



# Design Practice / Practice design

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**DESIGN PRACTICE / PRACTICE DESIGN**

A Thesis Submitted to the Department of Architecture  
Harvard University Graduate School of Design, by

**CLAUDE LUO**

In Partial Fulfillment of the Requirements for the Degree of  
Master of Architecture

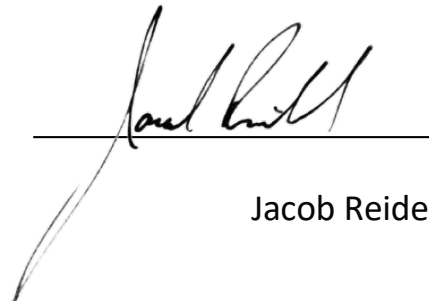
**JANUARY 2024**

(Month and Year Thesis Submitted)

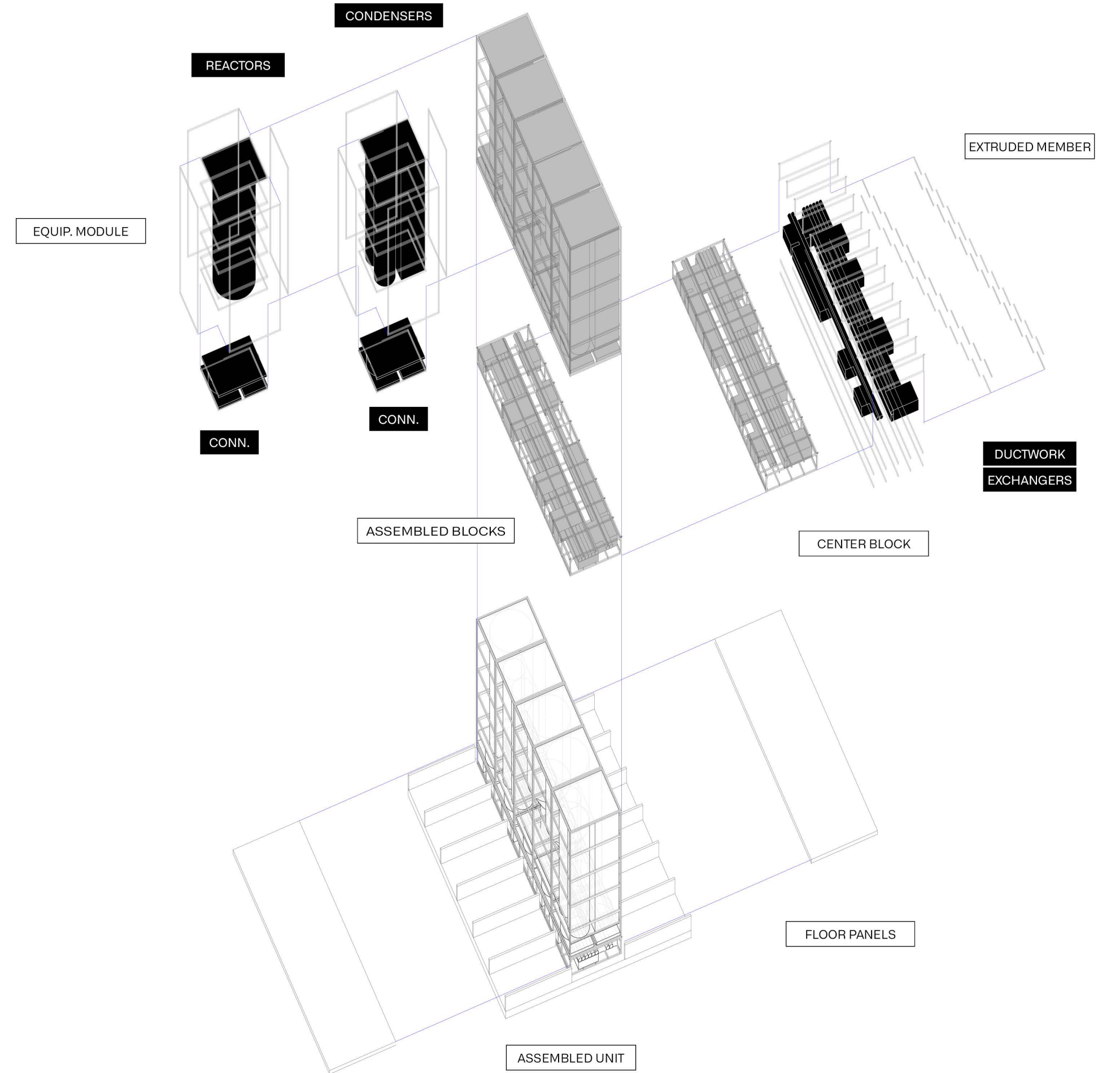
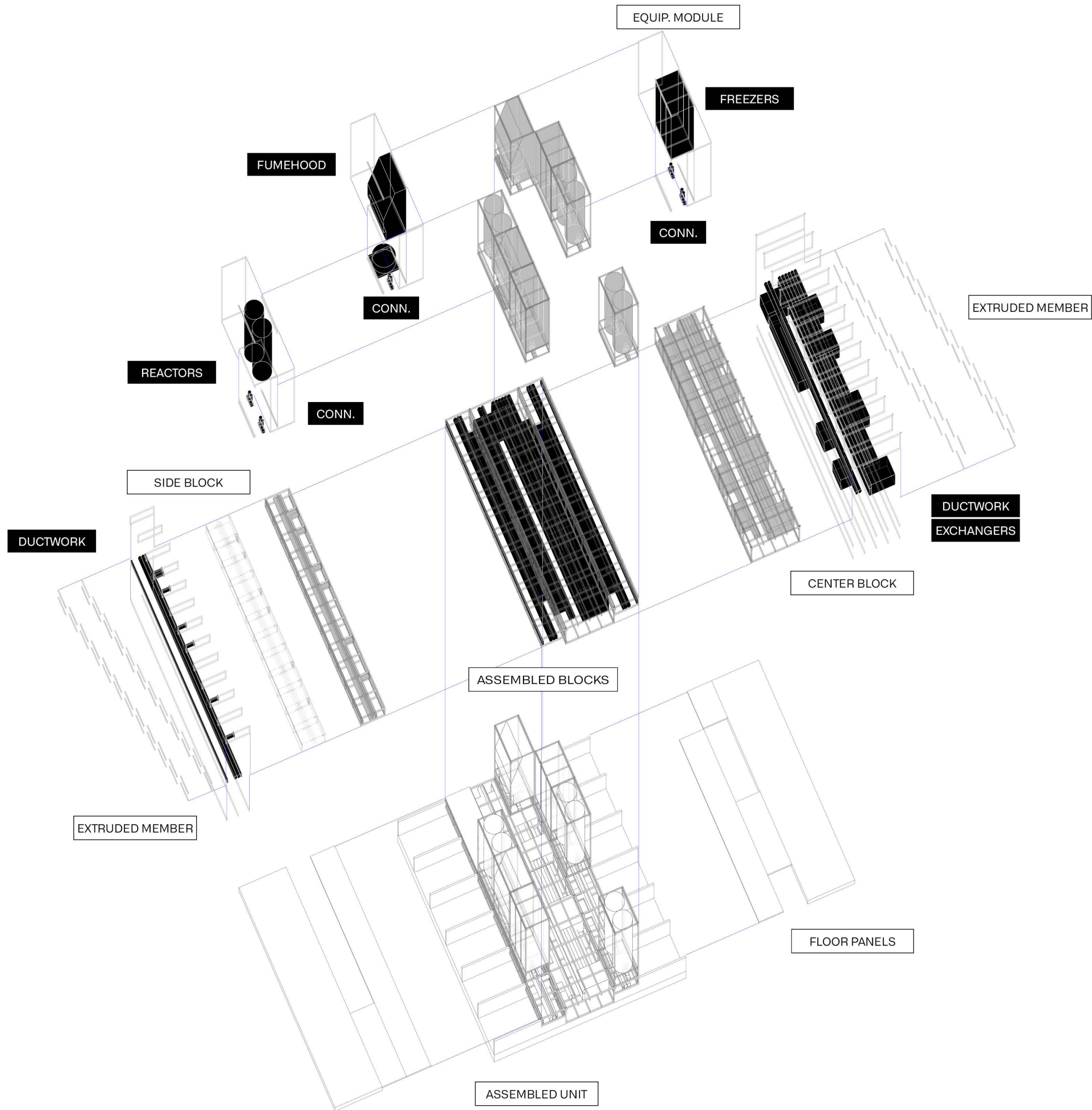
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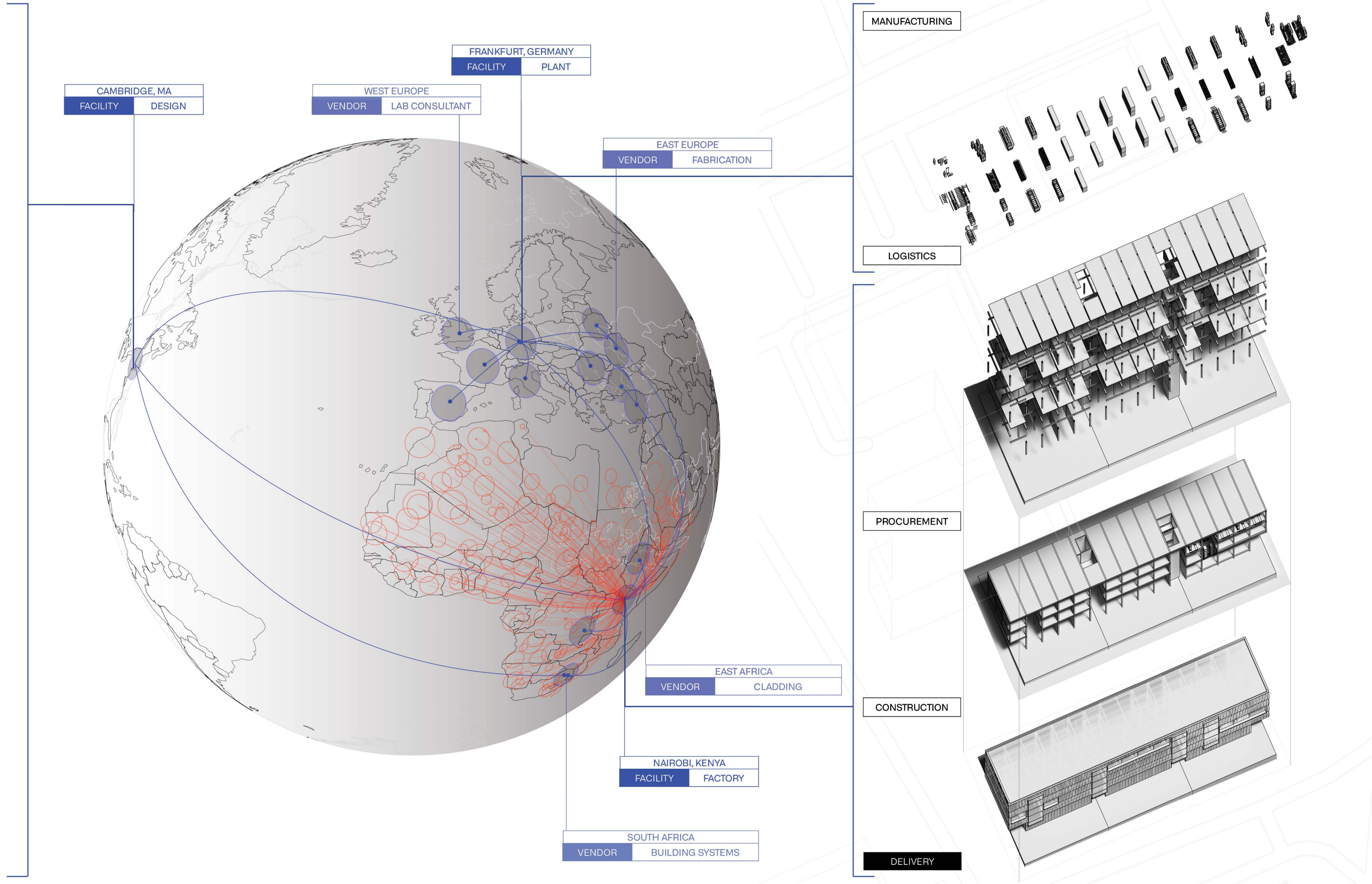
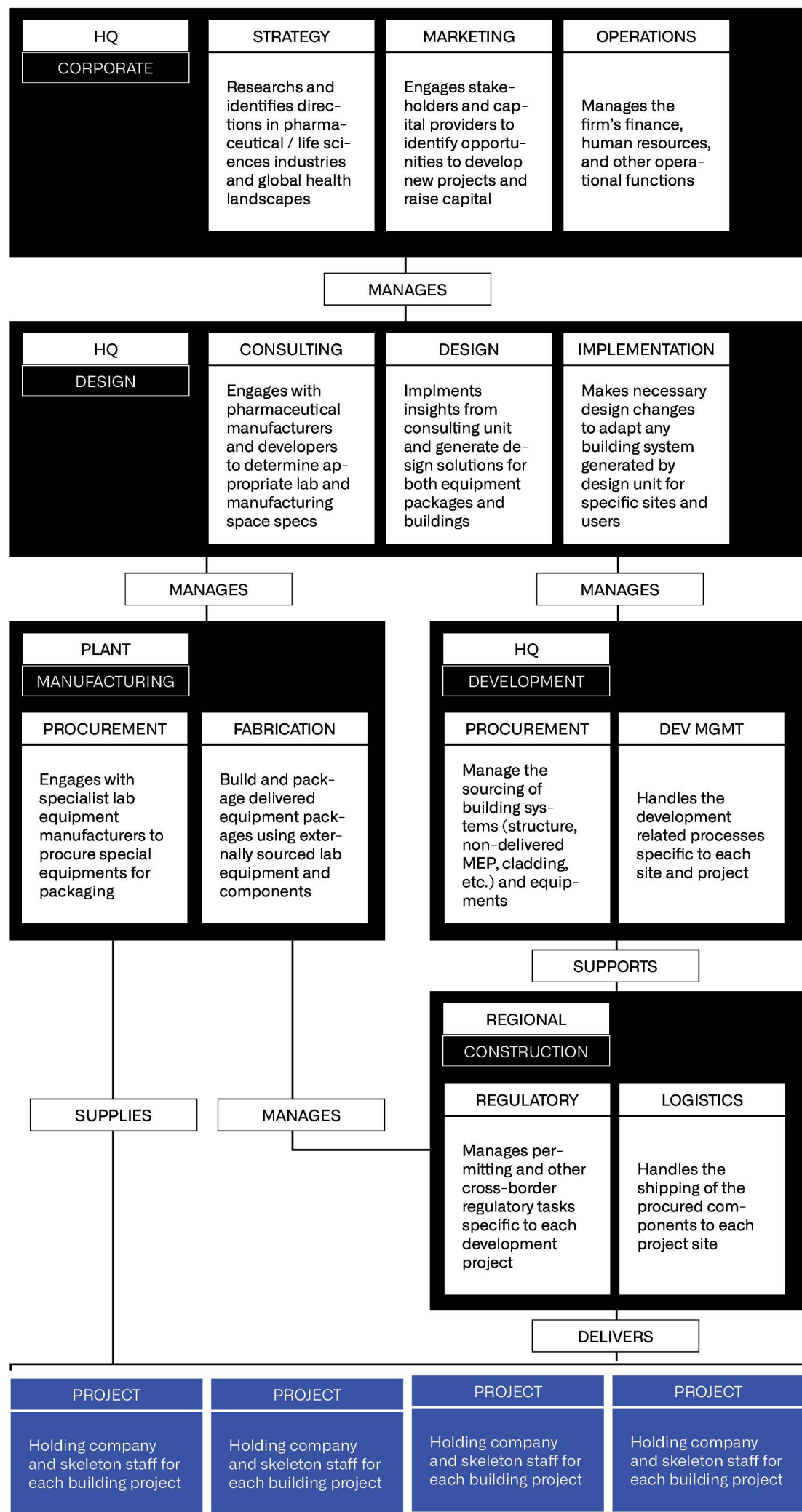
A handwritten signature in black ink, appearing to read 'Claude Luo', written over a horizontal line.

