

LIVING BUILDING CHALLENGE at the Monarch School Studio

USGBC Houston - Houston | 22 Jan 2014



MONARCH INSTITUTE
FOR NEUROLOGICAL DIFFERENCES

GreeNexus Consulting



architend

Learning Objectives:

I.

Understand how the Living Building Challenge is pushing the edges of green, high performance design

II.

Learn about toxic chemicals in building materials and their relationship to the performance of the building envelope

III.

Incorporate passive strategies, including natural ventilation, in a hot and humid climate

IIII.

Learn strategies for getting to net zero in a hot and humid climate





LIVING BUILDING CHALLENGE™ 2.0

A VISIONARY PATH TO A RESTORATIVE FUTURE

www.livingbuildingchallenge.org



INTERNATIONAL
LIVING FUTURE
INSTITUTE™

THE METAPHOR OF THE FLOWER

ROOTED IN PLACE AND YET:

Harvests all energy + water

Is adapted to climate and site

Operates pollution free

Is comprised of integrated systems

Is beautiful



2.0

WHY A CHALLENGE?

Infusing inspiration and poetry

Embracing the psychology of the 'end game'

Rewarding early adopters

Creating models for the future

Stirring the pot

Pulling the market forward







Renovation



Landscape + Infrastructure



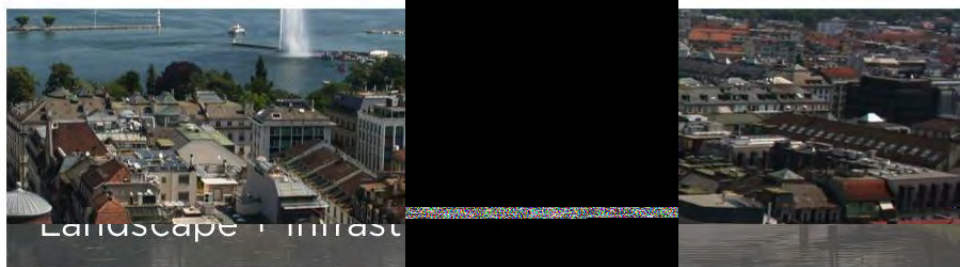
Renovation



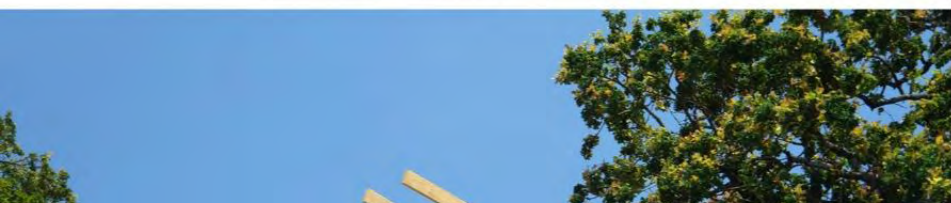
Landscape + Infrastru



Renovation



Landscape + Infrastru





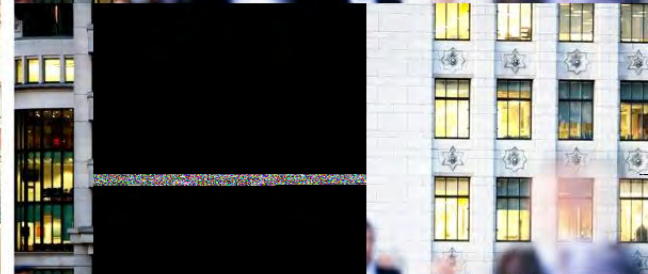
L1. Natural Habitat Preserve

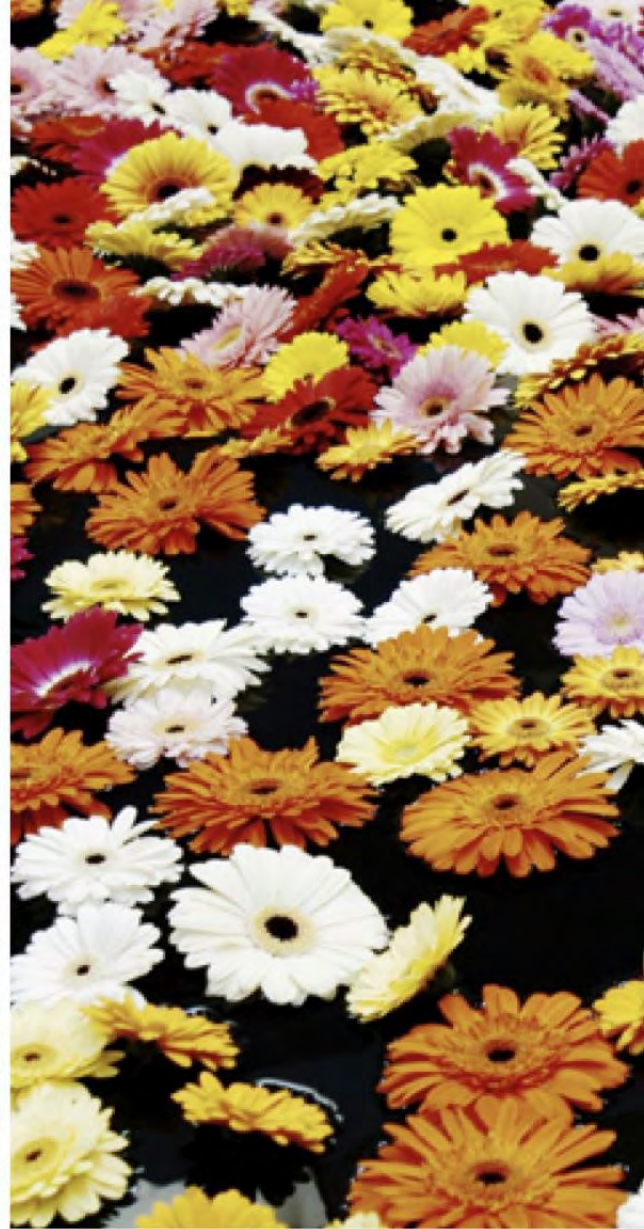


L2. Rural Agriculture Zone



L3. Village or Campus Zone





SCALE JUMPING



LIVING BUILDING CHALLENGE at the Monarch School Studio



“Shaping Lives from the Inside Out”

The Monarch School is a non-profit entity dedicated to providing innovative, therapeutic education for individuals with neurological differences- such as those associated with:

- autism spectrum disorder
- attention deficit (hyperactivity) disorder
- learning disabilities
- Tourette Syndrome
- mood disorders
- anxiety disorders
- traumatic brain injury and seizure disorders

The Monarch School Student Video: <http://youtu.be/zGCYCDIzNXY>



GreeNexus Consulting



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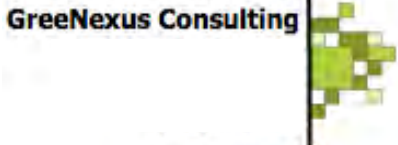
LIVING BUILDING CHALLENGE at the Monarch School Studio

The Monarch Living Building Studio is a result of an integrated, year long, visioning process, which included a variety of community and professional stakeholders.

Site specific data was collected by the Monarch community teams - energy, water, habitat, materials.

Handwritten notes and diagrams on the right side of the collage include:

- Oct. 10, 2011**
- There is a sleep-scent of human habit, or **sedentary** character to us from animal realities to those of black rock. This would be air in fact which habit to engage in these. See a Glare. Parkings
- There is a sleep-scent of human habit, or **sedentary** character to us from animal realities to those of black rock. This would be air in fact which habit to engage in these. See a Glare. Parkings
- Some of the things in supply some of them just below and some of them within the make to look like you are walking in water?
- Hand-drawn diagrams showing a cross-section of a building with labels for 'Wind', 'Cool air', 'Heat', 'Hot air', 'Water', 'Air', 'Soil', 'Plants', 'Animals', 'Civil', 'Plants', 'PUBLIC-GOOD', 'Engineers', 'Planners', 'Architects', 'Planners-Department', 'Non-Profits', 'Animals', 'Civil', 'Plants', 'PUBLIC-GOOD'.



LIVING BUILDING CHALLENGE at the Monarch School Studio

Faculty, staff, and design professionals helped to raise the walls of the building during the design build process

The Monarch School students hand designed and painted the interior wall finish (pallet board wainscot)



Market Shift -
Saturation and Tools

70%
typical
building
practices

market

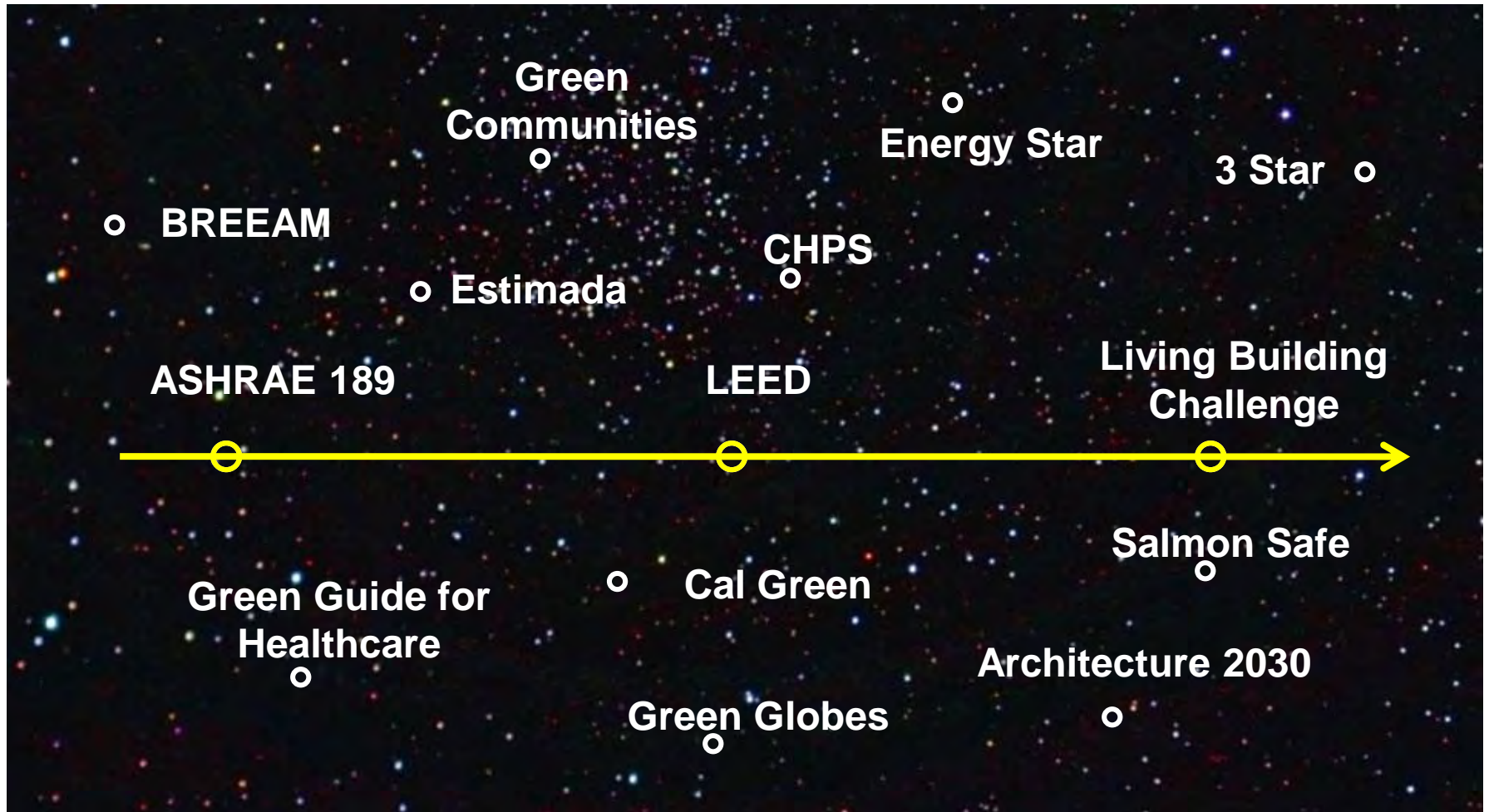
%

market

%



Current Trends: Green Building Standards



LIVING BUILDING CHALLENGE at the Monarch School Studio



“Shaping Lives from the Inside Out”



LOOKING SOUTH FROM THE 330 SF COVERED STUDIO PORCH, LEED GOLD CAMPUS BUILDINGS BEYOND (Chrysalis 24,720 SF, Butterfly 14,910 SF, and Monarch Center 17,540 SF)



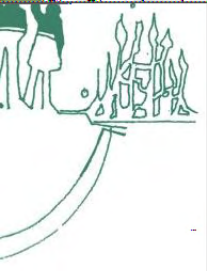
GreeNexus Consulting





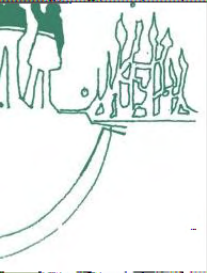
SITE

Restoring a healthy coexistence with nature



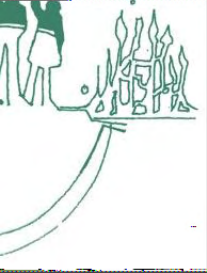
R

Healthy coexistence with nature



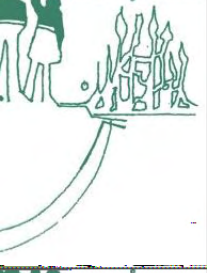
R

Healthy coexistence with nature



R

Healthy coexistence with nature



R

Healthy coexistence with nature



R

Healthy coexistence with nature



Project teams must document conditions prior to the start of work.

Characteristics of onsite landscape:

- native and/or naturalized species
- emulates density + biodiversity of indigenous ecosystems
- supports succession

plant succession The gradual evolution of vegetation over time. Also involved in plant community restoration. In *autogenic succession* the plants themselves are the genesis of change; succession is directed from within the ecosystem.

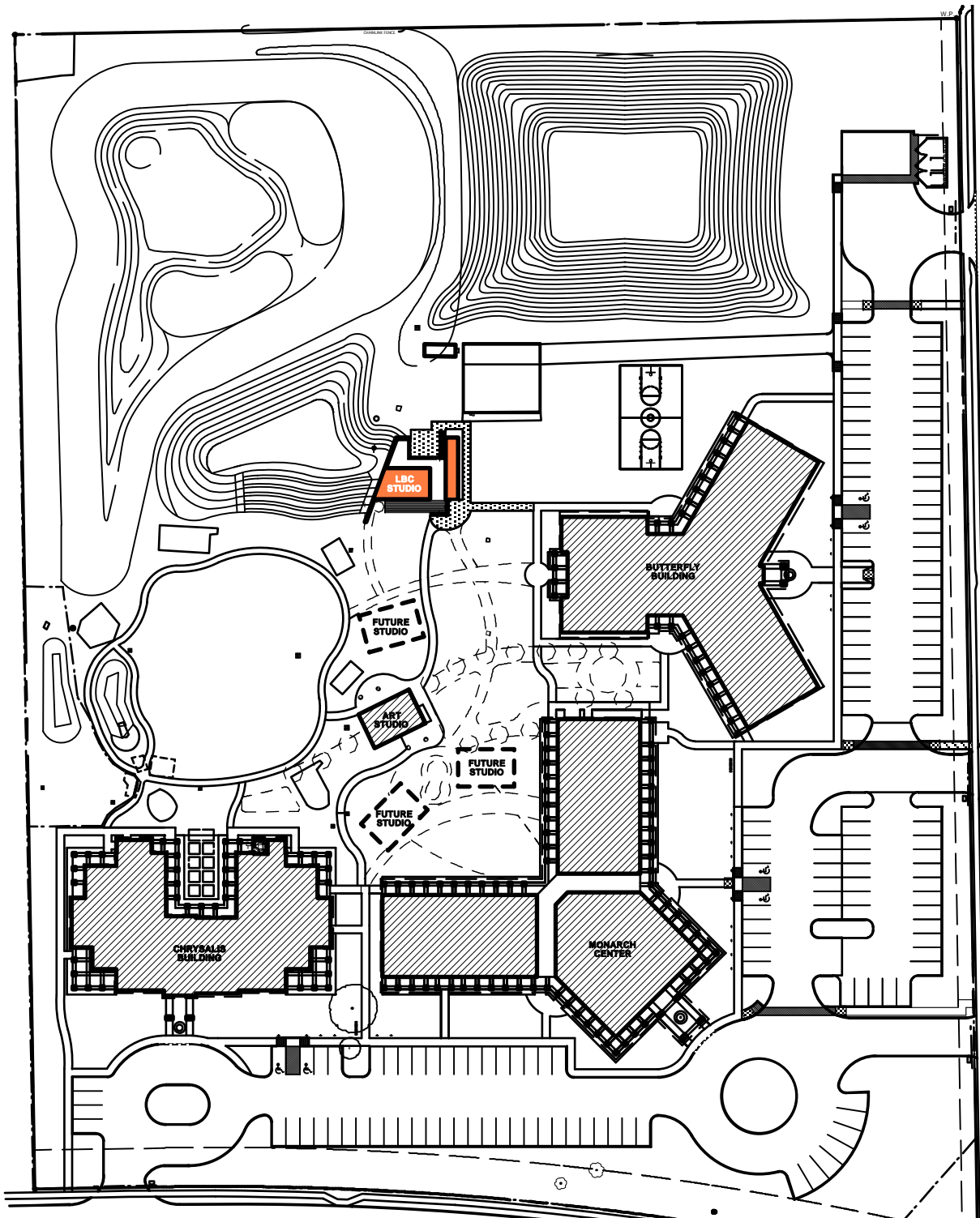


Environmental education and stewardship is integral to the Monarch philosophy, mission, and sense of place.

