

Light and Modularity

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M

Goals

Consider concept if any of the four types of modularity are interesting

Lecture

What is Modularity

4 Types we will focus on:

- Component Sharing
- Component Swapping
- Bus
- Sectional

Configurations

Standardized Parts

Sustainability Through Modularity

High Design Case Studies

T

Lecture

Modernism

Culture

How they intersect: Case Studies

Checho

Heller

Muji

W

Erco

TH

Ideate and

Make

Intro to Materials

F

Wrap Up and

Present

Goals



Consider....

Which types of modularity interest you.

How you will use the different configurations modularity allows?

How you will use standardized parts?

How You will approach sustainability?

(more specific goal ie design a sustainable modular light for landscape)

Defining Modularity



Modularity: the use of common units to create product variants.

The four kinds we will focus on:

- Component sharing modularity
- Component swapping modularity
- Bus modularity
- Sectional Modularity

Huang, Chun-Che, and Andrew Kusiak. "Modularity in Design of Products and Systems." IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans 28, no. 1

Component Sharing Modularity

Component Swapping



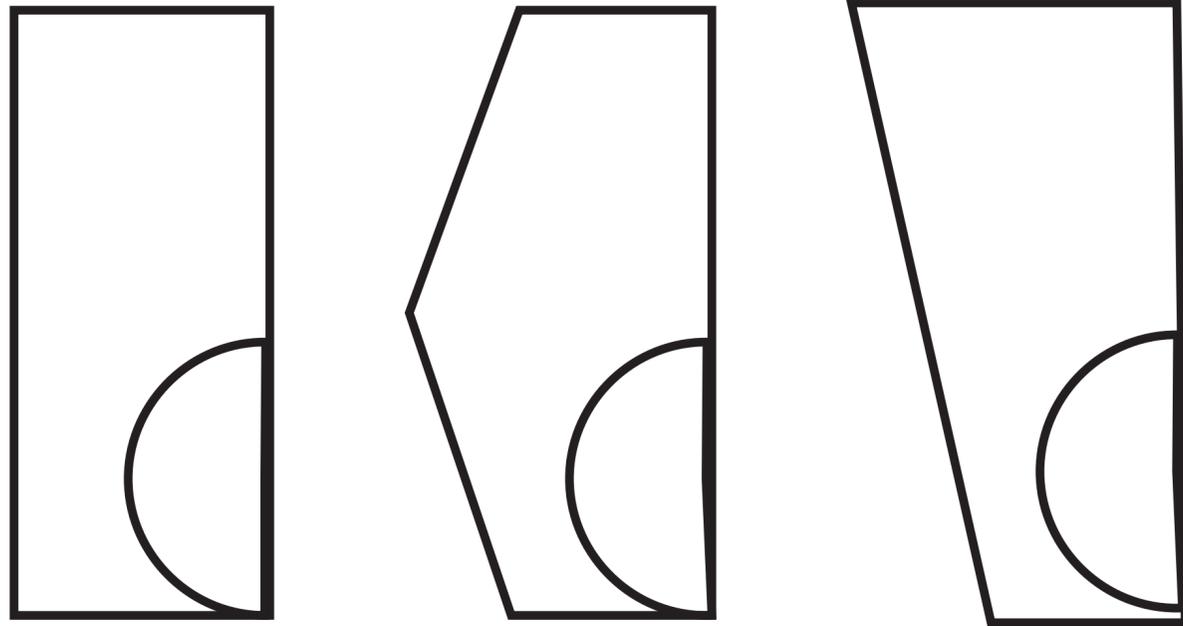
Bus



Sectional



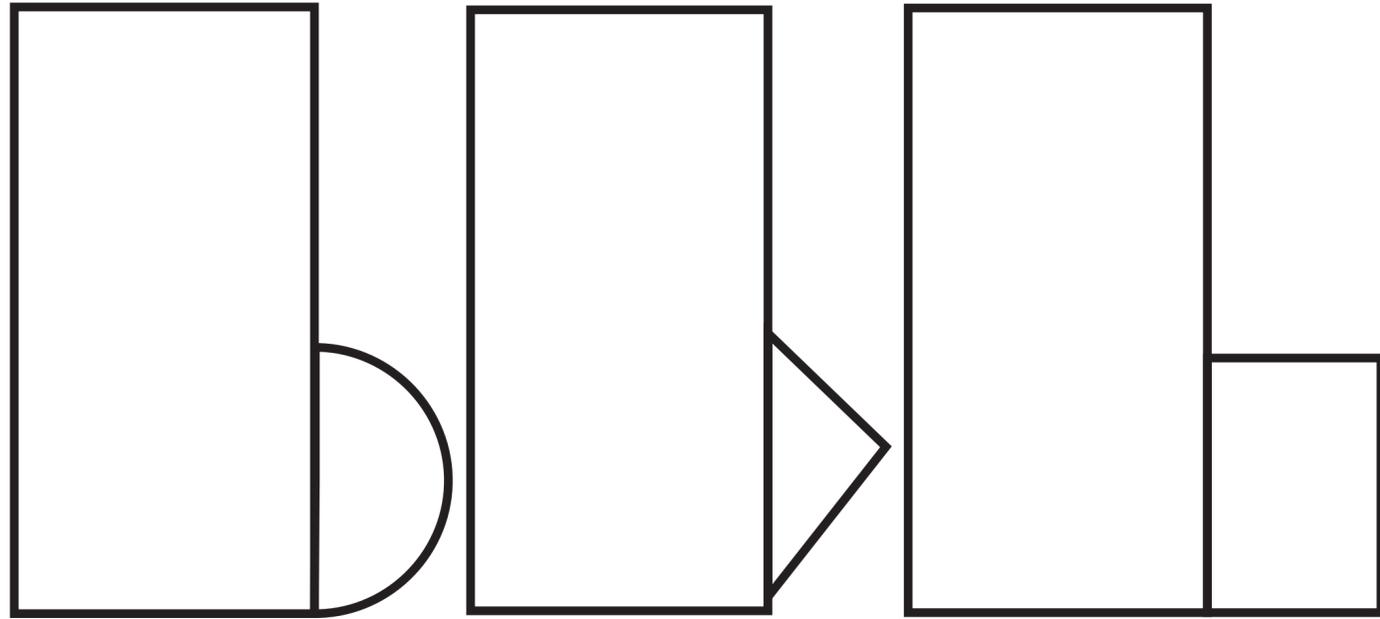
Component Sharing Modularity



Various modular components sharing the same basic component create different product variants belonging to different product families