Claude Luo

A handwritten signature in black ink, appearing to read 'Jacob Reidel', written over a horizontal line.

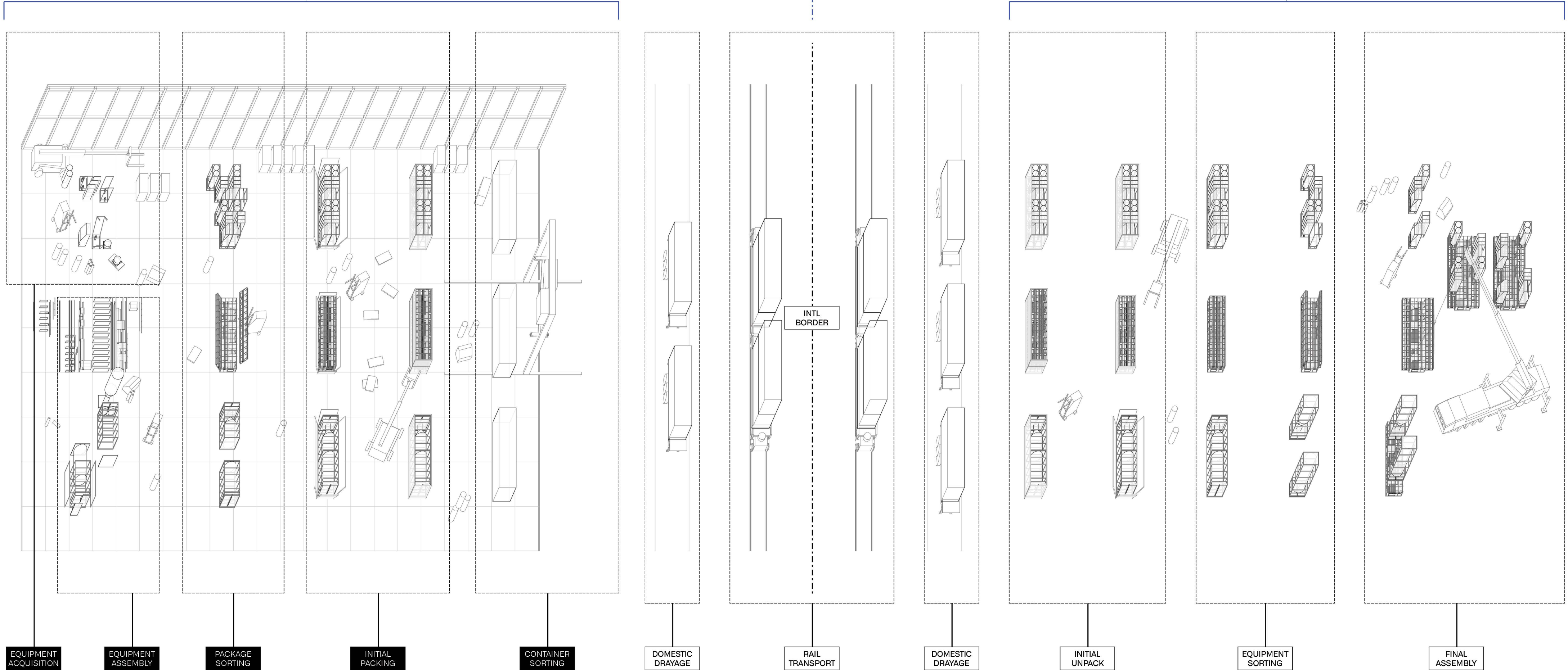
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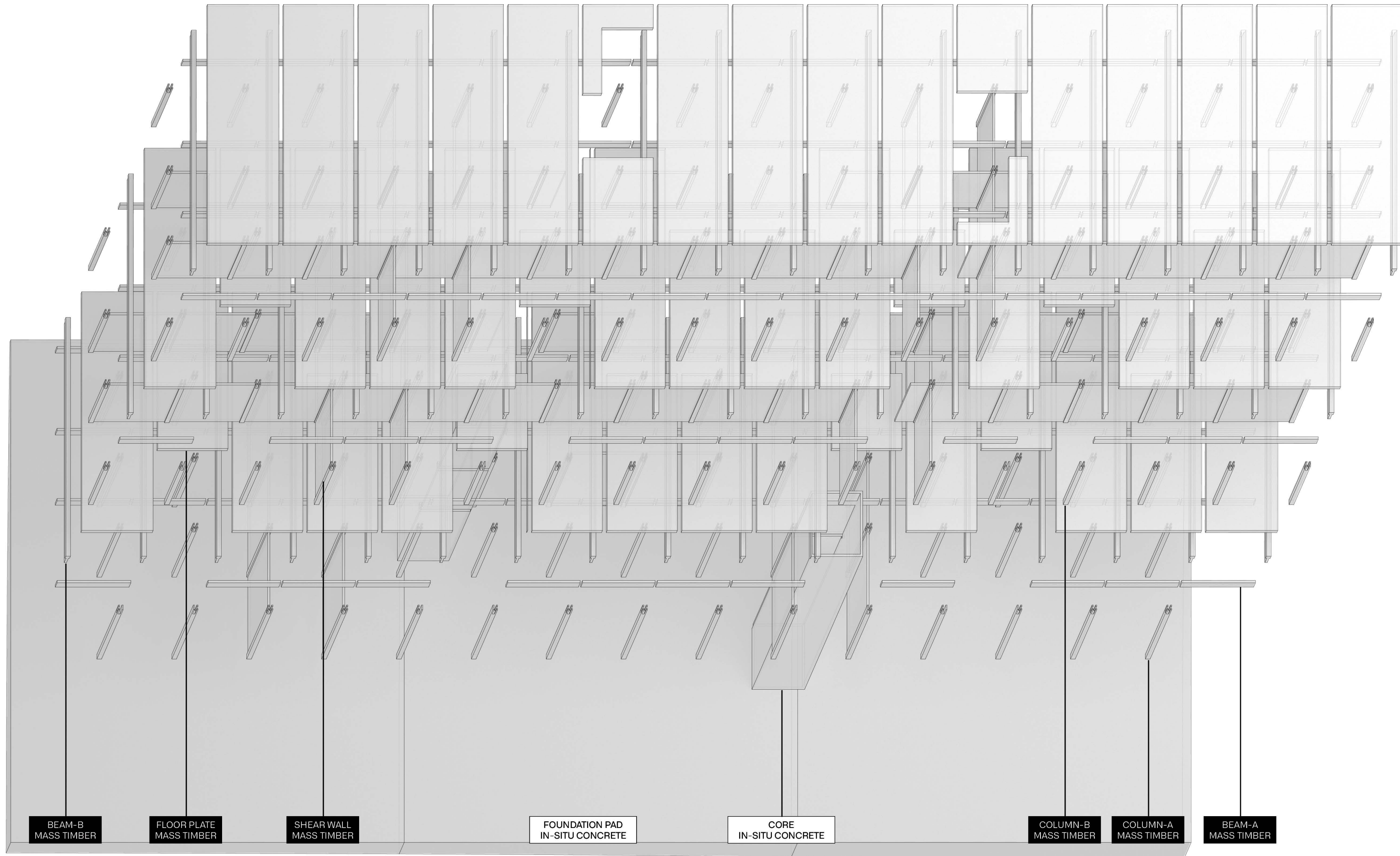


