

FREESOUP.INFO

by

Andrew Falls

Submitted in partial fulfilment of the requirements
for the degree of Master of Architecture

at

Dalhousie University
Halifax, Nova Scotia
March 2020

© Copyright by Andrew Falls, 2020

For mom.

Contents

Abstract	iv
Acknowledgements	v
Chapter 1: Introduction	1
Personal Power	1
Formlessness	1
Entropy	2
Power.....	3
Deployment	5
FREESOUP.INFO.....	7
Chapter 2: FREESOUP.INFO (as of 10:30am March 16, 2020).....	8
Layer 00: Power Extraction	13
000 Growth	14
000 Recipes.....	15
Layer 01: Power Insertion.....	26
010 Community Pool	27
Layer 02: Power Translation.....	34
020 Smog	36
Layer 03: Power Transmission	48
030 Mutual Inductance	50
035 Power Party	56
Layer 04: Power Inhabitation.....	59
041 Birds of The Garden	60
042 Winter Dwelling for Soup Maker	67
043 Aggrede lamigration.....	76
Chapter 3: Conclusion	83
Layer 05: Power Sublation	83
Child of The Weather	83
Appendix: Definitions of Key Terms.....	90
References	91

Abstract

Humans have developed systems of extraction to harness power outside of the cycles occurring in our atmosphere. These systems use this imbalance of power to influence behaviour and reject our previous existence dominated by atmospheric flux. Additionally, they attempt to isolate pockets of inhabitation within this context, neglecting the laws of thermodynamics, which state that within our open system, nothing is isolatable; every boundary is that of thermodynamic dissipation. Despite this reality, architectural systems constantly attempt to define thresholds and enclosures, reinforcing false ideas of boundary within a universe where chaos is constantly increasing. FREESOUP.INFO introduces a deployable system to harness the abundant layer of dissipation latent in monopolizing systems in order to break down and make visible the oppressive hierarchies of power control. By occupying these false boundaries, the system feeds power back into the individual, providing a layer for free inhabitation, celebration and fun.

Acknowledgements

Thank you to Ted Cavanah, James Forren, Kim Morgan and Roger Mullin for your guidance. Thank you to Aaron Outhwaite for providing a basis for the material system of this thesis. Thank you to Hannah Newton for your work on layer 051, Jacob Raetli for your work on layer 035, Max Patzelt for your work on layer 030, Sebastian Sarrazin for your work on layer 020 and to everyone who intended to present this work with me at the system launch. Thank you to those who attended power party. Mostly, thank you to those who I have had the pleasure to share soup with both throughout my life and during this process.

Chapter 1: Introduction

Personal Power

Personal power can be harnessed through the mobile device resting near to you. Cobalt is mined by human hands in the Congo to allow you to access information at your will. This information is the furthest energy (energy memory) storage medium from the sun in the Earth's energy hierarchy, requiring up to ten trillion emjoules of solar energy per joule, where wind uses six hundred and twenty three (Moe 2013). Your device, limitlessly provides you with a mobile freedom to interact with the free energy surrounding you. You may experience this thesis by the ocean, or near a tree, feeling the wind through a coat or blanket, or you may read this behind many fixed layers of matter that control your perception of such forces. Regardless of your choice, please celebrate the power our system has made available to you by scanning this code, closing the document, and beginning your journey with the sun through your own personal power. If a copy of this thesis has been shared to you in print, please consider burning it for warmth after completion.



Scan me
<https://www.freesoup.info>

<https://freesoup.info>

Formlessness

Georges Bataille introduced the concept of formlessness in the early twentieth century. The term removes metaphorical narratives as the driving force in the conception of art towards works conceived of through physical process. Formlessness uses forces such as material process, entropy, human kinetics and gravity to drive works that separate the designer as the “ultimate form-giver,” emphasizing instead

the interactions between the processes inherent in their base materialism. Regarding architecture, Bataille states:

Architecture is another name for system itself, for the regulation of the plan. Every monument is a monument of social order, a call to order issued to inspire fear [...] Architecture is the human ideal, the superego. Consequently, an attack on architecture is necessarily, as it were, an attack on man. (Bois and Krauss 1997, 17)

Here Bataille reveals the current physical reality of architecture; that rooted in its systemic basis and material composition are physical structures used as regulating tools for human behaviour. Through time, these tools, such as fixed aggregated wall assemblies, have become increasingly complicated and illegible, distorting the ability for humans to understand the realities of the processes they are governed by.

Entropy

The laws of thermodynamics are misunderstood in today's architectural discourse. Additive wall systems such as ones based on Passive House standards are rooted in misdirected ideas about separating interior and exterior environments. Their idea of efficiency is based on the singular principal of reducing the loads placed on mechanical systems they attempt to enclose.

In Canada, the singular idea of energy efficiency has grown since World War Two where the general population was convinced that HVAC systems based on an abundance of cheap extracted fossil fuels and aluminum were beneficial towards our spatial inhabitation (Moe 2014). This idea of efficiency does not take into account the energy inherent in the material that makes up systems or the complex qualities these materials possess. Additionally, the ability for materials, systems and occupants to feedback into their environment

through “a loop of mutually enhancing interactions” (Moe 2013, 41), is neglected, leaving processes of dissipation as imperceptible and unharnessed.

In rejection of this perceived idea of enclosure, built formations have the ability shape a “dialectic between an active inner nucleus and active perimeter [...] to organize fluctuating exchanges by means of form, material, passive systems and typological organization” (Abalos, Snetkiewicz and Ortega 2015, 236). This type of approach embraces our reality as living beings, by conceiving of material assemblies and systems as biological appendage to our inherently entropic processes. This “second law design” embraces the reality that energy cannot be created or destroyed, that entropy is constantly increasing - thereby orienting energy intervention as a first principal in design methodology (Moe 2013). In this methodology temperature, pressure, density, specific heat capacity and conductivity determine material and system design rather than superficial narratives that are commonly suggested as the basis of design (Moe 2017).

Through a method of intensive design, constructed formations become less complicated in their material assemblies and systems, but more complex in their relationships based on energy hierarchies (Moe 2013). By embracing realities of entropy, the method of intensive design positions itself to serve as an effective infrastructure of our dialogue between atmospheric processes, human life and established systems of power.

Power

In *Environment, Power and Society*, Howard T. Odum breaks down the self organizing solar based Earth energy system and established extraction based power system to place

the human as subject to greater hierarchical processes. He states prior to extraction based power systems, human freedom was comprised by “poor opportunities for survival and enslavement to environmental dictatorships such as poverty, famine, and disease” (Odum 1971, 294). He continues by stating that since establishing regimes of order, humans have taken over the dictatorship of nature (Odum 1971), and instead created systems based exclusively on the rate of corporate extraction and processing of extracted matter. Today the corporate regimes that control the flow of extracted power, control the individual as subject to their power. Currently, these systems in place are often monopolies such as in Halifax where there is one choice of electrical supply through the Emera Corporation.

In their 2016 Venice Biennale exhibit entitled *EXTRACTION*, RVTR distributed *UNDERMINING EMPIRE A Landscape Manifesto for the Next Century*, a pamphlet highlighting fourteen points on reforming the oppressive extraction based energy economy. On energy it states: “The power of human energy is the greatest and most precious renewable resource on the planet [...] Economies of labour can only be achieved by unlocking the energy of its workforce who’s intelligence is rooted in land itself” (RVTR 2016).

Replenishable energy reserves exist in the land all around us. In Halifax’s harbour, kelp grows naturally but is dismissed for consumption due to the proximity to pollution. This underutilized layer of the harbour used almost exclusively for energy transport has the ability to create a local, land based, replenishable material system unlocked by a collective work force.

Plants are second to wind in their efficacy in harnessing the sun's power. Each joule of plant energy contains 24,000-200,000 emjoules of solar energy (Odum 1971). More importantly, they live by the cycles of the sun, and regrow seasonally; while extraction based energy hierarchies utilize fossil fuels that take three hundred million years to develop (Berner 2003). Through utilizing the kelp grown in the harbour for the processing and utilization of biopolymers, the energy harnessed in plant life provides an effective layer to interact with the entropy latent in existing processes. A deployed biomaterial system will alter its presence seasonally and replenish itself each year, growing its occupation within the extraction based energy system it occupies, and ultimately leading to its demise.

Deployment

Today, movements such as fair trade, farm to table and ethical clothing manufacturing practices have shifted the way the educated consumer decides which product to support. At their core, these movements are grounded in the rejection of established systems of oppression to create a more equal distribution of commodity within their supply chains. Their success is highly dependant on the distribution of information which is effectively achieved in an uncensored, boundless and free manner through the internet. The processes of extraction are oppressive to their workers, consumers and the environment. FREESOUP.INFO positions itself as a venue to display, and begin to dismantle this oppression through open source information sharing.

Websites are places. They provide services and social environments. Like architecture, they distribute access and atmospheric context to these resources[...] Websites are inherently public. Architecture is by nature a public discipline.

Both buildings and websites are built realities. They are part of the fabric of societies that are now both physical and virtual. (Müller 2019)

By providing examples of alternative power channeling through the application of a locally available biomaterial, deployed single layer systems make legible both their material source and the contextual forces acting upon them. The prototypes highlighted on the website begin to break down the complex and mostly hidden layers of current architectural systems that leave the average consumer as unaware of their power source and material system. Each prototype treats the entropy inherent in the extraction hierarchy as a context, and proposes a deployed mediation which serves to both maximize the use of the entropic layer, and make visible its abundance. Through facilitating collective celebration and personal human action through event, the website serves a community driven system which aggregates with each moment of material deployment. The animations on the website highlight both processes and contextual forces as the driving factors in deployment, omitting the typical plan as a governing tool to make each project a suggested process for human driven aggregative growth, rather than predetermined outcome.

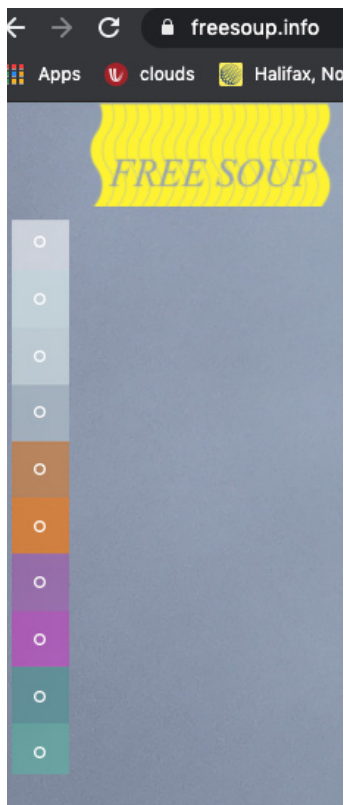
Through reinforcing *Second Law Design* principles, this entropic-determinant, formless approach to an architectural system embraces the intangible reality of boundary (Lalley 2009), by rejecting the proposition of architecture as a system of fixed spatial assemblies used for control. “As such, the design process reflects the indeterminacies of the designers role and the resultant inscriptions reflect a spatial distribution that defies conventional formal aesthetics.” (Moffit 2017, 777). The designer of FREESOUP.INFO thus becomes a member of the community who documents,

describes and communicates processes, rather than dictates their outcomes.

FREESOUP.INFO

The following pages contain excerpts from FREESOUP.INFO as it existed on March 16 2020. The website will continue to aggregate as our community grows and continues to submit their deployments. Each project will feed off of the others, constantly increasing our knowledge and material efficacy. No project is ever complete, they stand as a moment of time serving to reflect feeling and process. To assist in the legibility of dissipation, the website is organized around the existing extraction hierarchy, and places each work within the entropic context of one of its layers. All text in italics such as this is from one of our event organizers or an individual speaking about their personal deployment of the material system. This document will be obsolete by March 17 2020.

Chapter 2: FREESOUP.INFO (as of 10:30am March 16, 2020)



layer navigation
<https://www.freesoup.info>



*Humans have developed systems of extraction to harness power outside of the cycles occurring in our atmosphere. These systems use this unbalance of power to influence behaviour and reject our previous existence dominated by atmospheric flux. Additionally, they attempt to isolate pockets of inhabitation within this context, neglecting the laws of thermodynamics, which state that within our open system, nothing is isolatable; every boundary is that of thermodynamic dissipation. Despite this reality, architectural systems constantly attempt to define thresholds and enclosures, reinforcing false ideas of boundary within a universe where chaos is constantly increasing. **FREESOUP.INFO** introduces a deployable system to harness the abundant layer of dissipation latent in monopolizing systems in order to break down and make visible the oppressive hierarchies of power control. By occupying these false boundaries with materials that harness the cyclical abundance available in our atmosphere, the system feeds power back into the individual, providing a layer for free inhabitation, celebration and fun.*

**SCIENCE
HAS
FAILED**



[CALENDAR](#)

[REQUEST SOUP](#)

[FS RADIO](#)

[JOIN](#)

[MAP](#)

JOIN OUR COMMUNITY

Name

Email

Phone

Whats your favourite soup?

CALENDAR REQUEST SOUP FS RADIO JOIN MAP

000 COMMUNITY
<https://www.freesoup.info>



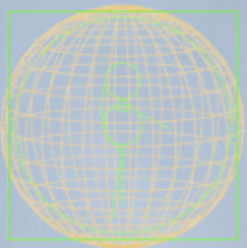
PLAYLIST

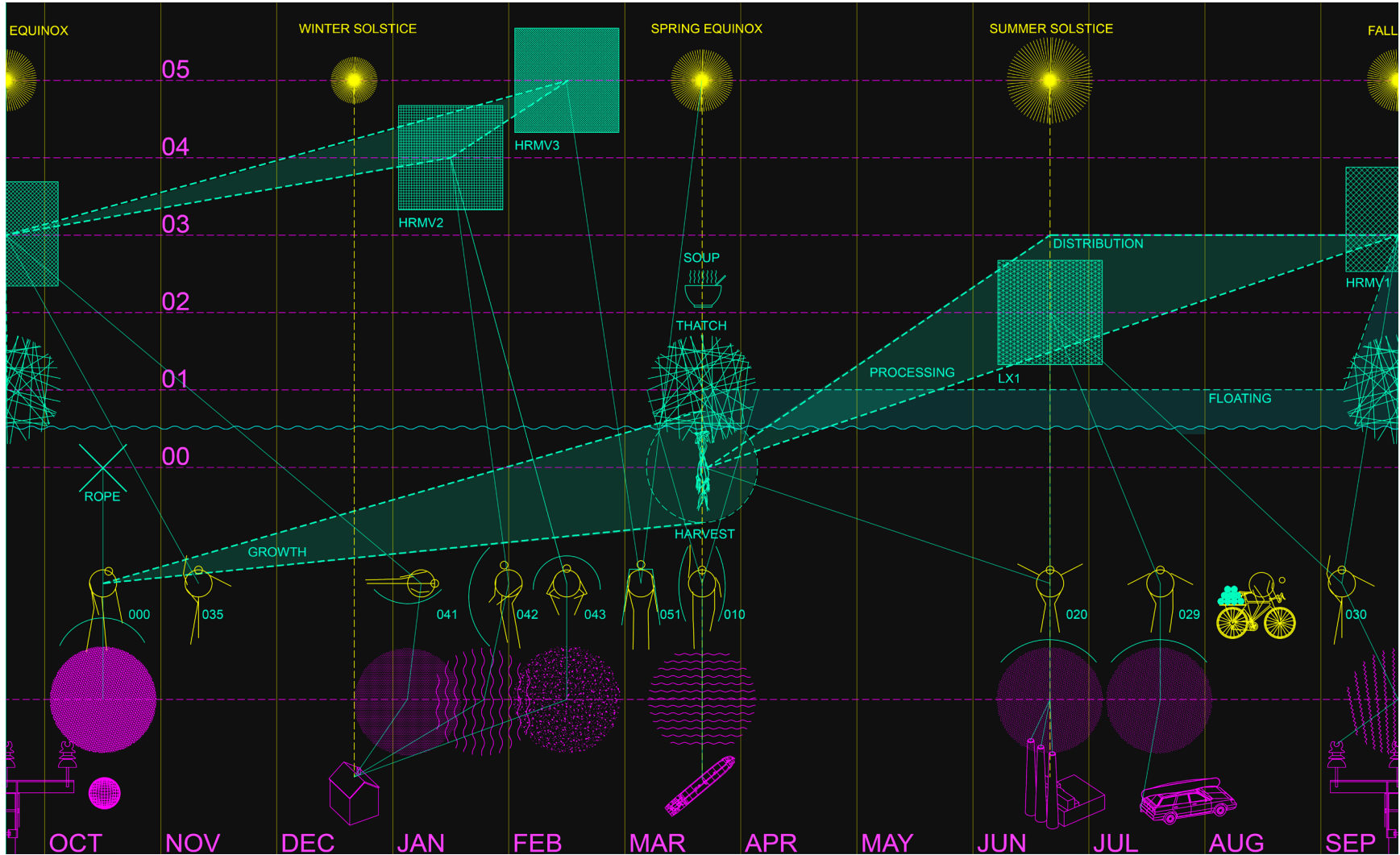
CORRESPONDING SONG PER DEPLOYMENT

- 000: FUTURE ENERGY FIELDS - JOYFULTALK
- 010: ENERGY FLEETS - KING KRULE
- 020: ECONOMY OF FREEDOM - YVES TUMOR
- 029: SMOKES QUANTITY - BOARDS OF CANADA
- 030: KINETIC THEORY - ALEKSI PERALA
- 035: SPACE IS ONLY NOISE IF YOU CAN SEE - NICHOLAS JAAR
- 041: LOOPS - JUNIP
- 042: BOWLS - CARIBOU
- 043: CANVAS HOME - ARTHUR RUSSELL
- 051: CHILD OF THE WEATHER - BABY EAGLE

<https://www.youtube.com/playlist?list=PLe1q6Mxb7-BajX13IEfmG6NGHVlqJPeXY>

<https://music.apple.com/ca/playlist/free-soup-radio/pl.u-GgA5epaCor10oA>





000: Infinite energy/seasonality map
<https://www.freesoup.info>

Layer 00: Power Extraction

Layers of matter

densify

as they near

the earth's core

beneath

air, water and soil

surface is etched

to remove

naturally occurring

combinations of

solid and liquid to

extract matter

for fuel.

A human system

outside the immediacy

of the sun

moves energy

harnessed in millions

of years

for the use

of tomorrow

elsewhere.

Entropy occurs as matter is extracted from beneath layers of the atmosphere, water and earth, beyond the places suitable for inhabitation, to provide a supply of energy through a multiplicity of mediums deemed necessary for our system. In Nova Scotia, Power extraction occurs in active coal mines, such as the Donkin mine which reopened in 2017 under American ownership (Morien 2017). Since

which time, several stop work orders have been issued due to negligent, unsafe work conditions (Martin 2020) demonstrating a general lack of concern for the value of human life. Despite this, Nova Scotia Power currently uses approximately 56% of their power from solid fuels such as those extracted from the land at Donkin. The use of coal and other extracted fossil fuels results in an abundance of carbon released into the atmosphere altering the earth's climate (Berner 2003).

The true powers of individuals, groups, and political bodies lie in the useful potential energies that flow under their control. Power does work, gains and manipulates storages of energy and directs forces. True power with a real energetic basis is a property that has no substitute. If some philosophy of government or some particular idealism attempts a form of control contrary to the hard facts of energy distribution, that system will fail. (Odum 1971, 206)

000 Growth

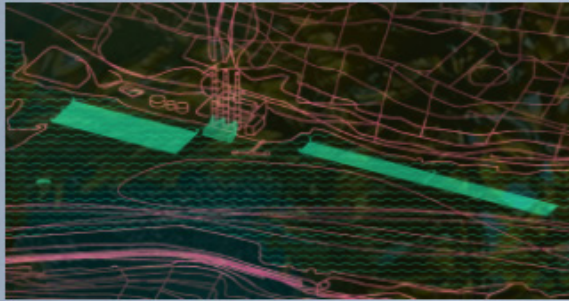
(October, yearly)

Each year, in mid October we plant the germinated kelp on our rope system in the harbour. Our system facilitates 9,600 linear metres of kelp line within the harbour, which has the capacity to channel enough of the sun's power to create a yearly yield of roughly 105,000 kilograms of raw kelp (Flavin, Flavin and Flahive 2013). The area we use for growth is next to our processing facility where large tanker ships were not previously using. The adjacency to our processing and distribution ensures minimum energy is gained through transportation. As the kelp grows it sequesters carbon and filters pollutants out of the surrounding water (AlgiKnit 2018). However, as common in unharnessed biological processes, its decomposition from lack of use releases this harnessed matter back into the atmosphere.

000 Recipes

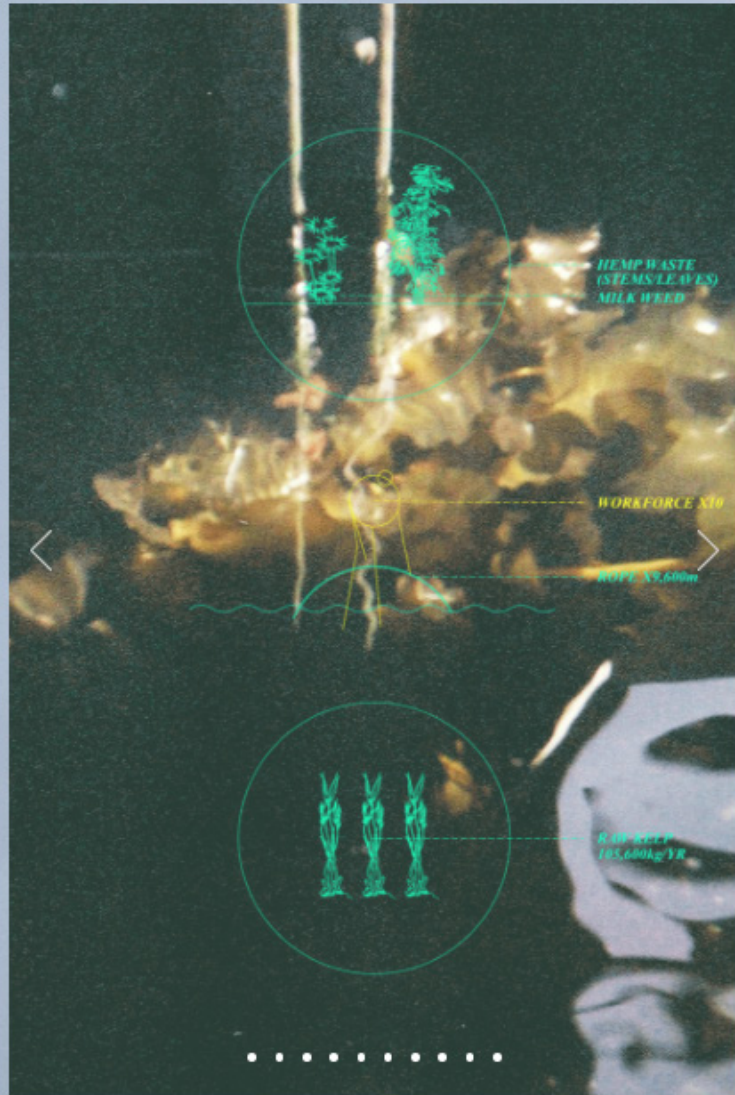
(Spring to Fall Equinox, yearly)

Every year between the spring and fall equinox we occupy the smog processing plant to make deployable fabric systems for distribution. We mostly use the kelp that we grow in the harbour to bind the naturally occurring cellulose harvested from used toilet paper (Outhwaite 2020) which we harvest from the local sewage treatment plants (CirTec 2020). We make other products such as rope and netting using hemp or textiles diverted from the landfill. Nova Scotia throws out roughly 35,000 tons of textiles yearly (Outhwaite 2020). The hemp is left over from the cannabis industry which previously lead to 15,000 tons of waste stems and leaves (Outhwaite 2020). Our website provides all of the recipes to encourage people to also make these fabrics on their own through foraging and collecting what is around them. We hope our example of using kelp as our local textile source can be applied on a local basis elsewhere.