“ If it is true that nature therapy reduces the symptoms of ADHD, then the converse may also be true: ADHD may be a set of symptoms aggravated by lack of exposure to nature. By this line of thinking,... the real disorder is less in the child than it is in the imposed, artificial environment.” - Richard Louv [Last Child in the Woods](#)

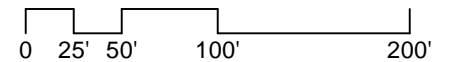


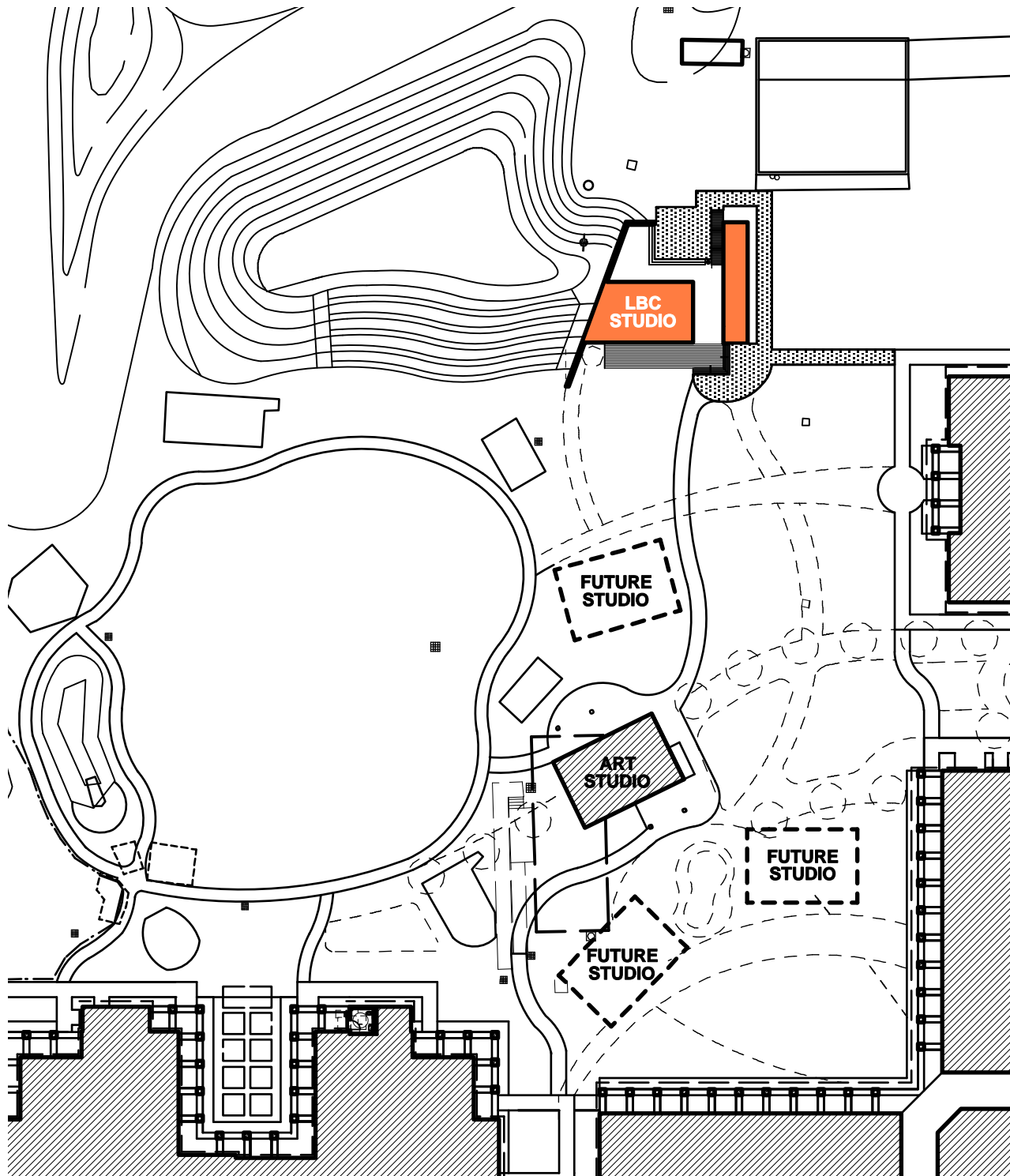




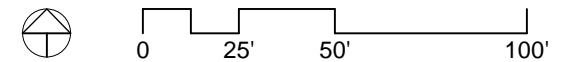
SITE PLAN

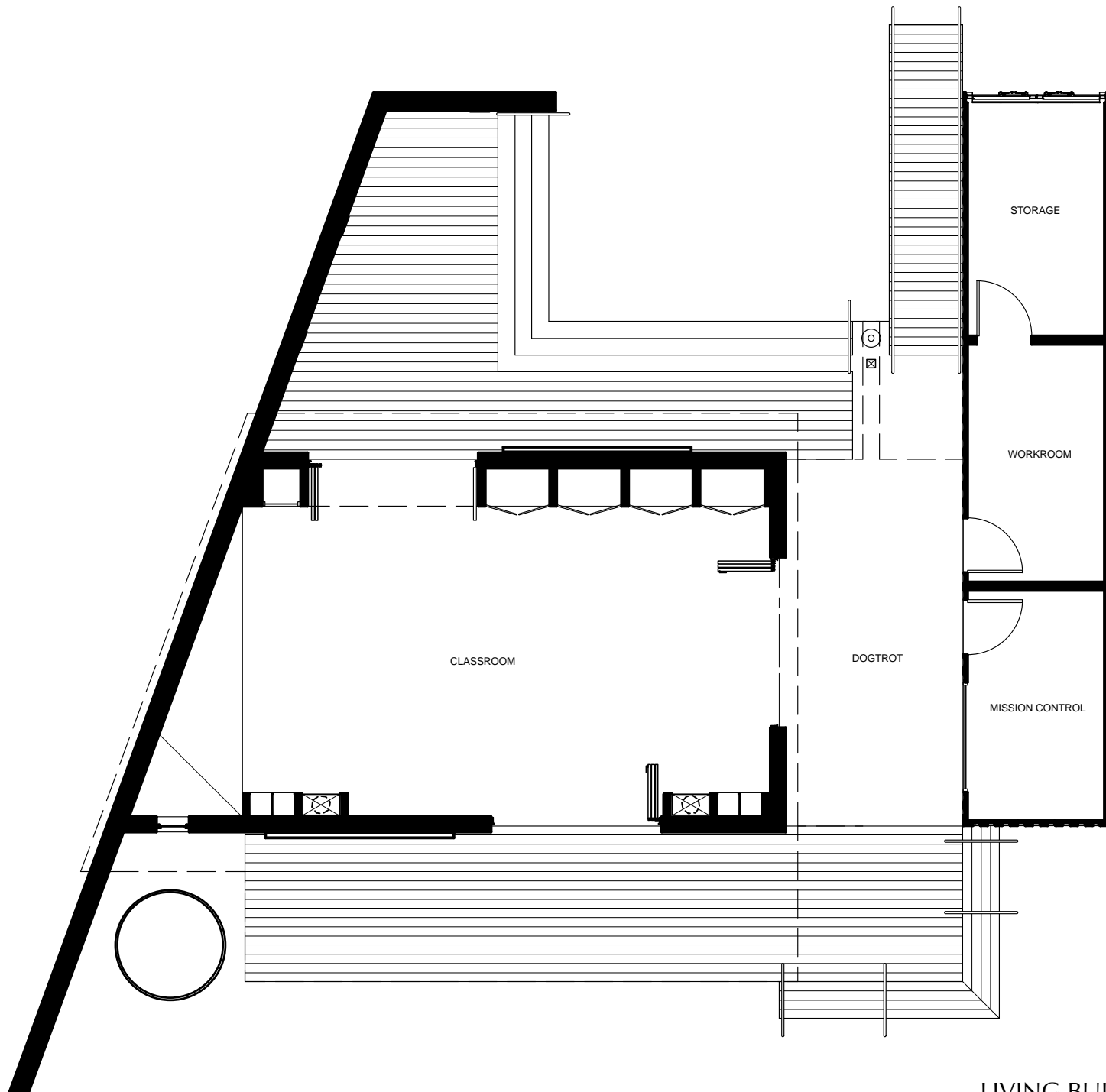
LIVING BUILDING CHALLENGE STUDIO
 THE MONARCH SCHOOL, HOUSTON, TX





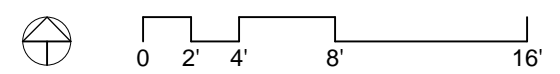
ENLARGED SITE PLAN
LIVING BUILDING CHALLENGE STUDIO
THE MONARCH SCHOOL, HOUSTON, TX





FLOOR PLAN

LIVING BUILDING CHALLENGE STUDIO
THE MONARCH SCHOOL, HOUSTON, TX



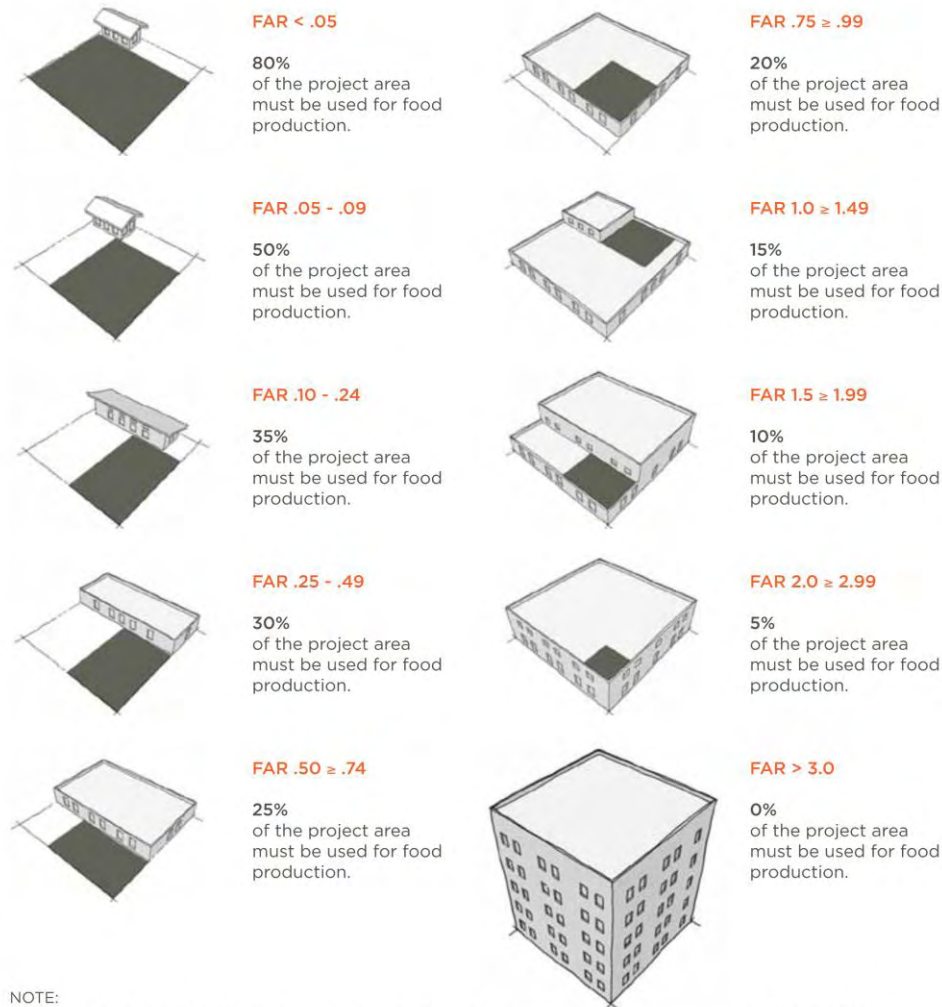
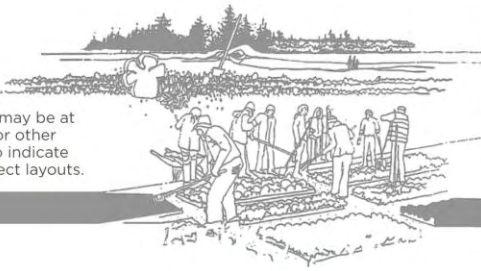
02

URBAN AGRICULTURE



All projects must integrate opportunities for agriculture appropriate to the scale and density of the project using its Floor Area Ratio (F.A.R.) as the basis for calculation.

The following diagrammatic illustrations show the relationship of agricultural coverage to projects of all densities. In application, area may be at ground level, on the roof or even incorporated into vegetated walls or other vertical design element. Building representations are solely shown to indicate relative mass - they are not indications of suggested designs or project layouts.



NOTE: Relative agricultural area is toned. Percentages indicate minimums.

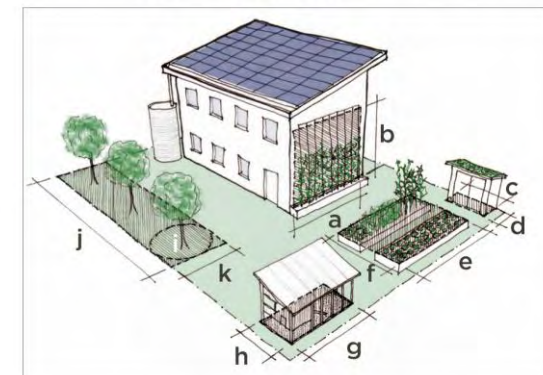
11 AUGUST 2011



02: Urban Agriculture

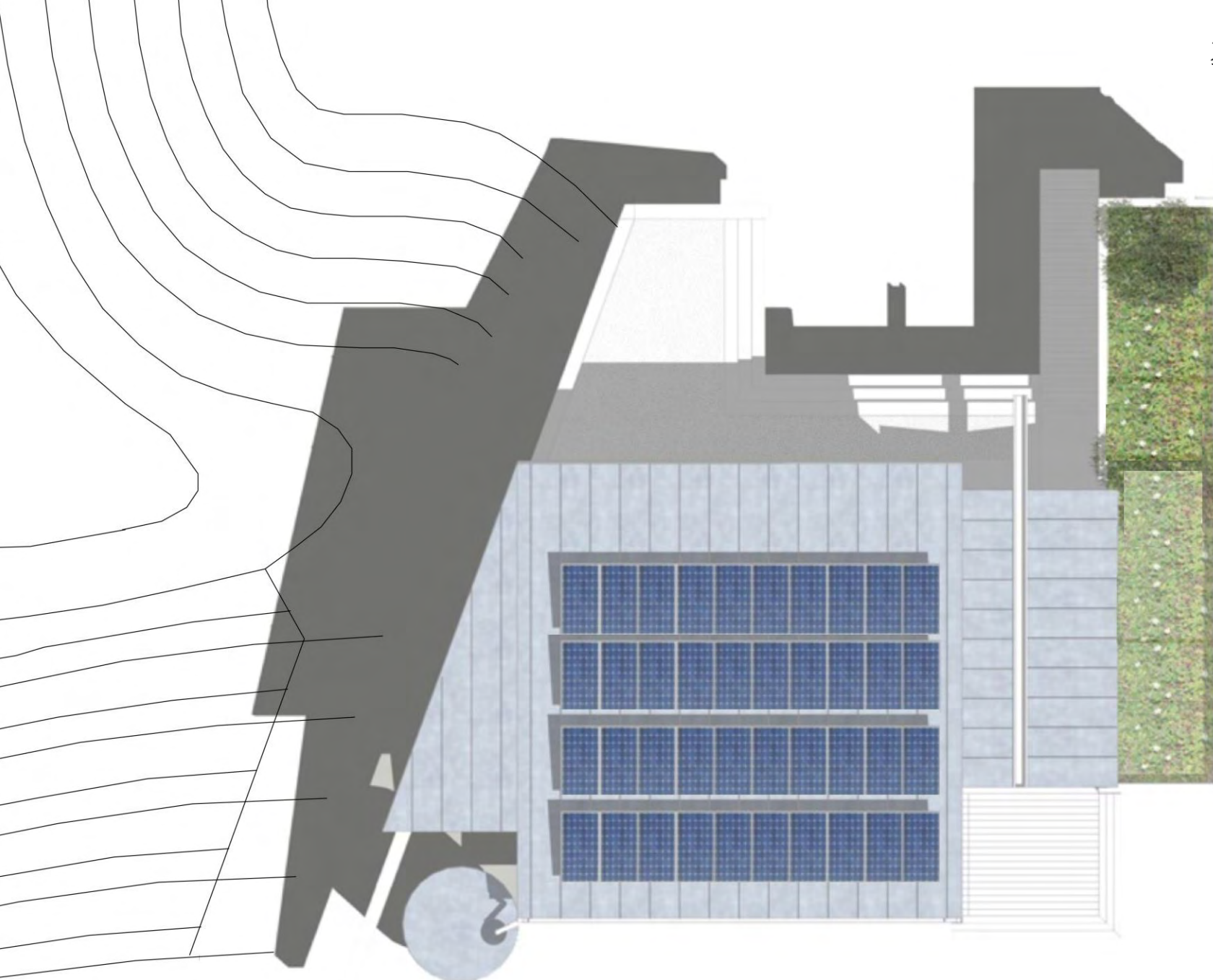


Figure 5. Examples of Urban Agricultural Area Calculations





02: Urban Agriculture



The Studio a local hub for environmental stewardship education, urban agriculture and will include a living wall, rooftop herb garden, vegetable terraces, an orchard and provides access to nature.









03

HABITAT EXCHANGE



For each hectare of development, an equal amount of land must be set-aside in perpetuity as part of a habitat exchange.



03: Habitat Exchange



04

CAR FREE LIVING



Each new project should contribute towards the creation of walkable, pedestrian-oriented communities.