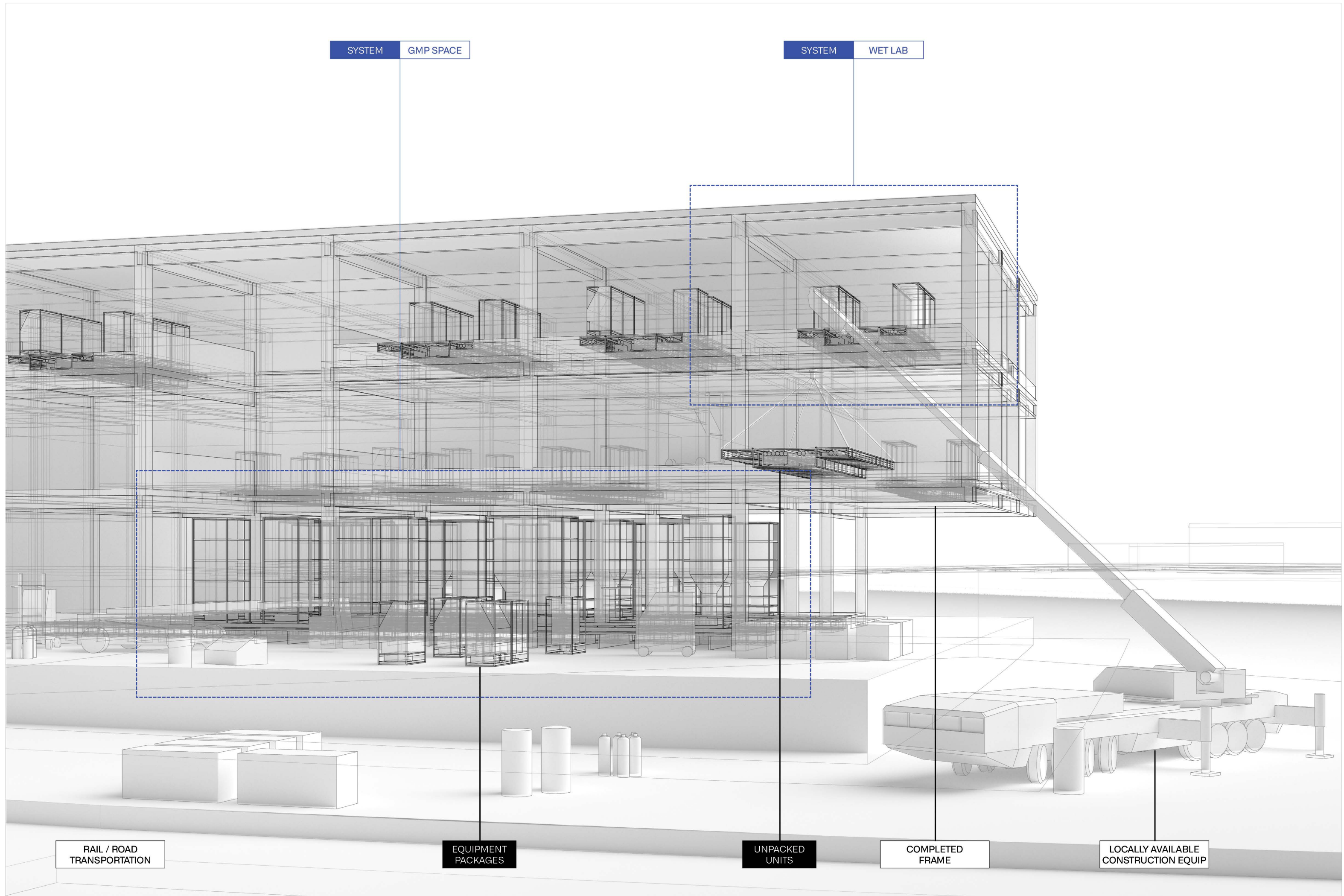


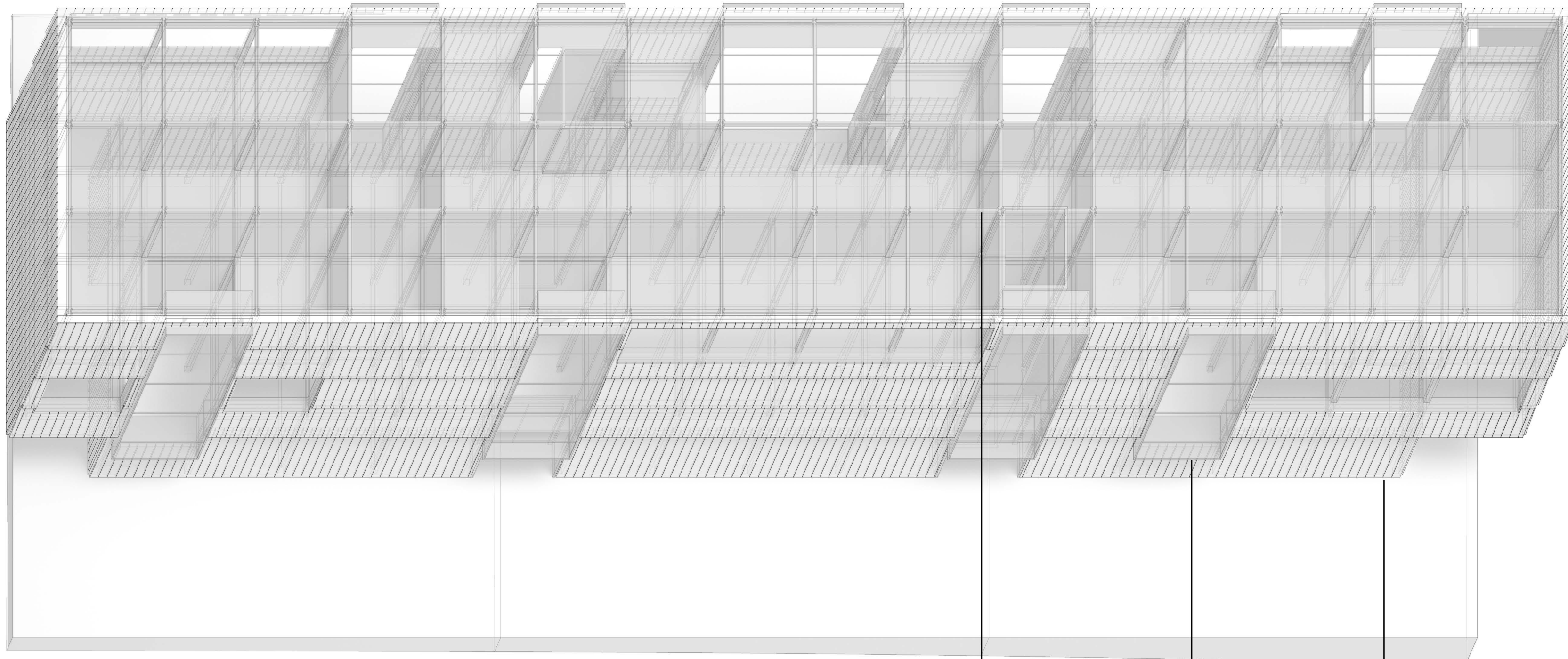
FRANKFURT, GERMANY  
FACILITY PLANT

NAIROBI, KENYA  
FACILITY FACTORY







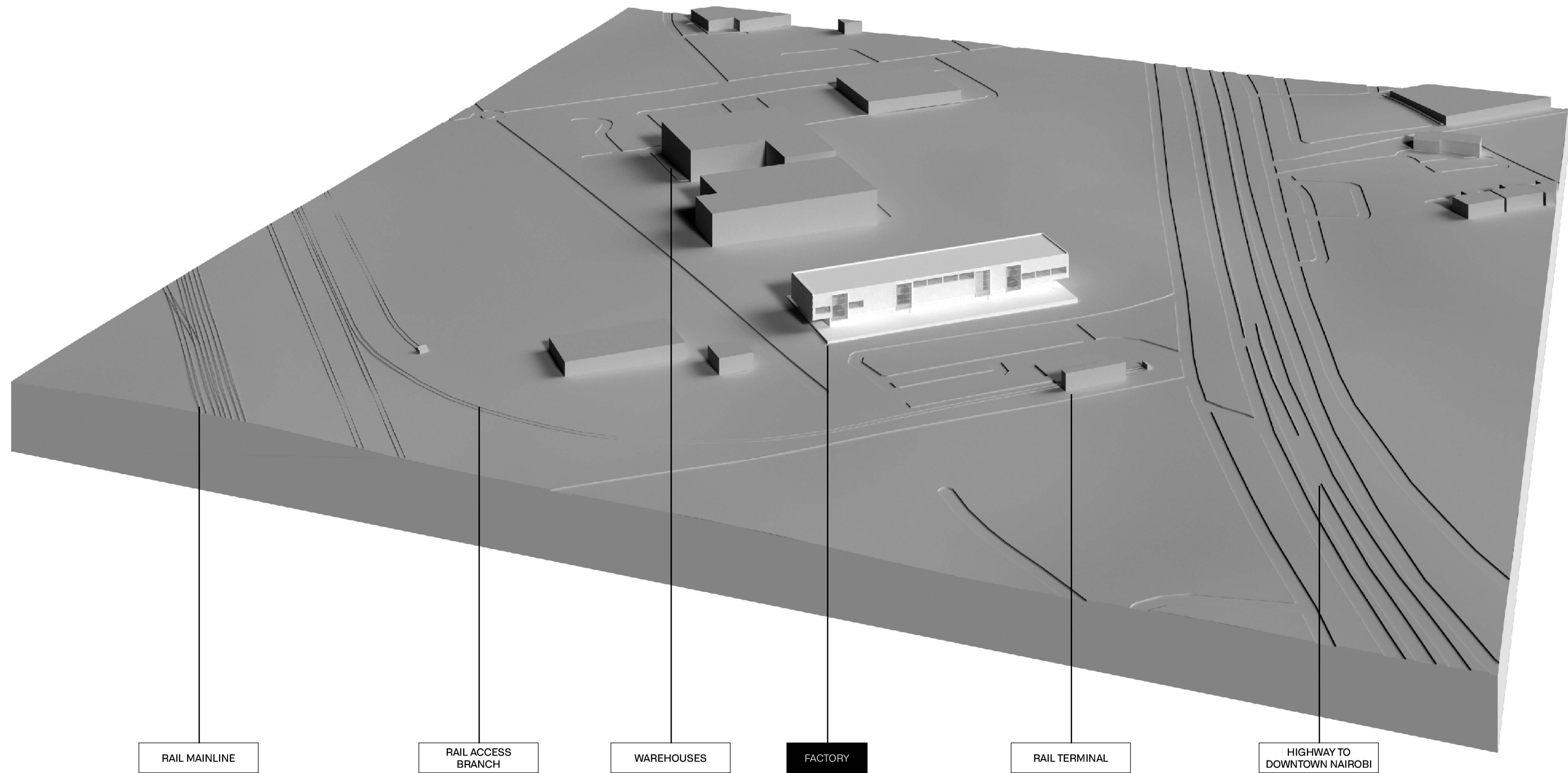


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STRUCTURAL FRAME

CUSTOM  
GLAZING

RAINSCREEN





RAIL MAINLINE

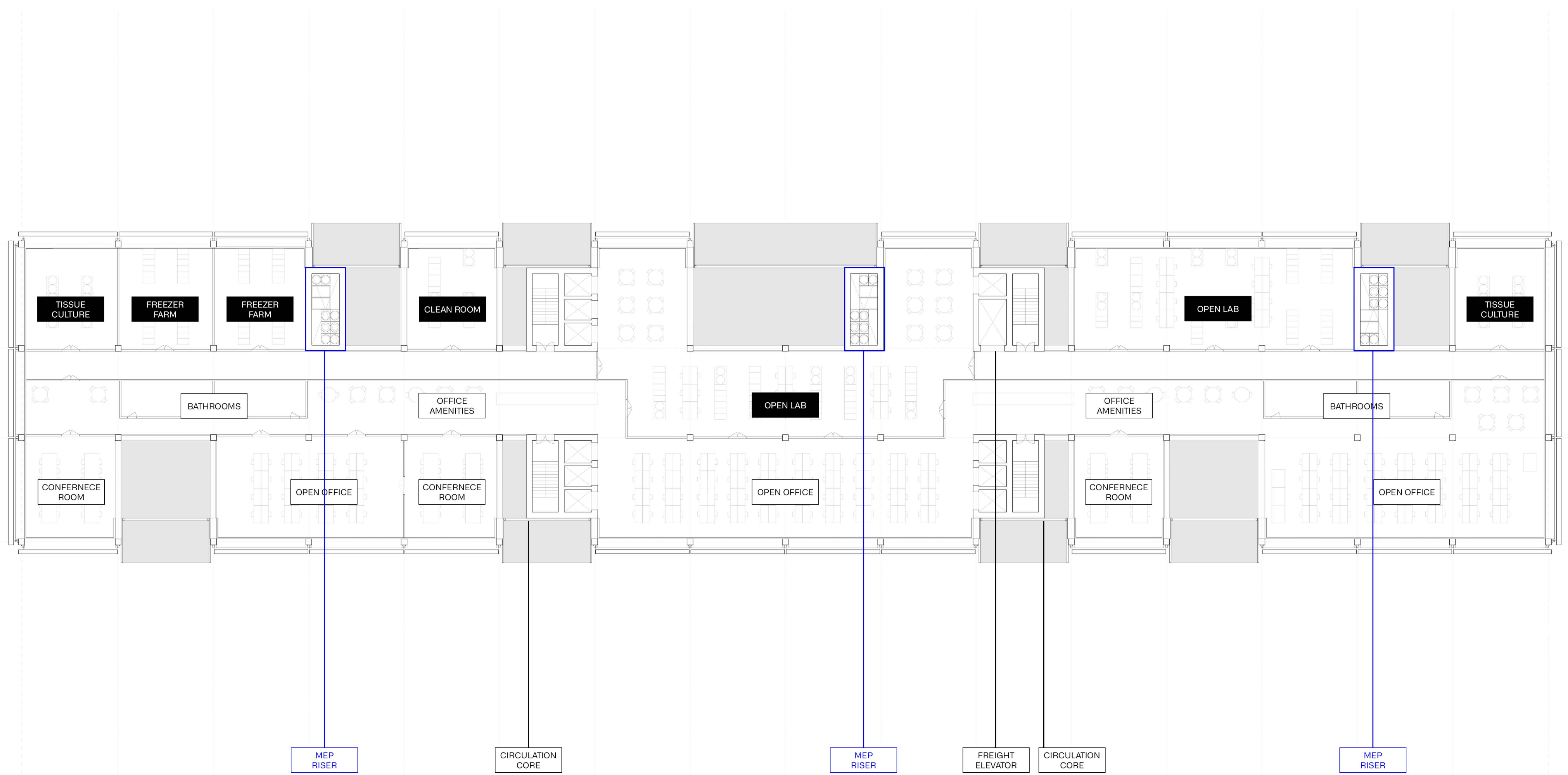
