FEATHER WEIGHTS: RAPID REDEPLOYABLE STRUCTURES FOR INTERIM USE

by
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Submitted to the Department of Architecture in Partial Fulfillment of the Requirements for the Degree of Master of Architecture

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ABSTRACT

This thesis examines vacant urban parcels that are either unviable for development or stalled as a result of the economic crisis, and asks: How is it possible to generate both economic and urban value on these sites until they are ready to be developed? Reluctant to invest in these areas developers resort to a wait-and-hold strategy leaving parcels vacant until the market is suitable for development. For these parcels, the conventional architectural process is stalled because the time and investment needed for design and construction outweighs the expected return on the development. This condition occurs throughout all major cities in the United States and is becoming more prevalent as the frequency of urban utilization cycles increases.

This thesis proposes that a designer can use architecture as a platform to navigate the unique demands of this condition by rapidly capturing the value of a parcel, thereby creating positive returns to the surrounding communities as well as landowners. Rather than acting as a conventional designer who develops a specific proposal for a particular site, this thesis proposes that a designer proactively provide a service to developers that generates unique design solutions to a particular condition. This is accomplished by establishing a design protocol that allows one to move from analysis to deployment of unique and dynamic architectural proposals for a range of uses and sites simultaneously while dramatically compressing both the time and cost required for design and construction.

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Feather Weight

Rapid Redeployable Structures For Interim Use

CONTENTS

INTRODUCTION

This thesis argues in favor of its proposed design protocol by describing the work accomplished at each step of the protocol in turn. Each chapter, corresponding to a single step, contains a thorough introduction, description of the general protocol, and its results applied to two specific case studies. To lay the foundation for the description, this section introduces and defines a few concepts that will emerge repeatedly.

Stalled Development

Through cycles of urban development, it is not uncommon for parcels of land to remain empty in areas where issues of financial success, ownership, planning, or zoning are uncertain or unresolved. As development requires a large investment and, when the future context of an area is largely unknown, building is undesirable or impossible. This condition, exemplified by the recent economic crisis, has left a number of urban parcels vacant in the midst of stalled development. Consequently, these parts of a city with ambiguous futures remain unutilized and stagnant, while landowners suffer from the burden of carrying costs and land taxes.

Figure 01.

Interim Use

In order ease the costs of holding on to these vacant parcels as well as generate urban economic, social and environmental value,[1] this thesis proposes the application of lightweight short lifespan structures for interim use. By altering the engagement of design and construction from a long-term commitment to a flexible short-term, this approach allows for the development of a seemingly unviable vacant parcel until external and environmental conditions become suitable for a more permanent development. Additionally designing for interim use allows for the introduction of a range of social programs that cannot accumulate enough capital to compete in established real estate markets or purchase space.[2]

Figure 01: The current state of the historic Filenes' Basement building at Downtown Crossing is an exemplary case of conditions created by stalled development.

Rapid Redeployment

Contemporary light manufacturing technologies, such as modular construction[3] and tensile membrane[4] systems are utilized in order to achieve designs proposals that can be physically reconfigured over short periods of time. These technologies allow one to rapidly move from design to de-

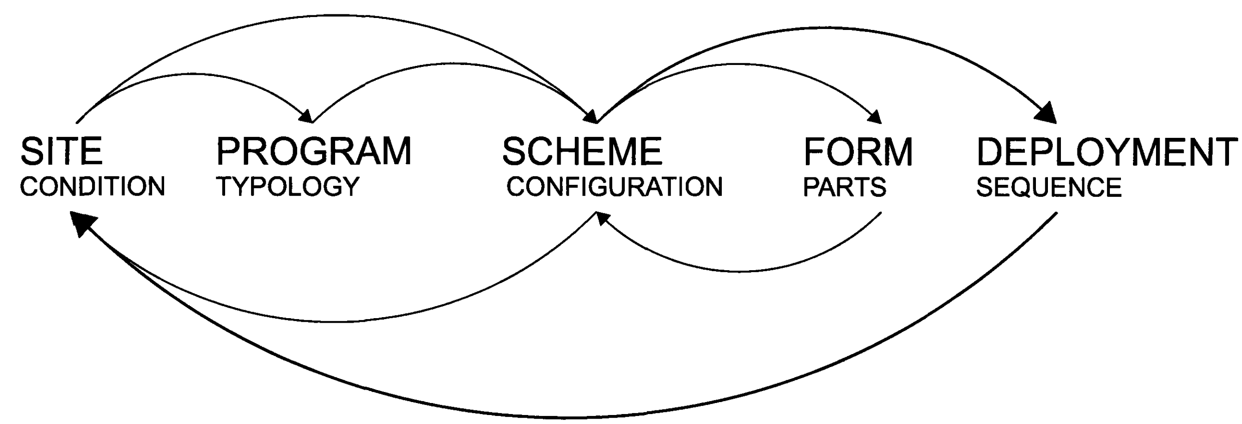


Figure 02.

ployment to disassembly. Iterating over this cycle building systems can be reconfigured to accommodate different uses over different sites. Rapid redeployment, reduces the cost for developers to intervene architecturally, because they are only required to invest based on the time they will use the building for.

Figure 02: Outline describing the five steps of the Design Protocol developed as they correspond to fundamental aspects of the design process.

Design Protocol

The focus of this thesis is the establishment of a design protocol[5], coupled with the development of an architectural language[6] in which the steps of an architectural design processes are systemized through the careful definition of rules and parameters. This is accomplished through a series computational tools developed specifically for this thesis in order to aid in the decision making of each step of the design process. Throughout each step design information is generated which then informs the next addition of the detail and complexity of the proposal. Employing a protocol allows for the generation unique architectural propositions through a singular method.

APPLICATION

1.Conditions: Urban Utilization Down Cycle

- **Developer** (Customer)
- **Vacant Parcel: Unviable for Development or Sale** (Site)
- **Investment > Expected Return of Development** (Site)
- **Wait and Hold For Market to Change** (Current Strategy)

2.Problems (Demand)

- **Parcel Generates Financial Loss without Development**
- **Parcel Generates no Urban Economic Value**
- **Uncertain Utilization Value**
- **Unknown Duration of Utilization Cycle**

3.Needs (Product)

- **Generate Urban Economic Value : Urban Catalyst**
- **Generate Financial Income**
- **Dynamic Lifespan to support uncertain development cycles**
- **Dynamic Investment(Lease structure with option to Buy)**

INNOVATIVE STRATEGIES

1. Building as Adaptable System A Building for Multiple Sites and Contexts?

- **User Generated Configurations** (Architectural Language)
- **Adapt to Variable Conditions** (Not One Off Design)

2. Rapid Assemblies Can a Building not be Permenant?

- **Reusable Components** (Assembly / Collection)
- **Quilting** (Deployment Sequencing)
- **Rapid Deployable Structure** (Assembly / Collection)

3. Dynamic Client Building Relationship Can a Building Never Be Owned?

- **Lease With Option to Buy** (Variable Lifespan)
- **Dynamic Layered Components** (Variable Assemblies, Build Up/Build Down)
- **Expansion, Conraction, Reconfiguration** (Variable Configuration)

4. Smart Systems Can a Building Never become Obsolete?

- **Consolidation** (Dumb Components & Smart Components)
- **Programmable** ( )
- **Plug and Play** ( )

Figure 03.

Service-Based Practice

The focus on the process of design itself and not its product has serious implications for the way that architects operate and the role of the designer. Architects are typically commissioned to design a building for a site based on a specific program brief. While, the existing model of architectural practice charges architects with delivering proposals for the creation of a building or artifact as a product. The development of a service-based system proposes that developers engage architects instead on service delivery. This creates a new role for the architect in the development process and presents a different approach for his intervention in the built environment as no longer an artist commissioned to produce a specific artifact but an entrepreneur working on a dynamic subject.

Figure 03: Outlines identifying the various issues in the application of interim use structures as well as innovative strategies to be developed and offered.

Figure 04.

Figure 05.

Case Studies

Figure 04: Arial Photograph of the first case study site at Downtown Crossing. Courtesy of Bing Maps

Figure 05: Arial Photograph of the second case study site at South Boston.Courtesy of Bing Maps

In order to test and refine the design protocol, it will be applied to two specific case studies in Boston, The old Filenes Basement[7] in Downtown Crossing, and typical row house parcel[8] in South Boston. Development in Boston has largely been halted as a result of recent economic conditions.[9] The Filenes basement site is a specific testament to this as its current state has created serious tensions between the city, pubic and its developers. These two sites are chosen because they represent two very distinct manifestations of the same condition: One is large, the other small; one is high value, the other low value; one is located at the center of the city, the other peripheral etc. These differences test the flexibility of this thesis to meet the radically different spatial and contextual demands of these two areas.

(Endnotes)

[1] Value based on definition of "Urban Economy" – "the totality of all activities and uses that are important for a city" Kohoutek, Rudolf. "Temporary Uses, Deregulation and Urbanity." Temporary Urban Spaces. Ed. Florian Haydn and Robert Temel. Basel: Birkhauser, 2006. 29. Print.

[2] Temel, Robert. "The Temporary In the City." Temporary Urban Spaces. Ed. Florian Haydn and Robert Temel. Basel: Birkhauser, 2006. 56. Print.

[3] See Background, Modular Design

[4] See Background, Tensile Membrane Structures

[5] See Background, Design Protocol

[6] See Background, Architectural Language

[7]426 Washington St, Boston, MA 02108

[8] 545 E Second St, Boston, MA 02127

[9] Peter, Howe. "Boston's Stalled Development." NECN - Breaking News, Boston Weather, World and US News Stories - Get the Latest Business, Health, Entertainment, Sports. 11 May 2010. Web. 11 Feb. 2011. <http://www.necn.com/03/11/10/Bostons-stalled-development/landing.html?blockID=195823&feedID=4215>.

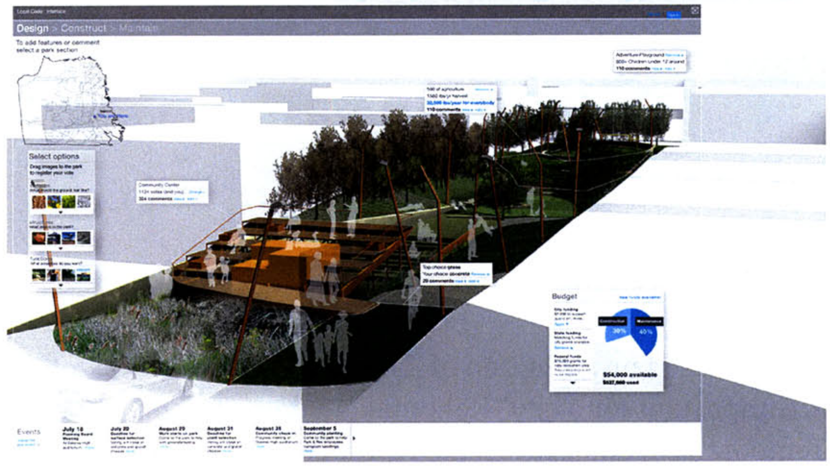


Figure 06.

BACKGROUND

Temporary Urbanism

"Wait and Hold" Development and Temporary Urban Spaces
Real Estate Opportunities

In many cases of urban site development, the significant economic uncertainty associated with the future or current conditions of a site conflict with the positive economic incentives to intervene on that site. In addressing the complicated ways in which uncertainty interacts with design planning and development, in his essay, "Design and Planning under Uncertainty", Lifei Cheng suggests that decision-makers "seek design solutions to satisfy several goals including maximizing profit, minimizing risk, and staying viable and competitive in business."[1] While the context of his writing is in financial enterprises, his assessment of "the difficulty [lying] in the conflicts among the various objectives"[2] certainly applies to urban development.

Large long-term permanent architectural projects provide a valuable service in anchoring areas of the city. Unfortunately, while land parcels in sub-optimal and riskier urban conditions are often of little value, the typical investment in the construction and maintenance of a building remains equivalent to that under different urban conditions. Further, that urban economies center around long-term ownership of real estate creates a condition in which developers are not incentivized to be sufficiently invested

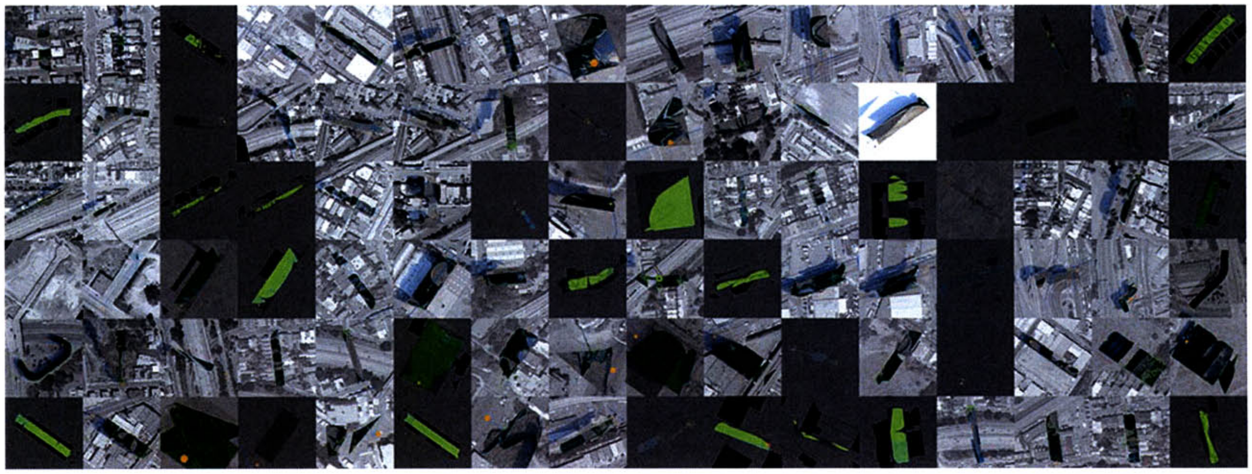


Figure 07.

in the more development areas themselves. As such, the enterprise of building on these sites today remains too slow, expensive and risky.[3]

Figure 06-07: Nicholas de Monchaux & collaborators : Local Codes WPA2 Competition entry that parses and analyses a database of rejected sites and generates landscape proposals based on unique conditions in San Francisco

Increasingly, as a way of reducing the overall economic risk of developing these sites, developers are stalling the decision-making process altogether as their primary strategy. This pattern of "wait and hold" or "wait and see" development has become commonplace at these sites. In describing the economic environment throughout a process's life cycle as "one in which the market conditions like product demand and price are uncertain,"[4] Cheng suggests that a "wait and hold" condition provides no true solution or resolution and advocates the usage of flexible planning strategies that can adapt to different scenarios as an alternative.

In making design decisions, Cheng argues that designers must be cognizant of several key urban conditions and economic symptoms: "1. The capacity of the process should be able to satisfy a changing uncertain demand, 2. Future technological advances may occur, e.g., a new catalyst could lead to rapid obsolescence of existing technology, and 3. In response to changes in the environment, existing reactors could be expanded, replaced, or salvaged in the future."[5] To address these challenges, a new kind of architectural and design strategy is needed, one that is based on the ability

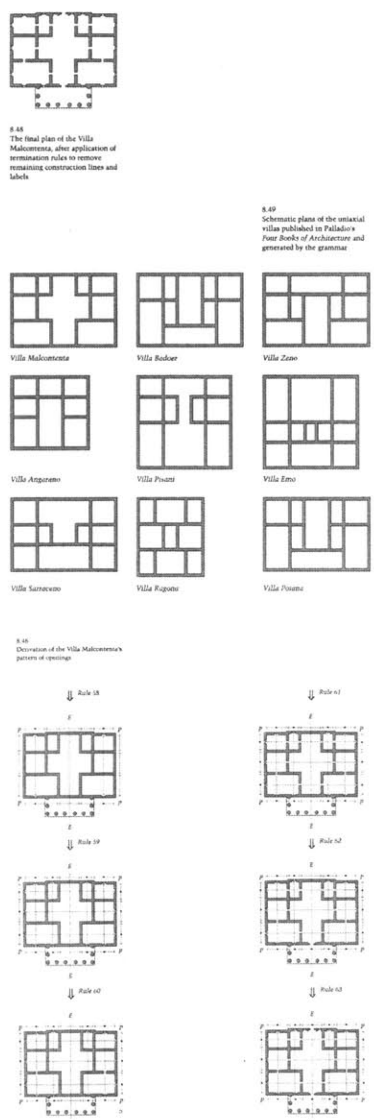


Figure 08.

Figure 08: William Mitchell: The Logic of Architecture Diagrams displaying how a series of operations determine spatial organization of the Villa Malcontenta

Figure 09: Yehia Madkour: Programmatic Formation: Parametric Design beyond Complex Geometry Housing Unit configurations generated through inputting data of various living scenarios

for architecture to minimize risk and investment in order to make these spaces viable development.

Design Operations

While there is no single approach to the design of a building or artifact many architects adhere to an established set of steps that, for them, define the design processes. This roughly begins with a site analysis, followed by schematic design, which is translated into a tectonic development. Architects iterative over these steps in order to draw conclusions from each phase that will inform a following step. Each phase of the design process produced more information and in whole an idea or concept translates into a physical artifact. Every designer develops their own process, which they rely on personally; this is often applied in situ where the goal is to arrive at a specific design solution for a specific context.

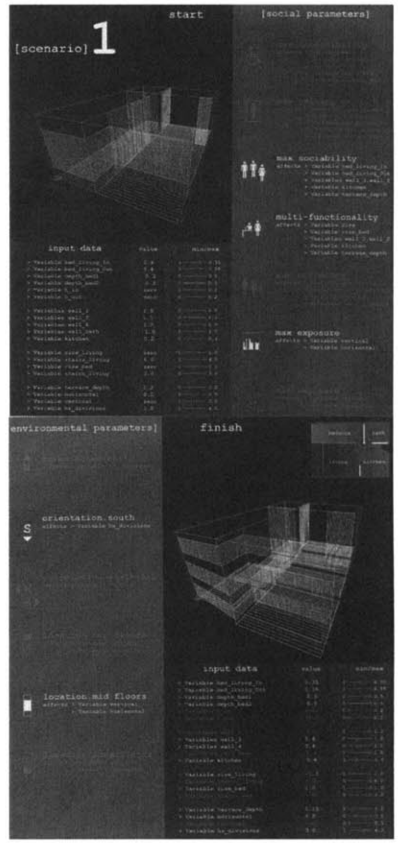
This thesis seeks to use the economic constraints of this problem, in which the laborious, lengthy and expensive process of design has left employers reluctant to invest to challenge the way in which traditional architects operate. "The economic pressures of differentiation and efficiency are sounding a mandate for innovation that digital methods are available to serve. The potential of process reconfiguration to reposition design as again central to building is large, and the opportunity for designers in taking on this challenge squarely seems open-ended."[6] Rather than focus on a specific design solution this thesis develops and specifies a design process by defining an explicit order of operations, which I refer to as a "Design Protocol".

Each operation given a defined set of data, through the use of computational tools developed specifically for this thesis, generates a number of proposals and evaluates there success while adding meaningful information to the description of the design proposal. Where computational tools in the past have traditional served in formal generation or optimization, this application is unique as they are applied directly to decision making throughout the design process. Not only can this dramatically compress the design process, it can applied to multiple manifestations of an urban condition simultaneously, by simply altering the information that each step of the protocol receives one can arrive at a range of different solutions for different manifestations of a given condition.

Architectural Language

A design protocol depends on the ability to establish an architectural language and parametric (constraint-based) modeling in order to generate a physical artifact through digital information informed to the level of architectural detail. In his book, "The Logic of Architecture", William Mitchell outlines in great length the history of rule based design approaches and displays how architectural languages can be established, interpreted and used to specify functional problems as well as rhetorical intentions of design. At the base of this approach is the establishment of "Building Descriptions" - a concept used to define a characteristic of a building or either a part of according to a certain criteria or variable. The use of building descriptions allows one to build rules or relationship based on these definitions through statements. "Statements" specify relationships, operations, rules, conditions and constraints. These statements can define the criteria of building descriptions and organize them according the logic of a given statement.

A healthy set of building descriptions and statements produce an architectural language, which can be used to design a building and the relationship between its different parts. "In order to produce and justify designs that not only have desired formal properties but also satisfy specified practical requirements, a designer must be able to infer the functions of architectural elements and compositions from their formal properties."[7] Mitchell describes how architectural languages are implicit in his design, as he shows in historical examples dating back to Palladio, however with the aid digital tools, a design protocol has the ability to make an architectural language both explicit and dynamic. Two interesting projects have recently applied the concepts outlined by Mitchell.



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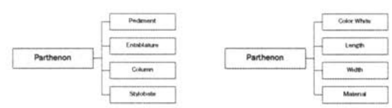


Figure 10.

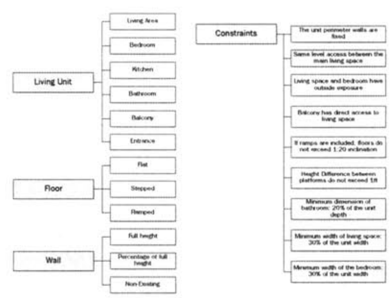


Figure 11.

Figure 10: Basic building description of the Parthenon

Figure 11: Building descriptions and constraints used in Programmatic Formation

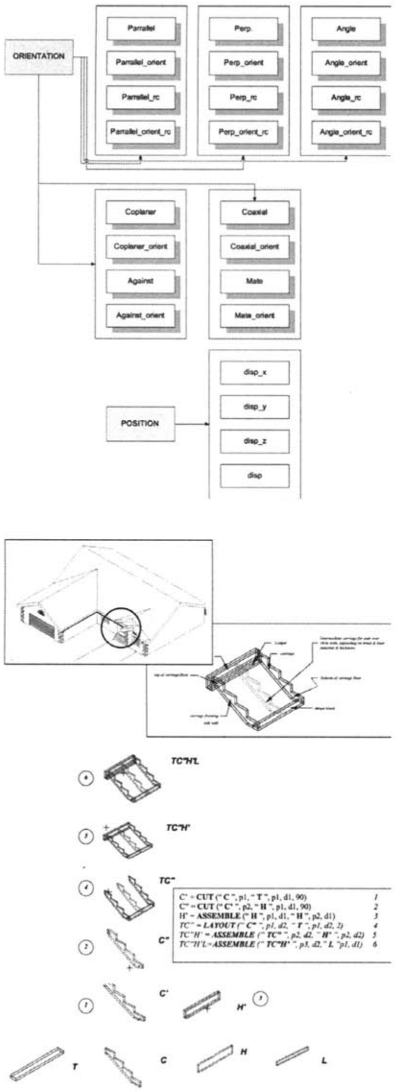


Figure 12.

Figure 12: Khaled Nassar: Building Assembly Detailing Using Constraint-Based Modeling. Language of assembly and generation of architectural details.

Figure 13: Kieran + Timberlake: Cellophane House. Transformation from module dimensions to frames, cartridges and final assembly.

Yehia Madkour coordinates complex programmatic relationships and conditions in urban housing in his research project "Programmatic Formation: Parametric Design beyond Complex Geometry". Using a set of building descriptions and constraints he develops a rule based design in order to generate various living unit configurations based in the input of social data into dynamic models that respond to changing programmatic parameters. "Descriptions and constraints were defined with a focus on space, occupation, view exposure, position and efficiency."[8] This project is valuable precedent in the task of generating programmatic and spatial relationships through an architectural language, although it remains diagrammatic in its articulation of various presented configurations.

In his research project "Building Assembly Detailing Using Constraint-Based Modeling" Associate Professor in the Department of Architectural Engineering - University of Sharjah, Khaled Nassar explores new methods of generating assemblies and architectural details through a set of design constraints based on the properties of materials and building components as well as sequence of assembly. "Parametric assemblies as they relate to architecture are presented by Nassar who relates materials during construction as a means of design constraints."[9] Constraint based modeling which is often used in the field of mechanical design differs from parametric modeling insofar as it involves defining a set of geometric constraints to control the location and orientation of components rather than relying on a set of annotations (dimensions, grids, etc.) and components (doors windows, walls, etc.) Acknowledging that details in architectural practice are often drawn separately from the main plans, elevations, and sections, Nassar advocates instead for abstracted 3D building models that can be coordinated with assembly details based on defined constraints.[10] Unlike Madkour, Nassar defines a language of assembly containing tectonic operations as cut, stack, assemble, and cover and displays how a small set of operations and descriptions can generate a variety of architectural details.

Construction Systems

This thesis proposes an interim design strategy that allows for the quick installation of temporary uses as a viable urban tactic to generate income while minimizing the economic investment required. Light, temporary buildings, can bring clarity to these areas of uncertainty by providing temporary uses on a site while making the relationship between developer, the lifespan of the building, and investment in the building more flexible. In economic terms, a single structure that can exist in several design forms across its overall lifespan and go easily and at low cost across such iterations thus frees the owner from the typical financial commitment required to develop a site. Providing flexibility doesn't just depend on design but on the tectonic performance of the architectural proposal.

Tectonic flexibility is explored through the concept of "Disentangled Parts". Unlike industrial artifacts in which individual parts separate different functional requirements, architectural components are often embedded with multiple functional demands (structural, environmental, electrical etc.) Disentanglement is explored through two types of building systems, deployed side by side yet isolated. By concentrating expensive functional building requirements into one specific construction system, while focusing more basic architectural demands onto another takes advantage of their unique flexible properties.

Modular Construction

Modular design strategies employ standardized units or dimensions to achieve flexibility and variety, in construction they a realized through modules or sections which are prefabricated in a remote facility and delivered and assembled on site. The use of standardized modules is a valuable strategy to achieve flexible architectural proposals not only because it is efficient but it has the ability to manifest itself in a variety of forms and configurations accommodating the need for physical change of a building.

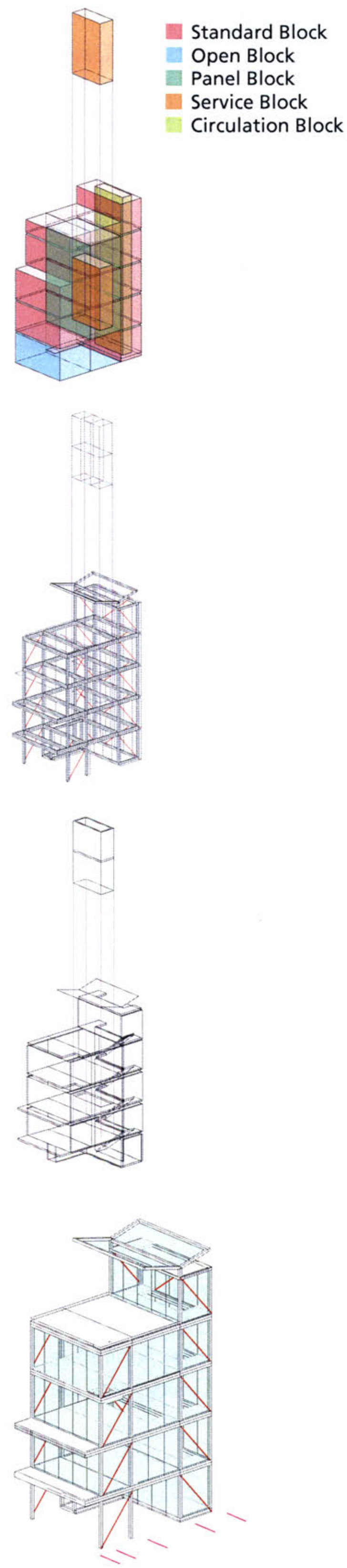


Figure 13.

Figure 14.

Figure 14: Kieran + Timberlake: Living Home. Prefabricated modules are installed on site in Newport Beach.

Figure 15: Frei Otto: 1972 Munich Olympic Stadium. Lightweight tensile membrane and cable net. Courtesy of Dave Morris

Figure 16: Axel Killian and John Ochsendorf: Particle-Spring Systems for Structural Form Finding. Examples of structural form finding with particle spring systems.

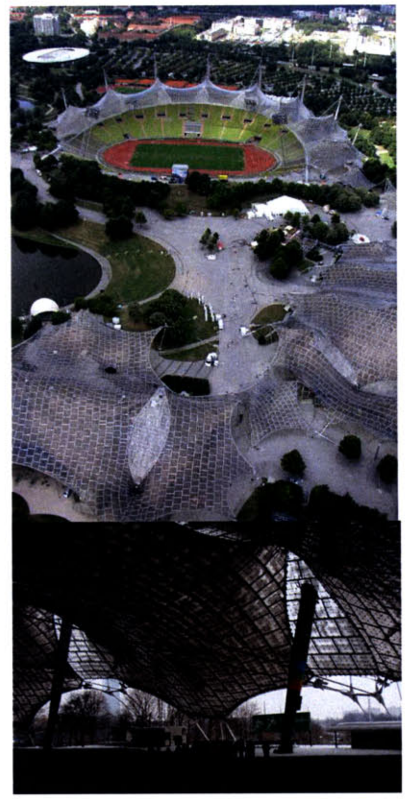
While commonplace in other industries modular building has come to be associated with trailer park housing in the architectural field. However the principles that govern modular design remain powerful for challenging traditional construction and delivery by eliminating the need for sequential construction processes that typically require the installation of a structural frame, from which cladding is attached, then services, interior partitions filled in and finishes applied. Instead components can be built and assembled simultaneously in various controlled environments and delivered to the site in relatively large pieces with few connections for a final assembly on site where it is least desirable to join materials.

The design of a component has potential in the way that it reorganizes and synthesizes the roles of various subcontractors making the construction process more efficient. Ulrich Knaack points out this relationship, "The development of modular systems has to aim for an optimization of the interface between the different sub-contracts... When industrially pre-manufactured elements are assembled in situ, the work of electricians, plumbers, glaziers and other craftsmen has already been carried out in the factory."[11] Furthermore this suggests that the design of an integrated component can reorganize the construction processes, making the organization of construction processes and assembly a design problem. Rather than rationalize an architectural concept into a building system, this problem requires designs based on principles of production assembly and delivery.

Tensile Membrane Structures

Tensile Membrane Structures consist of a membrane which carries loads through tension supported by some form of compression or bending elements such as masts, compression rings or beams, they often used as portable shelters as they can economically and attractively span large distances. Like modular construction components are prefabricated be delivered to the site in relatively few pieces and erected quickly. For these reasons they have become a popular construction system in the application of short term, light weight solutions that require large spaces such as theatres for concert tours, pavilions, and emergency shelters. Spatially, they are highly flexible, not in the reconfiguration of self-similar units, as is the case in modular construction but in the adaptability of the form of the membrane as a whole. This is due to the structural behavior of this system that requires a level of internal force throughout the membrane whose structural network is in a position of equilibrium. While this constraint is met, this system is high adaptable a number of different forms and adapt to a virtually any footprint.

