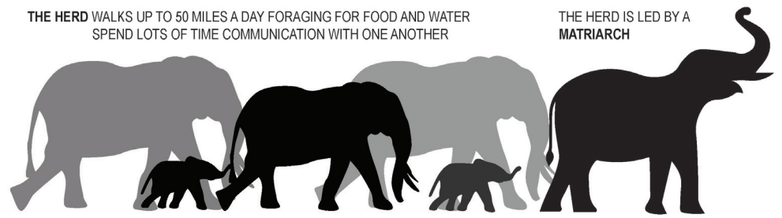


ASIAN ELEPHANT
ELEPHAS MAXIMUS
11,000 POUNDS (5,000 KG)

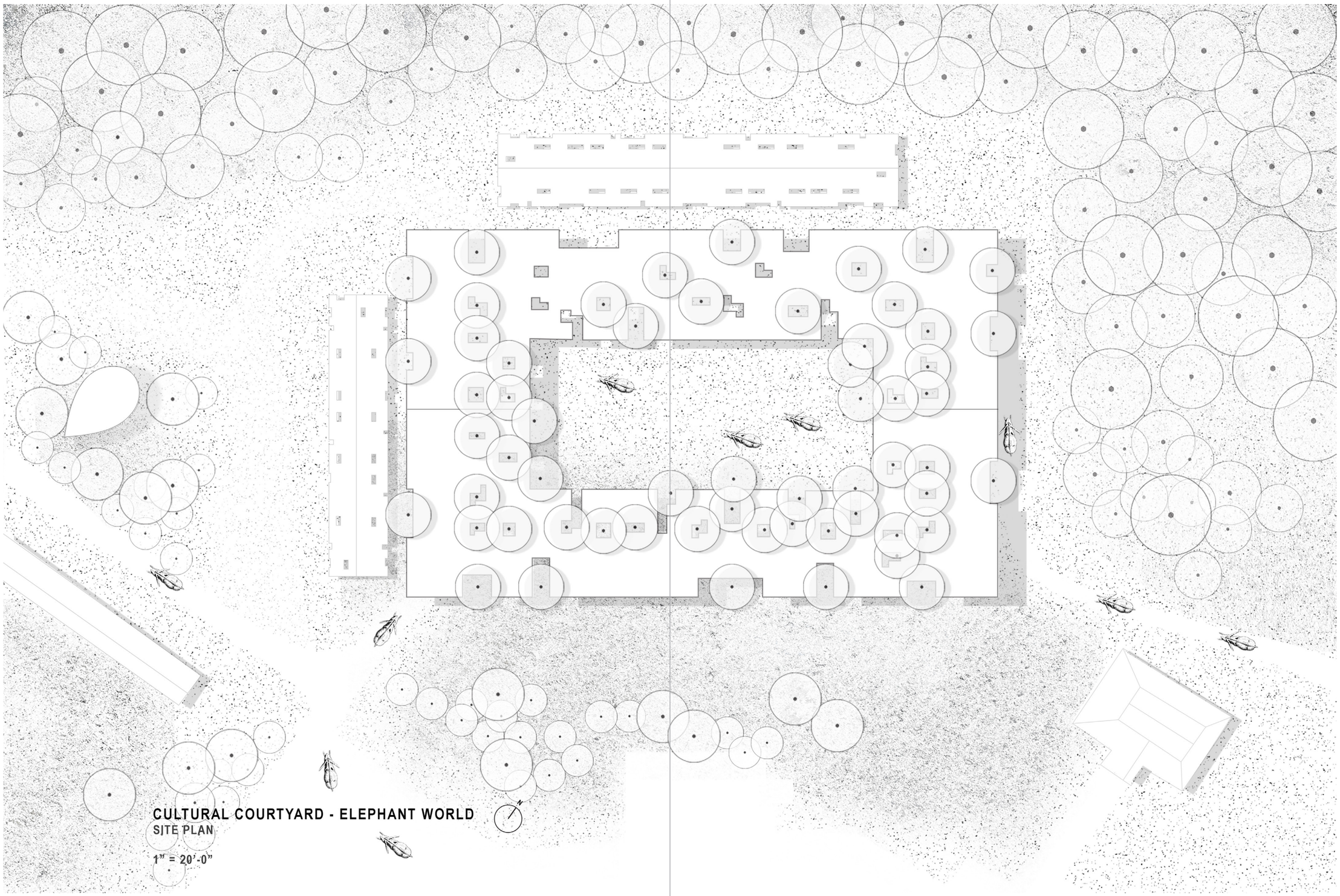
ADULT HUMAN

THE HERD WALKS UP TO 50 MILES A DAY FORAGING FOR FOOD AND WATER
SPEND LOTS OF TIME COMMUNICATION WITH ONE ANOTHER

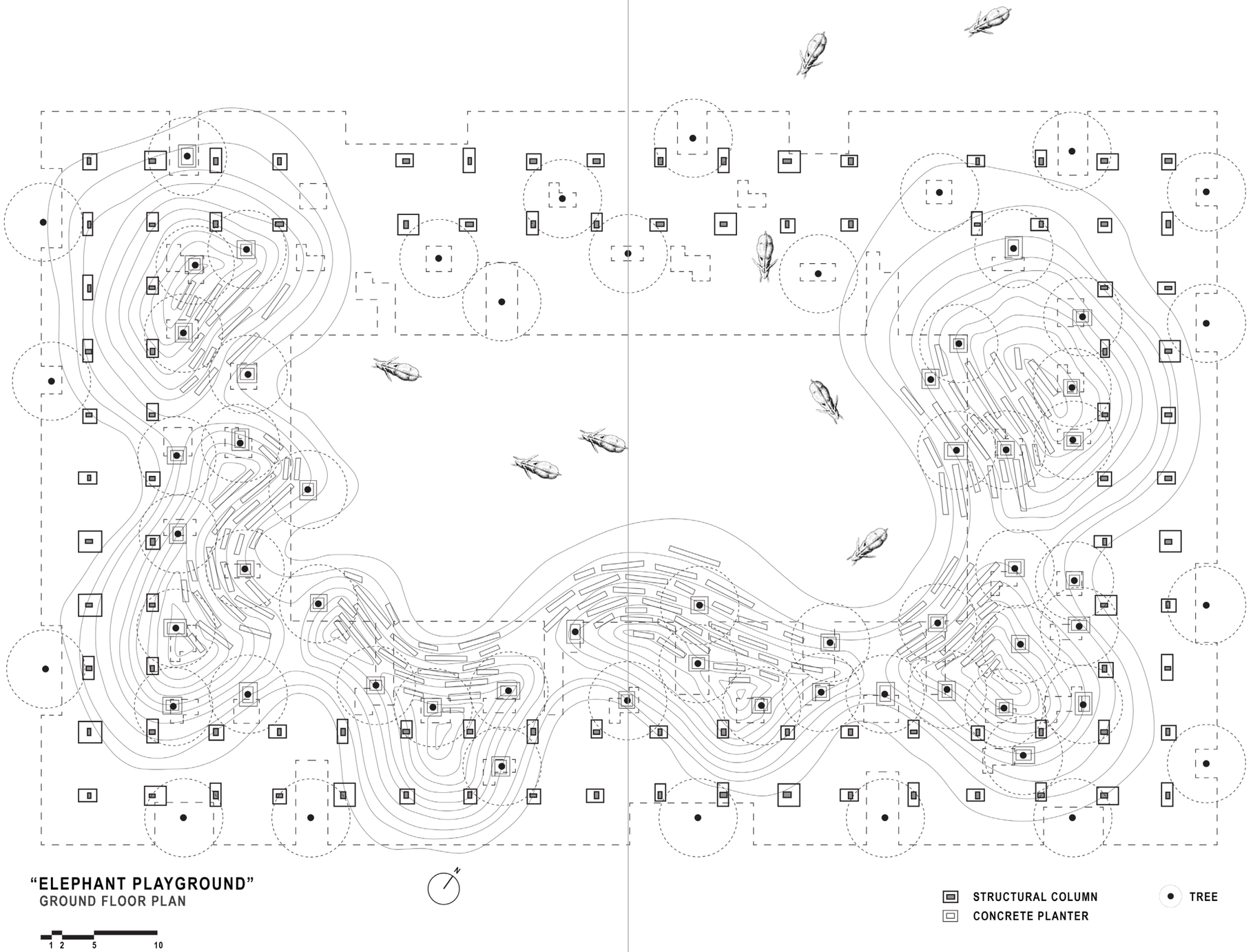
THE HERD IS LED BY A **MATRIARCH**



ELEPHANT FORMS TIGHT FAMILY GROUPS CALLED A HERD.

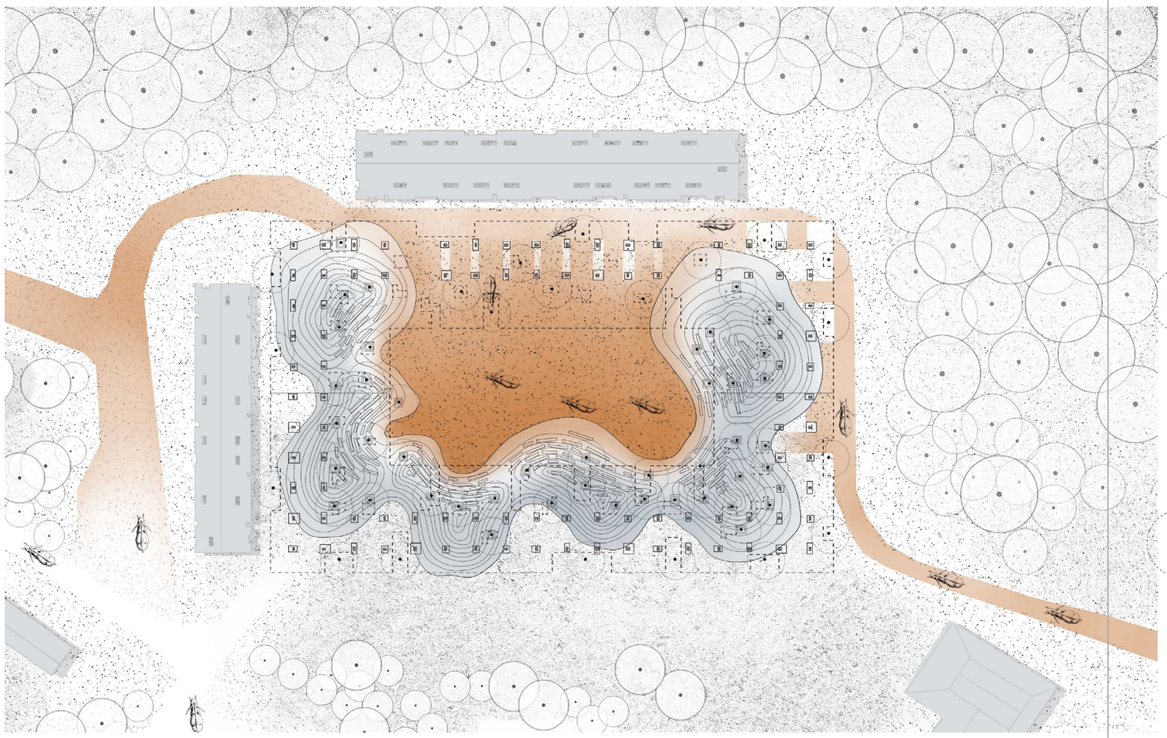


CULTURAL COURTYARD - ELEPHANT WORLD
SITE PLAN
1” = 20’-0”