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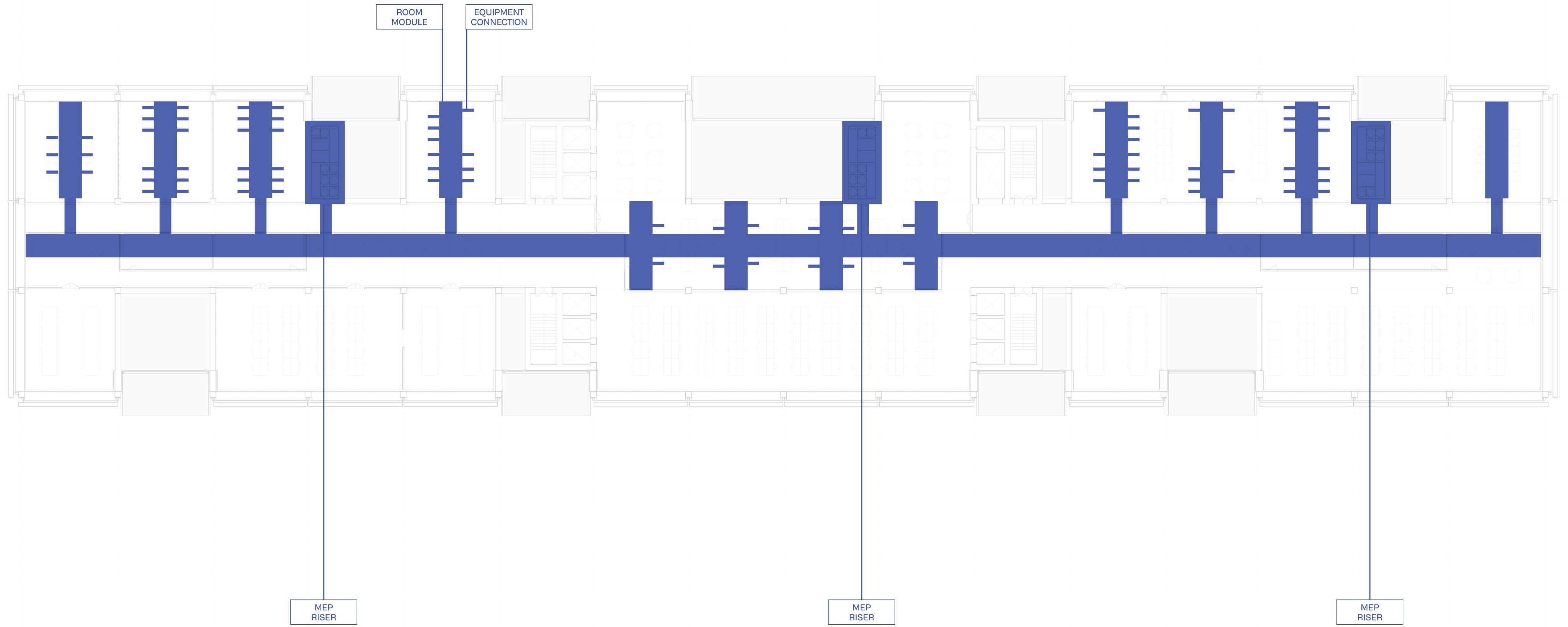
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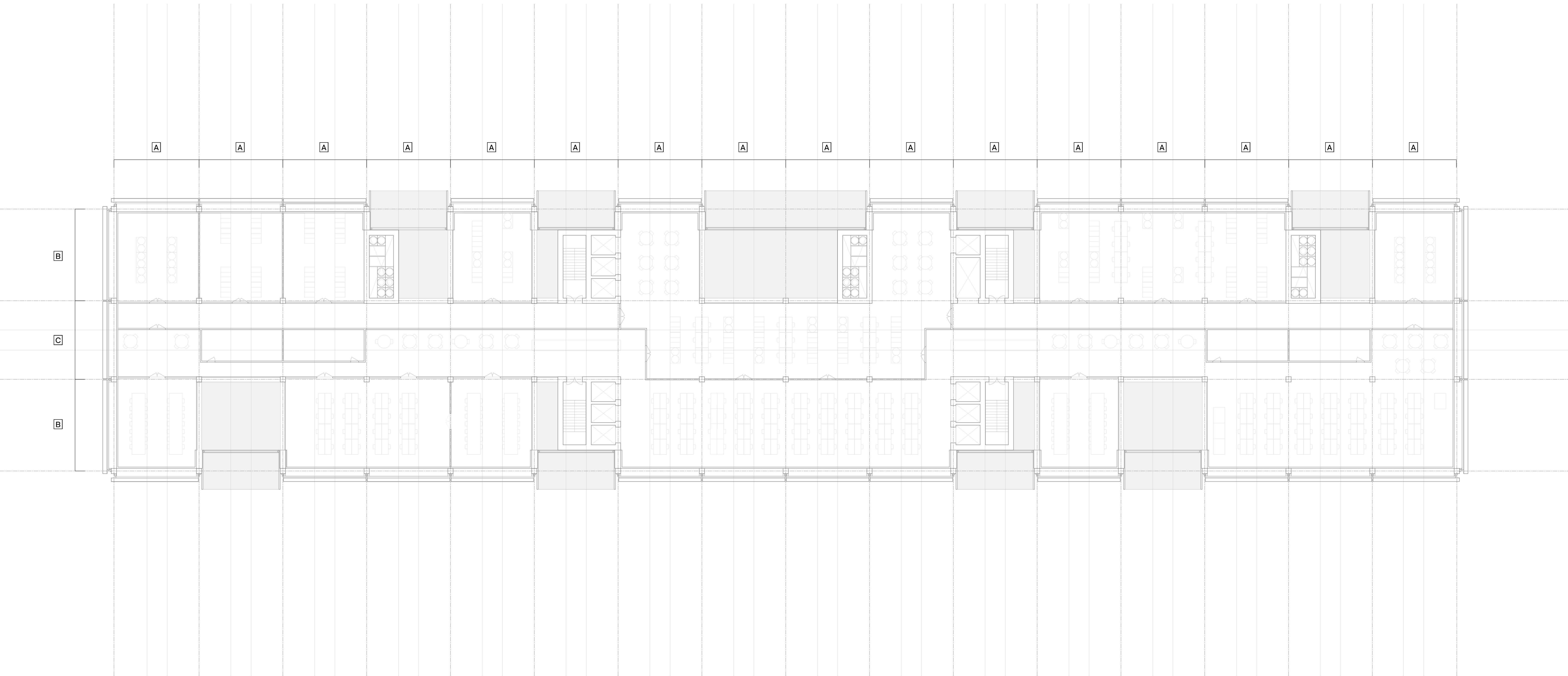
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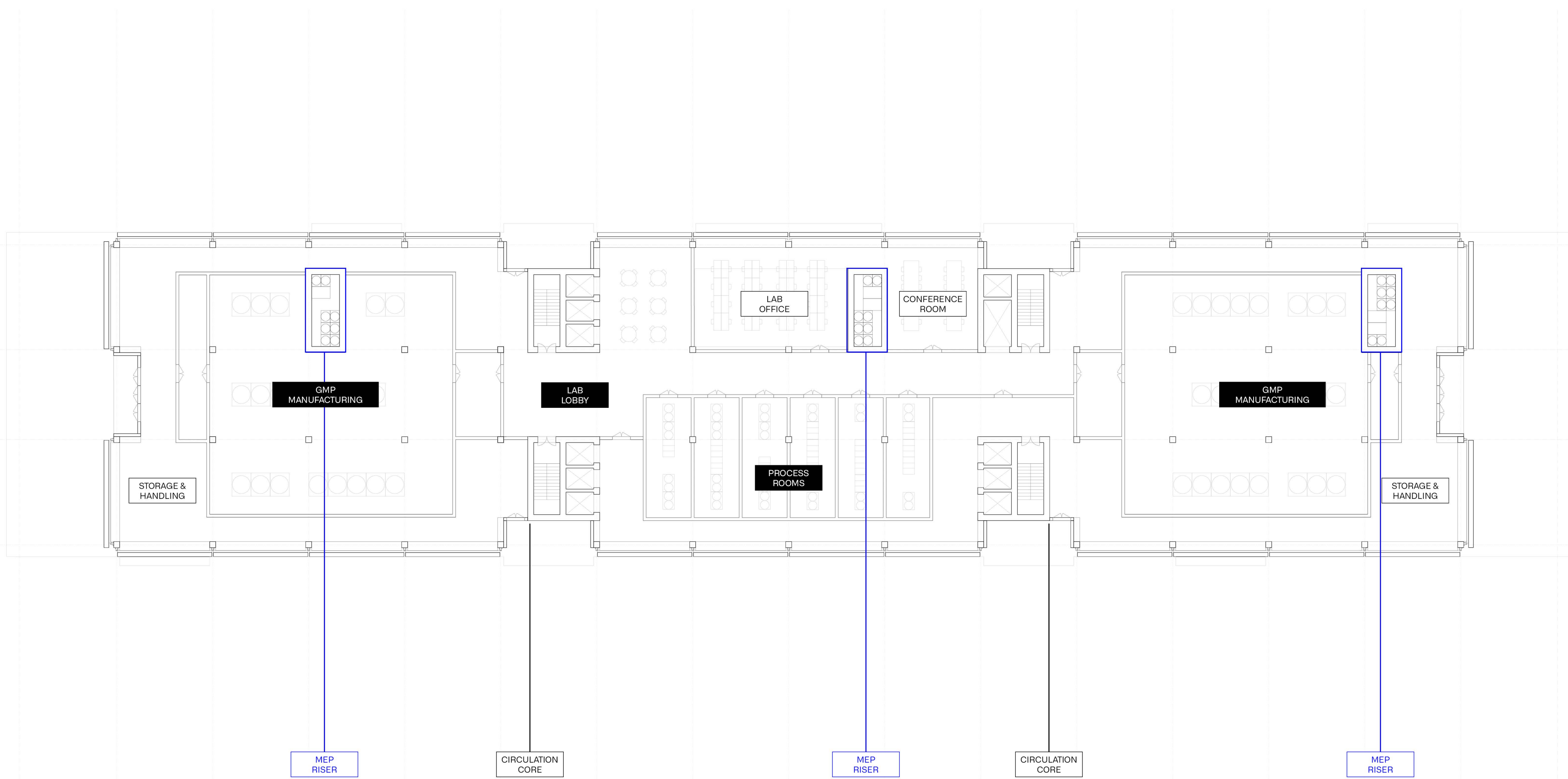
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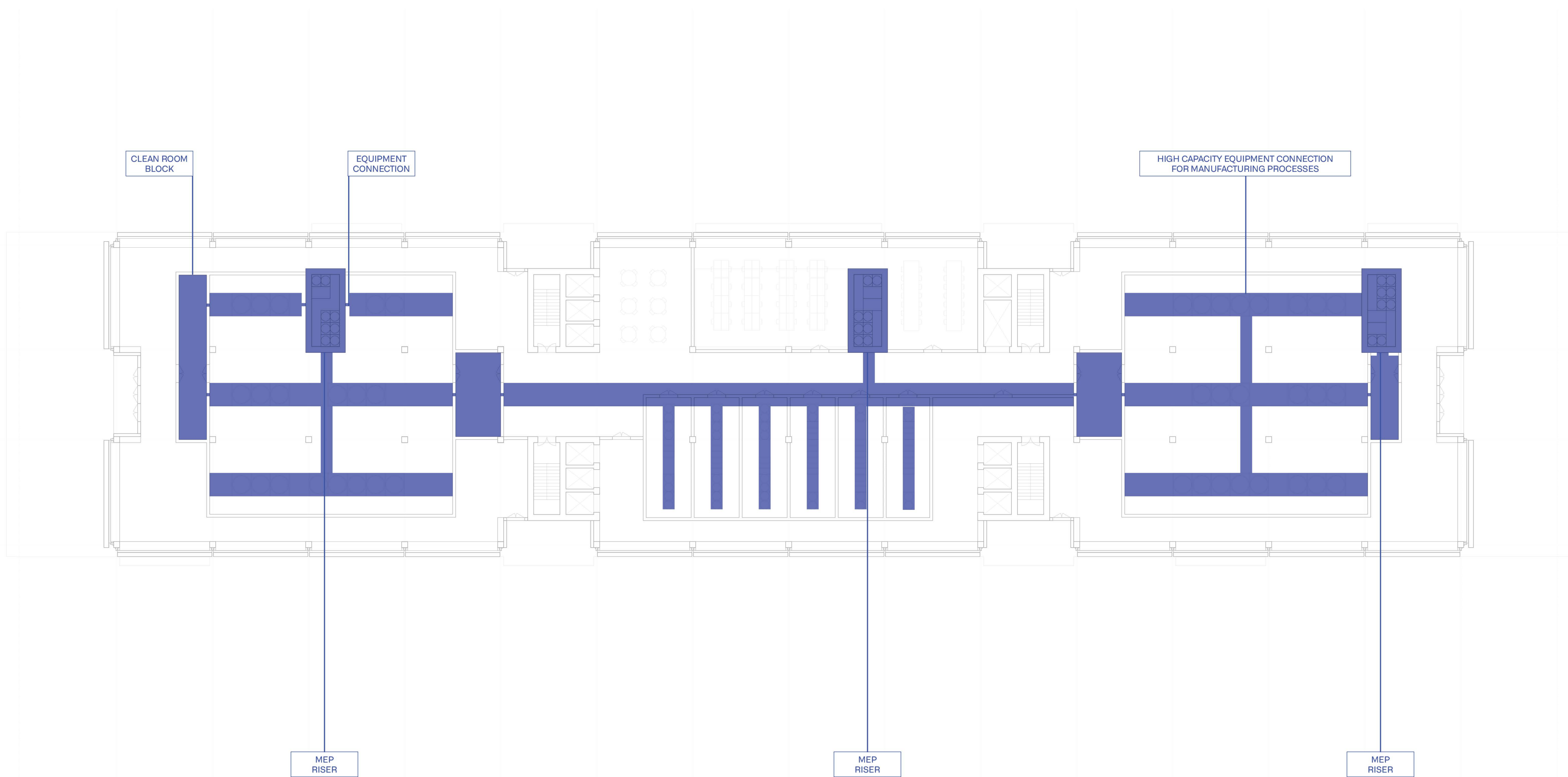
HIGHWAY TO  
DOWNTOWN NAIROBI