Defined by standardized parts available across various different product lines

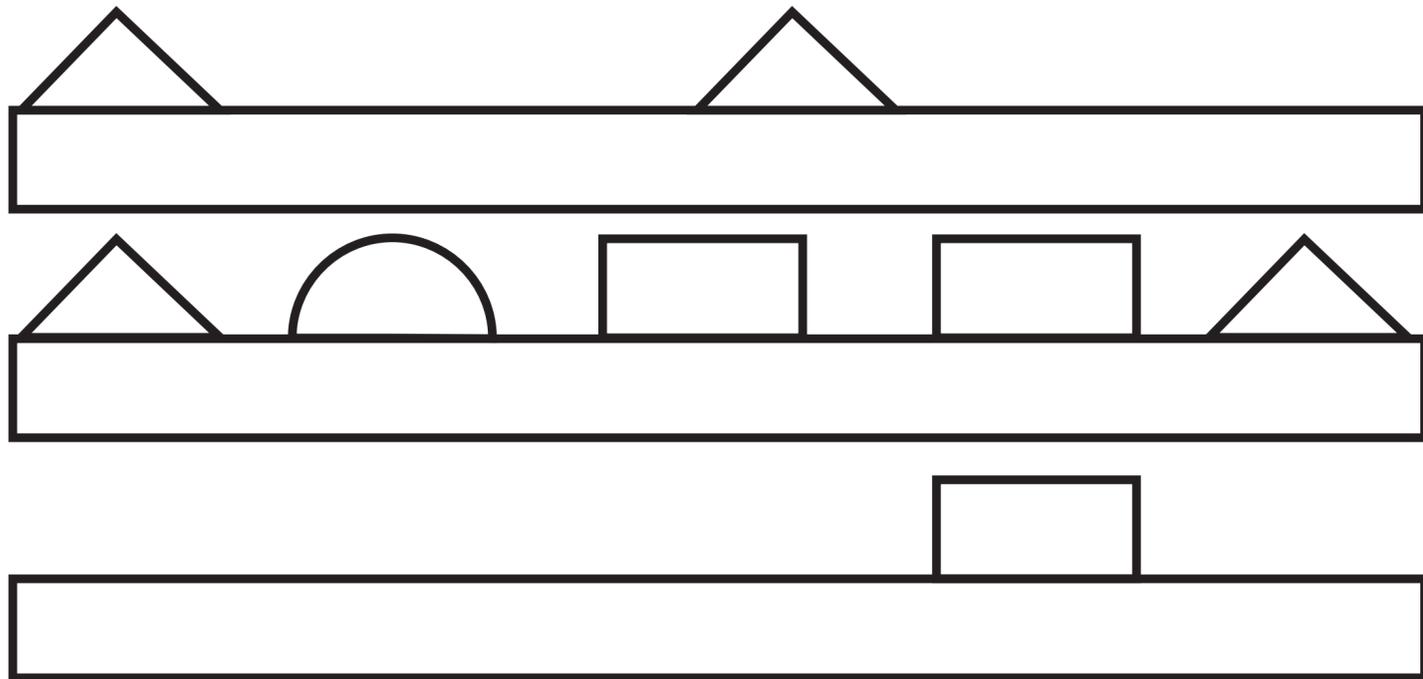
Component Swapping Modularity



Two or more alternative basic components can be paired with the same modular components creating different product variants belong to the same product family

Defined by modules creating a variation in a single product line

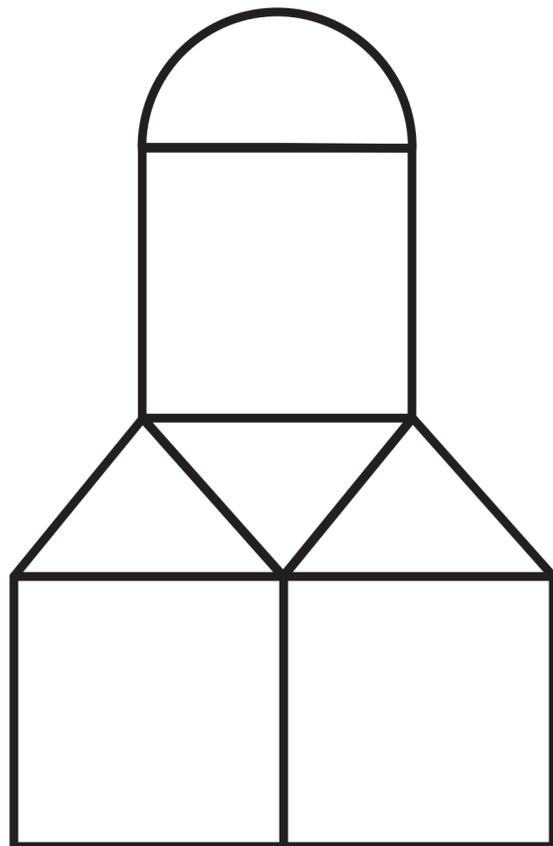
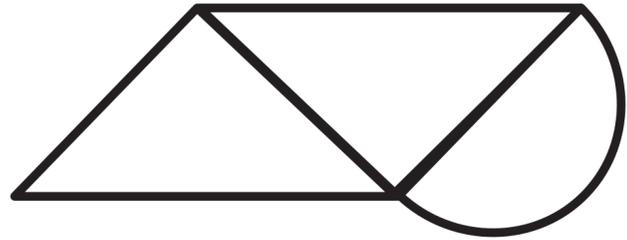
Bus Modularity