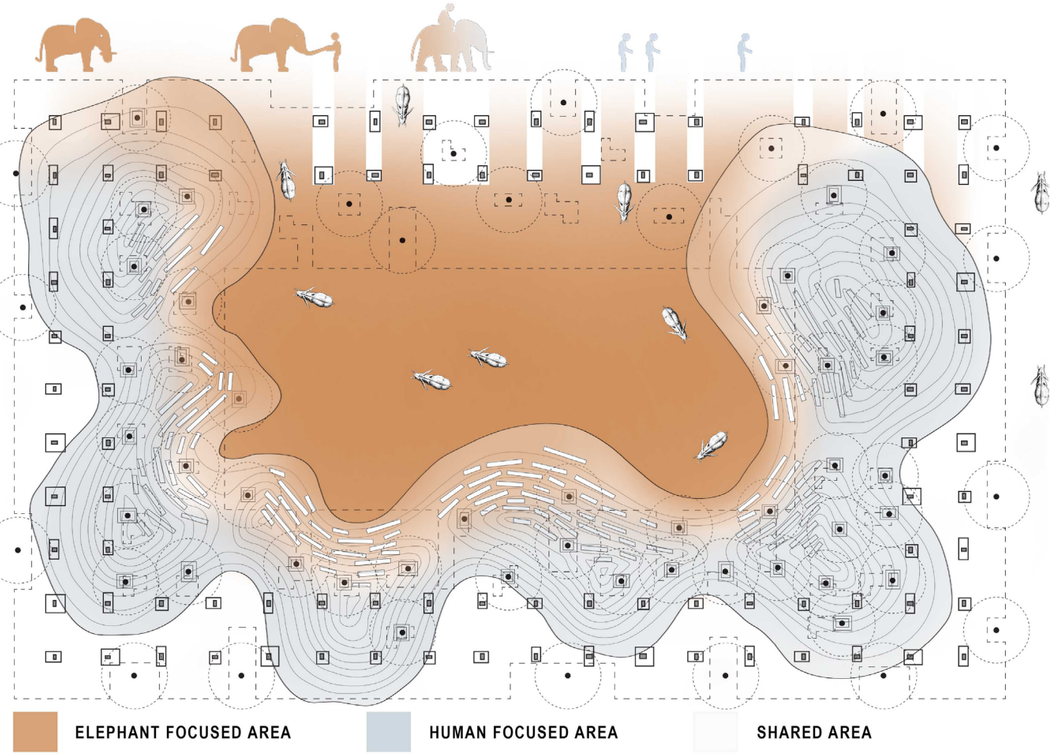


"ELEPHANT PLAYGROUND"
GROUND FLOOR PLAN

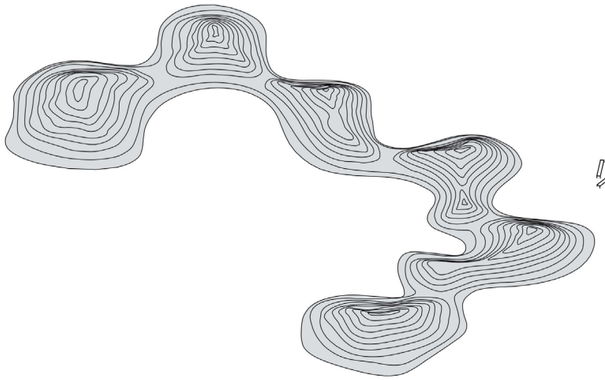
PLAN DIAGRAM - ZONES AND PROGRAM



BUILDING + SITE ZONING



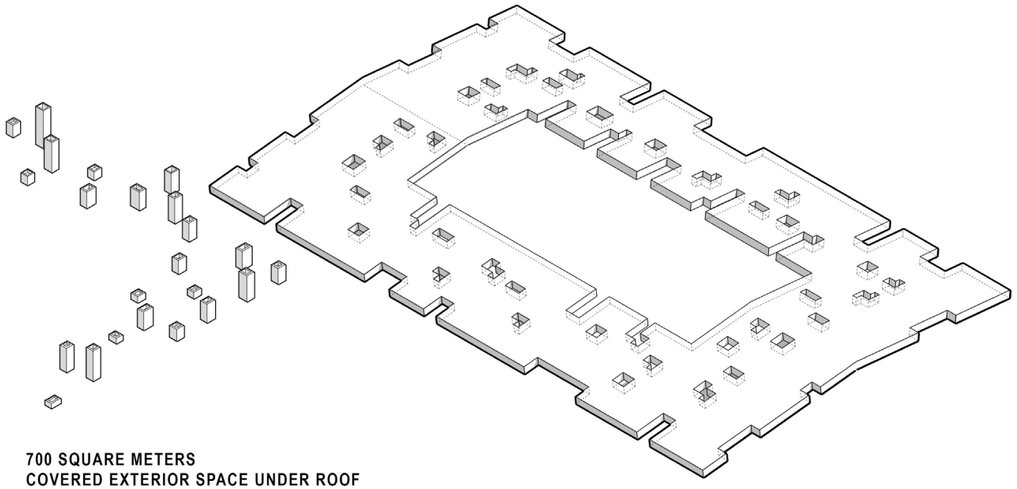
BUILDING ZONING



AMPHITHEATER

6 MOUNDS RISING FROM 4 TO 1.2 METERS
FORMED OF 8,500 CUBIC METERS OF SOIL

WITH 6 ROWS OF BENCHES FOR HUMANS

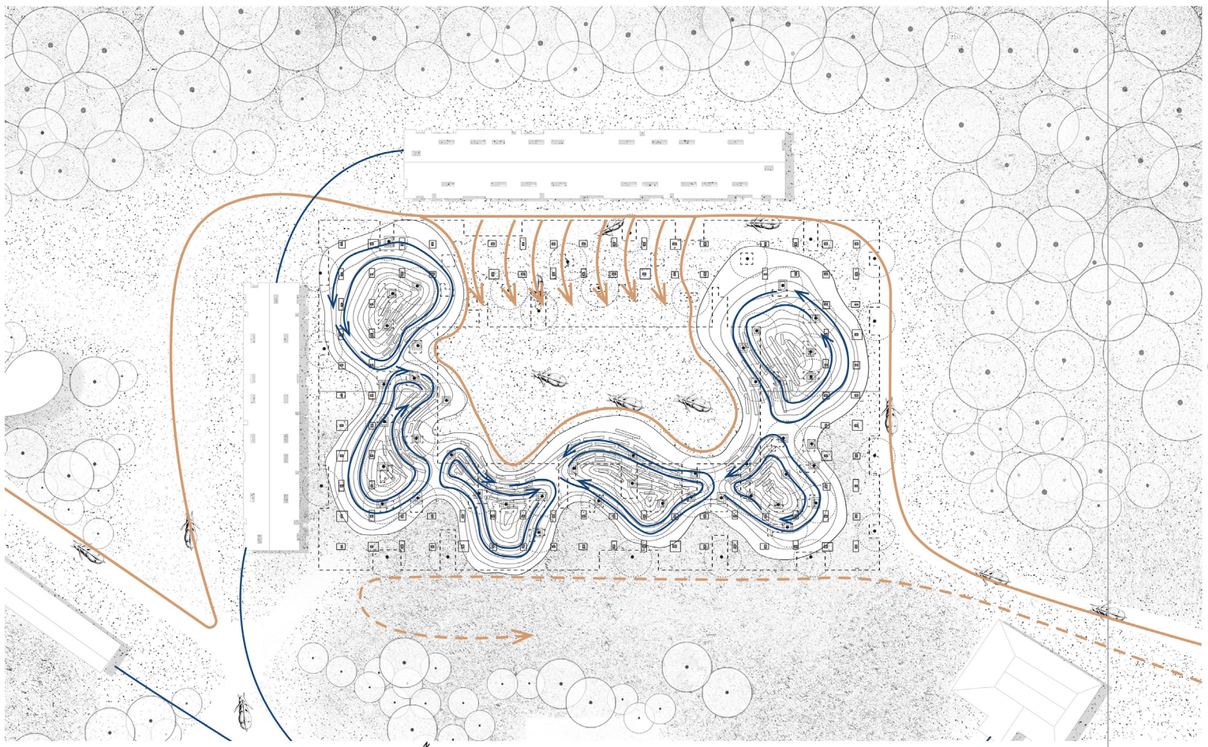


700 SQUARE METERS
COVERED EXTERIOR SPACE UNDER ROOF
(1) MAIN SKYLIGHT, (42) TREE SKYLIGHTS + (42) TREE PLANTINGS

OPEN PLAZA FOR ELEPHANTS AND HUMANS

BUILDING PROGRAM AREA + CATALOG

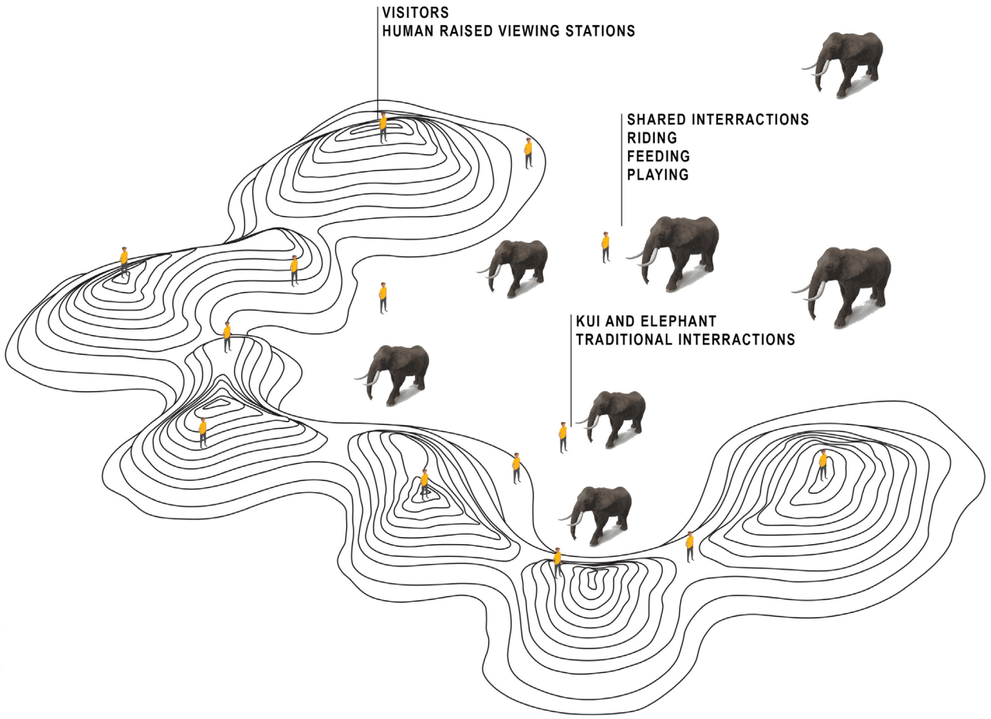
PLAN DIAGRAM - CIRCULATION AND USES



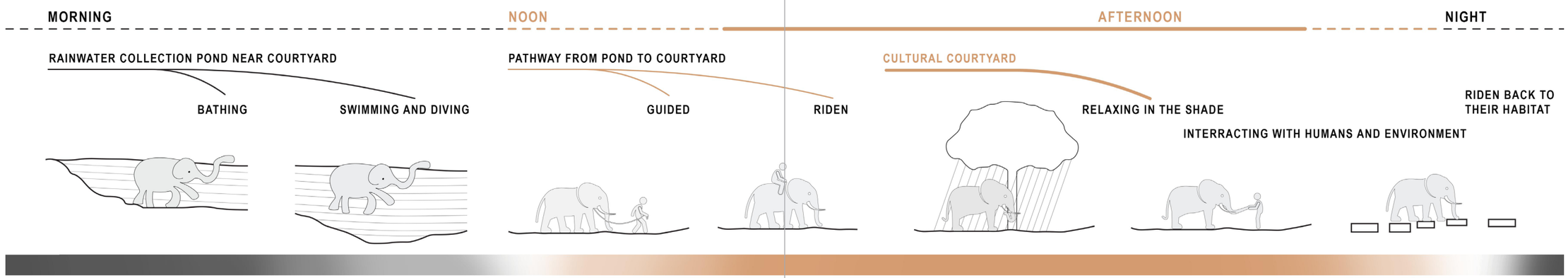
BUILDING + SITE CIRCULATION

ELEPHANT CIRCULATION

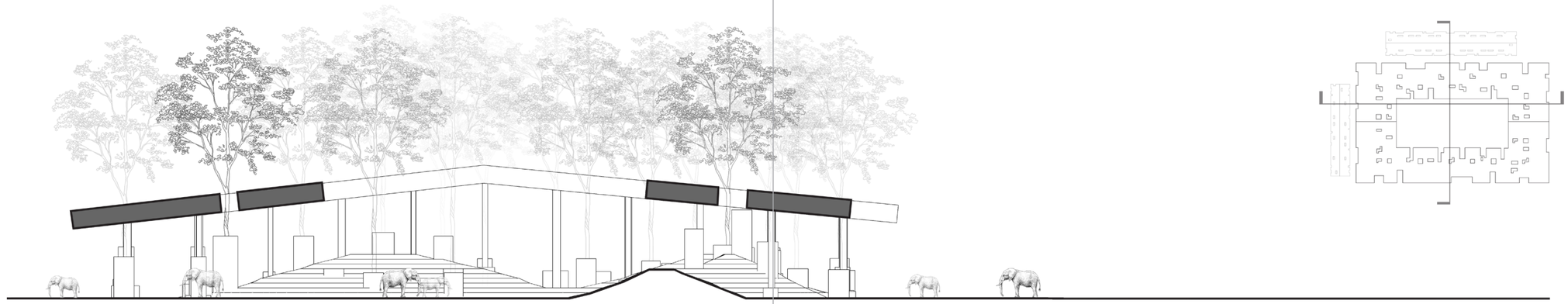
HUMAN CIRCULATION



ELEPHANT + HUMAN INTERRACTIONS (SCALE IS EXAGGERATED FOR DIAGRAM)

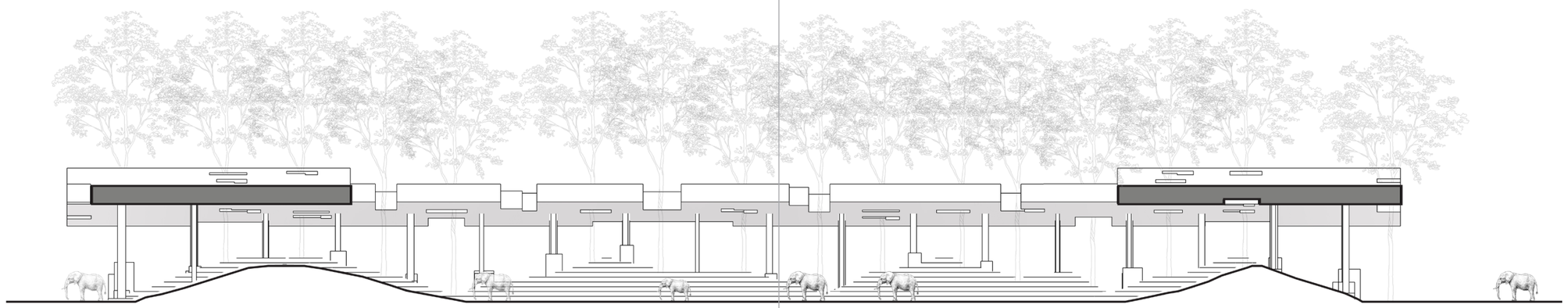


HUMAN + ELEPHANT DAILY RYTHM



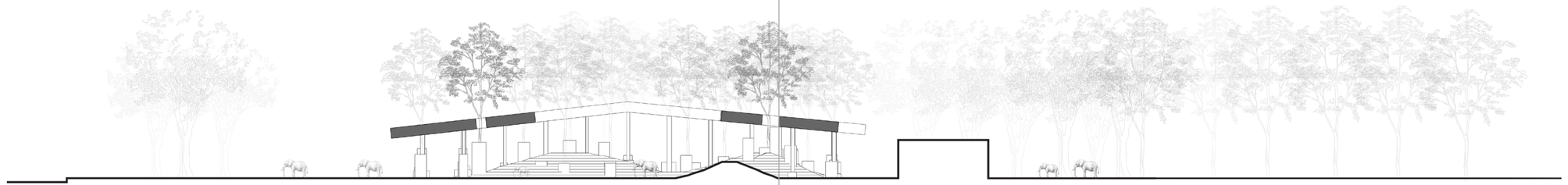
1. TRANSVERSE BUILDING SECTION

1 2 5 10

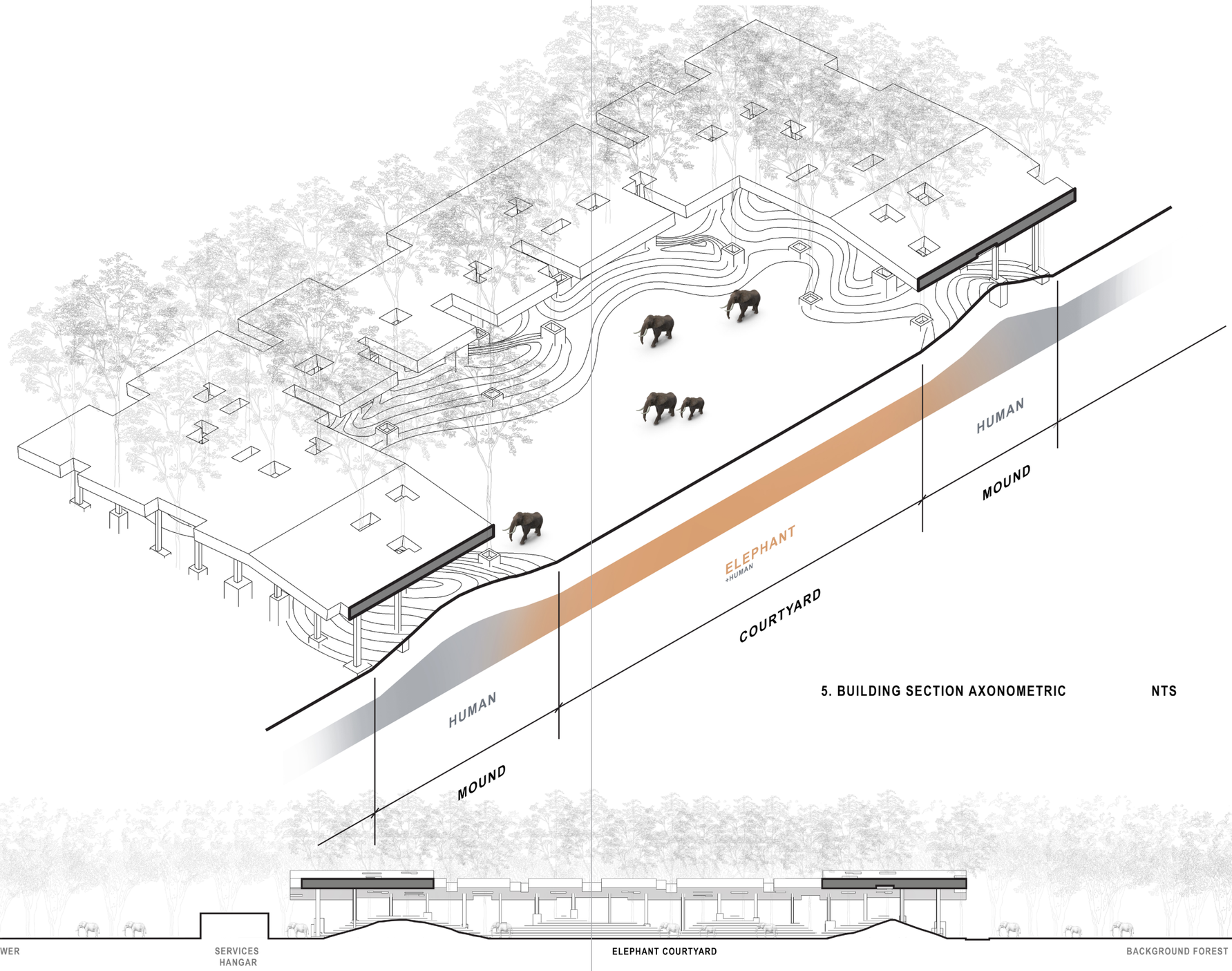


2. LONGITUDINAL BUILDING SECTION

1 2 5 10



3. TRANSVERSE SITE - BUILDING SECTION 1” = 20’ - 0”



5. BUILDING SECTION AXONOMETRIC NTS

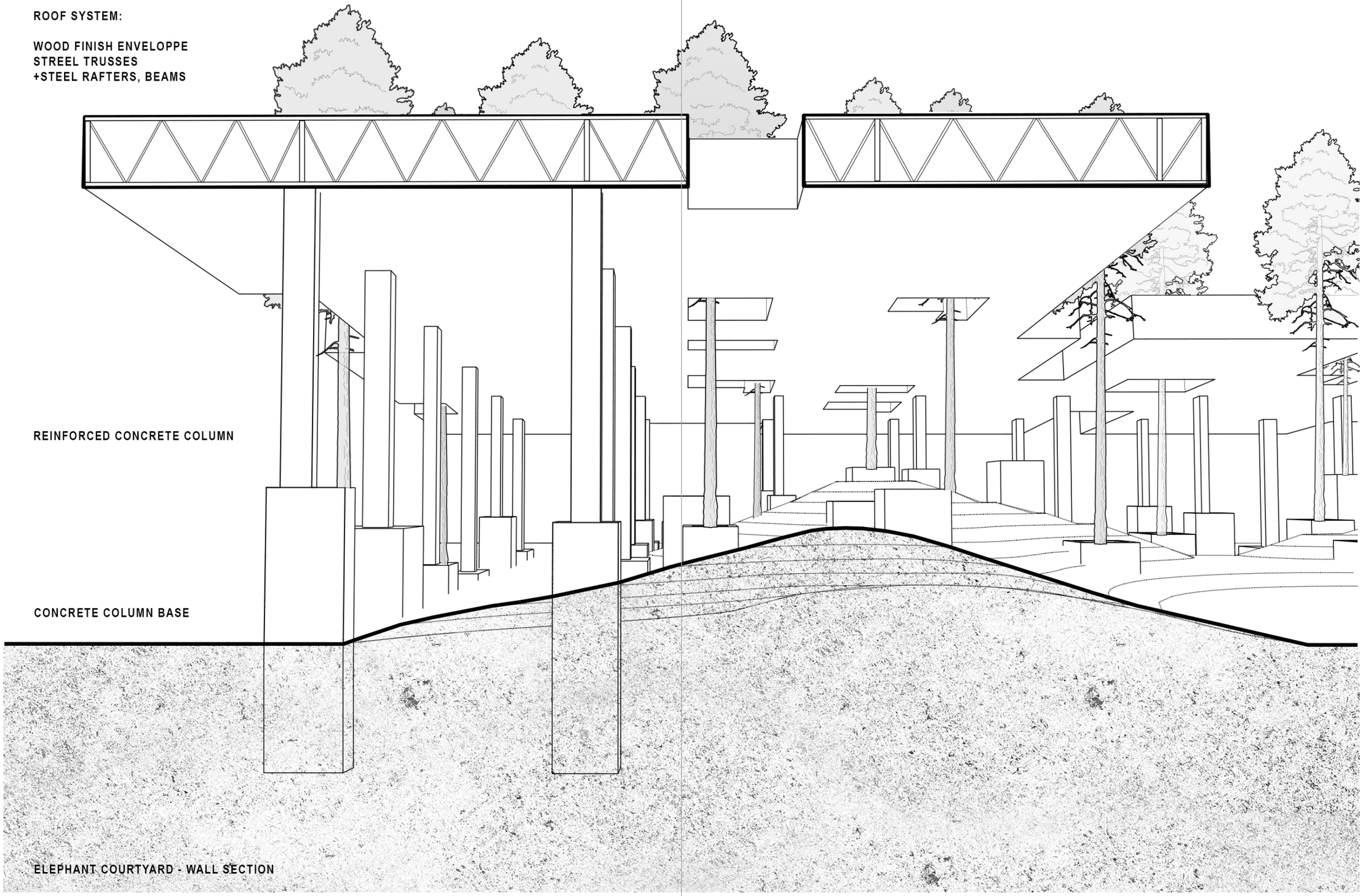
3. LONGITUDINAL SITE - BUILDING SECTION 1” = 20’ - 0”

ROOF SYSTEM:

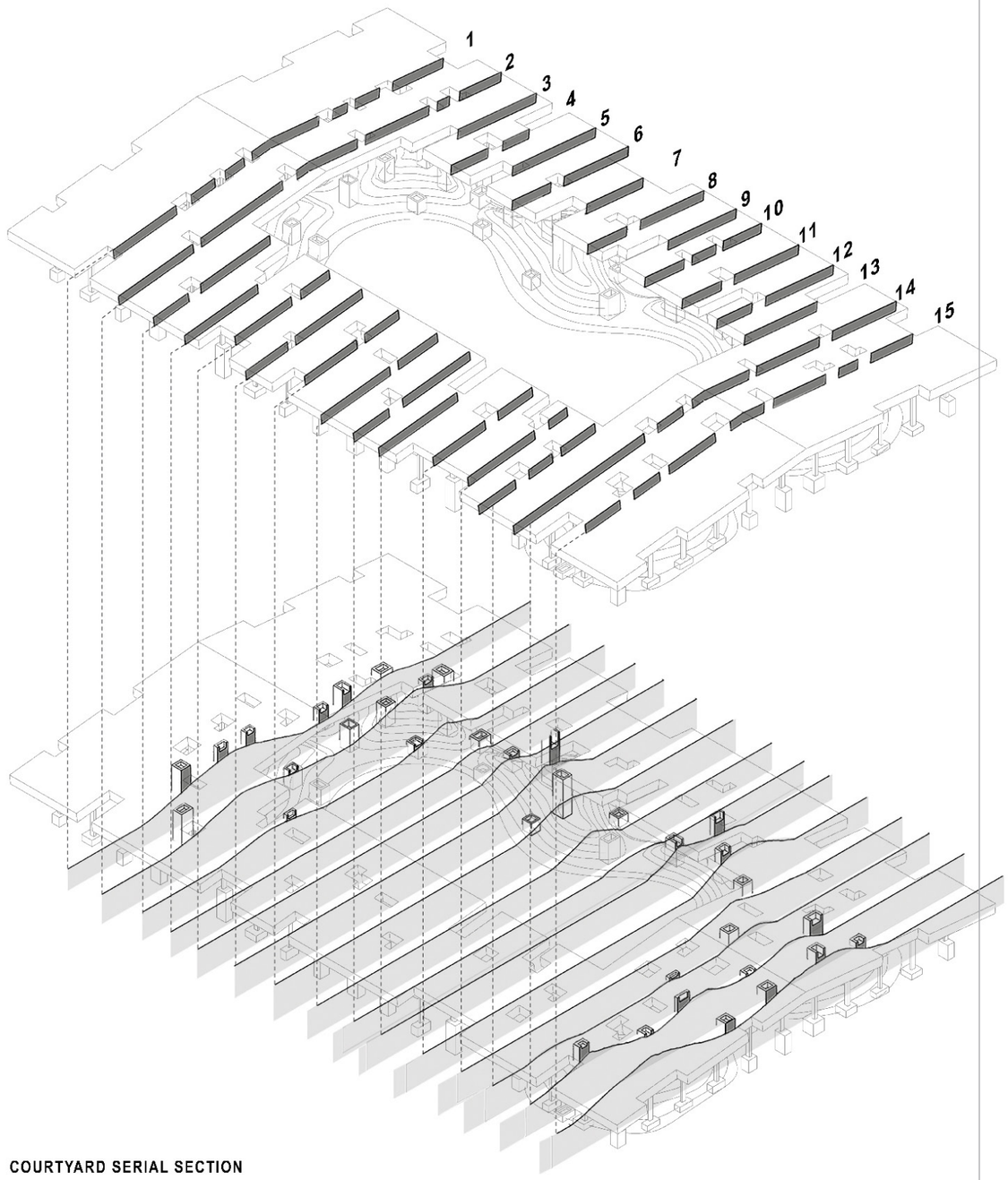
WOOD FINISH ENVELOPPE
STREEL TRUSSES
+STEEL RAFTERS, BEAMS

REINFORCED CONCRETE COLUMN

CONCRETE COLUMN BASE

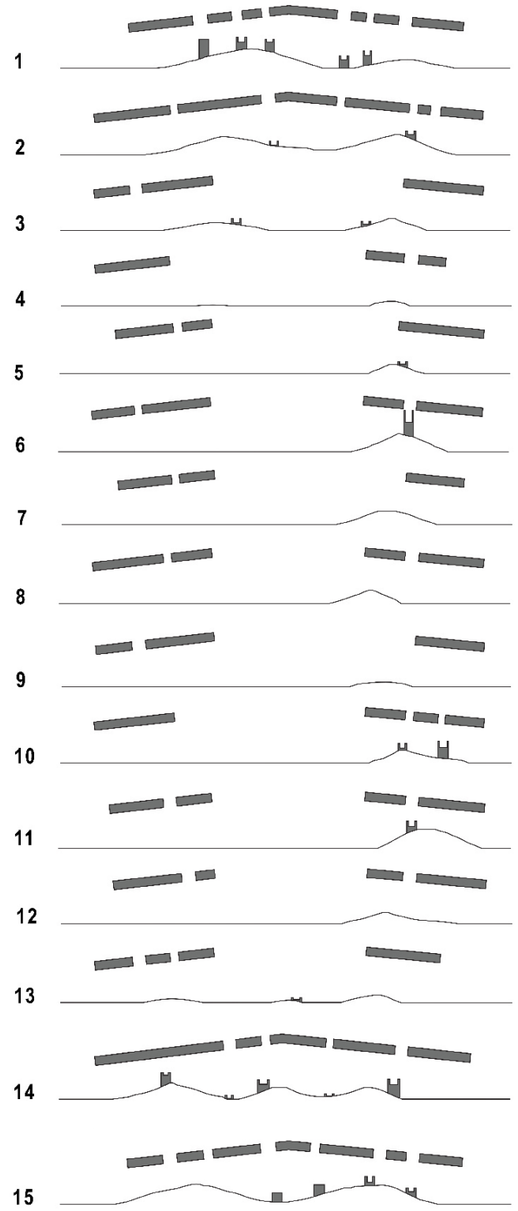


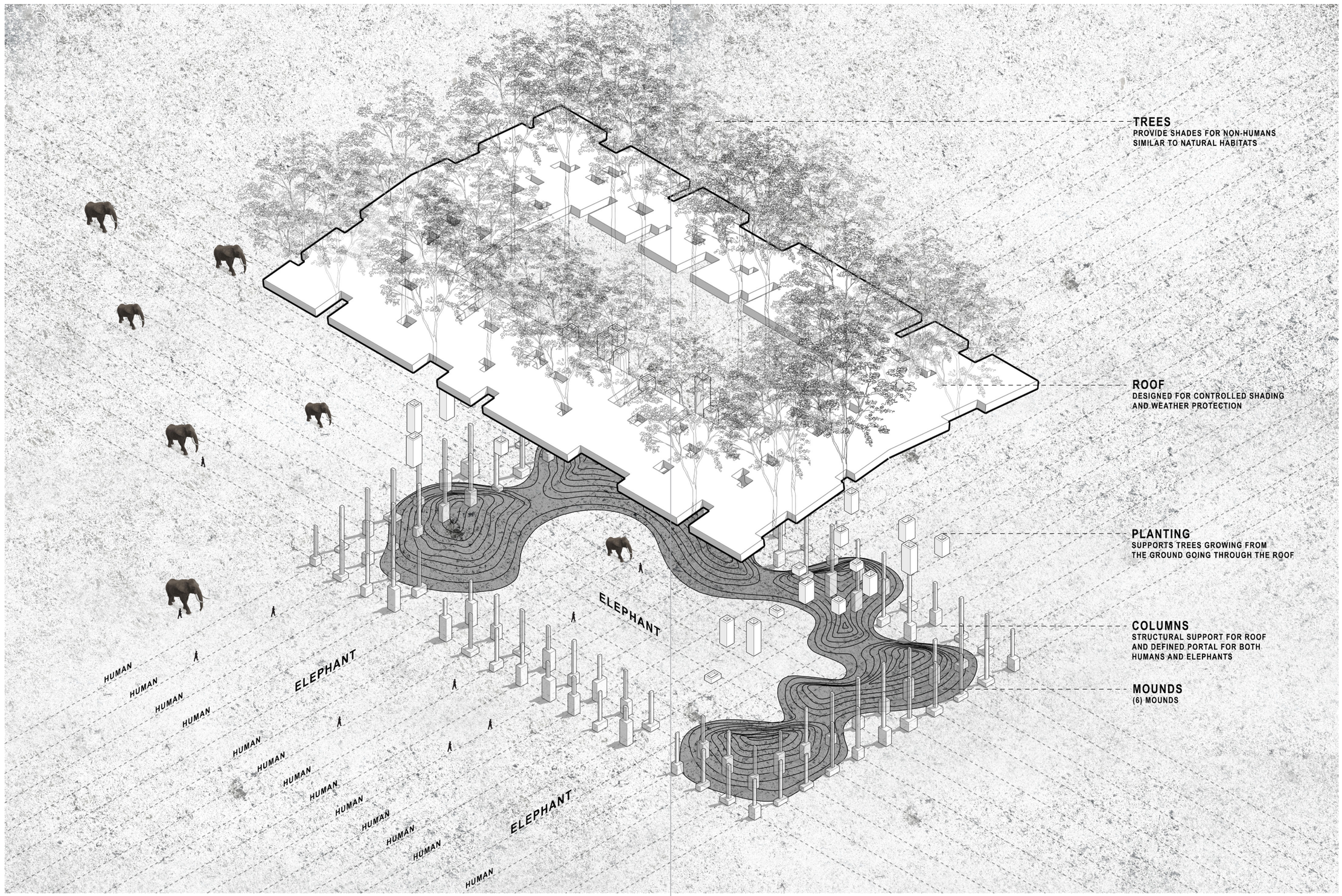
ELEPHANT COURTYARD - WALL SECTION



COURTYARD SERIAL SECTION

SKYLIGHT - PLANTING SERIAL SECTIONS




TREES
PROVIDE SHADES FOR NON-HUMANS
SIMILAR TO NATURAL HABITATS
ROOF
DESIGNED FOR CONTROLLED SHADING
AND WEATHER PROTECTION
PLANTING
SUPPORTS TREES GROWING FROM
THE GROUND GOING THROUGH THE ROOF
COLUMNS
STRUCTURAL SUPPORT FOR ROOF
AND DEFINED PORTAL FOR BOTH
HUMANS AND ELEPHANTS
MOUNDS
(6) MOUNDS
ELEPHANT
ELEPHANT
ELEPHANT
HUMAN
HUMAN
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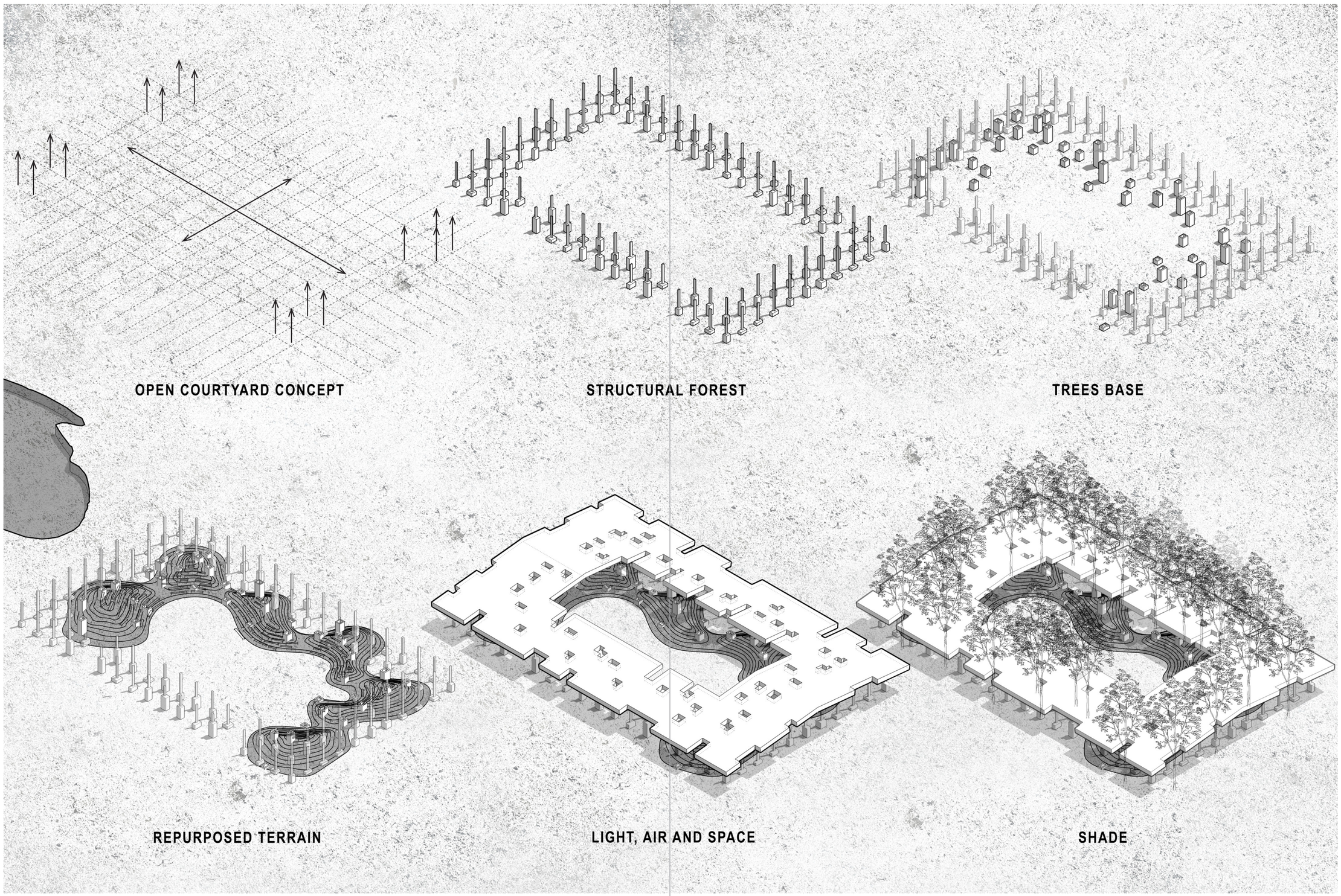
HUMAN


OPEN COURTYARD CONCEPT
STRUCTURAL FOREST
TREES BASE
REPURPOSED TERRAIN
LIGHT, AIR AND SPACE
SHADE

KOI CAFE

FARMING ARCHITECTS

HANOI, VIETNAM

2017 / 950 ft^2

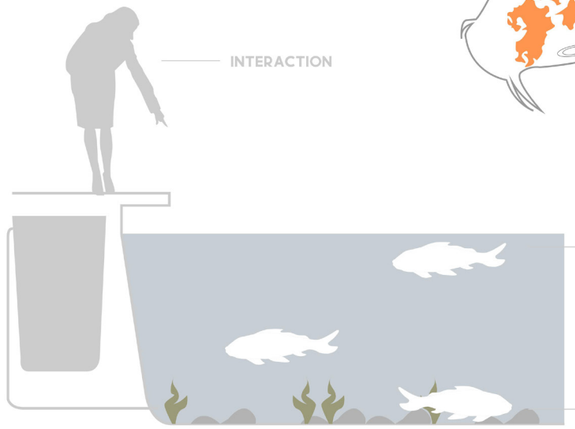
KOI CAFE, DESIGNED BY FARMING ARCHITECTS, IS A CAFE INTERTWINED WITH A KOI AQUARIUM. THE BUILDING IS SPLIT INTO TWO AREAS, THE EXISTING REAR STRUCTURE, HOUSING THE TRADITIONAL CAFE SPACE, AND THE OPEN-AIR FRONT ADDITION, HOUSING A 14' X 16' KOI AQUARIUM THAT IS THE CENTERPIECE OF THE BUILDING. THE AQUARIUM, SPANNING THE WIDTH OF THE INFILL SITE, IS THE HABITAT OF THE KOI FISH AND MAIN POINT OF SPECIES INTERACTION. HUMAN CIRCULATION FROM THE ENTRANCE TO THE MAIN CAFE SPACE IS FORCED OVER THE AQUARIUM VIA THE STEPPING STONES AND A RAISED GLASS TANK, BOTH OF WHICH ALLOW UP CLOSE INTERACTION WITH THE SOCIAL KOI HOPING TO BE FED. THE AQUARIUM CAN BE SEEN FROM MOST SPACES WITHIN THE 3 STORY CAFE, INCLUDING A SECOND FLOOR BALCONY HANGING OVER THE TANK. THE STEEL FRAMING, TILED FACADE, AND FENCE ROOF CREATE A PERMEABLE ENVELOPE THAT EXPOSES THE KOI FISH AND CAFE PATRONS TO THE ENVIRONMENT. THE KOI ARE INTERTWINED WITH THE BUILDING ITSELF THROUGH AN AQUAPONICS SYSTEM COMPRISED OF A SERIES OF WATERFALLS AND PLANTERS THAT UTILIZES THEIR WASTE AS FERTILIZER TO GROW PRODUCE USED IN THE CAFE. THEY ARE ADDITIONALLY INTERTWINED WITH THE BUILDING THROUGH THE TILE FACADE, WITH THE ORANGE TILES LAID IN A PATTERN THAT RESEMBLES THE SCALES OF THE VIBRANTLY COLORED FISH.