For decades designers have experimented with simulating its structural behavior and geometric implications through "Form Finding". Techniques in form finding are best known through the hanging chain models of Antonio Gaudi as well as the physical models of Frei Otto who experimented with a number of physical modeling techniques to discover highly accurate structural forms. Recently, methods such as dynamic relaxation and force density have been employed for analyzing and optimizing structural forms. [12] While these methods have led to a number of tools for refining structural forms, very few design tools exist for exploring and creating new structural forms. As a response to this Axel Killian and John Ochsenforf developed a three dimensional design and analysis tool to find funicular structural forms in real time through the use of particle-spring systems.[13] This can be accomplished directly through computational methods providing powerful fast ways to generate and manipulate dynamic formal solutions informed by constraints established within a design protocol and language.



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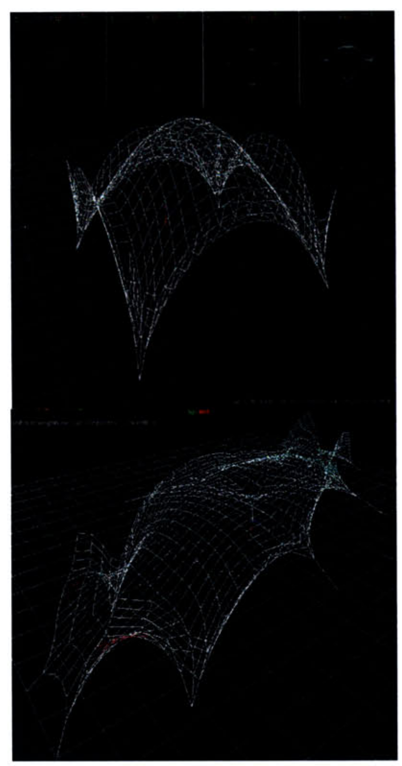

Figure 16.

(Endnotes)

[1] Cheng, L. "Design and Planning under Uncertainty: Issues on Problem Formation Ad Solution." *Computers and Chemical Engineering* 27.781 (2003): 1-3. Print.

[2] Cheng, L. "Design and Planning under Uncertainty: Issues on Problem Formation Ad Solution." *Computers and Chemical Engineering* 27.781 (2003): 1-3. Print.

[3] *For more on conflicts between the immobility of real estate and accelerated capitalist economy see.* Temel, Robert. "The Temporary In the City." Temporary Urban Spaces. Ed. Florian Haydn and Robert Temel. Basel: Birkhauser, 2006. 56. Print.

[4] Cheng, L. "Design and Planning under Uncertainty: Issues on Problem Formation Ad Solution." Computers and Chemical Engineering 27.781 (2003): 1-3. Print.

[5] Cheng, L. "Design and Planning under Uncertainty: Issues on Problem Formation Ad Solution." Computers and Chemical Engineering 27.781 (2003): 1-3. Print.

[6] 82, Shelden, Dennis R. "Tectonics, Economics and the Reconfiguration of Practice: the Case for Process Change by Digital Means." Architectural Design 76.4 (2006): 82-87. Print.

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[13] Kilian, Axel, and John Ochsendorf. "Particle-Spring Systems for Structural Form Finding." Journal of the International Association for Shell and Spatial Structures 46. 147 (2005).

PROTOCOL

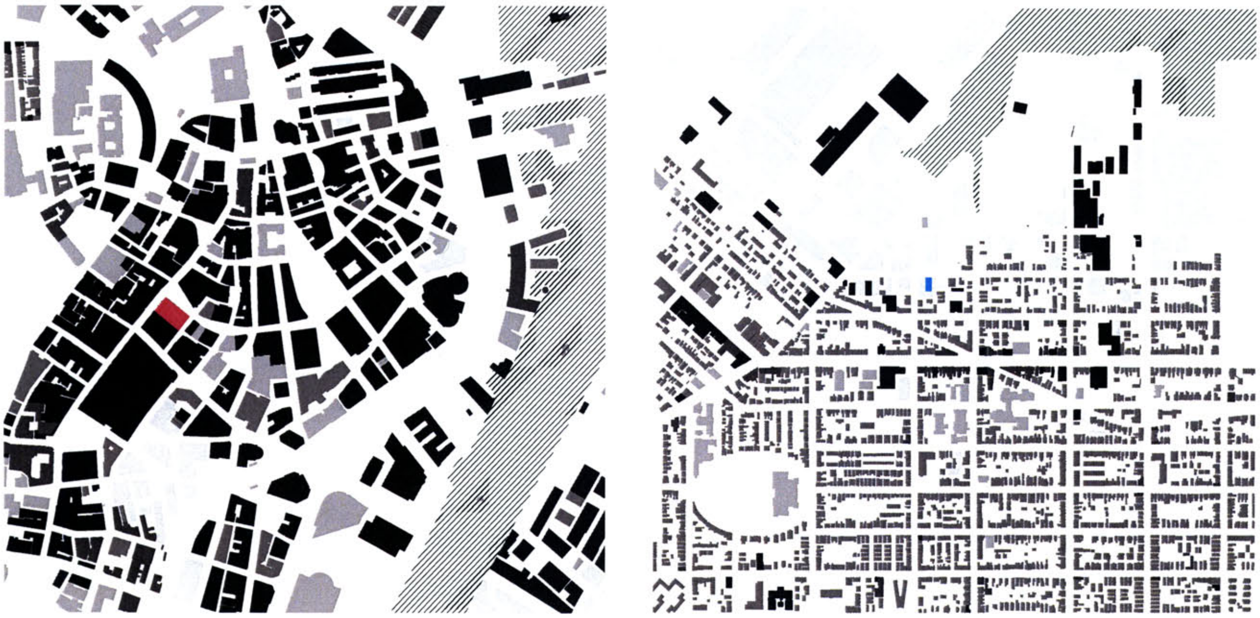


Figure 01.

CONDITION

Introduction - Site Analysis

In order to inform designs and gain insight into context, designers often begin with a

site analysis, in which designers examine and document aspects of a site. While there are established techniques of site analysis there is no standard method and it is traditionally carried out manually on a project-to-project basis. Techniques often differ from one project to another relying heavily on individual observation since resources at hand often depend on that specific scenario. While in the past it would have been difficult to draw meaningful conclusions through site analysis relying solely on quantifiable information, recent increases of transparency in information tracking and carrying has allowed one to conduct much more complex and detailed analyses of geographical locations through querying public databases.

In order to simultaneously design for various sites with unique urban conditions, scales and dimensions and boundary conditions, one must develop an objective method of site analysis. This thesis strictly leverages public databases that contain update to date information throughout the

Figure 02.

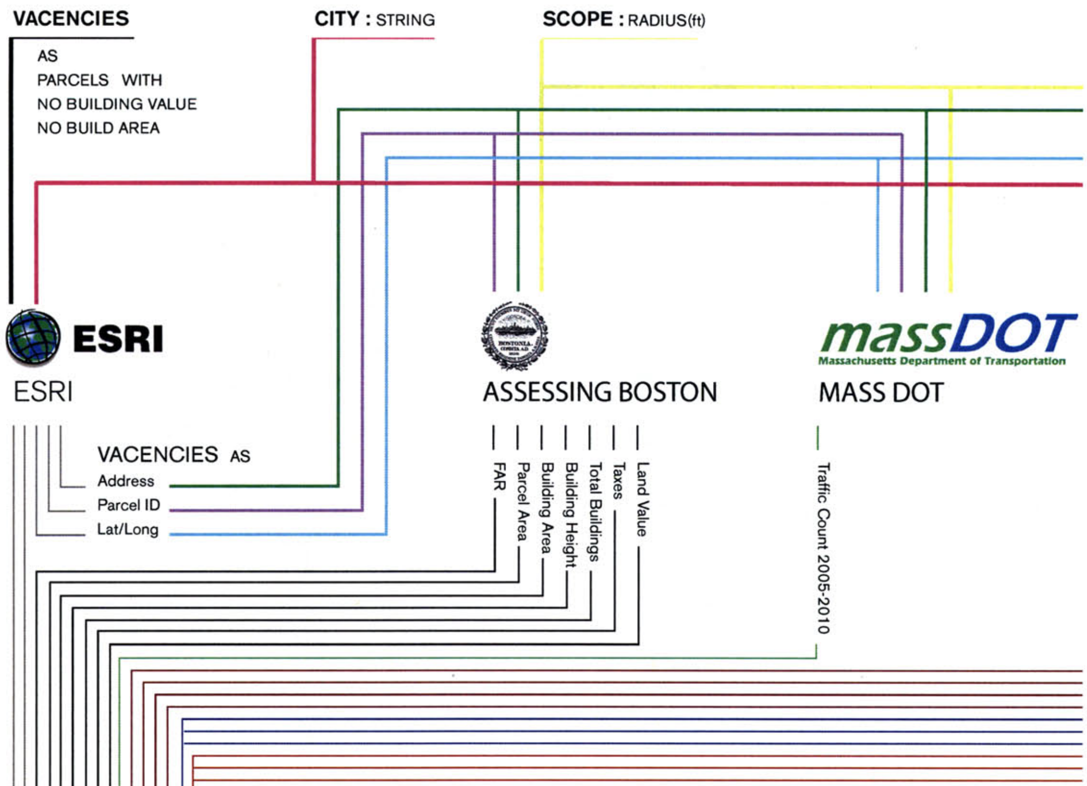
United States for site analysis rather than personal observation. This provides two important advantages; firstly by relying on quantifiable data, rather than personal observation one no longer needs to be in close proximity to the site. Secondly conclusions that we draw from the site are easily compare and contrast different site conditions automatically through computational tools. In order to remain objective, and fast.

Figure 01: Land use map for each case study according to current zoning. The Downtown Crossing case study is indicated by the color magenta and key "DTC". The South Boston case study is indicated by the color cyan and key "SBO"

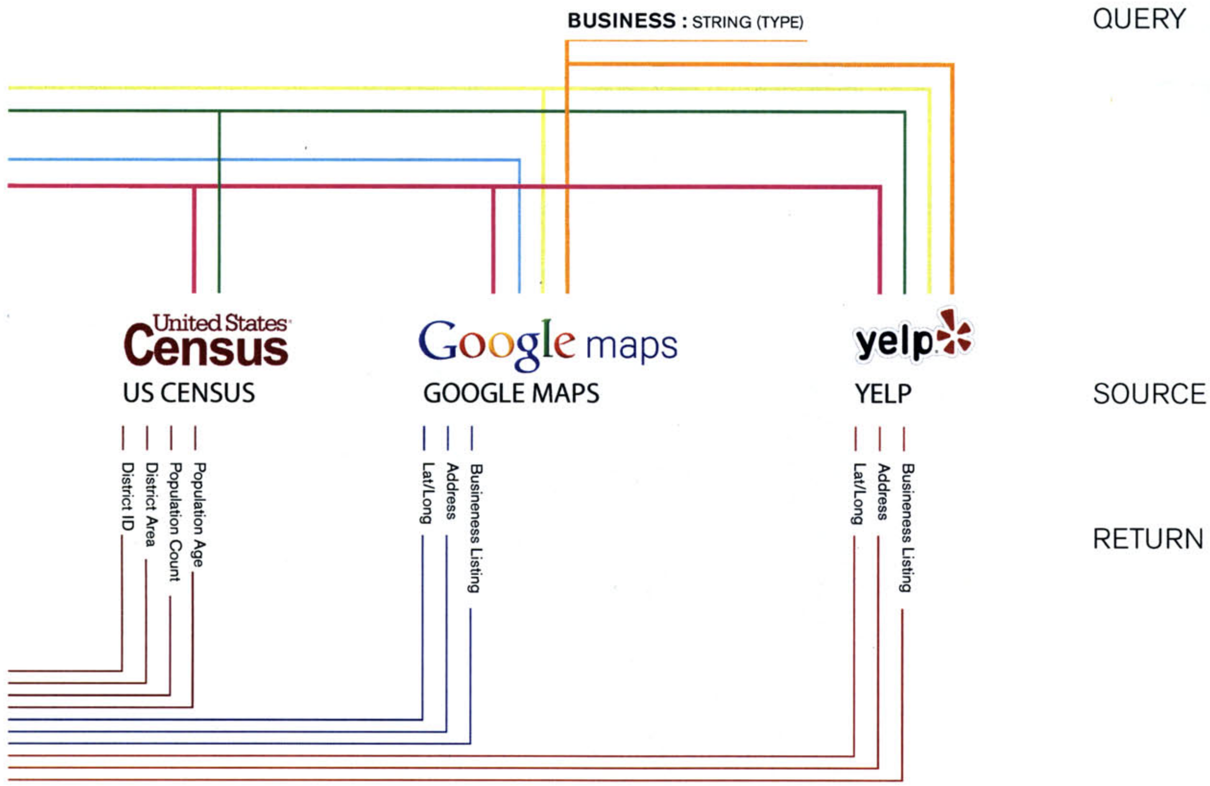
Figure 02: Vacancy figure ground for each case study as parcels returned by the Boston city database.

Protocol

It is important to have an idea about what areas and what data is significant to the application at hand. Since we are interested in vacant parcels that are waiting for development, the protocol begins by defining this condition as a set of attributes. The Boston city database[1] is queried using GIS for parcels with no building value, not defined as public use, and no built area, and returns their geographic location, parcel identification number and address which is imported into a local database.



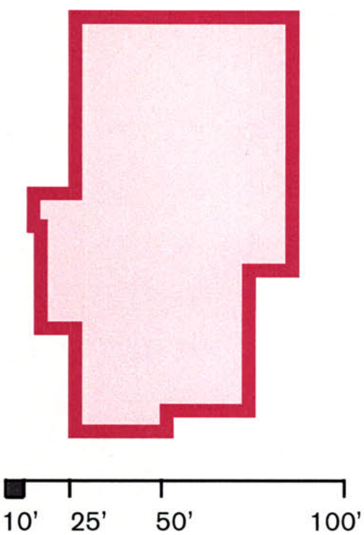
DATA	OPERATION
Parcel Area FAR	FAR * Parcel Area
Land Value 2010 Parcel Area FAR	Land Value / (FAR * Parcel Area)
Total Vacencies Total Buildings Land Value 1990 - 2010	Scale* (Averaged Vacency Rate & Inverse Growth Rate)
Tax Rate (per 1000 ft^2) Parcel Area	Tax Rate * Parcel Area / 1000
City Centroid Lat Long	Distance from City Centroid
Population of District District Area	Mean Population per m^2 Within District
Population Ages Population of District	Mean Population Age Within District
Traffic Count per 24 hours	Mean Traffic Count per 24 hours @ Site
Building Height Total Buildings Building Area	Mean Building Volume
Business Count (Google) Business Count (Yelp)	Total Businesses

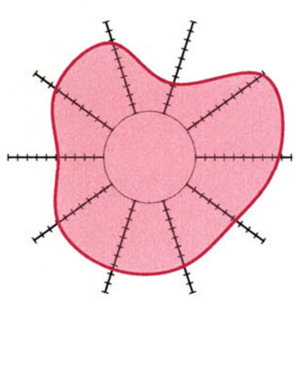


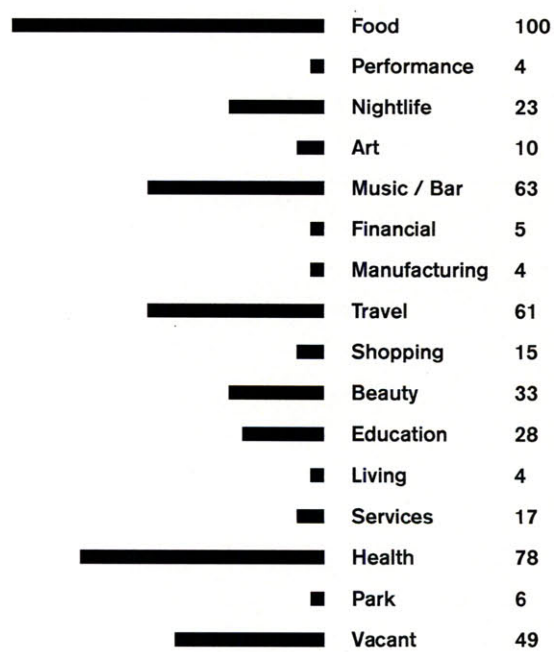
PROFILE

KEY	SCALE	SITE	ACTIVITY	VALUE
1	0-30,000 ft^2	Developable Area	Area Min	0-1
2	0-300,000 $\$/ft^2$	Land Value	Capital	0-1
3	0-20 years	Dormacy	Lifespan	0-1
4	0-1000 $	Carrying Cost	Revenue	0-1
5	0-100 miles	Locality	Locality Need	0-1
6	0-10 person per m^2	Population Density	Capacity	0-1
7	0-50 age	Population Age	Audience	0-1
8	0-20,000 (count)	Traffic Volume	Transient Potential	0-1
9	0-200,000 ft^3	Building Density	Density	0-1
10	0-500 (count)	Commercial Activity	Commercial Potential	0-1

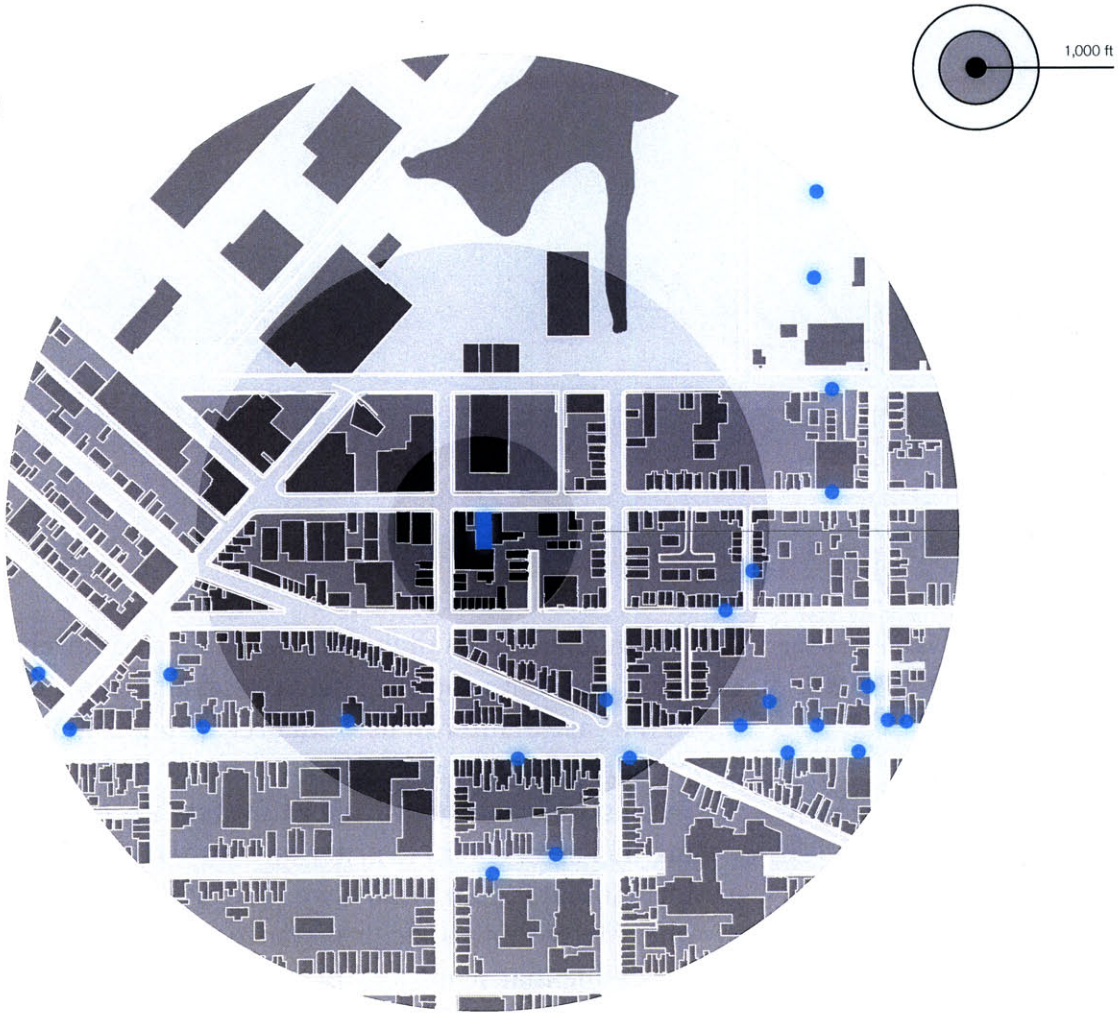
DTC

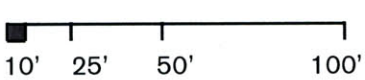

10'
25'
50'
100'

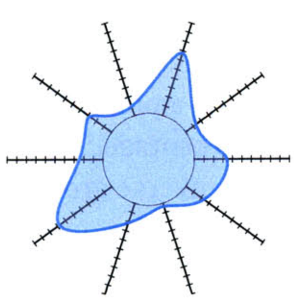


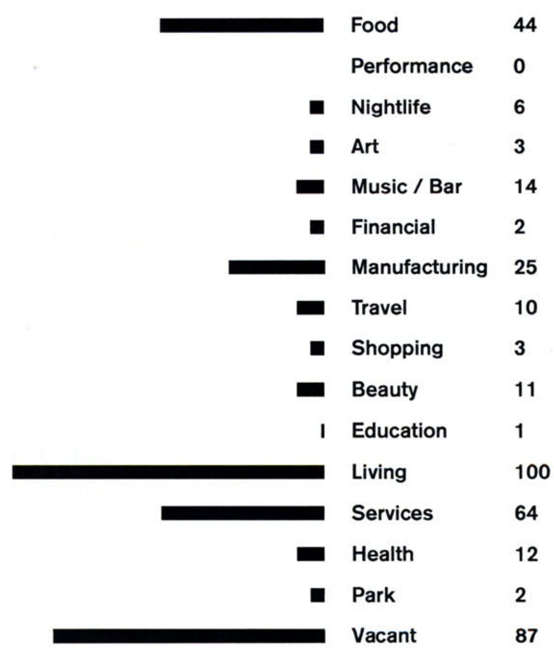

Food 100
Performance 4
Nightlife 23
Art 10
Music / Bar 63
Financial 5
Manufacturing 4
Travel 61
Shopping 15
Beauty 33
Education 28
Living 4
Services 17
Health 78
Park 6
Vacant 49

SBO


1,000 ft


10'
25'
50'
100'




Food 44
Performance 0
Nightlife 6
Art 3
Music / Bar 14
Financial 2
Manufacturing 25
Travel 10
Shopping 3
Beauty 11
Education 1
Living 100
Services 64
Health 12
Park 2
Vacant 87

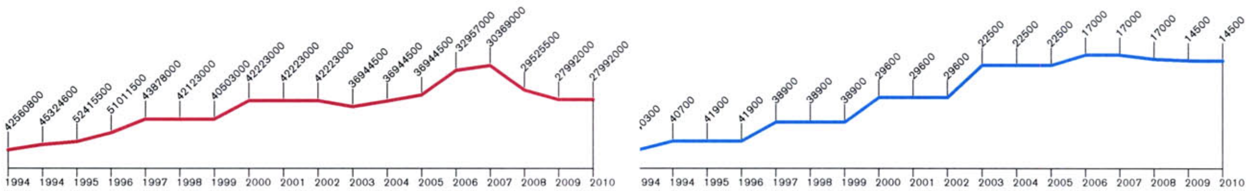


Figure 03.

Figure 03: Land value over time for each parcel, which is used in determining the dormancy for a site.

Figure 04: Site plans for each case study as returned from GIS.

An identifier is then used to obtain a comprehensive a set of data for a specific site(a parcel and its surroundings). In the case of interim use[2] data regarding zoning, development regulations, demographics, traffic flows, business activities and expected vacancy timespans is especially meaningful. Furthermore in order to ensure data is obtained in a format that is comparable we restrict the scope of what we query to within a specific distance of the site. In this case we define that scope as 1000 ft., which is a very centralized analysis that only looks the immediate surroundings of the site. Through a set of python and MySQL scripts which are given the identifier and scope for a specific parcel, information is gathered[3] from the Google Maps API, The Yelp API, GIS Boston, and the US Census and stored in a local database.

Data is then manipulated into a meaningful description of that site through a common language -A set of shared parameters that describe the most important characteristics of any site given our interest. For example the parameter "dormancy" is established, which indicates how long a site will remain vacant. "Dormancy" is defined as the average of both the rate of vacancies within our scope as a percentage and the inverse growth rate in value as a percentage.[4] So if a given parcel has high vacancy rate and high inverse growth rate (i.e. a site in which vacancies in the area are common and it is not growing in value) can be expected to remain

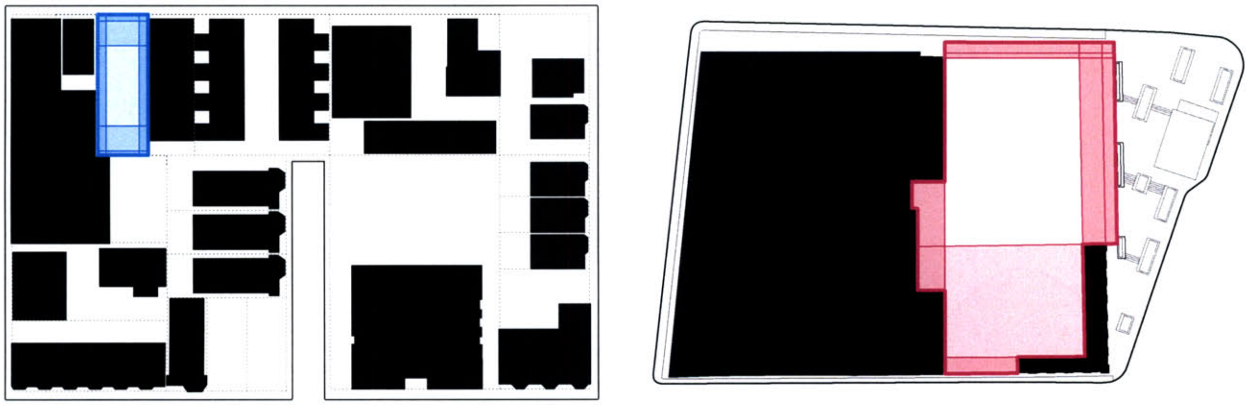
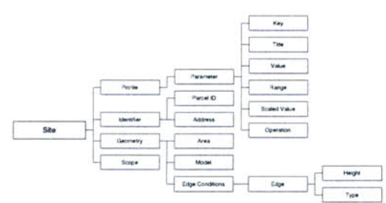


Figure 04.

vacant for some time and returns a high "dormancy" value.

Values such as dormancy whose unit is a percentage are already scaled(i.e. they are any value between 0 and 1). However the values of certain parameters are not and need to be scaled in order to reveal their relative significance. For example "developable area" which is defined as the parcel area multiplied by the floor area ration returns an area in ft^2. Minimum and maximum limits, common to the entire protocol, are established for each given parameter on which all specific sites values fall on. The value of each parameter from a specific site is scaled according to its corresponding range returning a value between 0 and 1. Thus given the limits protocol we can understand if a sites "developable area" value is relatively large or small.

As a result of the first step in the design protocol one has established a database of parcels which meet the criteria of our condition as well as "profiles" objectively describing specific parcels of interest and their surroundings through a common language based on quantifiable data pertaining to ones interests. Since data queried is standardized and the language describing sites of "profiles" is shared one can quickly and objectively compare sites against one another, understand the unique qualities of different sites, and swiftly make decisions for a certain programmatic proposal based on unique values that describe a site.



Outline of the description for a "Site" in the protocol.