Consider the proportion of the following occupancy types surrounding the project site:

- a. Residential
- b. Commercial or institutional
- c. Office or light-industrial



04: Car Free Living





WATER

Creating water independent sites, buildings + communities

05

NET ZERO WATER

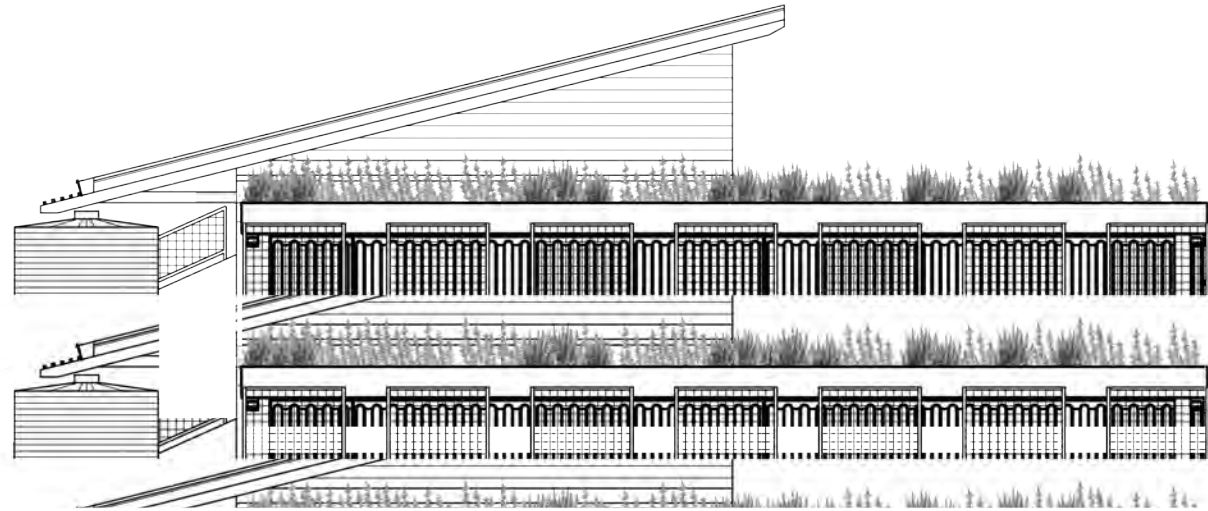


100% occupants' water use must come from captured precipitation or closed loop water systems that account for downstream ecosystem impacts and that are appropriately purified without the use of chemicals.



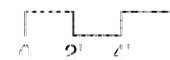
SECTION
LIVING BUILDING CHALLENGE STUDIO
1000 HOUSTON AVENUE, HOUSTON, TX

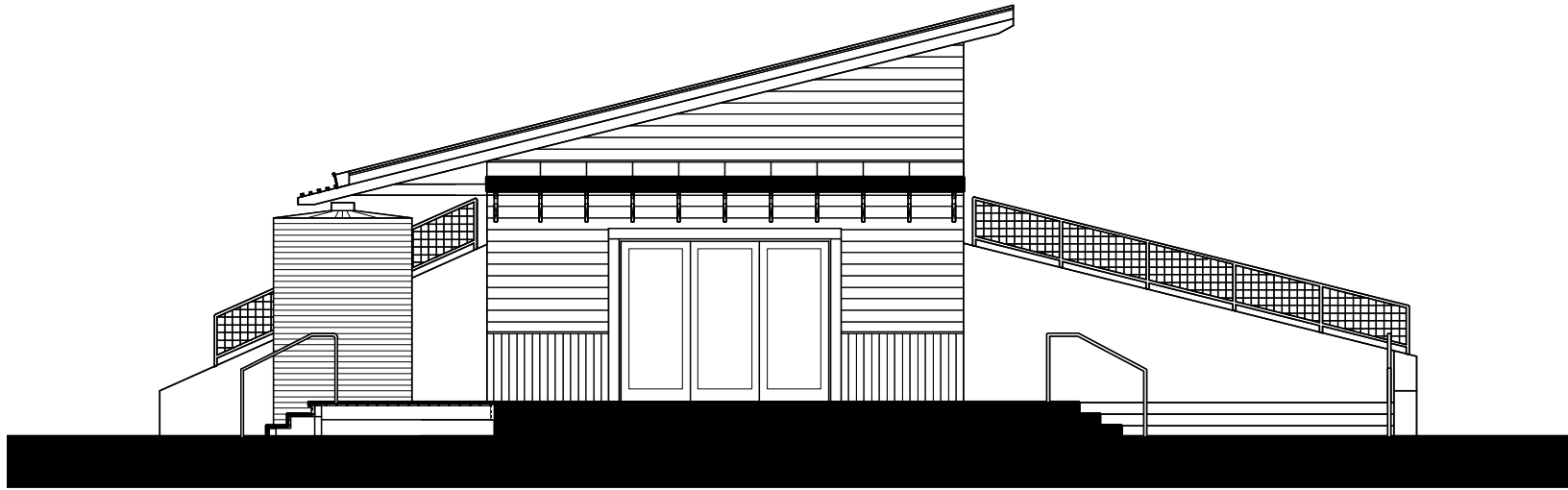




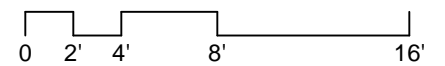
EAST ELEVATION

LIVING BUILDING CONCEPT
THE MONARCH STREET PROJECT





DOGTROT WEST ELEVATION
LIVING BUILDING CHALLENGE STUDIO
THE MONARCH SCHOOL, HOUSTON, TX



06

ECOLOGICAL WATER FLOW



100% storm water and building water discharge must be managed onsite to feed the project's internal water demands or released onto adjacent sites for management through acceptable natural time-scale surface flow, groundwater recharge, agricultural use or adjacent building needs.



Map | **Satellite**

Impervious Surfaces

06: Ecological Water Flow

City Boundaries



POWERED BY
Google
200 ft
50 m

Imagery ©2011 Map data ©2011 - Terms of Use





© 2009 ILBI

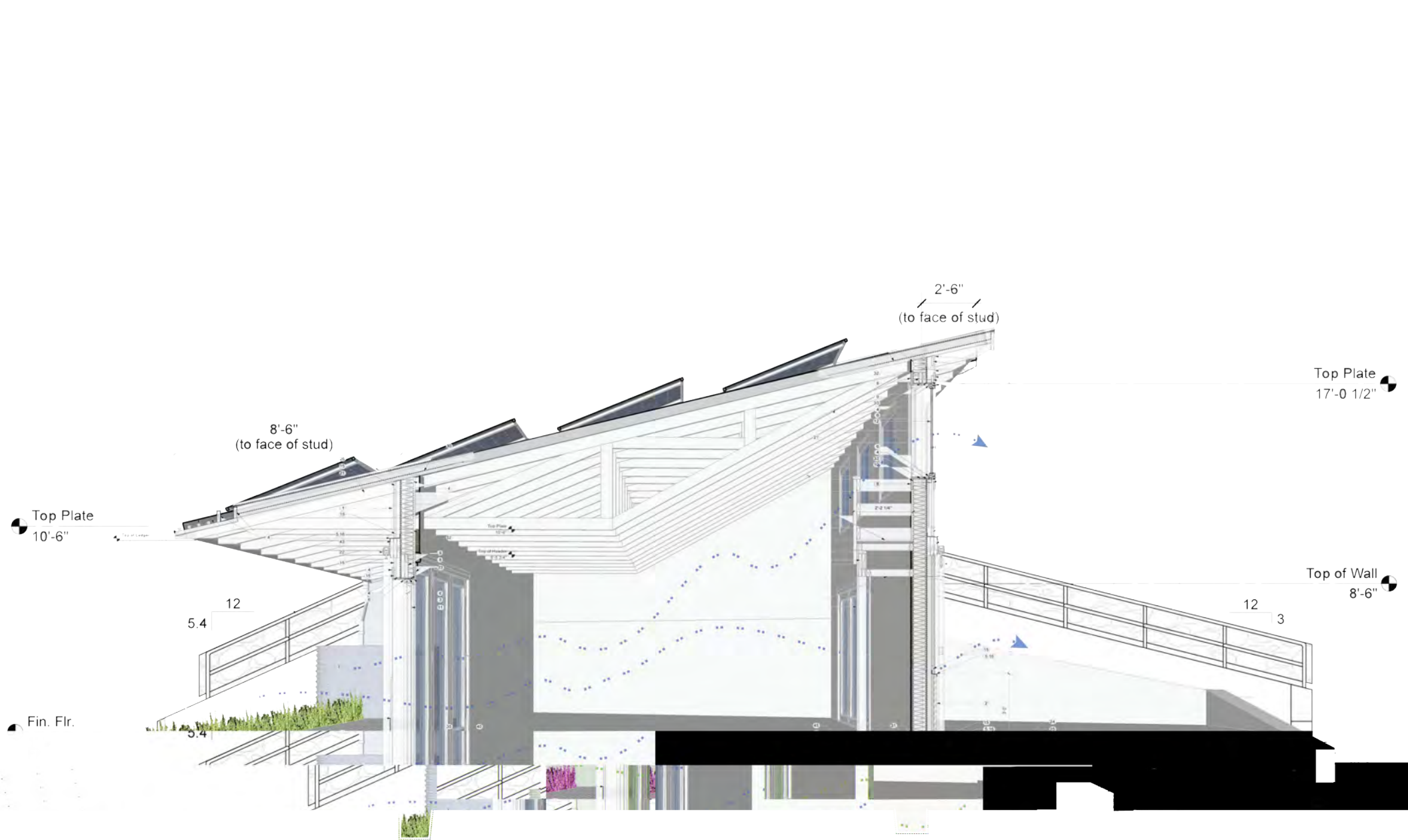
ENERGY

Relying only on current solar income

07

NET ZERO
ENERGY





8'-6"
(to face of stud)

2'-6"
(to face of stud)

Top Plate
17'-0 1/2"

Top Plate
10'-6"

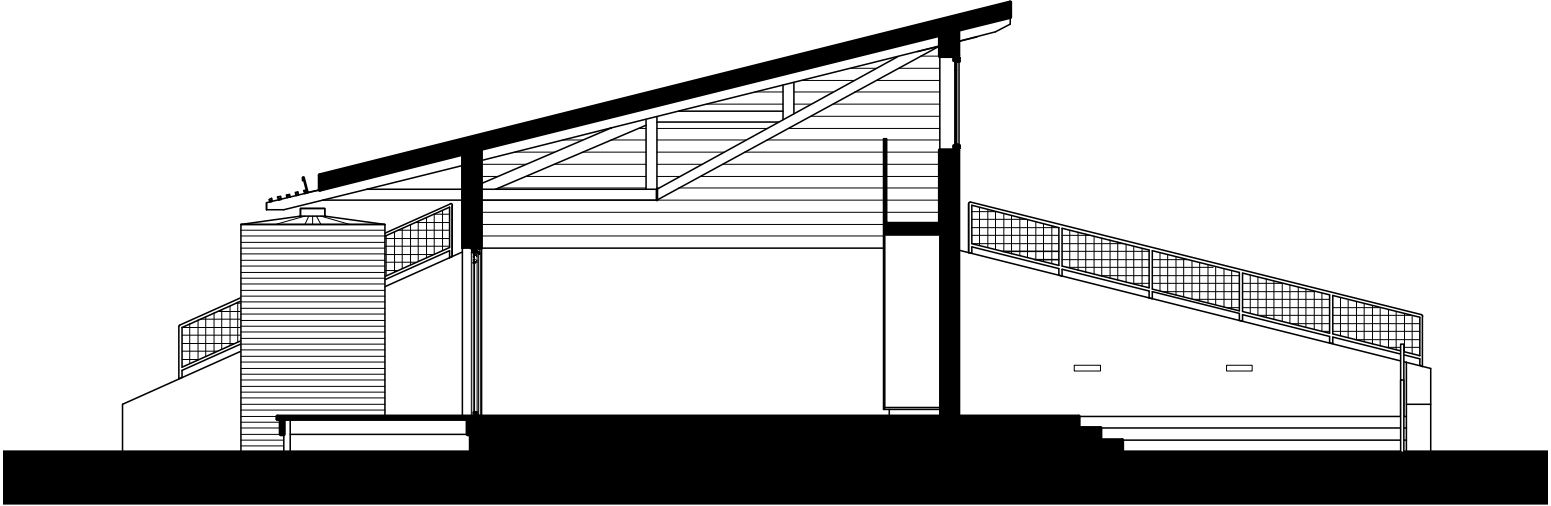
Top of Wall
8'-6"

12
5.4

12
3

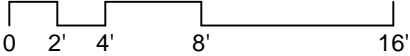
Fin. Flr.