MEGHAN REYNOLDS / ARCH445 / PROFESSOR EZBAN / SPRING 2021

KOI / NISHIKIGOI

C. rubrofuscus

COLORED VARIANTS OF THE AMUR CARP.
BRED FOR ORNAMENTAL COLOR AND PATTERNS
BEGAN IN JAPAN IN 19TH CENTURY



SPATIAL REQUIREMENTS

= 500 – 1000 GAL

SUMMER DIET

WINTER DIET

LIFESPAN

15 YRS

40+ YRS

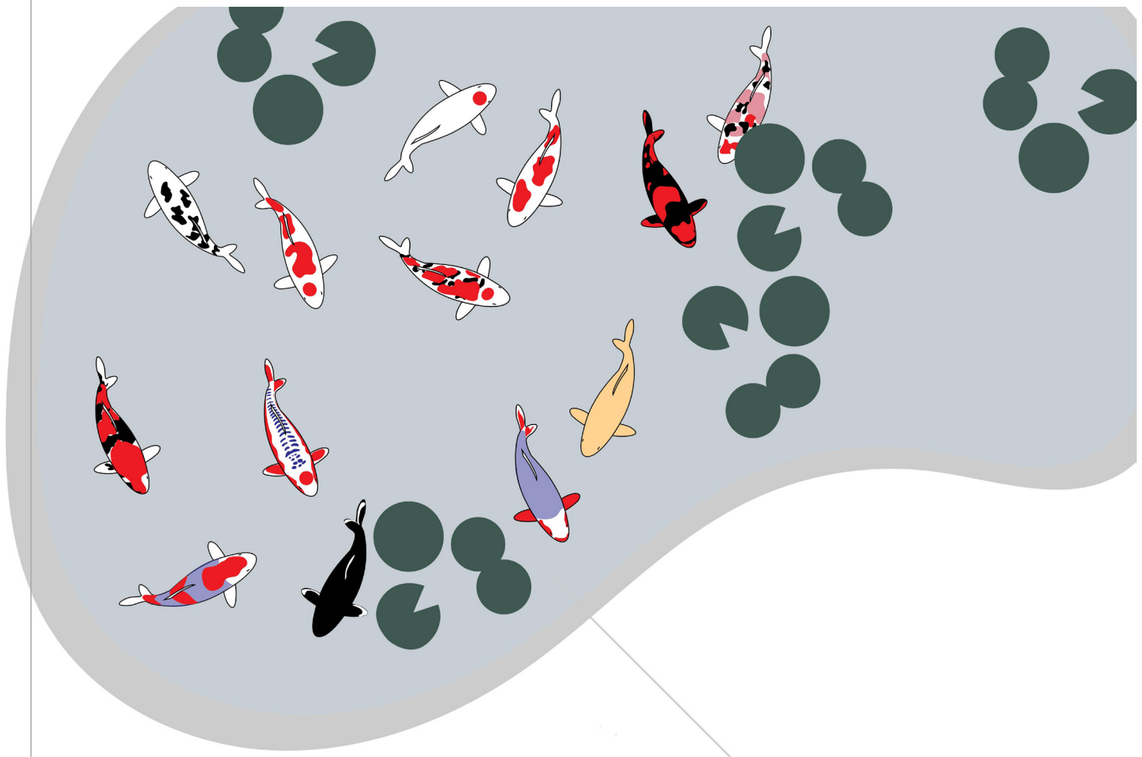
200+ YRS

WEIGHT

~ 12 LBS

LENGTH IN INCHES

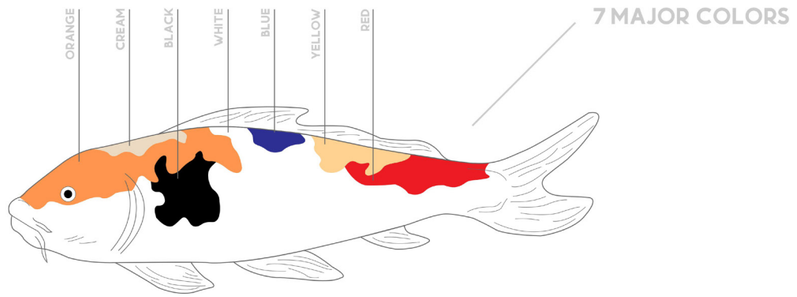
DOMESTIC 12 – 15



CLASSIFICATION / VARIETY

CLASSIFIED INTO
13 MAJOR GROUPS

DISTINGUISHED BY COLORATION, PATTERNING, AND SCALATION.
MORE THAN 100 VARIETIES
EACH VARIETY IS CLASSIFIED INTO 13 GROUPS

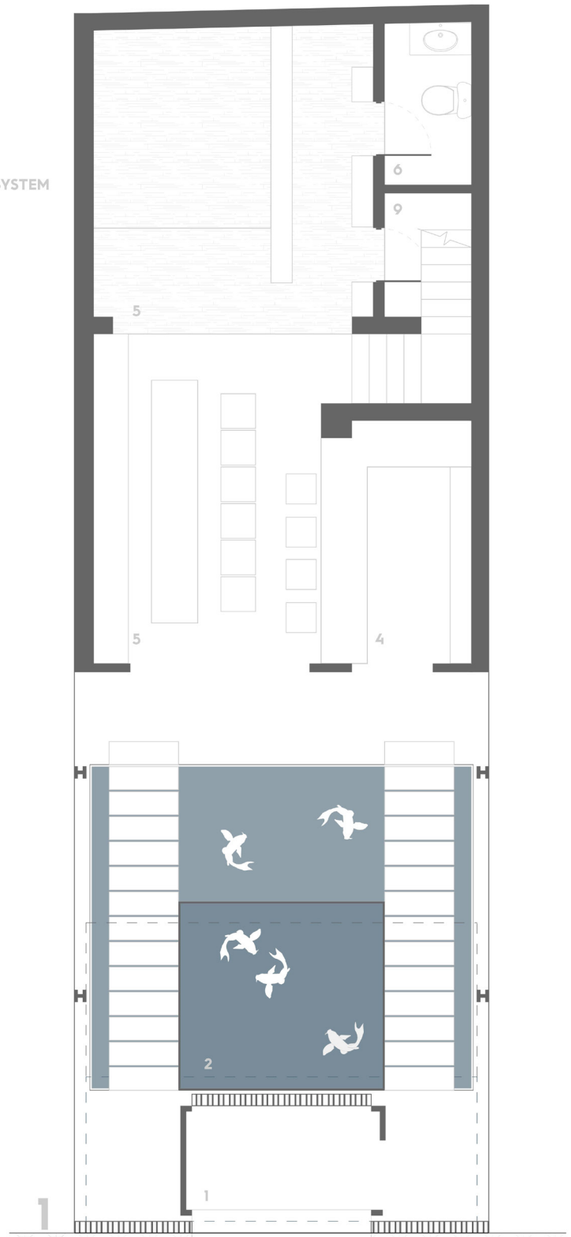


JAPANESE 24 – 34

JUMBO 34 – 36

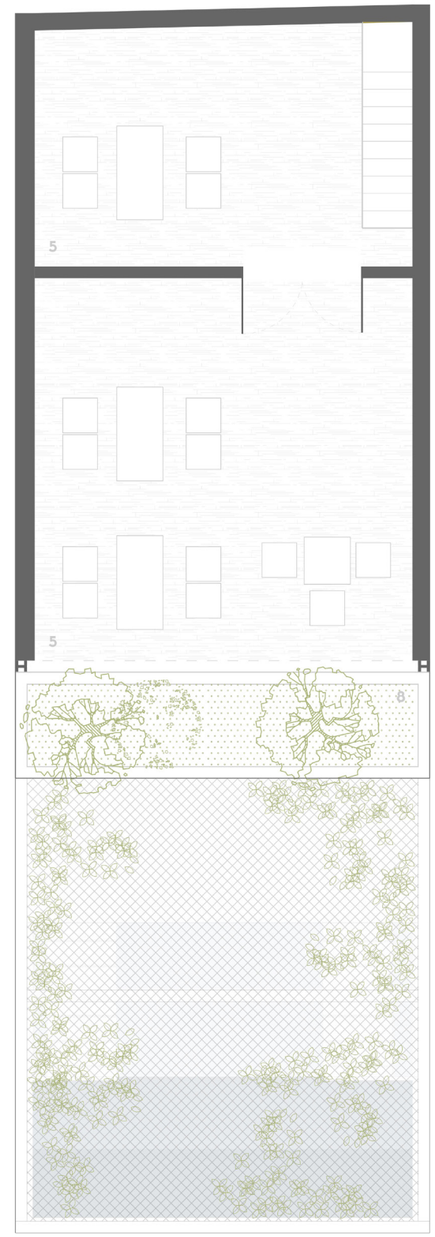
SITE PLAN
1/8" = 1'-0"

1 ENTRANCE
2 KOI POND
3 COFFEE BAR
4 KITCHEN
5 CAFE
6 RESTROOM
7 WATERFALL
8 AQUAPONICS SYSTEM
9 PRIVATE



1

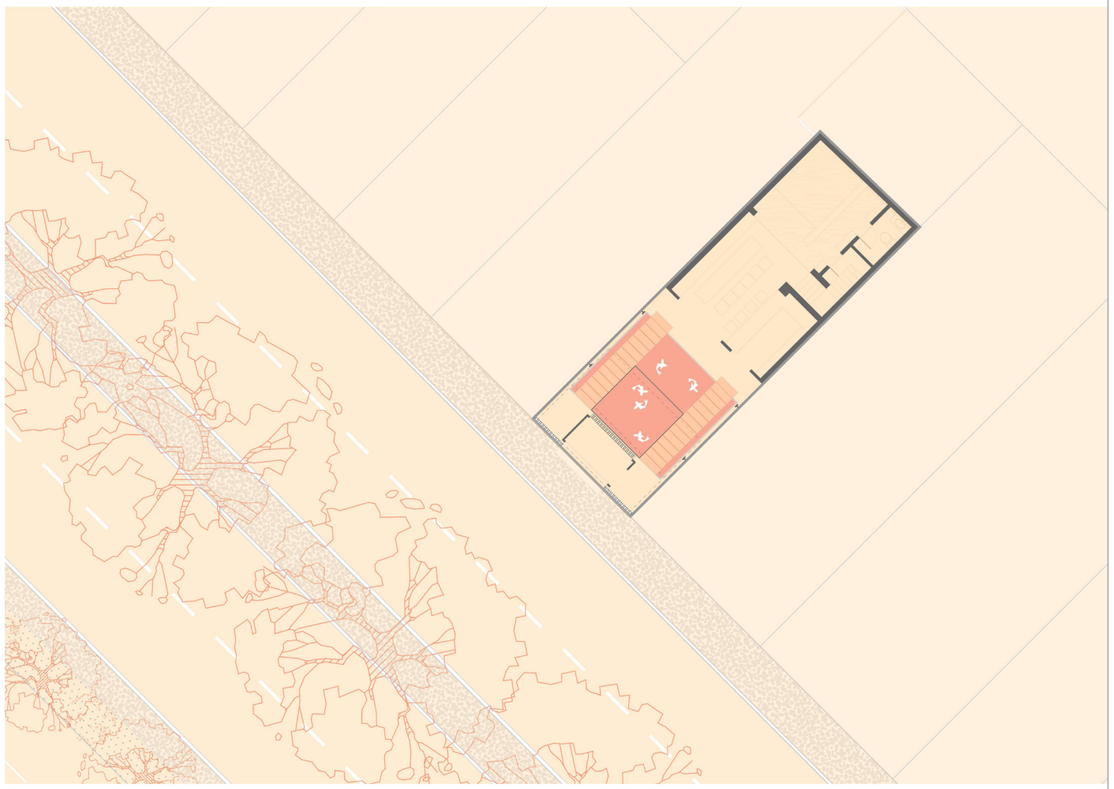
2



3

FLOOR PLANS

3/8" = 1'-0"

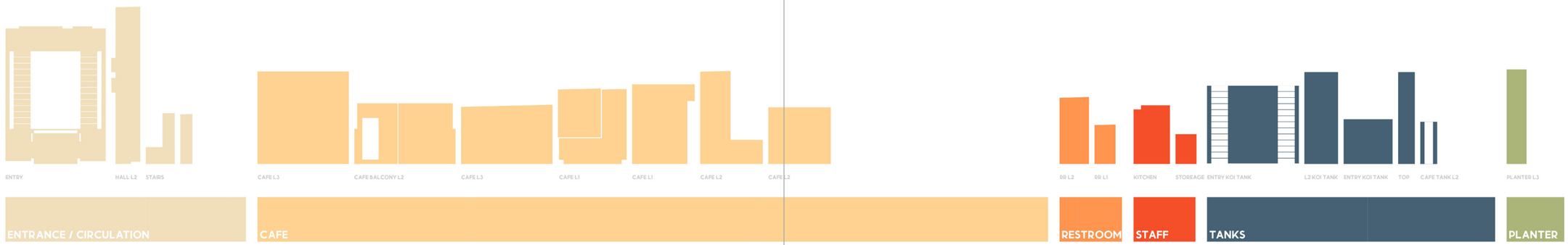


BUILDING / SITE ZONING

1/8" = 1'-0"

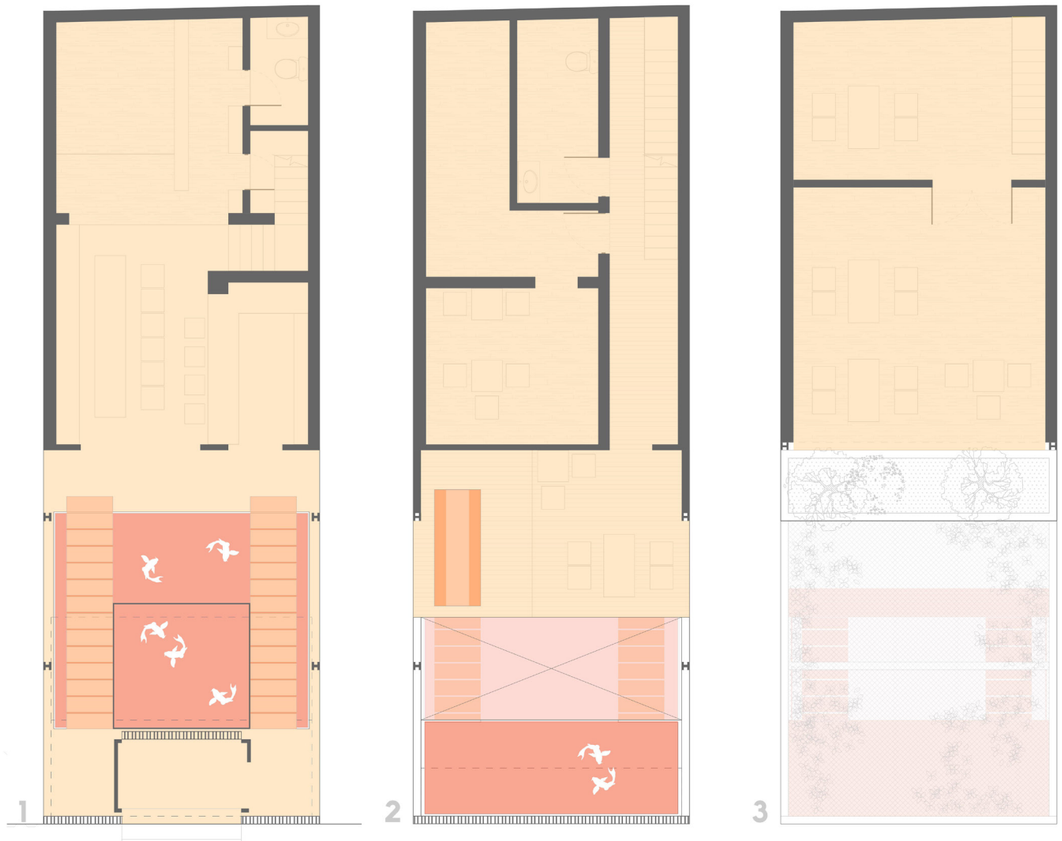
PROGRAM CATALOG / AREA

1/8" = 1'-0"



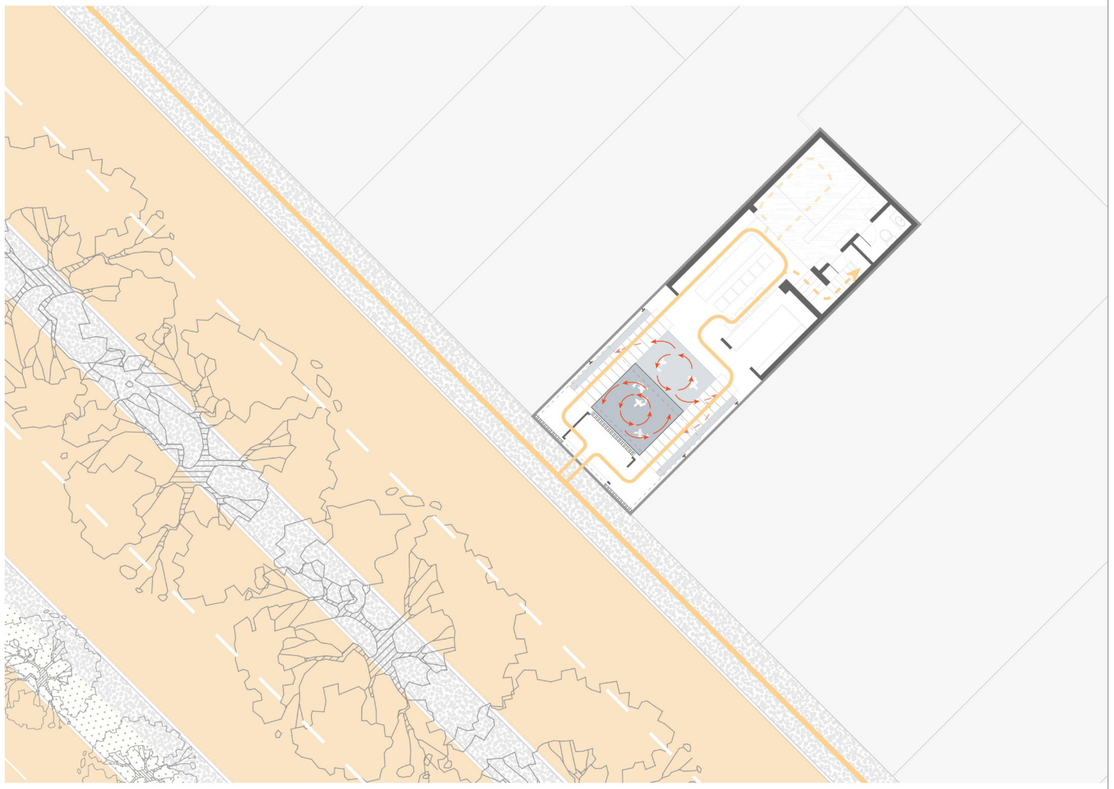
PROGRAM / ZONING

HUMAN
SHARED
NONHUMAN



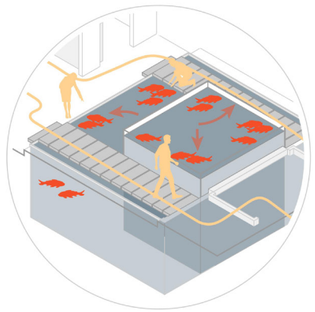
BUILDING ZONING

1/4" = 1'-0"

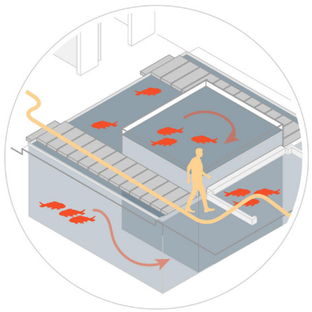


BUILDING / SITE CIRCULATION

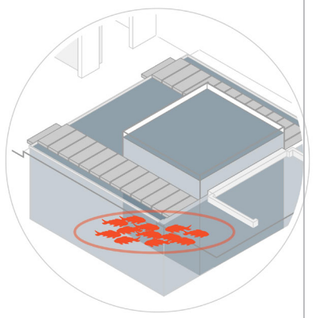
1/8" = 1'-0"



HIGH INTERACTION / PEAK HOURS



LOW / SLOW HOURS



NONE / NIGHT

KOI RHYTHMS / HUMAN INTERACTION LEVELS

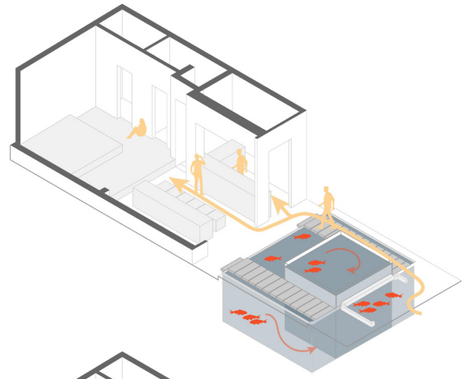
CIRCULATION / RHYTHM

HUMAN
SHARED
NONHUMAN

DAILY RHYTHMS

EARLY MORNING

SHOP OPENING, STAFF AND THE FIRST CUSTOMERS ARRIVE. KOI WAKE UP AND SWIM THROUGHOUT THE TANK, USUALLY SWIMMING IN CLUSTERS RATHER THAN SEPARATELY