DTC

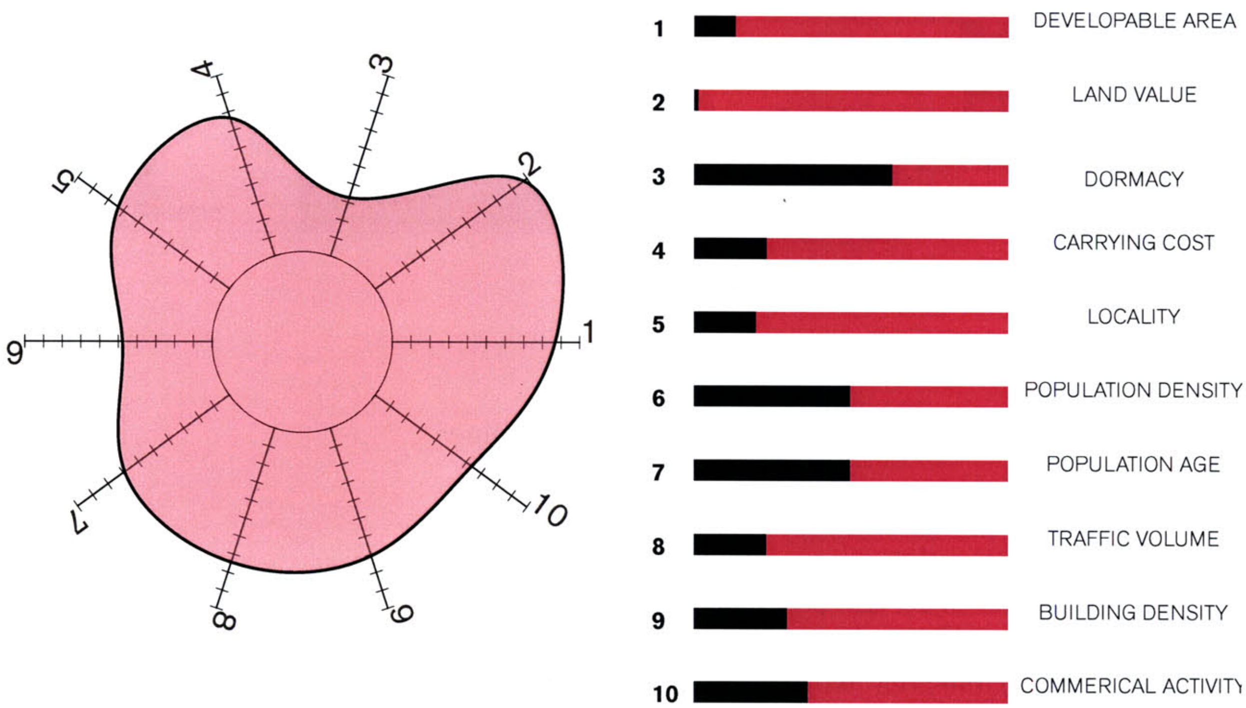
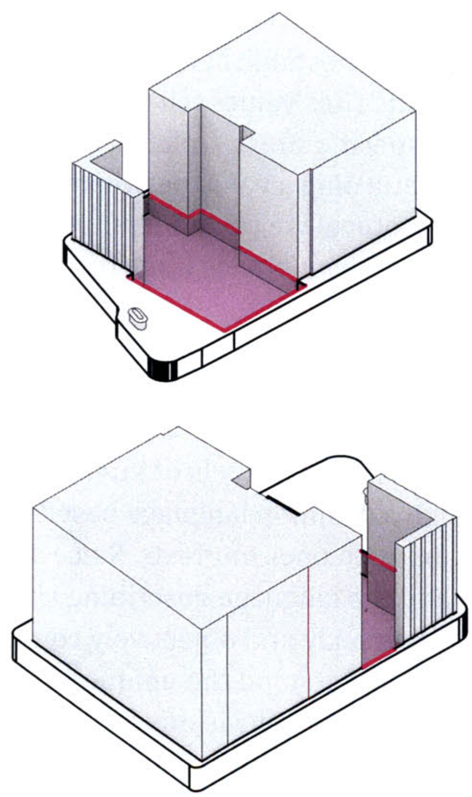
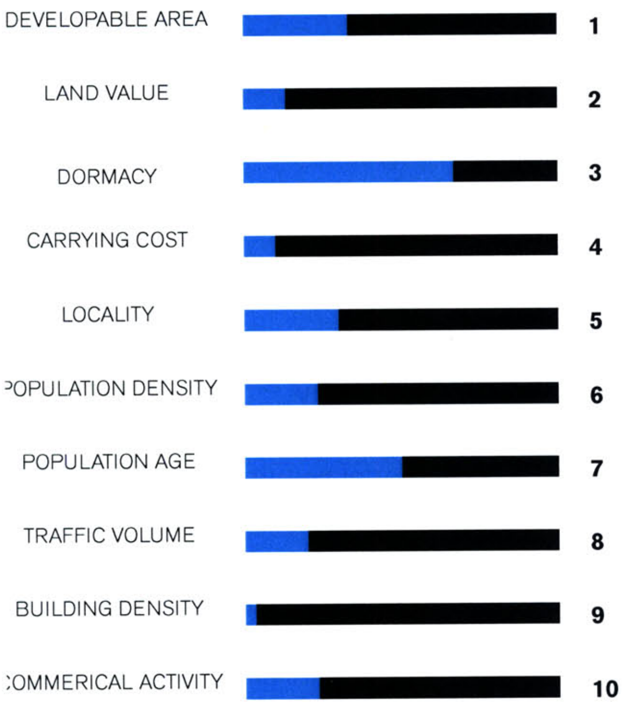
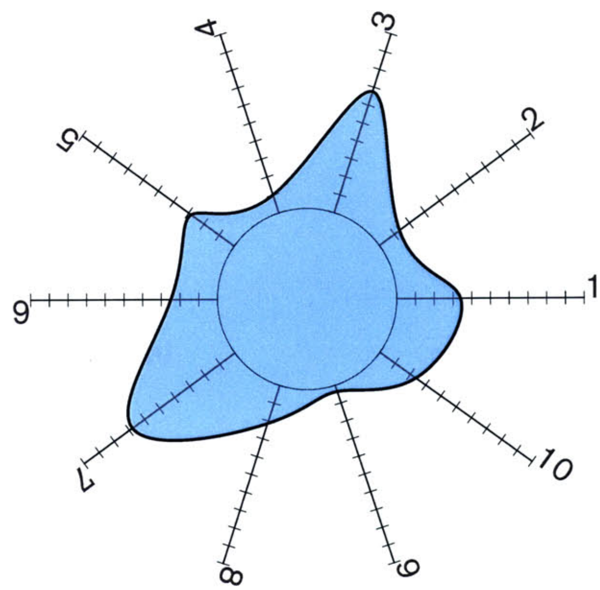


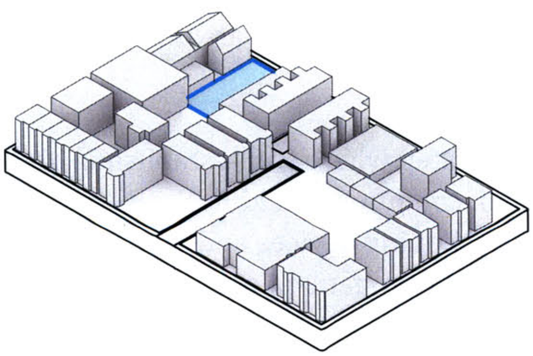
Figure 05.

Figure 05: Scaled parameters for each "Site Profile" with corresponding keys. Site profiles are represented through a unique shape generated by radially distributing each scale of a parameter and then drawing a curve through points where each value falls on that scale. This creates a simple representation of the unique properties of any site, which can easily be compared against others.









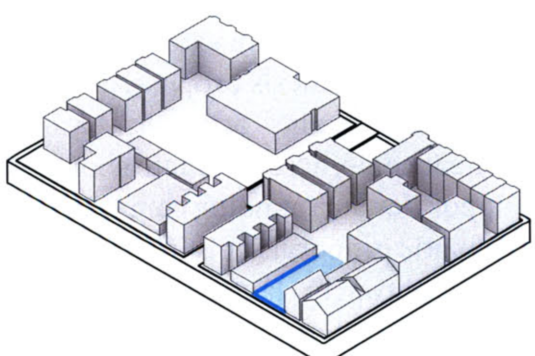


Figure 06: Site geometry and edge conditions as a result of building elevation and footprint data.

Figure 06.

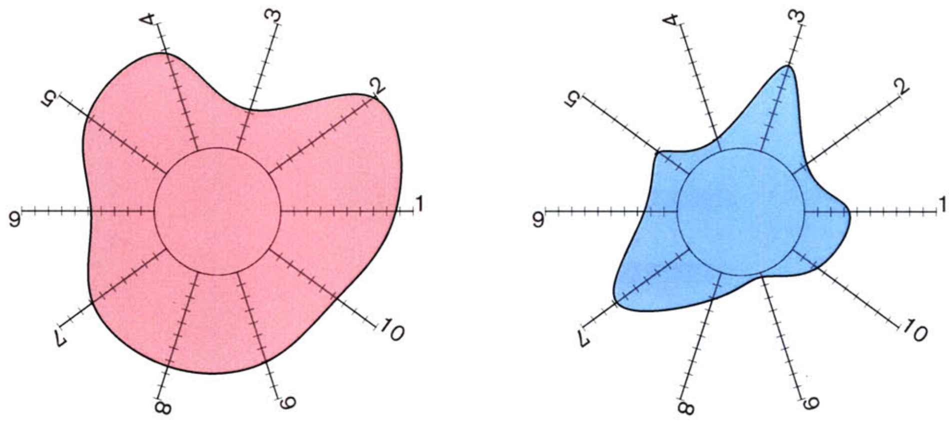


Figure 07.

TYPOLOGY

Introduction - Mixed Use Typology

Typically in architecture, spatial requirements and uses for a building are delivered to the designer in the form of a brief. However, in the case of this thesis which proactively proposes interventions, there is no brief given. it is necessary to find a way to generate unique proposals for different uses to best fit the unique demands of various sites. It is well understood that there is no single use appropriate for any urban context so it is important develop a method to generate programmatic proposals that are unique and appropriate for each site.

Unlike the previous step where well-established data exists regarding urban conditions building uses are very open to interpretation. Zoning devices and real estate property types classify use in very general terms (i.e. residential, industrial, commercial, military etc.) Don't provide valuable descriptions to conceive of specific or alternative programmatic scenarios. Rather than depend on external descriptions of programs and uses, this thesis proposes to establish its own suite of alternative programs "activities" based on their ability to generate income, accommodate short lifespans and provide support for surrounding communities. In order to test programmatic proposals, it is important that "activities" are described through a language that is compatible with previously established "profiles" of sites.

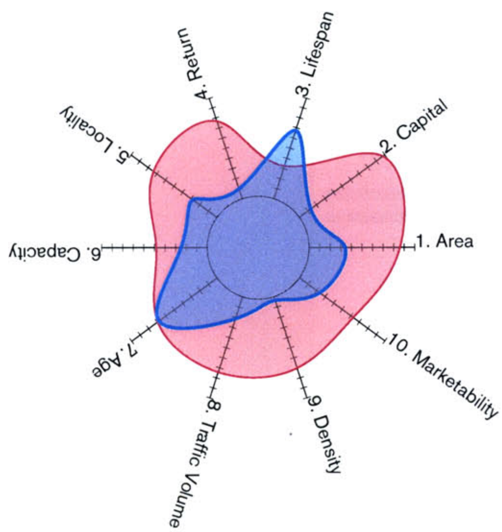


Figure 08.

Protocol

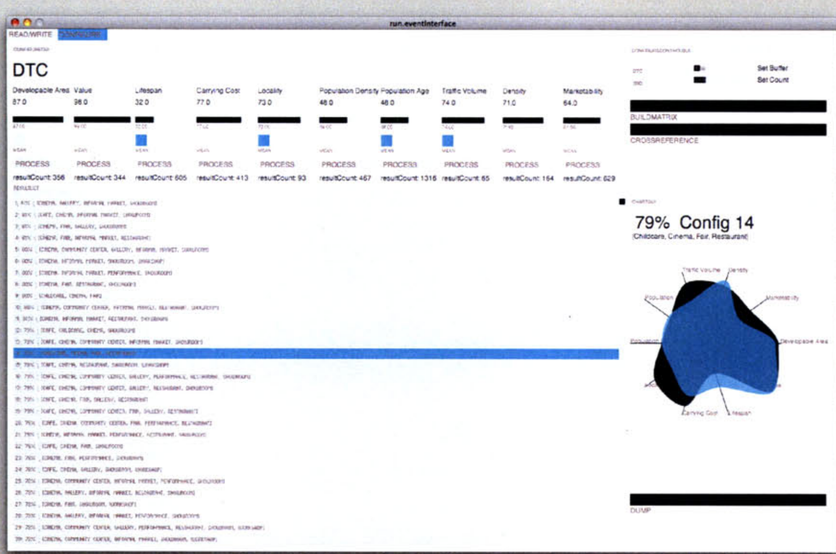
The site analysis in the previous step of the protocol has established an objective framework for describing urban parcels in sets of parameters for a given site, which describes attributes that are important to a specific condition. How can one leverage that data collected in order to make informed decisions about what an appropriate use for that site would be?

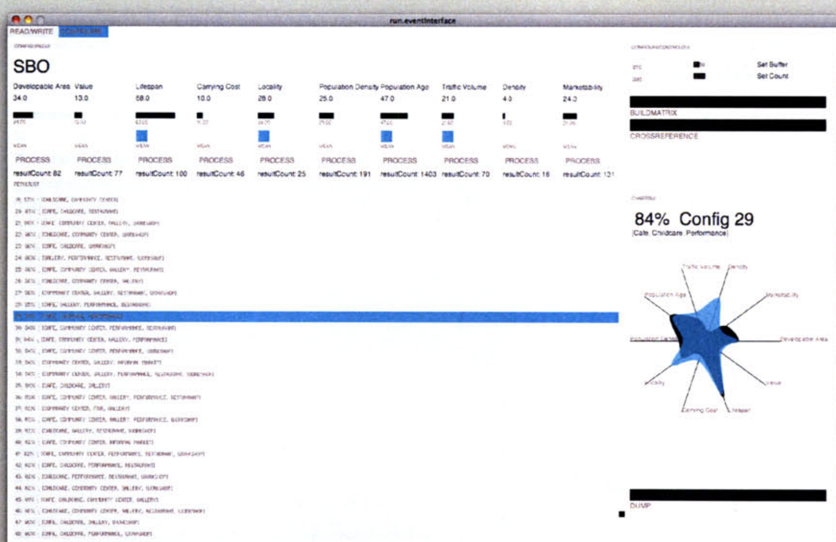
Figure 07: Resulting Site Profiles from previous step of the protocol.

Figure 08: Overlaid Site Profiles, displaying differences between the SBO Site and the DTC Site.

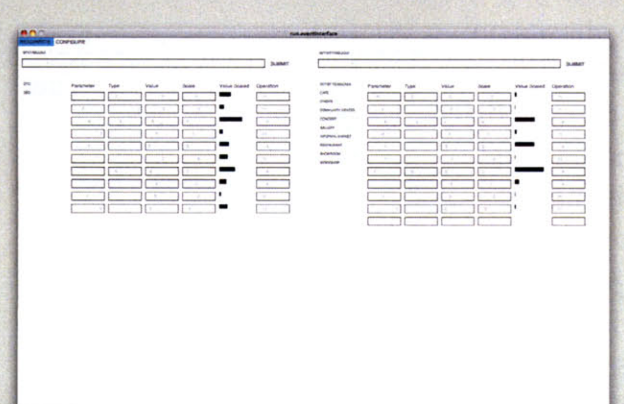
In order to reach unique programmatic proposals for a specific site, data collected from site analysis is measured against a suite of activities. A set of 20 unique activities is defined, from which programmatic typologies can be composed. Each of these activities are rated according to different aspects on a scale of 0-1 based on aspects that correspond to each parameters that are used to describe a site. These activities are rated based on ones own intuition. For example each activity is given a "lifespan" rating based on its life expectancy and infrastructure requirements, this rating corresponds to the "dormancy" parameter of a site that describes how long that site is expected to remain vacant. By matching similar values of corresponding site parameters and activity ratings one can determine how suitable a certain use is for a certain site. While any designer using the protocol has the freedom to name and rate their own brief for the purpose of this thesis chooses activities that are suitable for interim use.

ACTIVITY INTERFACE

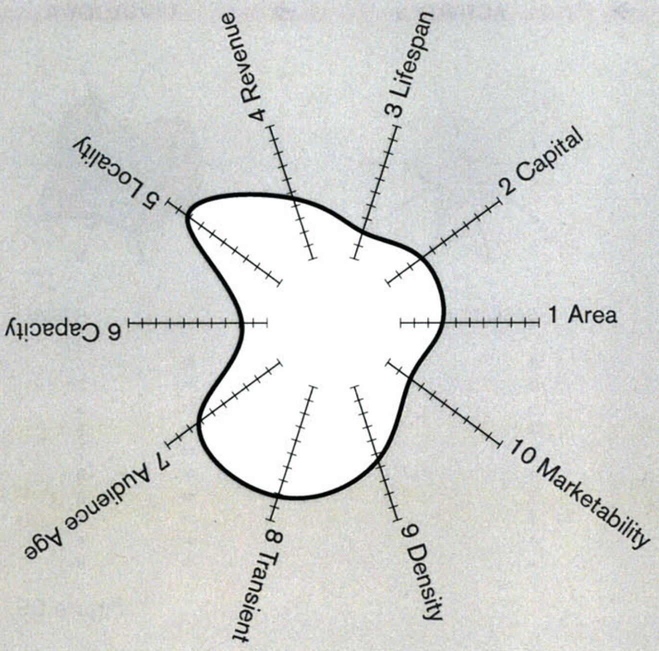




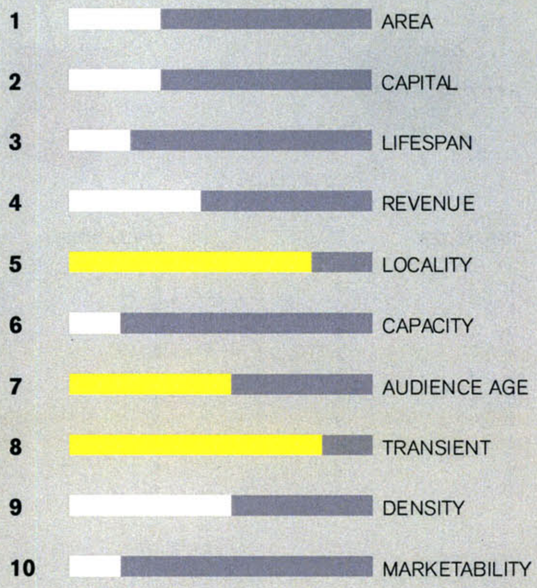
Interface for generated mixed-use typology proposals based on the best fit of activities from a suite for a given site.



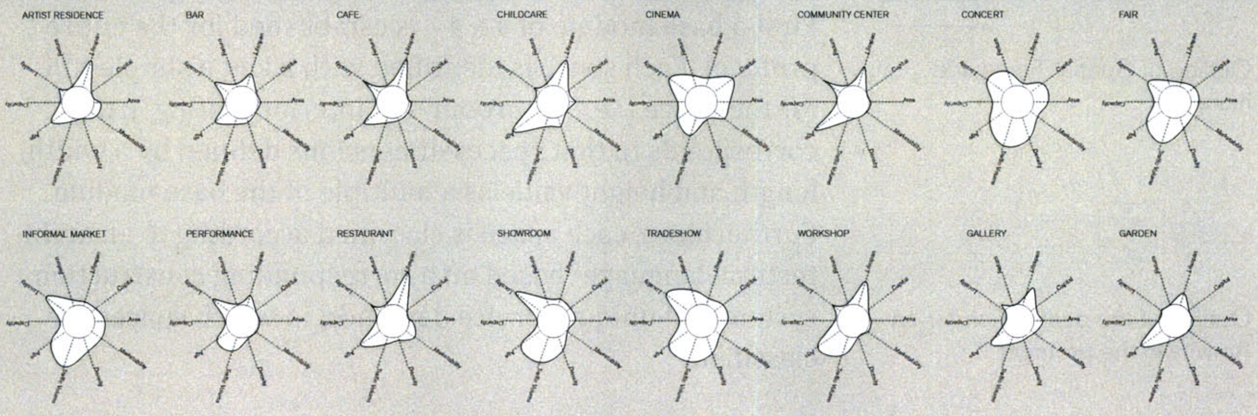
ACTIVITY PROFILE

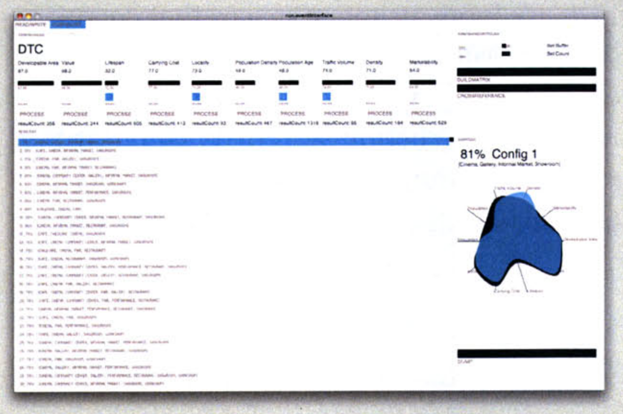


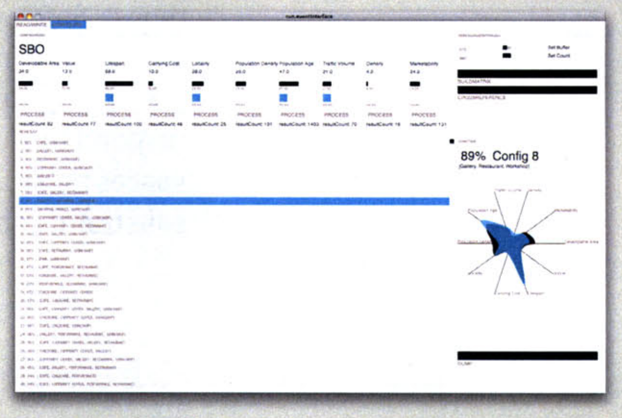
TRADESHOW

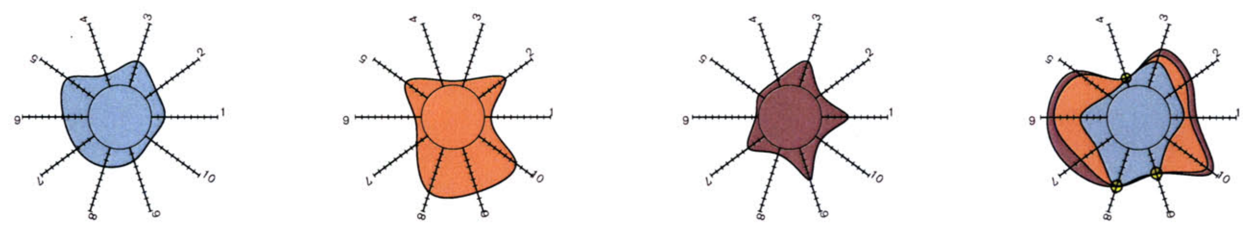


ACTIVITY SUITE



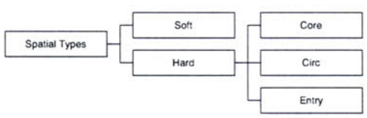




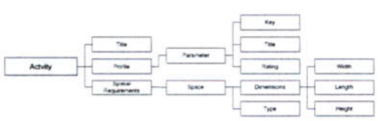


PARAMETER	VALUE	OPERATION	VALUE	OPERATION	VALUE		RESULT
1	2	+	1	+	4	=	4
2	2	+	6	+	1	=	5
3	4	+	1	+	5	=	3
4	2	x̄	1	x̄	1	=	6
5	6	+	4	+	1	=	7
6	4	+	1	+	1	=	9
7	3	x̄	2	x̄	4	=	8
8	4	x̄	6	x̄	1	=	6
9	2	+	7	+	5	=	4
10	1	+	7	+	1	=	9

Figure 09.



Outline of Spatial Types and hierarchy



Outline of the description for an Activity in the protocol

A set of spatial requirements is defined for each activity representing the actual spatial needs of an activity. First a base module of 4 x 4 ' is established for the entire protocol. Each space is identified with a key, a simple title for the space (i.e. "bathroom" or "interior seating"), that corresponds to that spaces dimensions defined by a width, length and height value as a multiple of the base module. Furthermore, each space is classified according to an architectural language[1] based on a corresponding construction system and unique service demands, in which spaces are classified.

Within this architectural language there are two spatial types, "Soft" which are large, primary spaces that correspond to a tensile construction system, and "Hard"-which are finer grained, secondary and service spaces that correspond to a modular construction system. Within Hard spaces there are three sub-types, which represent special constraints about that specific space. "Entry" which will

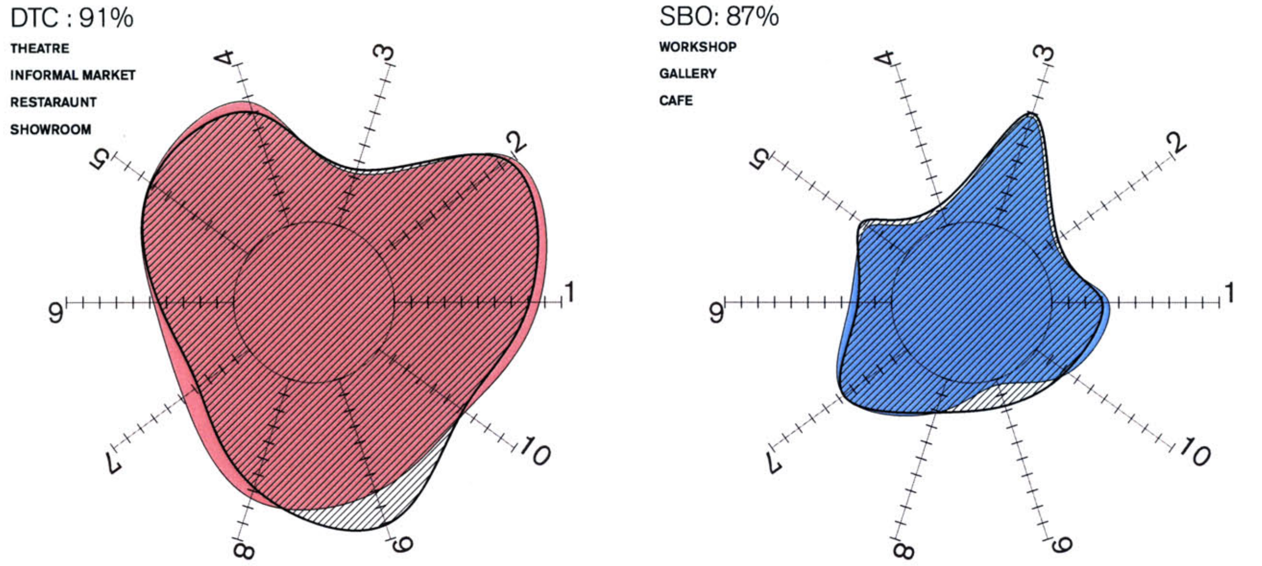


Figure 10.

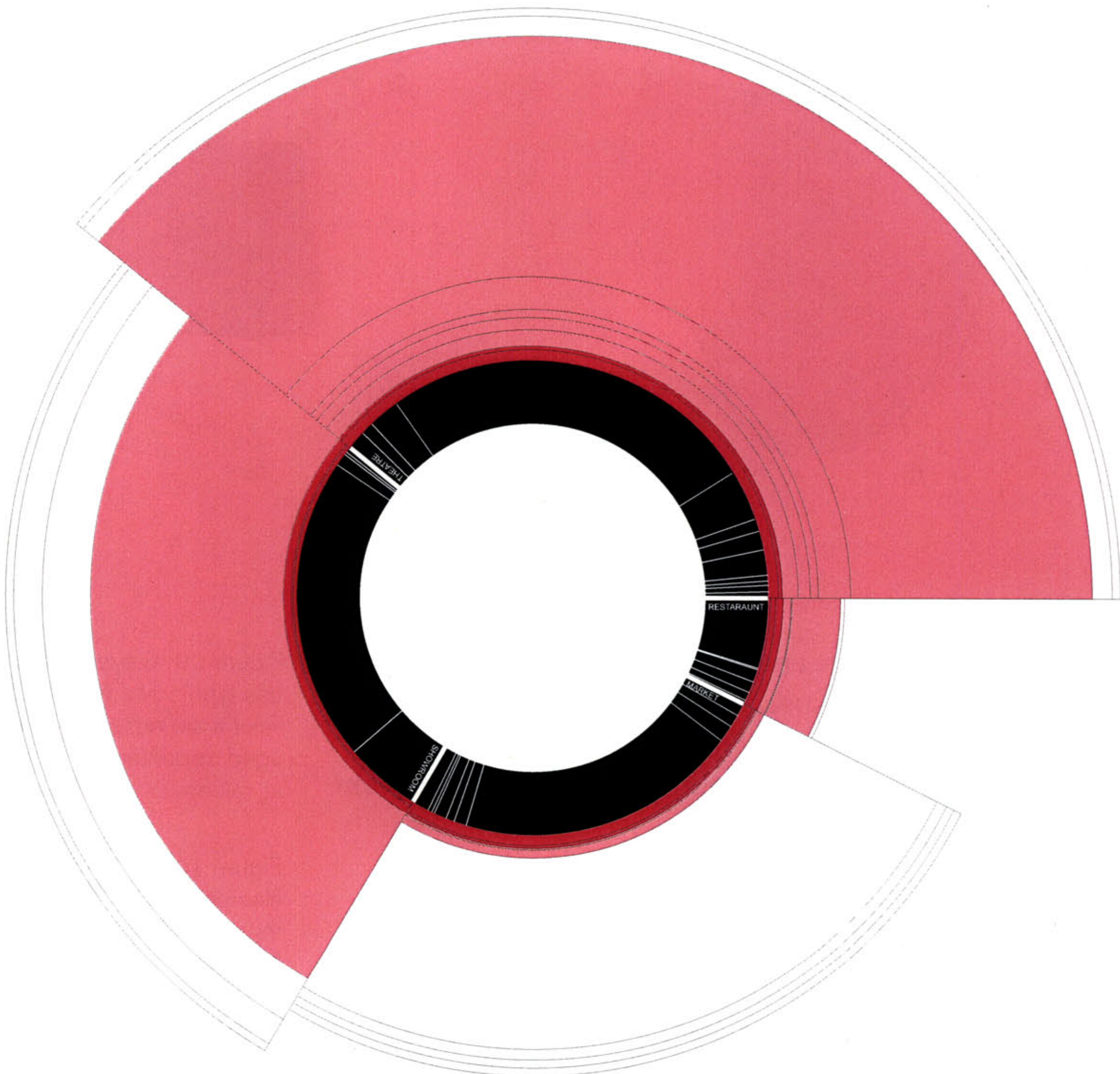
always be the first space entered in an activity, "Core" which are spaces that require special building services such as plumbing or environmental conditioning, and "Circ" which are vertical circulation spaces which connect activities from level to level.

Figure 09: Generation of Mixed use typologies where parameter values are either summed or averaged depending on type to arrive at values for typology.

Figure 10: Chosen Activity Profiles and ratings as generated by the protocol overlaid on top of Site Profiles

Given a suite of activities, and site with corresponding parameters, an algorithm is used to determine the best combination of activities for a certain site. This algorithm is based on the subset sum problem. For each parameter of a specific site, every possible combination of corresponding values within the suite of activities is returned and ranked based on how closely they align to the value of the corresponding site parameter, resulting in a set of activity combinations ordered and ranked by how suitable they are for the given site. Through this step, one can now choose a unique mixed-use programmatic proposal or "Typology" which is best for that site.

TYPOLOGY PORTRAIT



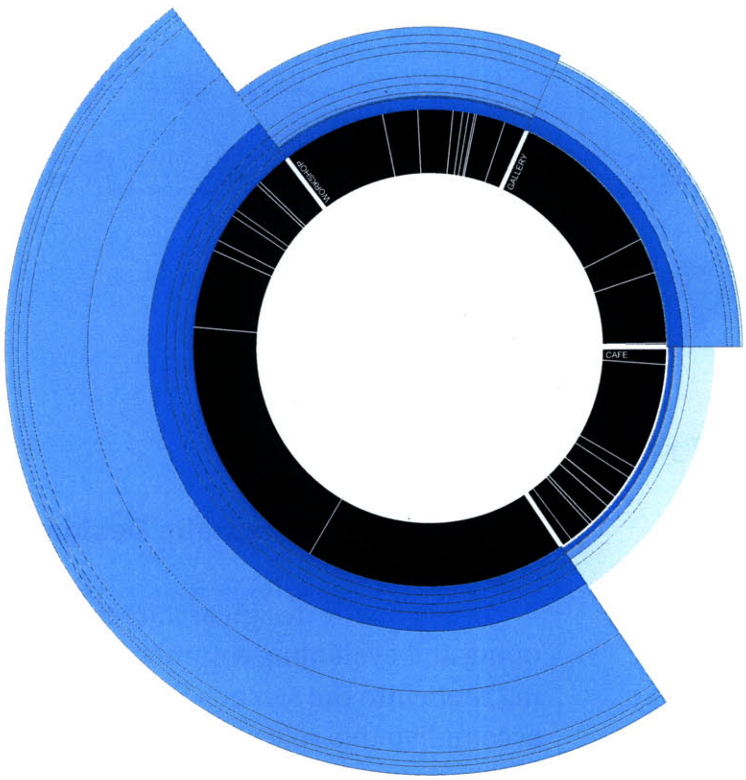
DTC

THEATRE

INFORMAL MARKET

RESTARAUNT

SHOWROOM



SBO

WORKSHOP

GALLERY

CAFFE

TYPOLOGY PORTRAIT

CORE SPACES

HARD SPACES

SOFT SPACES

OPEN SPACES

SBO

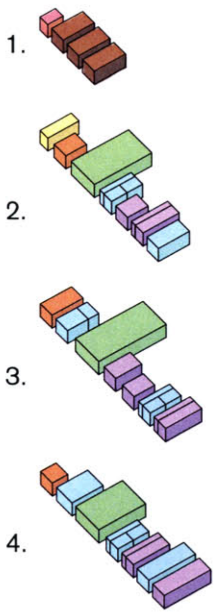


Figure 11.