Connecting multiple, different components on one standard and extensible linkage system

Defined by a central module with many different modules connected by a standardized connection point

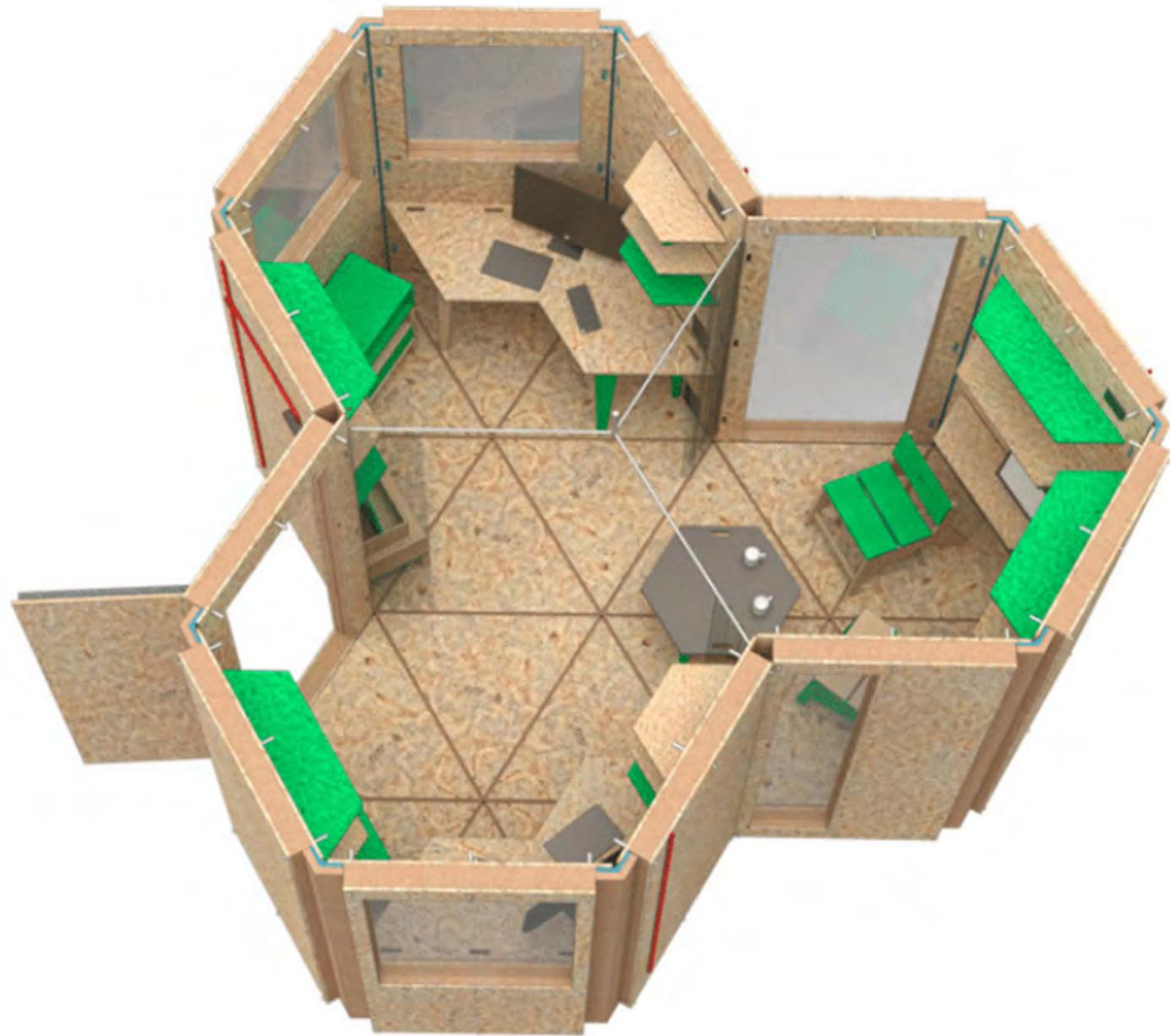
Sectional Modularity



Connecting modules together themselves, via a standard interface, without the need for a separate linkage system (the system in which the modules connect to each other)