POWER EXTRACTION

layers of matter densify as they near the earth's core beneath air, water and soil surface is etched to remove naturally occurring combinations of solid and liquid to extract matter for fuel. a human system outside the immediacy of the sun moves energy harnessed in millions of years for the use of tomorrow elsewhere.



Cookie policy SOUND

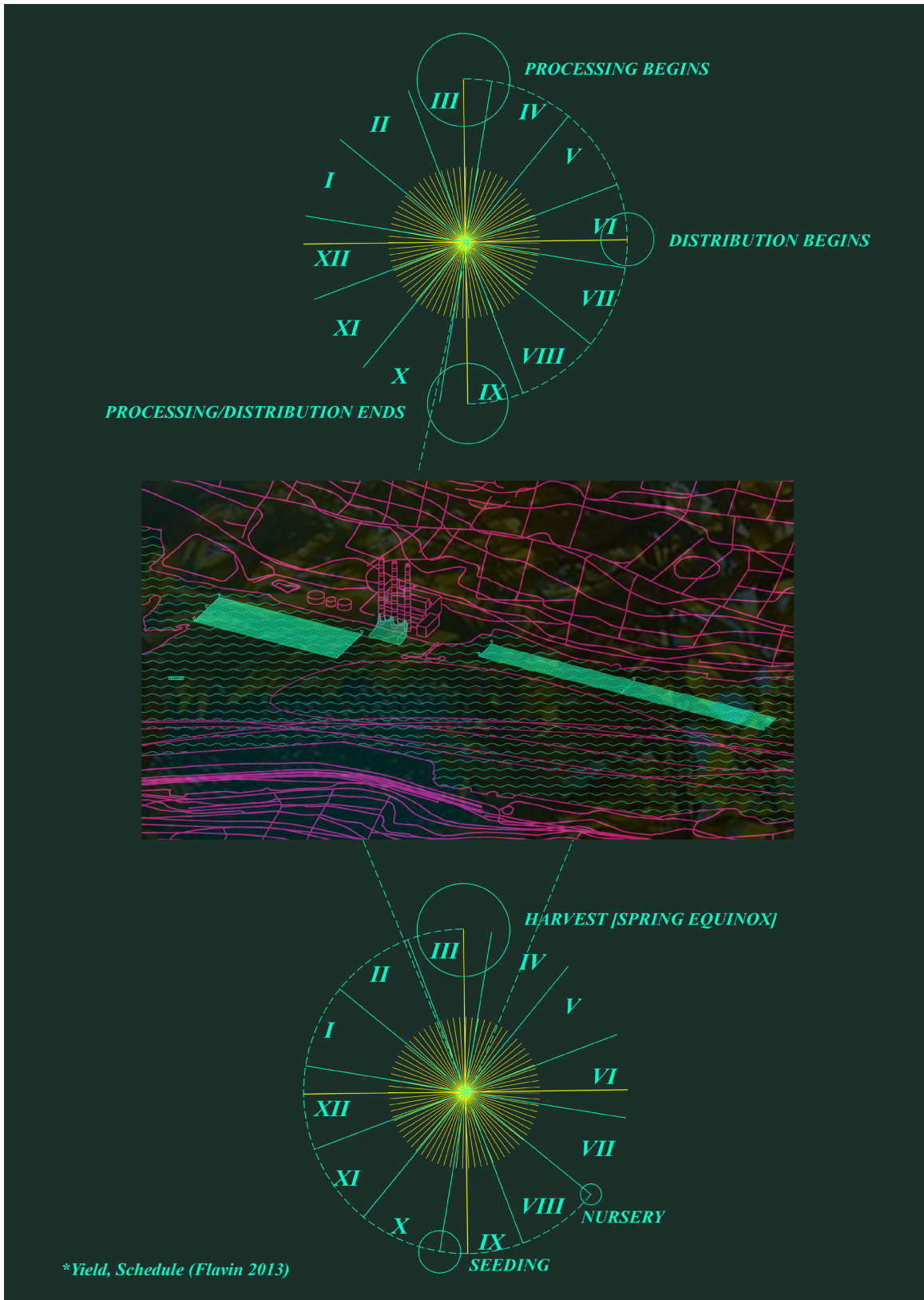
SEASONAL GROWTH/RECIPES

000

- CALENDAR
- REQUEST SOUP
- FS RADIO
- JOIN
- MAP



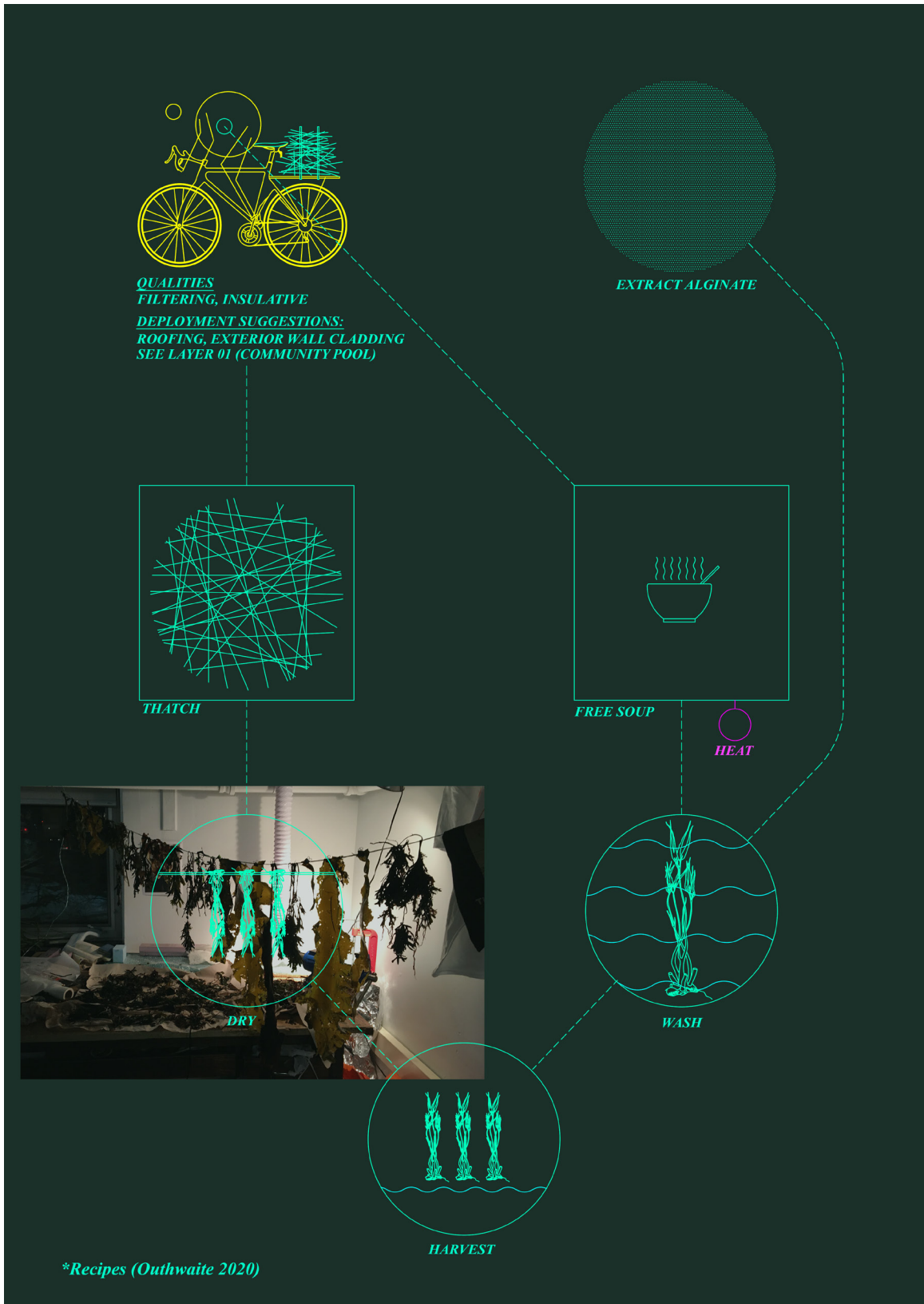
000 GROWTH: rope system
<https://www.freesoup.info>



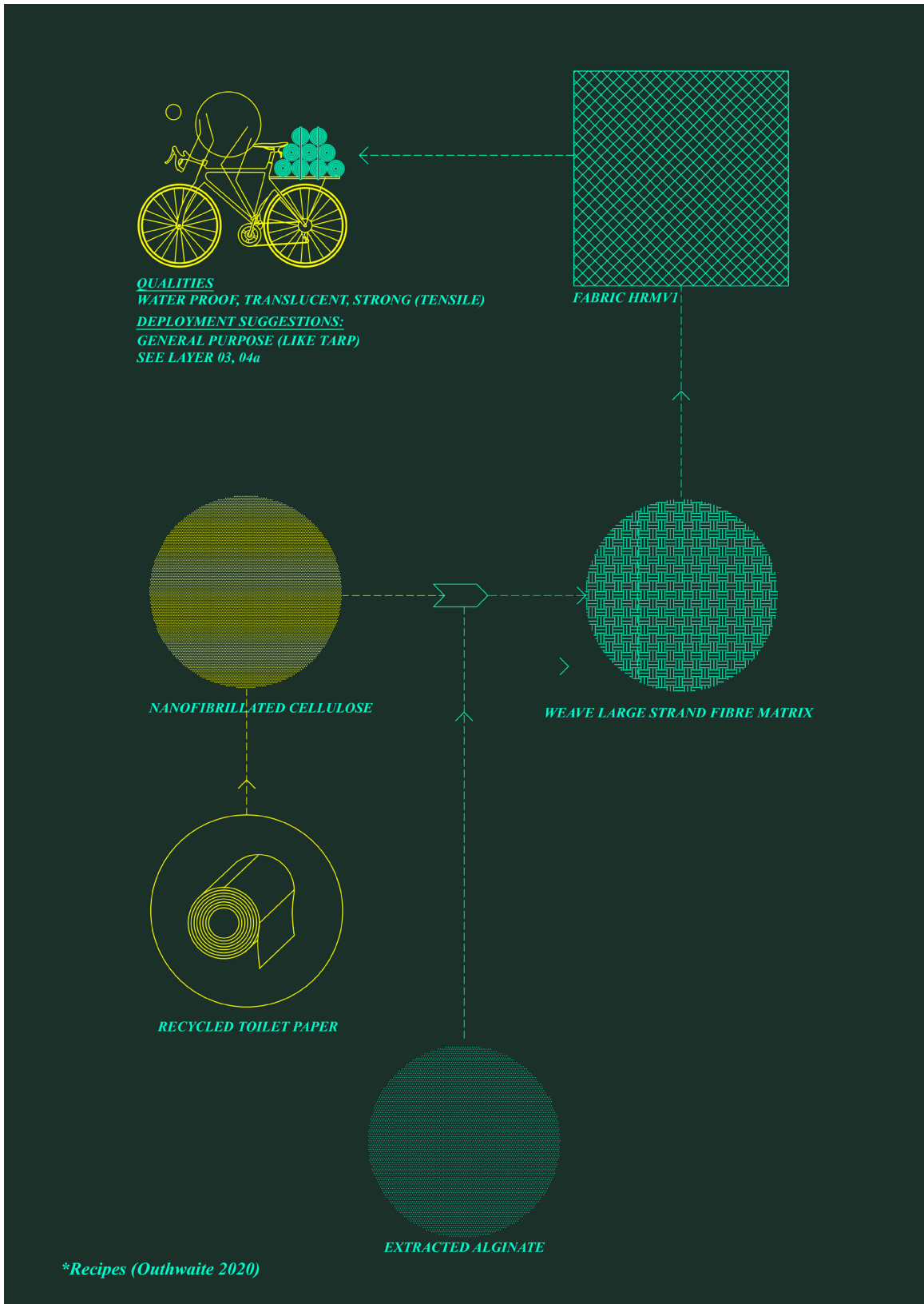
000 GROWTH/RECIPES: seasonality
<https://www.freesoup.info>



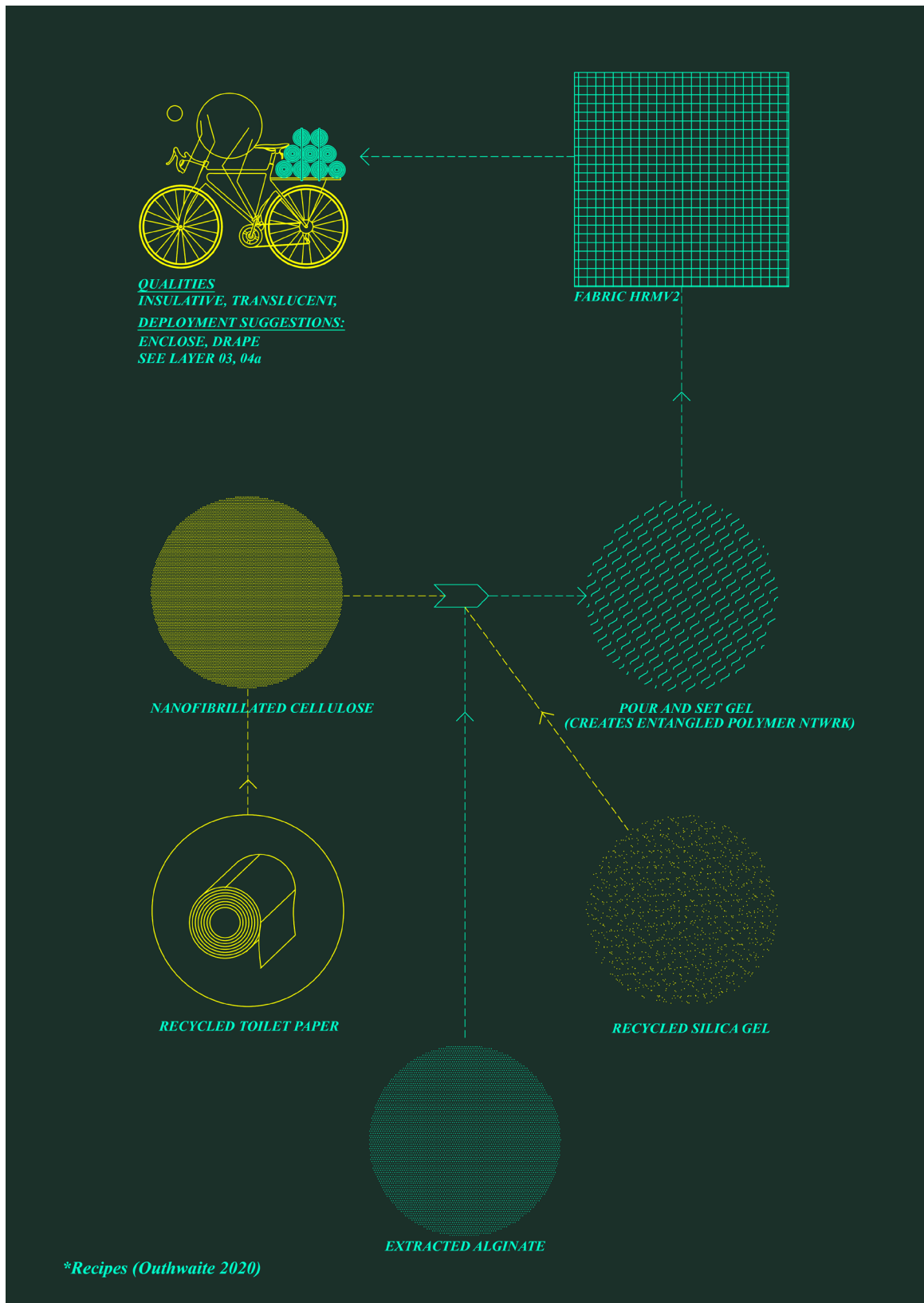
000 *GROWTH/RECIPES*: facilities/buoy
<https://www.freesoup.info>



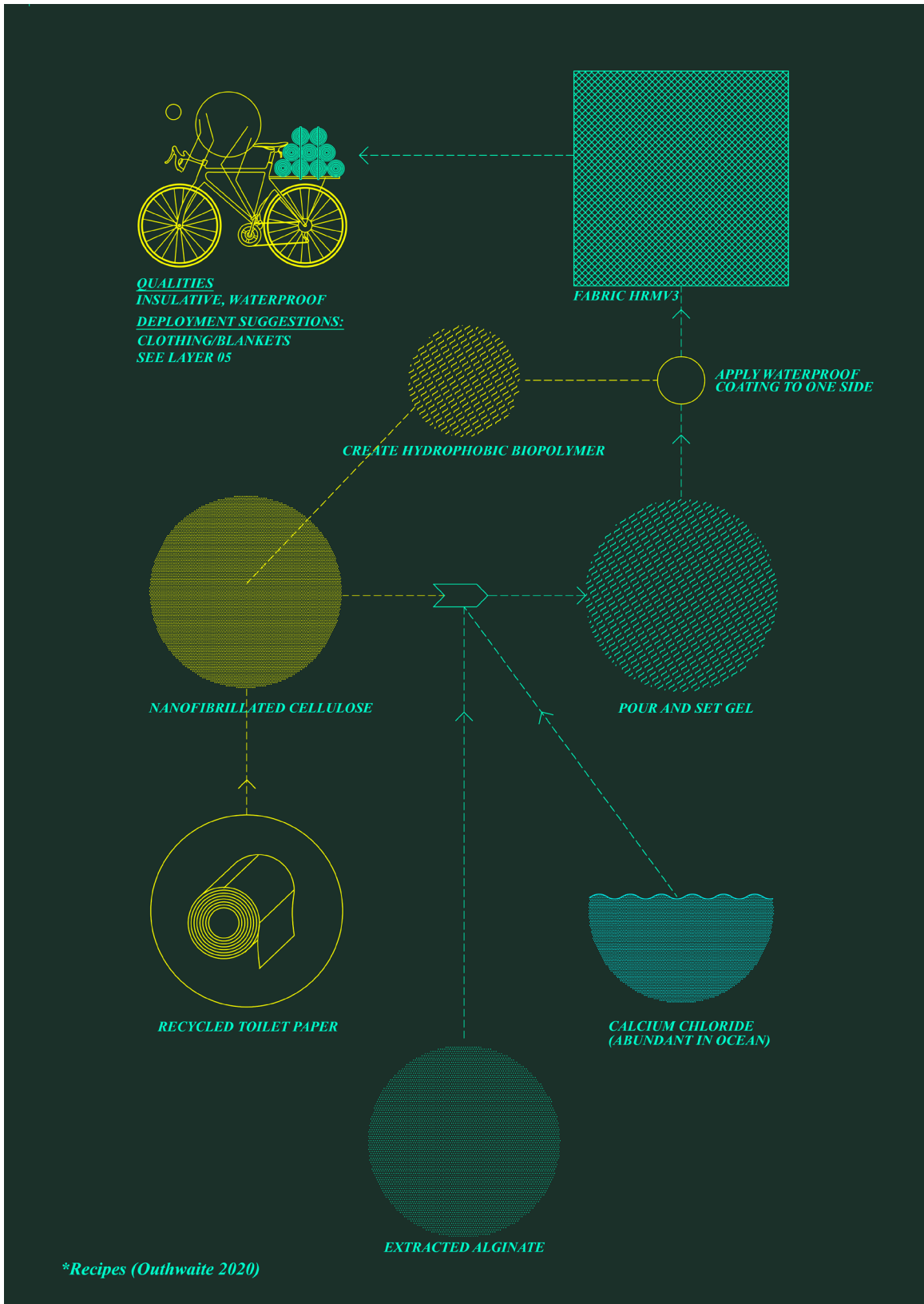
000 *RECIPES*: soup/alginate
<https://www.freesoup.info>