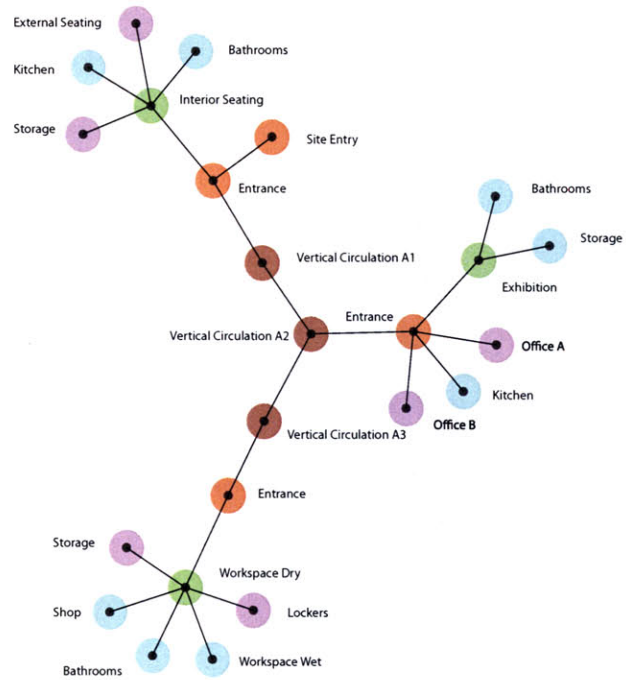


Figure 12.

CONFIGURATION

HARD SPACES
CORE SPACES
CIRC SPACES
SOFT SPACES
OPEN SPACES
ENTRY SPACES

Figure 11: Set of Spaces and corresponding volumes based on dimensions for the SBO Site.

1. Base
2. Cafe
3. Gallery
4. Workshop

Figure 12: Adjacency graph generated through interface for the SBO Site. one can define and adjust their own desired adjacencies on a Site by Site basis.

Introduction - Schematic Design

In schematic design architects are charged with developing and evaluating a number of configurations bringing them into the site at a diagrammatic level. In order to accomplish this rules and constraints for ordering spaces and bringing them into a coherent whole are established. Furthermore architects balance a set of values or goals that they have in the project and tries to achieve all of them. This phase is experiment, different systems are changed, rules are tweaked and compromises between values are established until an acceptable solution is reached.

Architects must develop a method for the ordering and arrangement of spaces, in which one has a set of objectives in the project, and must juggle their value and ability to meet them. When the method is designed in a way in which one can easily and explicitly define those values, whether they be environmental, structural, or formal. If the rules were embedded and based on literal values, one can then tip the scales in order to bias one objective over another based on personal values while iteratively shifting constraints and position.

DTC

1.

2.

3.

4.

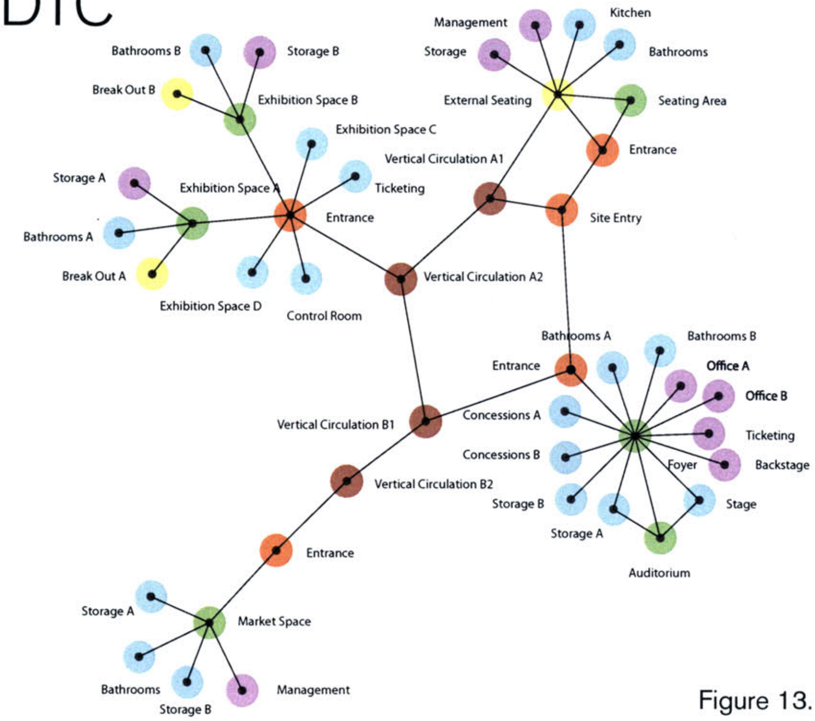


Figure 13.

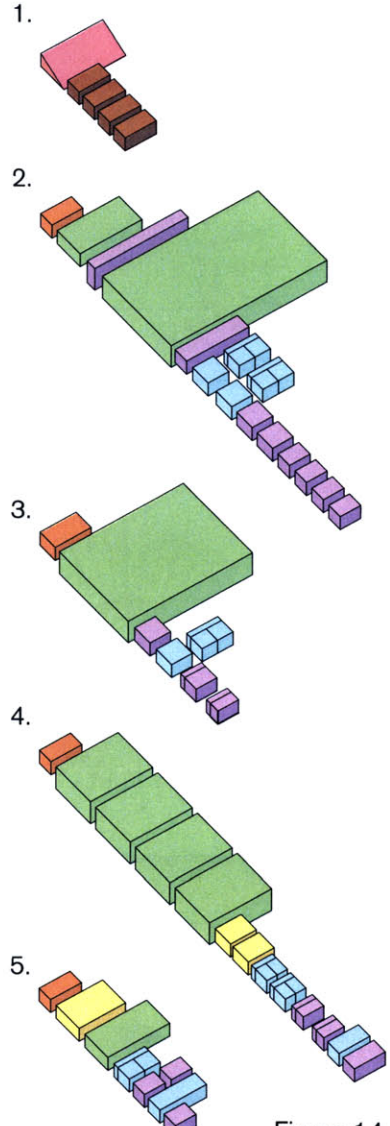


Figure 14.

By designing an environment for which rules are embedded, rather than simply making decisions according to them, allows one to rapidly iterate through possible design solutions based on different values . For set of spaces and an explicit set of constraints and objectives schematic design is enhanced through the use of computational methods, namely simulated annealing, by both compressing its timespan and allowing spaces and objectives to be dynamic.

Protocol

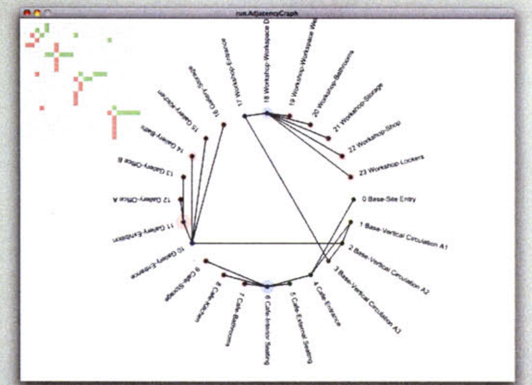
A site's dimensions (i.e. footprint, FAR and edge conditions) and corresponding typology (programmatic proposal and set of spaces), which have been established in previous steps, is not enough information to produce a coherent and functional scheme. A set of shared spaces and adjacencies needs to be defined in addition to this in order to organize these elements into a configuration on the site. Buildings of mix used require shared spaces such as lobbies, entryways, and vertical circulation. A "Base" activity, which consists of the spaces that will connect separate activities into a single

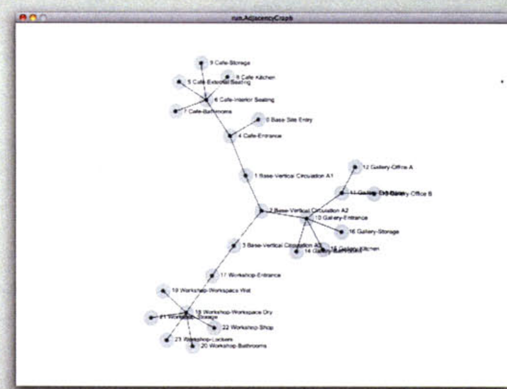
Figure 13: Adjacency graph generated through interface for the DTC Site one can define and adjust their own desired adjacencies on a Site by Site basis.

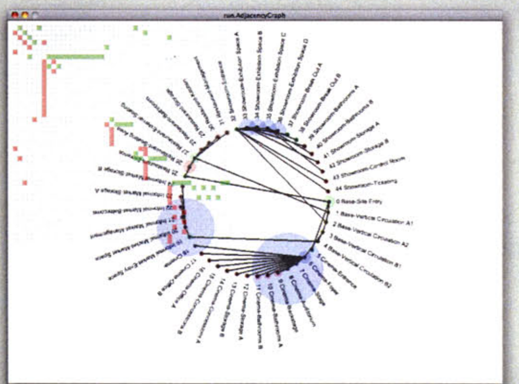
1. Base
2. Theatre
3. Informal Market
4. Showroom
5. Restaraunt

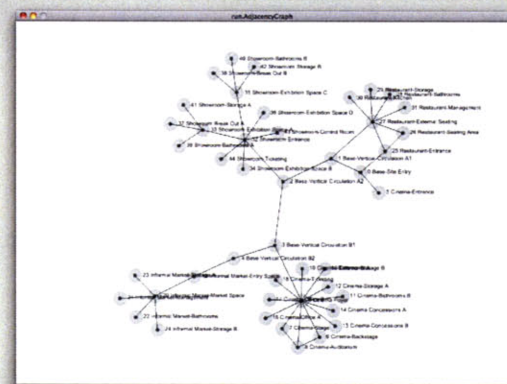
Figure 14: Set of Spaces and corresponding volumes based on dimensions for the DTC Site.

ADJACENCY INTERFACE

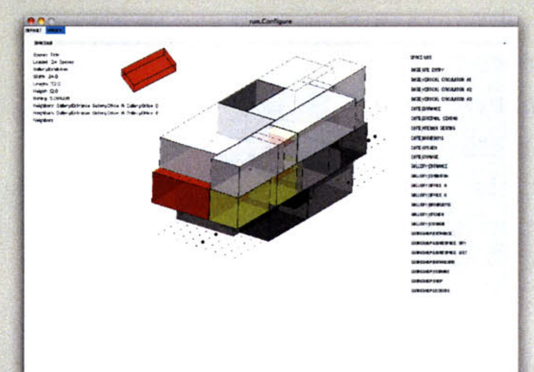


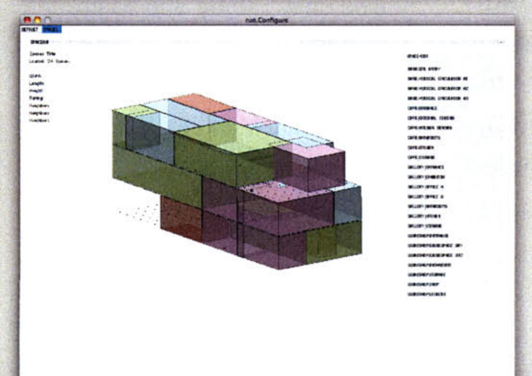


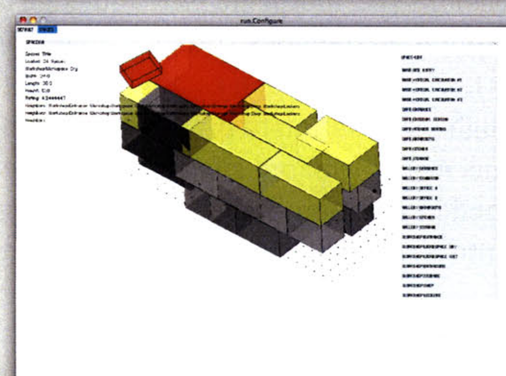




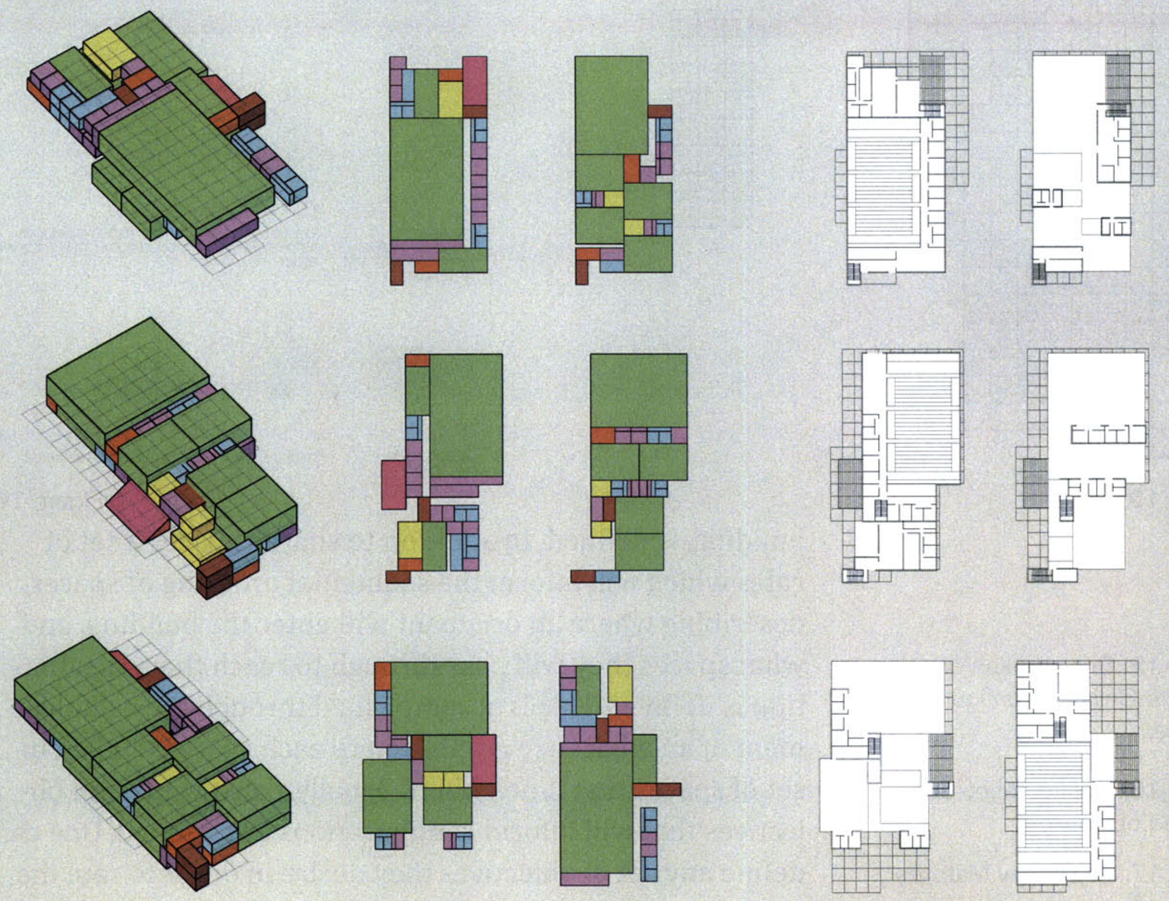
CONFIGURE INTERFACE



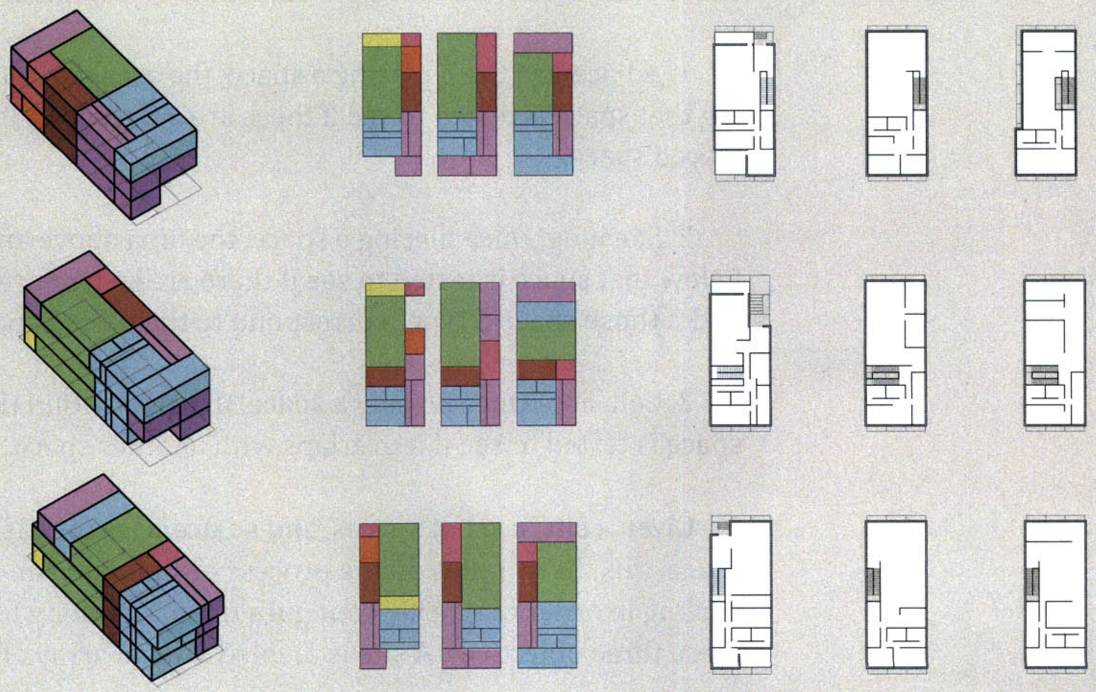




DTC CONFIGURATION ITERATIONS



SBO CONFIGURATION ITERATIONS



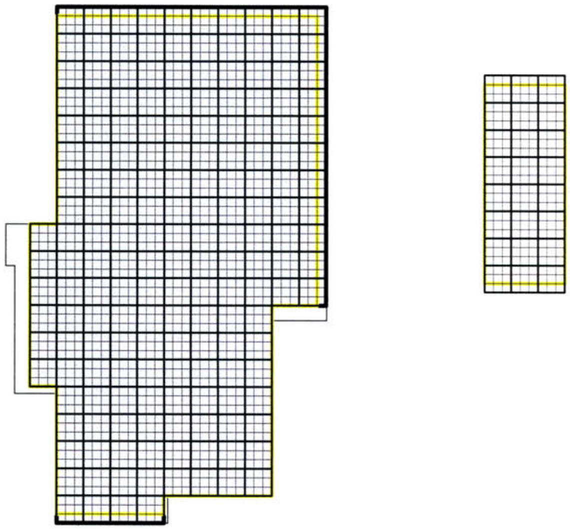


Figure 15.

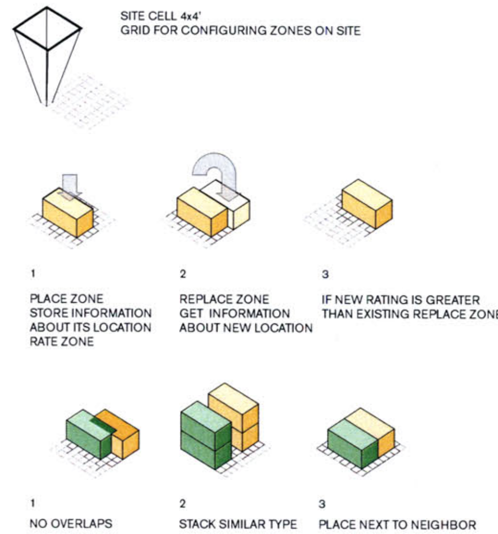


Figure 16.

Figure 15: Sites broken down into Site Cells for configuration of Spaces.

Figure 16: Configuration operation and objectives.

Figure 17: Adjacency Matrixes informing adjacency objective.

Figure 18: Set of Spaces with dimensions for configuration.

building, is defined. In addition to shared spaces a set of rules which will inform the sequential ordering of spaces, describing where an occupant will enter the building, and what spaces they will pass through to reach there destination is defined. This is accomplished through the establishment of an adjacency graph, where each space is linked to set of spaces that it neighbors. Finally, constraints and objectives that will inform configurations are defined. One can define any set of objectives they desire in order to rate the placement of a space on, furthermore one can increase or decrease their significance in order to bias a specific objective. In this thesis, three simple objectives are defined.

1. Adjacency: Once placing a space, the area surrounding that space is tested to see if there are adjacencies to the placed space.

2. Stacking: Once placing a space, the area above and below that space is tested to see if there are spaces present and if those spaces "type" correspond to the placed space.

3. Collision: Once placing a space, the area within that space is tested to see if it overlaps with another space.

Given a site, a set of spaces, and adjacencies for each space, this thesis relies on the process of simulated annealing in order to quickly configure them according to these three objectives. A site is divided into an array of cells

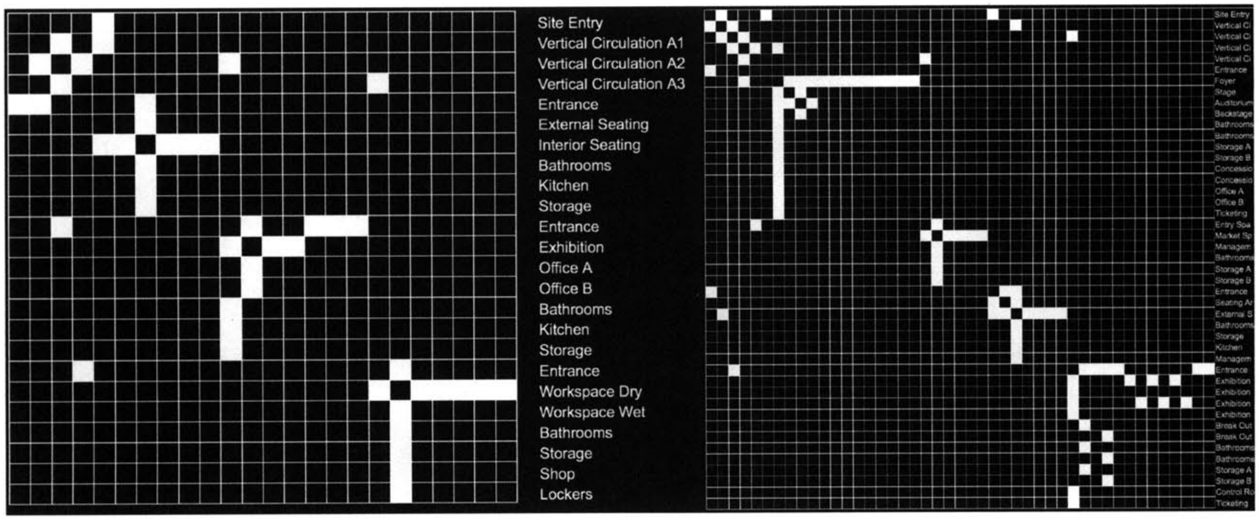


Figure 17.

according to the established base module (4'x4'). A space, defined as a rectangular box with corresponding dimensions, is placed in set of these cells at random. That space is then rated based on the three established objectives. For adjacency, if a neighbor is found the rating will increase, if a space is found it stays the same, if it finds nothing it will decrease. For stacking, if a space being rated is a core, and a core is found above it, the rating will increase, if a space is found above or below it the rating will stay the same, if nothing is found it will decrease. Cells within which the space is placed contain another space its rating will decrease, if no overlapping space is found, the rating will increase. The individual ratings for each objective are summed to create the spaces overall rating. Furthermore one can change the values by which each objective rates a space to optimize for one objective over another. That space is then moved temporarily to another set of cells at random, rated again, and if the rating of its temporary location is higher than its current location that space is moved, if not it remains in its place. This is repeated throughout the entire set of spaces, for a specified number of cycles. As spaces ratings become higher, the degree of randomness by which spaces are placed is decreased. After the number of cycles has run a geometrical configuration of spaces on a site is returned and can be saved. One can run this processes repeatedly to rapidly arrive at different configurations of the same spaces and site.

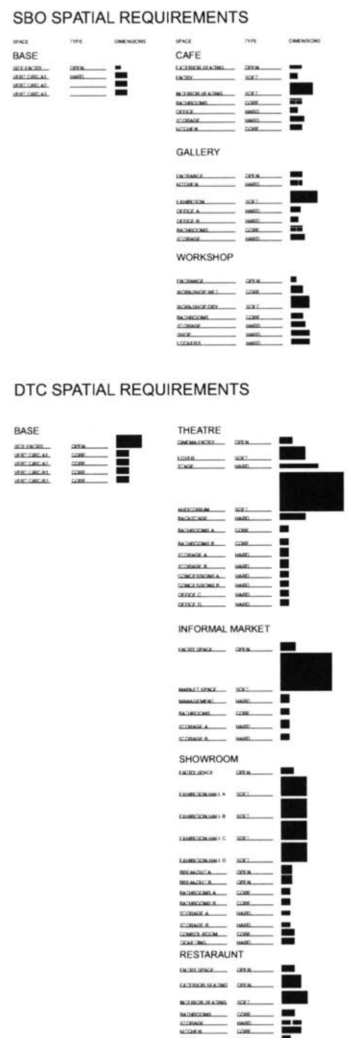
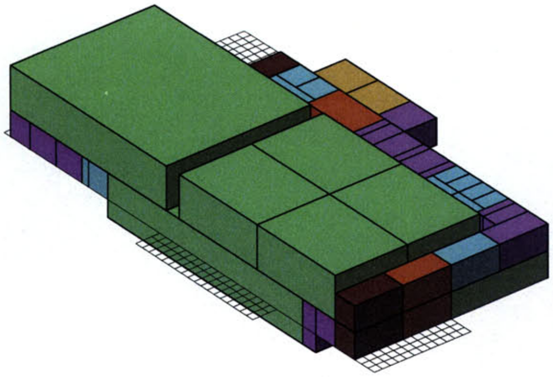
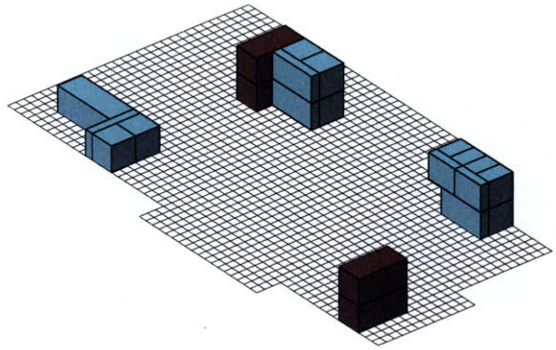
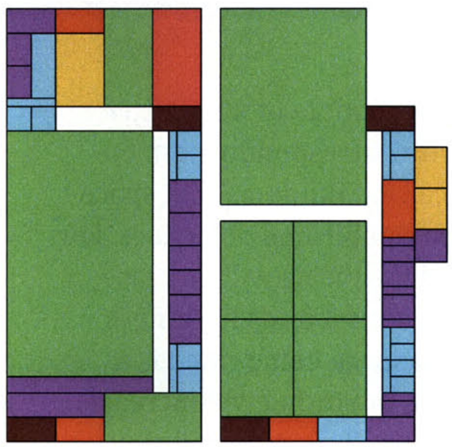


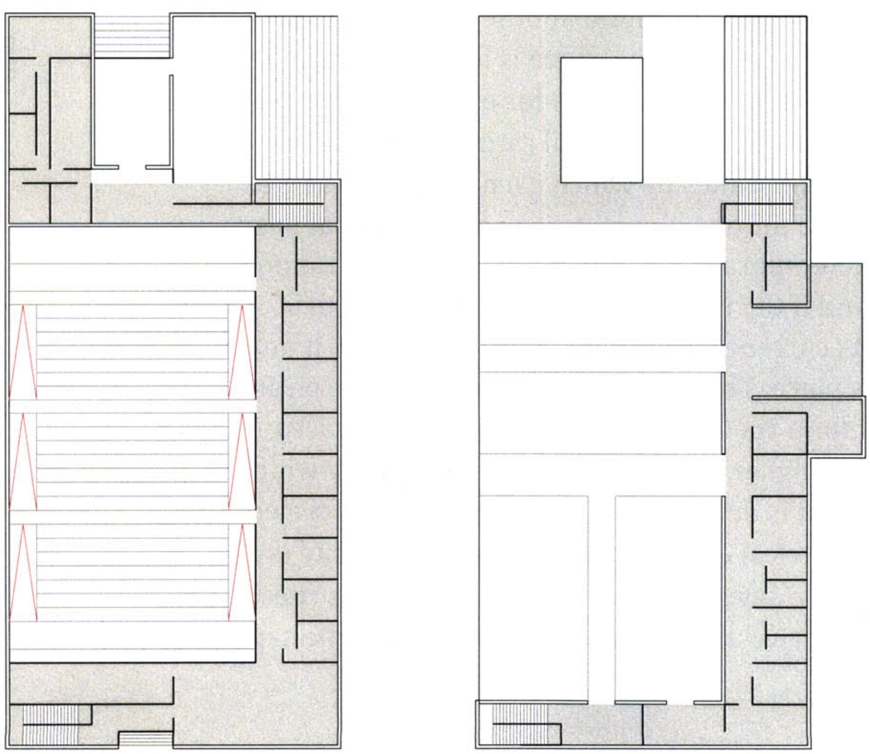
Figure 18.