Defined by a standardized connection system in all modules, think LEGO

Sustainability and Modularity



Three dimensions of Modularity:

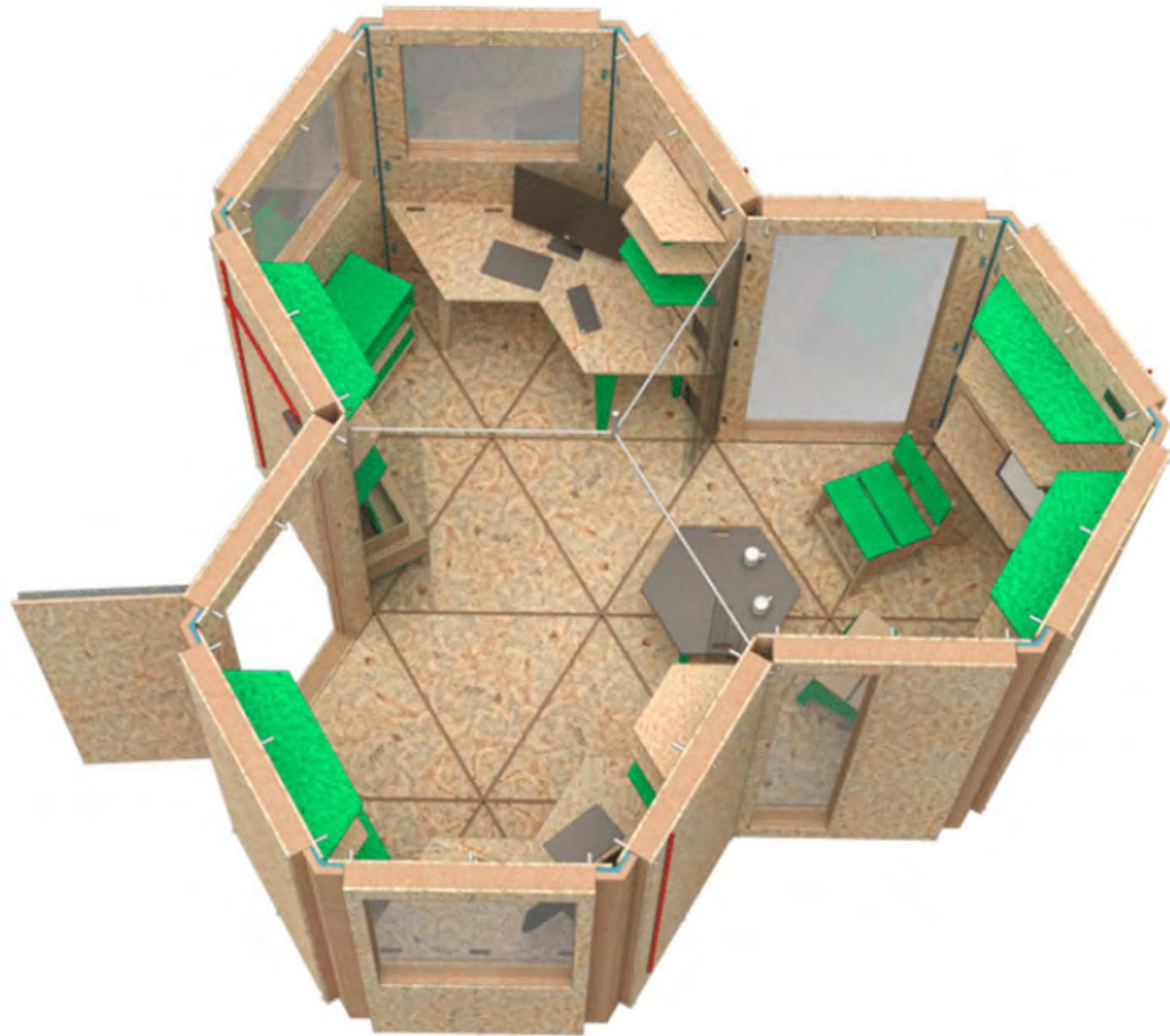
“modularity in the product that is focused on the architecture and design project; modularity in production involving the assembly line and; modularity in use that is aimed at the consumer that allows ease of use and customization”