3.4



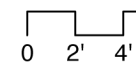
TRANSVERSE SECTION

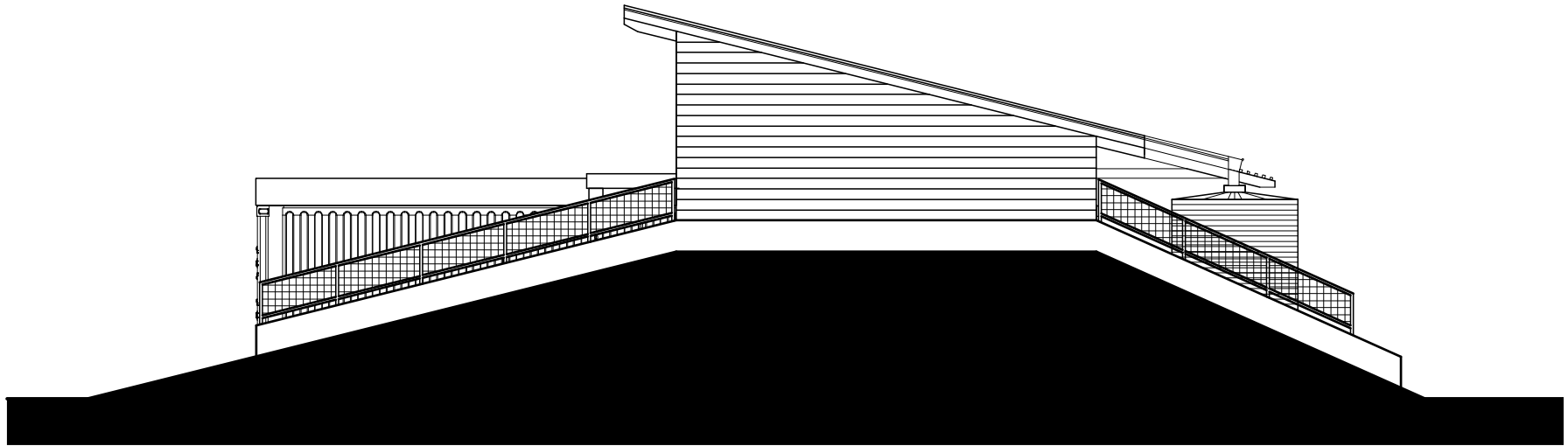
LIVING BUILDING CHALLENGE STUDIO
THE MONARCH SCHOOL, HOUSTON, TX





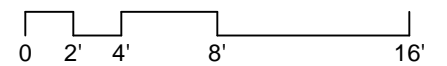
NORTH
LIVING BUILDING
THE MONARCH SCH

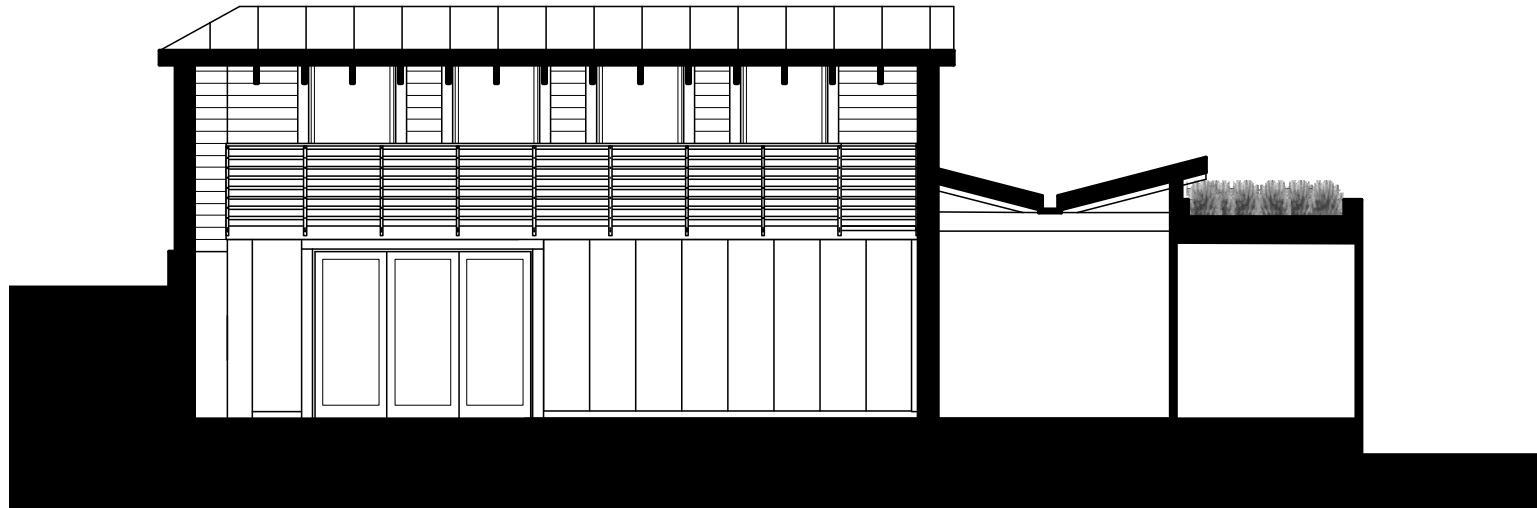




WEST ELEVATION

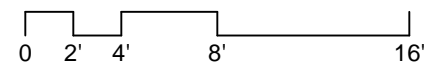
LIVING BUILDING CHALLENGE STUDIO
THE MONARCH SCHOOL, HOUSTON, TX

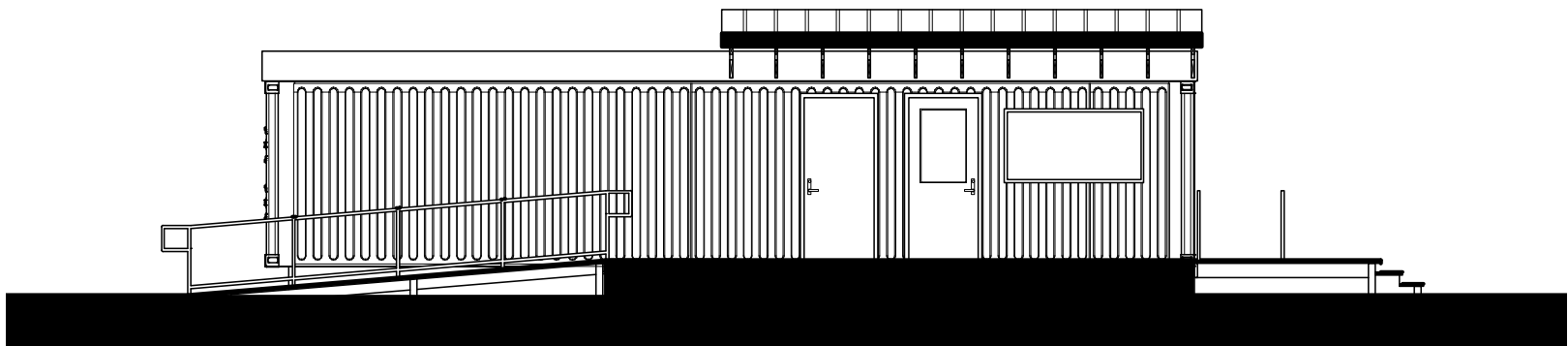




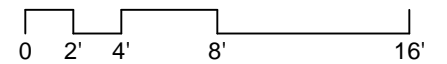
LONGITUDINAL SECTION

LIVING BUILDING CHALLENGE STUDIO
THE MONARCH SCHOOL, HOUSTON, TX





DOGTROT EAST ELEVATION
LIVING BUILDING CHALLENGE STUDIO
THE MONARCH SCHOOL, HOUSTON, TX



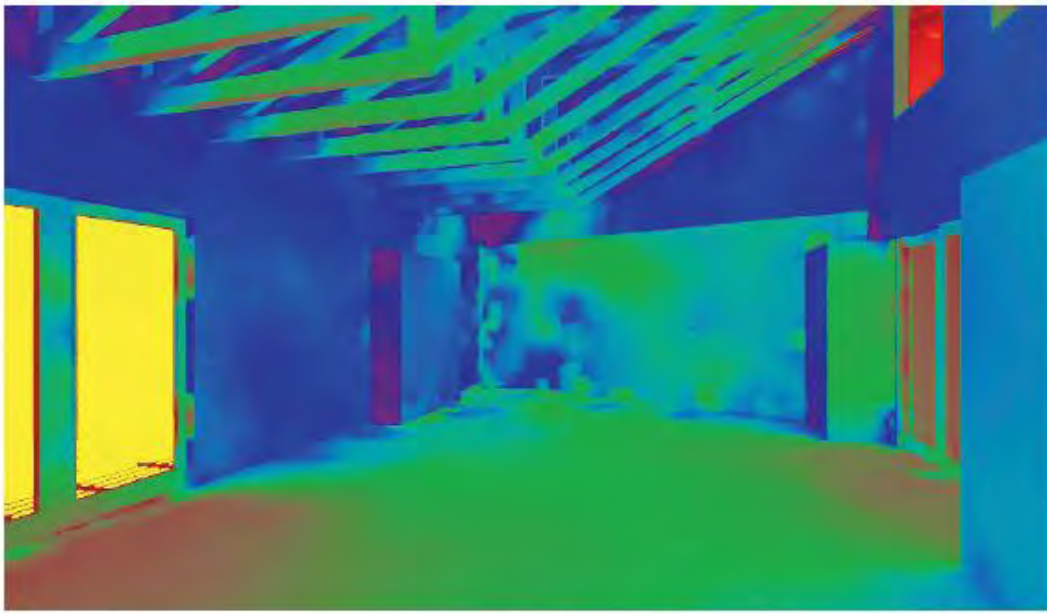








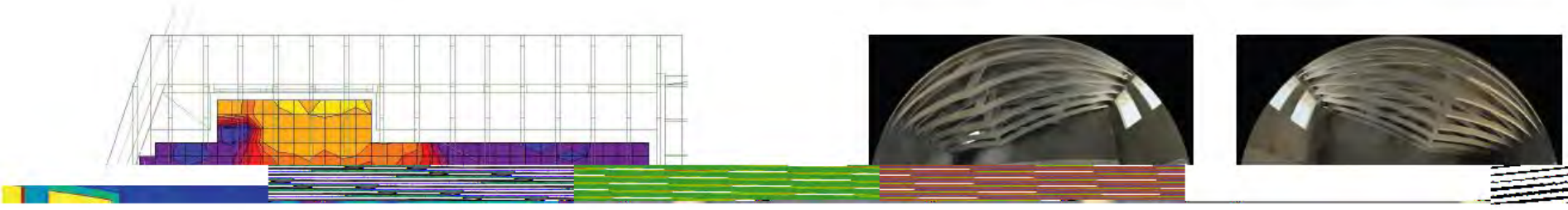
Luminance Rendering: Looking Southwest



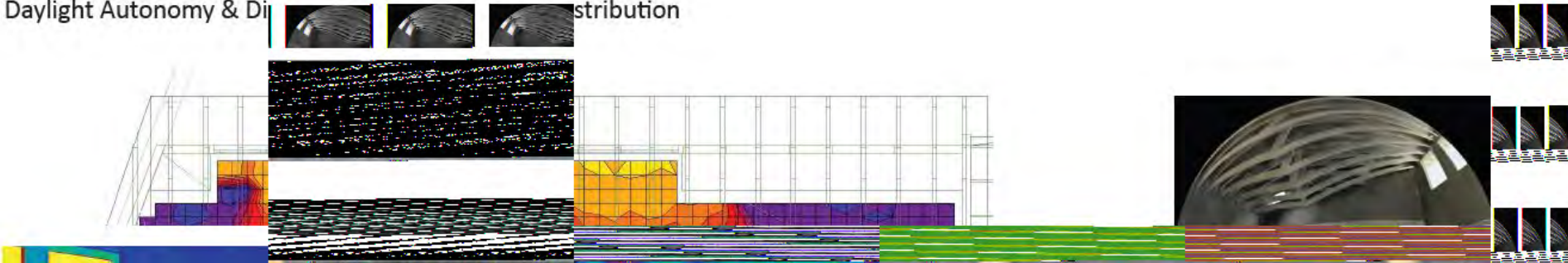
False Color Luminance Rendering: Looking Southwest



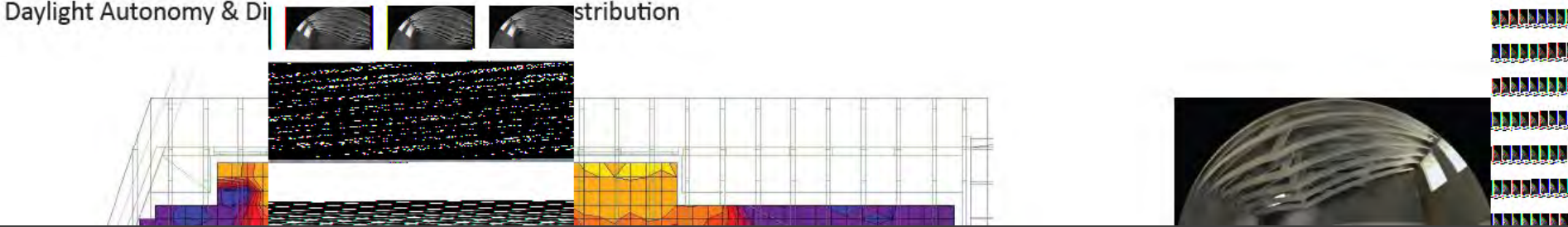
Daylight Autonomy & Distribution

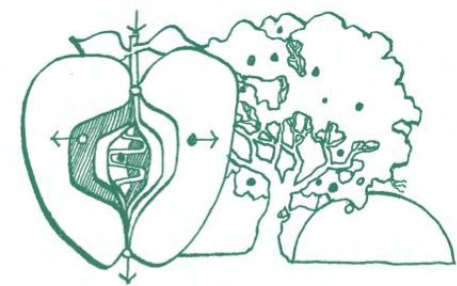


Daylight Autonomy & Distribution



Daylight Autonomy & Distribution





HEALTH

Maximizing physical and psychological health + well being

08

CIVILIZED ENVIRONMENT



Every occupiable space must have operable windows that provide access to fresh air and daylight.

09

HEALTHY AIR



To promote good indoor air quality, Renovations, Buildings, and buildings completed



To promote air quality, 5 good indoor Renovations, Buildings, and buildings completed



10

BIOPHILIA



The project must be designed to include elements that nurture the innate human attraction to natural systems and processes.

Environmental features

- Color
- Water
- Air
- Sunlight
- Plants
- Animals
- Natural materials
- Views and vistas
- Façade greening
- Geology and landscape
- Habitats and ecosystems
- Fire

Light and space

- Natural light
- Filtered and diffused light
- Light and shadow
- Reflected light
- Light pools
- Warm light
- Light as shape and form
- Spaciousness
- Spatial variability
- Space as shape and form
- Spatial harmony
- Inside-outside spaces

Natural shapes and forms

- Botanical motifs
- Tree and columnar supports
- Animal (mainly vertebrate) motifs
- Shells and spirals
- Egg, oval, and tubular forms
- Arches, vaults, domes
- Shapes resisting straight lines and right angles
- Simulation of natural features
- Biomorphy
- Geomorphology
- Biomimicry

Place-based relationships

- Geographic connection to place
- Historic connection to place
- Ecological connection to place
- Cultural connection to place
- Indigenous materials
- Landscape orientation
- Landscape features that define building form
- Landscape ecology
- Integration of culture and ecology
- Spirit of place
- Avoiding placelessness

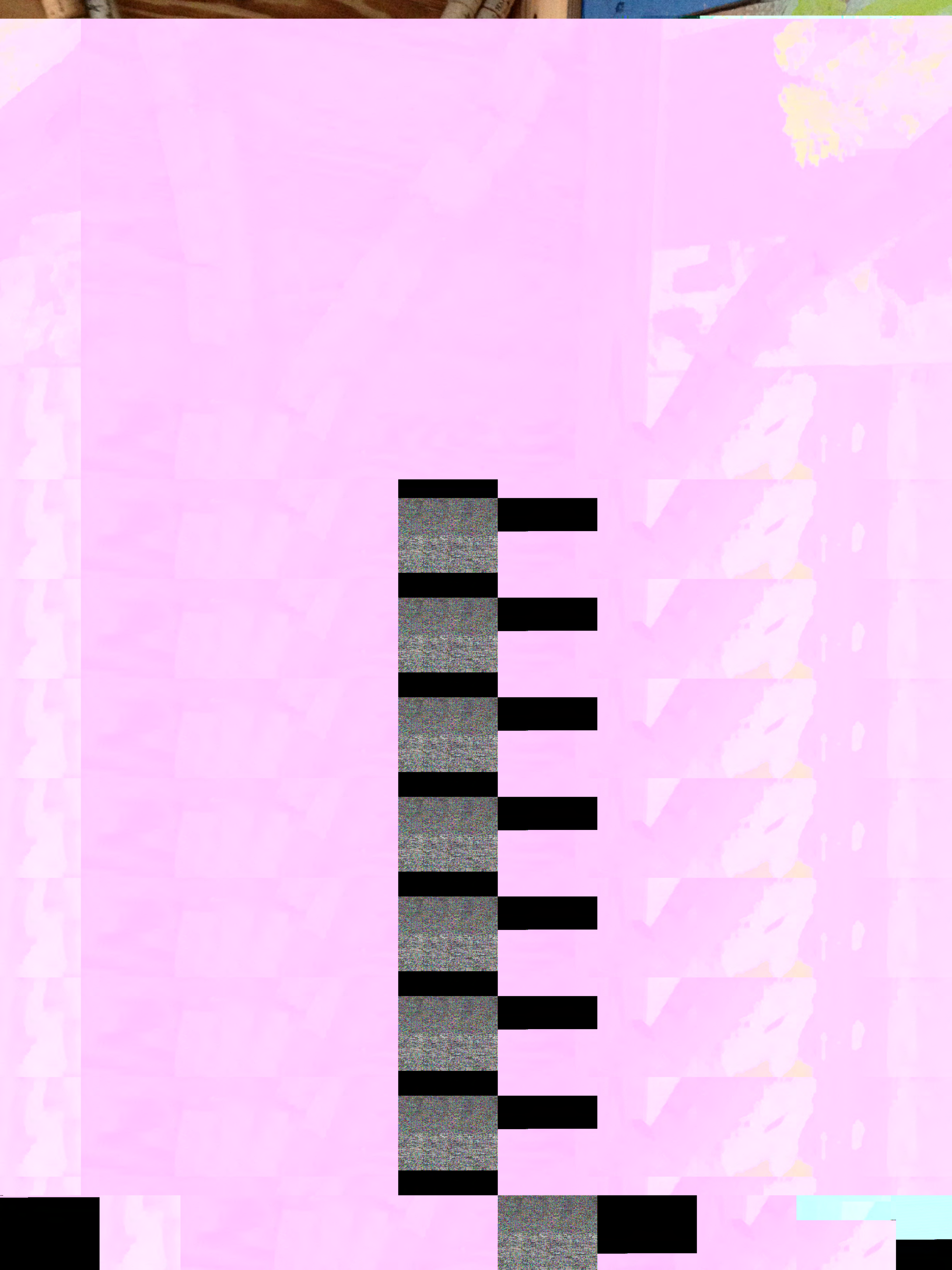
Natural patterns and processes

- Sensory variability
- Information richness
- Age, change, and the patina of time
- Growth and efflorescence
- Central focal point
- Patterned wholes
- Bounded spaces
- Transitional spaces
- Linked series and chains
- Integration of parts to wholes
- Complementary contrasts
- Dynamic balance and tension
- Fractals
- Hierarchically organized ratios and scales

Evolved human-nature relationships

- Prospect and refuge
- Order and complexity
- Curiosity and enticement
- Change and metamorphosis
- Security and protection
- Mastery and control
- Affection and attachment
- Attraction and beauty
- Exploration and discovery
- Information and cognition
- Fear and awe
- Reverence and spirituality

table reprinted with permission from Stephen Kellert



Space as shape
Spatial harmony
Inside-outside

Integration and form
Spirit of place
Avoiding spaces

Integration of culture and ecology
Sense of place
Avoiding placelessness

Information and cognition
Fear and awe
Reverence and spirituality

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10 BIOPHILIA

10 BIOPHILIA

The Six Biophilic Design Elements

Space as shape and form
Spatial harmony
Inside-outside spaces

Integration of culture and ecology
Spirit of place
Avoiding placelessness

Information and cognition
Fear and awe
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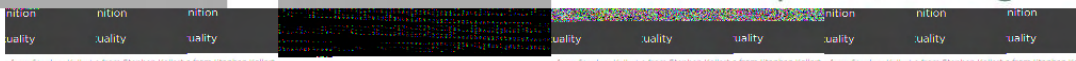
Information and cognition
Fear and awe
Reverence and spirituality

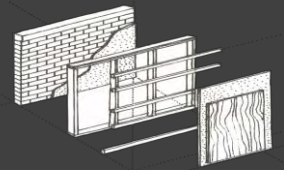
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10 BIOPHILIA

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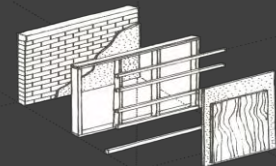
The Six Biophilic Design Elements





11: Red List





11: Red List

“As I spoke with the design and construction team, I was struck by their sense of reverence for the contribution they were making to this campus...

...As I walked across the campus past classroom after classroom of engaged students, I felt the reverence, too.

I’ve never felt a greater sense gratitude for the work of all the scientists, advocates, visionaries and builders working to provide the healthiest possible environment for our children. “

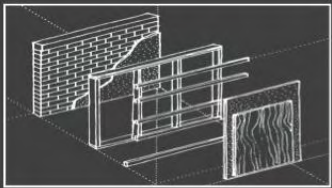
~ Bill Walsh, Healthy Building Network

See more at:

http://www.pharosproject.net/blog/detail/id/176/monarch_school#sthash.cRbWBfZb.dpuf

11

RED LIST



The project cannot contain worst-in-class materials or chemicals, such as carcinogens, persistent organic pollutants, bioaccumulative toxins, and endocrine disruptors.