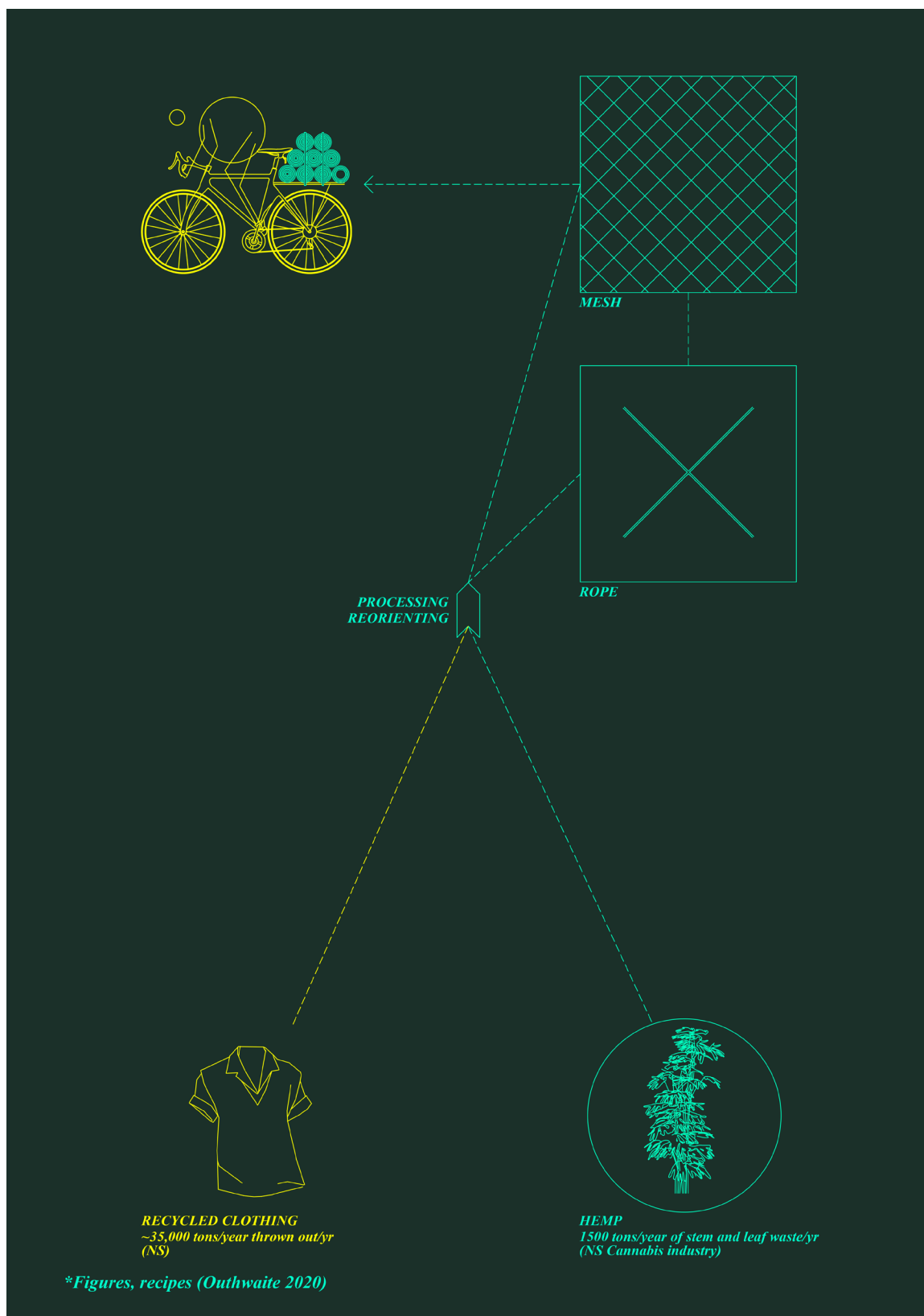
000 *RECIPE*: HRMV1
<https://www.freesoup.info>



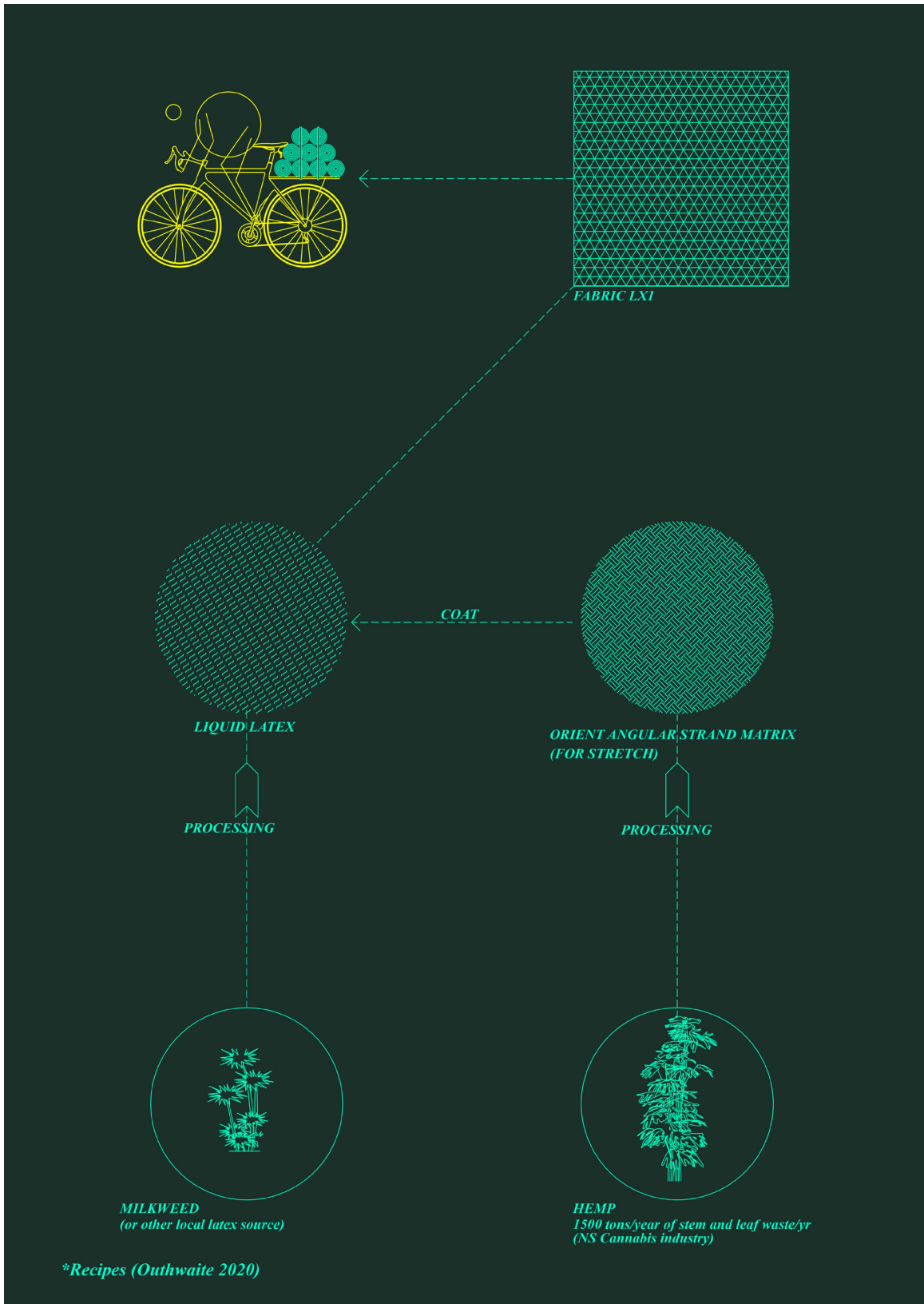
000 *RECIPE*: HRMV2
<https://www.freesoup.info>



000 *RECIPE*: HRMV3
<https://www.freesoup.info>



000 *RECIPE*: rope, net
<https://www.freesoup.info>



000 RECIPE: LX1
<https://www.freesoup.info>

Layer 01: Power Insertion

*Our harbour,
a dissipative
threshold
of liquid water
and fluid air
hosts a pulse
of introductions
and conclusions:
machines
transport
solids, liquids
oils, gas,
other matter
which often leak
creating
toxic, immiscible
solutions
of colloidal
substances
colliding
with biological
inhabitation.*

Entropy occurs through a multiplicity of mediums in an urban system. Extracted matter in the forms of coal, oil and natural gas are introduced in to Halifax through pipelines, trucks, trains and ships. Energy dissipates through transportation, as the efficacy of material energies are minimized through each further point along a supply chain (Odum 1971).

There are several nodes of power insertion within Halifax's port. Irving Oil's Halifax Terminal recently reopened, providing a venue for the storage and transfer of material energies in the form of crude oil, and refined fuels (Irving 2016). In places such as these that occur throughout the shores of Halifax and Dartmouth, human energies are removed from consideration in the interests of large cooperations. Despite the fact that the shores of Halifax and Dartmouth are in close proximity to heavily populated areas, they are only intermittently occupiable by the public. This is due to the common practice of separating the urban human from the realities of material processes that provide energy for their daily lives. A less monopolizing relationship would allow for an interaction between human energies and their greater power systems, facilitating a physical dialogue between the mutually reliant biological, mechanical and material energies of dissipation. When conceived of in symbiosis, these energies can perform as public infrastructure, activating unused parcels of air and water for free human activity.

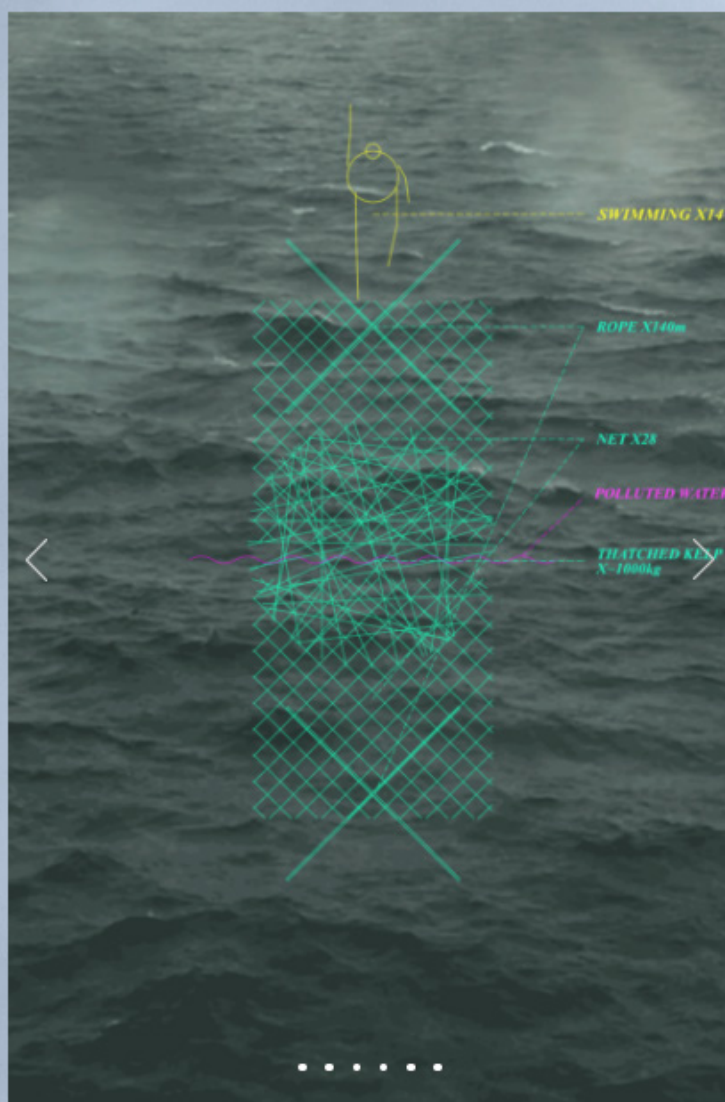
010 Community Pool

(Spring Equinox, yearly)

On the spring equinox, we begin to harvest the kelp that grows in the harbour. Every year a group of us meet to assemble the first crop to create a floating swimming pool that we deploy back into the water. It is thatched between layers of netting and rope to filter the debris prominent in the harbour, creating a clean microenvironment suitable to swim in. Each year it ends up somewhere different. You'll see groups move it to different places along the harbour, colliding with ships, or confusing people arriving on cruises. Despite the current and boats altering its movement, overall

its site is determined by the people who use it. Because of this there is a general sense of reclamation, that the harbour can be occupied for fun again, not just the transportation of goods. We let the pool stay in the harbour until the fall, we then untie it and let the thatch dry to be used on roofs for the winter.

**POWER
INSERTION**
 our harbour
 a dissipative
 threshold
 of liquid water
 and fluid air
 hosts a pulse
 of introductions
 and conclusions:
 machines
 transport
 solids, liquids
 oils, gas and
 other matter
 which often leak
 creating
 toxic, immiscible
 solutions
 of substances
 colliding
 with biological
 inhabitation.



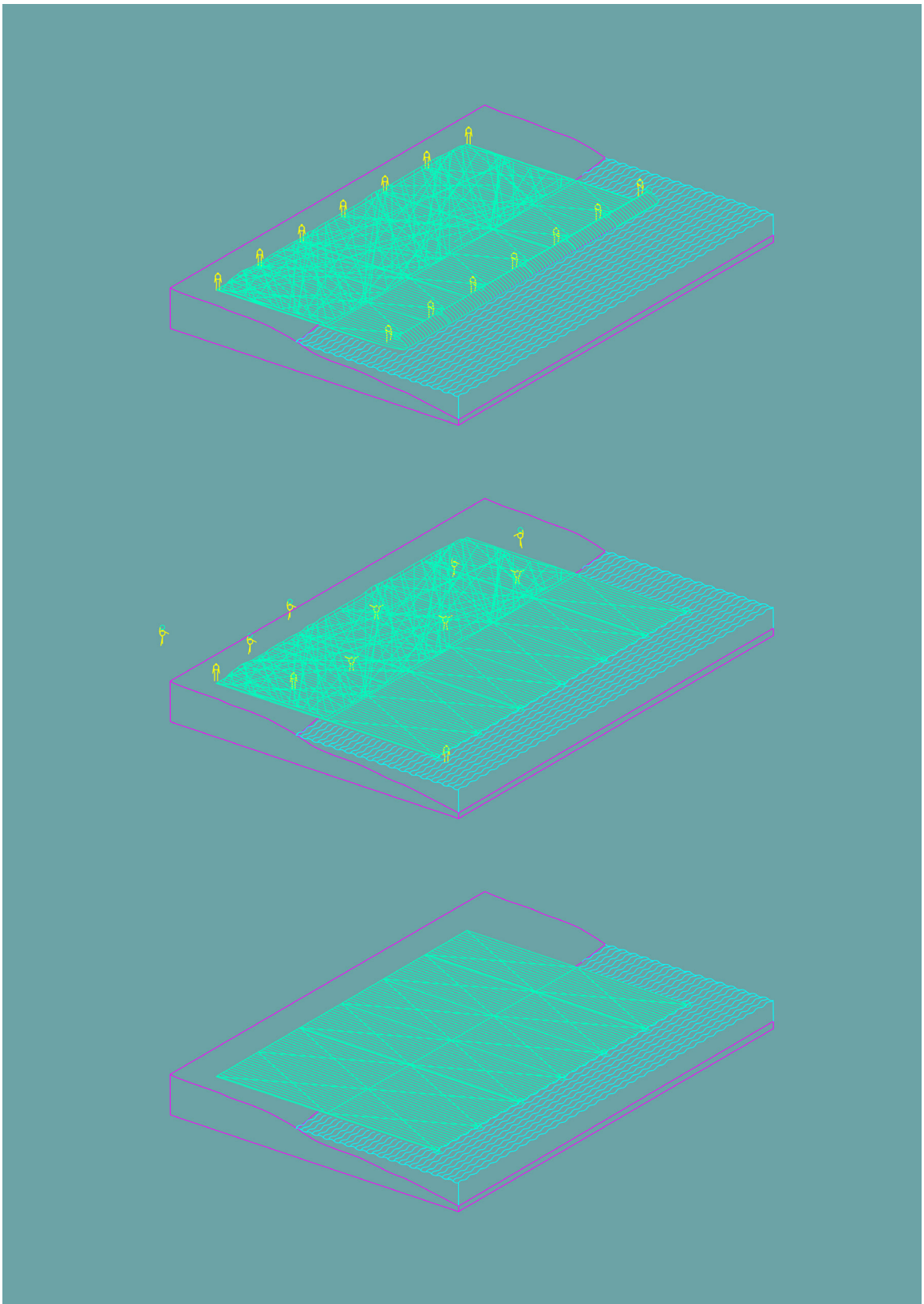
**SPRING EQUINOX
COMMUNITY POOL**

010

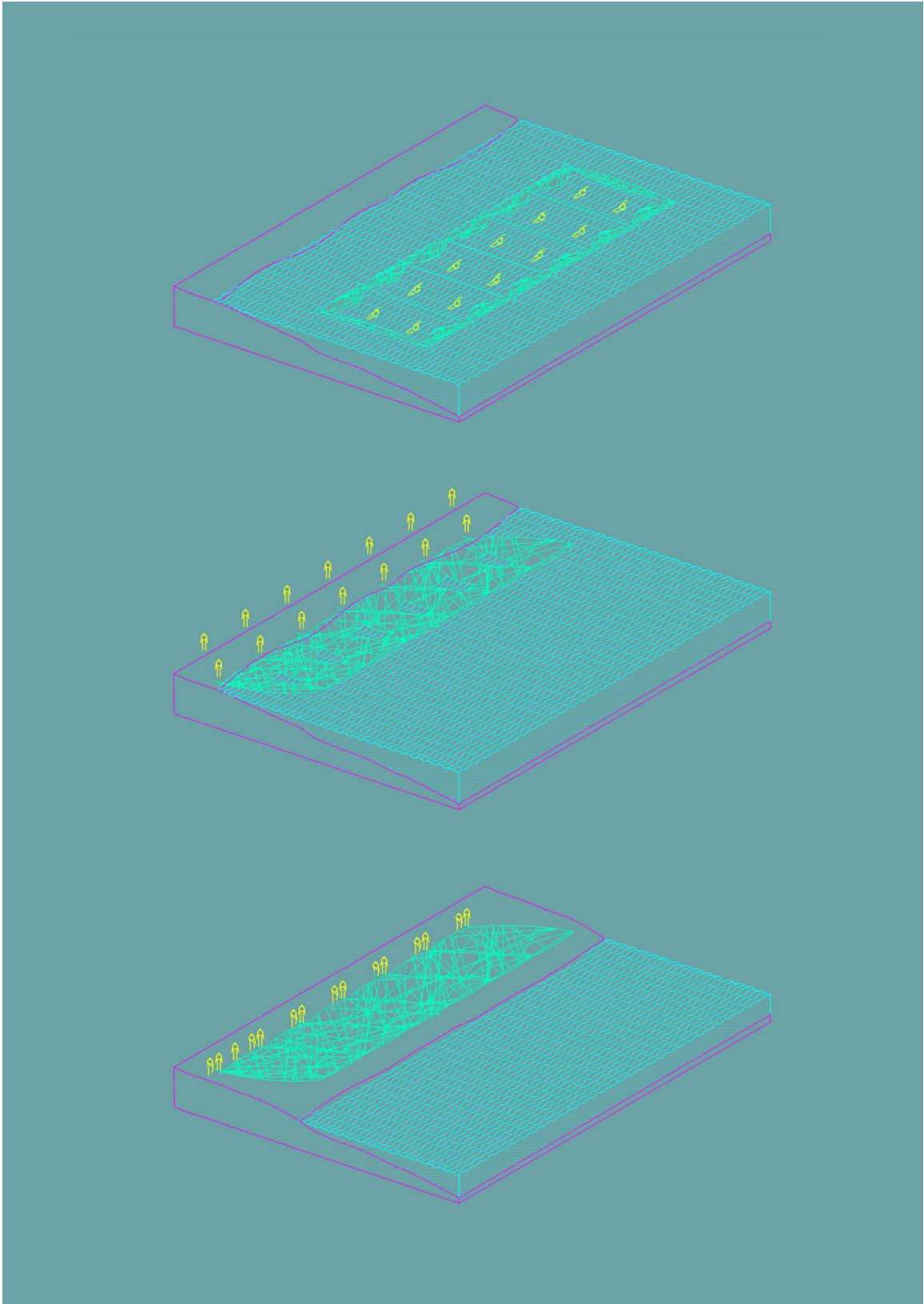
Cookie policy

SOUND

- CALENDAR
- REQUEST SOUP
- FS RADIO
- JOIN
- MAP



010 *COMMUNITY POOL*: sequence 1
<https://www.freesoup.info>



010 *COMMUNITY POOL*: sequence 2
<https://www.freesoup.info>



010 COMMUNITY POOL: rope/buoy/teamwork
<https://www.freesoup.info>



010 COMMUNITY POOL: detail/section/fun!
<https://www.freesoup.info>

Layer 02: Power Translation

*Translation of
 matter
 natural gas (70%) and oil (30%)
 to electric pulse
 results in air parcels
 containing
 STEAM
 CO2 SO2 Nox
 and other particulate
 fluctuates to a maximum
 of 52m³/s at 188C.
 Which is dismissed
 to the concerns
 of others elsewhere
 due to anthropocentric
 health concerns
 while the immediate
 population
 remains stagnant
 and separated
 from processes
 which
 surround them.*

Entropy occurs as a private corporation produces electricity for a grid of consumers bound by the receptacles they plug in to. A translation between two energies, matter and electricity, creates an abundance of entropic air commonly referred to as smog. This flow of fluid air into the atmosphere is lifted by a buoyant force due to its low pressure in relation to the

immediate weather. The continuously forming air parcel, containing carbon dioxide, sulfur dioxide and nitrogen oxide (NRCan 2019) as a result of energy translation is dismissed as waste for the concerns of atmospheric processes elsewhere. The Darwin-Lotka Energy Law states that where energy is translated between mediums, fifty per cent will be lost to the processes of dissipation (Odum 1971). At Tuff's Cove Power station this process results in continuously forming air parcels that fluctuate to an average temperature of 188°C at a rate of 52m³/s (Government of Canada 2002).

The station translates either oil or natural gas depending on weather and material price while the flux of translation varies based on temperature and time of day (Bujold 2019). Material translations for power occur throughout Earth's energy hierarchies. Established self organized systems prevail that maximize the utilization of the entropy inherent in translations for productive feedback into their system (Odum 1971). This greatly differs from the approach to energy translation throughout human power systems.

At Tuff's Cove, the Emera corporation does not harness the dissipative energies inherent to their processes. This dismissal leaves energies that are capable of providing a layer of self organized feed back (Moe 2013), through an alternative perception of their usefulness. The mentality of the established power system is to think of nodes as single purpose within a linear network. However, much like in a thriving ecological being (Moe 2013), our systems must "mobilize the necessary excess[...] to yield new types of abundance"(Moe 2013, 36). A new self organized abundance would break down physical boundaries surrounding translation processes in order to provide thermospatially dynamic infrastructures for public inhabitation. This would

maximize the urban human's ability to productively interact with their energy system rather than be exclusively subject to it.

020 Smog

There is no motion more uniform, silent or beautiful than that of smoke; and, therefore, when we wish the peace or stillness of a scene to be impressive, it is highly useful to draw the attention to it. (Ruskin 1894, 43)

(Summer Solstice, yearly)

On the summer solstice, we celebrate the presence of our sun at the Smog processing facility. At noon we begin to hand out the first batch of the fabrics we produce. Because of our developing knowledge base, the layers become more effective every year.

People enjoy jumping or resting on the warm air. For the work force, using the space for production is effective, the fresh air is continuously circulating, entering our lungs and feeding back into the drying process. Smog speaks to how much power is being translated that day, at times when the power station is operating at a minimum, the cloud becomes more still and peaceful, but on days when it's operating fully, there is a loud dynamic chaos. By the early fall we run out of our harvest and shut things down, but the fabric keeps dancing, I often see it in the winter glowing loudly from a distance.

Precedent

The Roof that Goes Up in Smoke was an installation that demonstrated this same principal of entropic channeling. By creating a light membrane that harnessed the dissipating smoke from a fire used for cooking, the processes inherent in energy translation were maximized by providing the

structure for the roof. This entropy based, formless approach to enclosure provided the user with a legible display of the processes inherent in the pavilion's programme of cooking, showing an example of the efficacy of integrating human process with enclosure.