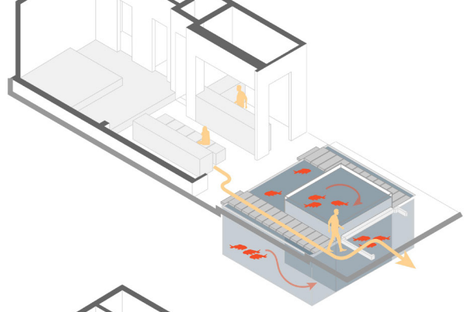


PEAK HOURS

PEAK VISITOR HOURS, HUMAN CUSTOMERS ENTER AND PASS THE KOI POND, ORDER AT THE COUNTER, AND SIT AT TABLES THROUGHOUT THE CAFE TO EAT, DRINK, WORK, AND ADMIRE KOI. SOCIAL KOI SWIM NEAR THE TOP AND EDGES OF THE TANK FOR FEEDING BY STAFF AND CUSTOMERS

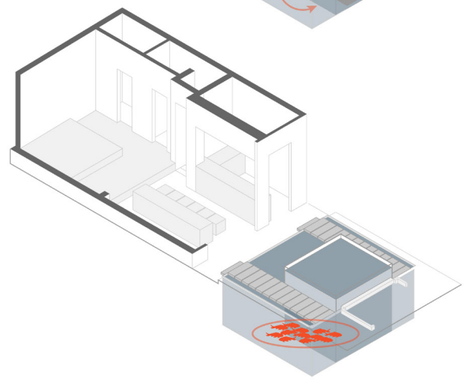
EVENING

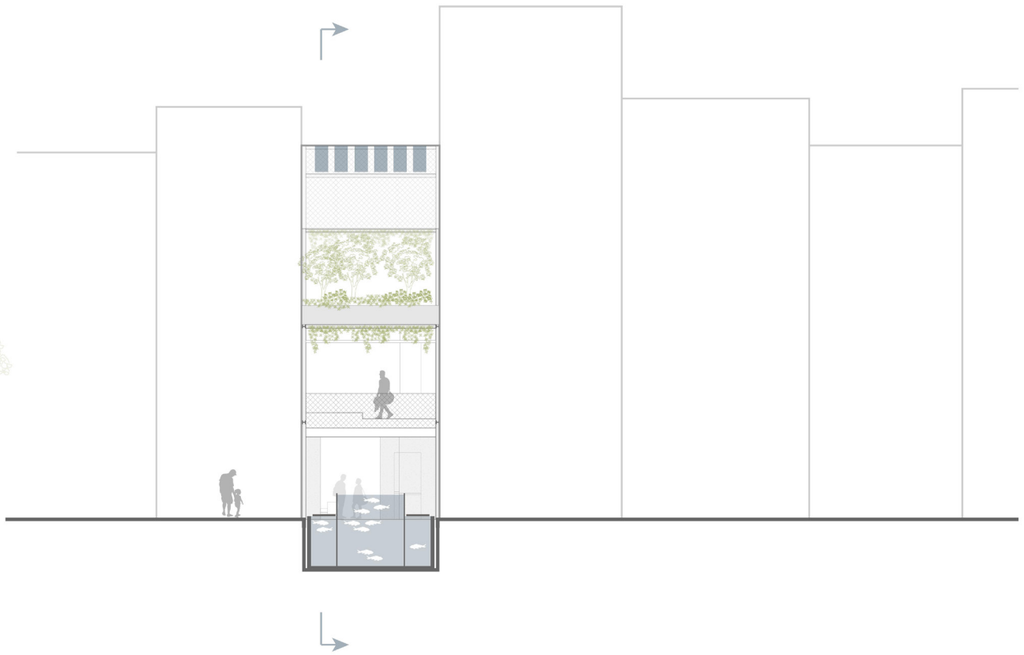
THE LAST OF THE STAFF AND CUSTOMERS EXIT THE CAFE AND KOI HANG OUT IN CLUSTERS THROUGHOUT THE TANK



NIGHT

SHOP CLOSED AND EMPTY OF HUMAN TRAFFIC, KOI REST IN LARGE GROUP AT THE BOTTOM CENTER OF THE TANK



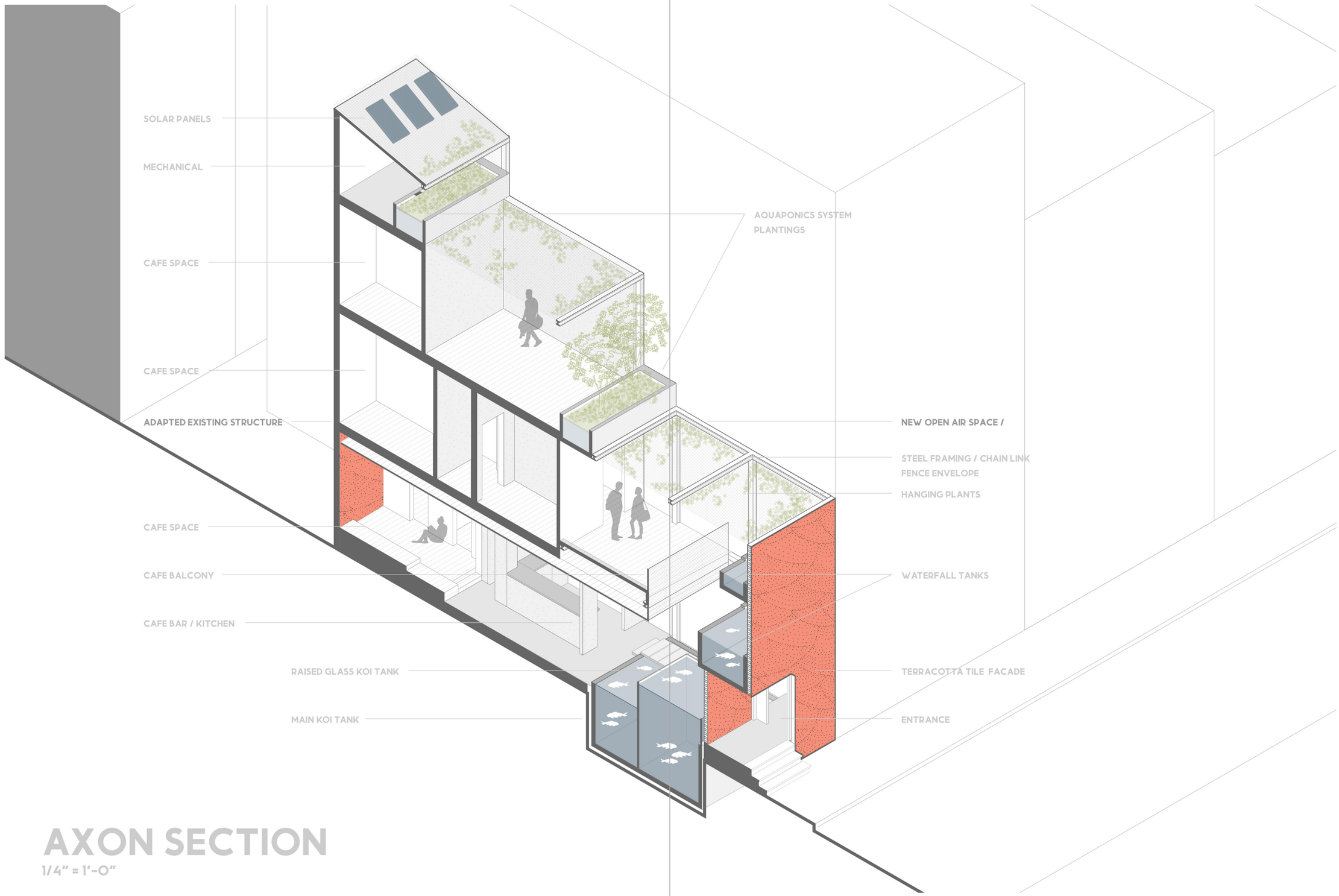


BUILDING / SITE SECTIONS

1/8" = 1'-0"

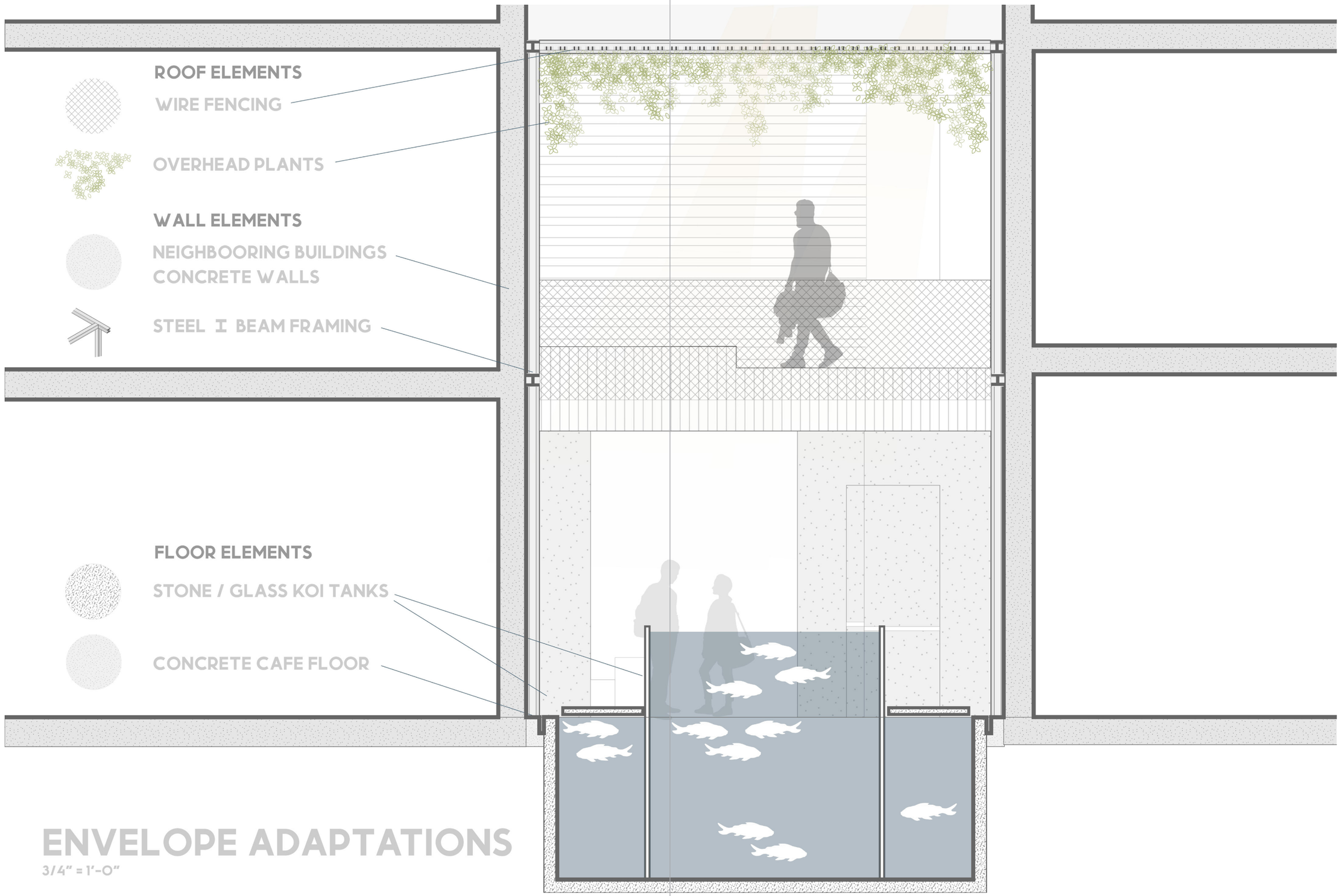
BUILDING SECTIONS

3/8" = 1'-0"



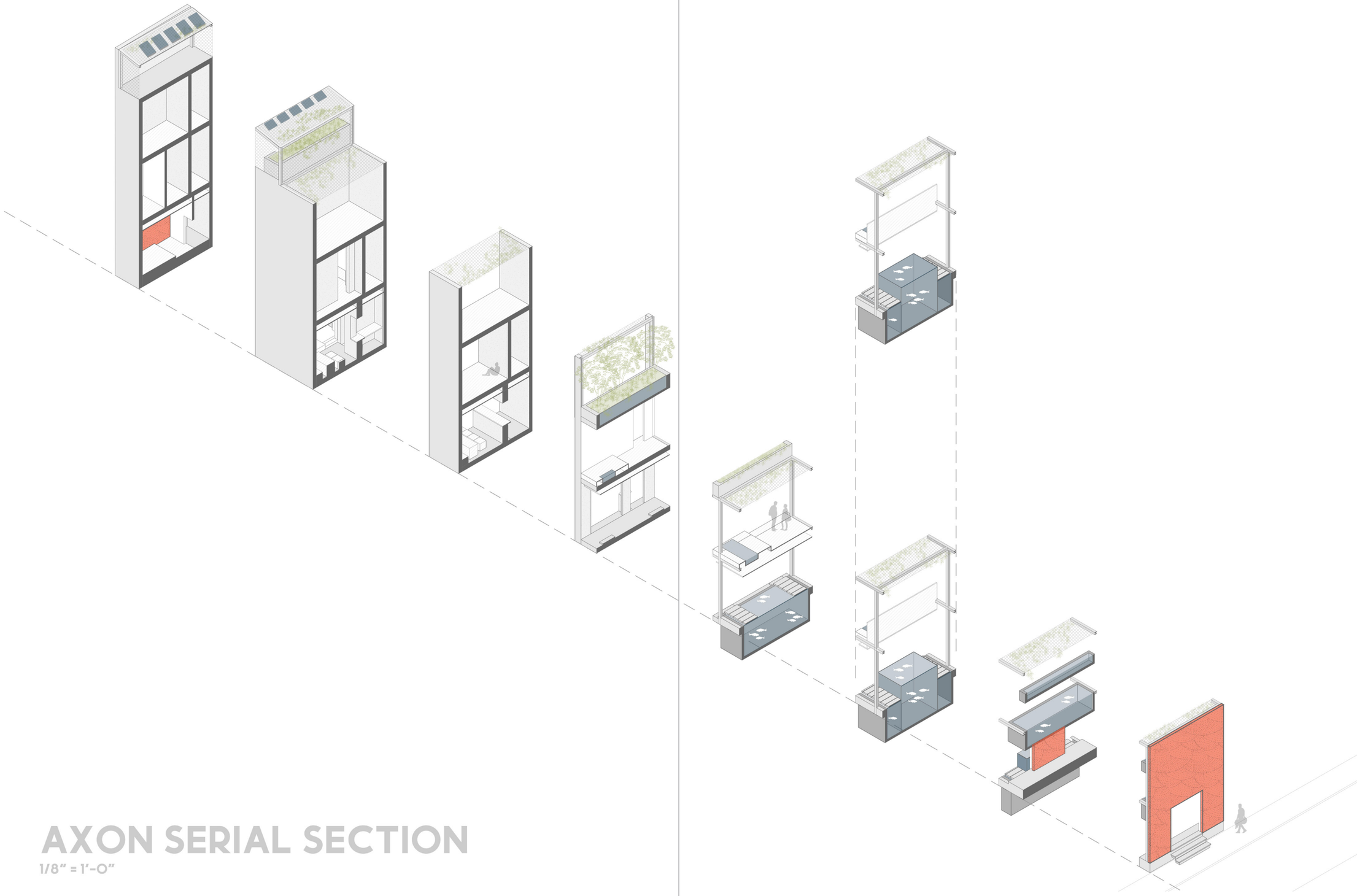
AXON SECTION

1/4" = 1'-0"



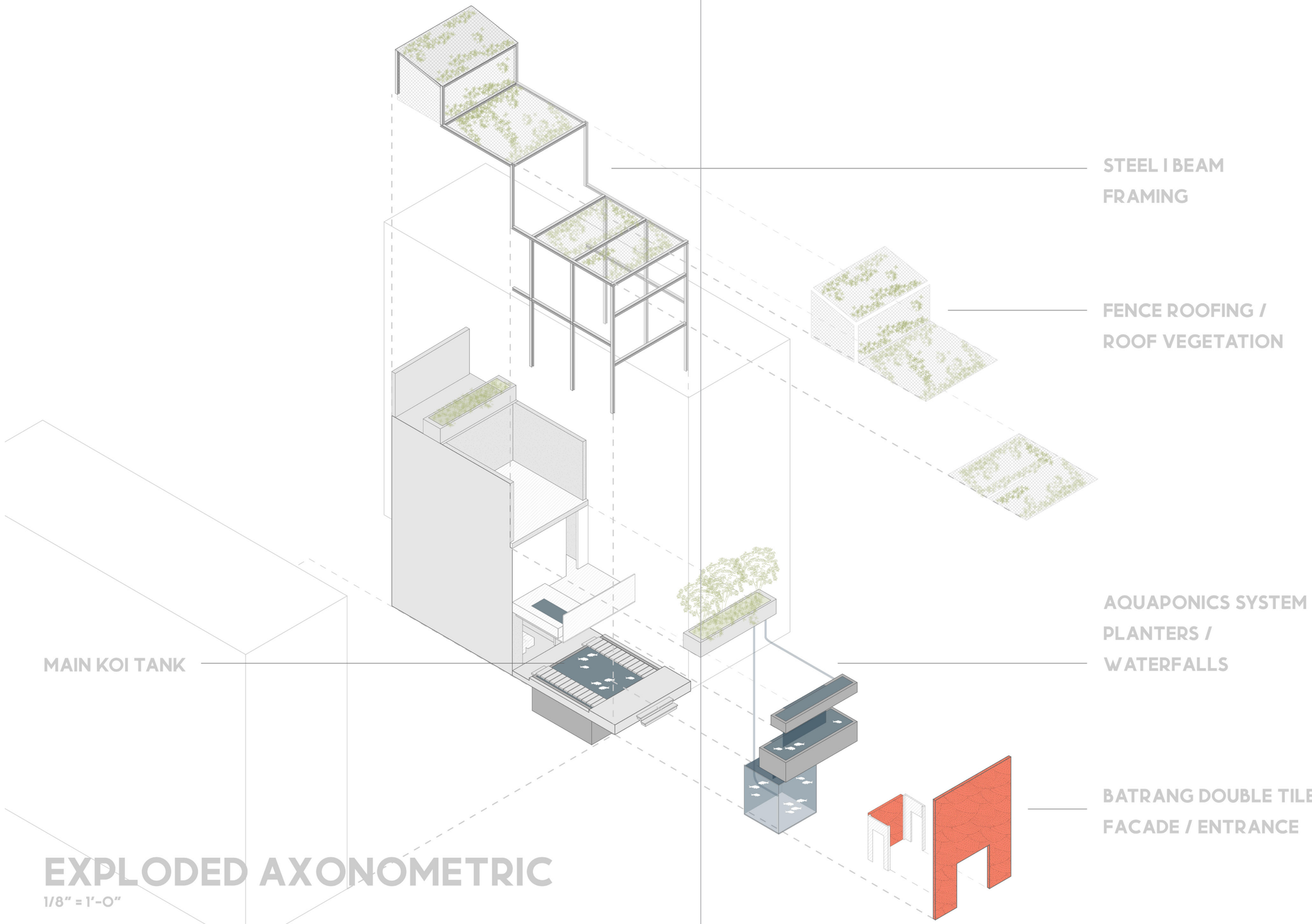
ENVELOPE ADAPTATIONS

3/4" = 1'-0"