FINAL CONFIGURATION









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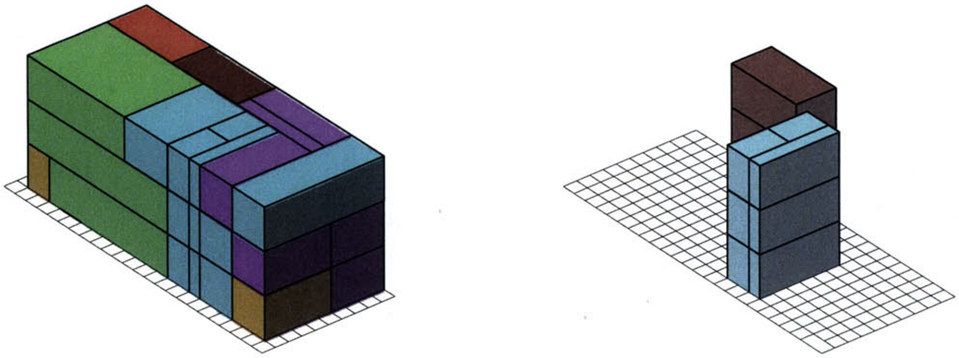
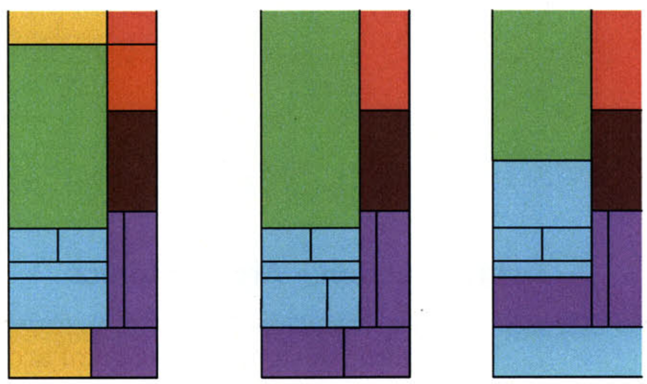
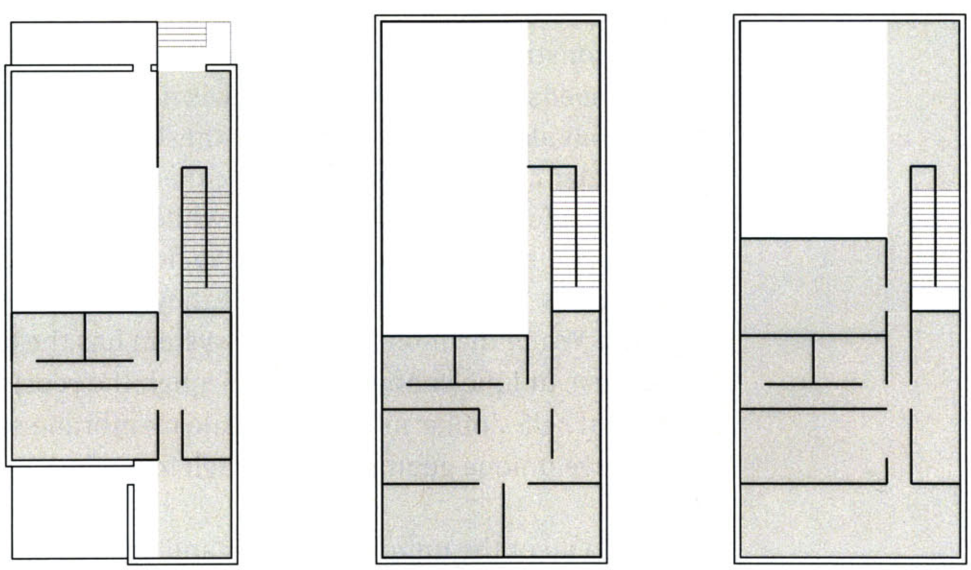






SBO

PARTS

Introduction - Architectonics

Tectonic design, the design of architecture as pertaining to its construction and materials, is often based on established construction strategies, organized around specific material systems (i.e. wood framing, pre-cast concrete, curtain-wall etc.) with different consequences on a building's performance. One must commit to a material system and construction strategy appropriate for particular goals and needs of a project. Flexibility is not only a formal problem but also a tectonic one. This thesis takes advantage of modular construction and tensile membrane structures, which allow for physical change while requiring minimal time and effort, In order to achieve flexibility in design solutions. While both are flexible they behave very differently. While the modular design system has the ability to achieve unique configurations through the reorganization of self-similar modules, tensile membrane structures achieve unique geometries through form finding.

To meet the unique demands and desires of various sites and spatial configurations, a tectonic language is established by defining of a kit of dynamic parts in which

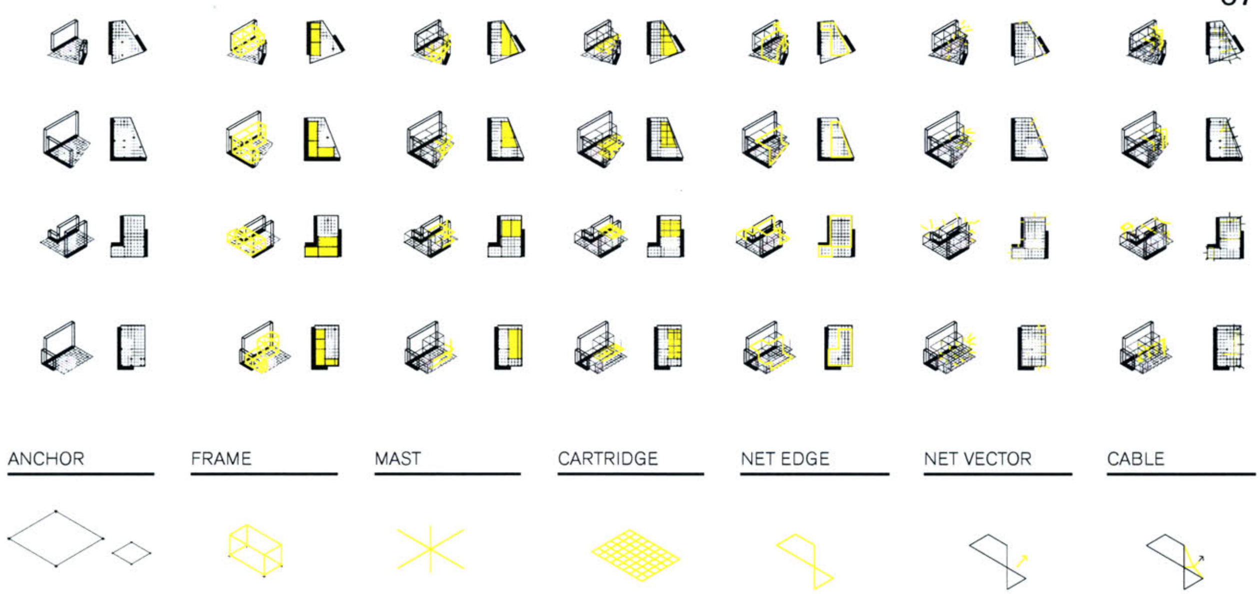


Figure 19.

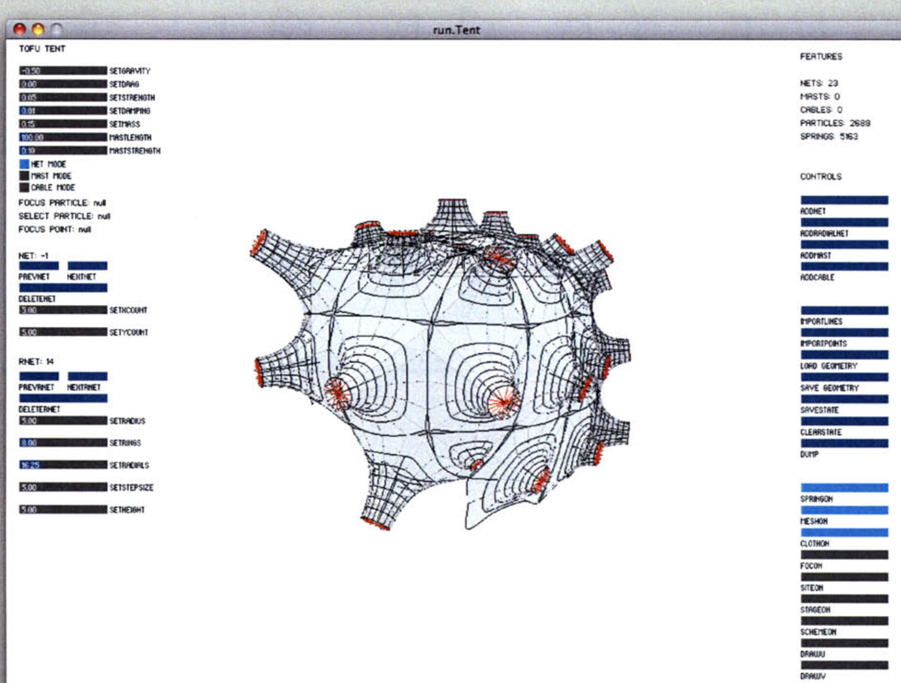
Figure 19: Axis types for protocol with application tests on various site geometries.

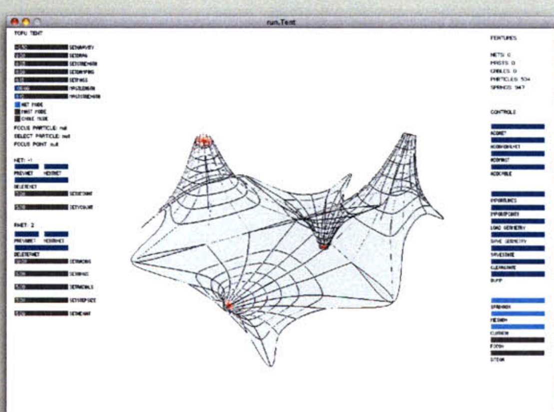
each part performs a needed function within the overall assembly. The number, position and orientation of parts are governed by regulating geometry in a digital model. By manipulating regulating geometry, and part definitions one can quickly alter the characteristic of the assembly. Further more, relationships are specified between the tectonic language and the previously established spatial language, ensuring the fluid translation of spatial configurations into tectonic assemblies.

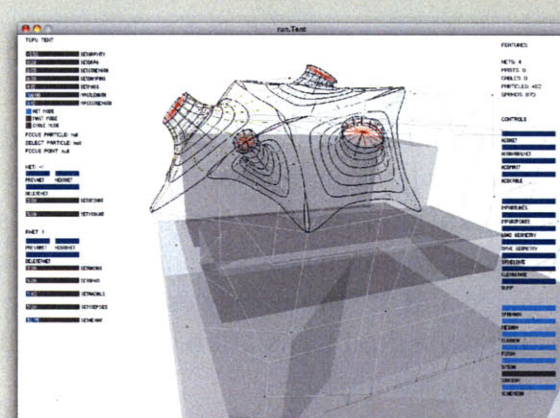
Protocol

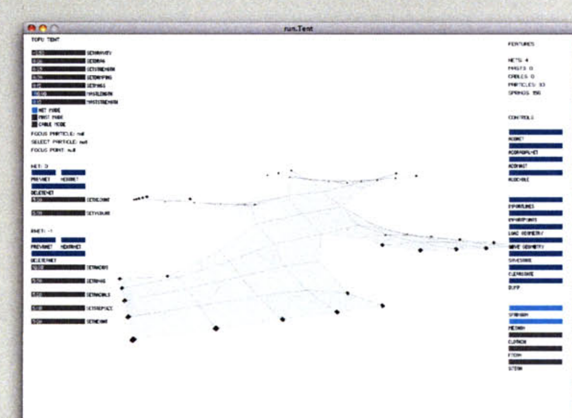
Each volume within a configuration not only represents a space and part of an activity but is also linked to information about its corresponding building system based on its type. Soft spaces indicate that space is constructed according to a tensile membrane system, while Hard spaces indicate a Modular building system. These two systems perform very differently and require different kinds of methods in constructing them, so they are separated and assigned different roles. Hard parts, which require costly parts, are

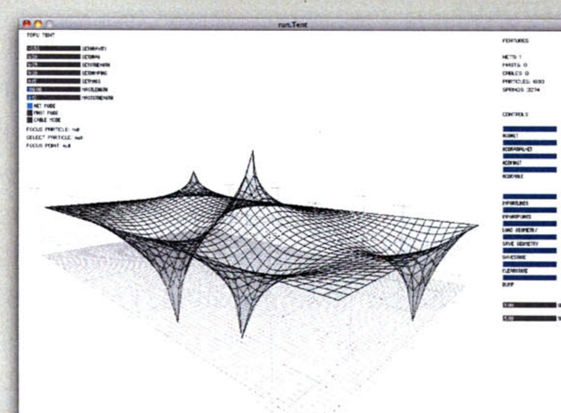
TENSILE MEMBRANE INTERFACE



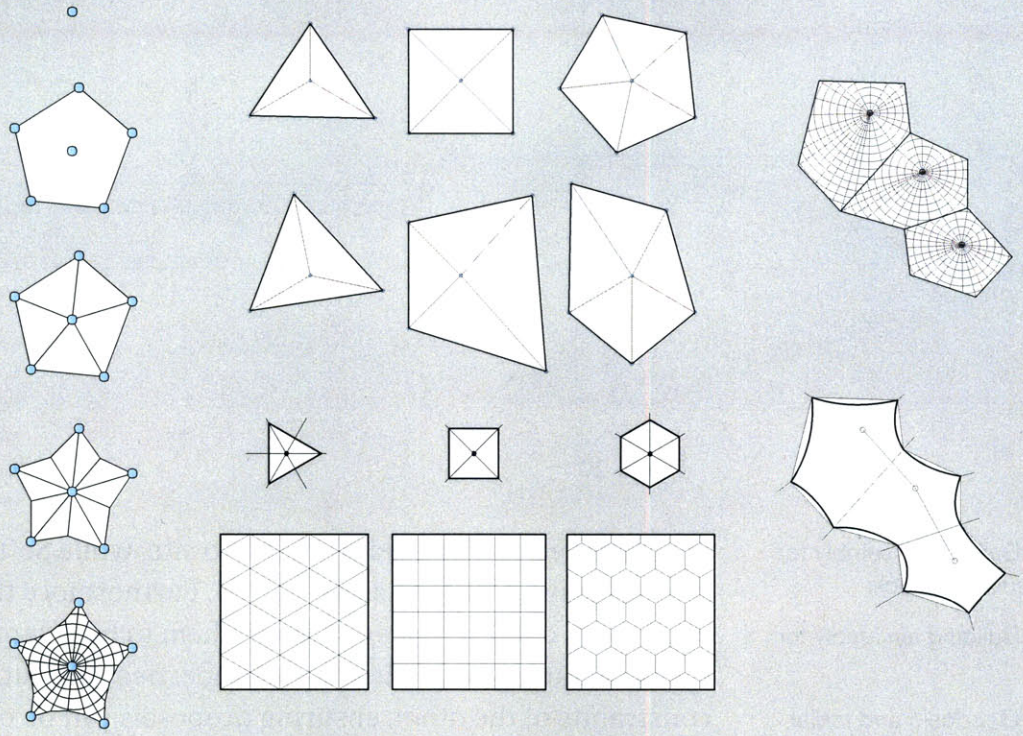




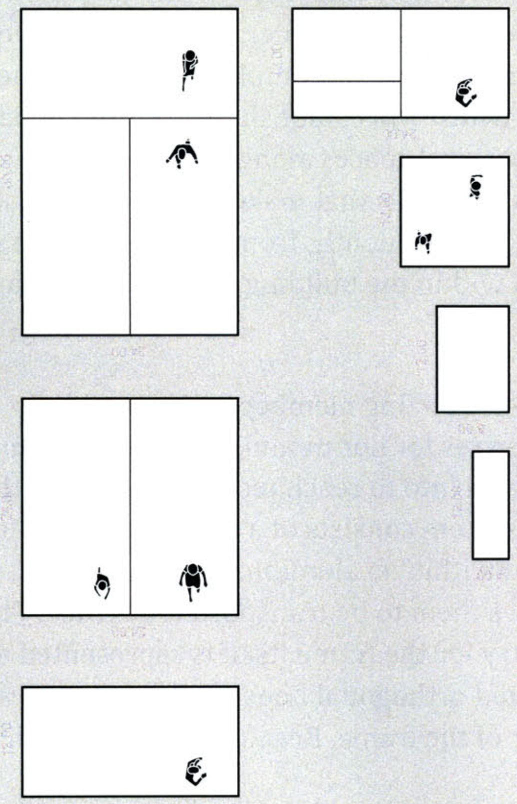




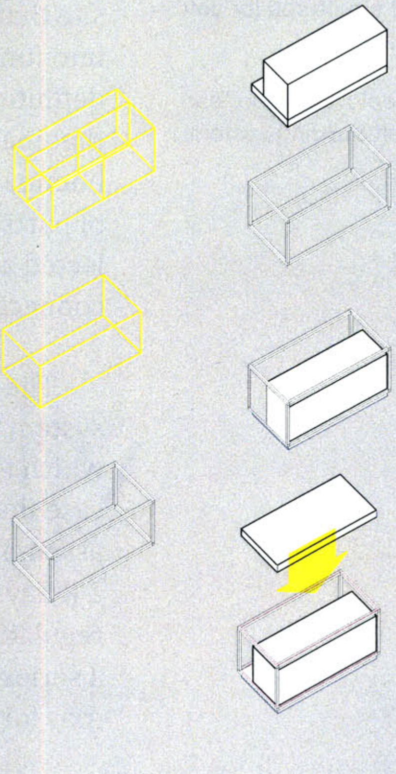
SOFT CONSTRAINTS



HARD CONSTRAINTS



FRAME AXES TO ASSEMBLY



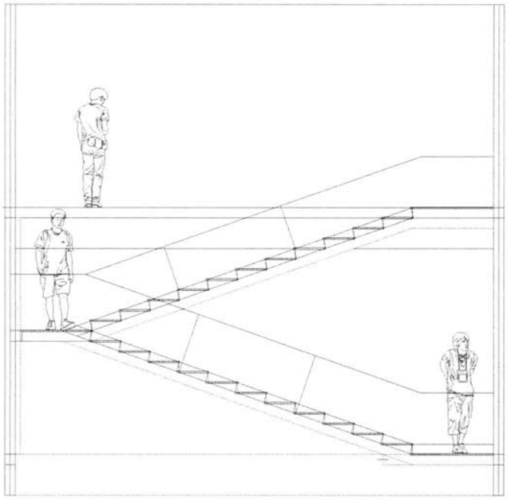


Figure 20.

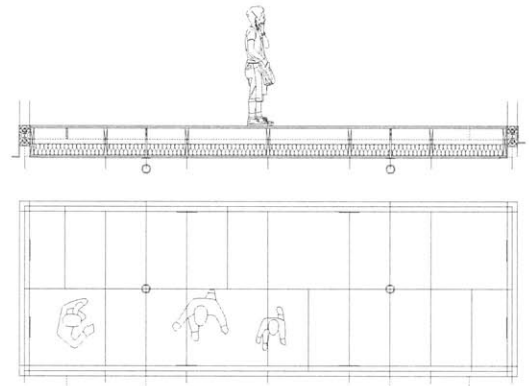


Figure 21.

Figure 20: Building assembly for vertical circulation block.

Figure 21: Building assembly for floor block.

Figure 22: Geodesic and radial geometries for tensile membrane generation.

Figure 23: Morphologies of tensile and mast structures for soft building system.

Figure 24: Deployable floor cartridges for soft building system.

standardized, and reused from site to site, while Soft parts are customized per site and recycled. Furthermore the separation of these systems allows them to be disentangled, taking advantage of their unique properties without the constraints of the other, ensuring proposals can be easily assembled and disassembled.

A configuration is simply a set volumes arranged on a site that need to be delimited in order to transform them into functional spaces. This is accomplished through the definition of axes, which will establish the location of parts that makeup the physical spaces along with the edges, boundaries, floors and walls that makeup a building. A kit of parts is defined independently, from which parts are selected and located within the building by an axis, type and connection.

The dominant-organizing members of the building system first define axes for our modular building assembly, which is drilled down into to reach tectonic details. In this case the modular system consists of a set of prefabricated assemblies housed within an aluminum frame in 12' x 24' Bays that allows them to be transported by truck. The regulating geometry for the frame itself is represented as a series of connected orthogonal lines in which each is an Axis for a member of the frame. Because the dimensions of

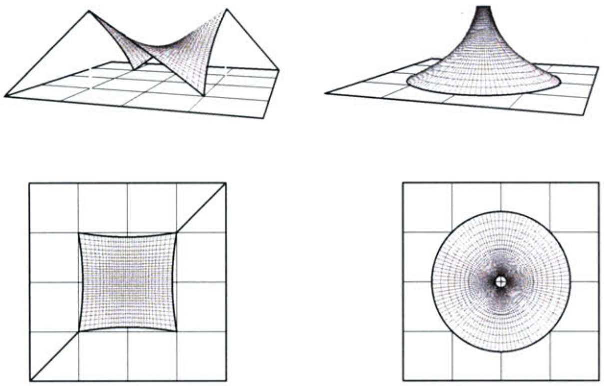


Figure 22.

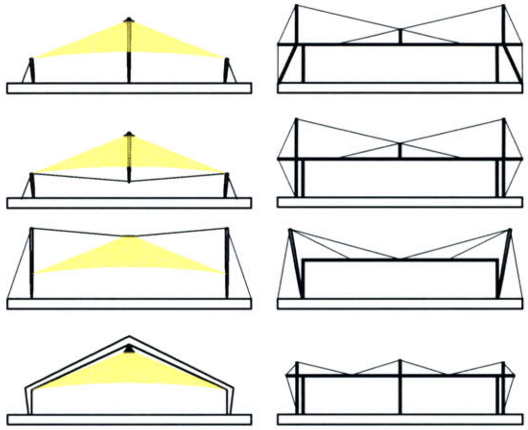


Figure 23.

this frame are standardized, different parts housed within it can be exchanged for one another. Then depending on the specified space in which bays of the frame are located, assemblies for walls, floors, etc. are assigned, represented as boxes according to their constraining dimensions. Each of these is then broken down into the appropriate predefined sub assemblies and corresponding parts.

Soft spaces are constructed through a tensile membrane structure, like the modular building system this is established by defining axes that organize membranes, cables, and masts into an envelope to shelter the larger spaces of the building. Unlike the modular building axis, which is governed by a fix dimension, tensile membrane structures behavior and geometry are governed by stresses within the membrane to attain their strength. In order to define axes for this system its structural behavior is modeled using particle springs system, to interact with these parts and resulting geometries. One imports site geometry and modular axes which can be modeled around by placing and manipulating parts such as masts, joists, cables, and nets and either geodesic and radial net geometries. This allows for the design of a unique tensile membrane structure that integrates with other building features and responds to unique site conditions.

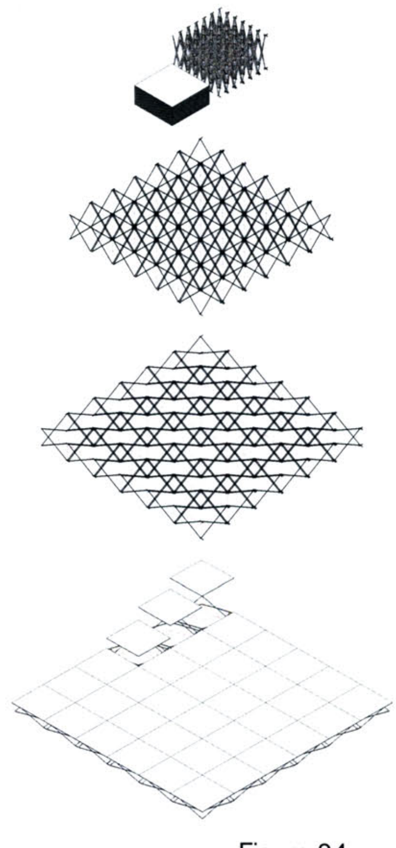
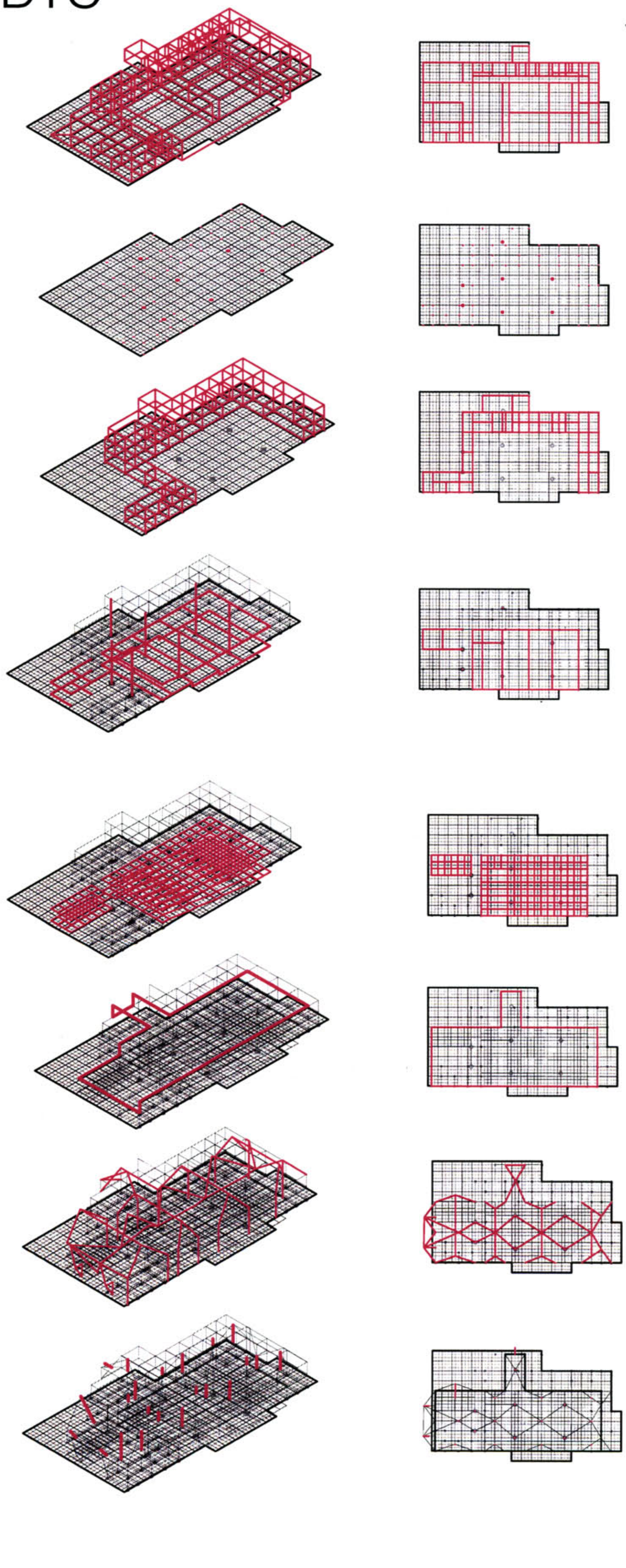


Figure 24.

DTC



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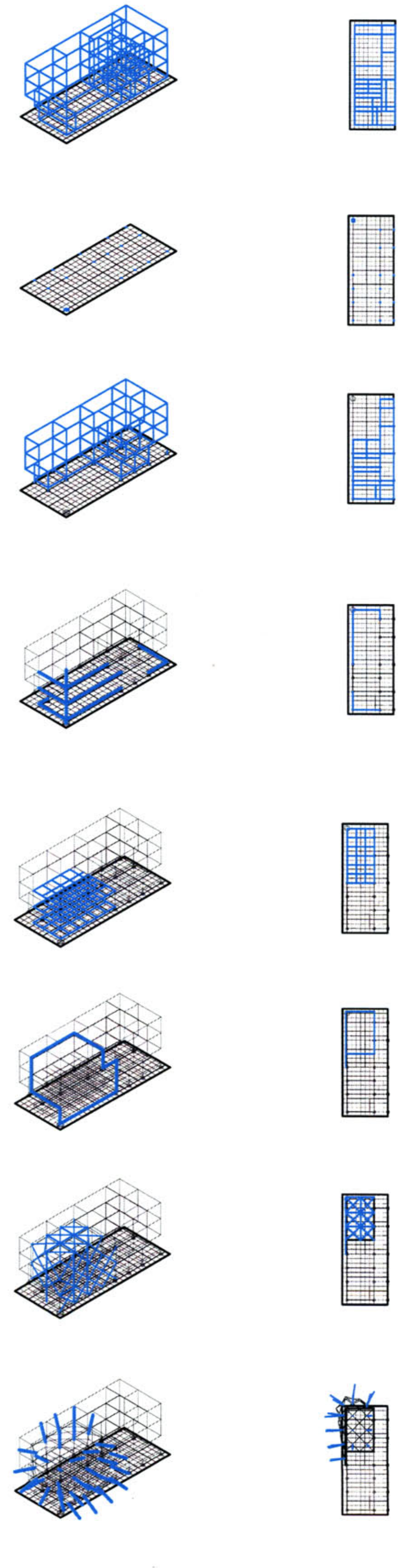


BLOCKS

ANCHORS

FRAME

MAST

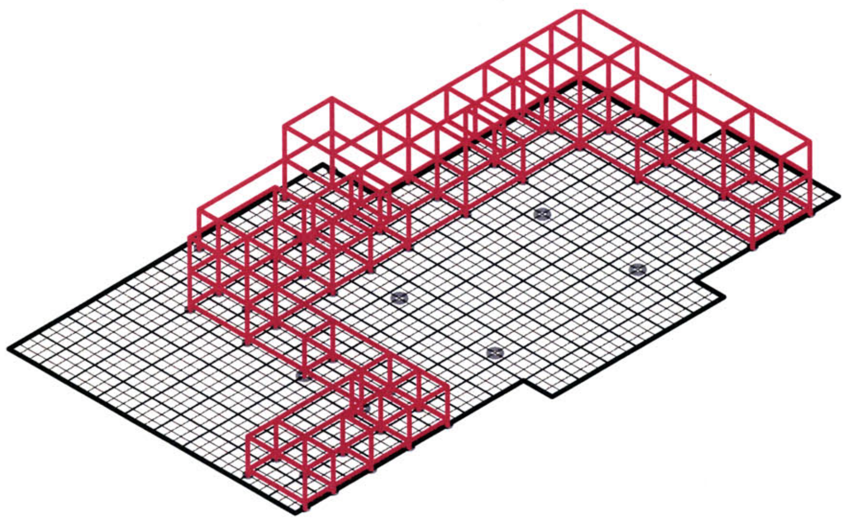
CARTRIDGE

NET EDGE

CABLE

NET VECTOR

DTC



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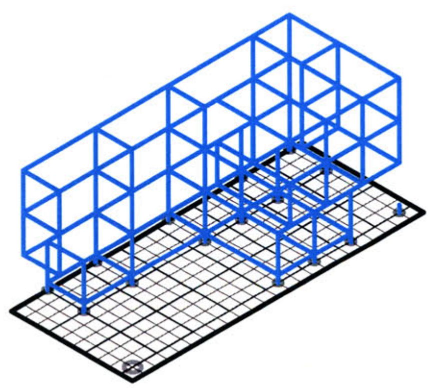


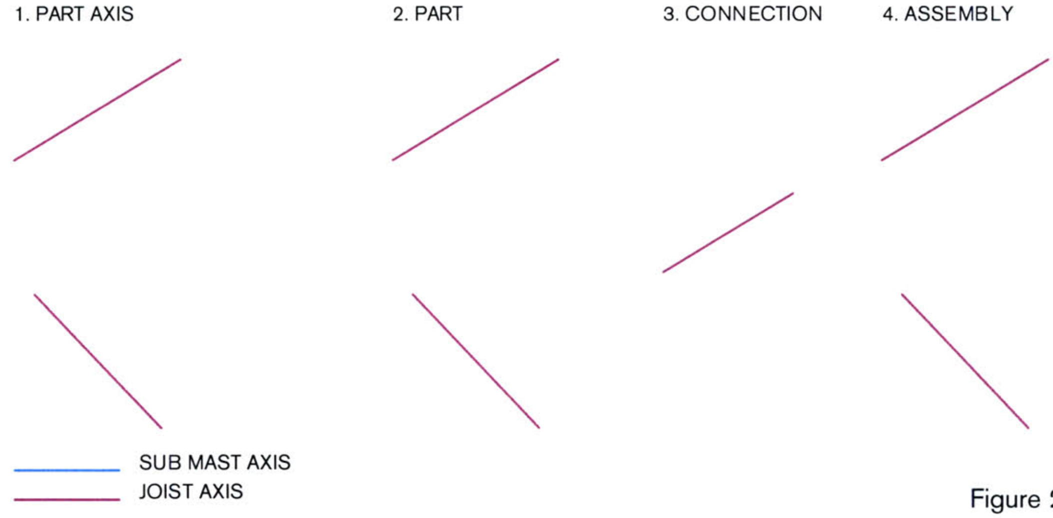


Figure 25.