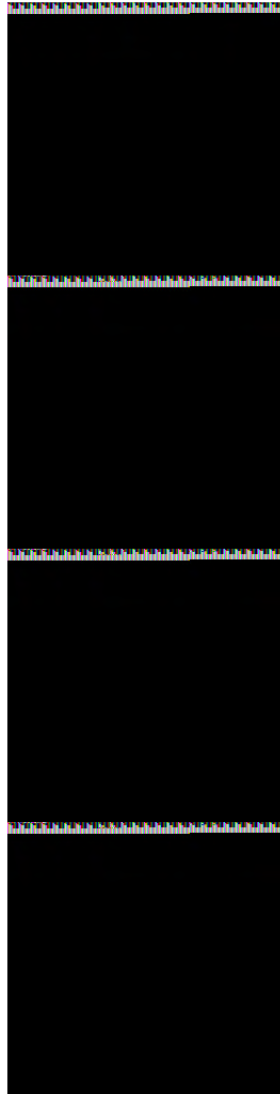
Asbestos
Cadmium

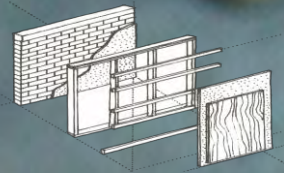
Asbestos
Cadmium

Asbestos
Cadmium

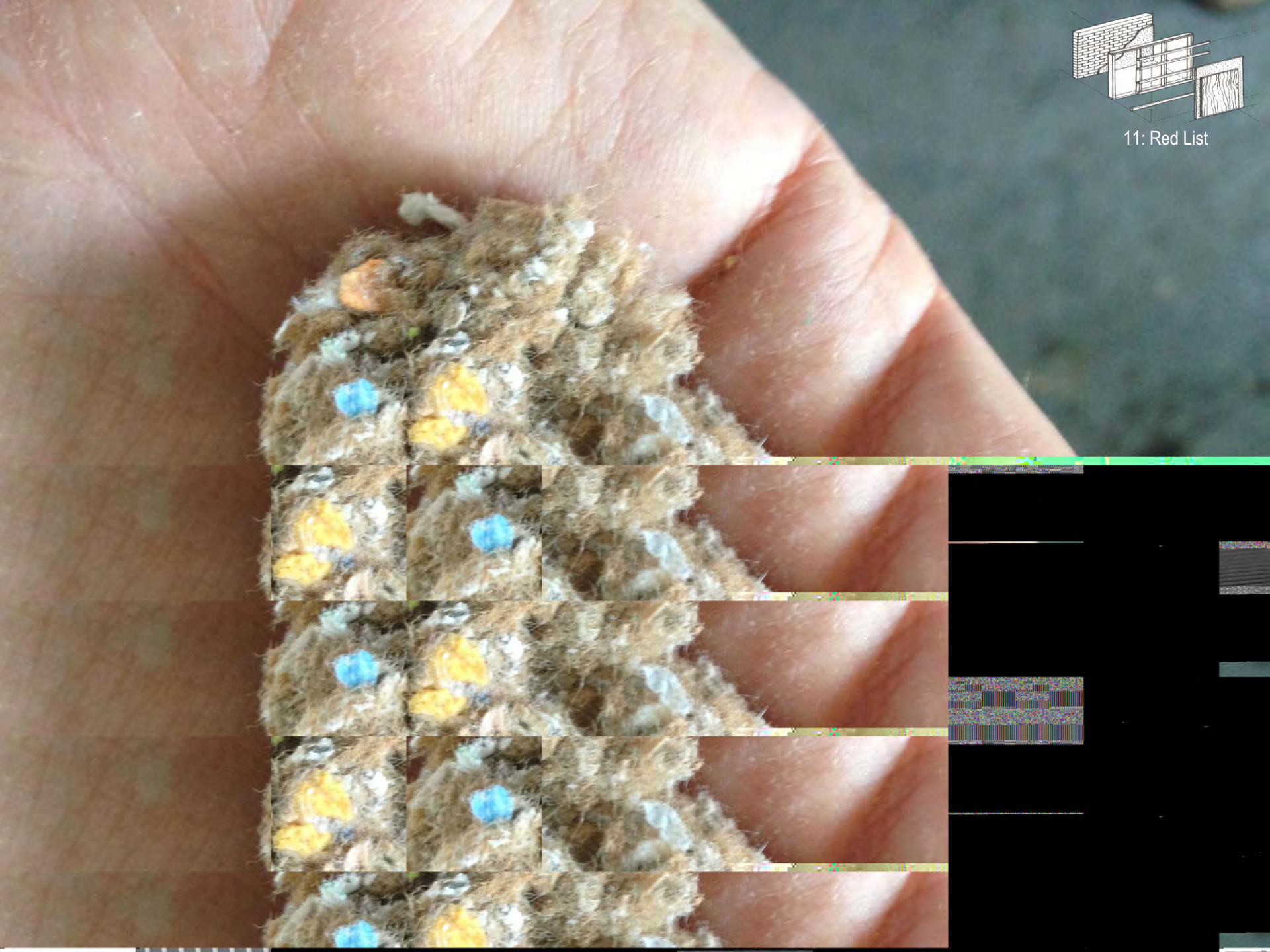
Asbestos
Cadmium

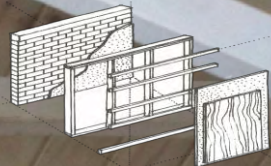
Asbestos
Cadmium





11: Red List



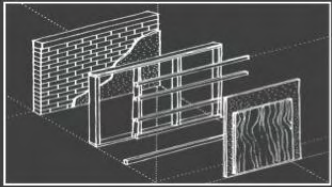


11: Red List



12

EMBODIED CARBON FOOTPRINT



The project must account for the total footprint of embodied carbon (tCO₂e) from its construction and projected replacement parts through a one-time carbon offset tied to the project boundary.



12 EMBODIED CARBON FOOTPRINT

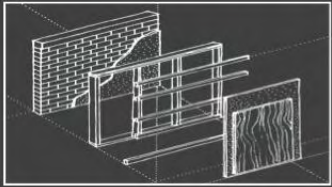
Offsets may only be from renewable energy projects that ensure real, verifiable, permanent carbon reductions.

Also consider:

- Meet/exceed criteria of: Gold Standard, VCS, Climate Action Reserve, Green-e Climate Protocol
- Green-e certified (3rd party verification)
- Additionality
- Forecasted performance
- Unique Recipients
- Transparency / Education to buyers
- Social co-benefits
- Minimal environmental impacts

13

RESPONSIBLE INDUSTRY



The project must advocate for the creation and adoption of third-party certified standards for sustainable resource extraction and fair labor practices. Applicable raw materials include stone and rock, metal, and timber.



For timber, all wood must be certified by the Forest Stewardship Council (FSC), from salvaged sources, or from the intentional harvest of timber onsite for the purpose of clearing the area for construction.

WHY FSC?

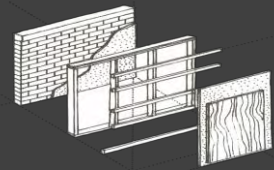
- Triple bottom line: social, economic, environmental interests
- Supports health and long-term integrity of

WHY FSC?

- Triple bott
environme
- Supports k

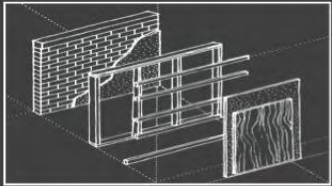
- om line: socia
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- health and lo
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14

APPROPRIATE SOURCING

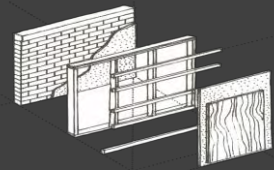


The project must incorporate place-based solutions and contribute to the expansion of a regional economy rooted in sustainable practices, products and services.

14 APPROPRIATE SOURCING

Source locations for materials and services must adhere to the following restrictions:

ZONE	MAX DISTANCE	MATERIALS/SERVICES	MASTERFORMAT 2004 CLASSIFICATION
7	20,004 km	Ideas	-
6	15,000 km	Renewable Technologies	Divisions: 42, 48
5	5,000 km	Assemblies that actively contribute to building performance + adaptable reuse once installed	Divisions: 08 (exterior), 11, 14, 22, 23, 26, 33, 44 Sections: 07 50 00, 10 21 23, 10 22 00, 10 70 00, 44 40 00
4	2,500 km	Consultant Travel	-
3	2,000 km	Light or low-density materials	Sections: 07 31 00, 07 33 00, 07 40 00, 09 50 00, 09 60 00
2	1,000 km	Medium weight or density materials	Divisions: 06, 08 (interior) Sections: 07 32 00, 09 20 00, 09 30 00, 12 30 00
1	500 km	Heavy or high-density materials	Divisions: 03, 04, 05, 31, 32



14: Appropriate Sourcing



Image IBCAO
US Dept of State Geographer
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2013 Google

15

CONSERVATION
+ REUSE



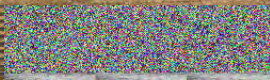
CONSERVATION
+ REUSE



CONSERVATION
+ REUSE



CONSERVATION
+ REUSE





Project teams must create a material conservation management plan that explains how the project optimizes materials and in each of the following phases:

- Design Phase
- Construction Phase
- Operation Phase
- End of Life Phase

During construction, teams must divert wasted materials from landfills:

Material	Minimum Diverted/Weight
Metals	95 %
Paper and Cardboard	95 %
Soil, and biomass	100 %
Rigid Foam, carpet & insulation	90 %
All others - combined weighted average	80 %

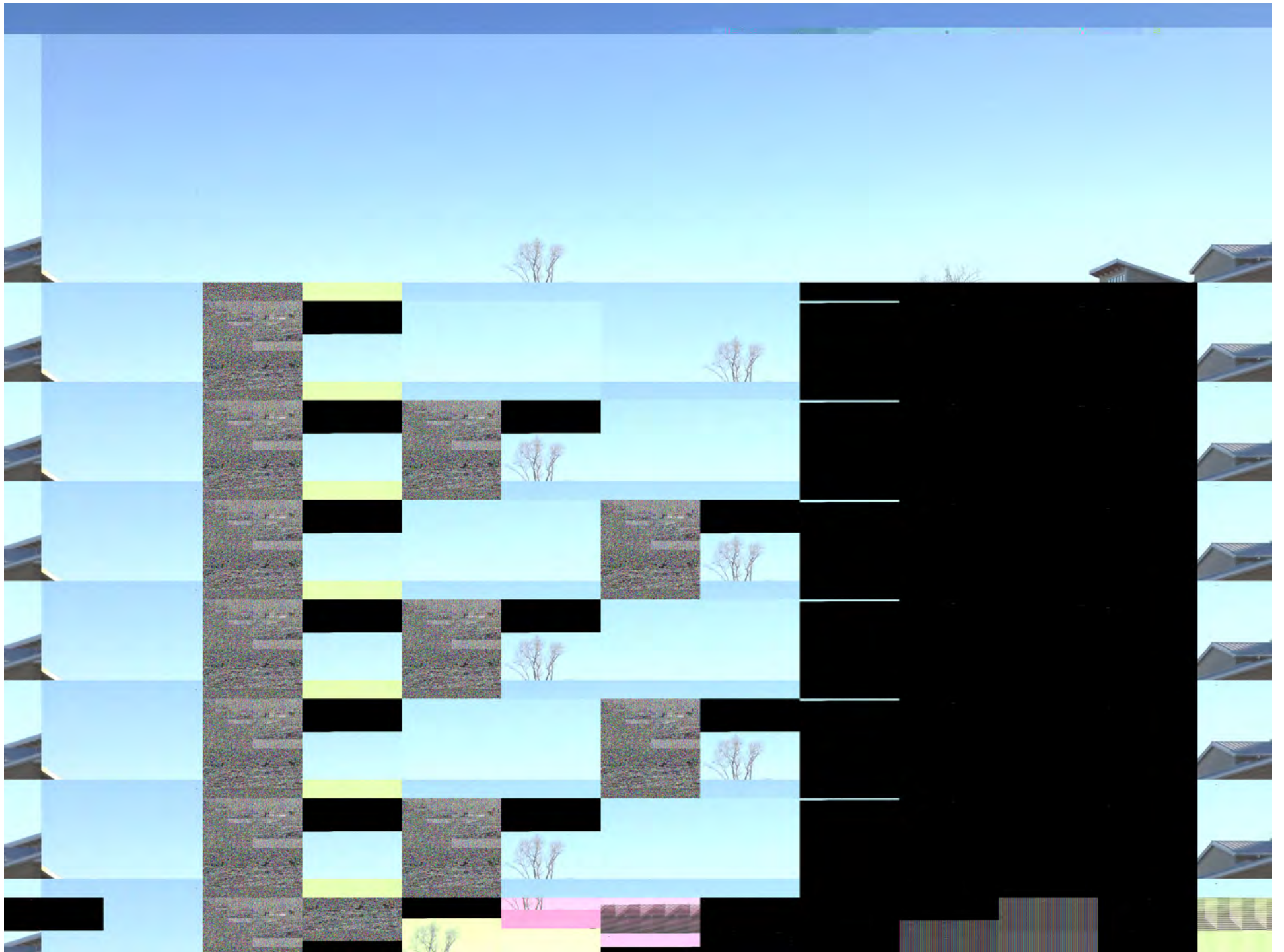
100 %	100 %	100 %
90 %	90 %	90 %
80 %	80 %	80 %
95 %	95 %	95 %

80 %	80 %	80 %
95 %	95 %	95 %

100 %	100 %	100 %
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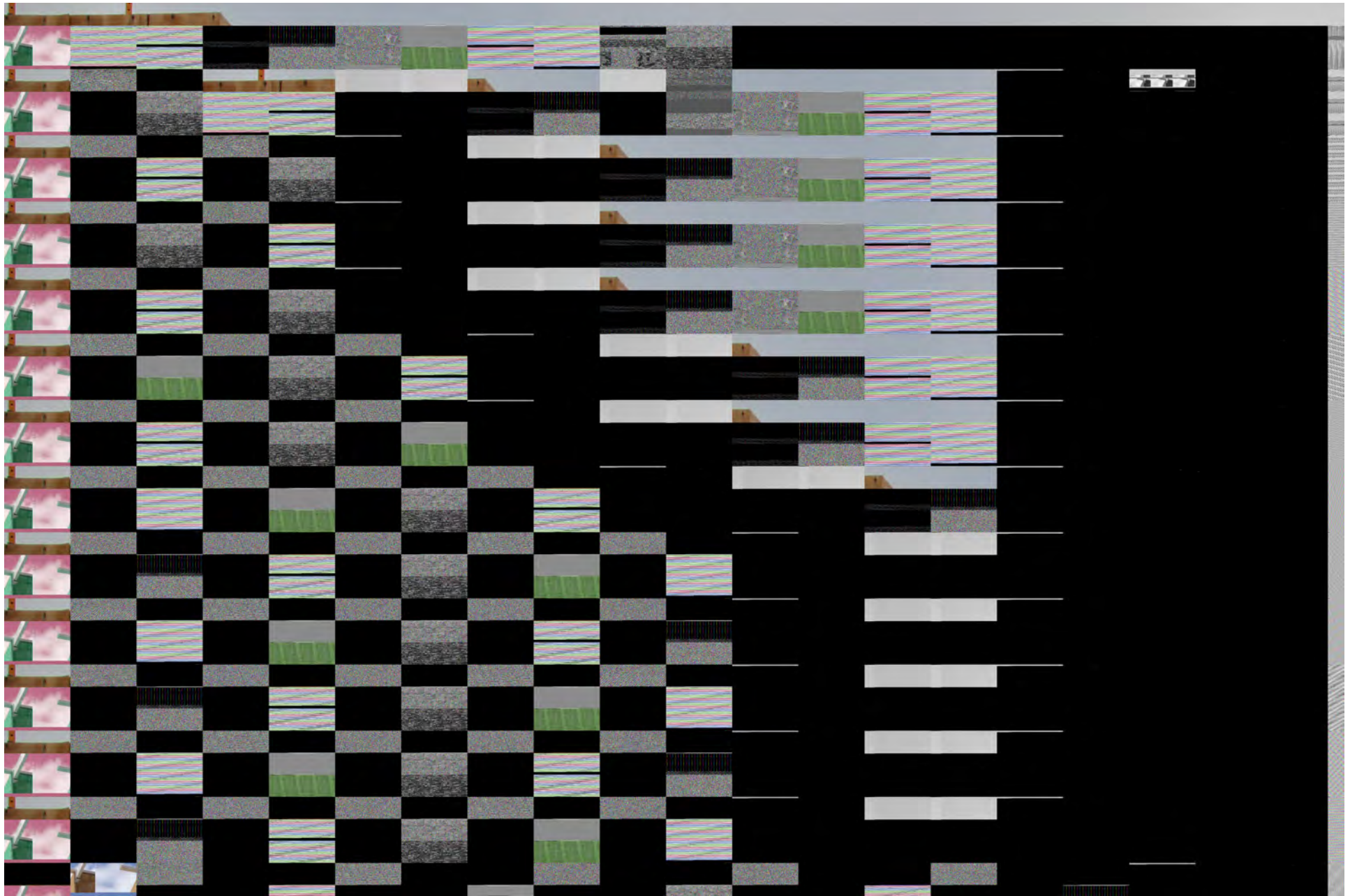