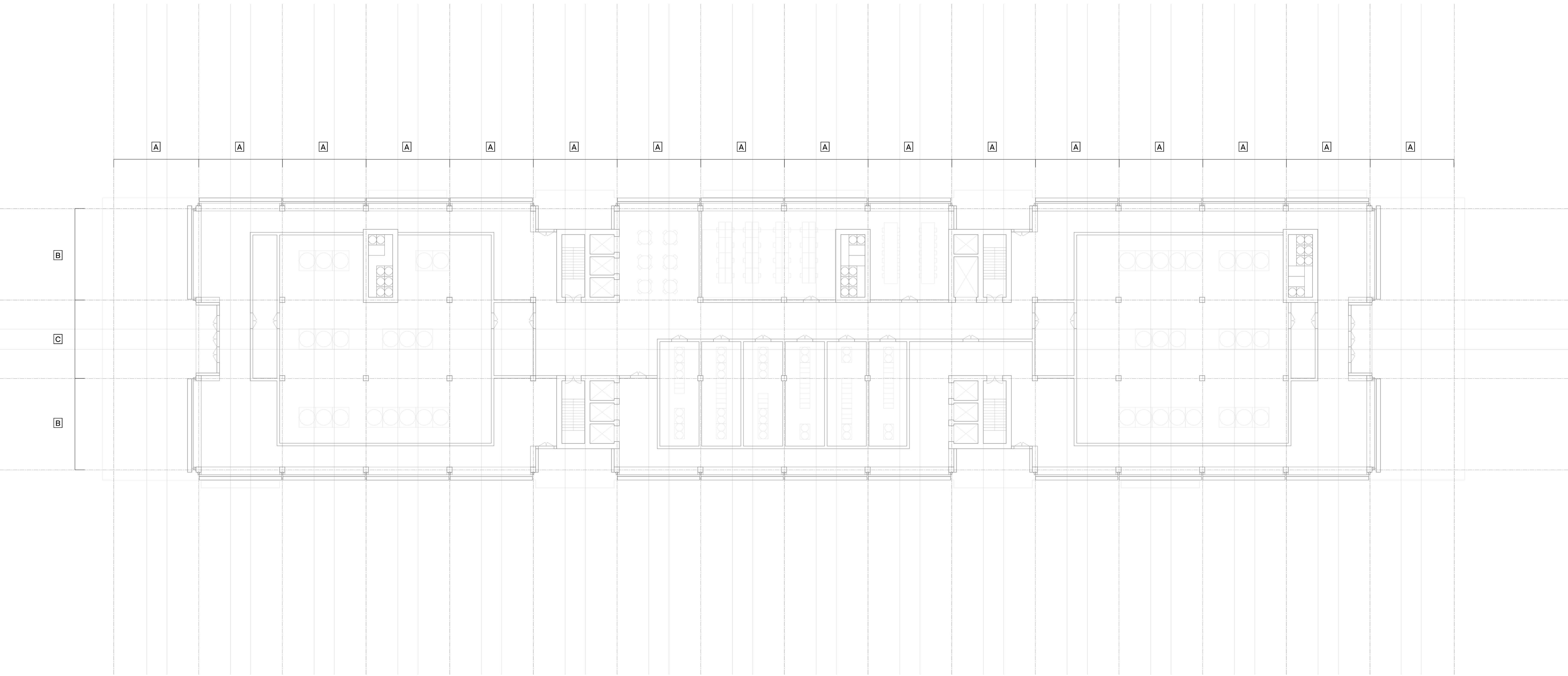


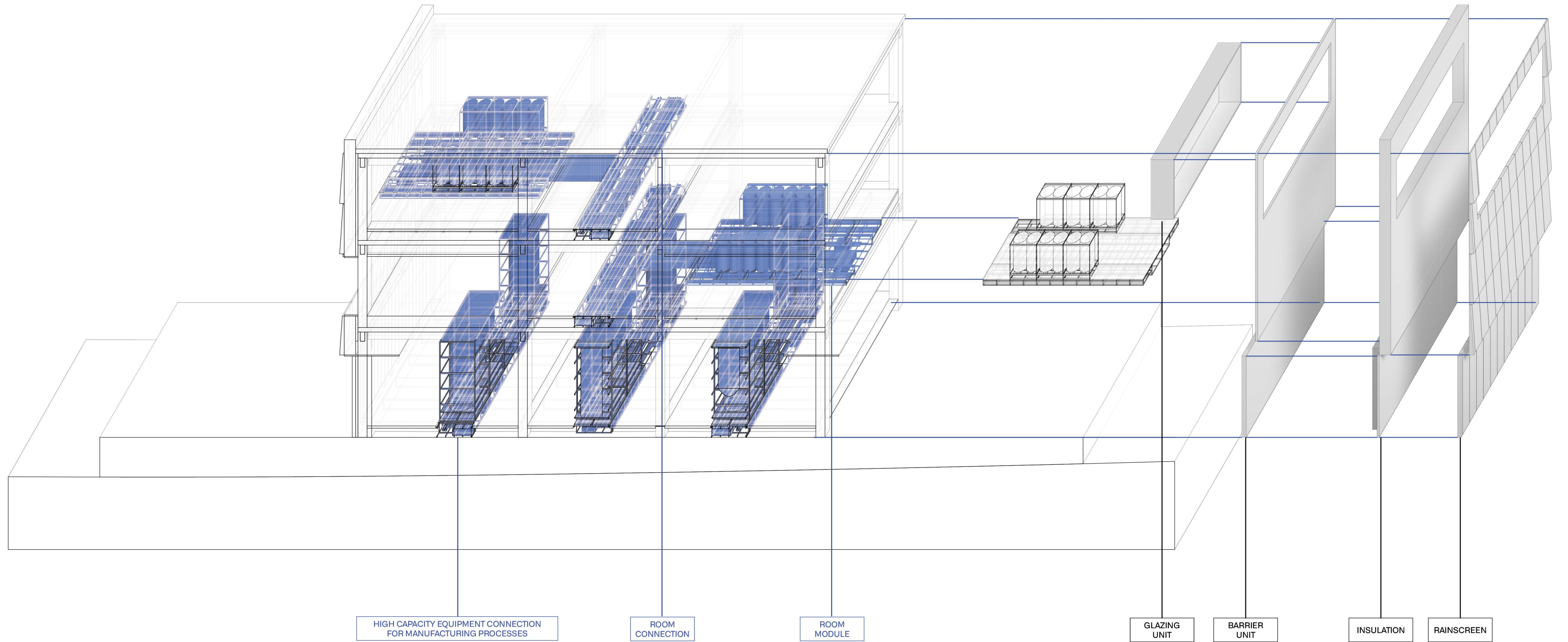














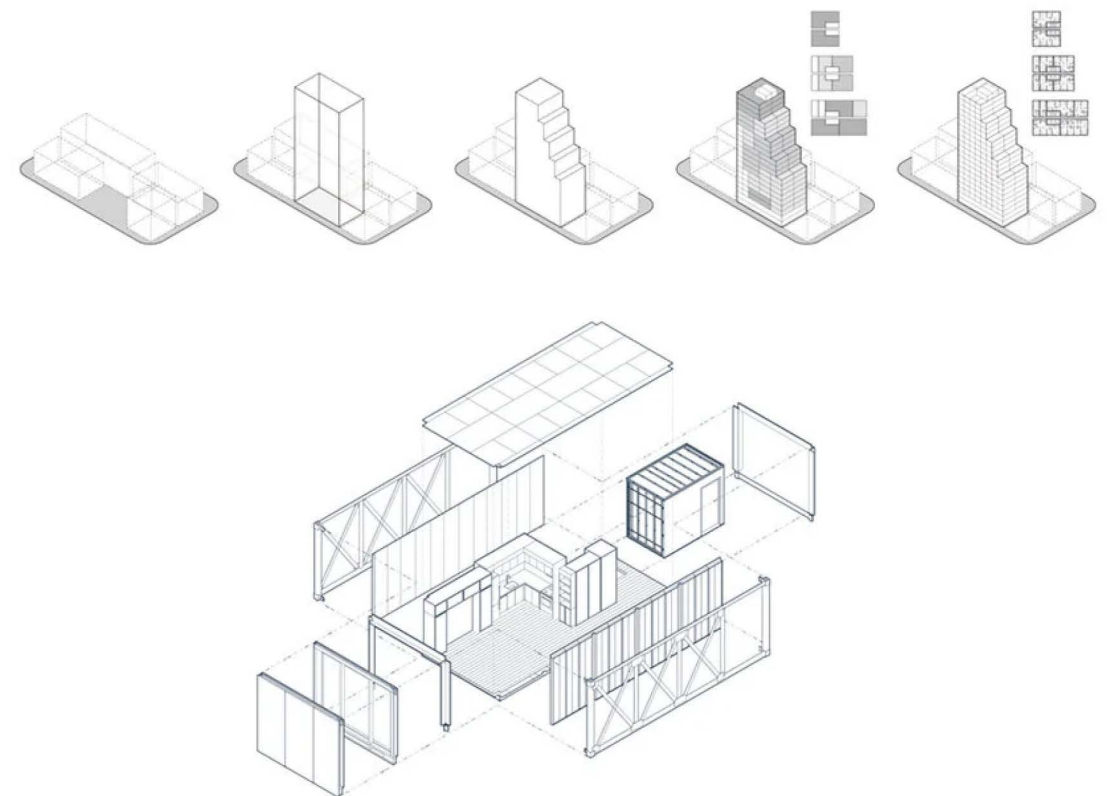
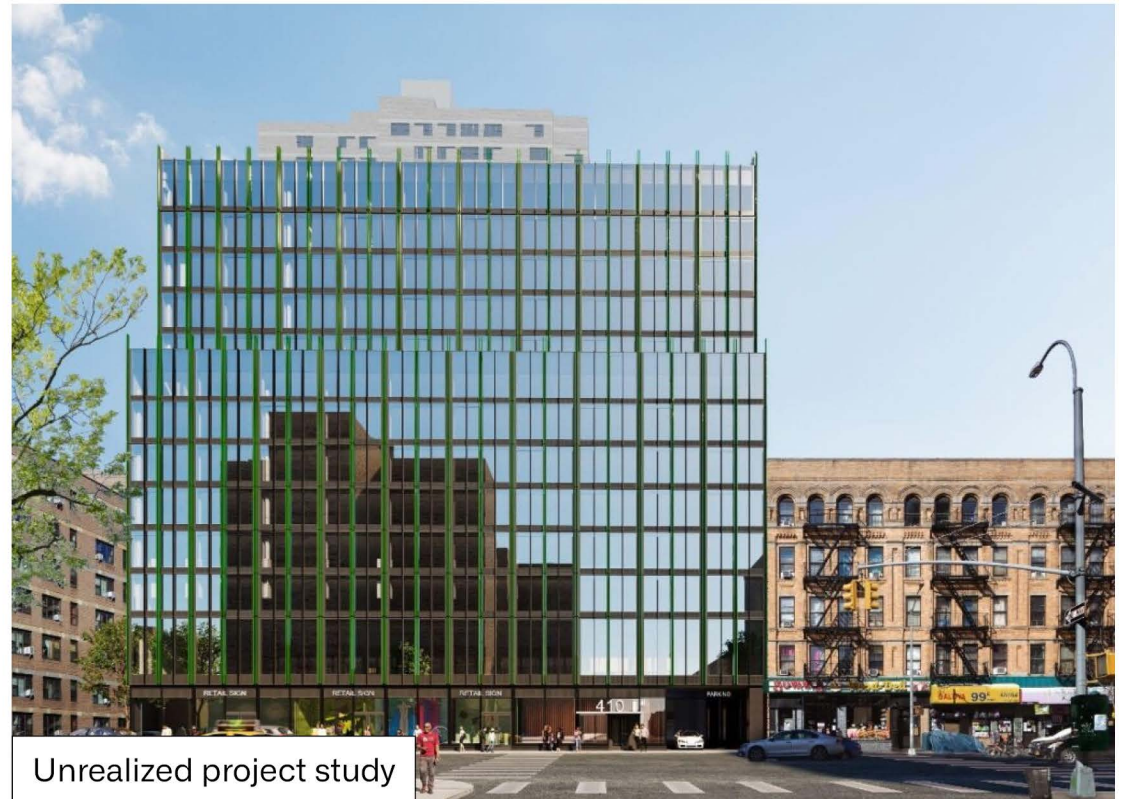
# ASSEMBLY OSM

Assembly OSM is a distinctive architectural design firm co-founded by Chris and Bill Sharples, who are also the founders of SHoP Architects. The firm emerged from their ambition to revolutionize housing construction, particularly in urban settings. The firm's business model is centered around a fully digital design and modeling process, employing unitized components and subsystems, which are created through a global supply chain of expert fabricators. This approach also integrates advanced manufacturing and automation techniques aimed at delivering high-quality, resilient housing for urban areas.

A significant innovation of Assembly's business model is its modular construction approach, which has been updated for urban high-rise buildings. Unlike traditional modular construction, which often results in repetitive designs, Assembly OSM emphasizes a custom building approach. They have developed a method that allows for the creation of custom buildings while retaining the benefits of modular construction. This is often compared to putting together Ikea furniture but on a larger scale, aiming to provide a balance between customization and the cost-efficiency of modular designs.

The firm's approach to offsite assembly is described as "post-modular", which is a technologically advanced process encompassing digital design, manufacturing, assembly, and on-site installation, especially for architecturally distinctive high-rise buildings. Through this approach, Assembly seeks to address common challenges in the construction sector, such as lengthy project durations and high costs. By leveraging digital tools and a well-managed supply chain, they aim to deliver projects faster and at a lower cost.

Assembly's official website provides a detailed breakdown of their approach, highlighting several key areas such as architectural distinction, speed, cost efficiency, and regulatory advantages among others. Their buildings are designed to achieve a level of precision and quality akin to manufactured products rather than conventional construction. They claim to reduce the typical construction timeline by 40-50%, thus completing buildings in under 30 months as opposed to the usual 48 months or more. This speed also translates to cost savings in various areas such as labor, materials, and carrying costs. The firm's design-build contract structure provides a streamlined process for clients, reducing bureaucracy and miscommunication commonly associated with conventional construction processes. Their model also emphasizes resilience and sustainability, with a focus on utilizing greener materials and advanced environmental systems for energy conservation.

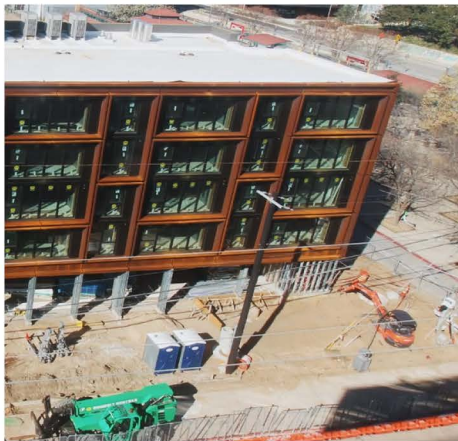


While the economic implication of off-site manufacturing hinges on specifics of development projects often beyond the architect's control, Assembly's approach is valuable in that it provides insights as to what types of off-site manufacturing processes are manageable from an architect's point-of-view.

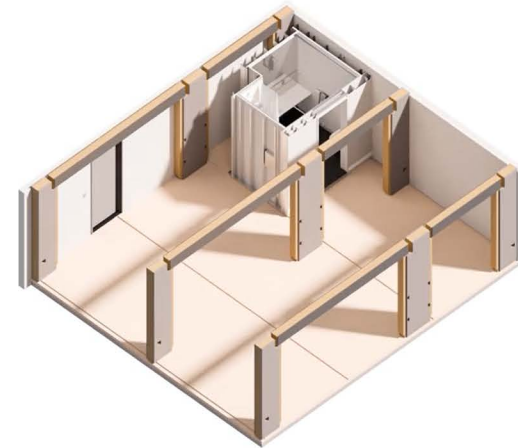
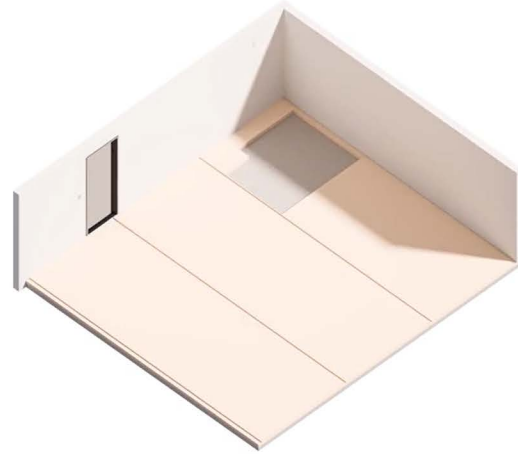
# JUNO



JUNO's buildings take advantage of the kit-of-parts characteristics of mass-timber buildings, as the key features of the building, such as millwork required to produce the joints, can be completed off-site, which reduces the time required for vertical construction.



Presently, the main design innovation resulting from the firm's novel method of design and construction is acceleration of the delivery of its projects, which produces significant economic benefits during periods of high effective construction interest rate and labor costs.



Juno is an architectural design and consulting firm that leverages proprietary techniques in modular construction in its services. The firm leverages its technology-powered design process and the use of mass timber components, which not only accelerate development but also significantly reduce greenhouse gas emissions. This integrated approach from concept design through construction aims to provide residents with luxuriously appointed homes while supposedly minimizing the environmental footprint. The vision behind Juno's business model is to bring a productization approach to the built environment, which results from the product-design background of much of the firm's founders. By treating housing design akin to product design, Juno strives to achieve a new standard in sustainable architectural practice.

Juno, often classed as a proptech startup, raised \$20 million in Series A funding round, underscoring the industry's recognition and support for its innovative model. The funding is geared towards building more sustainable and affordable apartment buildings, shedding light on Juno's commitment to addressing both environmental and affordability challenges in the housing sector. Further, the firm's human-centered, technology-powered model for ground-up development sets it apart in the realm of real estate platforms, indicating a broader ambition to transform urban landscapes.

Juno's innovative approach extends to modular housing design, where the use of mass timber components that can be re-assembled in different configurations plays a crucial role. This modular approach not only offers elegant and sustainable housing solutions but also fosters innovation in design, which is achieved in partnership with other architectural firms like Ennead. The streamlined development process, propelled by a blend of repeatable architectural components, a network of specialized suppliers, and sophisticated software systems, further accelerates the building process, showcasing Juno's prowess in optimizing architectural design and construction processes for better efficiency and sustainability.

While the firm focuses on the delivery of buildings through supposedly repeatable design and production processes, these techniques cannot presently compete with the highly optimized and localized techniques of construction already employed in the building of single- and multi-family housing in the United States. The technical innovation of the firm - both in design and construction - however can inform the delivery of architectural services and the resultant built environment intervention for other types of commercial real estate.

# ALLOY

Alloy Development, a Brooklyn-based boutique real estate developer, employs a unique approach that combines the delivery of architectural design services, real estate development, and community-driven initiatives. At its core, Alloy's business model thrives on a vertically integrated framework, enabling control over the entire development process including design, construction, brokerage, and property management. This all-encompassing approach has positioned Alloy as a thought leader in the industry, with a project portfolio exceeding \$1.6 billion since 2006.

The journey of Alloy's evolution began with Jared Della Valle, a graduate with a vision to meld architecture and development into a singular entity. Fueled by the idea of not merely providing architectural services but capturing the value of intellectual property, Della Valle embarked on a self-driven venture to delve into real estate development. Over seven years, he honed his skills, fostered relationships, and laid the groundwork for what would become a full-service development company, not just an architecture firm dabbling in development.

The inception of Alloy in 2006 marked a pivotal transition as Katherine McConvey, a seasoned entrepreneur, joined hands with Della Valle. The synergy between McConvey's financial acumen and Della Valle's architectural prowess propelled Alloy into a domain where they could expediently act on property opportunities, thus amplifying their capacity to undertake substantial projects.

Alloy's philosophy transcends conventional development paradigms. It treasures the architectural essence while maneuvering the real estate playground, ensuring that their projects not only stand as architectural marvels but also as thoughtful responses to urban complexities. For instance, the development of New York's first all-electric skyscraper and passive house schools underlines Alloy's commitment to sustainable and community-centric development.



Alloy's vertical integration of its design and development arms, combined with the fact the firm is not a typical merchant builder, allows the firm to support longer-term design and planning efforts for the sites it develops. In Brooklyn, Alloy is able to develop a coherent scheme of mixed-use development that include components such as affordable housing, and realize a integrated architectural vision at the block scale.

# MASS DESIGN GROUP

	2022	2021	2020	2019	2018	2017	2016
<b>Contributions</b>							
Government grants (contributions)	769	-	-	-	-	-	-
Normal grants, contributions, etc.	13,384	4,389	3,362	30,844	2,371	2,588	2,825
<b>Total grants, contributions, etc.</b>	<b>14,154</b>	<b>4,389</b>	<b>3,362</b>	<b>30,844</b>	<b>2,371</b>	<b>2,588</b>	<b>2,825</b>
<b>% of revenue</b>	<b>30%</b>	<b>16%</b>	<b>13%</b>	<b>90%</b>	<b>22%</b>	<b>44%</b>	<b>52%</b> ◀
<b>Service Revenue</b>							
<b>Program services</b>	<b>32,873</b>	<b>22,224</b>	<b>22,768</b>	<b>3,369</b>	<b>8,535</b>	<b>3,309</b>	<b>2,569</b>
<b>% of revenue</b>	<b>70%</b>	<b>84%</b>	<b>87%</b>	<b>10%</b>	<b>78%</b>	<b>56%</b>	<b>48%</b> ◀
<b>Other Revenue</b>							
<b>Total revenues</b>	<b>46,988</b>	<b>26,614</b>	<b>26,130</b>	<b>34,213</b>	<b>10,900</b>	<b>5,897</b>	<b>5,394</b> ◀
<b>Expenses</b>							
Compensation of current officers, etc.	527	486	340	469	399	383	220
Non-officer salaries and wages	11,622	2,849	5,806	4,058	2,584	2,243	1,581
Pension contributions	156	-	-	-	-	-	-
Other employee benefits	1,307	600	615	525	392	281	143
<b>Compensations</b>	<b>13,612</b>	<b>3,935</b>	<b>6,760</b>	<b>5,053</b>	<b>3,375</b>	<b>2,908</b>	<b>1,944</b>
<b>% of revenue</b>	<b>29%</b>	<b>15%</b>	<b>26%</b>	<b>15%</b>	<b>31%</b>	<b>49%</b>	<b>36%</b>
<b>% of expenses</b>	<b>34%</b>	<b>14%</b>	<b>30%</b>	<b>14%</b>	<b>32%</b>	<b>49%</b>	<b>44%</b>
All other expenses	20,155	19,938	13,039	27,635	4,686	1,259	1,255
<b>Total expenses</b>	<b>40,374</b>	<b>27,588</b>	<b>22,882</b>	<b>35,854</b>	<b>10,703</b>	<b>5,923</b>	<b>4,402</b>
<b>Assets</b>							
Cash (non-interest-bearing)	3,345	14,561	4,524	7,208	4,740	1,287	2,046
Pledges and grants receivable	6,334	-	-	-	-	-	781
Accounts receivable	4,436	3,305	2,507	1,544	1,519	1,100	-
Prepaid expenses and deferred charges	268	102	217	123	3,444	63	27
PPE	4,350	884	615	714	590	464	332
Other assets	17	6	33	33	49	42	27
<b>Total assets</b>	<b>18,749</b>	<b>18,858</b>	<b>7,897</b>	<b>9,622</b>	<b>10,342</b>	<b>2,956</b>	<b>3,213</b>
<b>Liabilities</b>							
Accounts payable and accrued expenses	4,031	3,855	801	509	670	115	55
Deferred revenue	5,752	10,805	1,193	7,387	6,552	-	395
Notes payables	1,400	740	362	-	-	-	-
Other liabilities	1,421	966	1,155	588	341	259	154
<i>Lease Obligations</i>	<i>1,421</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>
<b>Total liabilities</b>	<b>12,604</b>	<b>16,366</b>	<b>3,511</b>	<b>8,484</b>	<b>7,563</b>	<b>374</b>	<b>605</b>
<b>Net Assets</b>							
Net assets without donor restrictions	6,145	2,317	4,212	-	-	-	-
Legacy temporarily restricted net assets	-	-	-	115	214	211	3
<b>Net assets, or fund balances</b>	<b>6,145</b>	<b>2,492</b>	<b>4,386</b>	<b>1,138</b>	<b>2,779</b>	<b>2,582</b>	<b>2,608</b>