SEQUENCE

Introduction - Connections

Fabrication and delivery of redeployable building proposals raise a number of specific significance problems, namely the methods of joining materials, assembling components and organizing and integrating various systems within a building. Proposals requires various means of joining materials and components without the use of adhesives in order to develop connections that can meet the criteria for buildings with the ability to be rapidly assembled and disassembled. Moments where non-standard parts interface with standard parts, the relationship between components and the site, and the number and organization of parts in within assemblies and their impact on error, cost and time all need to be addressed with special significance.

The delivery of parts is the dominant constraint in terms of the size of modules installed on the site. The goal for efficient construction time is to complete as much of the assembly as possible off site and ship parts to the site in minimal pieces. Developing a tiered assembly system, in which sub components can be installed into primary modules, to be assembled on site is an important strategy for managing the complexity of joinery and labor of assembly. Not only is developing a tectonic language critical in the realization of highly flexible design proposals but establishing a corresponding taxonomy of connections and sequence of assembly.

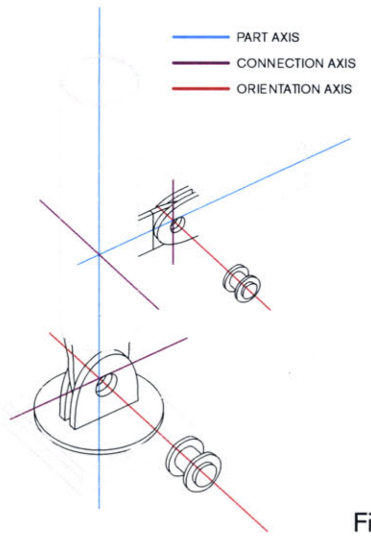


Figure 26.

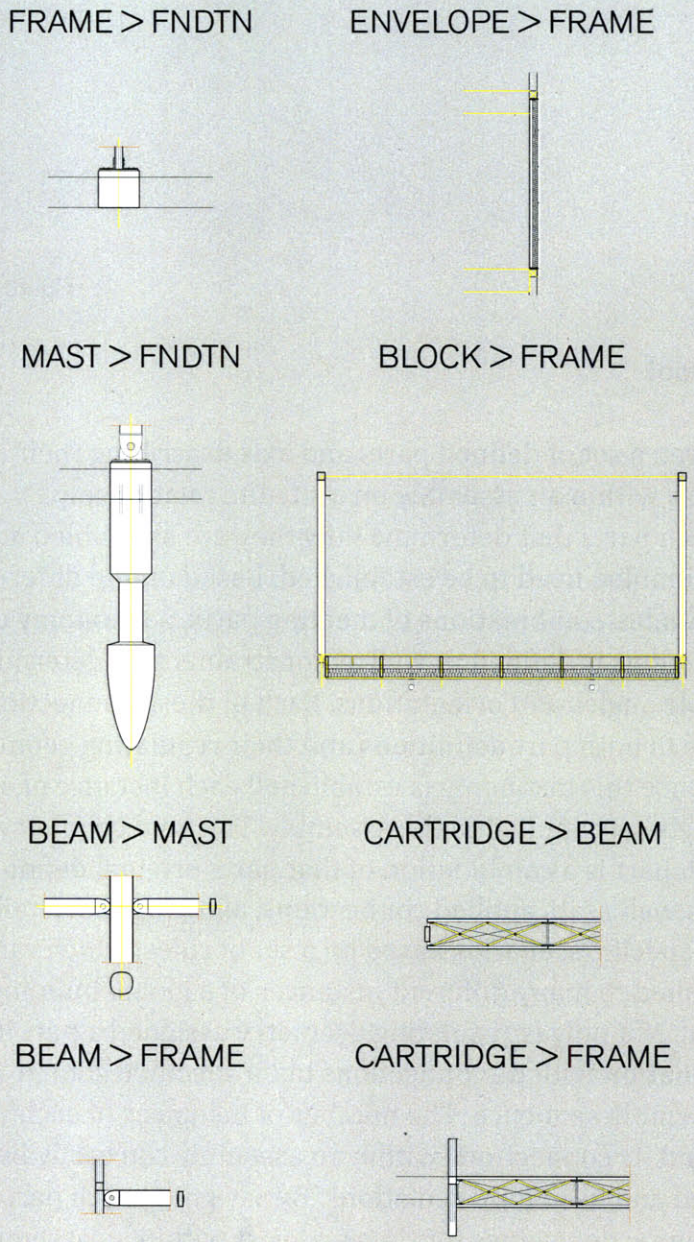
Protocol

Given a set of defined parts and axis describing their location within an assembly on a site the relationships between parts that determine how they are assembled and disassembled need to be established. Based on the different possible combinations of meeting parts, a taxonomy of connections is defined as well as constraints that determine possible angles and orientations. Each of these connections relates to both part definitions and their regulating geometry. Once this taxonomy is established each instance of a connection is applied to the assembly. The final geometry of each part is a combination of that parts original definition as well as its applied connections, allowing the detailing of specific scenarios based on a set of rules, which can be applied to many different instances of a global building system. Not only is regulating geometry assigned a part in combination with its connections but a specified step in an assembly sequence. The number of instances of each part and its connections within an assembly can easily be tracked and used for calculations. By assigning each part and connection values for time and cost within an assembly it is possible to estimate the time and cost for the overall building deployment in order to determine whether or not a proposal is viable.

Figure 25: Generation of assembly based on part and connection axes.

Figure 26: Connection axis, specifying location of connection relative to part and axis of orientation from which the connection can pivot around.

The construction of buildings is often a linear process, where phases of construction depend on the completion of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MAST > FNDTN
BLOCK > FRAME
BEAM > MAST
CARTRIDGE > BEAM
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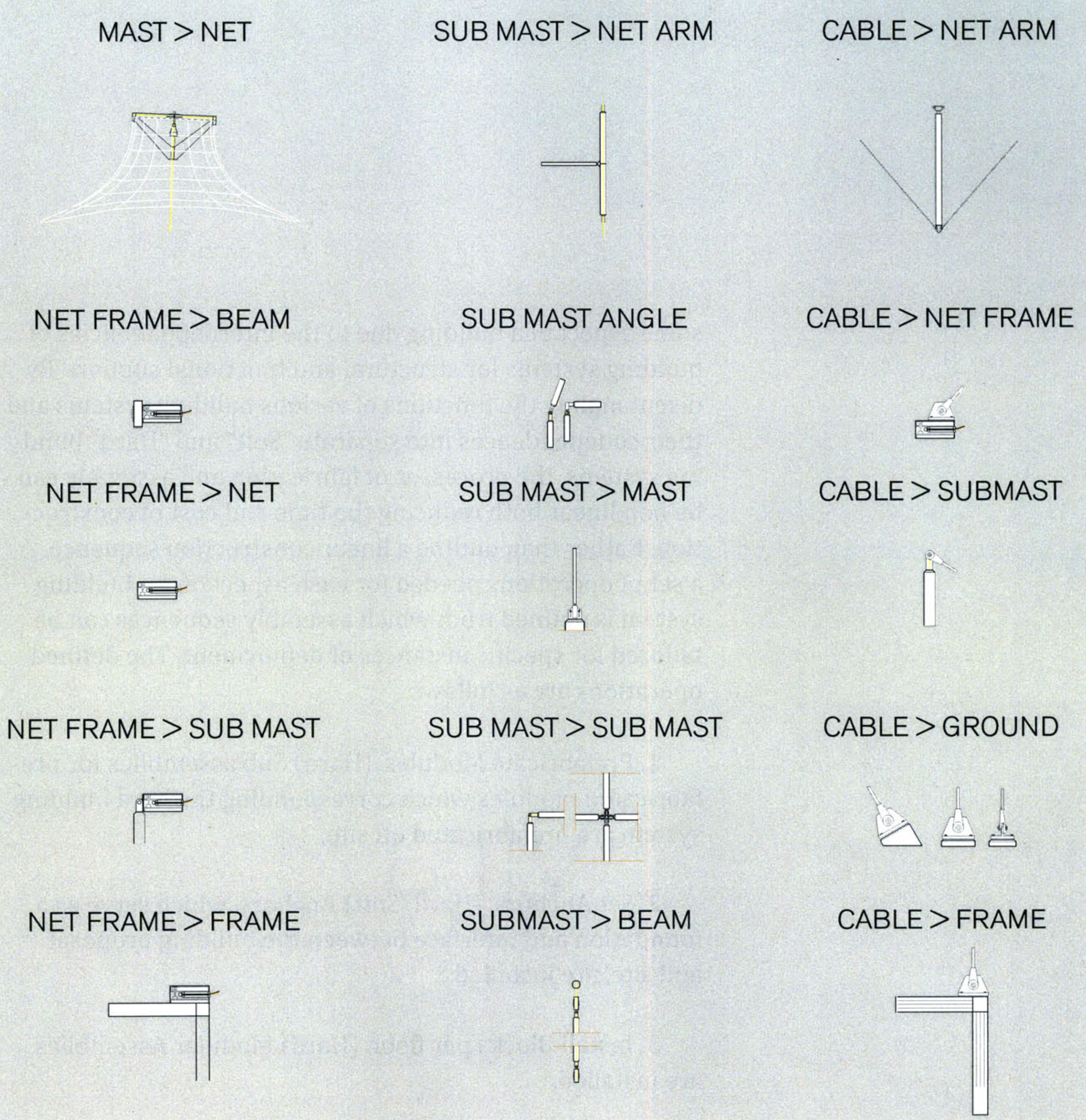
CARTRIDGE > FRAME


MAST > NET
SUB MAST > NET ARM
CABLE > NET ARM
NET FRAME > BEAM
SUB MAST ANGLE
CABLE > NET FRAME
NET FRAME > NET
SUB MAST > MAST
CABLE > SUBMAST
NET FRAME > SUB MAST
SUB MAST > SUB MAST
CABLE > GROUND
NET FRAME > FRAME
SUBMAST > BEAM
CABLE > FRAME

some aspect of a building due to the interdependencies of building systems for structural and functional support. By disentangling the functions of various building systems and their codependences into separate “Soft” and “Hard” building systems, the processes of fabrication and assembly can be non linear both reducing the time and cost of construction. Rather than outline a linear construction sequence, a set of operations needed for each aspect of the building system is defined from which assembly sequences can be tailored for specific instances of deployment. The defined operations are as follows.

1. Prefabricate Modules. (Hard) Sub assemblies for prefabricated modules which corresponding the hard building system are prefabricated off site.

2. Set Anchors. (Hard/Soft) Anchors, which serve as a foundation and interface between the building proposal and site, are installed.

3. Install Blocks per floor. (Hard) Modular Assemblies are installed.

4. Deploy Cartridges per floor. (Soft) Cartridges, which serve as the lightweight flooring system, are installed.

5. Erect Masts. (Soft) Masts, which will support the tensile membrane of the proposal, are installed and erected.

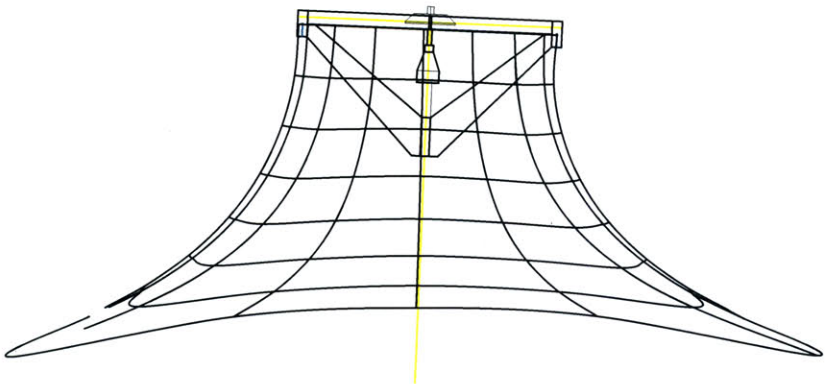


Figure 27.

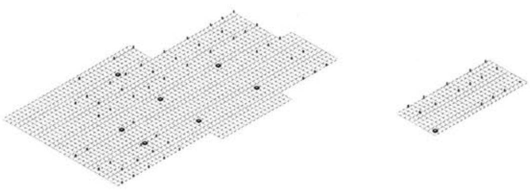
Figure 27: Radial net crown connection, informed by net vectors and radii generated through particle springs interface.

6. Fix Net Edge. (Hard / Soft) The net edge, which serves as the interface between the tensile membrane and hard building system, is installed.

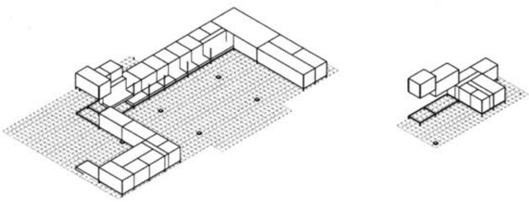
7. Fix Net Supports. (Soft) Other required supports for the tensile membrane such as sub masts, arms and cables are installed.

8. Deploy Net. (Soft) The tensile membrane, which encloses Soft spaces, is installed.

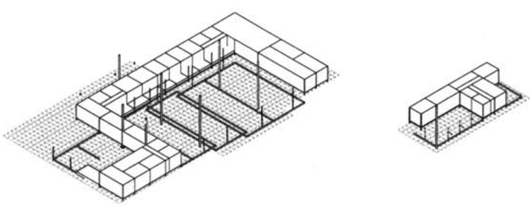
Through the appropriate combination of these operations, custom sequences for specific proposals can be composed.



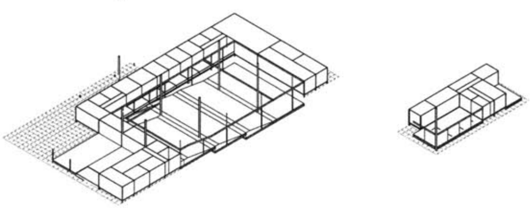
SET ANCHORS



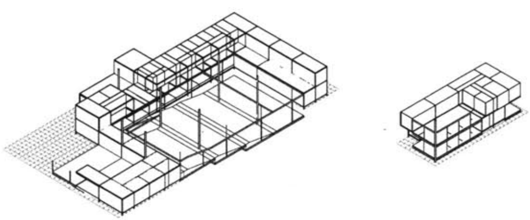
LAY BLOCKS



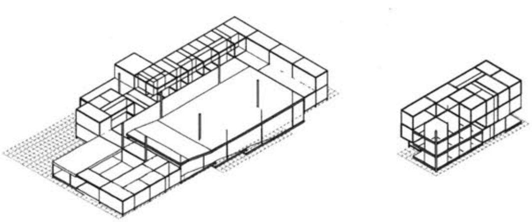
ERECT MASTS



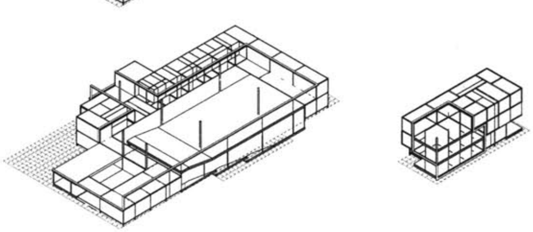
LAY CARTRIDGES



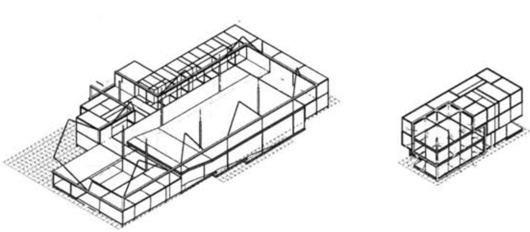
LAY BLOCKS



LAY CARTRIDGES



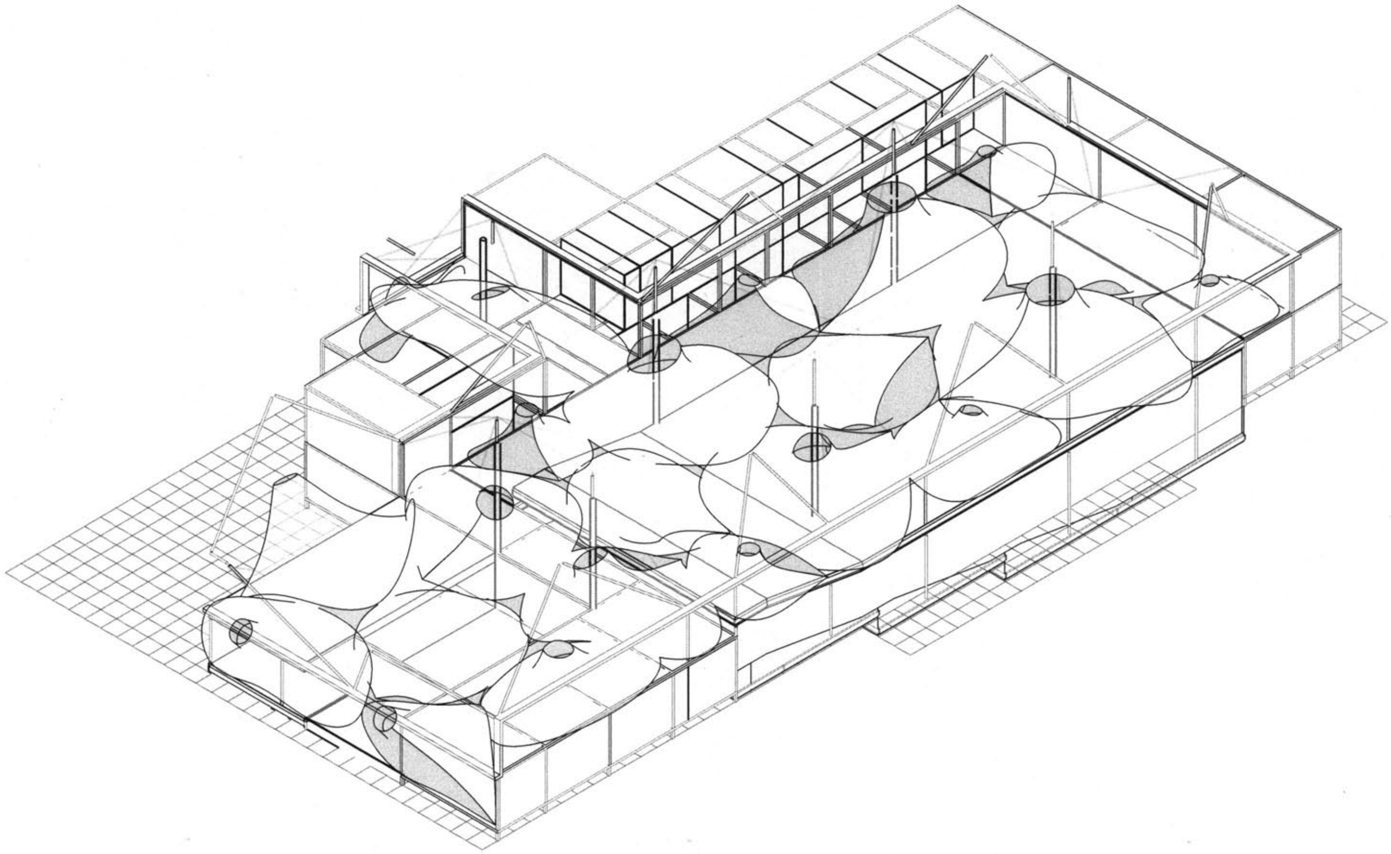
FIX NET EDGE



FIX NET SUPPORTS

DEPLOY NET

DTC



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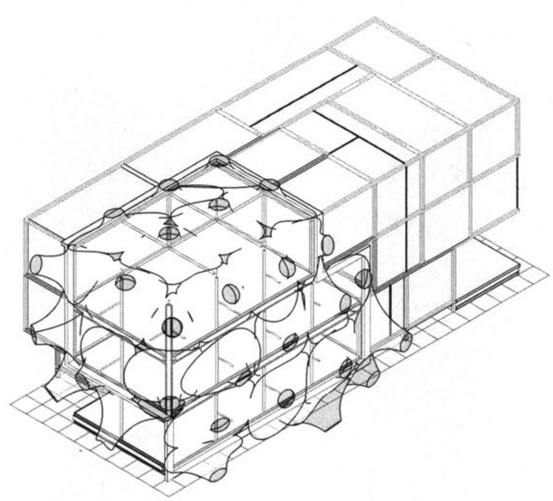

PROPOSAL

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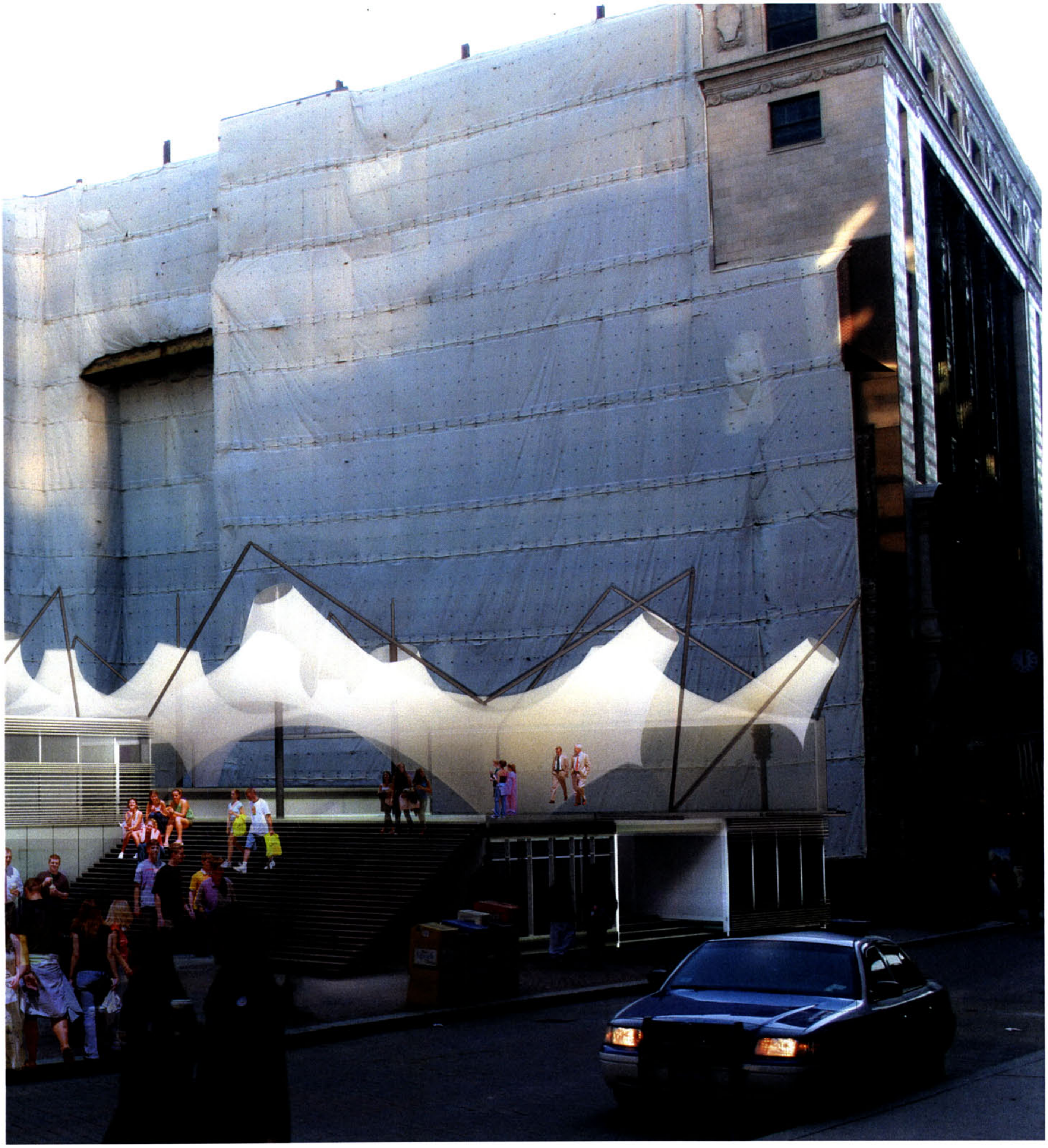

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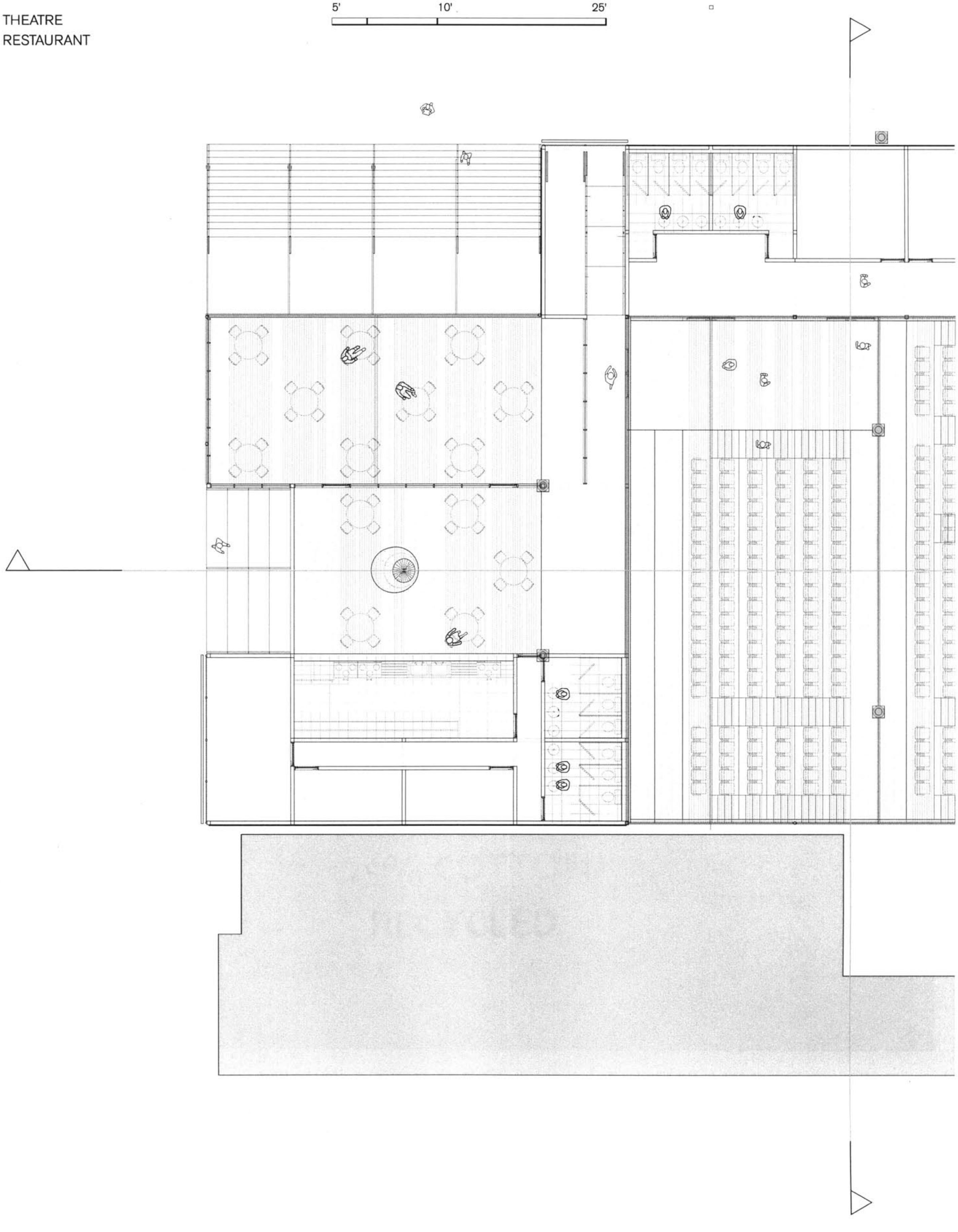
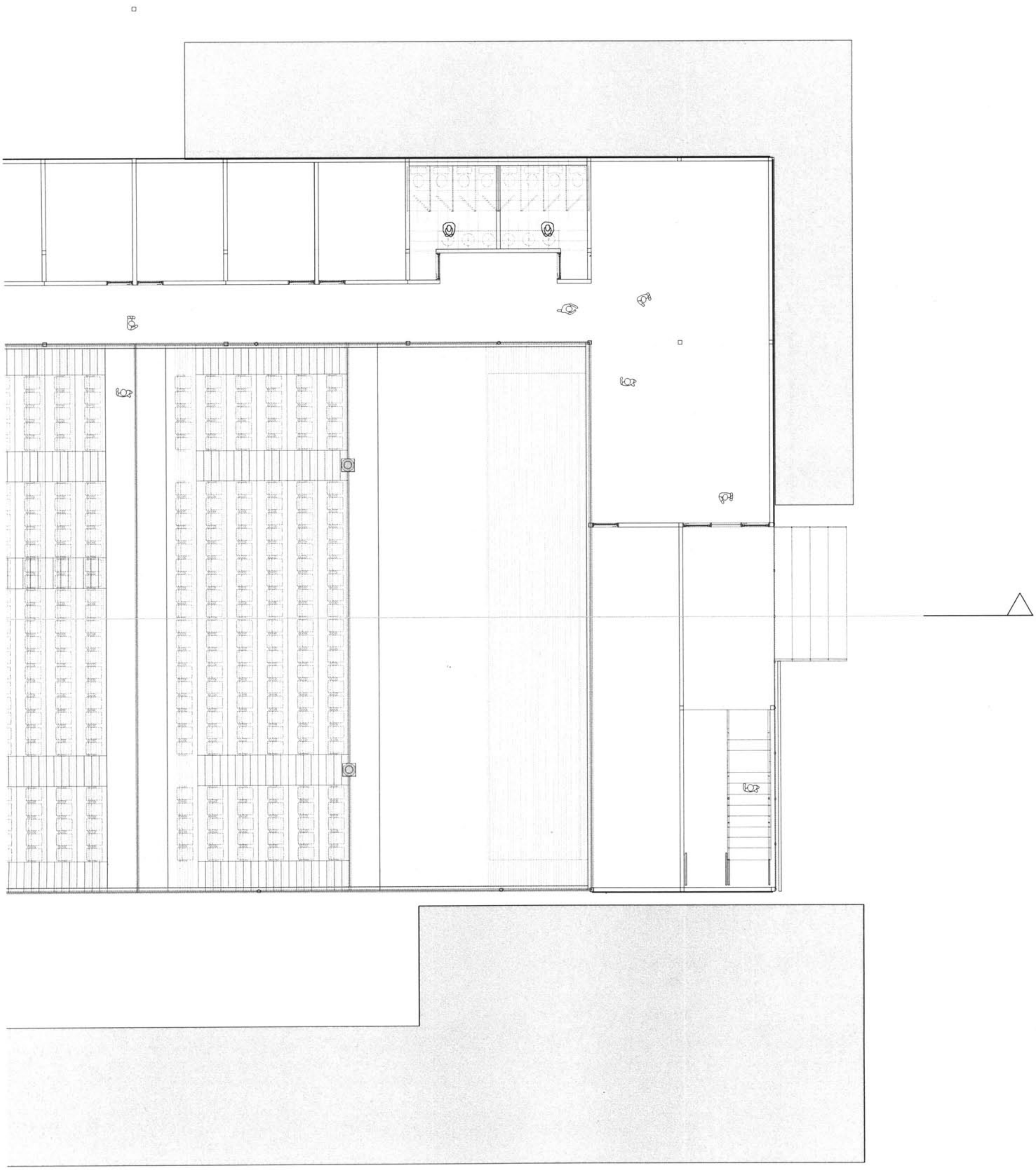
LOWER LEVEL