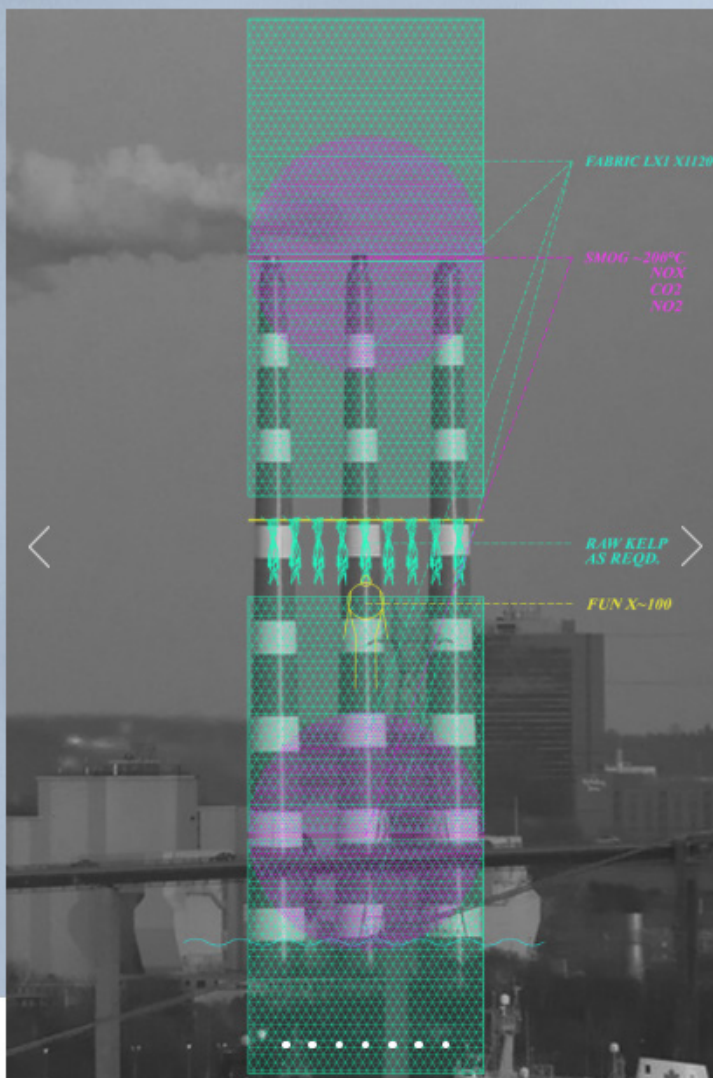


"The Roof That Goes Up in Smoke" (Warmann 2010)



**POWER
TRANSLATION**

*translation of
matter
natural gas (70%)
and oil (30%)
to electric pulse
results in warm,
high velocity air
parcels containing
STEAM
CO2 SO2 Nox
and other
particulate.
which is
left dismissed
to the concerns
of others
elsewhere
due to
anthropocentric
health concerns,
while the
immediate
population
remains
separated
from processes
which surround
them.*

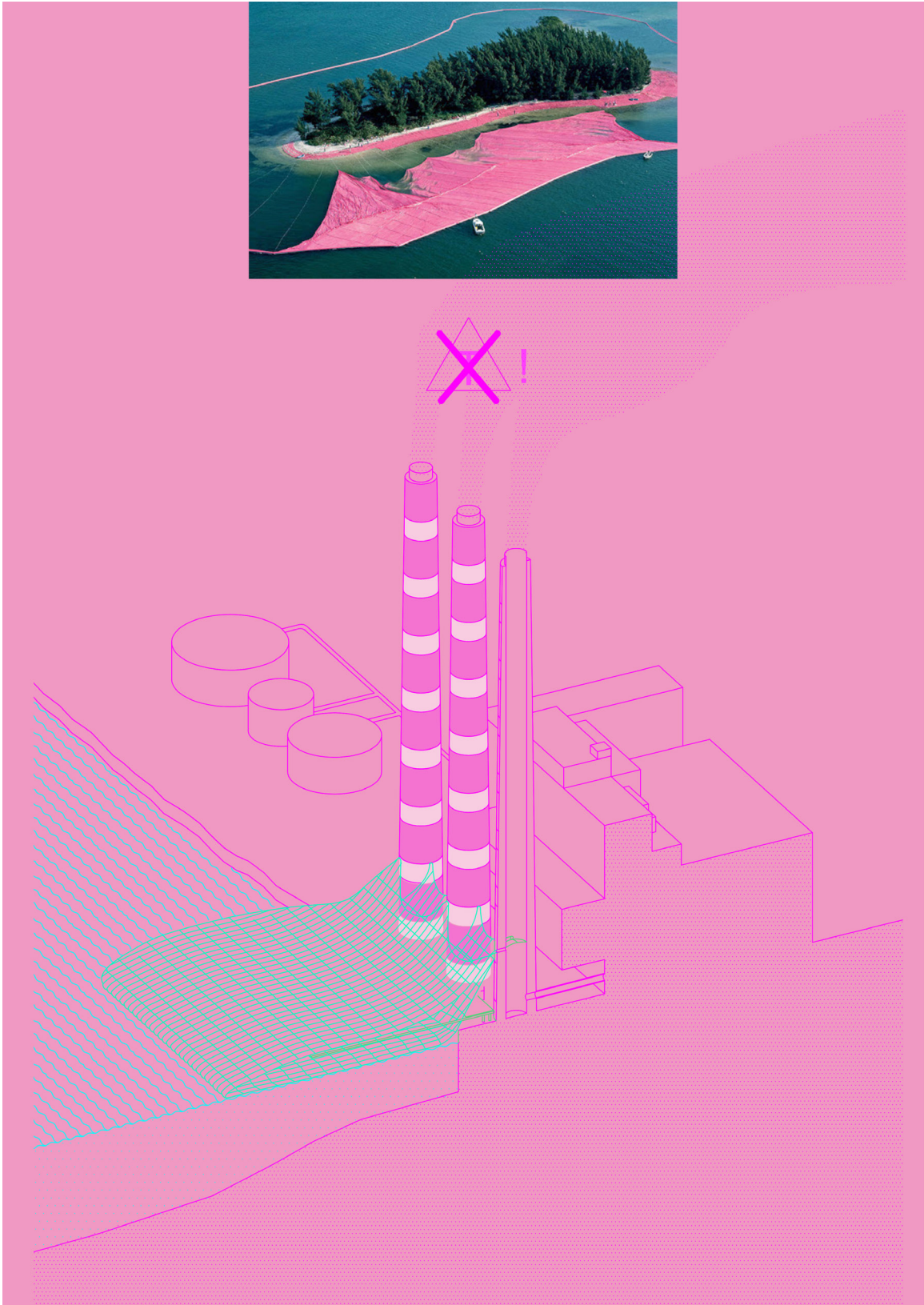


**SUMMER SOLSTICE
SMOG**

020

Cookie policy  SOUND 

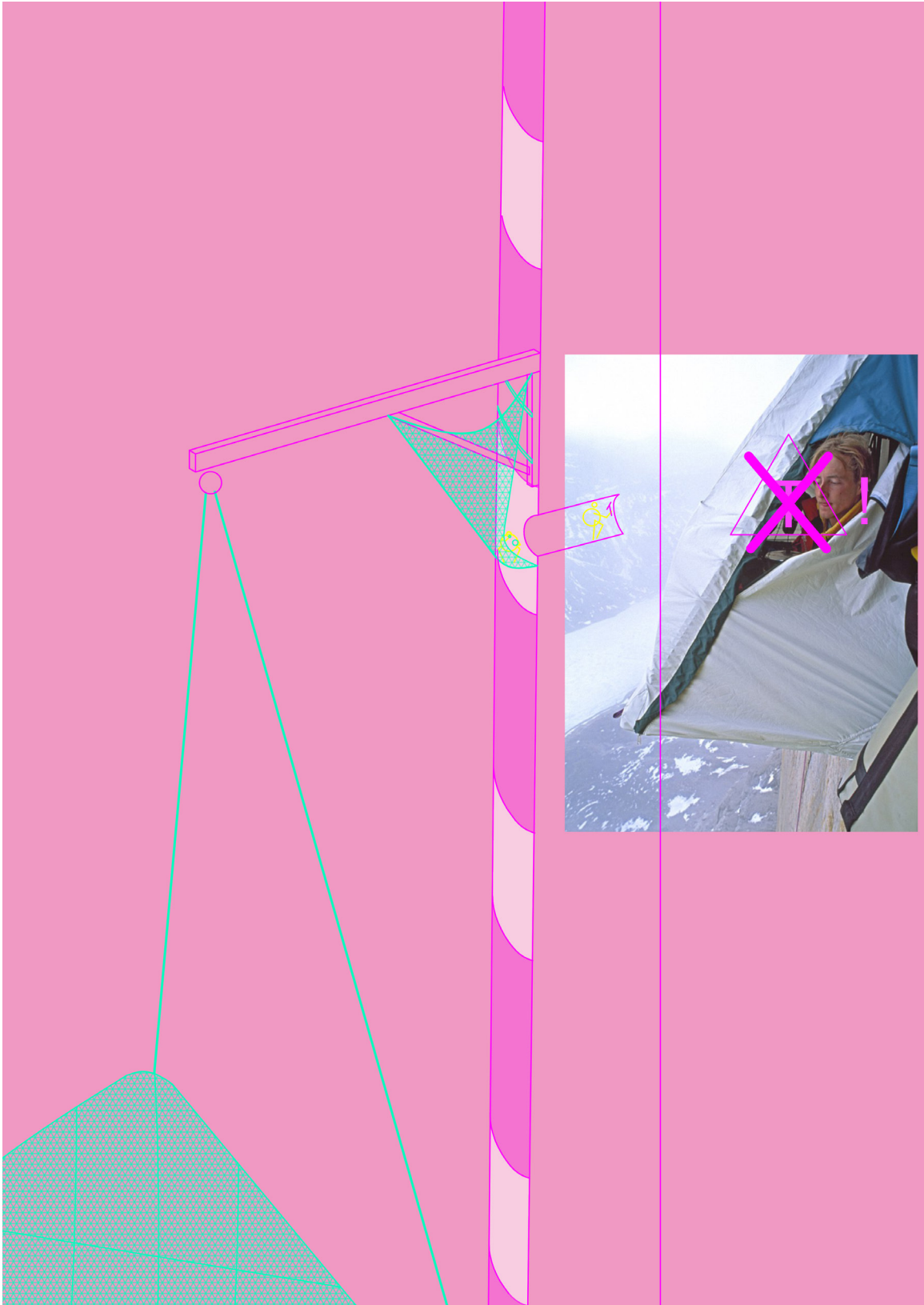
- [CALENDAR](#)
- [REQUEST SOUP](#)
- [FS RADIO](#)
- [JOIN](#)
- [MAP](#)



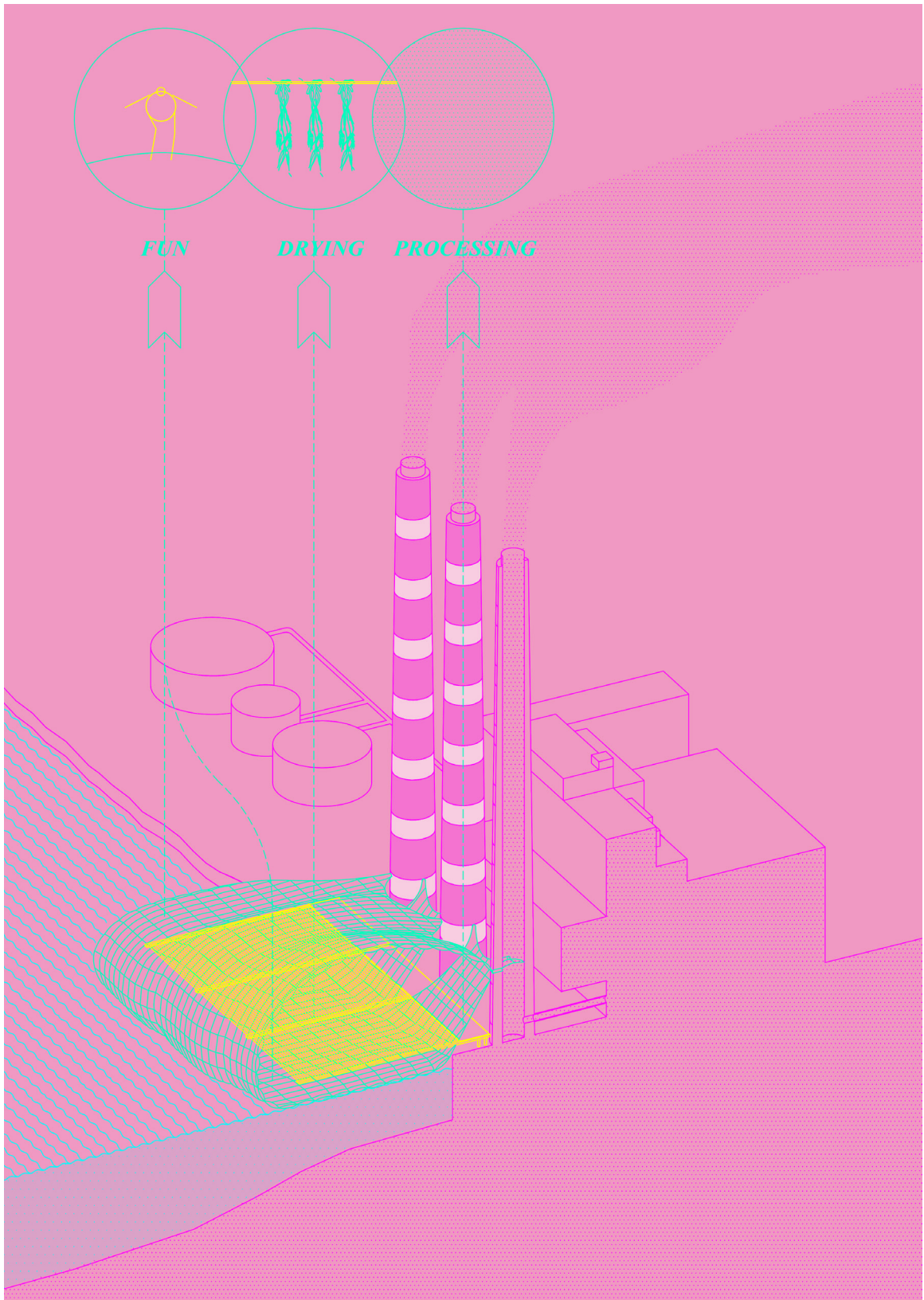
020 SMOG: sequence
<https://www.freesoup.info>



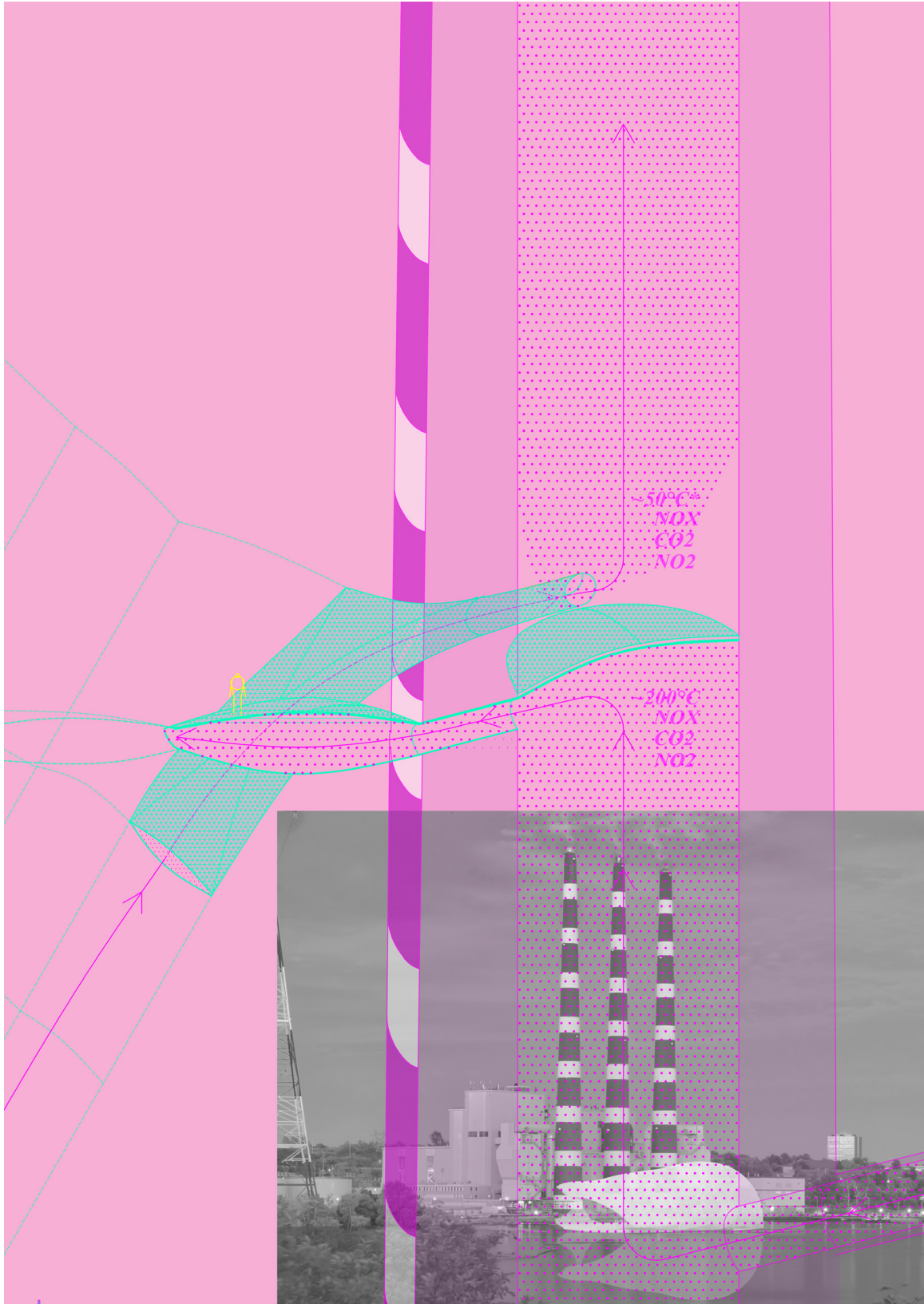
020 SMOG: assembly 1. smog (heat) activated seal, 2. LX1 membrane, 3. line of smog, 4. rope system



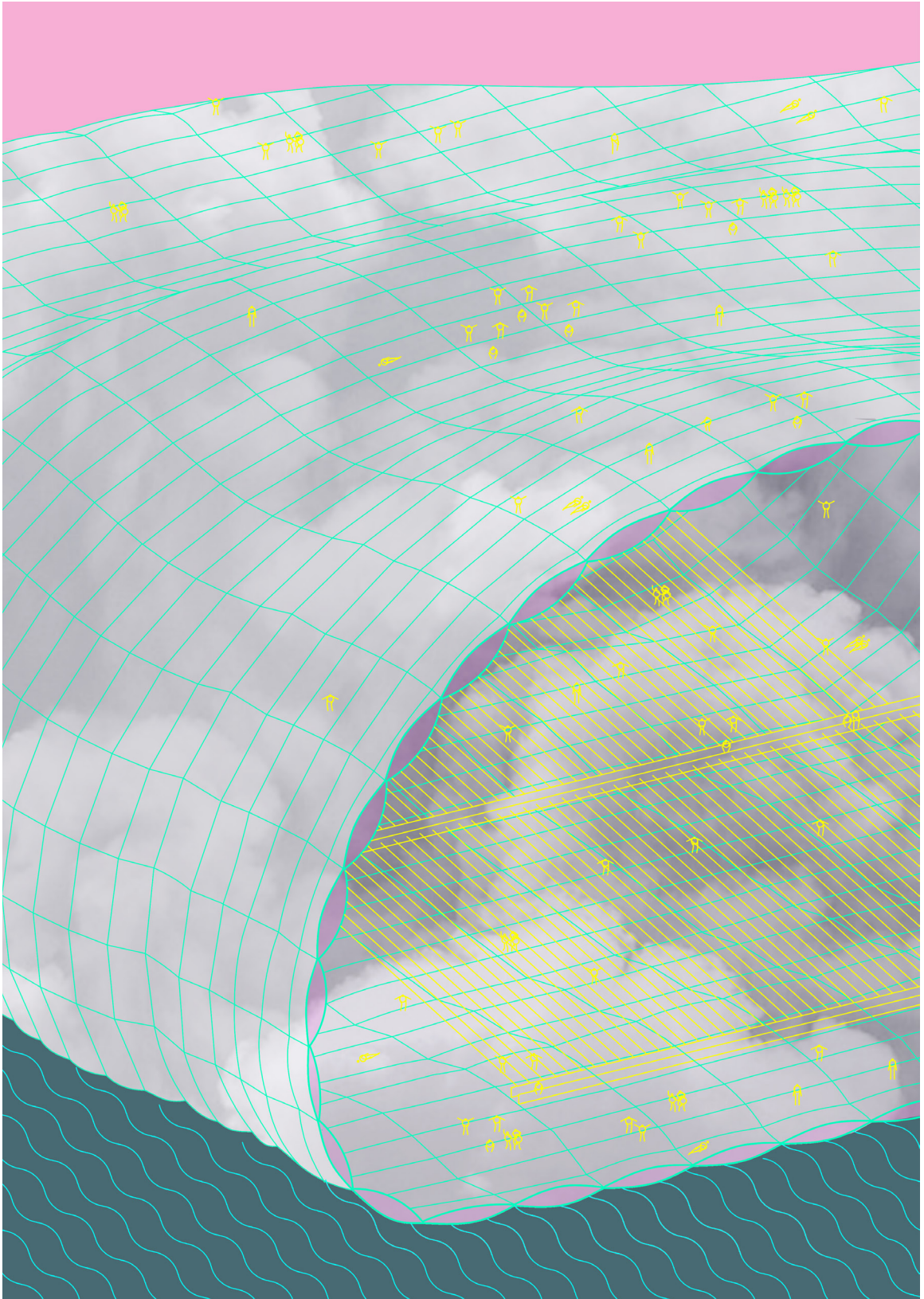
020 SMOG: burrow/hoist
<https://www.freesoup.info>



020 SMOG: operation
<https://www.freesoup.info>



020 SMOG: flow detail
<https://www.freesoup.info>



020 SMOG: fun!
<https://www.freesoup.info>

Our cities are becoming softer, there are places for rest and fun everywhere now.