\* Financial statements sourced from Form 990 filings

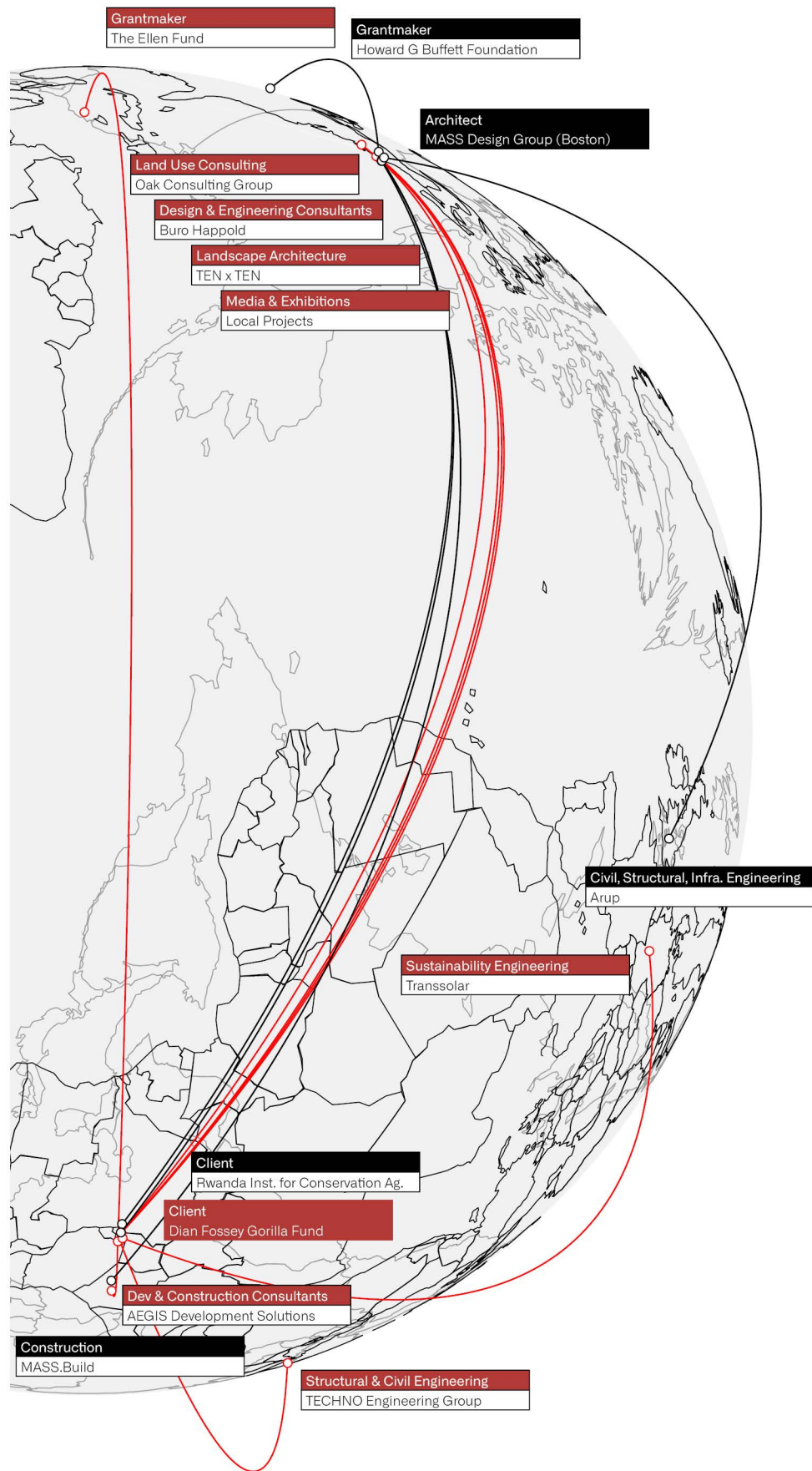
The focus of MASS Design Group and its subsidiaries' organizational strategy is in enhancing its ability to design in the interest of underserved stakeholders and constituents. By aligning the organization with the design needs of non-profit organizations and underrepresented users globally, the firm has also been able to create a unique source of projects. The effects of this long-term alignment - a theme central to MASS since its 2008 founding - is that the firm is able to act as the long-term steward of community and social interests in the built environment.

Fundamentally, the success of MASS lies in its ability to integrate itself directly into the delivery of other organizations' missions. While many non-profit organizations have need for interventions in built environment that require the service of architects and other technical advisors, few would seek to engage the service of architects early-on in the process prior to the establishment of funding and budgets, which not only limit the ability for the architect to exert control over the direction of project outcome, but also restrict the ability for architects who are especially engaged with the specific mission or agenda of the project-sponsoring organization to reach potential clients.

To counter these effects of the orthodox model of service provision and project delivery, MASS participates directly in the sourcing of project funding by acting as the built-environment advisor to non-profit organizations that potentially require the service of architects. In return, these organizations - often underfunded and without the representation of professional architects - can reach out to potential funding providers with technical credibility, as they are advised by experts in the planning, design, and construction of building projects. This partnership that predates the funding of projects pose limited risk to MASS, as the firm does not need to commit large amounts of financial capital or personnel to these early engagements, but leads often to significant payoffs for the architect if the partner organizations are able to secure funding for their projects.

upstream

# MASS DESIGN GROUP



\* Grant information sourced from grantmakers' Form 990 filings

Grantmaker	Date	Use	Amounts
▶ Howard G Buffett Foundation (HGBF)	2018-12	Support for Rwanda Institute for Conservation Agriculture - Africa	11,191,763
▶ Howard G Buffett Foundation (HGBF)	2017-12	Infrastructure for Rwanda Institute for Conservation Agriculture - Rwanda	10,344,135
Margaret A Cargill Foundation	2021-12	Support for Native Communities Disaster Preparedness and Recovery Design Services	1,000,000
Margaret A Cargill Foundation	2021-12	Support for Native Communities Disaster Preparedness and Recovery Design Services	1,000,000
Wagner Foundation	2021-12	The Catalyst Fund, Learning & Engagement Program, and Labs Program	1,000,000
Wagner Foundation	2021-12	The Catalyst Fund, Learning & Engagement Program, and Labs Program	1,000,000
Howard G Buffett Foundation (HGBF)	2017-12	Design Concept for Rwanda Institute for Conservation Agriculture - Rwanda	759,700
The Ellen Fund	2020-12	To Conceptualize, Produce, Review and Distribute Videos & Mixed Media in Relation To the Constuction of the Ellen Degeneres Campus of the Dian Fossey Gorilla Fund Located in Musanze, Rwanda.	123,600
▶ The Ellen Fund	2021-12	The Ellen Degeneres Campus of the Dian Fossey Gorilla Fund International Campus Media Project	105,000
▶ The Ellen Fund	2021-12	The Ellen Degeneres Campus of the Dian Fossey Gorilla Fund International Campus Media Project	105,000
Everytown for Gun Safety Support Fund	2019-12	Memorial To Victims of Gun Violence in Chicago	100,000
Dyson Foundation	2021-12	Multi-Year Support for the Hudson Valley Design Lab, A Community Design Center That Uses Inclusive, Collaborative, Context-Specific Practices To Develop Innovative Architectural Solutions To Systemic Regional Challenges.	80,000
Dyson Foundation	2019-12	Multi-Year Support for the Hudson Valley Design Lab, A Community Design and Innovation Center in Poughkeepsie.	80,000
Dyson Foundation	2021-12	Multi-Year Support for the Hudson Valley Design Lab, A Community Design Center That Uses Inclusive, Collaborative, Context-Specific Practices To Develop Innovative Architectural Solutions To Systemic Regional Challenges.	80,000
The Ellen Fund	2019-12	To Conceptualize, Produce, Review and Distribute Videos & Mixed Media in Relation To the Constuction of the Ellen Degeneres Campus of the Dian Fossey Gorilla Fund Located in Musanze, Rwanda.	74,400
▶ Esb Charitable Foundation	2017-12	Funds for A Collaborative Project With the Atlantic Philanthropies To Assess the Impact of Select Capital Grants, and To Develop A Toolkit To Help Nonprofits and Funders Plan, Implement, and Evaluate Capital Projects More Effectively.	30,000
The JPB Foundation	2020-12	To Partner With Designing the We To Undertake Phase One of Digitizing the Undesign the Redline Exhibit.	20,000
Esb Charitable Foundation	2017-12	Funds for A Collaborative Project With the Atlantic Philanthropies To Assess the Impact of Select Capital Grants, and To Develop A Toolkit To Help Nonprofits and Funders Plan, Implement, and Evaluate Capital Projects More Effectively.	15,000

upstream

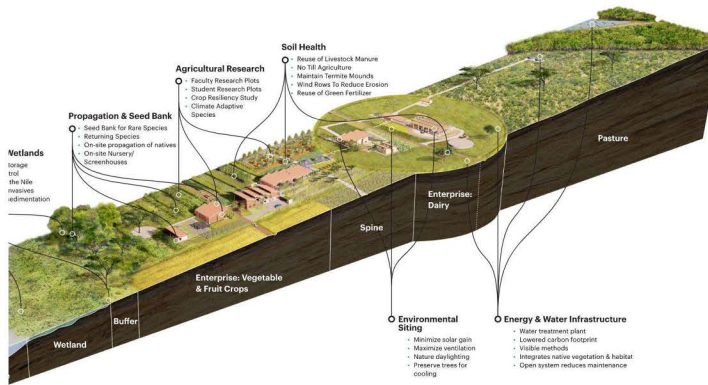
MASS' proximity to grantmakers and non-profit clients allows the firm to either directly act as the grant recipient and operate as a design-build partner to non-profits and community organizations, or as a more traditional architectural services provider to clients who have received funding from grantmakers.

# MASS DESIGN GROUP



The relationships MASS maintains with both its existing and potential clients - often family offices or non-profit foundations that manage large amounts of capital dedicated to supporting the missions of many smaller organizations with idiosyncratic needs - allow the firm to develop high-level concepts and visions for its projects from very early stages.

Because MASS often enjoy the freedom to manage both the specific design outcome as well as guiding strategy for these projects, its work is often able to support the missions of its clients in unconventional ways, or integrated elements of design that do not usually fall under the architect's purview.



AFRICA - MEGAFUNA CONSERVATORY

AFRICA - AGRICULTURAL RESEARCH FACILITY

## SPECULATION

Integrating strategic advisory and architectural services into one coherent package for clients with needs for these offerings result in architectural outputs that better reflect both the client's needs and the architect's mission.

# ADAMSON ASSOCIATES

Adamson Associates / AAI Architects, PC is the architect-of-record of some of the most celebrated architectural projects around the world. Despite its involvement in many high-profile developments globally, the firm enjoys little recognition outside of the construction and development world. Because the concept design of Adamson's projects are often completed by architecture firms with recognized brands, Adamson's work often consist of realizing these designs in construction documentation while maintaining a curious neutrality in its work.

The dichotomy between their vast influence on global architecture and their relative anonymity outside of the construction and development world is striking, yet a cornerstone of the commercial success it now enjoys. By branding itself as completely generic, Adamson is able to attract and obtain project commissions consistently. It also benefits from the consistent working relationship it enjoys with

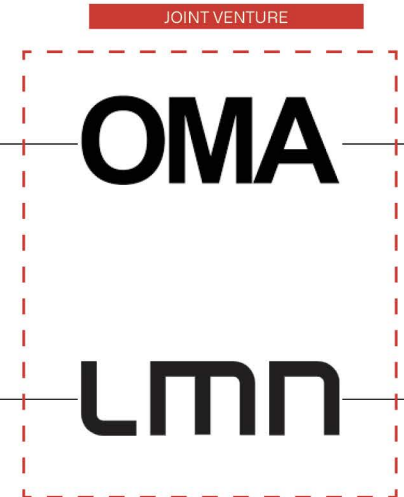
many design-architect firms, as Adamson is recognized in the reality of its genericity. In this way, the firm became highly specialized in the later stages of design, allowing for an economy of scale that benefits it in both its operations and strategic positioning.

The firm typically operates at a project level by contracting independently with owners. This is markedly different from the joint-venture model adopted in some other projects, in which a "design architect" who contributes key elements of the concept design is partnered up with a more experienced local architects and share in the liabilities and profits of their services. In contrast, Adamson's model makes it liable directly for tasks such as the generation of construction documents and other tasks more closely related to the construction process.

## Design Architects



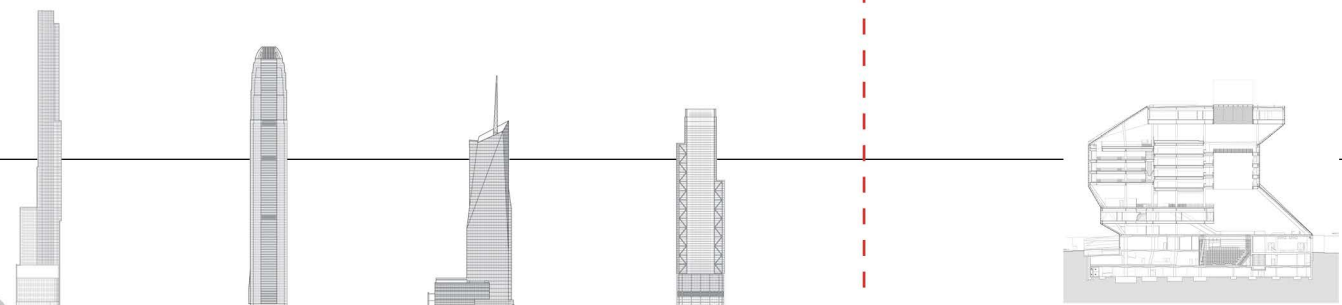
## Executive Architects



## Construction Firms



## Project Delivery



specialize

# specialize

<b>Hearst Tower</b>
Foster + Partners
Adamson Associates Architects
Hearst Corporation
<b>Central Park Tower</b>
Adrian Smith + Gordon Gill
AAI Architects, P.C.
Extell Development Company
<b>MoMA Tower (53W53)</b>
Ateliers Jean Nouvel
AAI Architects, P.C.
Hines Interests / Goldman Sachs
<b>550 Madison Retrofit</b>
Snehetta
AAI Architects, P.C.
Olayan America

<b>731 Lexington Place</b>
Pelli Clarke Pelli / SLCE Architects
Adamson Associates Architects
Vornado Realty Trust
<b>425 Park Avenue</b>
Foster + Partners
AAI Architects, P.C.
L&L Holding Company

<b>390 Madison Avenue</b>
Kohn Pedersen Fox Associates
AAI Architects, P.C.
L&L Holding Company

<b>Chrysler Center Redevelopment</b>
-
Adamson Associates Architects
Tishman Speyer Properties

<b>One Bryant Park</b>
Cook + Fox Architects
Adamson Associates Architects
The Durst Organization / BAML

<b>Stephen Sondheim Theatre</b>
Cook + Fox Architects
Adamson Associates Architects
The Durst Organization / BAML

<b>Times Square Building Renovation</b>
Andres Escobar & Associates
AAI Architects, P.C.
AFI USA

<b>5 Manhattan West Office Building</b>
REX
AAI Architects, P.C.
Brookfield Office Properties

<b>The Spiral</b>
Bjarke Ingels Group
AAI Architects, P.C.
Tishman Speyer Properties

<b>51 Astor Place</b>
Maki & Associates
AAI Architects, P.C.
Edward J. Minskoff Equities, Inc.