AXON SERIAL SECTION

1/8" = 1'-0"

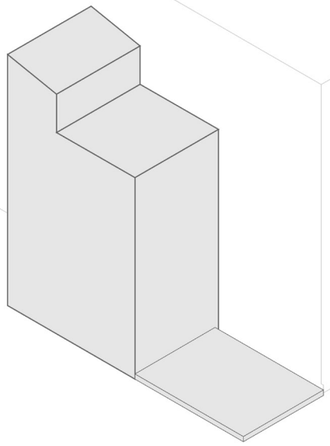


EXPLODED AXONOMETRIC

1/8" = 1'-0"

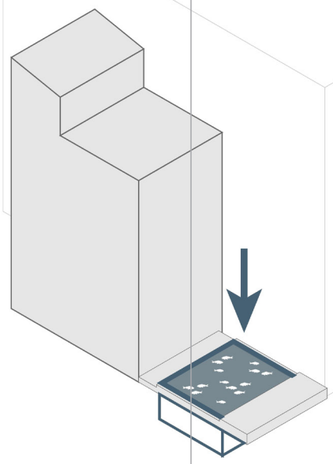
EXISTING

EXISTING HOUSE AND YARD



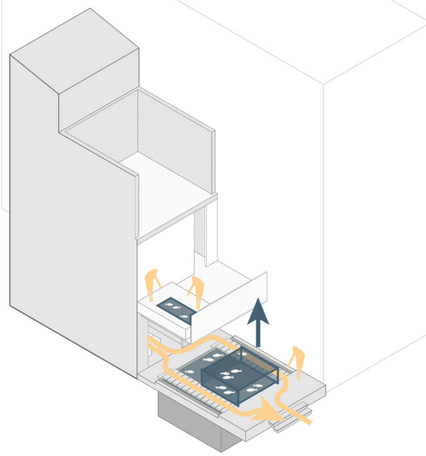
DIG

KOI TANK DUG INTO YARD



ENGAGEMENT

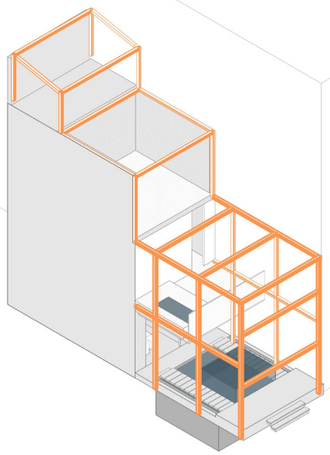
RAISED TANK AND CIRCULATION OVER TANK



STRUCTURE

EASY TO INSTALL AND REMOVE

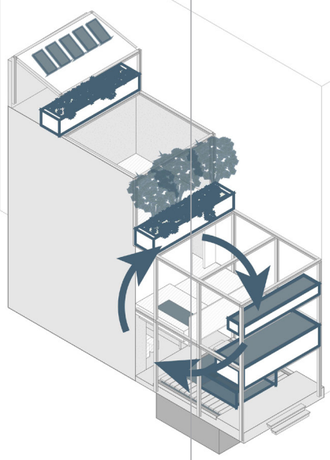
STEEL FRAMING



FUNCTION

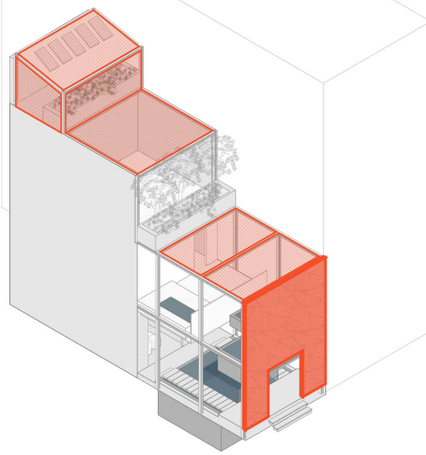
WATERFALLS / AQUAPONICS SYSTEM /

SOLAR PANELS



SKIN

PERMEABLE TILE FACADE AND WIRE ROOF



PROCESS SEQUENCE

1/12" = 1'-0"

HOUSE OF CHICKENS

ETHAN RATLIFF
ARCH445
PROFESSOR EZBAN
SPRING 2021

ERZINCAN, TURKEY
SO? Architecture and Ideas
2018
456 ft²

House of Chickens, designed by SO? Architecture and Ideas, is a brilliantly designed chicken coop. The structure strives to enhance the bond between it and the surrounding nature. Using simple construction techniques, the coop does not dominate the surrounding terrain. The structure is formed by timber, an attempt to further mimic the natural environment, in which the chickens can take shelter. As various dangers approach the building, the coop reacts to ensure that the chickens are protected. Due to the elevated platform, predators have difficulty preying on the chicken. Additionally, for extreme weather conditions such as snow, the pitched roof catches the snow and leaves the ground beneath clear for the chickens. Not only was the structure designed with consideration of the chickens, but also human interaction. Every chicken has an individual module for sleeping and incubating; this can be seen in the longitudinal section of the structure. However, looking at the cross section of the structure, the subtle design choices that allow humans to interact are clear. Every module possesses a hatch in which a human can collect eggs. Furthermore, the modularity of the units and other panel systems allow the humans to clean/maintain the coop efficiently. With such efficient design, the chickens have a luxurious home for them to thrive and further bond with their human caretakers.

CHICKEN:

(Gallus gallus domesticus)

5.7 lbs

AGE 8-12 years

SPATIAL REQUIREMENTS: INSIDE

3 ft²

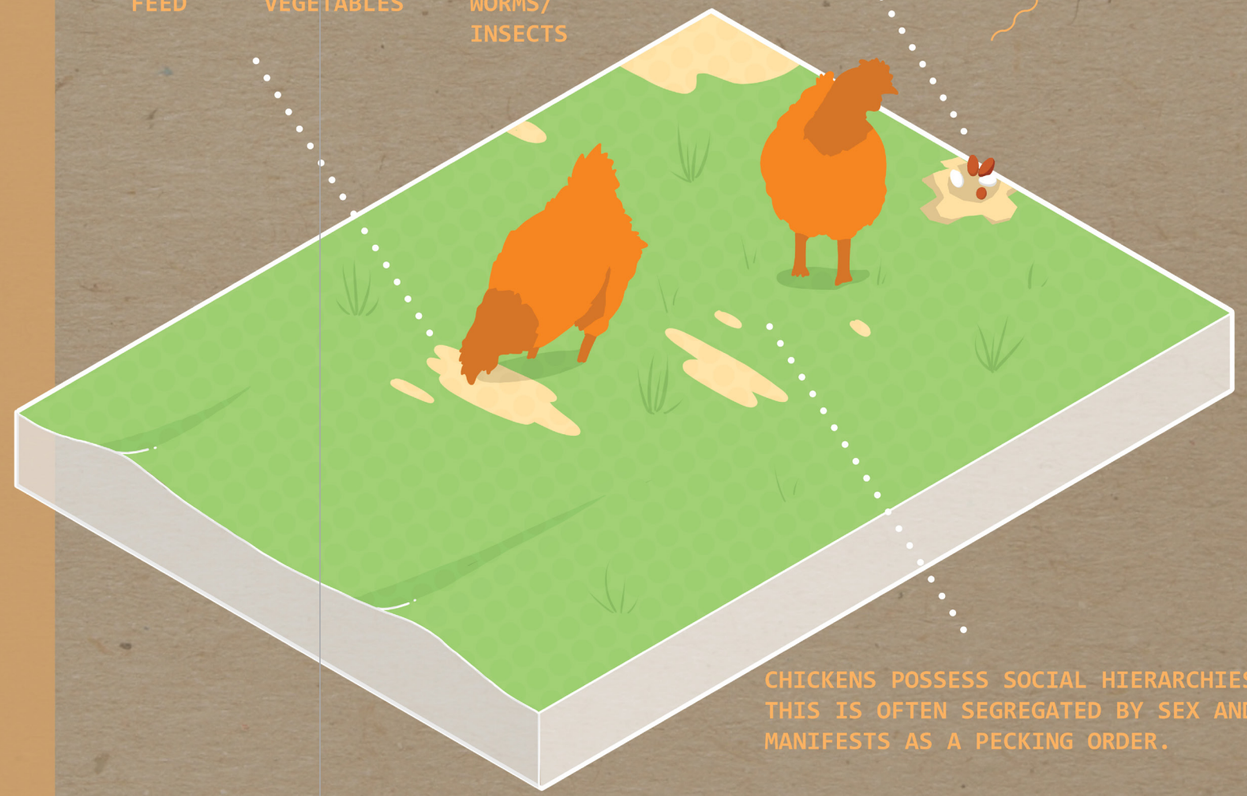
9 ft²

MINIMAL SPACE CAN CAUSE STRESS, CANNIBALISM, PECKING, AND SOMETIMES DEATH FOR THE CHICKEN.

CHICKENS BREED IN THE SPRING AND SUMMER MONTHS. EGG LAYING IS STIMULATED BY LONGER STRETCHES OFF DAYLIGHT.

FEED VEGETABLES WORMS/ INSECTS

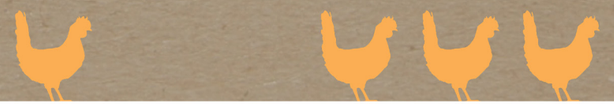
EGGS ARE COLLECTED, CLEANED, AND STORED.



CHICKENS POSSESS SOCIAL HIERARCHIES. THIS IS OFTEN SEGREGATED BY SEX AND MANIFESTS AS A PECKING ORDER.

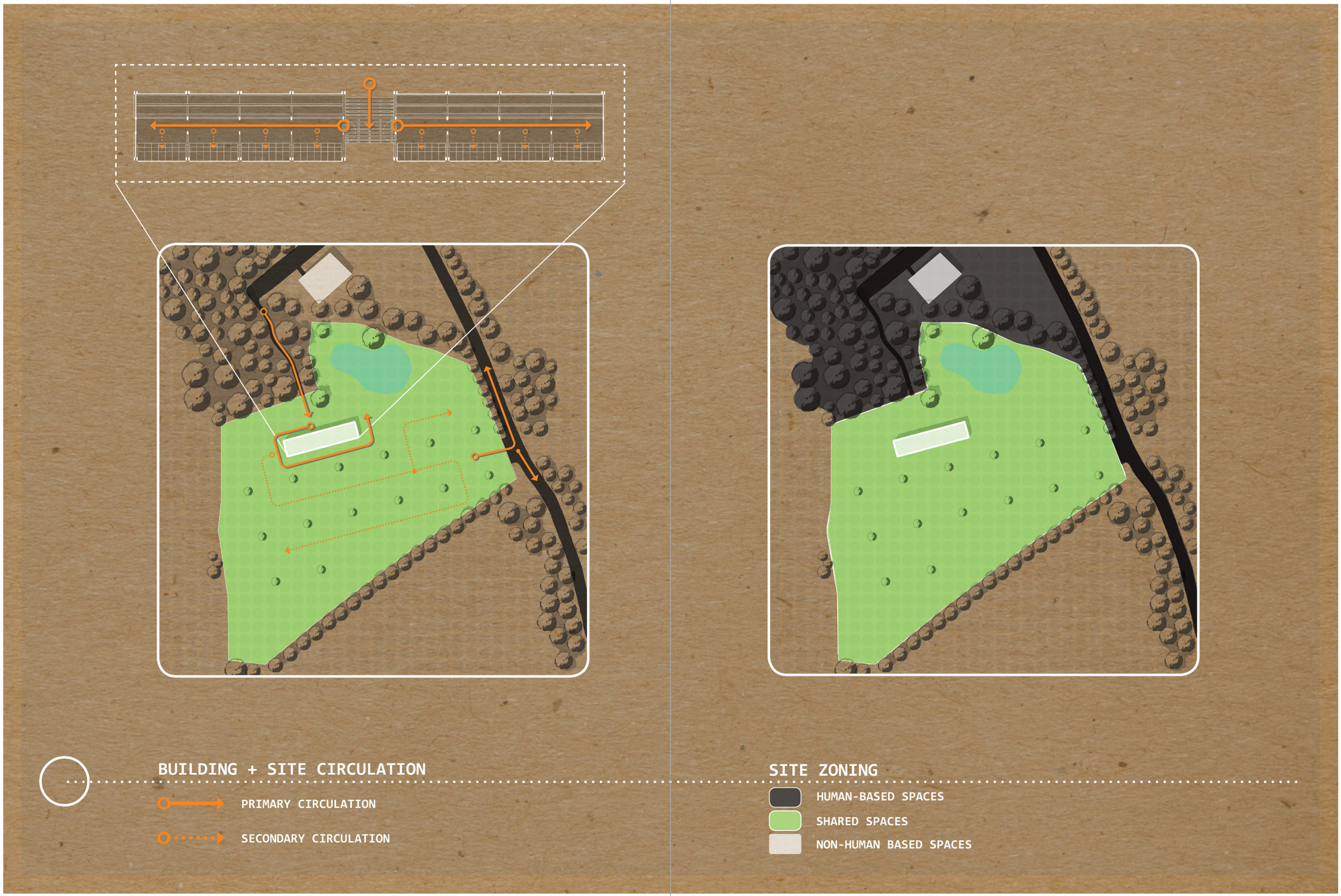
8-10 ft²

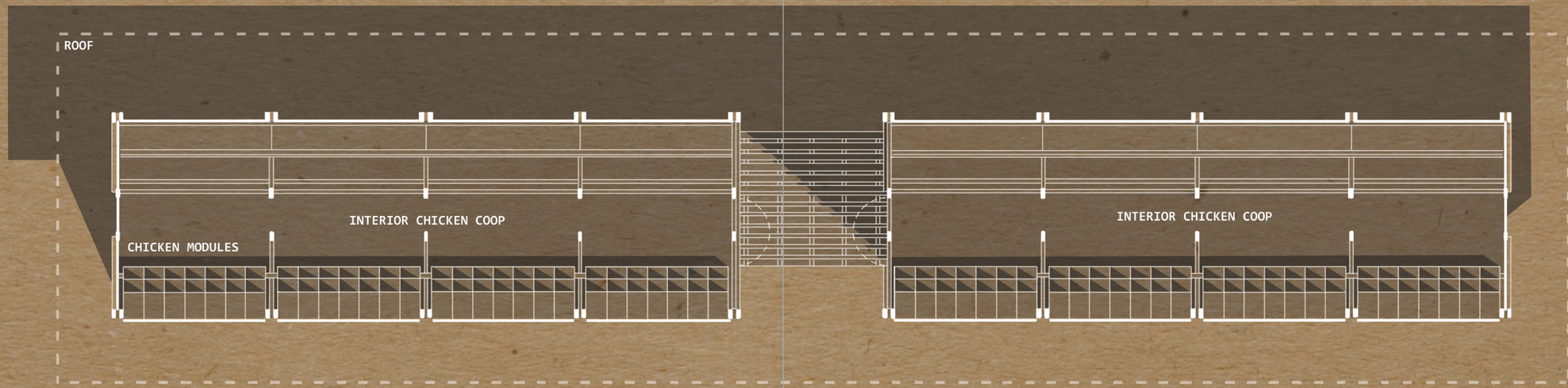
24-30 ft²



SPATIAL REQUIREMENTS: OUTSIDE PEN SPACE

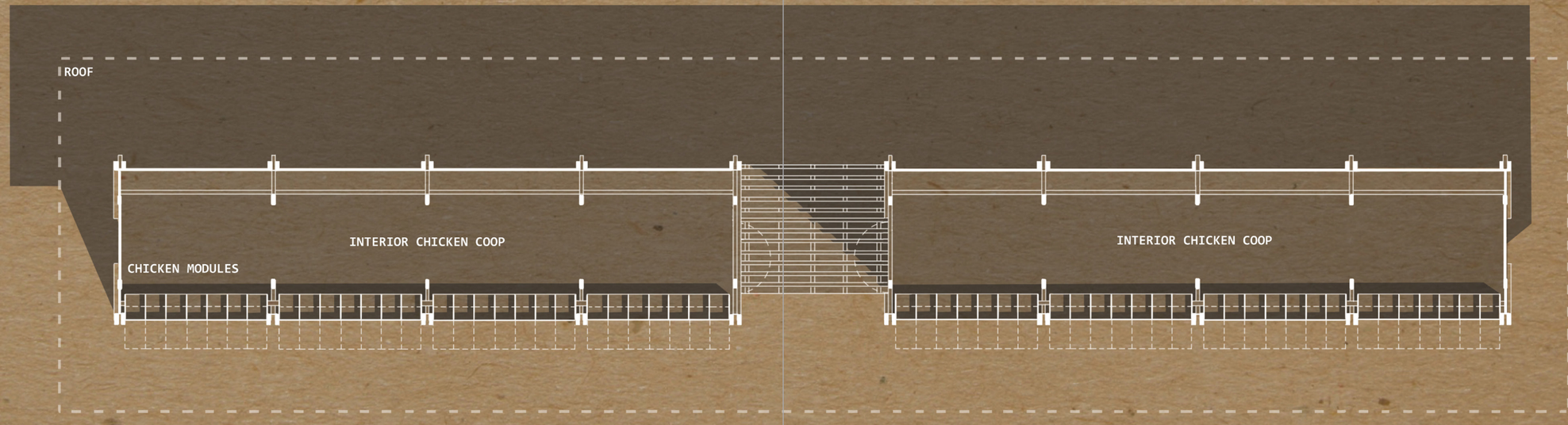
TURKEY
SYRIA
FARMER'S HOUSE
POND
COOP
FREE RANGE AREA
N
SITE PLAN - 1/20" = 1'-0"