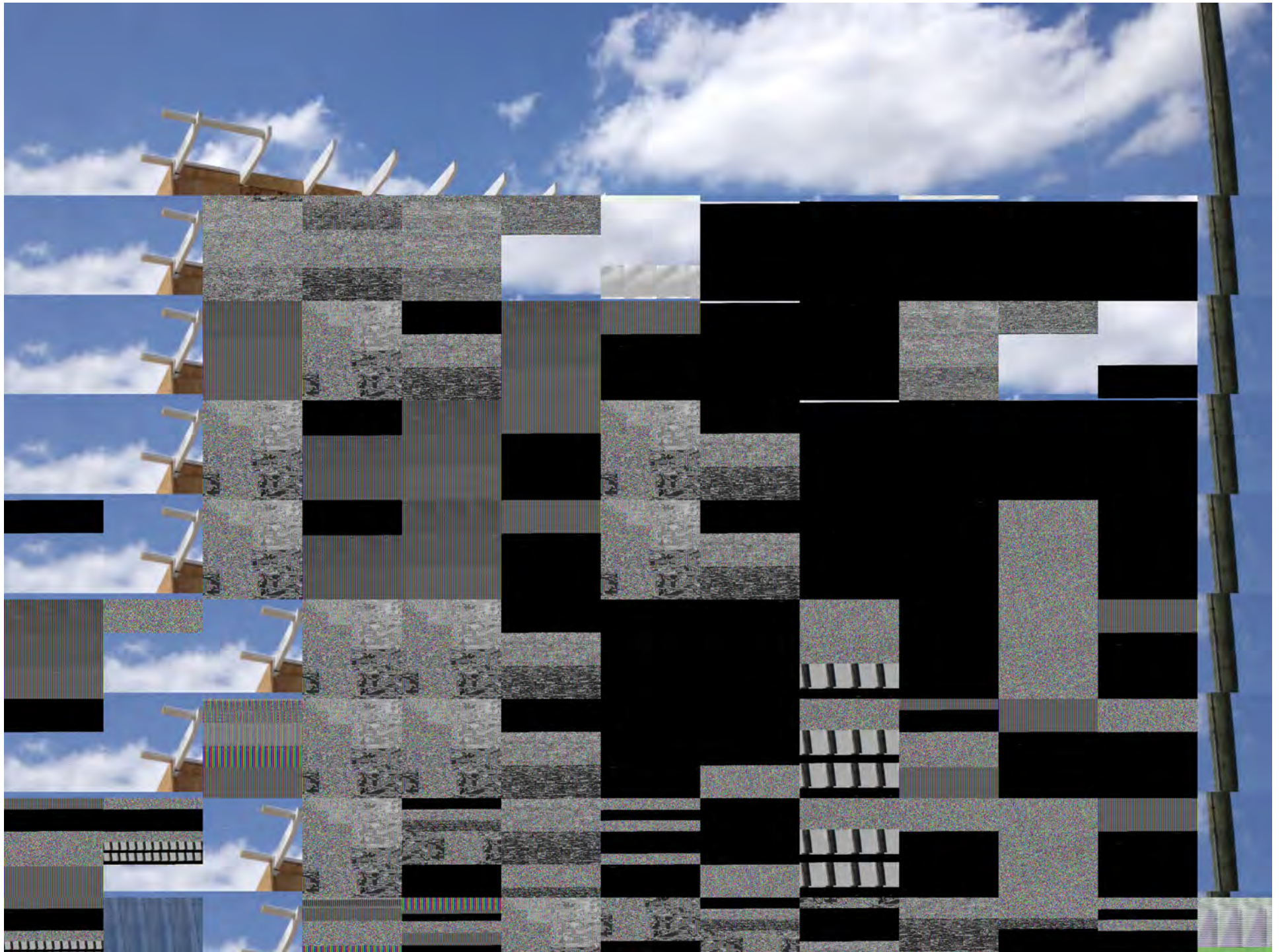


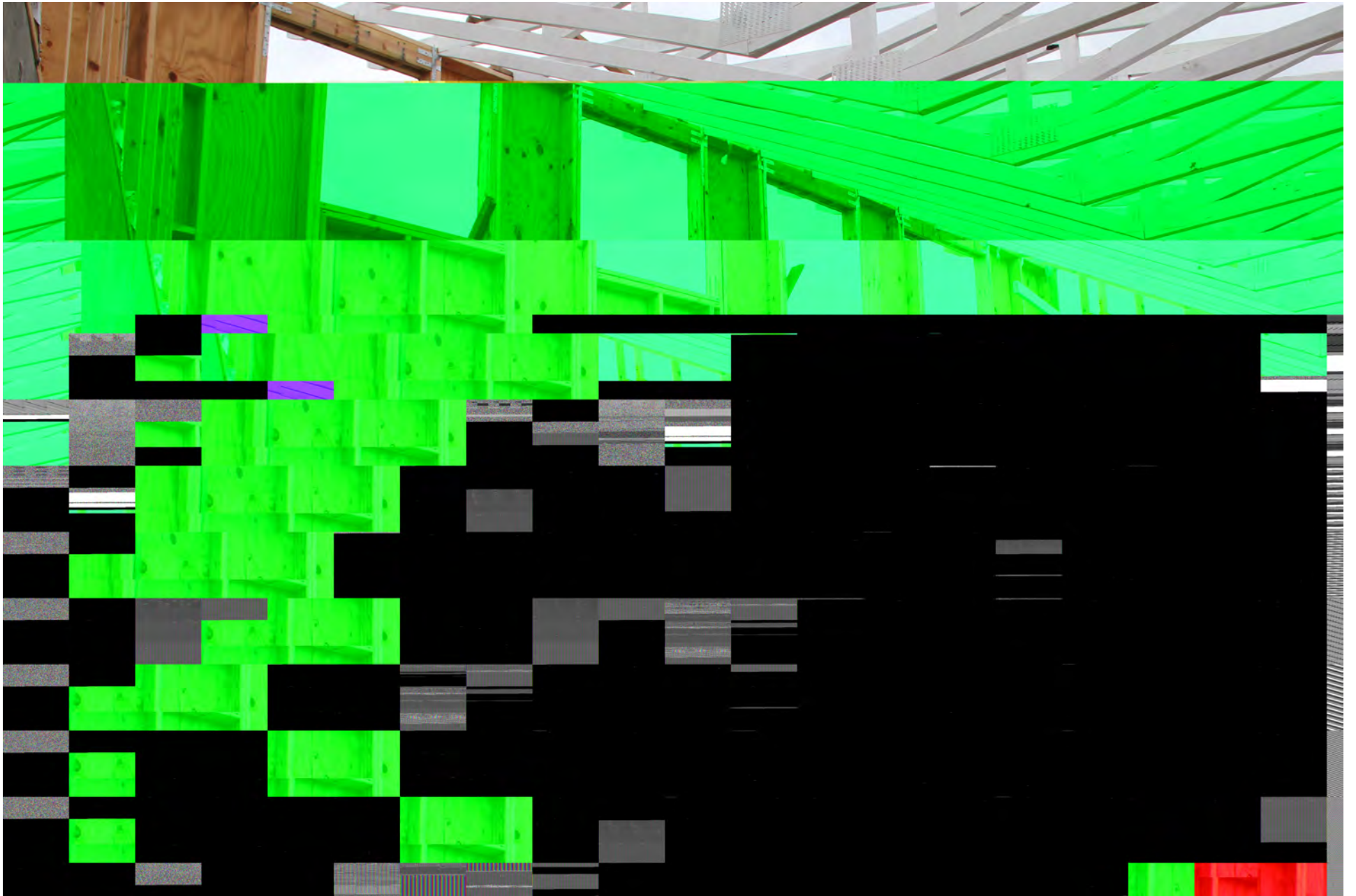




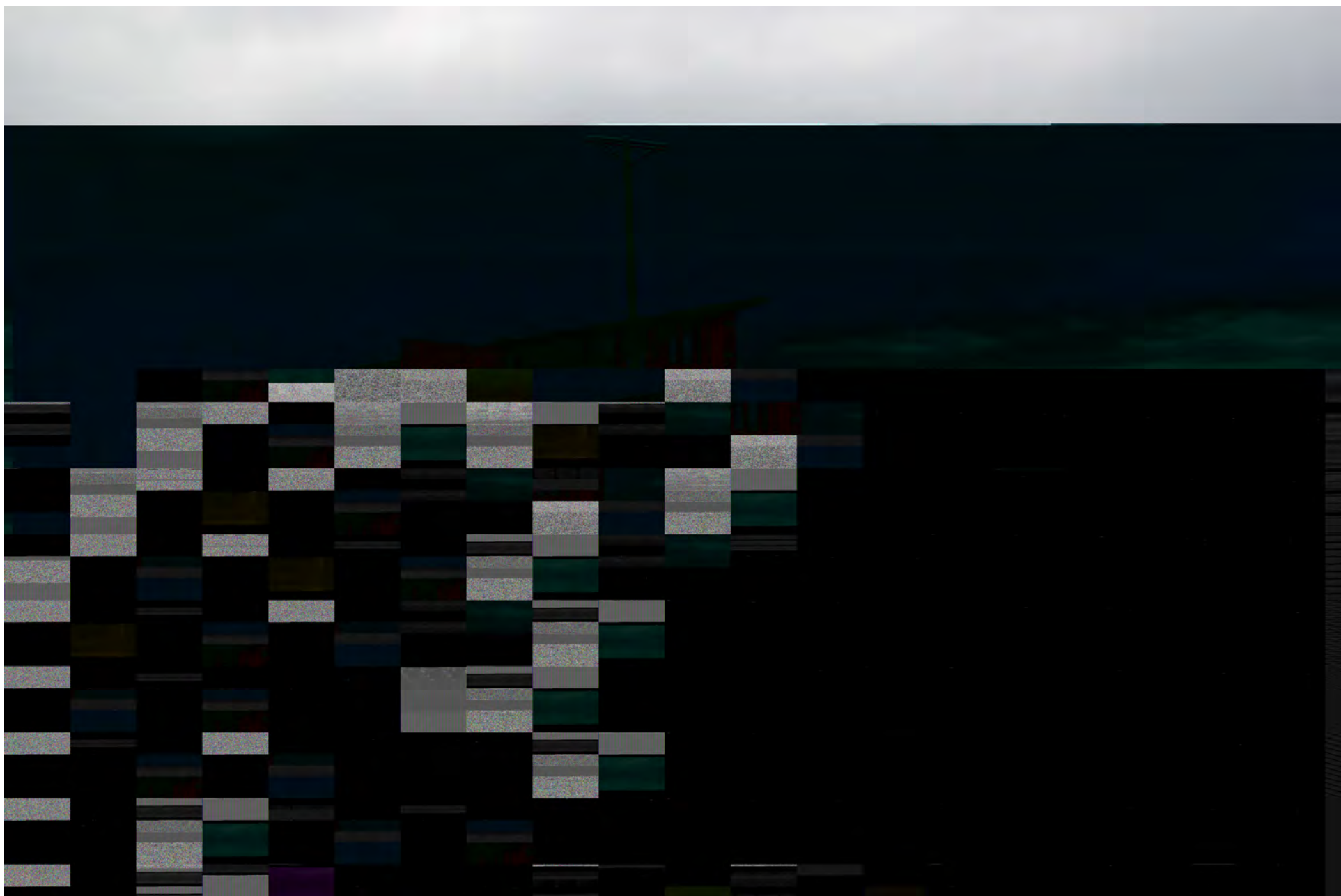


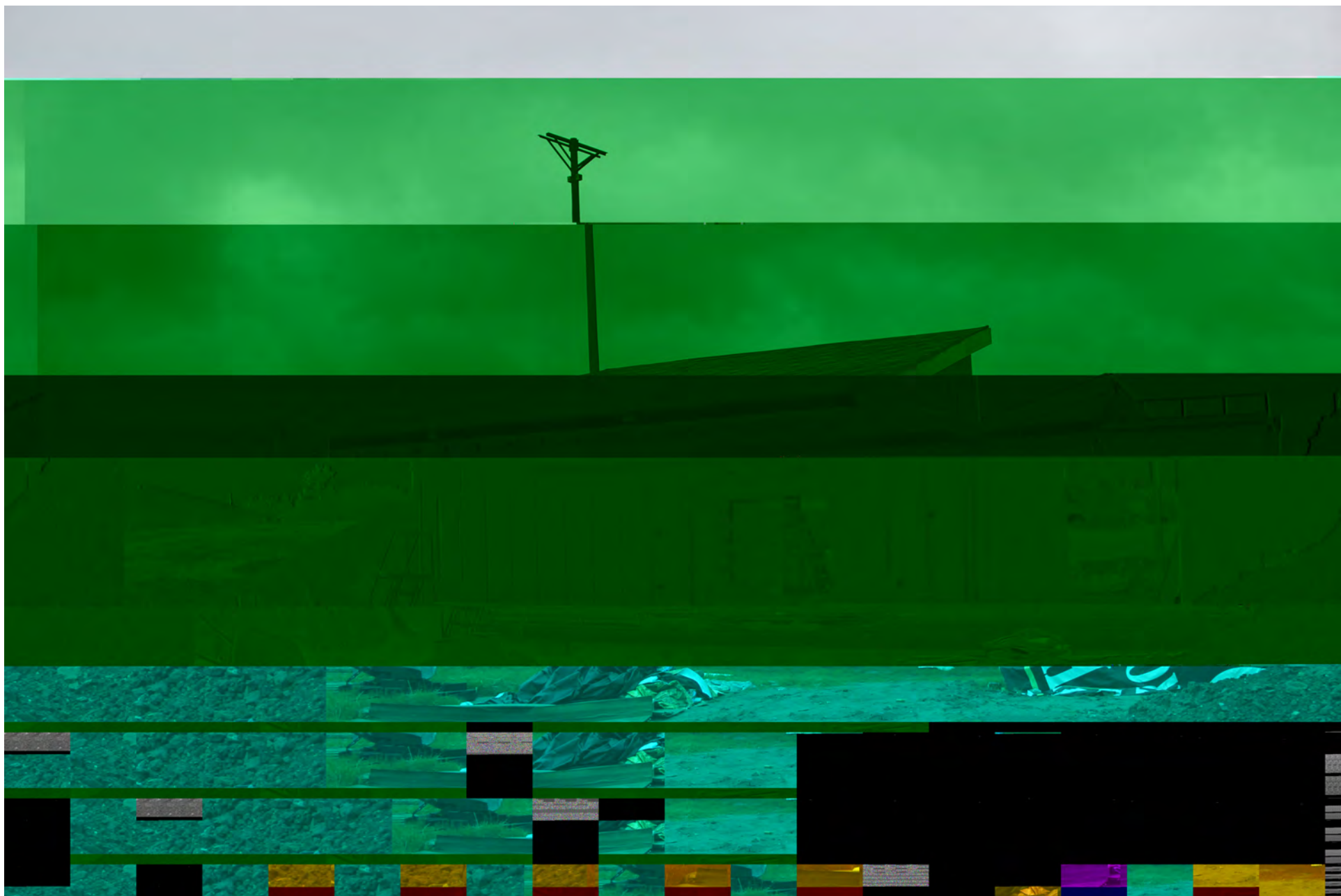






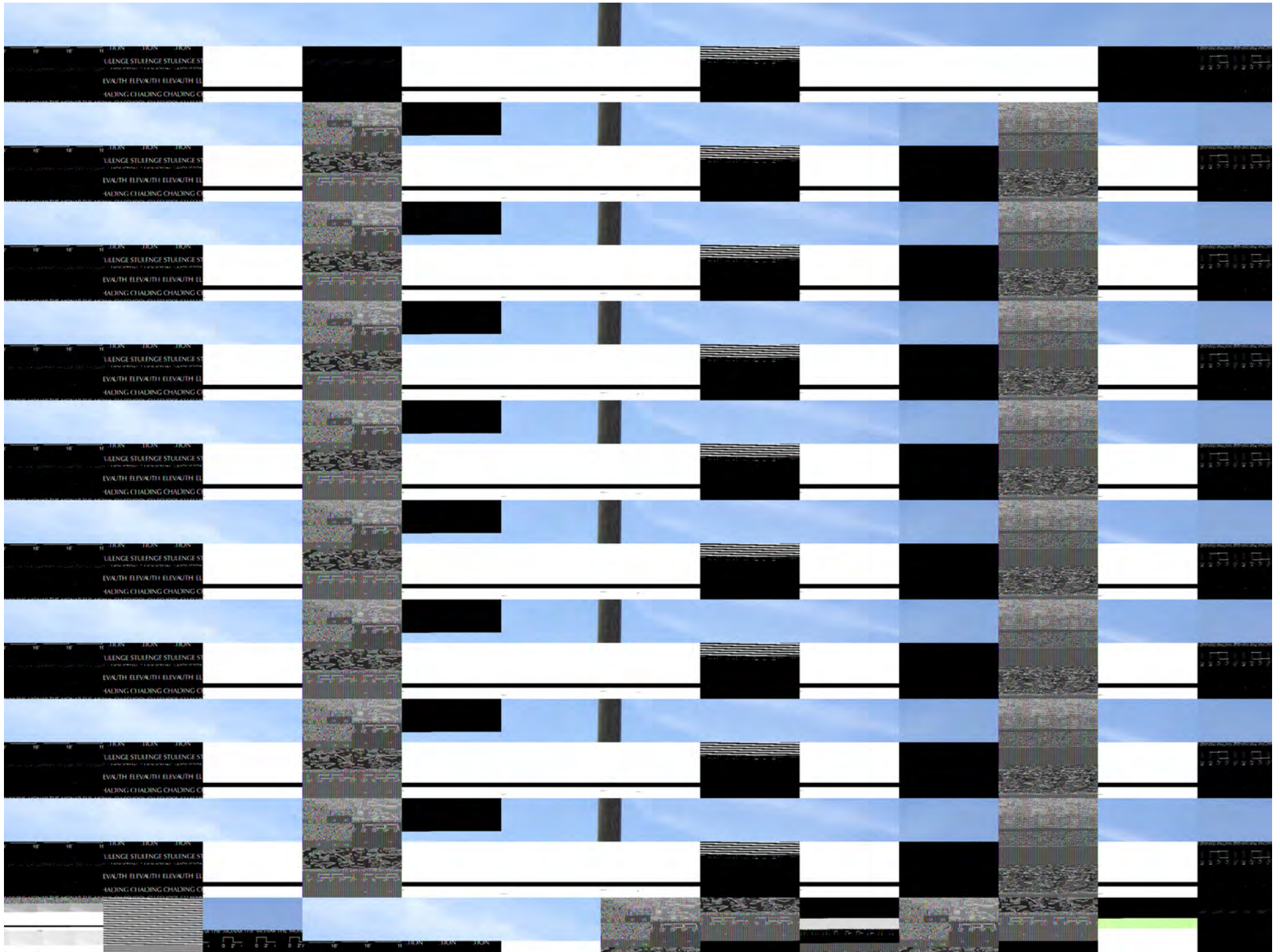














15: Conservation and Reuse



40000
1200 270

ON
SIEMENS
Control Energy
Safety
OFF

WARNING
DANGER
ELECTRIC SHOCK
DEATH

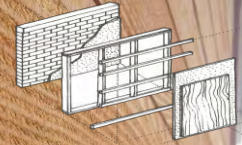
Green box with logo

Yellow container
Red paper

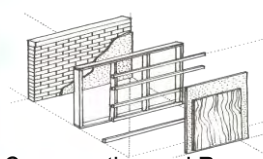
Cardboard box

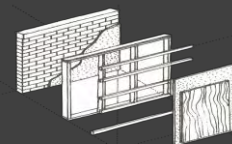


6/3/89



15: Conservation and Reuse





15: Conservation and Reuse





EQUITY

Supporting a just, equitable world

16

HUMAN SCALE +

16

HUMAN SCALE +

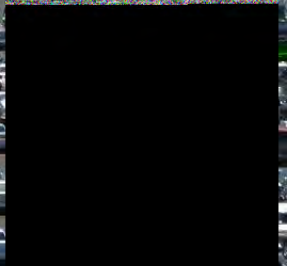
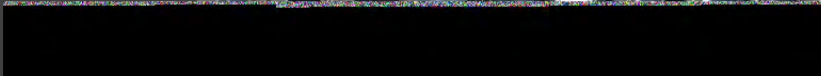
16

HUMAN SCALE +

16

HUMAN SCALE +

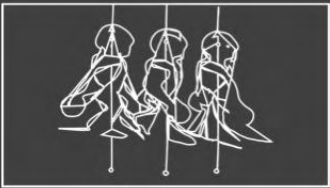
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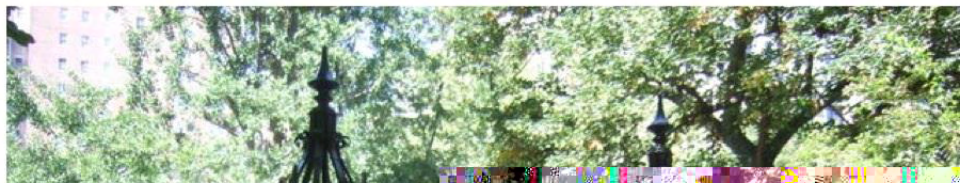
17