029 WARM AIR PARCEL
<https://www.freesoup.info>



029 WARM AIR PARCEL
<https://www.freesoup.info>

Layer 03: Power Transmission

*Traveling electric
current
translates
from high (230Kv)
to low (120v)
voltage
through a network
of converters
emitting currents
of Extremely low
frequency (60Hz)
electromagnetic fields
and heat.
A fence
keeps users away
from the dangers
of electrocution,
but remains silent
to the
radiative
energies
not perceivable
as they dissipate
in radius surrounding.*

Entropy occurs as electricity flows from high voltage to low, through power lines above and below the Earth's surface. Substations step voltage down to allow for a safer flux of power to enter places deemed suitable for inhabitation. The process of transmission emits dissipating heat and

low frequency electromagnetic waves. Dissipating waves, mostly invisible to a human eye, occur throughout our system in a spectrum from 10Hz-1021Hz and vary in source from sun to machine (NRCan 2015). The radiation caused by power lines and transformers is of a low frequency on the spectrum at 50-60Hz and dissipates in an imperceptible manner in radius to the atmosphere surrounding (Ward et al. 2017).

In Halifax, substations translate electrical flux from 230kV to 13-26kV where it is then translated down to 120-240V at nodes along power lines above streets before entering a dwelling (Bujold 2019). Fences surround substations, while power lines are kept above surfaces of human habitation, but these measures are not designed to interact with dissipating electromagnetic waves. They simply act to keep people away from dangers of electrocution, a more immediately perceivable threat. Despite the scientific contention of the dangers of dissipative waves, the human ability to perceive how their immediate power affects their biological existence is lacking. According to Heisenberg, electromagnetic waves are an elementary energy which all organism's life depends on (Zwolińska et al. 2016). This has been demonstrated in human life when astronauts return from space displaying insomnia, fatigue and depression due to prolonged time away from the Earth's naturally occurring electromagnetic field (Zwolińska et al. 2016). However, the effect of radiation on a biological being varies depending on wave length. Human made ELF (extremely low frequency) radiation as a result of transmitting electricity is subject to a wide debate within the scientific community. In 2016 Health Canada concluded that there is no conclusive evidence regarding the dangers of electromagnetic waves due to

living in close proximity to electrical corridors or substations (Ward et al. 2017). While in Europe studies determined prolonged exposure low frequency radiation has been deemed a carcinogen linked to several types of cancer (Ward et al. 2017).

030 Mutual Inductance

First, viewing sites through the lens of entropy raises questions about the agency and role of the designer. Entropic processes are spatially indeterminate, and they raise corresponding questions about design indeterminacy [...] spaces should focus less on large-scale control and more on making the subtle tracings of forces and flows on the site legible. (Solà-Morales as cited in Moffit 2017, 777)

(Fall Equinox, Yearly)

To celebrate the end of our distribution season, each Fall Equinox we gather at a different substation within our city's electrical network. We cycle our ELF DJ booth to a fence and begin to harness the extremely low frequency electromagnetic waves. It harnesses the interference from transformers through a coil and speaker to broadcast what mostly goes unnoticed throughout the year. A DJ occupies the structure, improvising alternative frequencies in dialogue with the existing. The sound is amplified through stretching an LX1 fabric drum between the bike frame and fence. This allows the noise to be heard by the neighbourhood surrounding. A dance begins, energizing the community before the impending cold winter. We distribute the remaining fabrics and thatch left over from the pool, the community gains a last layer of energy storage before the seasons shift.

Precedent

In response to the imperceptible magnitude of this dissipative power, sound artist Christina Kubisch invented

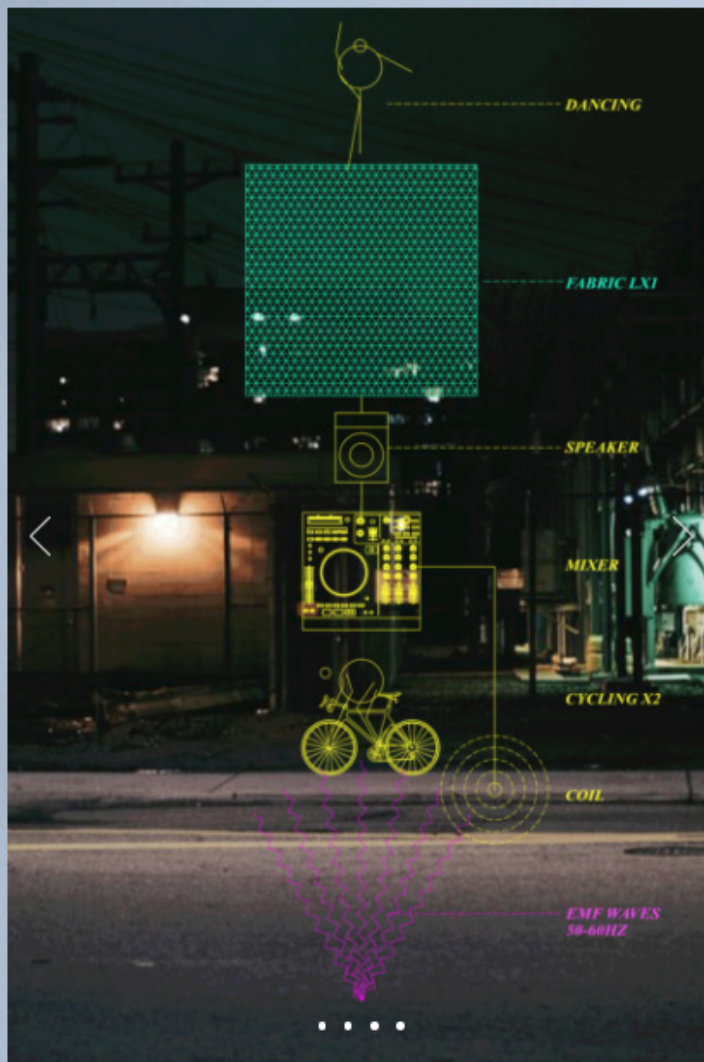
a pair of headphones which amplify and make audible the electromagnetic waves that occur in our urban environment. On her “Electrical Walks” users experience a layering of sound depending on the proximity to the gradient of waves constantly dissipating around them. “The perception of everyday reality changes when one listens to the electromagnetic fields; what is accustomed appears in a different context. Nothing looks the way it sounds. And nothing sounds the way it looks” (Kubisch 2017).





“Electrical Walks” (Milani 2010)

POWER TRANSMISSION

traveling electric current translates from high (230Kv) to low (120v) voltage through a network of converters emitting currents of Extremely low frequency (<60Hz) electromagnetic waves and heat. a fence keeps users away from the dangers of electrocution but remains silent to the radiative energies not perceivable as they dissipate in radius surrounding



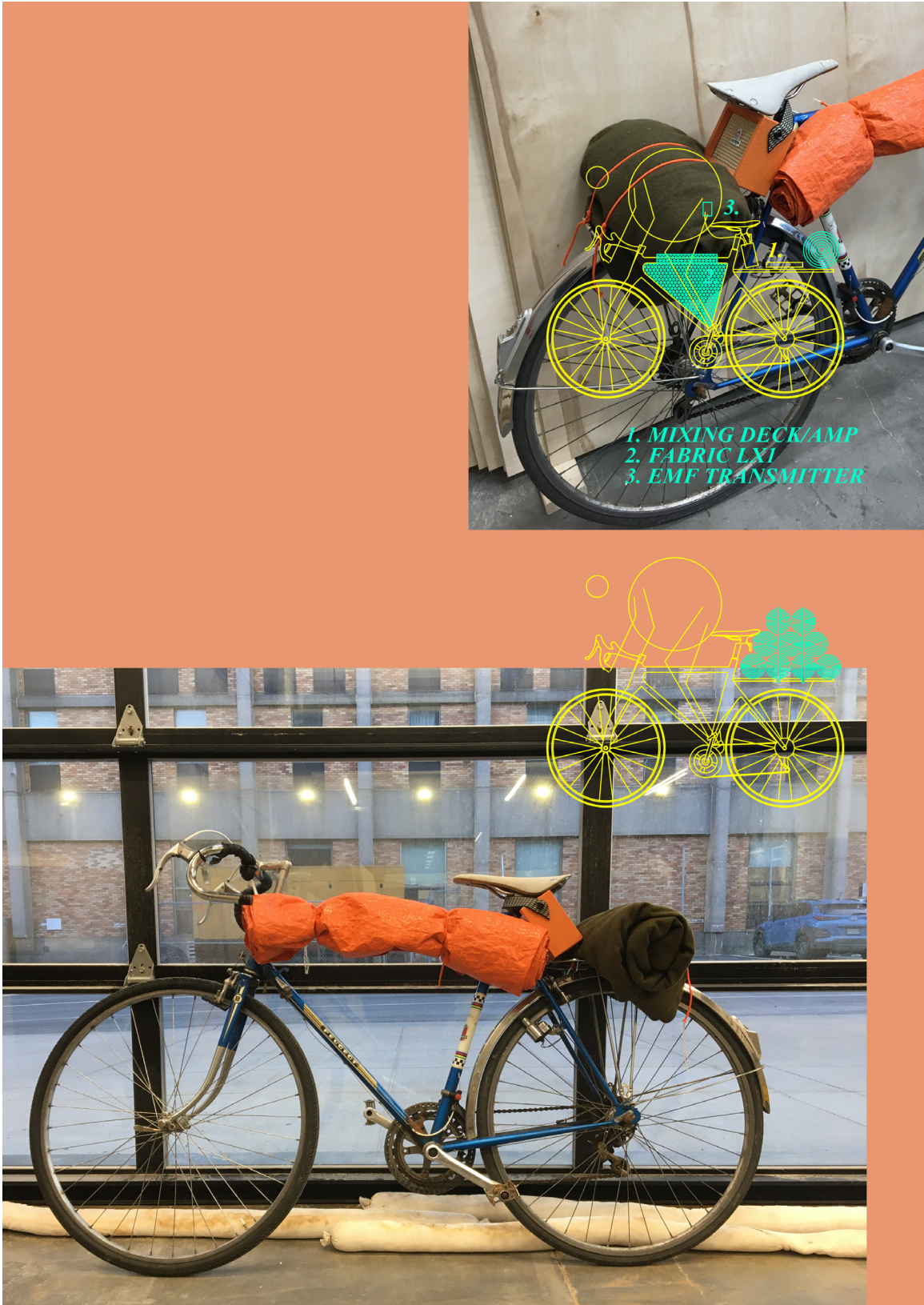
Cookie policy  SOUND  0:34

FALL EQUINOX
MUTUAL INDUCTANCE

030



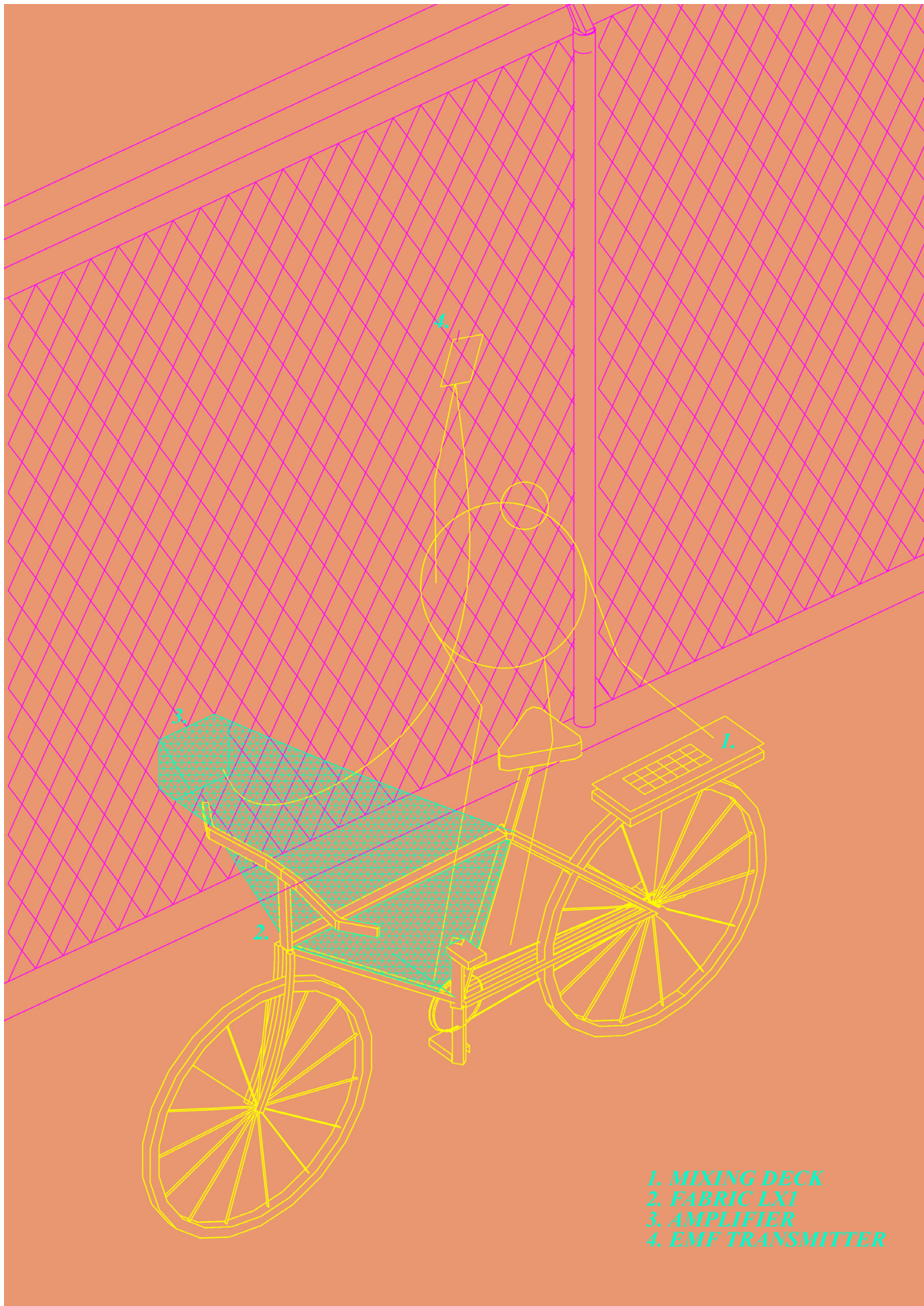
- CALENDAR
- REQUEST SOUP
- FS RADIO
- JOIN
- MAP



030 MUTUAL INDUCTANCE: dj booth/material distribution system
<https://www.freesoup.info>



030 *MUTUAL INDUCTANCE*: sequence/electromagnetic wave transmitter
<https://www.freesoup.info>

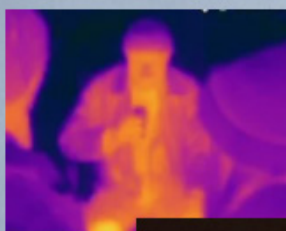


030 *MUTUAL INDUCTANCE*: dj booth
<https://www.freesoup.info>

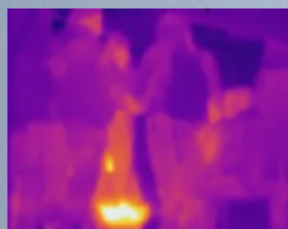
035 Power Party

(November 09 2010)

I was going to have far too many friends over, so I hung some HRMV1 fabrics outside of my apartment off hooks fences and trash bins. I moved some waste wood from a shop to burn for warmth. The evening air was mostly still but dropped to -2C. Still, very few people went inside. I provided some blankets to those who needed an additional layer of enclosure between the air, tarps and their clothing. It was nice to celebrate a momentary abundance of power through reorganizing a heat source. If everyone had been overstuffed into an idea of interior, it would not have been a successful gathering. Instead, the warmth of the fire organized a space and allowed everyone to breathe the fresh fall air. It was quite freeing to no longer have a gathering depend on the walls around me. As the evening progressed more wood was added to the fire, I had a grilled cheese bar and it was emptied as people slowly came and left.



**POWER
TRANSMISSION**
*what happens on
earth, stays on earth*
-Kendrick Lamar



09/11/2020
035 POWER PARTY

035

- CALENDAR
- REQUEST SOUP
- FS RADIO
- JOIN
- MAP



035 POWER PARTY: sequence

Layer 04: Power Inhabitation

human proximity

to fixed

sources of power

alters efficacy

in mediating

the layer of

warmth

dissipating into

our atmosphere,

which

we rarely

experience

without clothing

or blankets.

Entropy occurs as a private dwelling feeds off of a multiplicity of energy networks embedded in an urban system. Translations of fuel to heat and electricity to light create an atmosphere that is perceived as suitable for inhabitation. Electronics, nutrition and matter are consumed at varying cycles, while waste energies are refused for the concerns of processes elsewhere. Despite its common perception as an ordered isolated system, this home, as a biological appendage of its users is constant only in its increasing of the entropy of the universe (Moe 2013). Architects are trained to find “order in chaos” though false attempts at delineating our physical systems. This leads to ideas of energy efficiency based perceived “interior” isolation through an additive approach to wall systems (Moe 2013) who’s performative requirements involve reducing conductance and refusing

various states of water. These methodologies are in direct opposition to the first two laws of thermodynamics:

1. Energy can neither be created or destroyed in an isolated system
2. Entropy in an isolated system is always increasing.

Like everything in the universe, our built environments are subject to these realities, yet the current architectural dialogue of energy efficiency seems to reject the usefulness second law thinking (Moe 2013). A more appropriate task for the designer would then be to accept buildings as chaos creating machines within the universe of chaos or to embrace the realities of a constantly increasing Earth system chaos to develop adaptable infrastructures to channel it.




041 Birds of The Garden

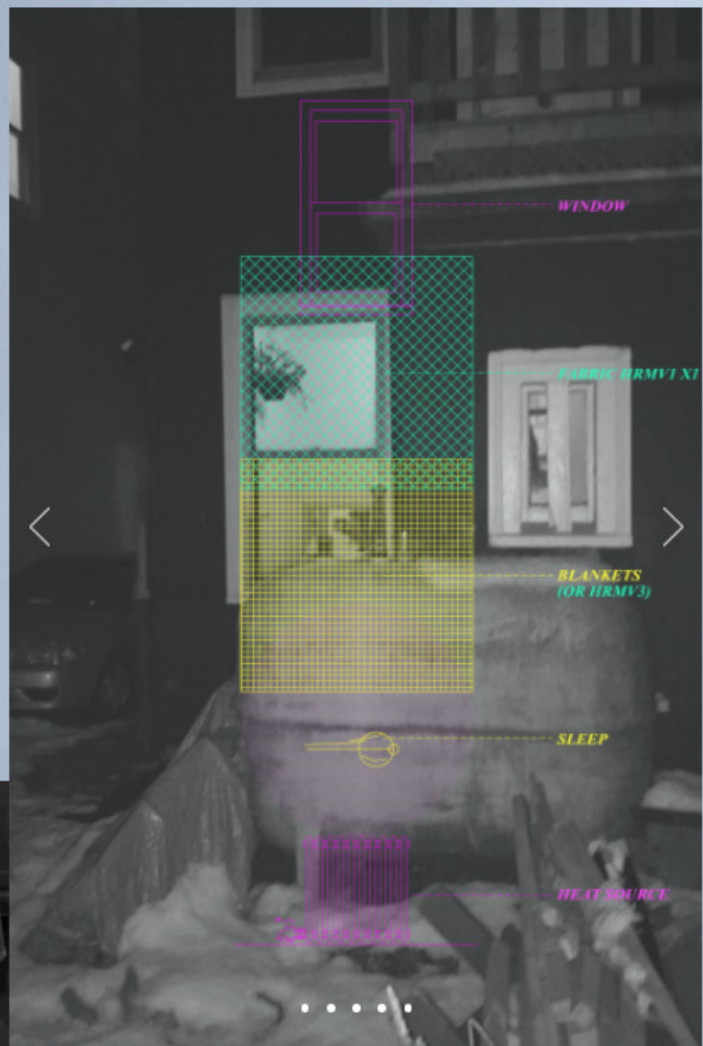
The convergence of energy in matter and matter into materials is essential to any architectural agenda for energy. Grasping the energetic basis of all matter and of all processes helps situate architecture - in its material and spatial practices - with the energy for designers that far exceed the common preoccupations with conservation, efficiency, and optimization that dominate the discourse on architecture and energy. (Moe 2013, 23)

(January 08, 2020)

My friend needed to stay over one evening in January. Everyone always complains the floor in my kitchen is cold and uncomfortable, so I used my fabric to push the boundaries of my bedroom towards the exterior. My radiator is located next to the window, which is old and leaky. Because of the proximity to the heat source, they were quite warm through the night but needed a few blankets. They mentioned that it felt like a nest, and like they were being cuddled the entire evening. I don't get many guests, so I think I'll use this to start some seeds next month, like a cold frame.