BUILDING + SITE CIRCULATION
PRIMARY CIRCULATION
SECONDARY CIRCULATION
SITE ZONING
HUMAN-BASED SPACES
SHARED SPACES
NON-HUMAN BASED SPACES



N

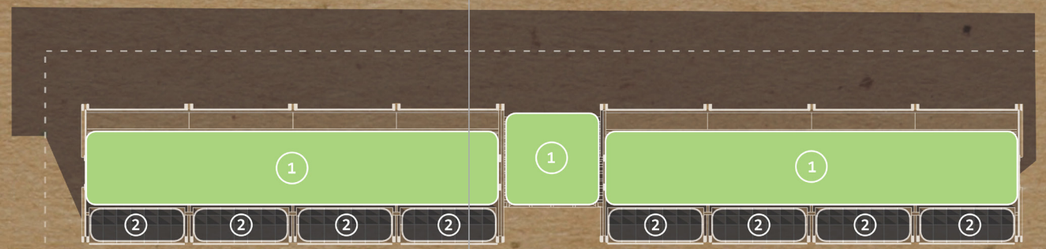
FLOOR PLAN - 3/8” = 1’-0”



N

FLOOR PLAN - 3/8” = 1’-0”

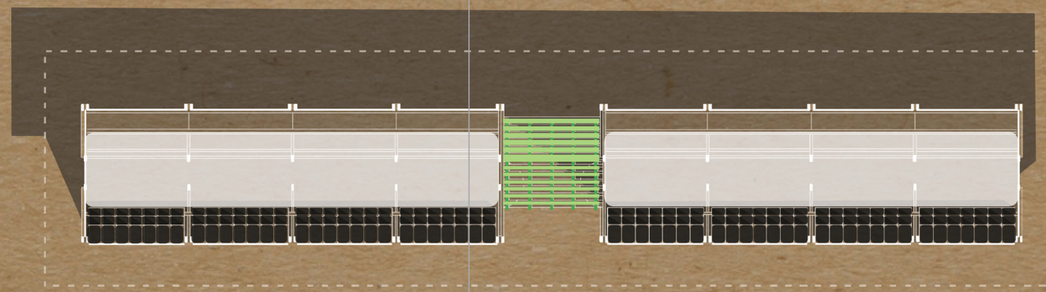
BUILDING ZONING



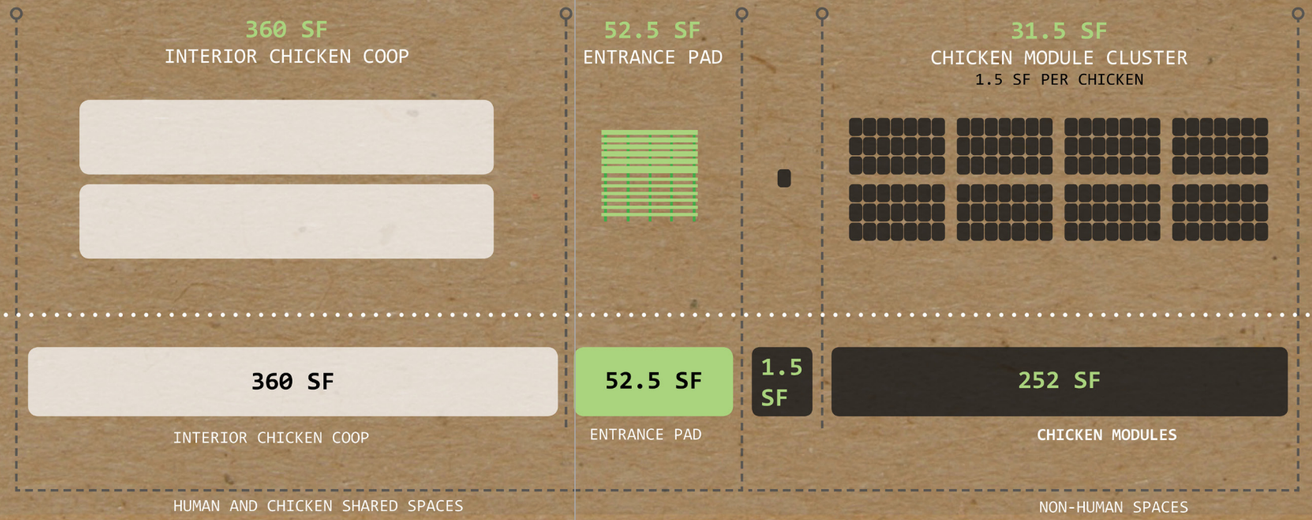
1 SHARED SPACES

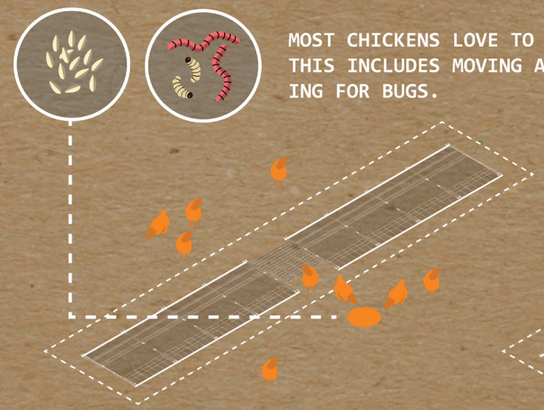
2 NON-HUMAN BASED SPACES

PROGRAM CATALOG

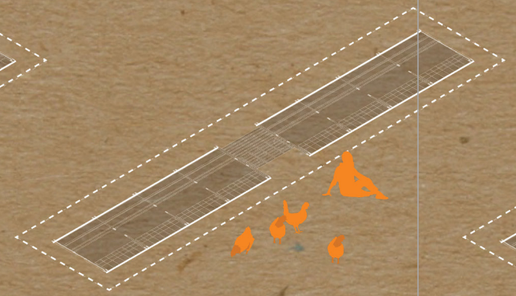


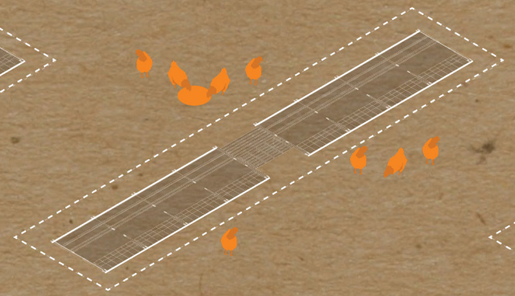
PROGRAM AREA



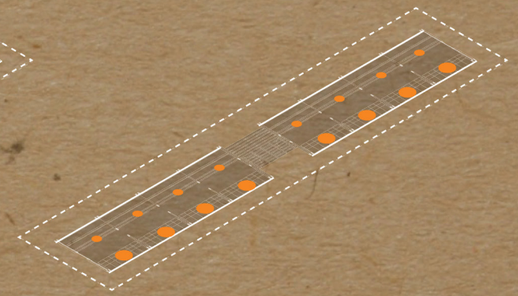


MOST CHICKENS LOVE TO FORAGE. THIS INCLUDES MOVING AND LOOKING FOR BUGS.





ROOSTING BARS ARE OFTEN USED FOR SLEEP.



WAKING

EGG COLLECTION (10:00 AM)

FEEDING & DRINKING (MORNING)

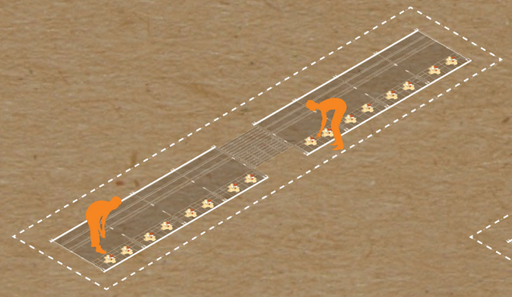
CLEANING (ONCE A MONTH)

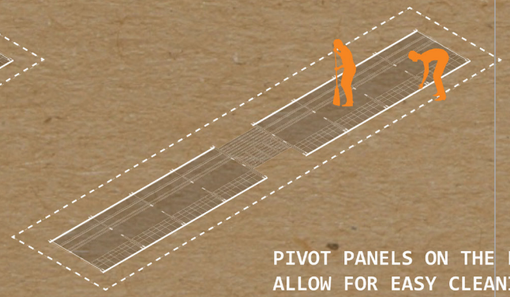
SOCIALIZING (INCLUDES HUMANS)

FEEDING & DRINKING (EVENING)

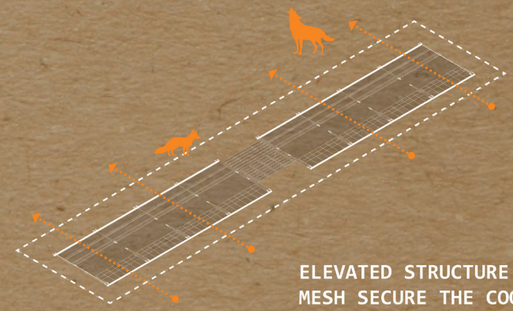
PREDATORS CIRCULATE UNDER THE COOP AT NIGHT

SLEEPING





PIVOT PANELS ON THE EXTERIOR ALLOW FOR EASY CLEANING



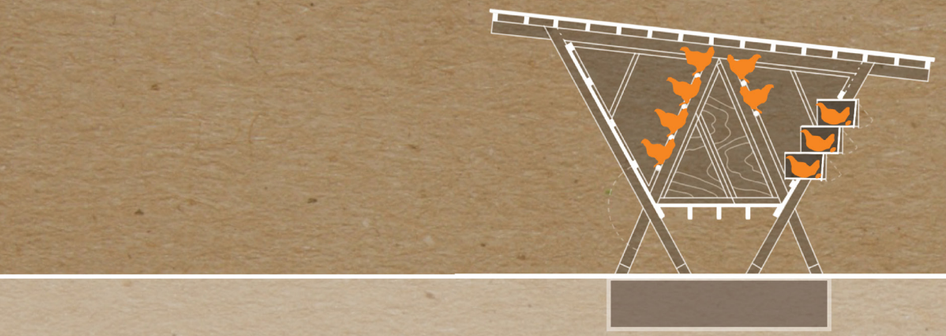
ELEVATED STRUCTURE AND WIRE MESH SECURE THE COOP

EARLY MORNING

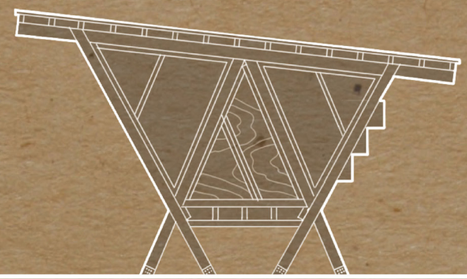
MID-DAY

NIGHT

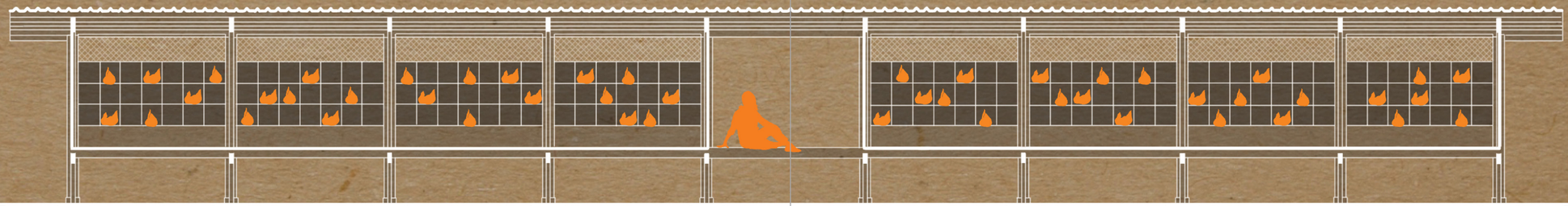
HUMAN + NONHUMAN DAILY RHYTHM



CROSS SECTION - 3/8” = 1’-0”

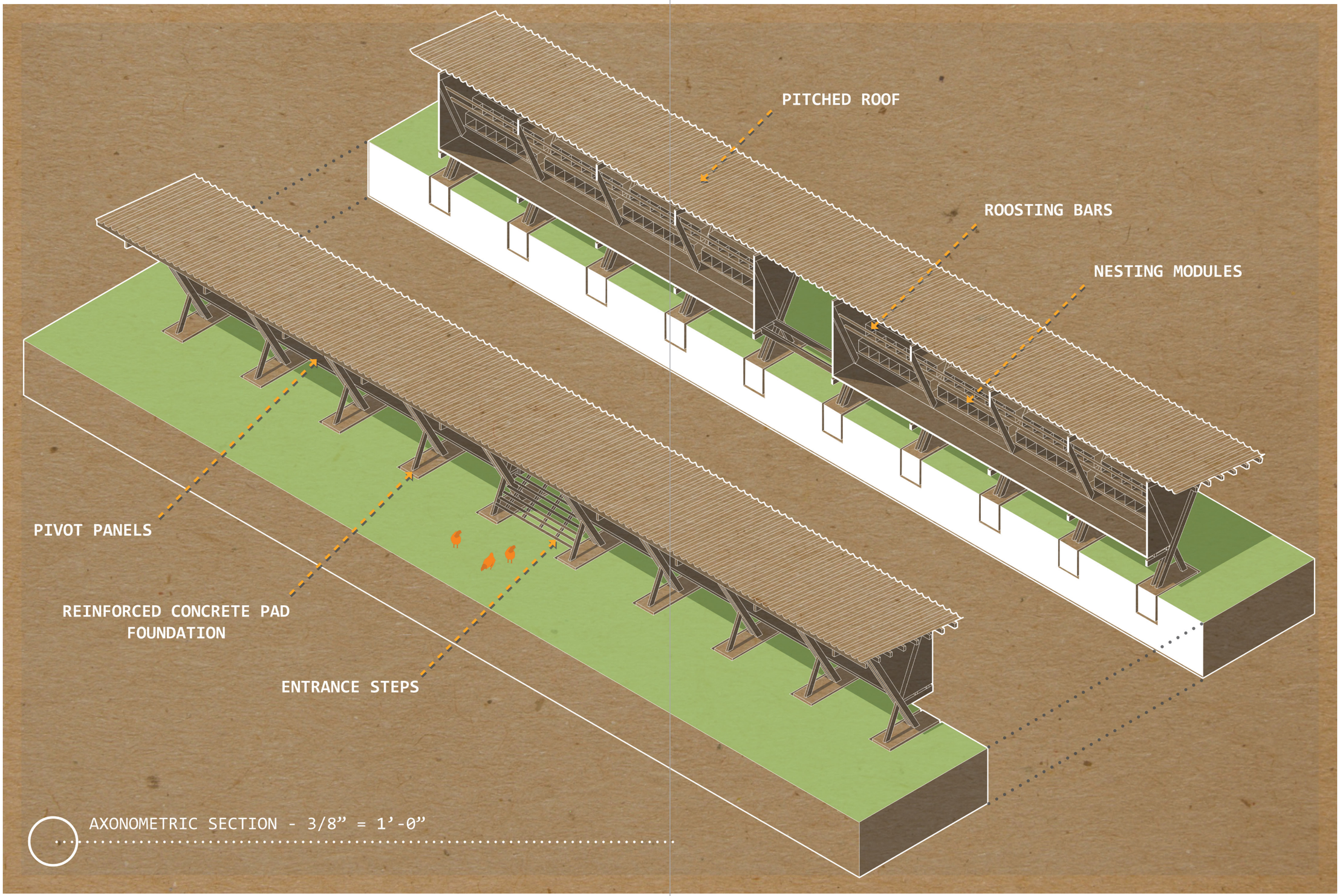


WEST ELEVATION - 3/8” = 1’-0”

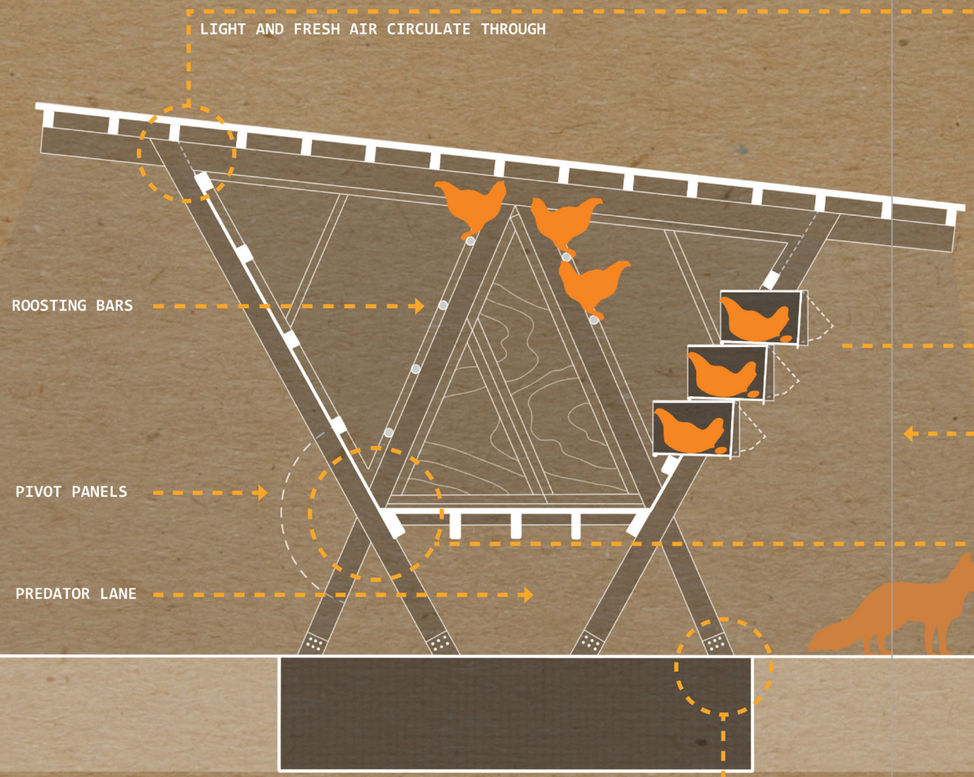


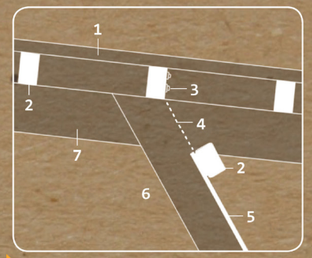
LONGITUDINAL SECTION - 3/8” = 1’-0”