DEMOCRACY + SOCIAL JUSTICE

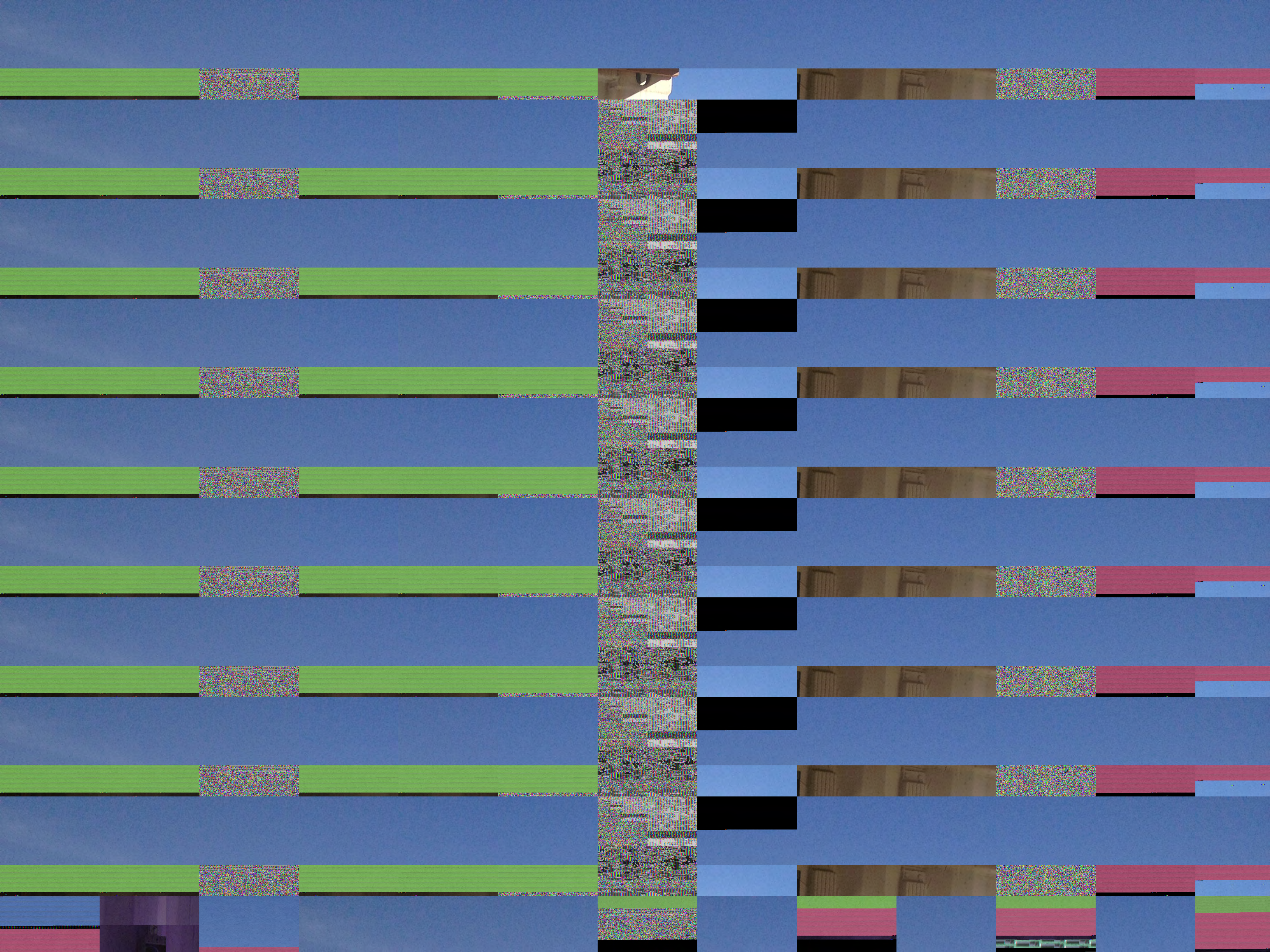


All primary transportation, roads and non-building infrastructure that are externally focused must be equally accessible to all members of the public regardless of background, age and socioeconomic class, with reasonable steps taken to ensure that all people can benefit from the project's creation.

Access for those with physical disabilities must be safeguarded through designs meeting the Americans with Disabilities Act (ADA).



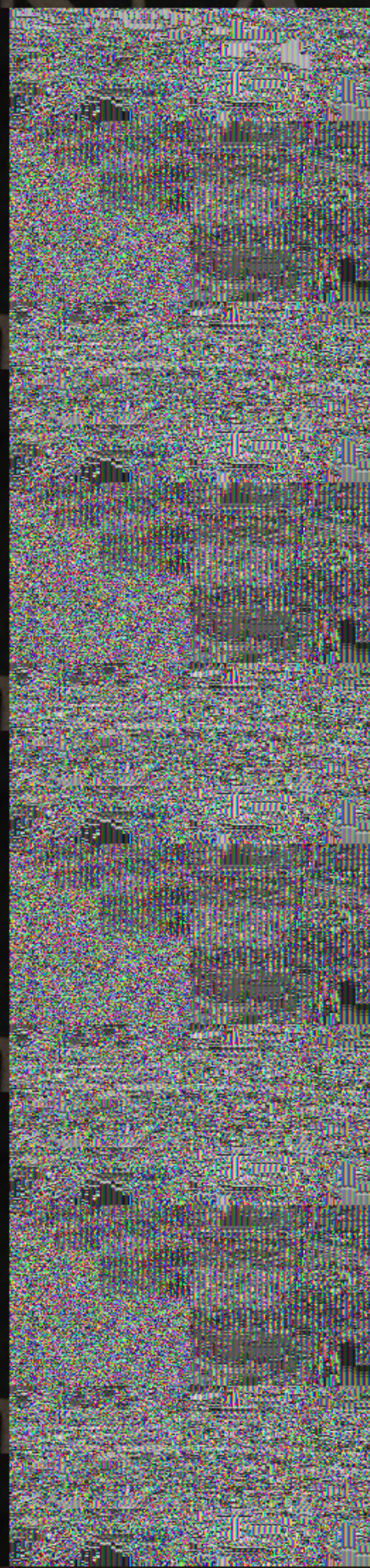






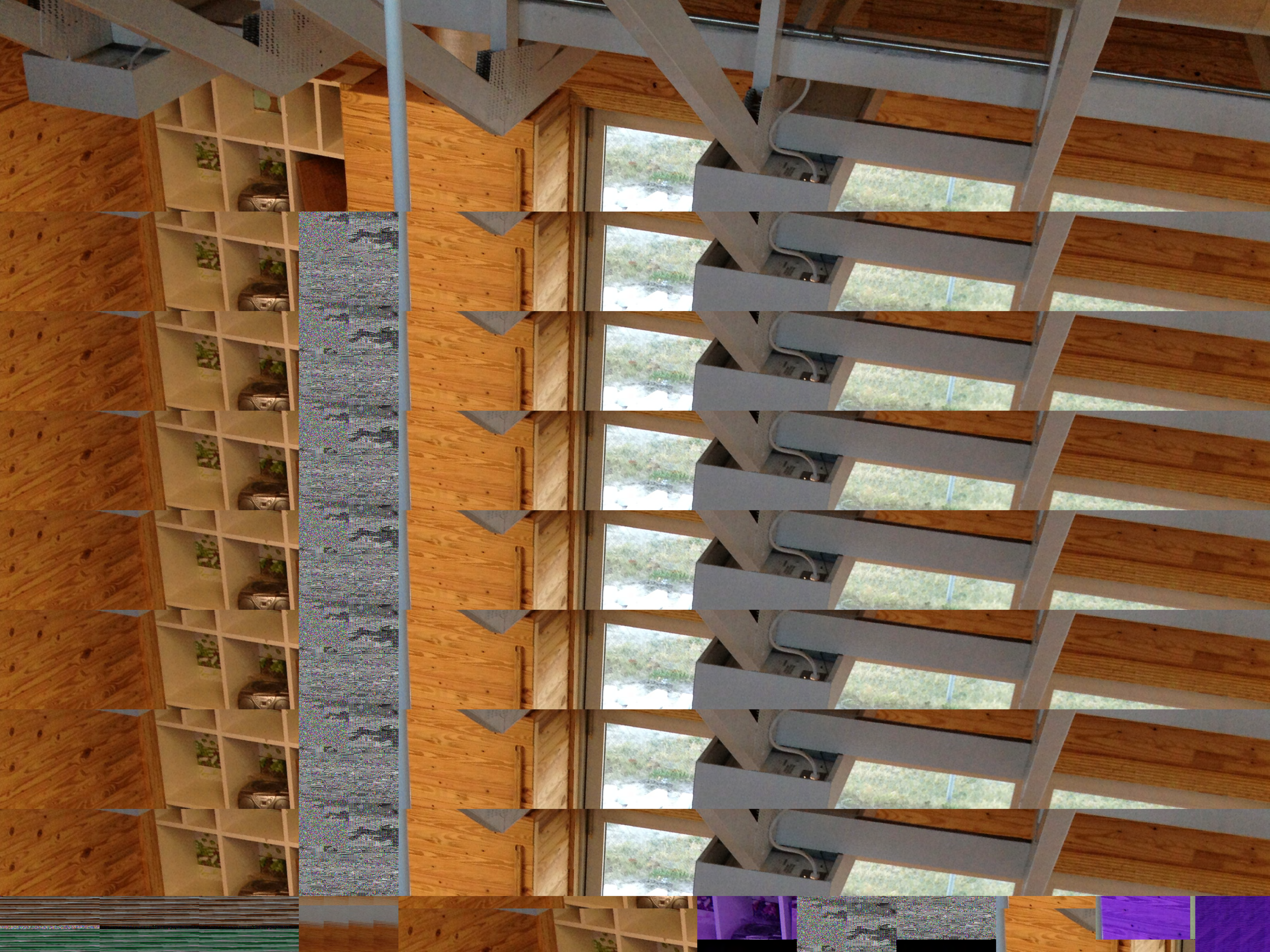


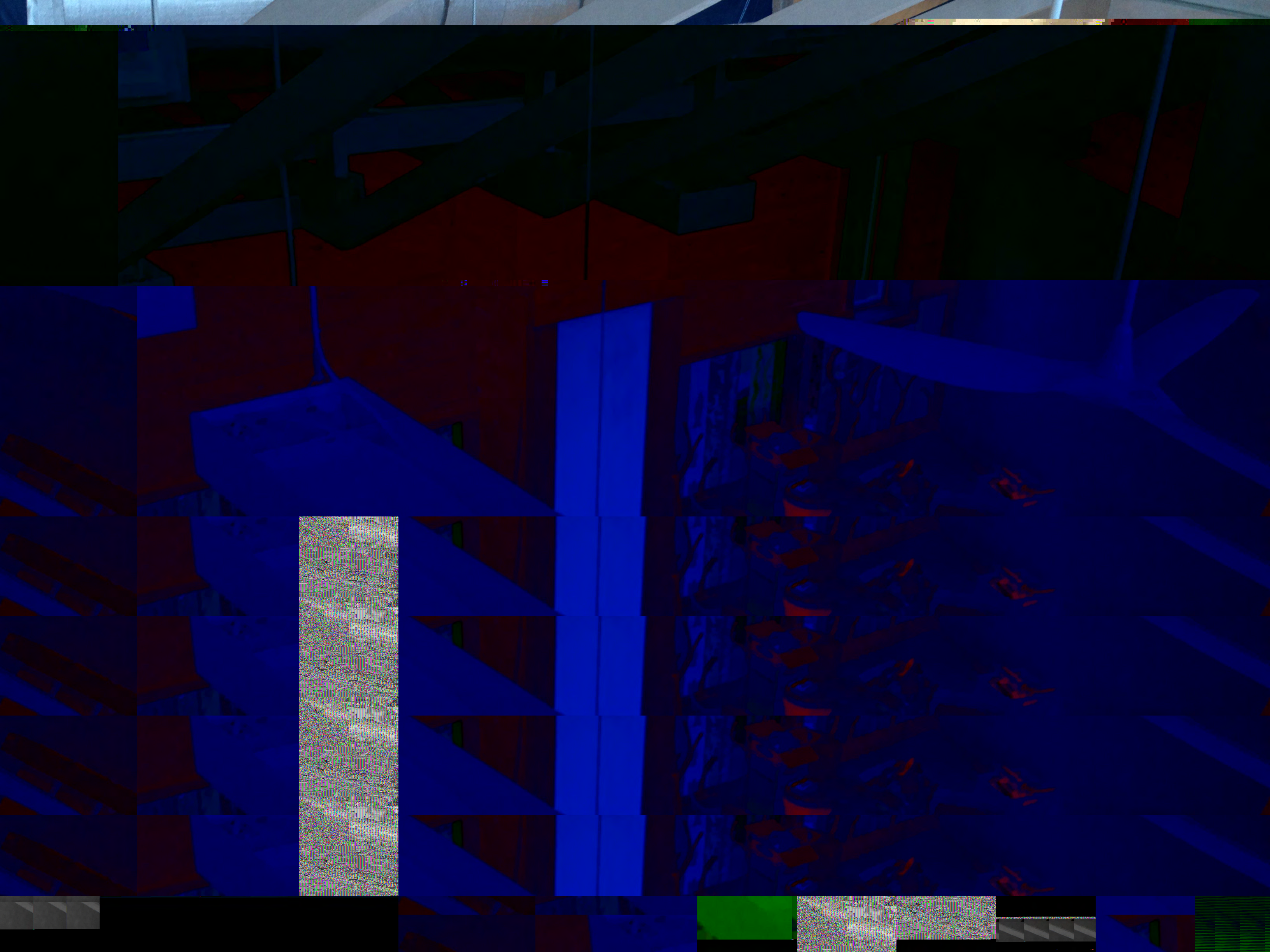
THE MONARCH SCHOOL

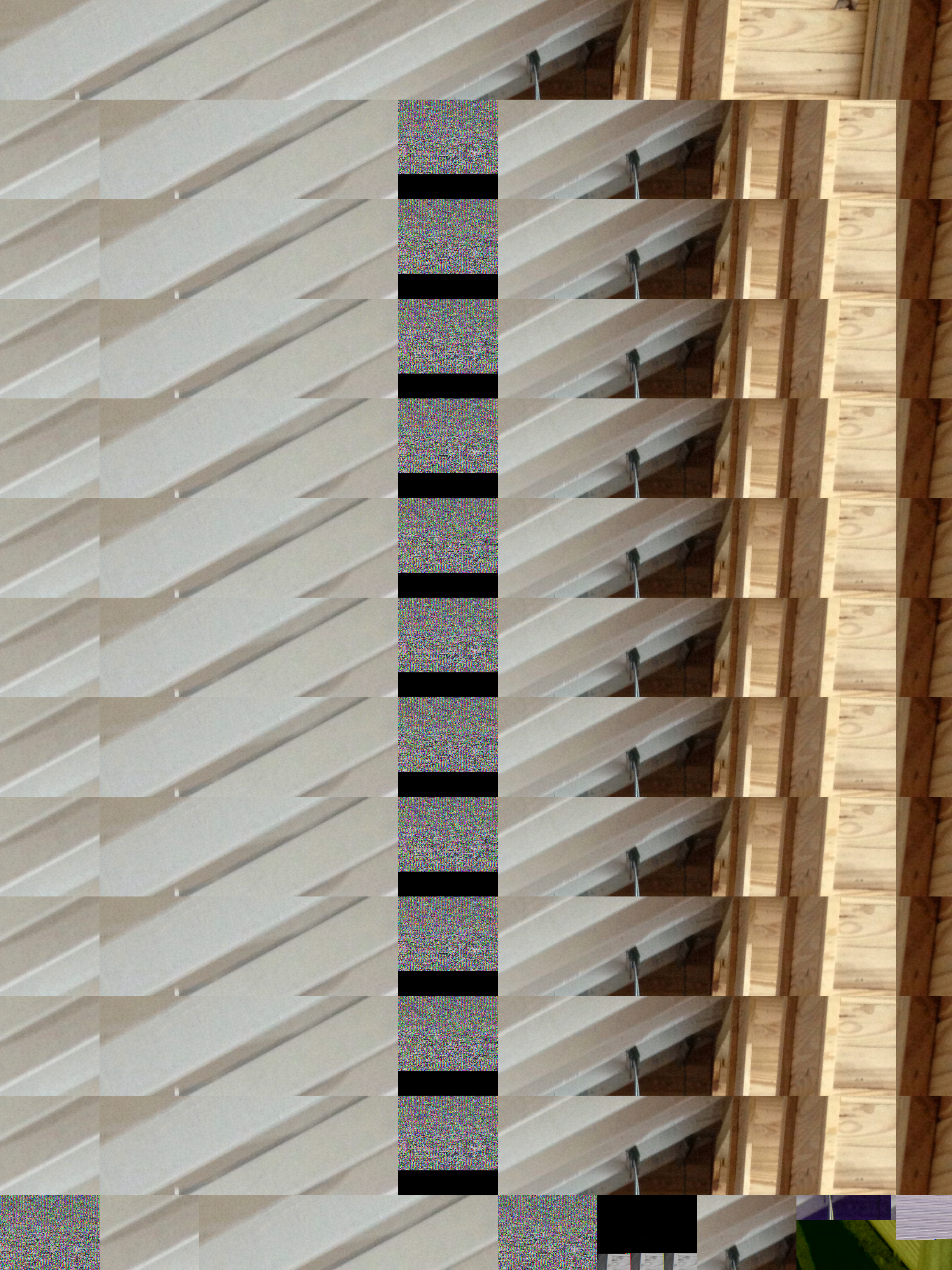




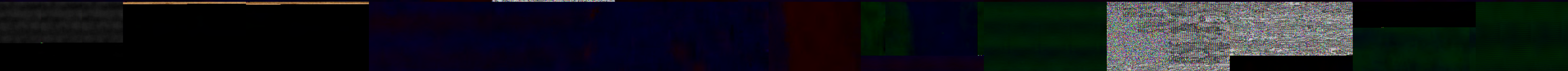
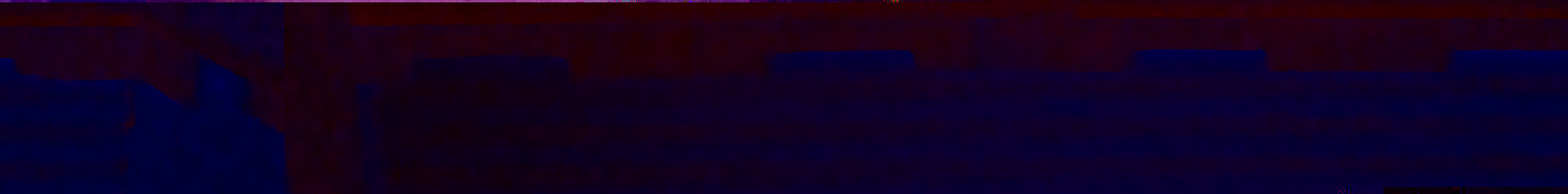