**POWER
INHABITATION**
 human proximity
 to fixed
 sources of power
 alters efficacy
 in mediating
 the layer of
 warmth
 dissipating into
 our atmosphere
 which
 we rarely
 experience
 without clothing
 or blankets

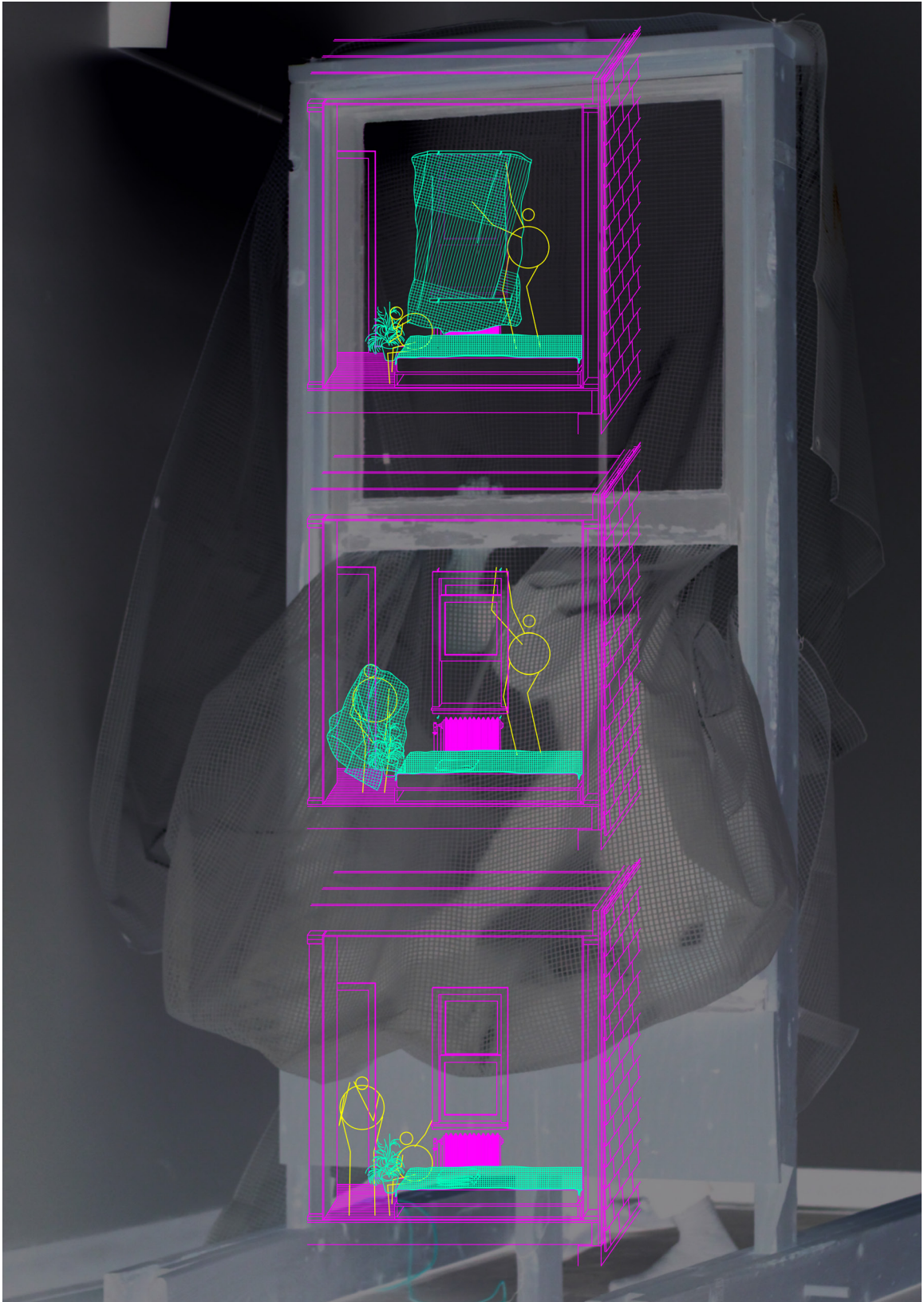
Cookie policy  SOUND   0.26



18/01/2020
 BIRDS OF THE GARDEN

041

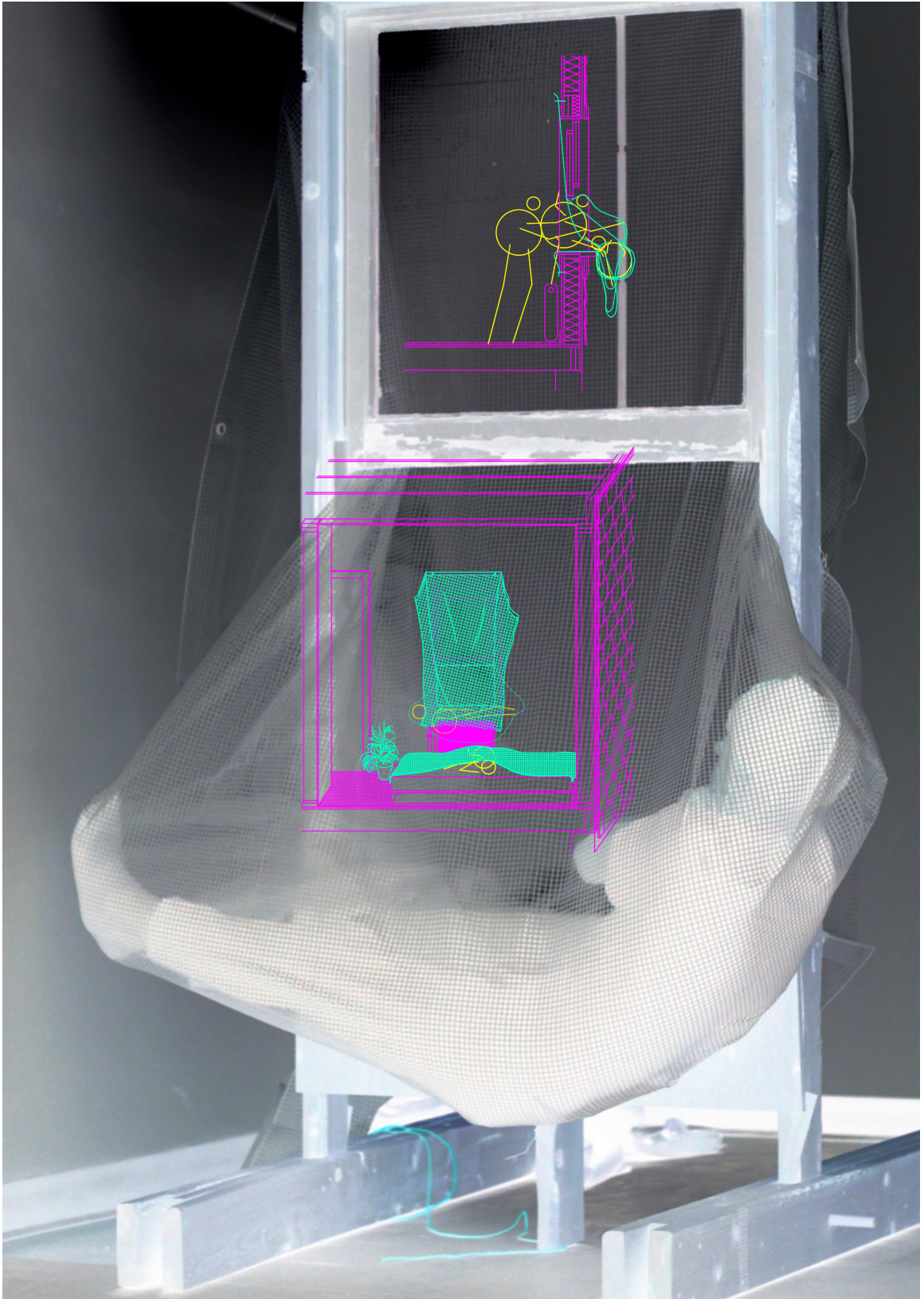
- [CALENDAR](#)
- [REQUEST SOUP](#)
- [FS RADIO](#)
- [JOIN](#)
- [MAP](#)



041 *BIRDS OF THE GARDEN*: sequence



041 *BIRDS OF THE GARDEN*: folding/pinning detail



041 *BIRDS OF THE GARDEN*: rest



041 *BIRDS OF THE GARDEN*: wall section



041 *BIRDS OF THE GARDEN*: garden

042 Winter Dwelling for Soup Maker

*At the expense
of the universe
humans
order nutrition
within their bodies
causing the
entropy
of their environment
to increase.*

(January 18, 2020)

In mid January my oil heater ran dry, so I started to make soup to stay warm. I noticed while standing near the pot that the steam provided quite a lot of comfort despite the cold day. I started fashioning my fabric to my fridge, cabinet and stove. It was draping towards the pot, adjusting to my movements and hugging my position through an intimate closeness.

The steam began to collect on my HRMV2 fabric, slowly finding its way to the floor. Having discovered this warmth, I began to sleep in the dwelling, leaving broths to simmer over night, and created different soups while I was home throughout the day. I soon realized that I was making too much soup to eat for one person and started inviting friends and people passing on the street into my dwelling to share the newly channeled abundance.

I began spending too much money on ingredients from the market but remembered what surrounded me and started to collect the kelp that washes up in the harbour. My friends say I always smell like the ocean now.

Ingredients for winter soup:

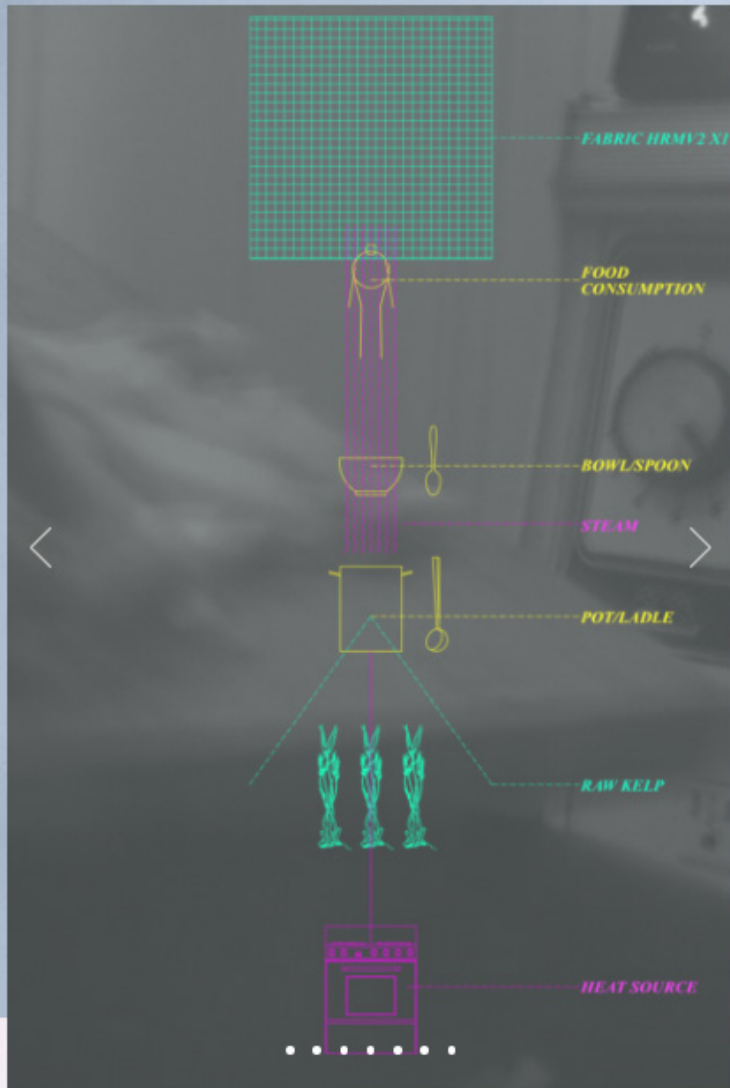
*bone broth (waste carcass of animal) /or vegetable broth
(waste carcass of vegetables)*

miso paste (fermented soy beans ~1yr)

kelp (from the harbour, seasonal, wash thoroughly)

**POWER
INHABITATION**
at the expense
of the universe
humans
order nutrition
within their bodies
causing the
entropy
of their
environment to
increase.

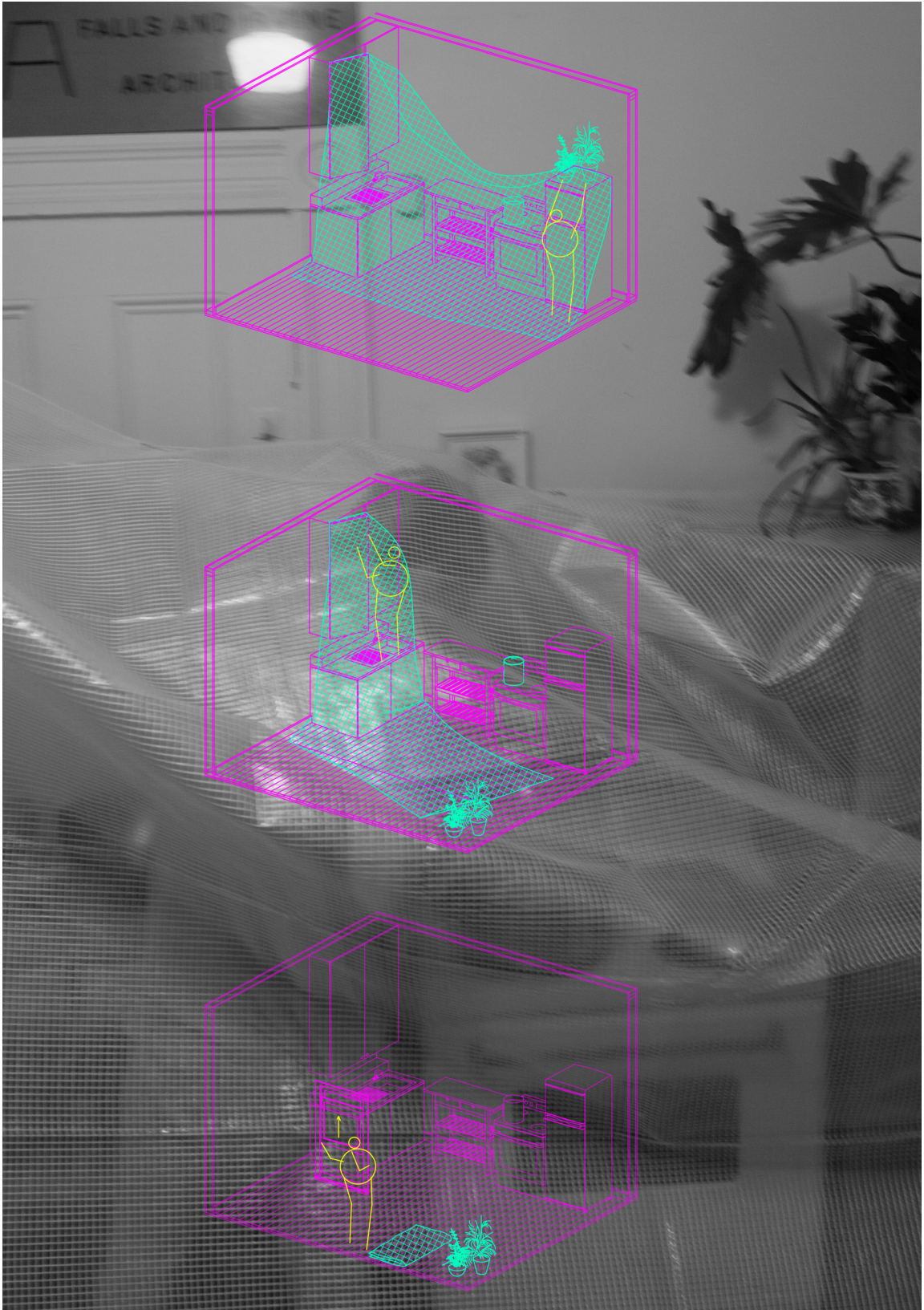
Cookie policy  SOUND 



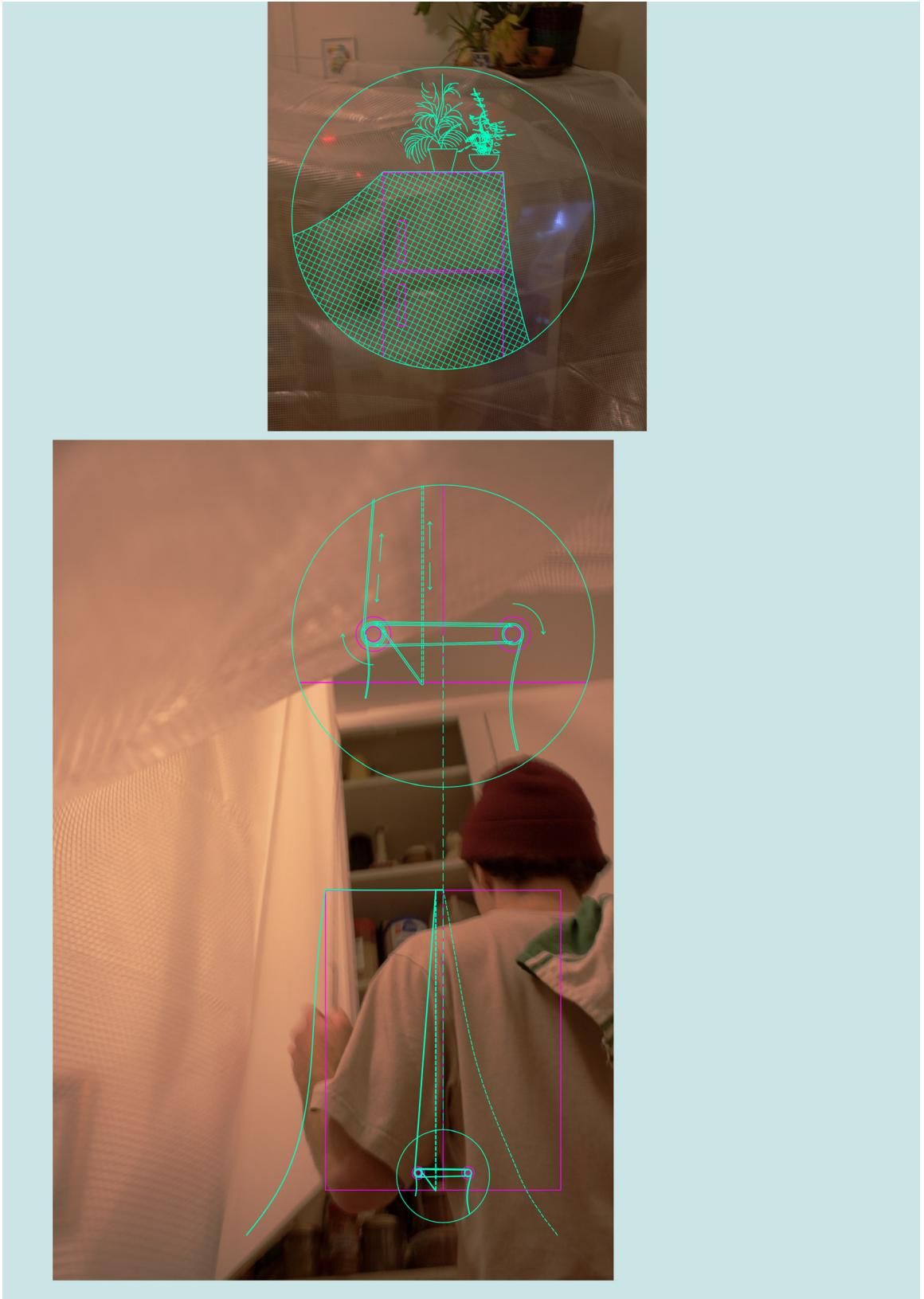
18/01/2020
WINTER DWELLING FOR SOUP MAKER

042

042 WINTER DWELLING FOR SOUP MAKER



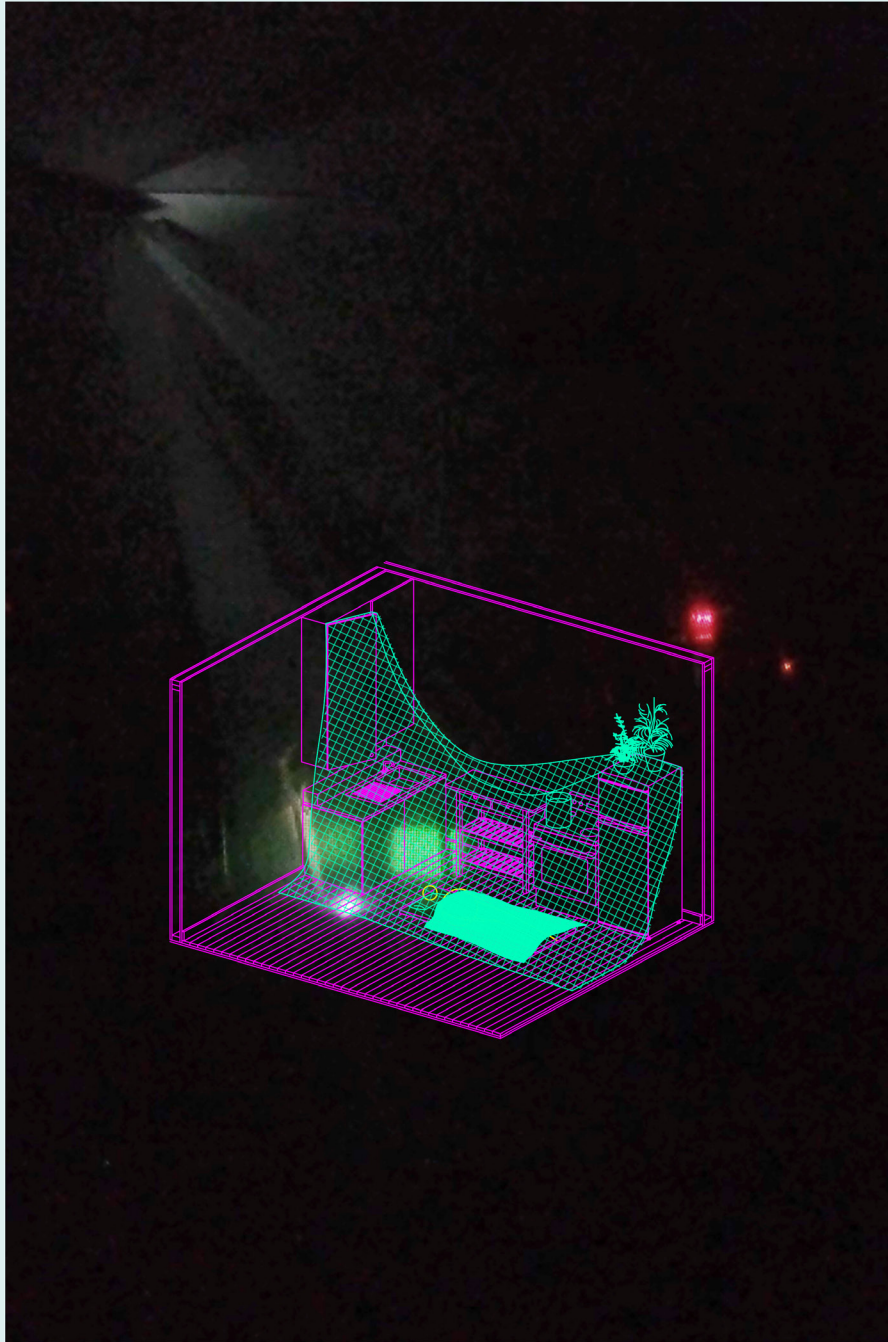
042 WINTER DWELLING FOR SOUP MAKER: sequence