SOUTH ELEVATION - 3/8” = 1’-0”



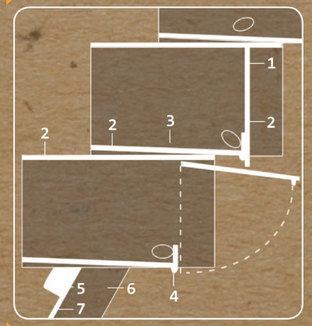
AXONOMETRIC SECTION - 3/8” = 1’-0”





ROOF DETAIL

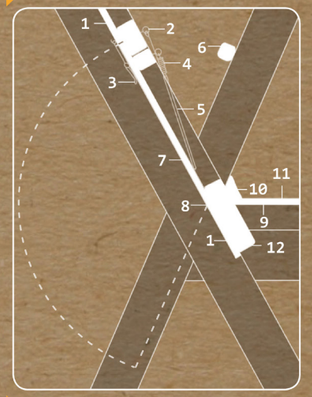
1. Galvanized corrugated roof sheet
2. 10x6cm structural wood beam
3. Galvanized screw
4. Galvanized welded wire mesh
5. 18mm magnesium oxide panel
6. 14x6cm structural wood column
7. 16x6cm structural wood beam



NESTING BOX DETAIL

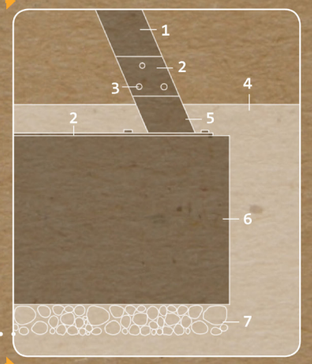
1. Galvanized hinge
2. 12mm pine plywood
3. Sawdust
4. Galvanized lock
5. Structural wood beam (spruce)
6. Structural wood column (spruce)
7. 18mm magnesium oxide panel

SHADE GENERATED BY ROOF



COVER DETAIL

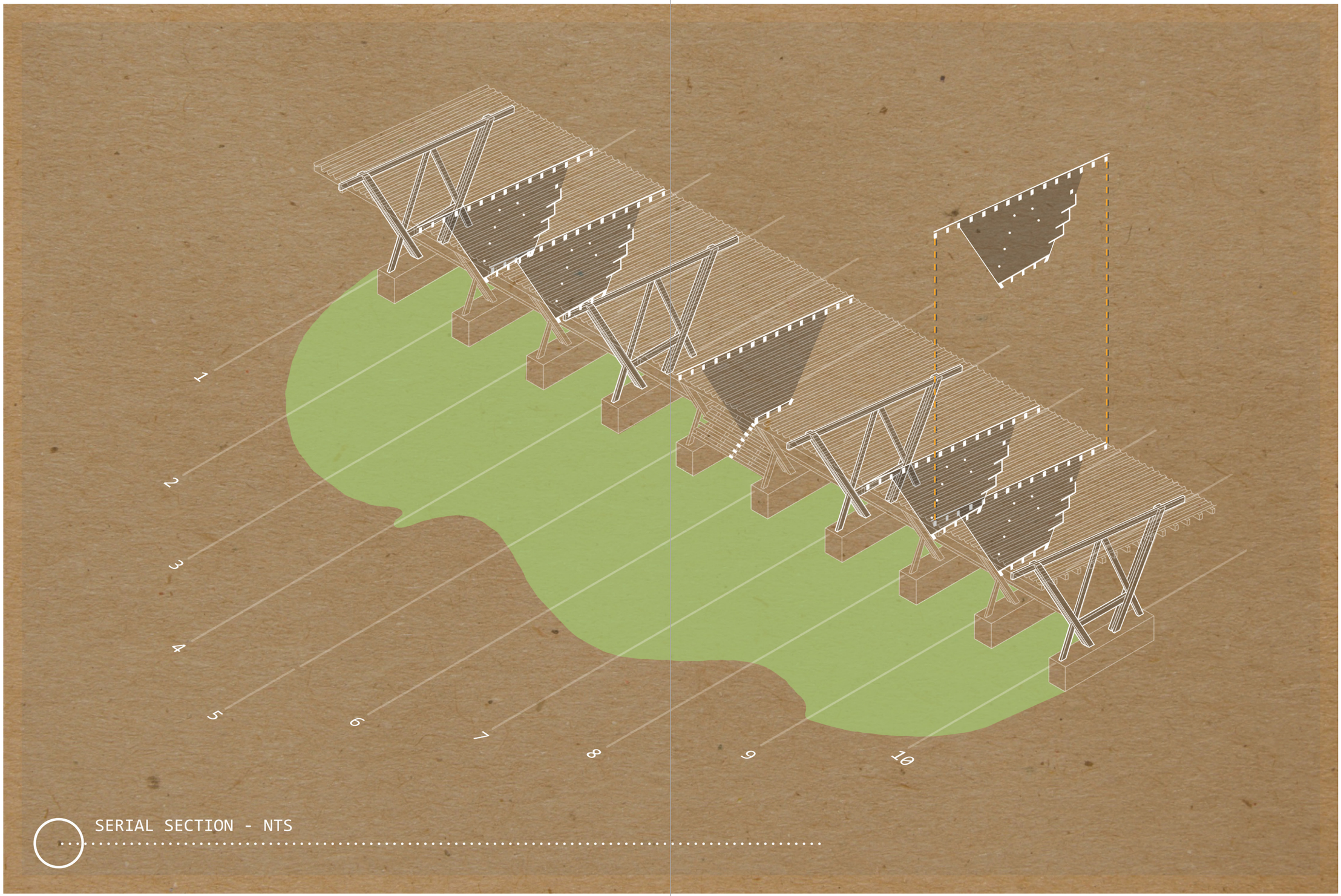
1. 18mm magnesium oxide panel
2. Galvanized hook
3. Galvanized adjustable fastener
4. Galvanized spring
5. Galvanized wire rope
6. 5x5cm chamfered wood roosting bar
7. 18mm pine plywood cover
8. Galvanized hinge
9. 18mm laminated pine plywood floor
10. Wood profile
11. Sawddust
12. Structural wood beam (spruce)



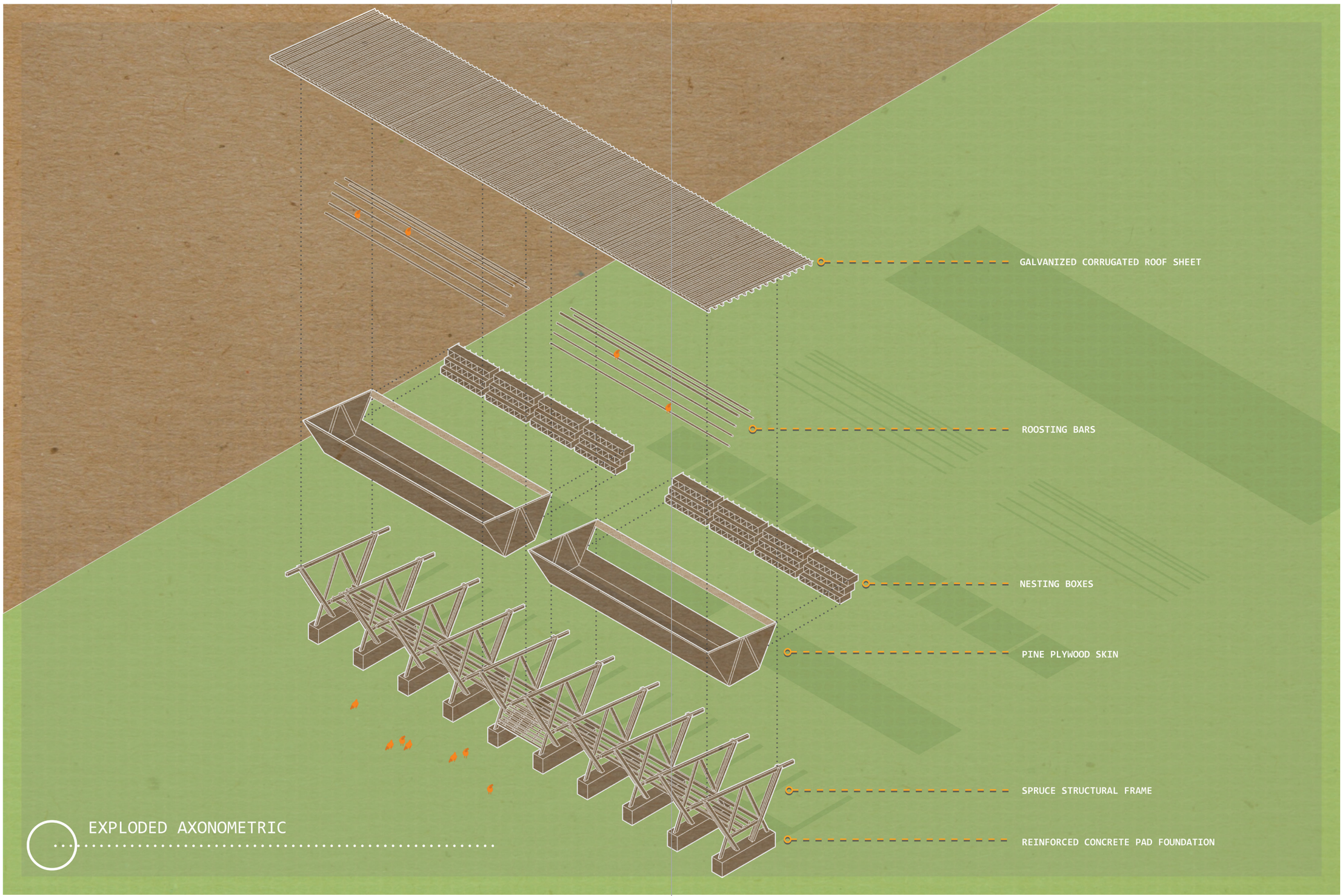
FOUNDATION DETAIL

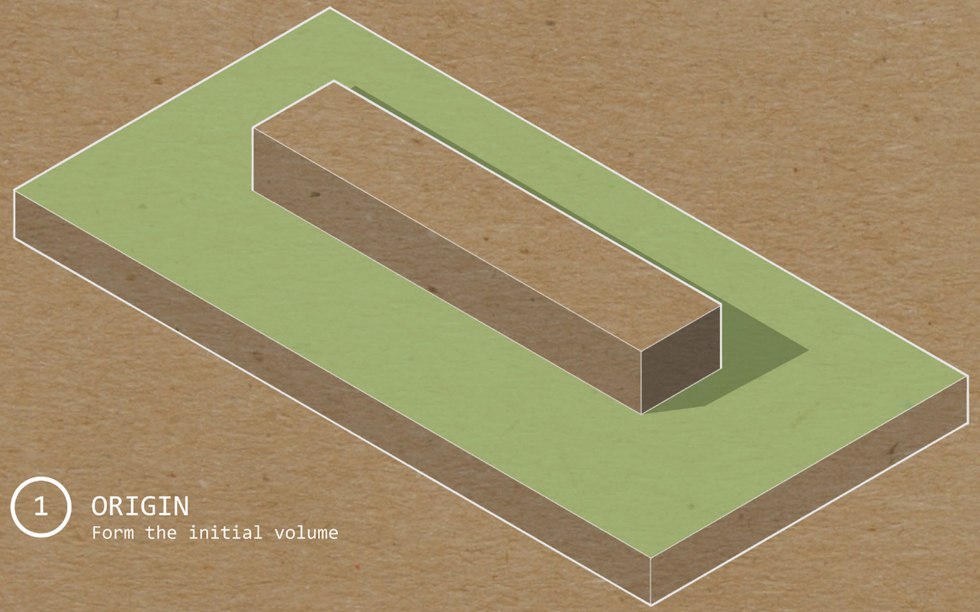
1. 14x6cm Structural wood column (Spruce)
2. 10mm galvanized steel pole anchor plate
3. M10 galvanized hexagon head bolt
4. Planting
5. Polyamide protection level
6. Reinforced concrete pad foundation
7. Pebble

ENVELOPE SECTION - 3/4” = 1’-0”

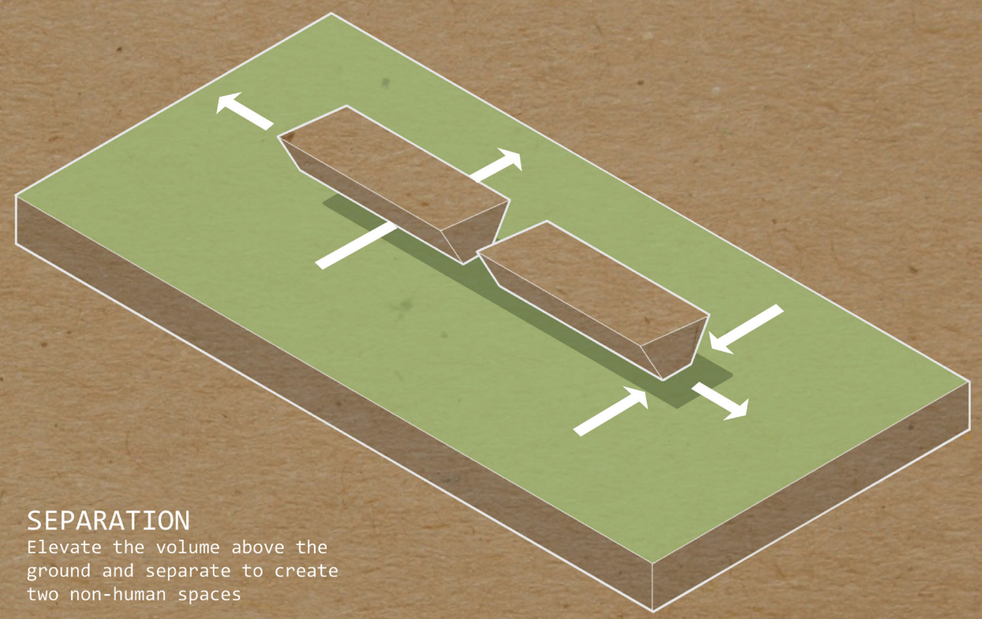


SERIAL SECTION - NTS

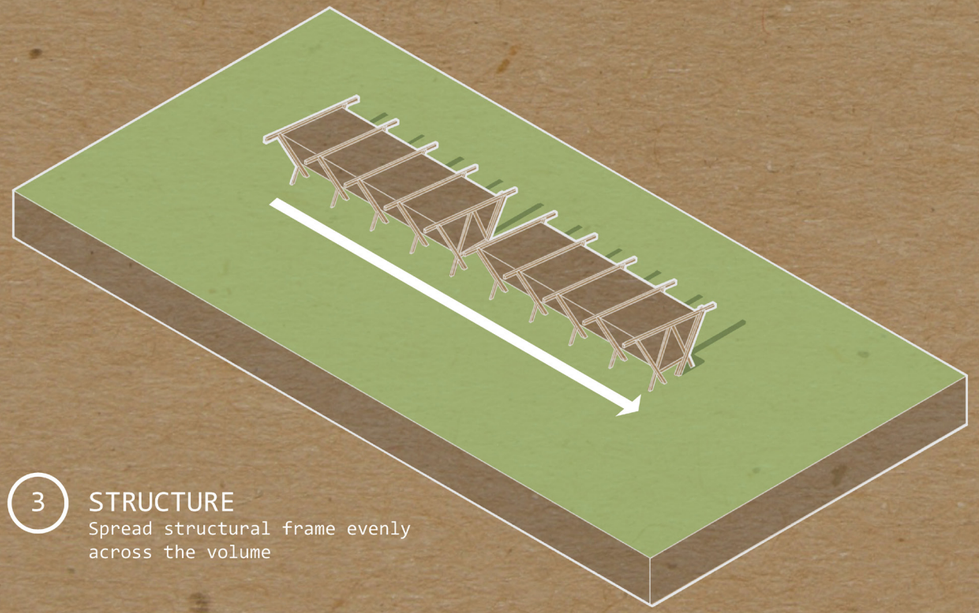

GALVANIZED CORRUGATED ROOF SHEET
ROOSTING BARS
NESTING BOXES
PINE PLYWOOD SKIN
SPRUCE STRUCTURAL FRAME
REINFORCED CONCRETE PAD FOUNDATION
EXPLODED AXONOMETRIC



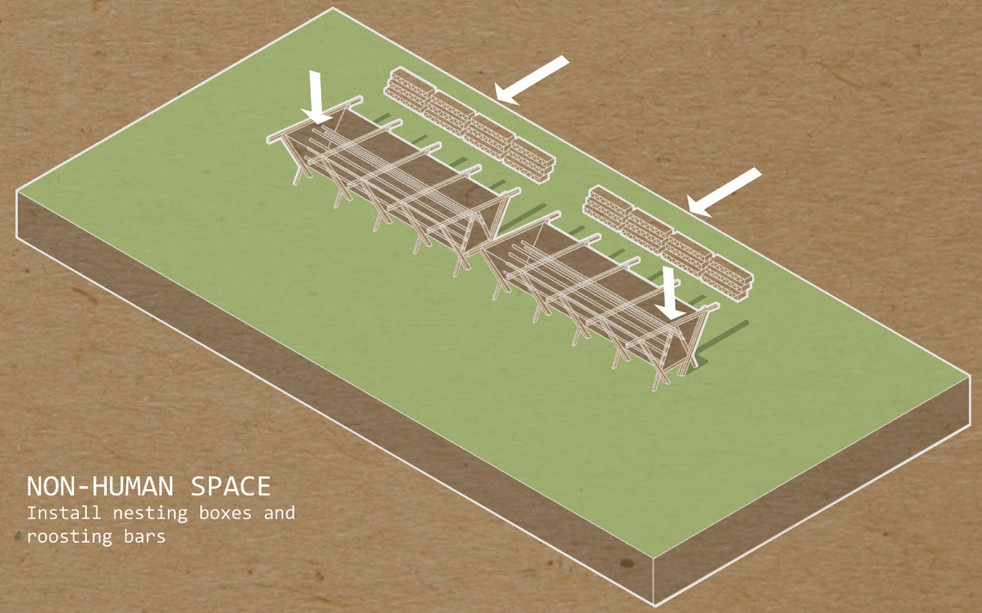
1 ORIGIN
Form the initial volume



2 SEPARATION
Elevate the volume above the ground and separate to create two non-human spaces



3 STRUCTURE
Spread structural frame evenly across the volume



4 NON-HUMAN SPACE
Install nesting boxes and roosting bars

PROCESS SEQUENCE

UNIVERSITY OF
18
56
MARYLAND
SCHOOL OF
ARCHITECTURE,
PLANNING & PRESERVATION