THEATRE
RESTAURANT





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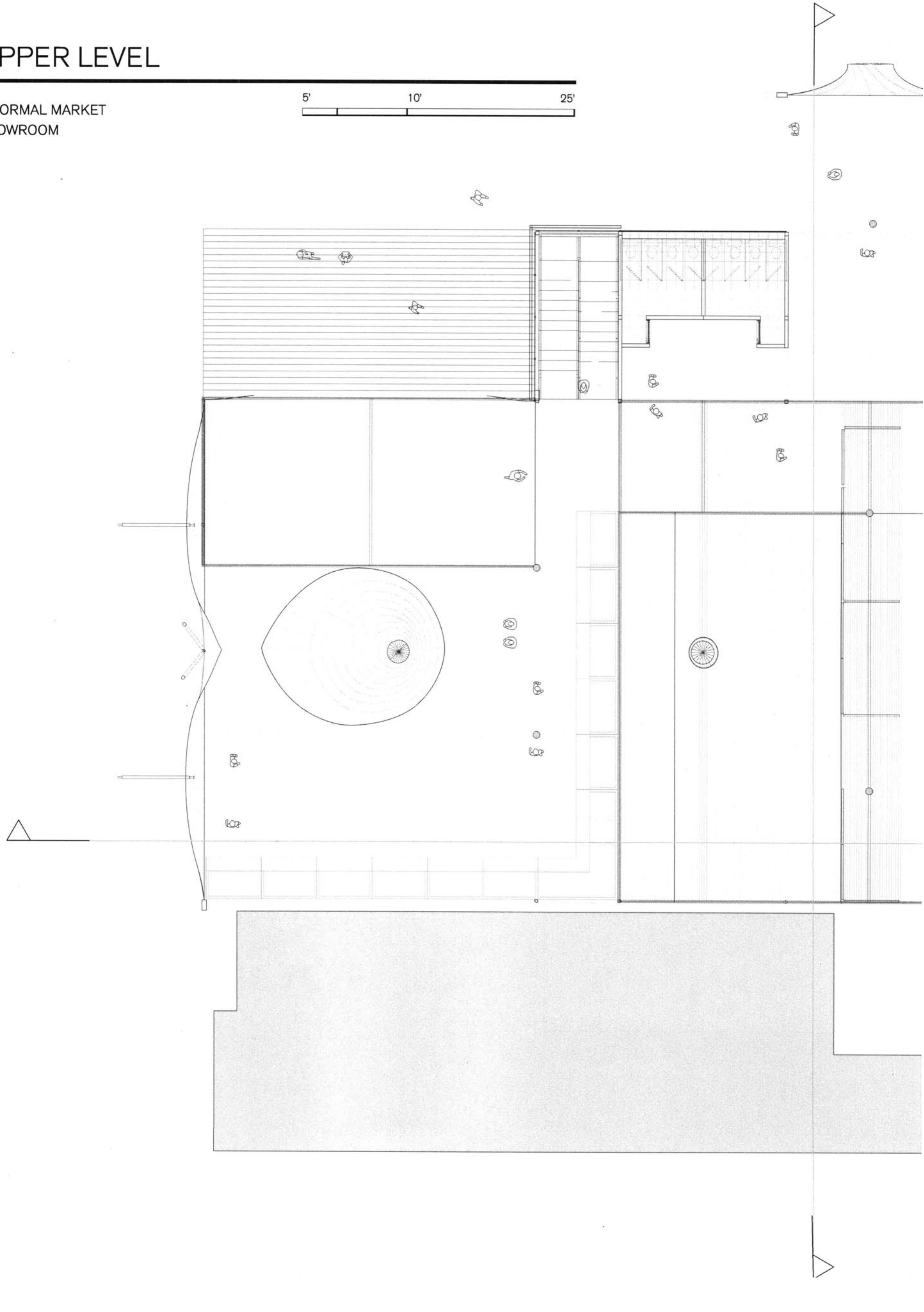
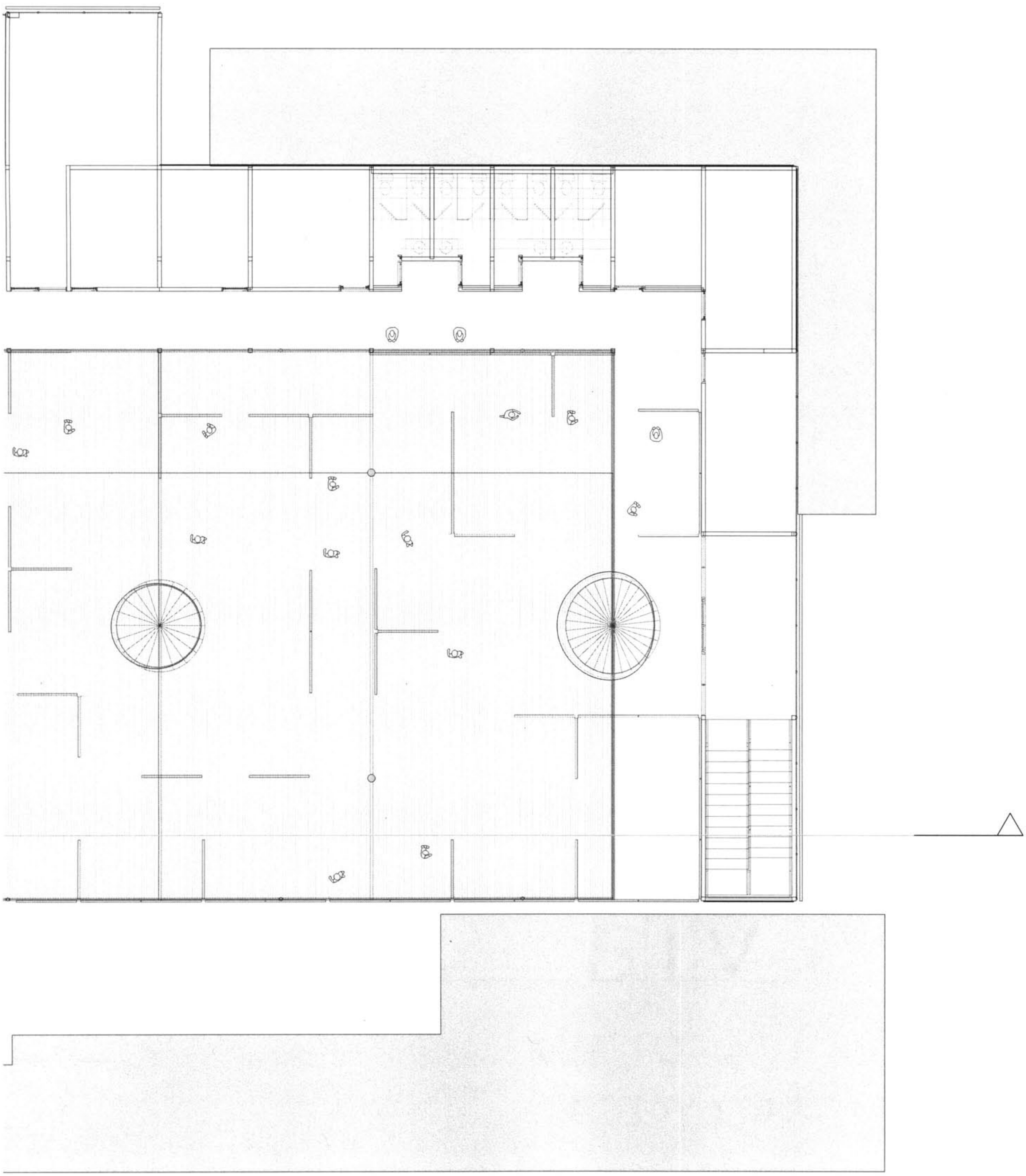
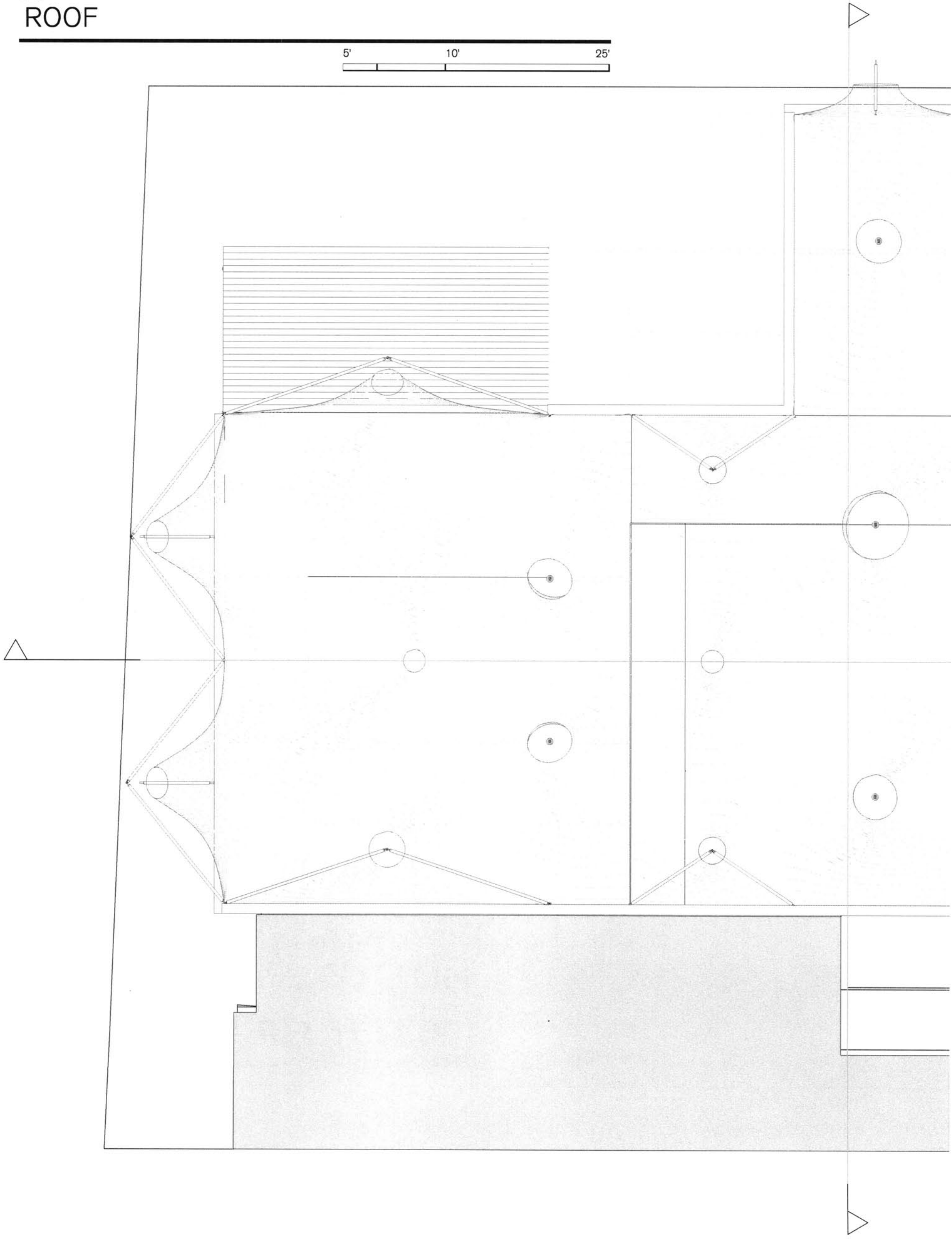
UPPER LEVEL

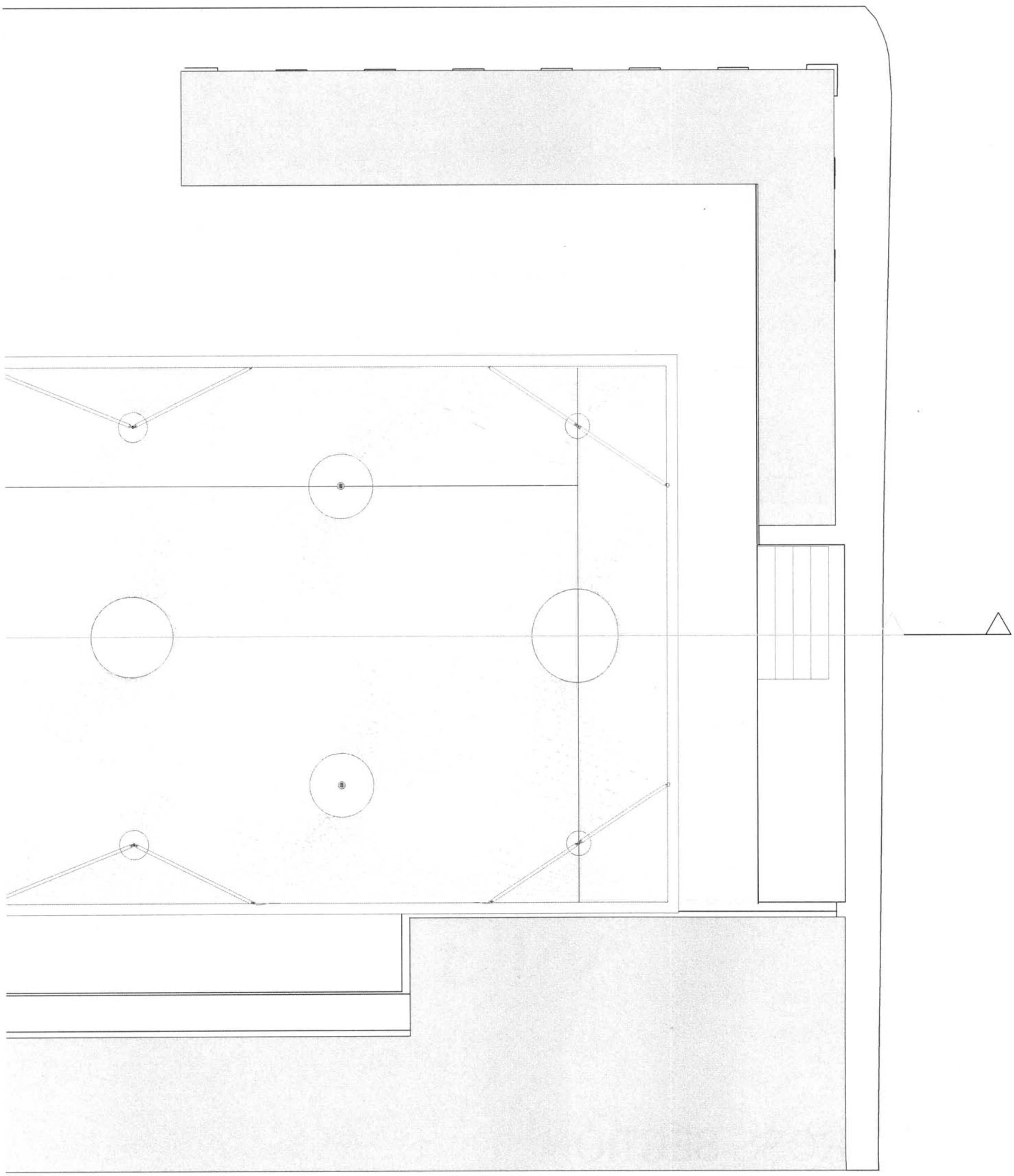
INFORMAL MARKET
SHOWROOM



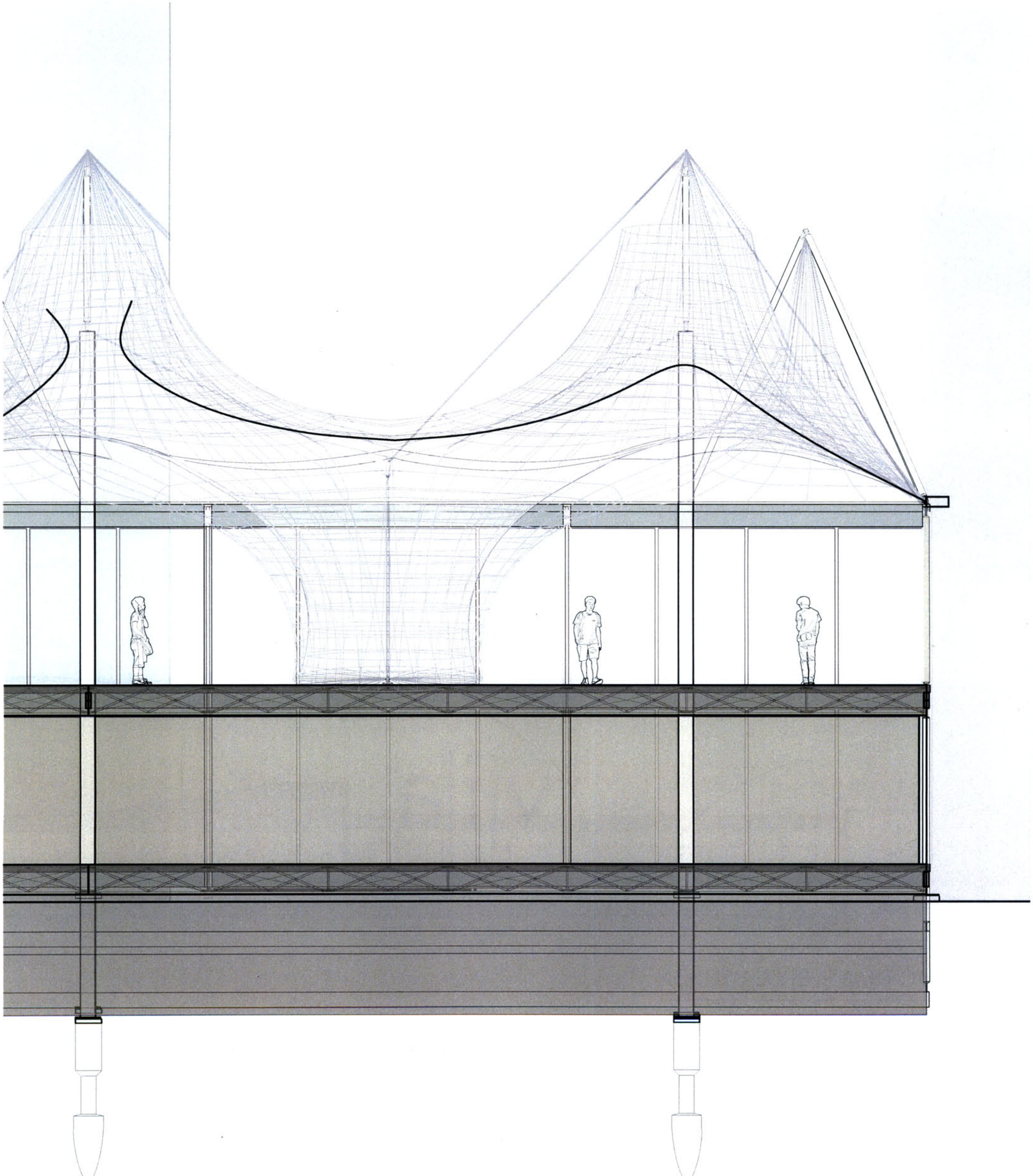


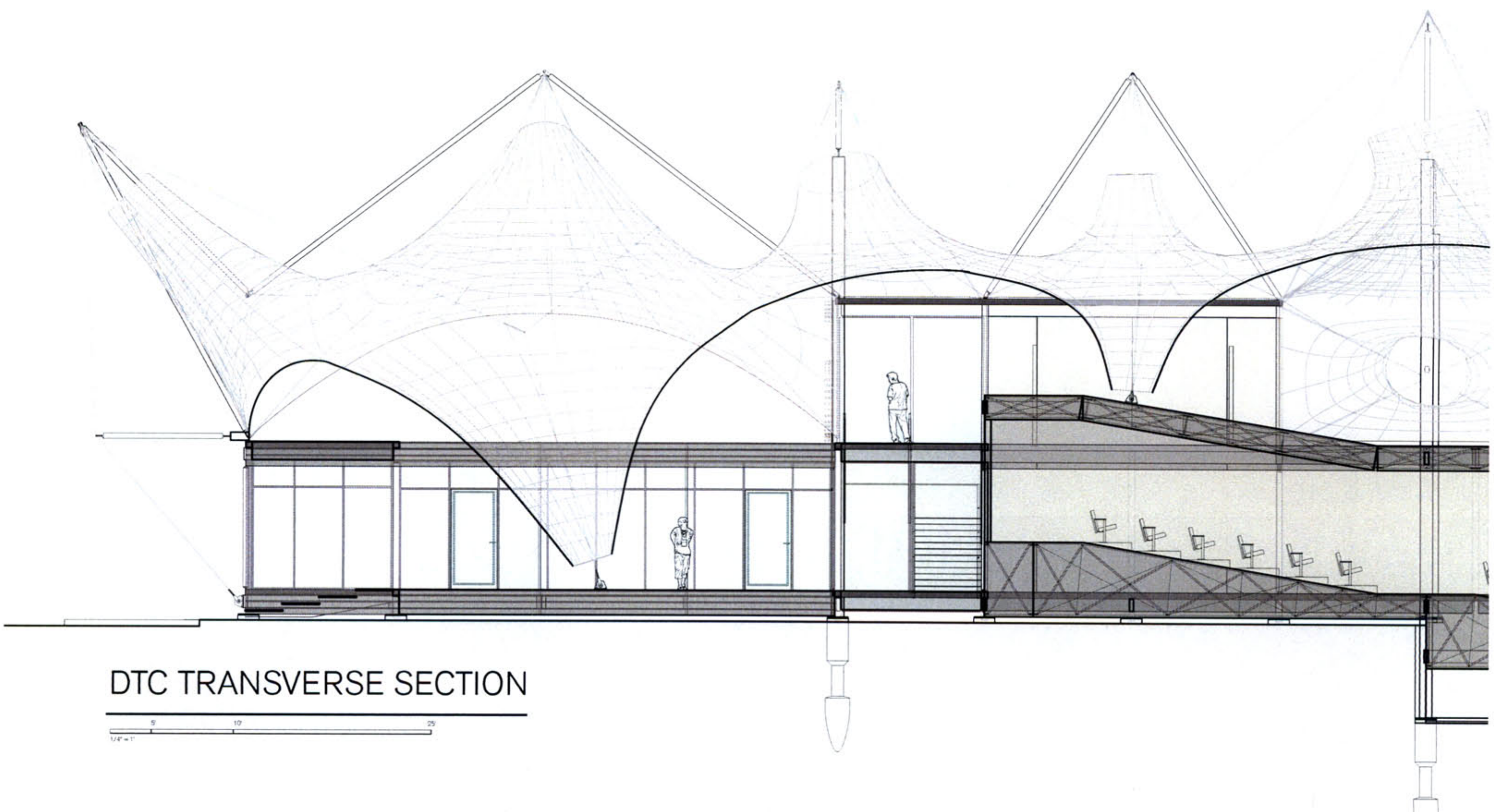
ROOF



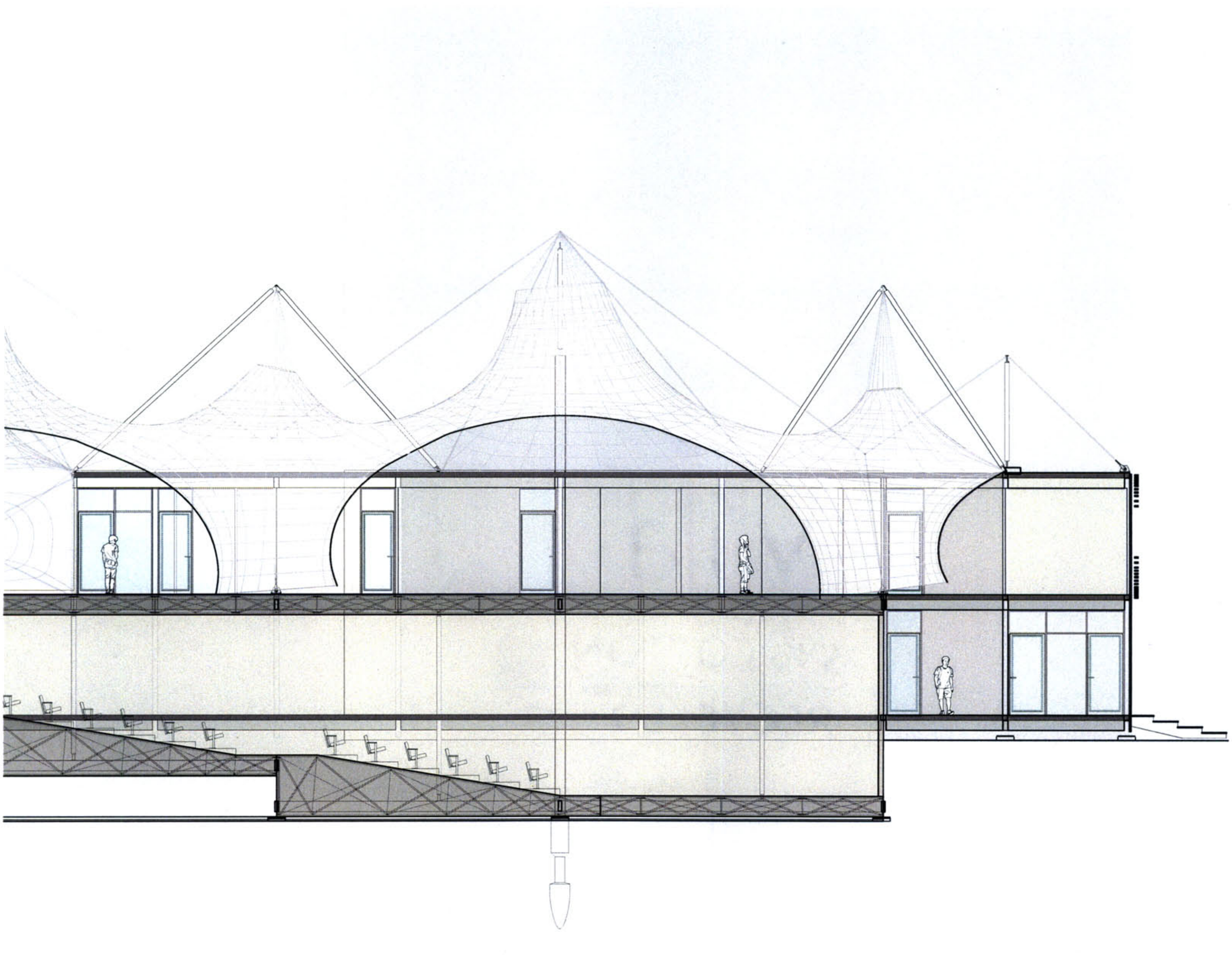


DTC CROSS SECTION

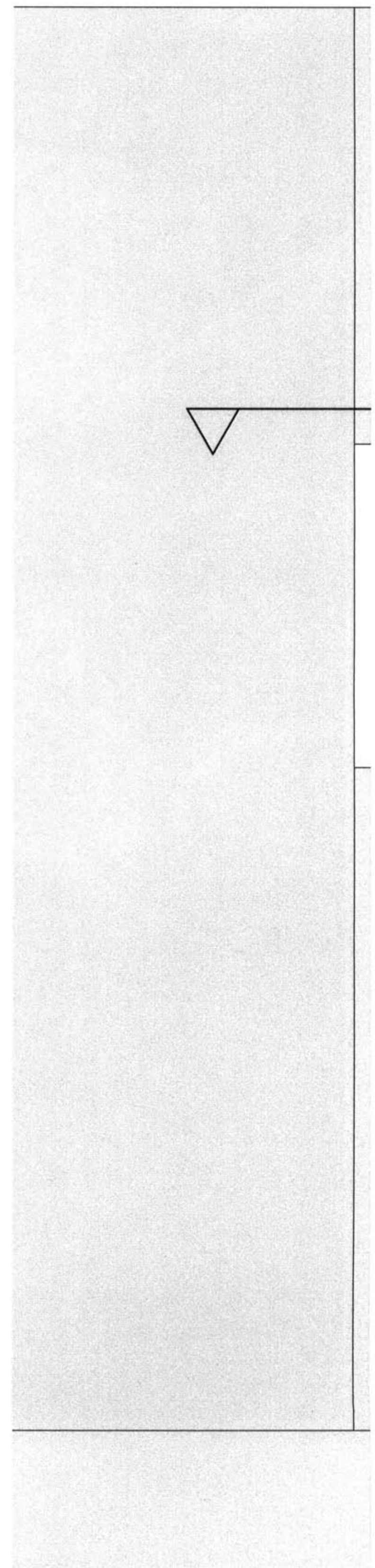




DTC TRANSVERSE SECTION



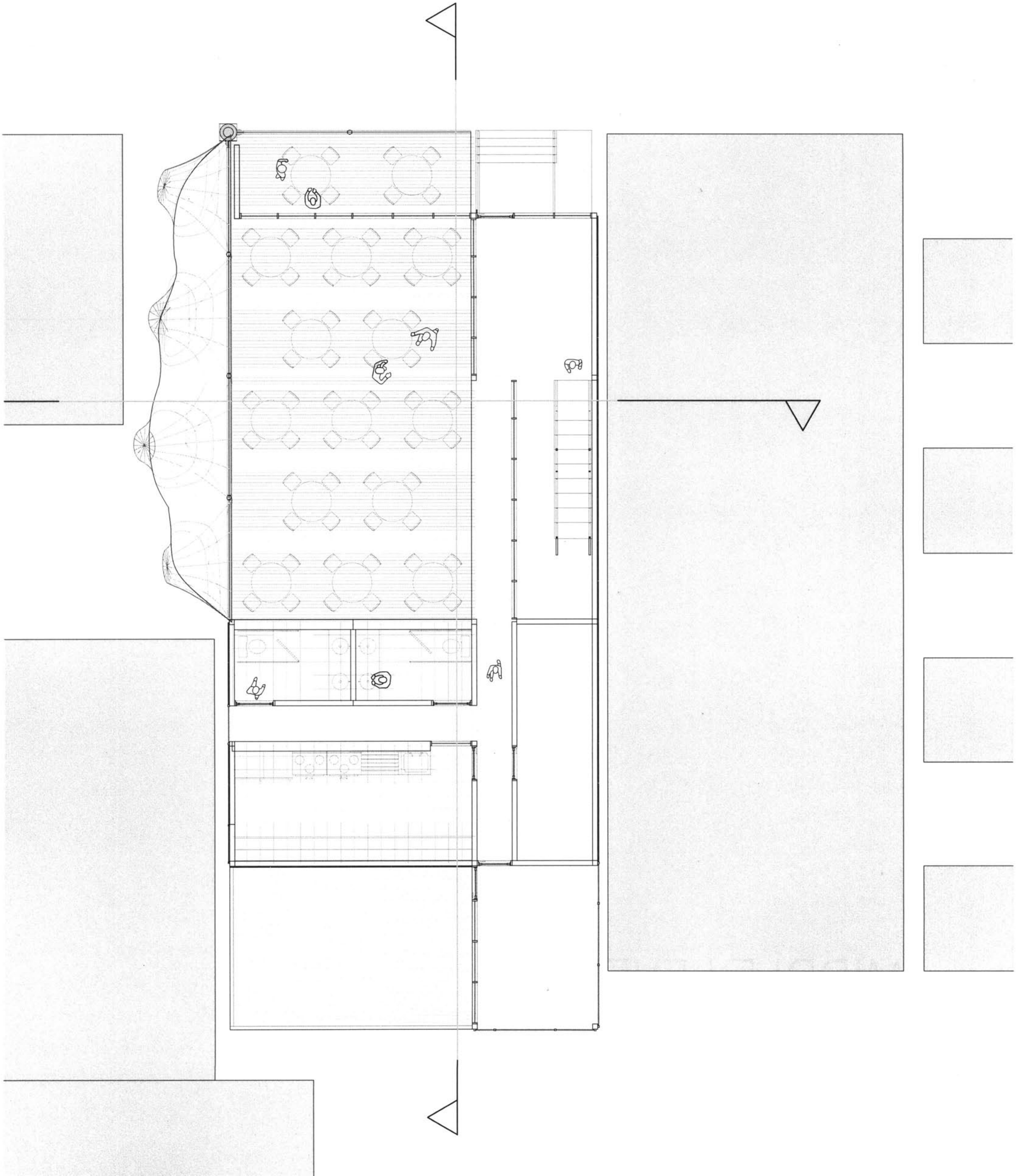
SBO

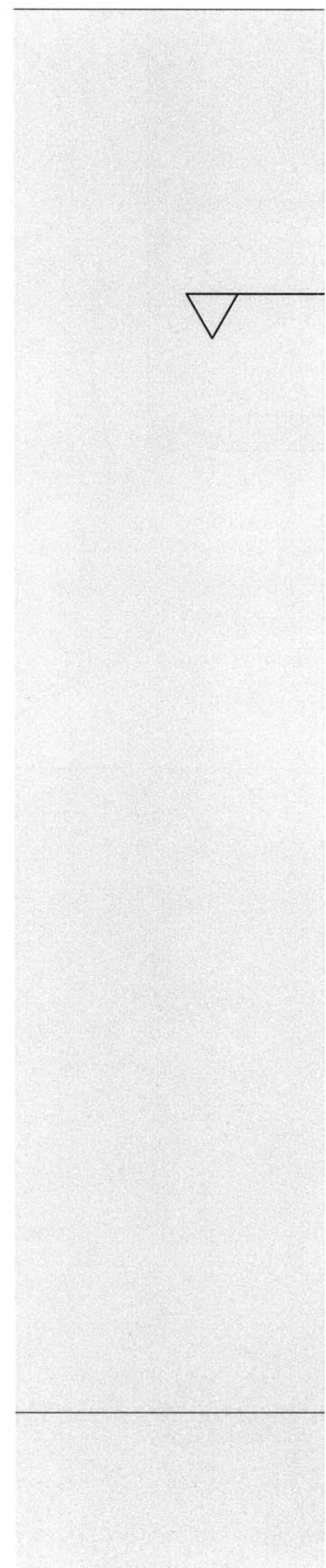


GROUND LEVEL

CAFE

5' 10' 25'