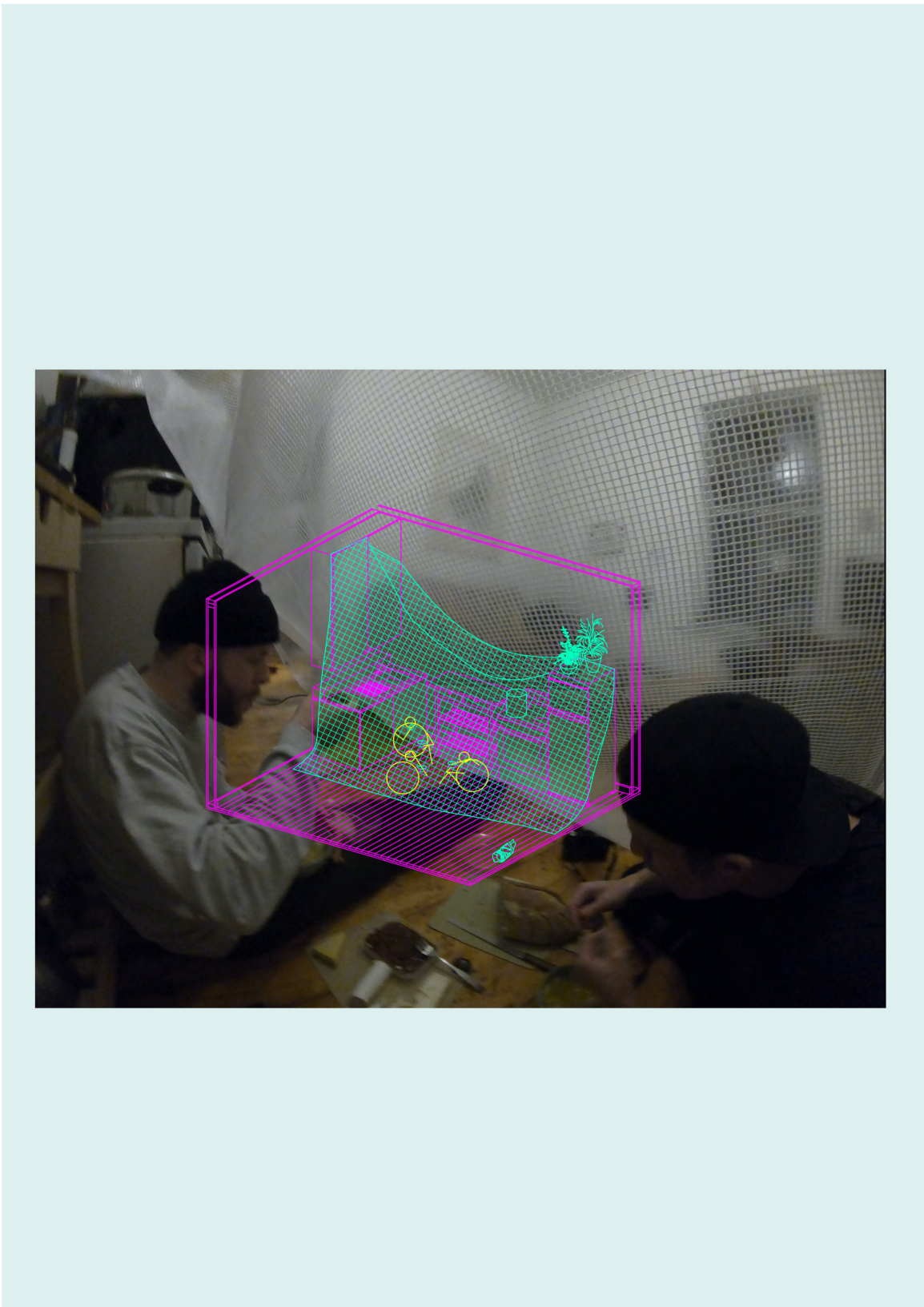
042 WINTER DWELLING FOR SOUP MAKER: details



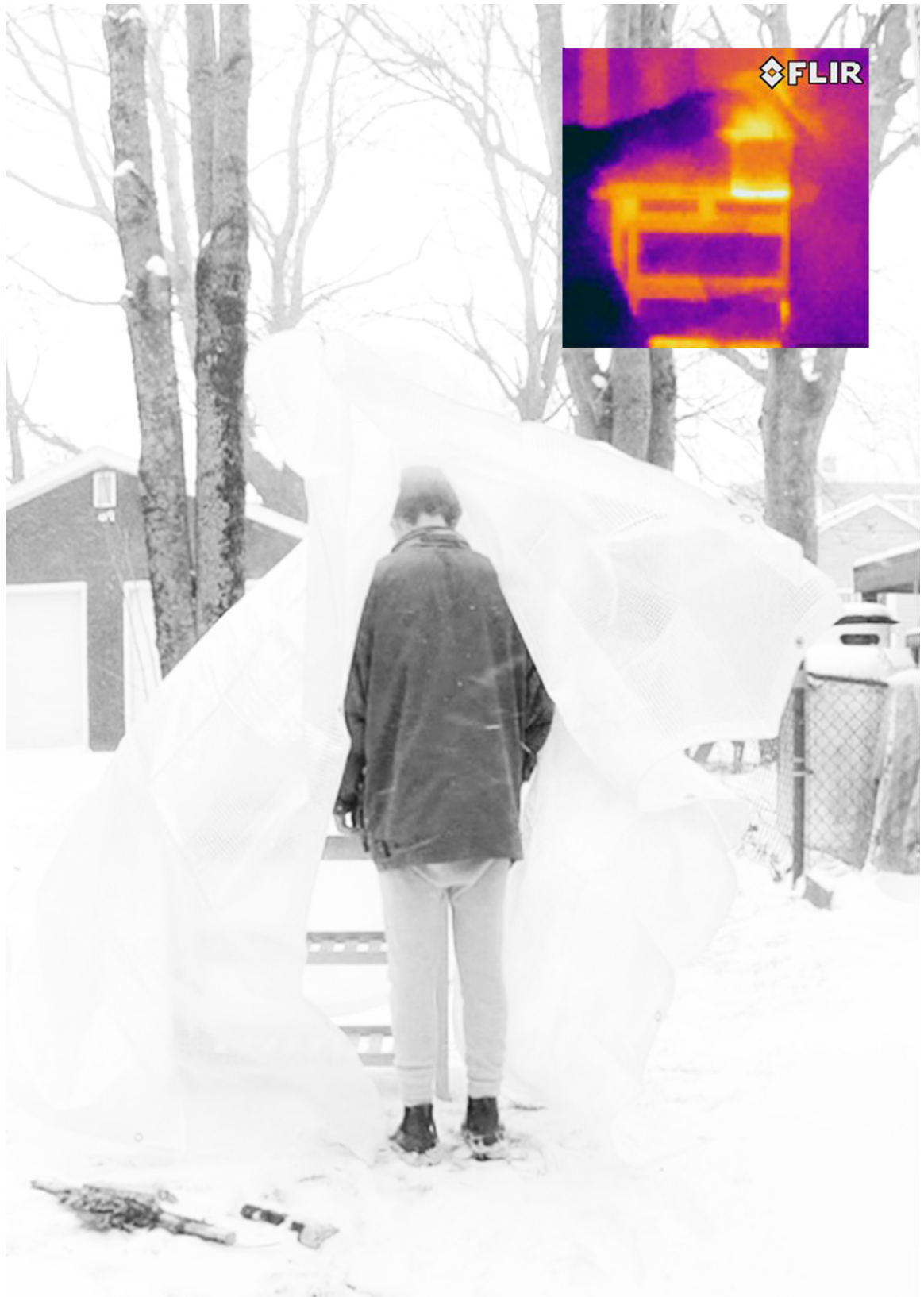
042 WINTER DWELLING FOR SOUP MAKER: making soup



042 WINTER DWELLING FOR SOUP MAKER: sleep



042 WINTER DWELLING FOR SOUP MAKER: gathering



042 WINTER DWELLING FOR SOUP MAKER: steam test



“Selective Insulation”
(Etherington 2009)

Precedent

Selective insulation by Davidson Rafilidis demonstrates an entropy based design intervention in an existing dwelling. Here the architects created a bubble wrapped space around a window, door and desk to create a warm microclimate for working. The client previously found it difficult to stay warm throughout the winter in the large cold environment of a nineteenth century dwelling. The project highlights a symbiosis between capturing the dissipating energies of the sun and human by wrapping the function (desk) and excluding the radiant heater. Here, the architects refused the additive convention to aggregate insulation onto the existing wall assembly and reinforce the isolation between human and atmospheric context. Instead they treated the building as context and created a mediation which brings the inhabitant closer to the sun.

043 Aggrede/amigration

*Fixed, aggregated
convergences of
matter
hide active layers
to cloud
thermospatial
perception
to the falsity of
isolation (Moe 2013)
within a system
that is otherwise
conceived of
as dynamic.*

(March 03, 2020)

I decided I needed out of these fixed walls, they began to feel like cages, trapping me, feeling unnecessary given the abundance of soup I was making. I started disassembling them, but soon realized I needed to live closer to the sun and began to delaminate my roof assembly which previously hid the discussion between what was above and below me. I began to occupy this layer, using my objects and body to mutually feed back into the dissipation below. I also fashioned a device like at the SMOG facility to channel the smoke from the chimney back into my dwelling. I sleep on it like an air mattress.

**POWER
INHABITATION**

*fixed
aggregated
convergences of
matter
hide active layers
to cloud
thermospatial
perception
to the falsity of
isolation from 00:00
within a system
that is otherwise
conceived of
as dynamic.*



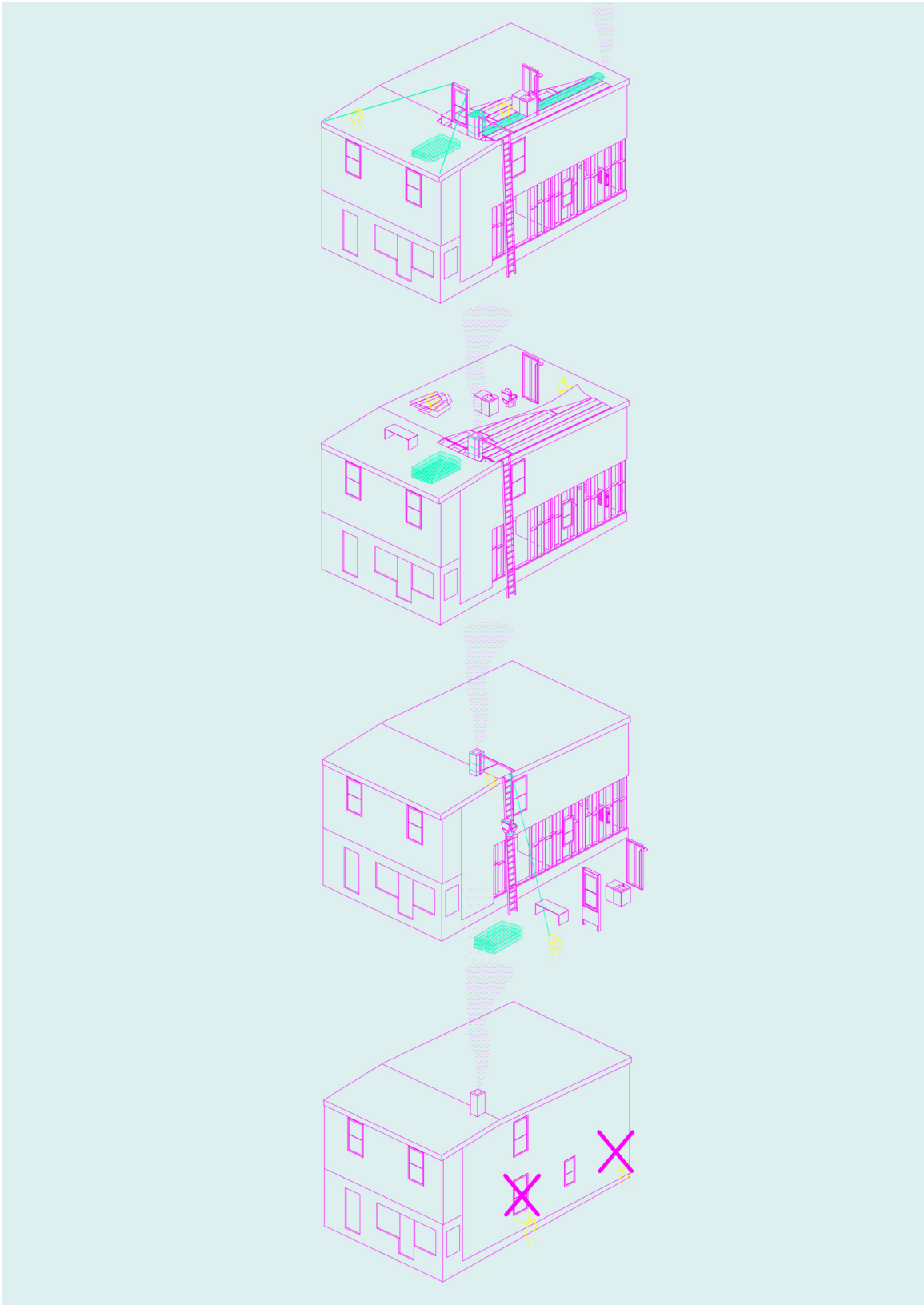
03/03/2020
AGGREDELAMIGRATION

043

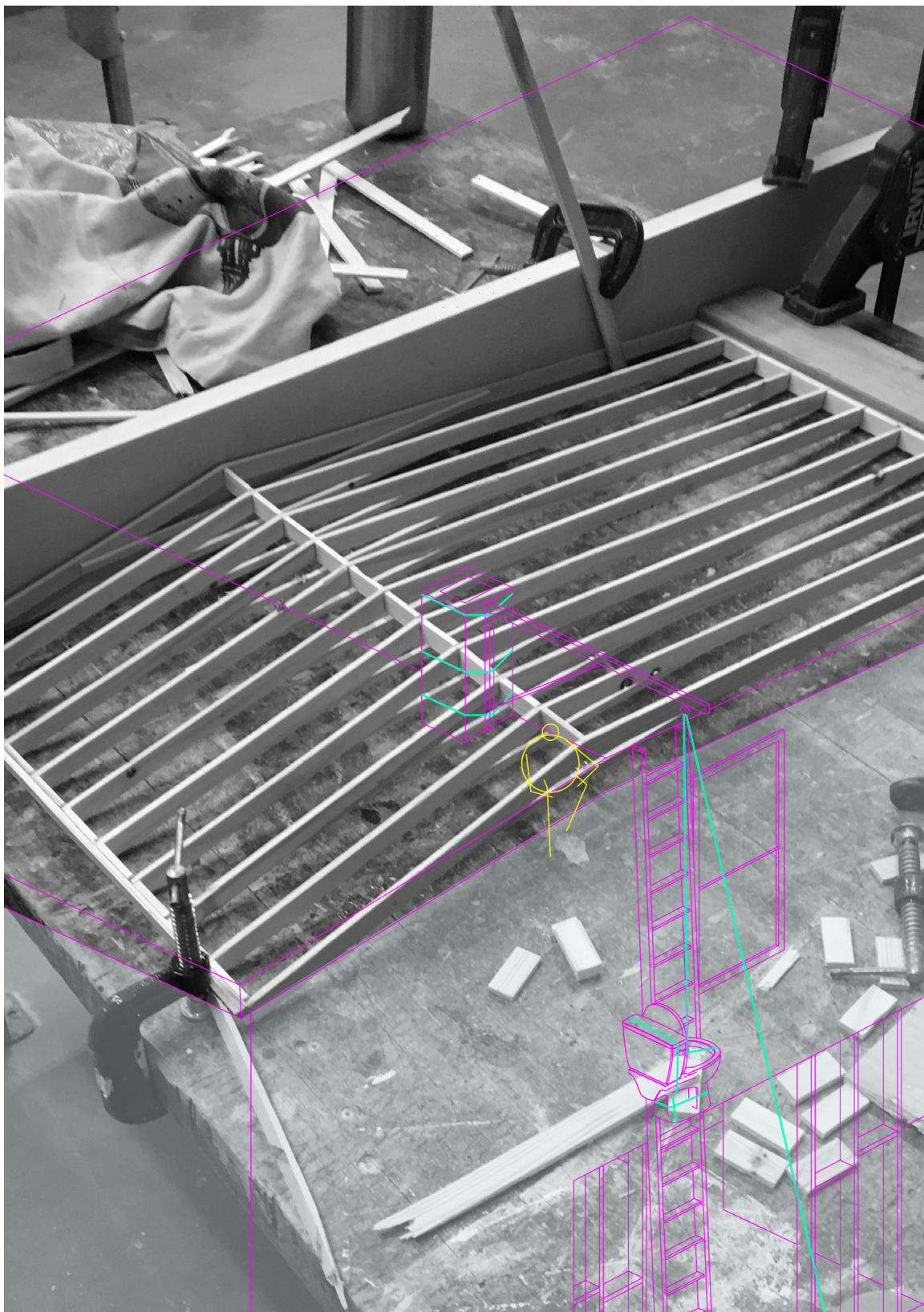
Cookie policy  SOUND  0:36

- [CALENDAR](#)
- [REQUEST SOUP](#)
- [FS RADIO](#)
- [JOIN](#)
- [MAP](#)

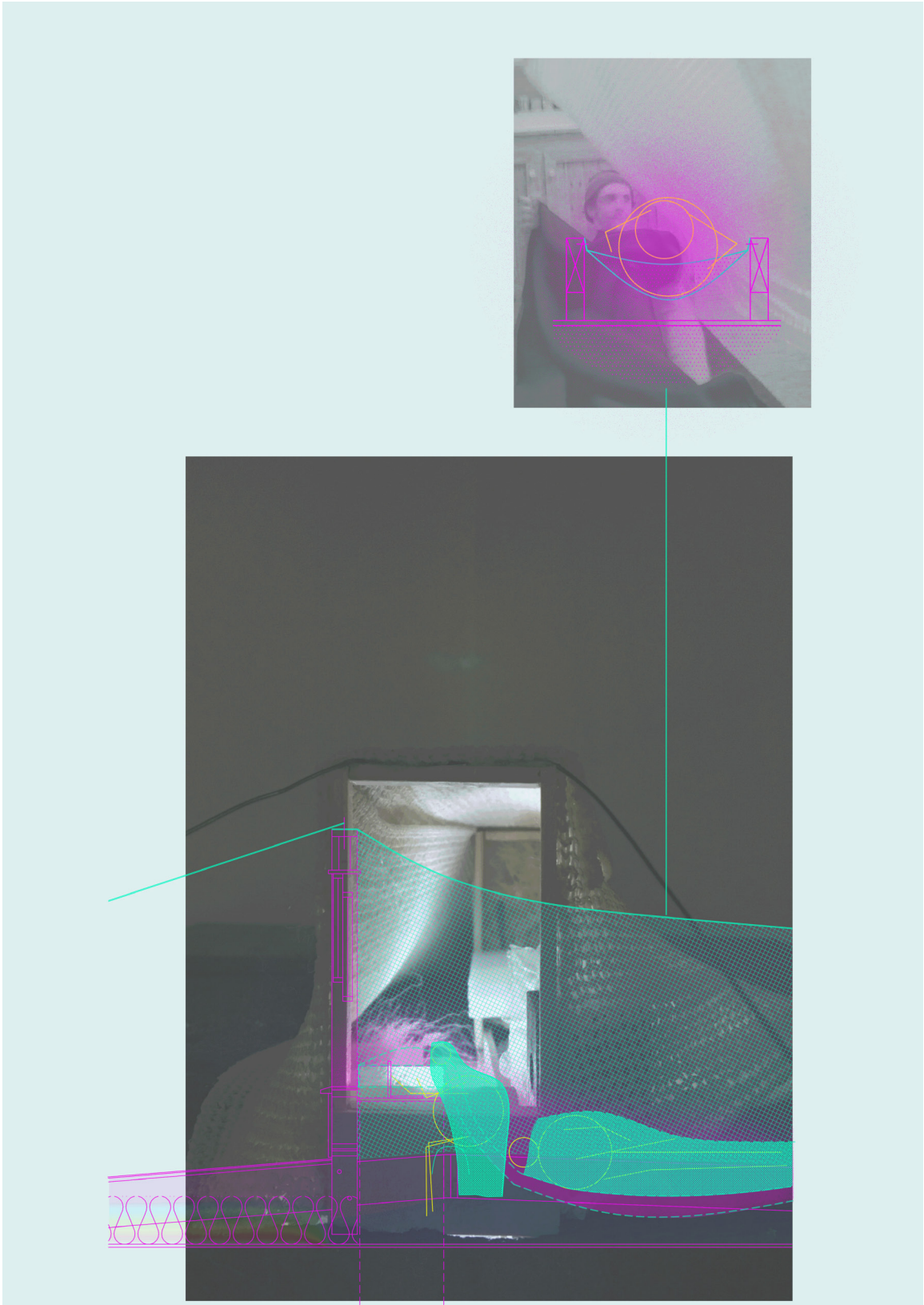
043 AGGREDELAMIGRATION



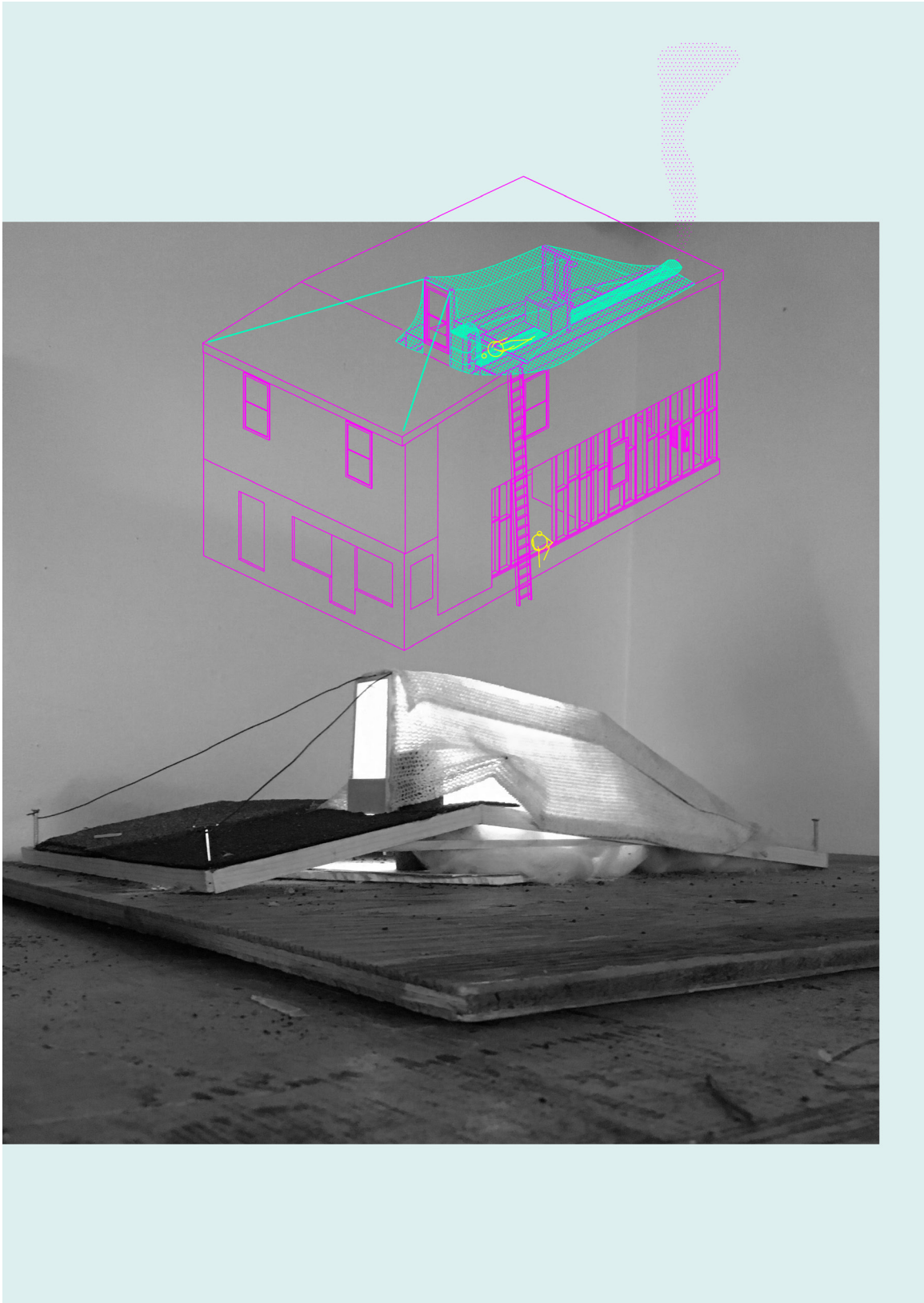
043 AGGREDELAMIGRATION: sequence



043 AGGREDELAMIGRATION: model process/hoist



043 AGGREDELAMIGRATION: section/model



043 AGGREDELAMIGRATION: model/inhabited isometric

Chapter 3: Conclusion

Layer 05: Power Sublation

Established systems

separate

the human system

from the pulses

of the sun's

waves

as they hit

the earth's surface

translating from

short wave to long.