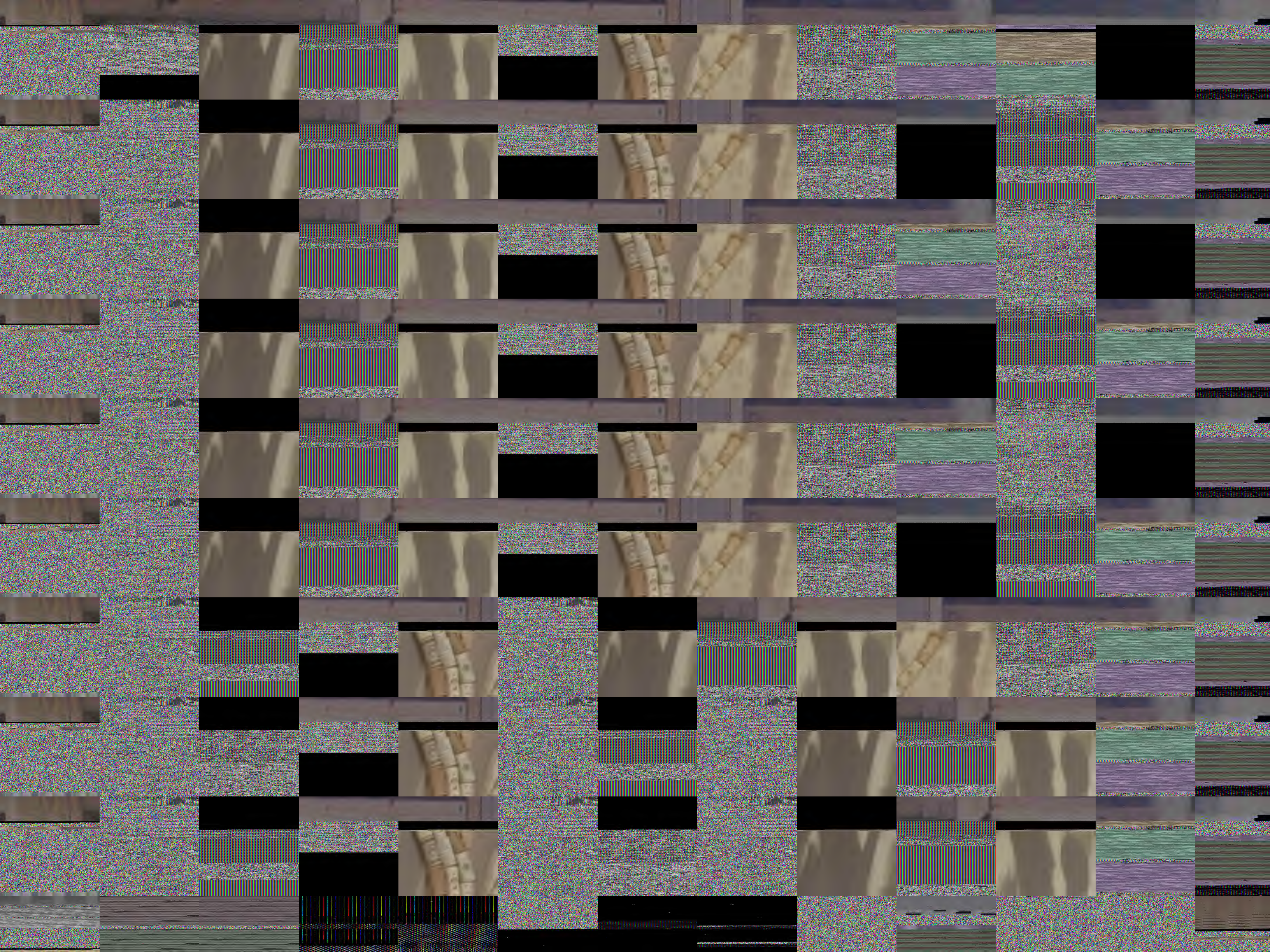














18

RIGHTS TO NATURE

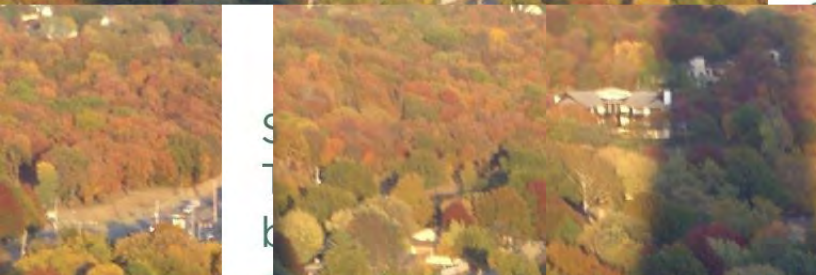


The project may not block access to, nor diminish the quality of, fresh air, sunlight and natural waterways for any member of society or adjacent developments.



Fresh Air

The project must be designed to protect adjacent properties from any noxious emissions that would compromise its ability to use natural ventilation.



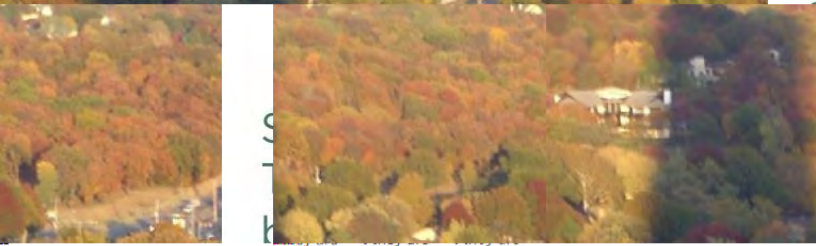
Sunlight

The project may not block sunlight to adjacent building façades and rooftops such that they are



Sunlight

The project may not block sunlight to adjacent building façades and rooftops such that they are

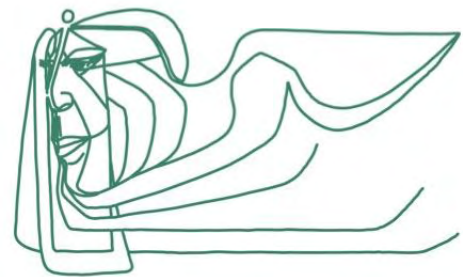


Sunlight

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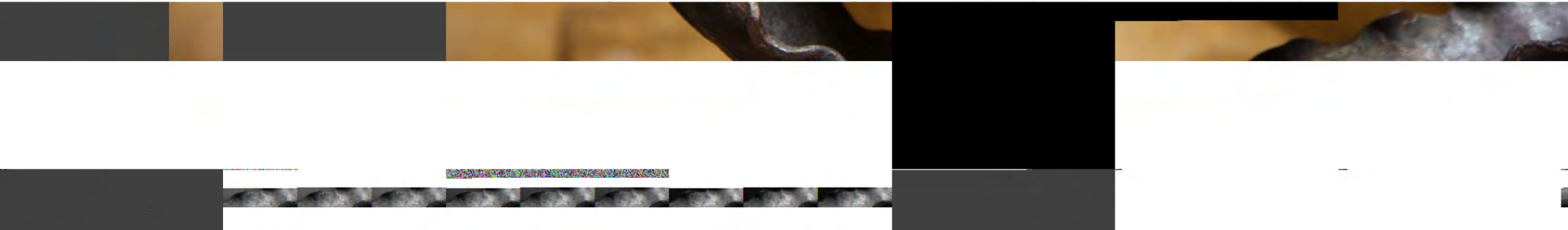
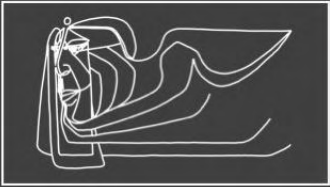


BEAUTY

Celebrating design that creates transformative change

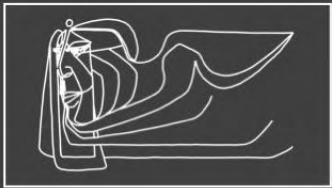
19

BEAUTY + SPIRIT



20

INSPIRATION + EDUCATION



Educational materials about the performance and operation of the project must be provided to the public to share successful solutions and to motivate others to make change.

certified
'LIVING'



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OMEGA CENTER FOR SUSTAINABLE LIVING RHINEBECK, NEW YORK

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'LIVING'



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TYSON LIVING LEARNING CENTER
EUREKA, MISSOURI

certified
'PETAL'
health, beauty,
site, water



certified
'LIVING'



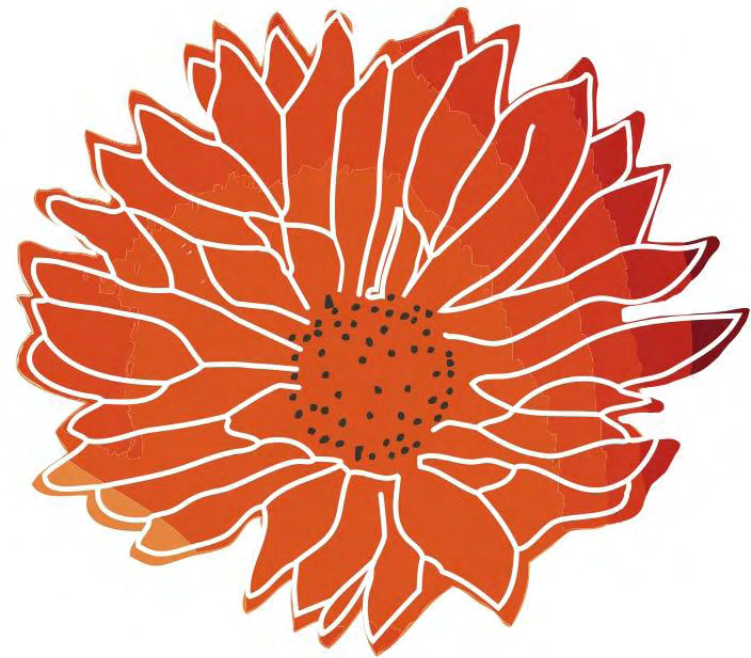
burgh Architects

Image © 2010 Matthew Millman Photography, courtesy of Flansburg

HAWAII PREPARATORY ACADEMY ENERGY LABORATORY WAIMEA, HAWAII



BREAKING DOWN BARRIERS



UniverCity Childcare Facility
Hughes Condon Marler Architects



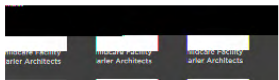
UniverCity Childcare Facility
Hughes Condon Marler Architects



UniverCity Childcare Facility
Hughes Condon Marler Architects



UniverCity Childcare Facility
Hughes Condon Marler Architects



UniverCity Childcare Facility
Hughes Condon Marler Architects



UniverCity Childcare Facility
Hughes Condon Marler Architects

IN-HOUSE WORKSHOPS

Designed for your needs, delivered to your office.



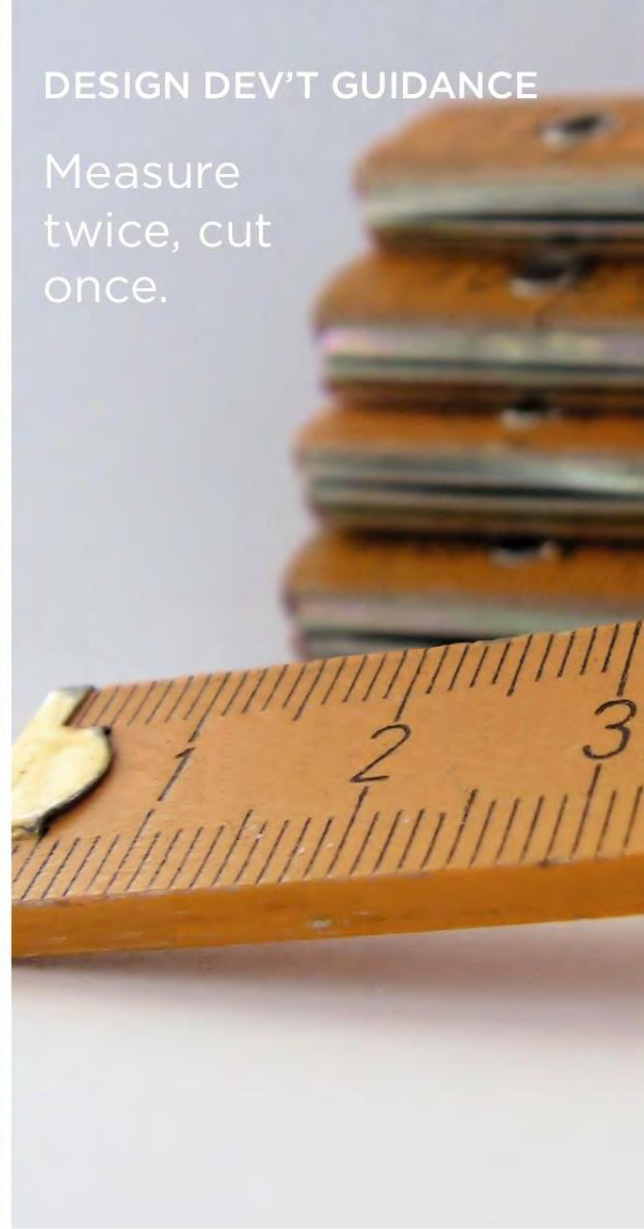
CHARRETTE FACILITATION

The early bird gets the worm.



DESIGN DEV'T GUIDANCE

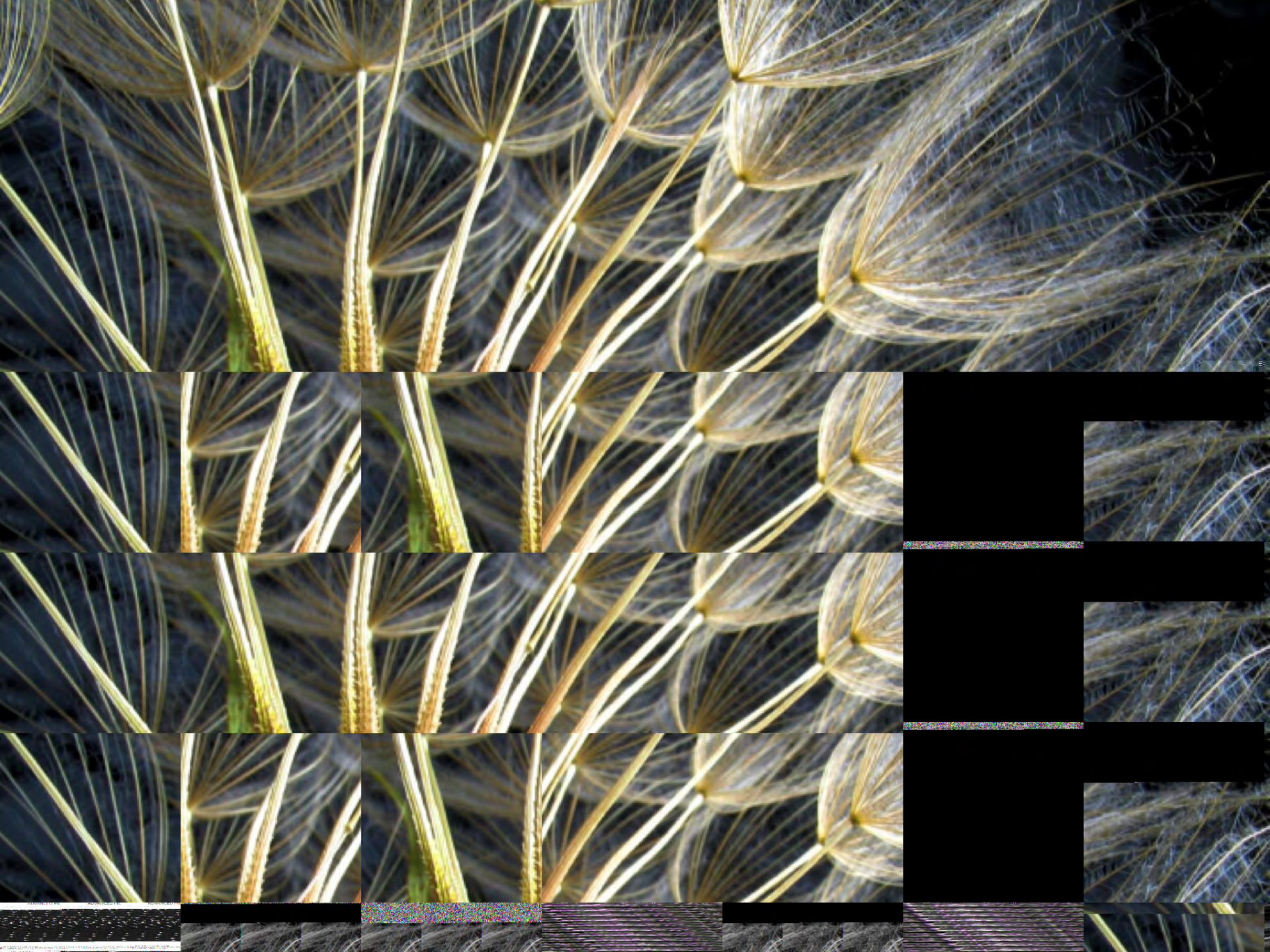
Measure twice, cut once.



TECHNICAL ASSISTANCE FOR PROJECT TEAMS



THE INSTITUTE IS LOOKING FOR INTERESTED INDIVIDUALS AND
ADVANCED PRACTITIONERS TO SPREAD THE WORD



Thank You

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Shelly Pottorf, AIA, LEED AP, Architend

spottorf@architend.com