All Three of these contribute to Life Cycle

With proper consideration of life cycle, modularity can contribute to reducing “the environmental impacts of discarded products”

Machado, Natália, and Sandra Naomi Morioka. “Contributions of Modularity to the Circular Economy: A Systematic Review of Literature.” *Journal of Building Engineering* 44 (2021):

Sustainability and Modularity



Modularity and Manufacturing

“Manufacturers have shorter learning curves in understanding the production of each small item, and the overall speed of production increases... Faster production means less energy used”

Modular Products are less Disposable

Due to their flexibility in how they can be modified to fit changing environments, modular products are less likely to be thrown away

Schrader, Kelsie. “How Modularity Promotes Sustainability.” Shieldcasework.com, October 6, 2016. <https://www.shieldcasework.com/how-modularity-promotes-sustainability/>.

Case Study



10 Unit System by Shigeru Ban

L-shaped units made of recycled materials, can be arranged into several configurations, sold in sets of 10.

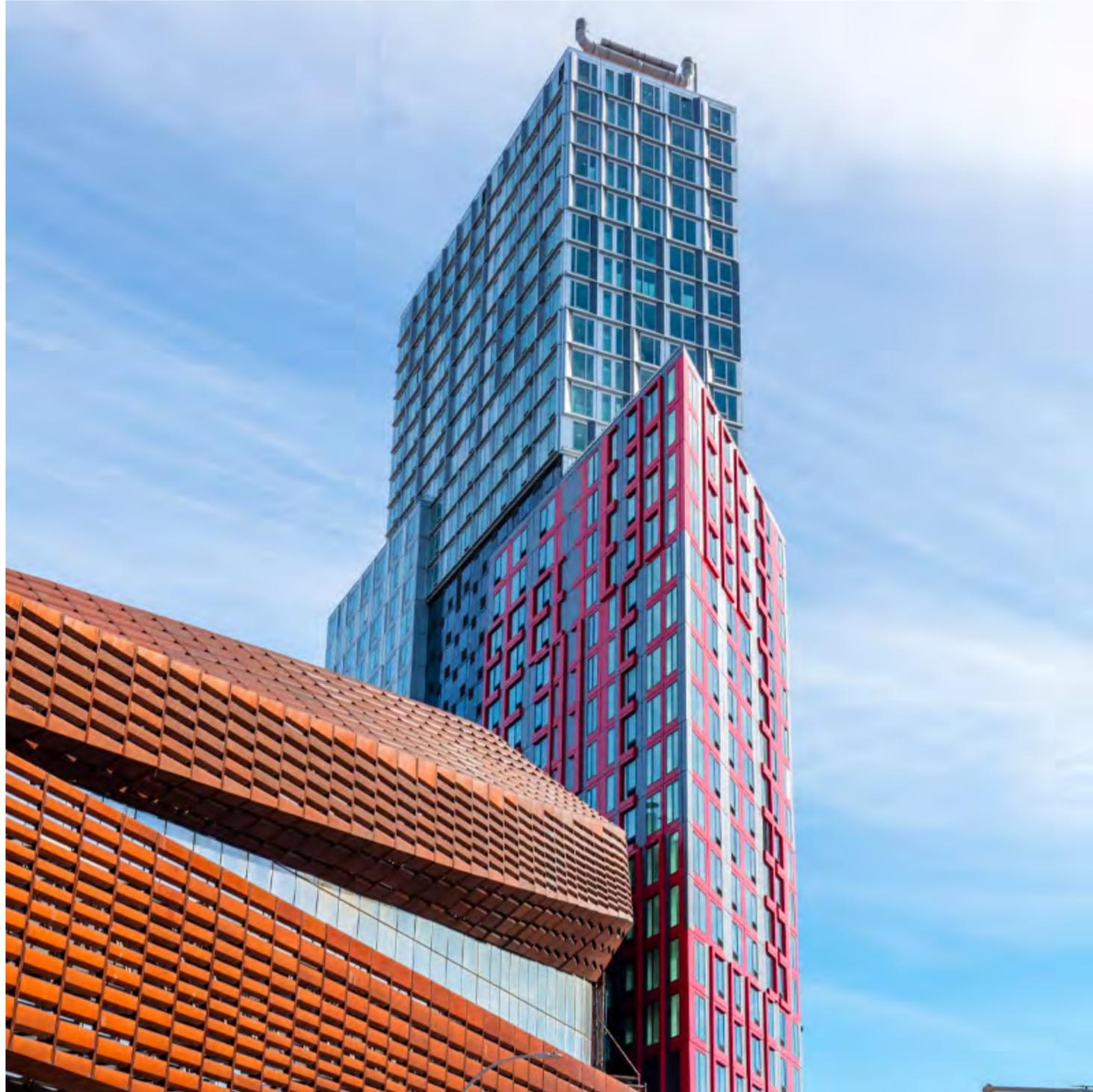
Can be configured into many different pieces of furniture.