Chaos increases

as we loose access

to cosmic energies

in their immediate form

living in light,

wind, water,

and matter.

051 Child of The Weather

(March 16 2055)

Beneath this fabric I feel the winds speak to me. Through the warmth of our mother sun, surrounding every breath, allowing movement - freely through this system. I welcome chaos as I order energy within my body feeling the layers beyond myself dancing. The glow of my screen keeps me warm as evening falls. Perhaps tonight I will sleep beneath a tree.

Entropy occurs as a human orders energy within their body through the harnessing of sunlight, radiation, air, water, plants and proteins. Energy flows through our ecological system originating from the sun, constantly translating in to different forms resulting in a self regulating system with a complexity of nutritional hierarchies (Odum 1971). As biological beings, humans are constant in their ordering of energy within their bodies while increasing the chaos of the universe.

Fixed walls are not necessary so long as one organizes themselves around effective sources of power. In his essay *A Home is not a House* Reyner Banham questions the efficacy of fixed walls by challenging their purpose amongst the abundantly present mechanical and electrical services they enclose.

Man started with two basic ways of controlling environments: one by avoiding the issue and hiding under a rock, tree, tent, or roof (this led ultimately to architecture as we know it) and the other by actually interfering with the local meteorology, usually by means of a campfire, which, in a more polished form, might lead to the kind of situation now under discussion. Unlike the living space trapped with our forebears under a rock or roof, the space around a campfire has many unique qualities which architecture cannot hope to equal, above all, its freedom and variability. (Banham 1965, 70)

As mobile technologies continue to develop, humans are becoming increasingly nomadic. Our campfires which provided freedom and variability have evolved to our adoption of the smart phone. Humans no longer focus the orientation of their lives around a heat source, but instead around the limitless connectivity and abundant information made possible by such devices. These devices will continue to evolve to the point where they will have the ability to physically warm their user and order nutrients, leading to

the obsolescence of the tools and technology architecture currently designs itself around.

In their 1972 video *Supersurface an Alternative Model for Life on the Earth*, Superstudio speculated a future built on free energy, harnessable by a society of nomadic people.

The transformation of body and mind to the only tool results in new models which are evolved out of reductive processes. From the use of tools to the use of the body, from the use of matter to the use of energy[...] The problem stands in the rediscovery of ourselves through the elimination of all formal structures and in general all that which exists apart from the individual. (Superstudio 1972)

A future that eliminates all formal structures requires an alternative harnessing and distribution of power to our current extraction based energy system. In 1931 Tesla speculated that the dissipating energies between the positive charge of the sun and negative charge of the earth had the ability to be harnessed and broadcast globally through a wireless distribution system (Mitra 2018). These ideas are still alive today, with many wireless charging companies such as Wi-Charge developing technologies that wirelessly charge mobile devices. Given a wireless, constant source of electrical flow based on energy harnessed from the atmosphere, extraction would no longer be necessary. Batteries based on extracted elements would become smaller, and eventually obsolete. The fossil fuel being translated to heat or kinetic power would no longer be necessary. Our existence would be provided by limitless personal power, accessed through mobile devices, tuned to a free energy network of dissipating waves.

In this future, our connection to universal energies will evolve. The source of our electricity and source of atmospheric energies, such as sun, wind and rain will have the ability to speak to each other freely. The fixed walls clouding our

perception of the universe will be abolished. Architecture will become lighter, adaptable, and deployable as needed to allow for human energies to dictate their site, orientation and proxemics. Through these means technology will no longer separate us from our greater environmental context but instead work to create an evolved symbioses with it. Buildings will become clothing, they will hold us, no longer in a stationary, submissive mannar, but with a gentle lightness, encouraging our freedom, and discussion with the cosmos.

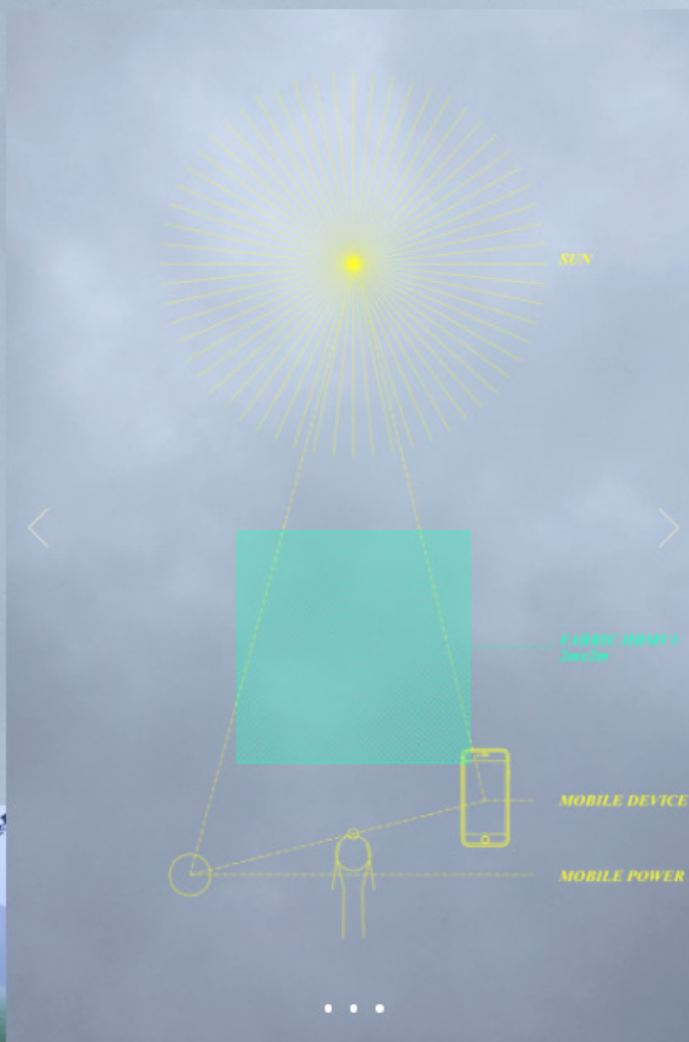
**POWER
SUBLATION**

*established
systems
separate
the human
from the pulses
of the sun's
waves
as they hit
the earth's surface
translating from
short wave to
long.
chaos increases
as we loose
access
to cosmic
energies
in their immediate
form
living in light,
wind, water,
and matter.*

Cookie policy

SOUND

0:25



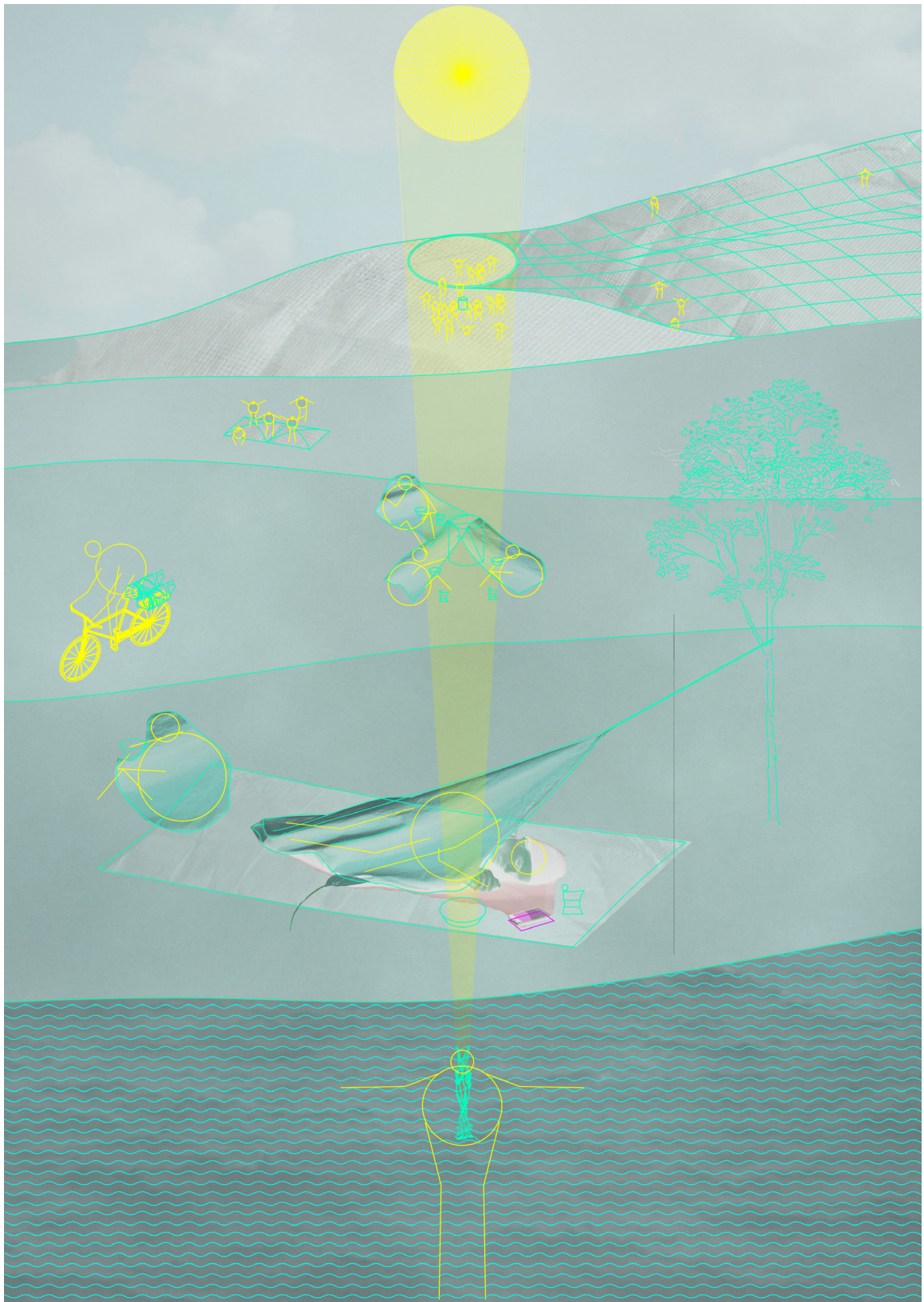
16/03/2015

CHILD OF THE WEATHER

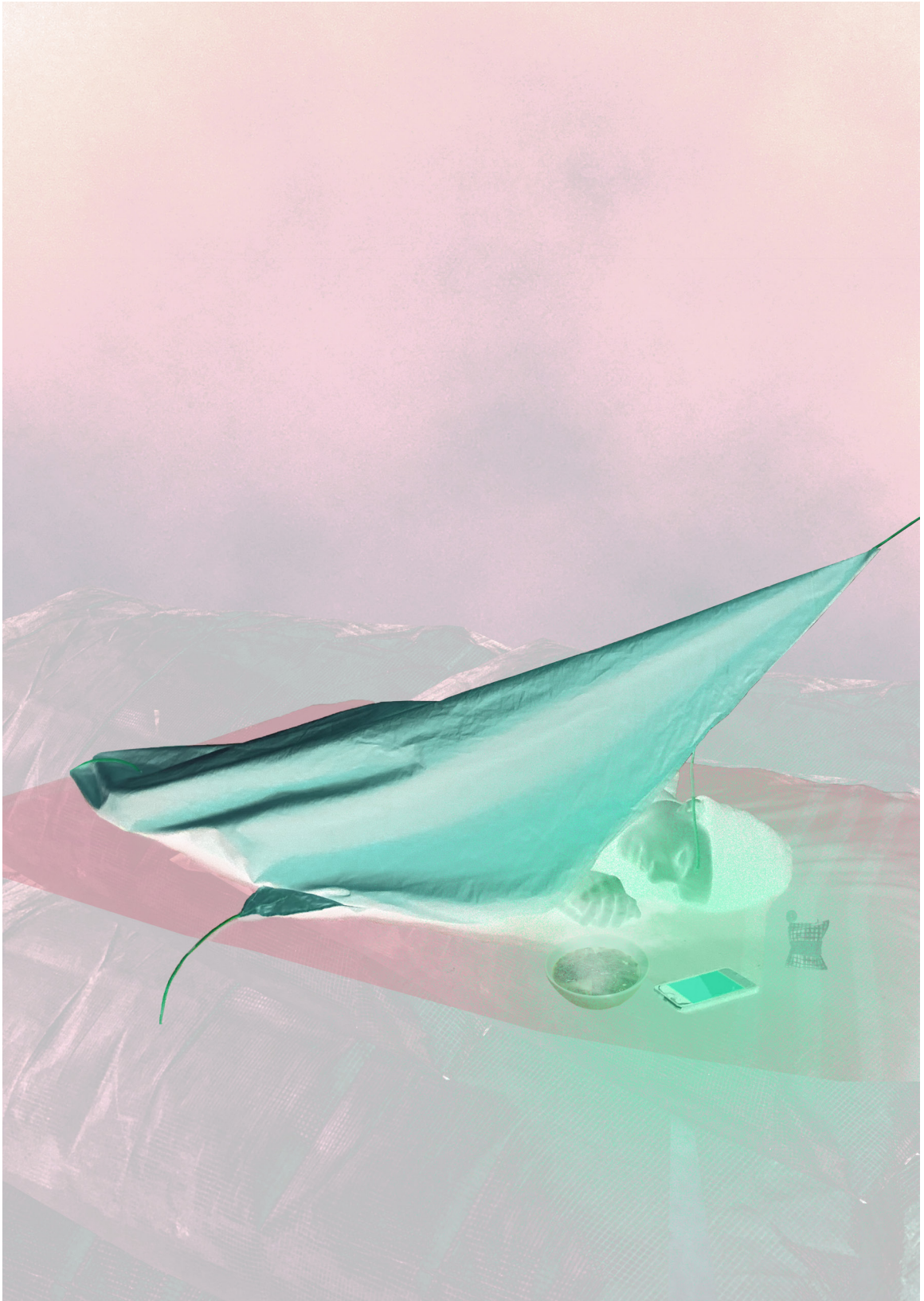
051

- CALENDAR
- REQUEST SOUP
- FS RADIO
- JOIN
- MAP

051 CHILD OF THE WEATHER



051 CHILD OF THE WEATHER: private to public



051 *CHILD OF THE WEATHER*: rest

Appendix: Definitions of Key Terms

entropy: disorder, chaos, the unavailability of a systems energy to do work

formlessness: without a clear order or arrangement
“an adjective having a given meaning [...] a term that serves to bring things down in the world, generally required that each thing have its form.”

power: energy used to influence behavior to do work

dissipation: the process of energy becoming disordered

emergy: quantifies the amount of energy that is captured in a material process including human and bio-geophysical factors

exergy: the qualitative description of energy: the capacity for energy to do work, what is destroyed as entropy increases

matter: captured energy occupies space

nutrition: energy ordered to maintain health and fuel growth

mediation: energy intervention in dissipative processes

mutual inductance: interaction between two coil's magnetic fields

perception: sensorial experience of energies

self-organized energy systems: structures where order coordination arises out of the interactions between smaller components, triggered by random fluctuations that are amplified by positive feedback

sublation: to raise from a lower to a higher state, also to negate or contradict

smog: air combined with pollutants

voltage: electrical pressure

References

- Abalos, Iñaki, Renata Snetkiewicz, and Lluís Ortega. 2015. *Essays on Thermodynamics, Architecture and Beauty*. New York: Actar.
- Algiknit. 2018. *Biology is the Future of Fashion*. <https://www.algiknit.com/>.
- Banham, Reyner. 1965. "A Home is not a House." In *Rethinking Technology: A Reader in Architectural Theory*, edited by William W. Braham and Johnathan A. Hale, 167-175. New York: Routledge.
- Berner, Robert. 2003. "The Long-term Carbon Cycle, Fossil Fuels and Atmospheric Composition." *Nature* 426: 323-326.
- Bois, Yve-Alain and Rosalind E. Krauss. 1997. *Formlessness: A User's Guide*. Cambridge: MIT Press.
- Bujold, Jim. 2019. "Re: Thesis Student Requesting Information." Email to author, November 21.
- CirTec. 2020. *Cellulose Recovery*. <https://www.cirtec.nl/en/cellulose-terugwinning/>.
- Etherington, Rose. 2009. "Selective Insulation by Davidson Rafailidis" *Dezeen*. <https://www.dezeen.com/2009/05/28/selective-insulation-by-davidson-rafailidis/>.
- Flavin, Katie, Nick Flavin, and Bill Flahive. 2013. *Kelp Farming Manual: A Guide to the Processing, Techniques, and Equipment for Farming Kelp in New England Waters*. Portland, ME: Ocean Approved, LLC.
- FREESOUP.INFO. 2020. *FREE SOUP* <https://www.freesoup.info/>.
- Gissen, David. 2009. *Subnature: Architecture's Other Environments*. New York: Princeton Architectural Press.
- Government of Canada. 2002. *Detailed Facility Information*. https://pollution-waste.canada.ca/national-release-inventory/archives/index.cfm?do=facility_information&lang=En&opt_npri_id=0000003998&opt_report_year=2002.
- Irving. 2016. *Irving Oil Announces Successful Commission of its Halifax Harbour Terminal*. <https://www.irvingoil.com/en-CA/press-room/irving-oil-announces-successful-commission-its-halifax-harbour-terminal>.
- Kubisch, Christina. 2017. *Electrical Walks: Electromagnetic Investigations in the City* http://www.christinakubisch.de/en/works/electrical_walks.
- Lalley, Sean. 2009. "Twelve Easy Pieces for the Piano." *Architectural Design* 79, no. 3: 7-11.
- Lamar, Kendrick. 2018. "DUCKWORTH." Track 14 on *DAMN*. Top Dawg Entertainment.
- Martin, Wendy. 2020. "Stop-Work Order Lifted After Rockfall at Cape Breton's Donkin Coal Mine" *Canadian Broadcasting Corporation*. <https://www.cbc.ca/news/canada/nova-scotia/stop-work-order-issued-in-section-of-donkin-coal-mine-1.5451553>.
- Milani, Matteo. 2010. *Walking the City with Christina Kubisch*. <http://digicult.it/digimag/issue-045/walking-in-the-city-with-christina-kubisch/>.

- Mitra, Manu. 2018. "Nikola Tesla's Free Electricity Electronic Circuit." *Journal of Electronics and Communication* 1, no. 1: 1-6.
- Moe, Kiel. 2013. *Convergence: An Architectural Agenda for Energy*. Basel: Birkhäuser.
- Moe, Kiel. 2014. *Insulating Modernism: Isolated and Non-Isolated Thermodynamics in Architecture*. Basel: Birkhäuser.
- Moe, Kiel. 2017. "Energy and Form in the Aftermath of Sustainability." *Journal for Architectural Education* 71, no. 1: 88-93.
- Moffit, Lisa. 2017. "Sand, Silt, Salt, Water: Entropy as a Lens for Design in Post-industrial Landscapes" *Landscape Research* 42, no. 7: 769-781.
- Morien. 2017. "Donkin Mine Recent Activities" *Morien Resources Corp*. <https://morien-res.com/donkin-mine/>.
- Müller, Malte. 2019. *WEB DESIGN AS ARCHITECTURE*. <http://www--arc.com/>.
- NRCan (Natural Resources Canada). 2015. *The Electromagnetic Spectrum*. <https://www.nrcan.gc.ca/maps-tools-publications/satellite-imagery-air-photos/remote-sensing-tutorials/introduction/electromagnetic-spectrum/14623>.
- NRCan (Natural Resources Canada). 2019. *Energy and Greenhouse Gas Emissions*. <https://www.nrcan.gc.ca/science-data/data-analysis/energy-data-analysis/energy-facts/energy-and-greenhouse-gas-emissions-ghgs/20063>.
- Odum, Howard T. 1971. *Environment, Power and Society For the Twenty First Century*. New York: Columbia University Press.
- Outhwaite, Aaron. 2020. "Re: Kelp Thesis." Email to author, March 04.
- Ruskin, John. 1894. *The Complete Works: Poetry of Architecture, Poems*. New York. Bryan, Taylor and Company.
- RVTR. 2016. *UNDERMINING EMPIRE A Landscape Manifesto for the Next Century*. OPSYS.
- Smithson, Robert. 1996. *The Collected Writings*. Berkley: University of California Press.
- Superstudio. 1972. *Supersurface - An alternative model for life on the Earth*. <https://www.architectureplayer.com/clips/supersurface-an-alternative-model-for-life-on-the-earth>.
- Ward Helen, Aroha Miller, Lydia Ma and Tom Kosatsky. 2017. *Going Underground: Electrical Substations and Health*. <http://www.ncceh.ca/documents/practice-scenario/going-underground-electrical-substations-and-health#authors>.
- Warmann, Catherine. 2010. "The Roof That Goes Up in Smoke by Overtreders W." *Dezeen*. <https://www.dezeen.com/2010/12/27/the-roof-that-goes-up-in-smoke-by-overtreders-w/>.
- Zwolińska, Jolanta, Monika Gasior, Elizbieta Sniezelck and Andrezej Kwolek. 2016. "The Use of Magnetic Fields in Treatment of Patients with Rheumatoid Arthritis. Review of the Literature." *Reumatologie* 54, no. 3, 201-206. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5090029/>.