<b>Sperone Westwater Gallery</b>
Foster + Partners
AAI Architects, P.C.
Sperone Westwater Inc.

<b>St. John's Terminal Redevelopment</b>
Cook Fox
AAI Architects, P.C.
Oxford Properties

<b>St. John's Terminal Redevelopment</b>
Cook Fox
AAI Architects, P.C.
Oxford Properties

<b>One Manhattan Square</b>
AAI Architects, P.C.
AAI Architects, P.C.
Extell Development Company

<b>3 World Trade Center</b>
Rogers Stirk Harbour + Partners
AAI Architects, P.C.
Silverstein Properties

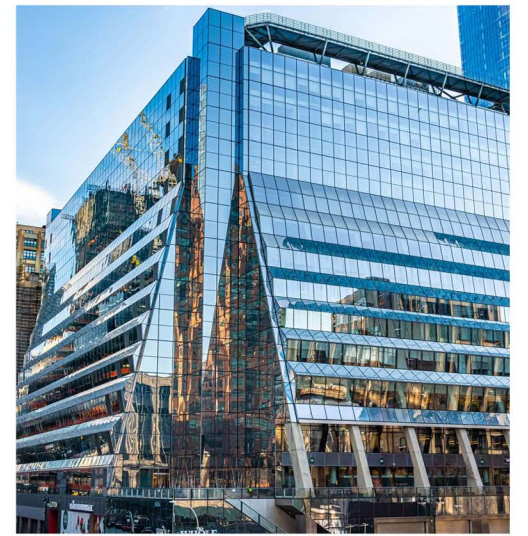
<b>World Trade Center Masterplan</b>
Studio Daniel Libeskind
AAI Architects, P.C.
-

The anonymity afforded by Adamson's (and its affiliates') relative obscurity in popular perception of architecture allowed the firm to become the default choice of executive architect on projects that require high-fidelity execution of sophisticated design ideas and building programs. The complete genericity of Adamson meant that the firm is perceived as a safe pairing with design architects whose concepts tend to be the focus of the projects' commercial branding. For the firm, this branding as the executive architect of choice for complex, high-value projects also meant that it is able to consistently capture the market for construction documentation on certain types of projects: high-rises, large-scale mixed-use developments, corporate campuses and headquarters, etc. This allows the firm to become completely specialized in delivering these projects despite the geographical dispersion of its works.

# ADAMSON ASSOCIATES

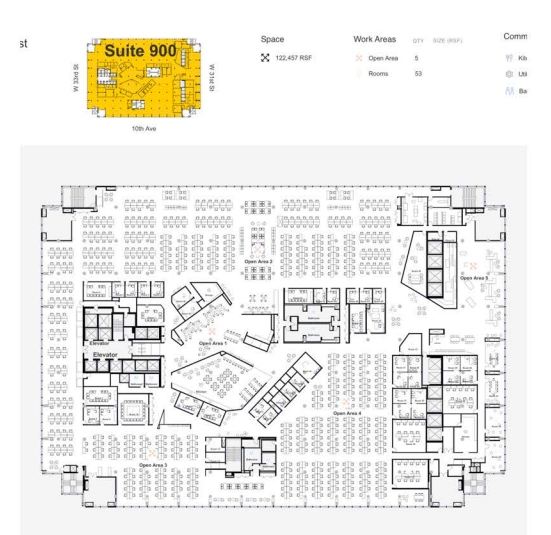
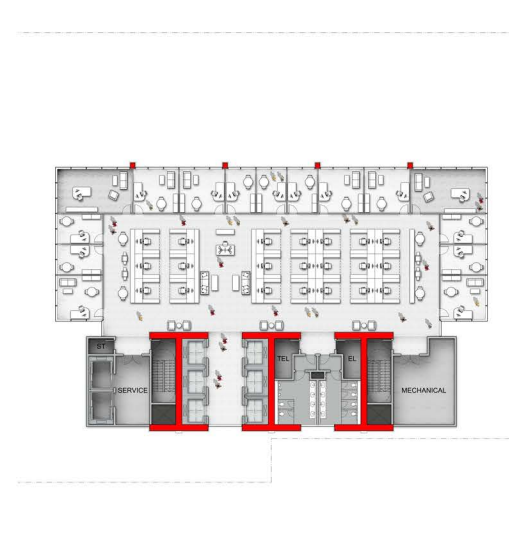
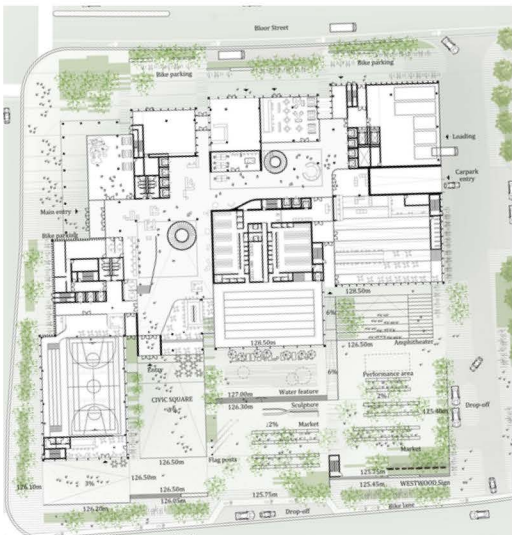


# ADAMSON ASSOCIATES



IDIOSYNCRACY

COMMONALITY



TORONTO CIVIC CENTER

NEW YORK MIXED-USE OFFICE

NEW YORK HIGH RISE RESIDENTIAL

NEW YORK RETROFIT

While the firm engages each of its projects as individual works of architecture, its ability to reuse established, tried and true solutions for key components in each of its projects is a unique advantage. For example, in the execution of large scale building projects with high rise components, the firm can potentially contribute to the solving of circulation and other key design problems by reference its own prior work.

specialize

## SPECULATION

The relegation of construction documentation and other tasks closely related to the final production of the building allows Adamson to realize drastically different design concepts using common construction techniques.

# AECOM



INSTITUTIONS  
87.85%

PUBLIC  
11.65%

0.49%  
OTHER

AECOM (NYSE:ACM) is today one of the largest provider of architectural and engineering services globally. Originally started as the Ashland Oil & Refining Company, AECOM today has grown into a global design, engineering, and consulting firm through strategic M&A as well as organic development of its business. It derives a majority of its operating revenue from businesses associated with project and construction management, although it is increasingly focused on the higher value-add business segment of design and engineering services.

Compared to almost any other architecture firms and design practices, AECOM's operating business is significantly larger and more diversified. Furthermore, the firm went public through an IPO in 2007, which allowed its management and key employees to seek exit liquidity through the public equity markets. Furthermore, the ability to access public capital markets has allowed the firm to complete strategic acquisitions using investor capital.

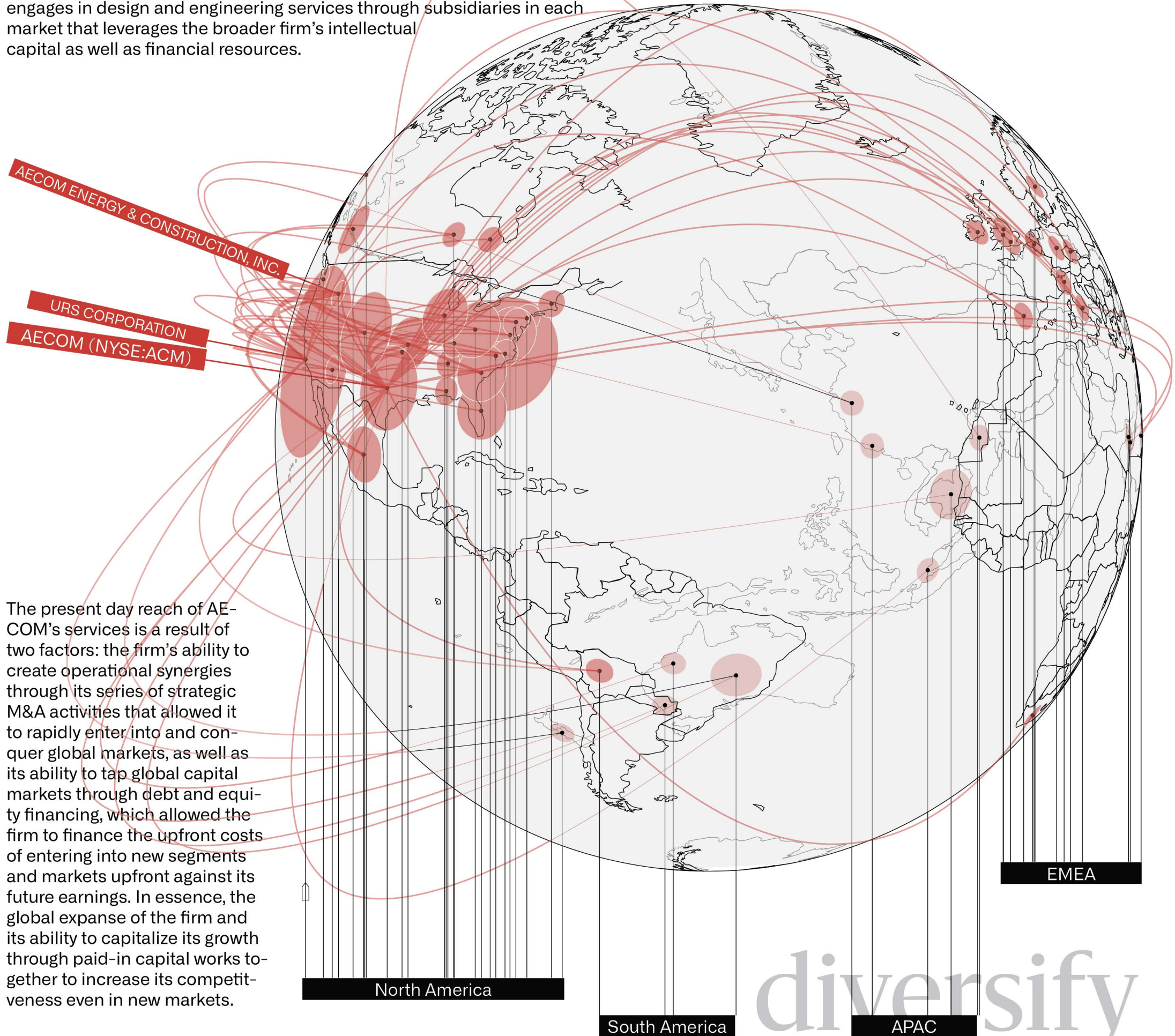


diversify

Construction and Engineering San Francisco, California

# AECOM

The expansive geographical footprint of the firm's offices and subsidiaries allows it to diversify its business activities across markets and industries. In the United States, AECOM leverages its Energy & Construction business to provide AEC services for infrastructural developments, including the construction and maintenance of hydroelectric power facilities as well as oil and gas plants. Elsewhere in the world, the firm engages in design and engineering services through subsidiaries in each market that leverages the broader firm's intellectual capital as well as financial resources.



The present day reach of AECOM's services is a result of two factors: the firm's ability to create operational synergies through its series of strategic M&A activities that allowed it to rapidly enter into and conquer global markets, as well as its ability to tap global capital markets through debt and equity financing, which allowed the firm to finance the upfront costs of entering into new segments and markets upfront against its future earnings. In essence, the global expanse of the firm and its ability to capitalize its growth through paid-in capital works together to increase its competitiveness even in new markets.

# AECOM

## SPECULATION

The globally diversified, vertically integrated business model of AECOM and other large design / engineering / construction firms allow them to comprehensively and economically deliver sophisticated designs consistently.

## DESIGN & ENGINEERING



The firm specializes in the design of large-scale, high-impact, high-complexity projects globally.

## CONSTRUCTION MANAGEMENT



As such, its construction management business has credibility and can deliver projects of similar nature effectively.

## FINANCE



The principal investment management business of the firm further enhances its flexibility - not only can the firm now invest excess cash off its balance sheet and potentially hedge the cyclicity of the construction business, it can also capture more of the upside of potential financial success in the buildings it delivers.

diversify

# PROTO-PRACTICE

Based on the principles established in the examination of firm business models, one can envision a kind of PROTO-PRACTICE that weaves together the characteristics of these firms' business models to deliver a combined, integrated form of architectural service. This thesis outlines three stages of growth for the proto-practice and how each of the three key business model themes can be incorporated in each stage: the seed, expansion, and stable stages.

The PROTO-PRACTICE will focus on delivering specialized lab, advanced manufacturing, and on-premise computation spaces for clients using off-site manufacturing and modular construction. While modular construction is typically uneconomical when compared to the already-efficient delivery of commoditized space offerings (homes, typical offices, etc.), it is uniquely valuable to the clients to be served by the PROTO-PRACTICE.

## SEED STAGE

### UPSTREAM

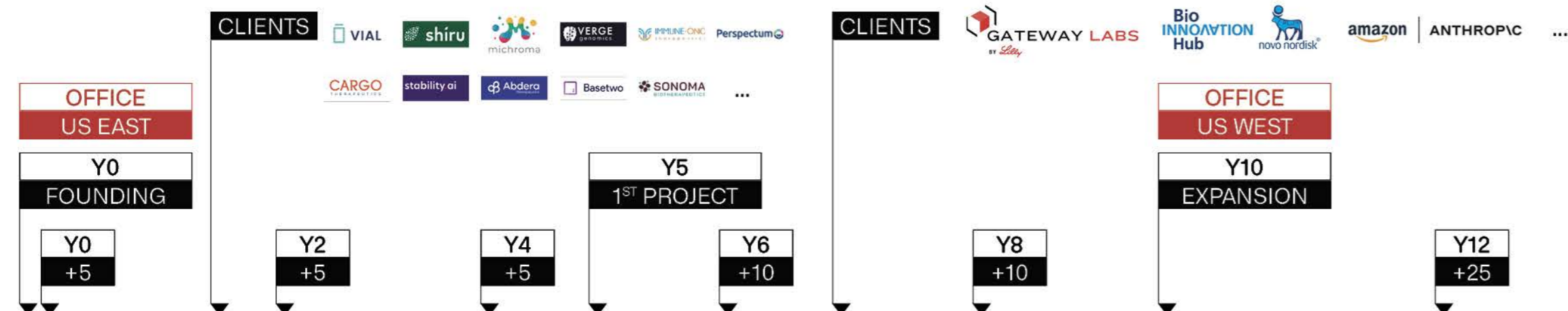
The PROTO-PRACTICE will open its initial offices in strategic locations within developed economics such that it can directly approach clients in life sciences and other high-tech industries who have specialized needs for spaces. Similar to the operating model of MASS Design, the PROTO-PRACTICE will directly engage with the capital providers of the final space users (venture capital and growth equity firms, in the case of startups with prosepcts for rapid growth).

### SPECIALIZE

As a small, independent design practice, PROTO-PRACTICE will focus on the concept and schematic design work and real estate advisory services for its clients. In the context of its development of relationships with early stage life sciences, artificial intelligence, and other firms operating in verticals with strong fundraising tailwinds, the PROTO-PRACTICE will develop design methodologies and specific architectural products that address the needs of these firms.

### DIVERSIFY

While the PROTO-PRACTICE is focused on establishing its reputation of technical expertise during this early stage of its operations, the diversification it adopts should orient towards attracting clients from diverse segments of the economy so that in the first ten years of its operation, the PROTO-PRACTICE can weather the downturn resulting from economic cyclicality.