Designed to be easily assembled and disassembled.

Made for furniture company Artek.

Etherington, Rose. "10 Unit System by Shigeru Ban." Dezeen, January 18, 2022. <https://www.dezeen.com/2009/04/14/10-unit-system-by-shigeru-ban/>.

Case Study



SHoP Architects Modular High Rise

"Offsite construction reduces environmental impact and offers a creative way forward for the construction industry to address the intersecting needs of cities today."

This "building contains 363 rental apartments, with a total of 23 different configurations."

Modules were fabricated offsites and shipped to construction site.

McKnight, Jenna. "Prefabricated Apartment Tower by Shop Architects Opens in Brooklyn." Dezeen, December 1, 2016. <https://www.dezeen.com/2016/11/18/worlds-tallest-modu->

Case Study



LEGO

Sectional Modularity allows for a deep building system which facilitates structured and unstructured play.

LEGO is defined by its connection system, which is used to create a world of possibility and supports the user's creativity.

A Piece of My Work



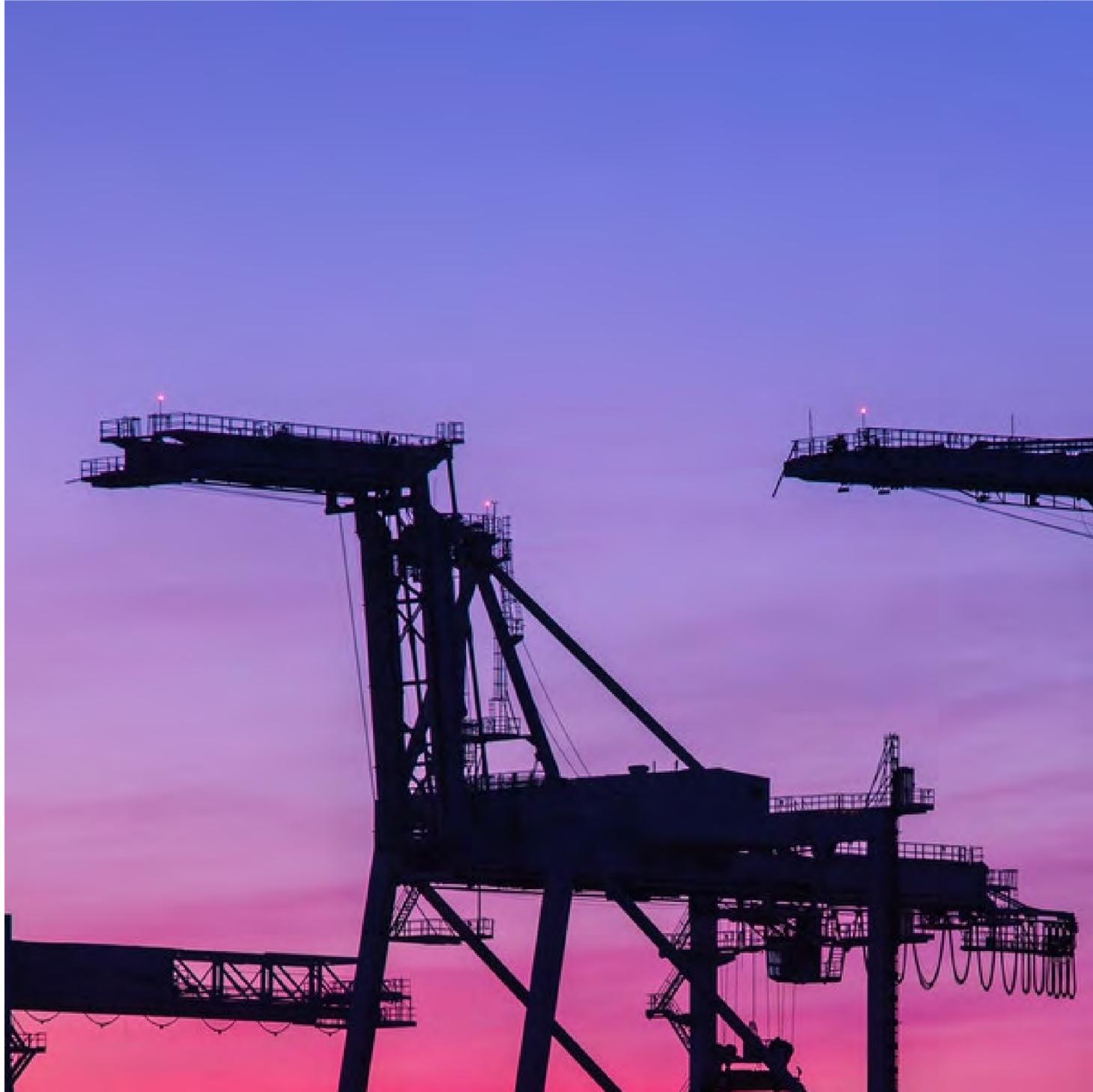
Modular GamePad

Fully Modular Game Controller with the ability to swap all modules.

Uses a central bus module with standardized connection ports that allow for all modules to work in all positions.

Sustainability in multiple dimensions, ease of replacement and repair, personalization creates emotional connection, and utilizes reclaimed thermoplastic.

Urban Lighting



Oakland California

Population: 440,646, 45th in the United States, 8th in California.

31% of Oakland neighborhoods are being gentrified, with formally low income neighborhoods being replaced with high cost housing for Silicon Valley tech workers.

Major port city, with Oakland handling 99% of imports for northern California

Urban Lighting



Oakland California

Oakland has over 38,000 street lights, the city cites that the main goal is to produce a safe environment and streets.

Lake Merrit Area, Gentrified Neighborhood.

Areas include circling the lake, and a rose garden

Aesthetics are pre-modernist, inspired by Edison lighting, ornamental.



In Summary

Types of Modularity

Component Sharing Modularity

Component Swapping Modularity

Bus Modularity

Sectional Modularity

Sustainability and Modularity

Life cycle

Ease of manufacturing

Makes product less disposable

Rest of Today

Ideation Process

Draw out your modularity with concept

Do more research if needed

Use ideation as a way to internalize different types of modularity

Try to ideate a concept for each type of modularity