Firm founding, assembly of initial team of life science / advanced manufacturing design specialists in NY / MA.

Delivery of first project in Cambridge | Indianapolis | New York. Prototypes the architectural system to be deployed globally.

Completion of the first project outside of the US northeast (in Palo Alto) - establishment of US-based manufacturing capacity.

## SERVICE

**Y0** The practice will initially focus on areas of design where the value creation resulting from specialized expertise is highest - i.e., space strategy consulting, technical design services, etc. While the firm must compete with highly entrenched competitors with higher margins, it can distinguish its services by becoming especially familiar with the needs of this small group of clients.

**Y10** The initial research conducted on behalf of clients during normal course of service will allow the firm to build up considerable human and intellectual capital, which can be condensed into a prototypical architectural "product," potentially consisting of offsite manufactured components, that allow quick and economic deployment and recycling of lab and research spaces.

## EXPANSION STAGE

### UPSTREAM

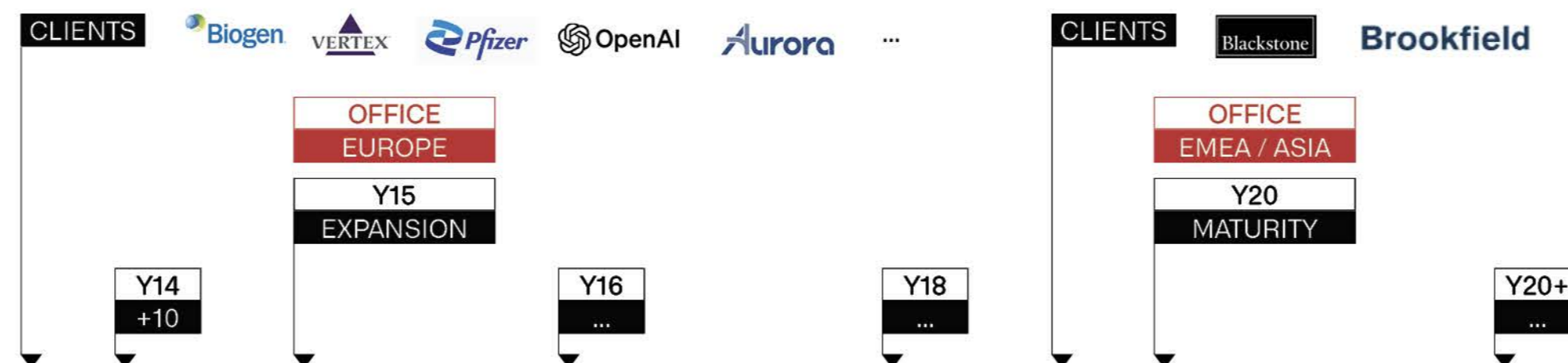
At this stage, the PROTO-PRACTICE will expand based on its existing relationship within the startup and venture capital community into serving the space needs of mature pharmaceutical and technology firms. This further "upstreaming" of its service offerings can also be a result of its previous clients being acquired by strategic buyers, which is a common mode of exit for startups.

### SPECIALIZE

The PROTO-PRACTICE will, at this point, have accumulated a wealth of market data, operational experience, and human capital specifically intended to address the space needs of its highly specialized clientele. Utilizing these resources, the firm will begin its initial development of a replicable architectural "product", transforming itself into a specialist not just in design but in the entire delivery process of lab and research spaces.

### DIVERSIFY

Because the firm will now engage in the design and prototypical manufacturing of its standardized lab / R&D space offering, which can potentially leverage advances in offsite manufacturing and other areas of technology, the PROTO-PRACTICE will enter into a phase of vertical expansion either by organically building out capacity to develop and construct its designs, or by sponsor-led growth by M&A.



Deliver first large-scale project fully utilizing the OSM technology in the US; establishment of first overseas office in Europe.

Establish consistent revenue stream through the continued servicing of existing OSM platforms and client portfolios. Potential public listing.

## PRODUCT

**Y15** The refined version of the architectural "product" can be produced at scale with increasingly attractive unit economics. The firm can then focus on vertically integrating construction management, manufacturing, and other components to form a full service delivery firm - not unlike other attempts at similar models (such as Kattera), except with significant focus on one single sector.

**Y20** Some of the manufacturing expertise and construction capacity of the firm can be spun out to service clients outside of the typical tech / pharma firm profile, including non-profit organizations and other firms that can potentially benefit from the delivery method of the architectural product, which at this point should have global adaptability.

## STABLE STAGE

### UPSTREAM

The PROTO-PRACTICE's expansion leading up to this stage of its lifecycle should allow the firm to expand beyond the now highly efficient delivery of its standardized service and product offerings. The firm will engage with the stakeholders of its various clients and develop programmatic ventures to serve underserved communities globally.

### SPECIALIZE

The development of the PROTO-PRACTICE's product and service offerings portfolio will allow it to engage clients outside of its ordinary course of business. Because many of its clients in the life sciences industry and other sectors are associated with organizations that make considerable charitable contributions, the PROTO-PRACTICE can leverage this network of partnership to deliver architecture for underserved communities globally.

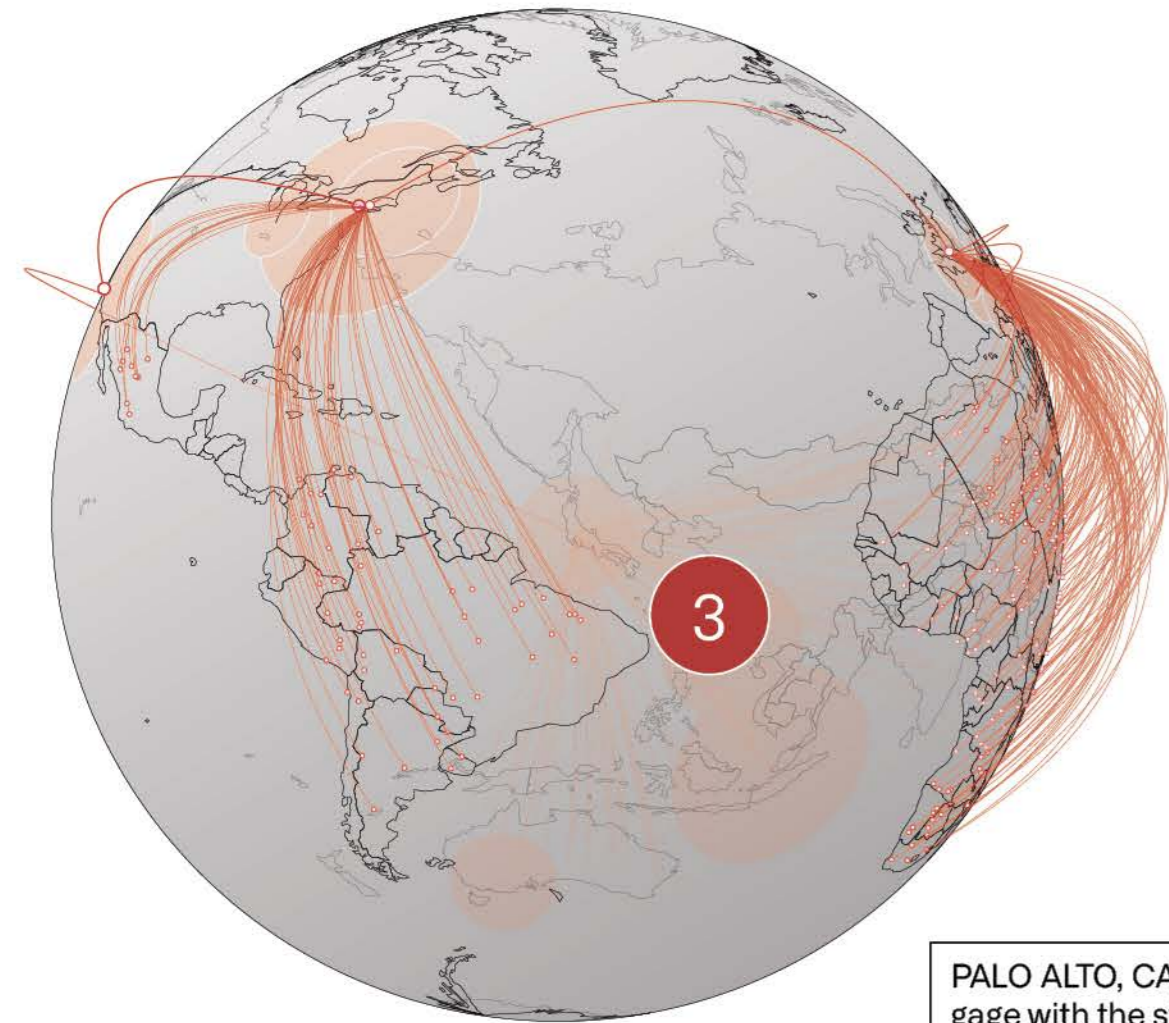
### DIVERSIFY

The PROTO-PRACTICE will expand both upward into the investment management business (which will allow it to exert significantly more control over its projects as well as the organization's mission) and also downward into construction management and manufacturing (which will lower the cost to deliver the architectural product).



The PROTO-PRACTICE can eventually grow to become a large, globally diversified cologmerate of investment, design, engineering, manufacturing, and construction firm, using the profits generated by its operations to finance projects that confer broad based benefits to society at large.

# PROTO-PRACTICE



## STABLE STAGE

The stable stage operation of the PROTO-PRACTICE is the most geographically agnostic. At this point, the firm has established operational, financial, and developmental infrastructure to grow its service offerings globally.

Because its service offerings are adaptable and containerized (based on the PRACTICE's previous work establishing supply chains and manufacturing capacity in developed economies), the firm can quickly scale both its design and delivery infrastructure in global markets by either organic growth (in the case of EMEA and the Americas), or acquiring local operating partners (in other parts of the world).

The goal of this stage of the firm's expansion is both to take advantage of the growth occurring in global emerging markets, as well as use the firm's considerable expertise in delivering architectural design services and products economically for societal good.

PALO ALTO, CA represents both an opportunity to engage with the startup ecosystem based out of Stanford University and its incubators, as well as a temperate environment that contrasts with the northeast.

UNITED STATES  
PALO ALTO, CA

INDIANAPOLIS, IN is home to one of the largest pharmaceutical firms in the US. Eli Lilly is not only one of the region's top employers / users of life sciences spaces, but also a sponsor of scientific research globally.

UNITED STATES  
INDIANAPOLIS, IN

NEW YORK, NY, as well as the surrounding contiguous metropolitan area in New Jersey and other parts of the tri-state area, offers access to venture capital and technology firms, as well as global capital markets.

UNITED STATES  
NEW YORK, NY

UNITED STATES  
CAMBRIDGE, MA

CAMBRIDGE, MA, as a key satellite office of the proposed PROTO-PRACTICE, offers the firm direct access to both a highly trained workforce and clients in the life sciences industries.

1

## SEED STAGE

The PROTO-PRACTICE will initially establish offices staffed by locally licensed architectural professionals in key metropolitan statistical areas in the United States.

The focus of selecting initial office sites are the availability of reliable, local operating teams, and the presence of potential clients concentrated in industries such as life sciences, advanced manufacturing, autonomous vehicle research, and artificial intelligence developments.

These industries each demand highly technical architectural services and have attracted in recent years significant attention from capital markets. As such, there is an abundance of startup firms and venture capital investors that require small-scale, highly flexible spaces with specialized technical requirements. The PROTO-PRACTICE will leverage this characteristic of these markets to develop its initial commercial clientele.

LONDON, UK provides an opportunity for the PROTO-PRACTICE - by now more established in its expertise and capacity to serve specialized clients in the life sciences and high-tech industries, to grow globally.

UNITED KINGDOM  
LONDON

FRANCE  
PARIS

SWITZERLAND  
ZUG

GERMANY  
BERLIN

DENMARK  
BAGSVAERD

BAGSVAERD, DENMARK is home to both the pharmaceutical giant Novo Nordisk, as well as its associated charitable organization, the Novo Nordisk Foundation, which provides a springboard for the practice's growth.

2

## EXPANSION STAGE

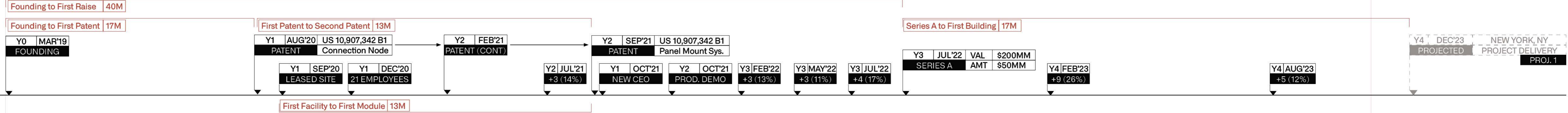
After establishing operational infrastructure and local teams in the United States, the PROTO-PRACTICE will expand to global markets, starting with developed economies with significant investments in both the built environment and technology. In this phase, the firm will engage both in the recruitment of global talents and conduct strategic mergers and acquisitions to enter into new markets.

To achieve this goal of accelerated growth, the PROTO-PRACTICE will require capital infusion both in the form of equity investments and leverage collateralized by its intellectual properties. The technologies developed in the seed stage of the firm will serve as the key valuation driver and allow the practice to access global capital markets.

**PRODUCT**

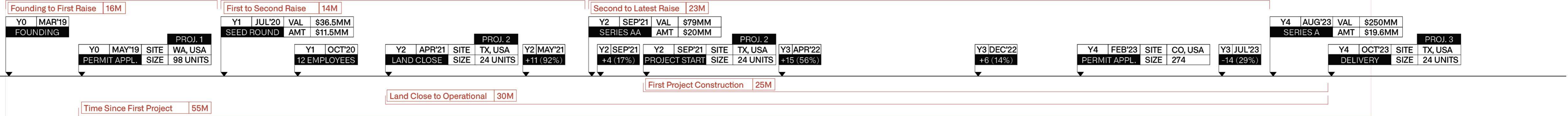
For business models that require significant upfront investments in R&D and fixed assets (such as leasing fabrication / manufacturing facilities), the first round of fundraising occurs after some proof-of-feasibility production has been completed. Here, scaling up enables production and gives credibility to fundraising.

**ASSEMBLY OSM**



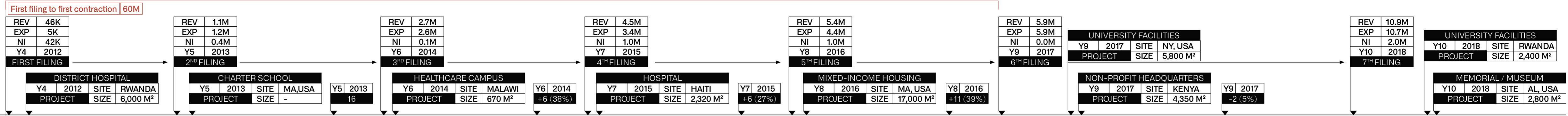
Compared to the capital-intensive model adopted by Assembly, Juno's service-oriented business model required more frequent but smaller fundraising rounds and larger employee headcount growths. The development risk of the model (evidenced by extremely long permitting times) further increases the firm's reliance on venture backing.

**JUNO**



The traditional service model of architectural design firms, such as that employed by MASS Design Group, pegs the firm's growth in terms of revenue and employee headcounts to its ability to source projects. Because of relatively fixed relationship between the firm's scale and its ability to render service, growth is steady and generally do not benefit from leverage.

**MASS DESIGN GROUP**



**SERVICE**

growth trajectories