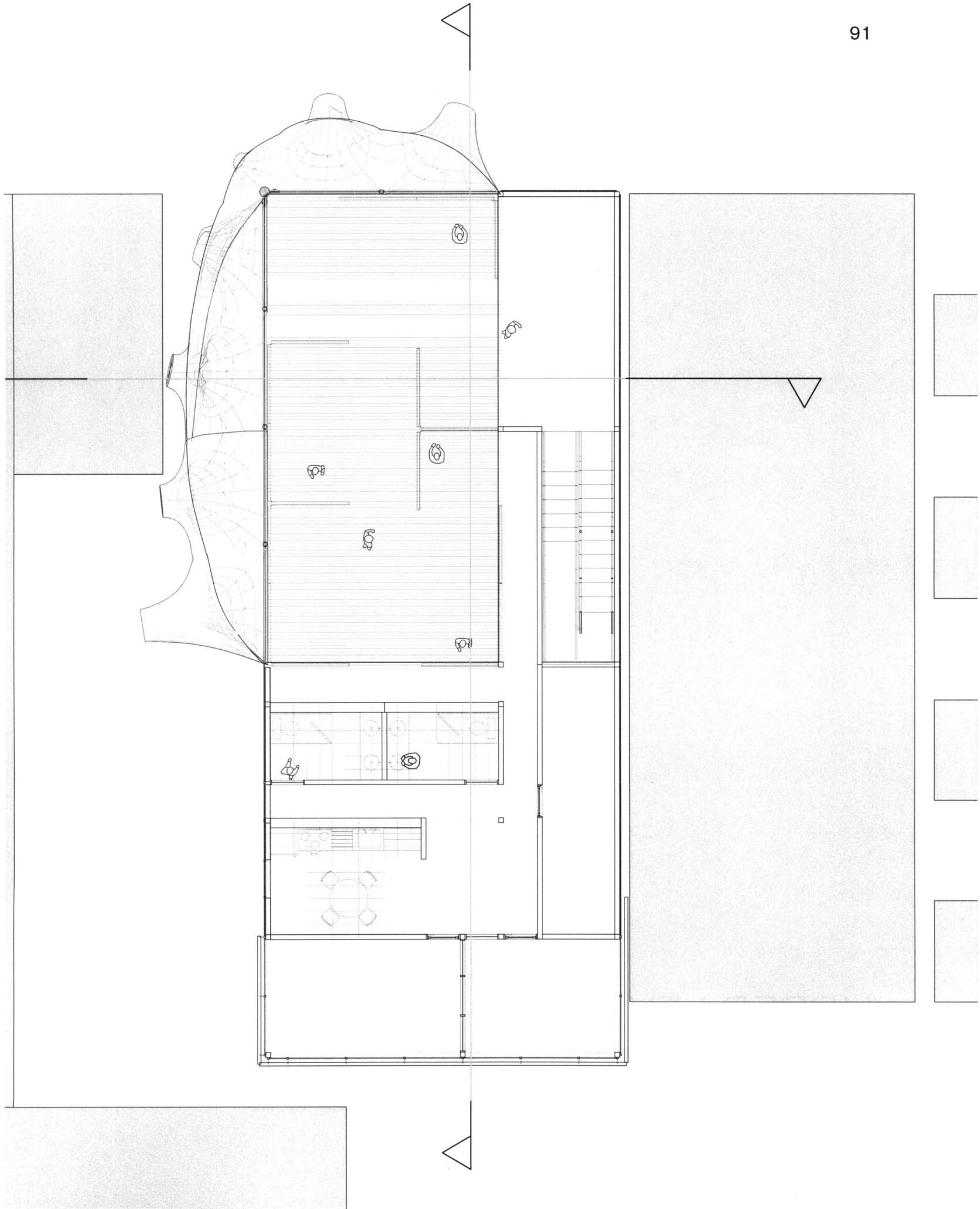


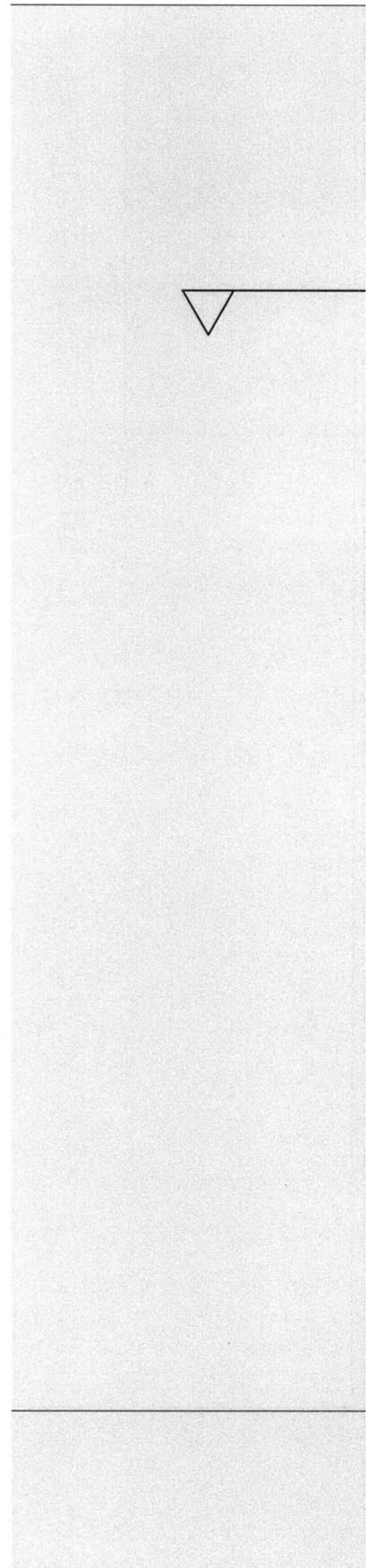


MIDDLE LEVEL

GALLERY

5' 10' 25'

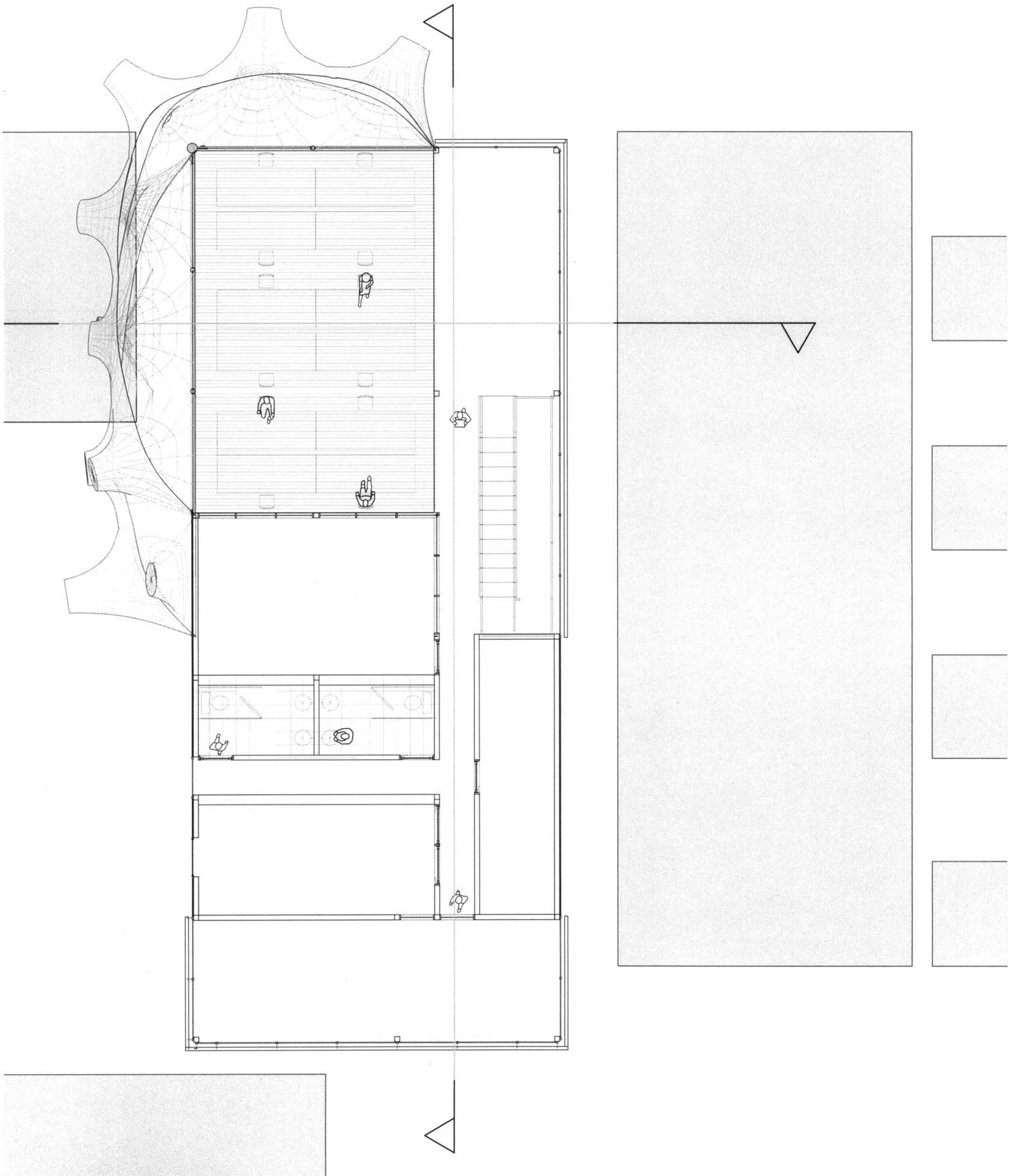


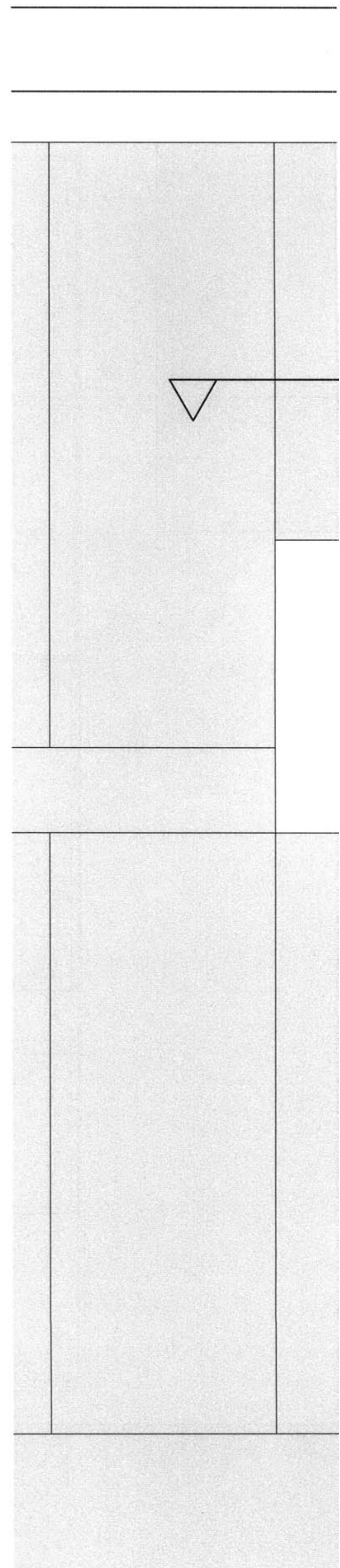


UPPER LEVEL

WORKSHOP

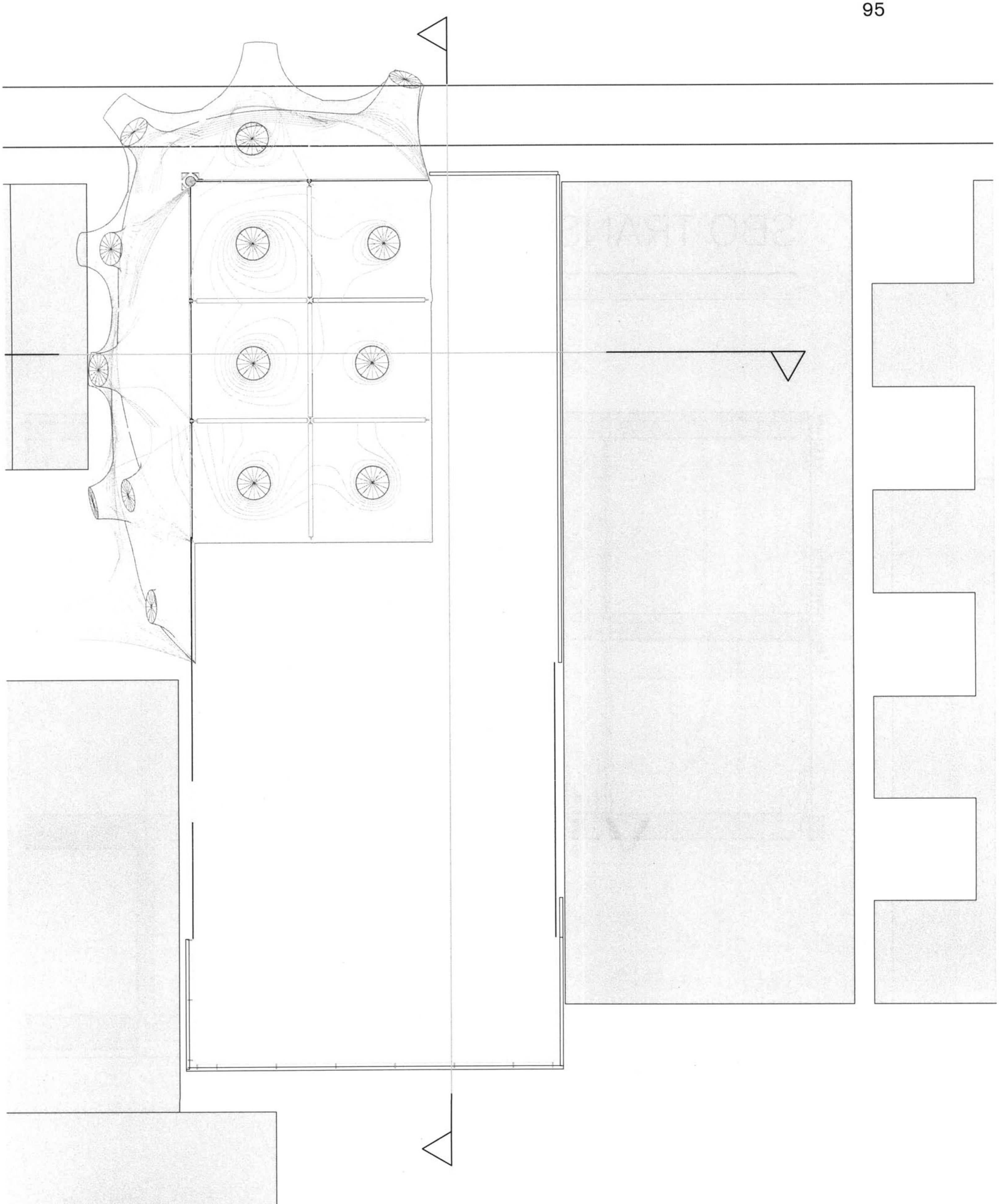
5' 10' 25'





ROOF

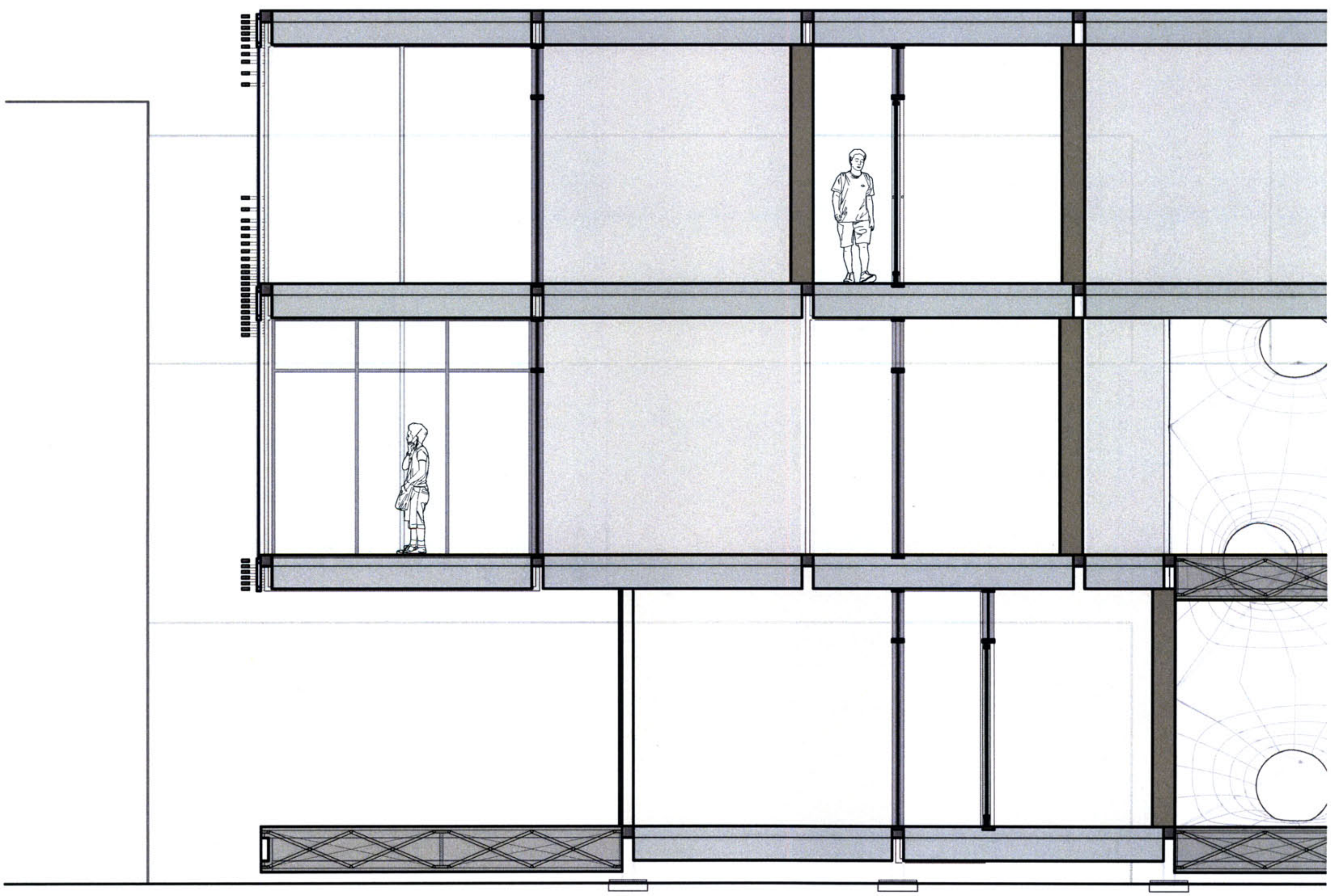
5' 10' 25'

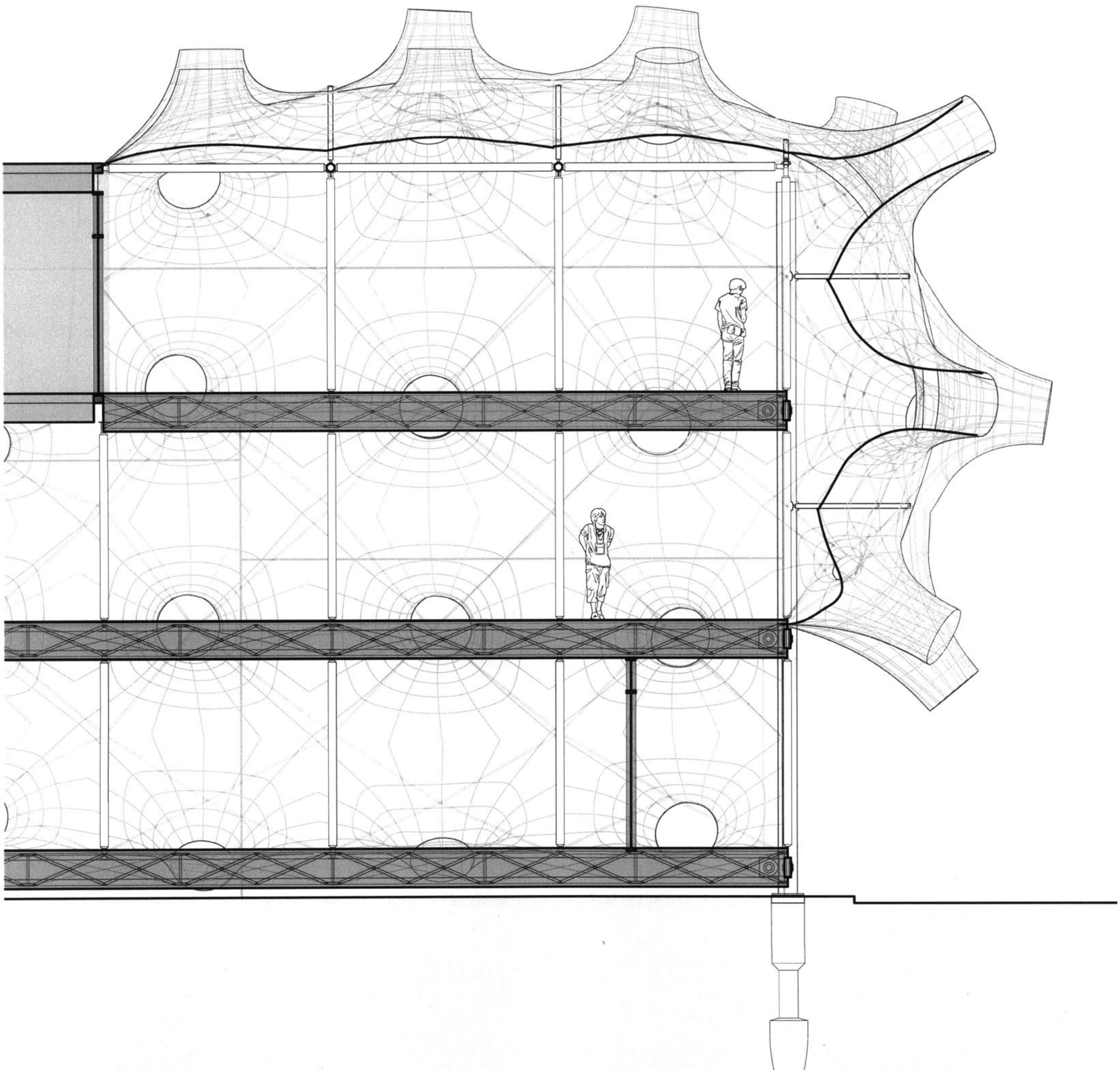


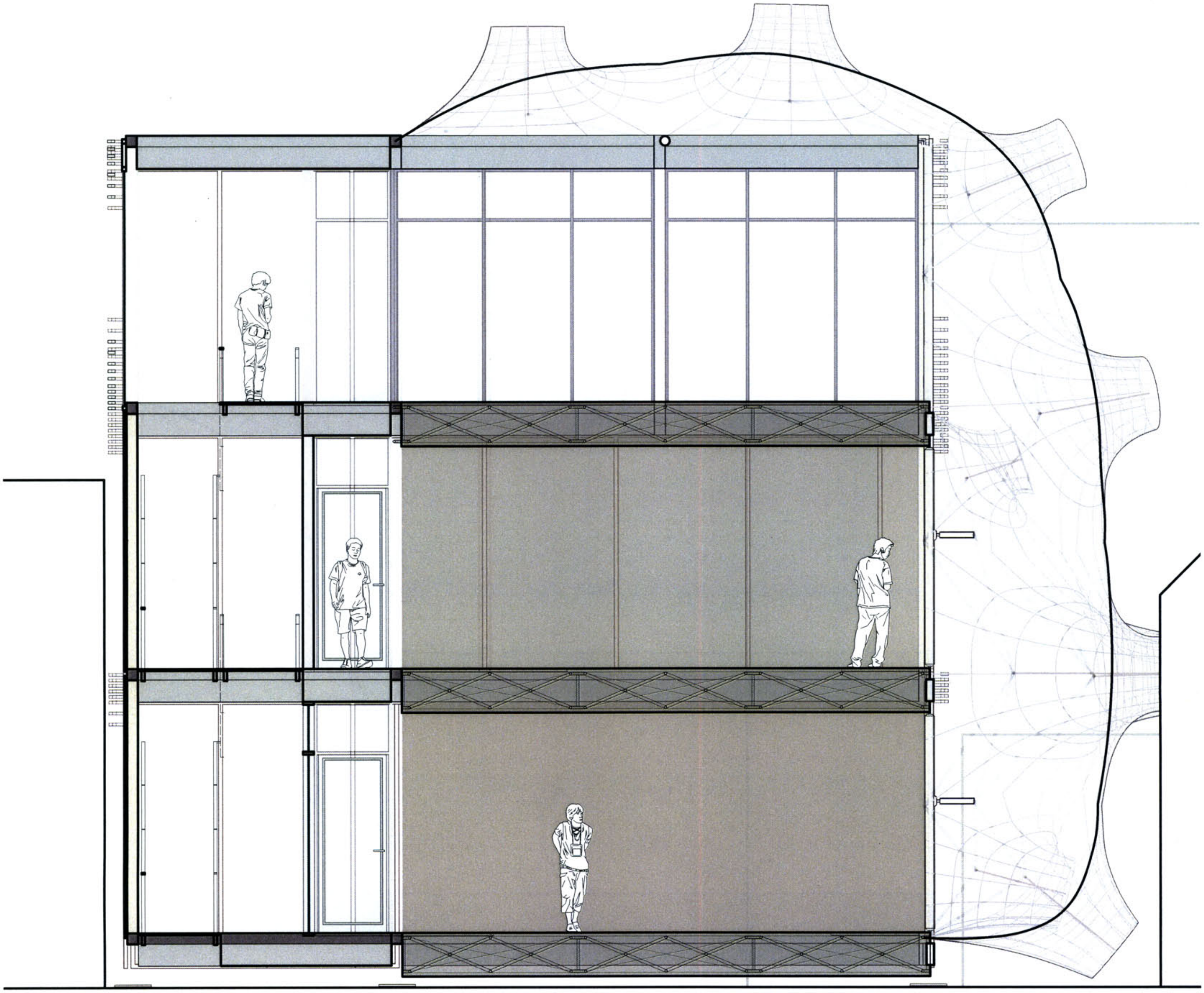
SBO TRANSVERSE SECTION

5' 10' 25'

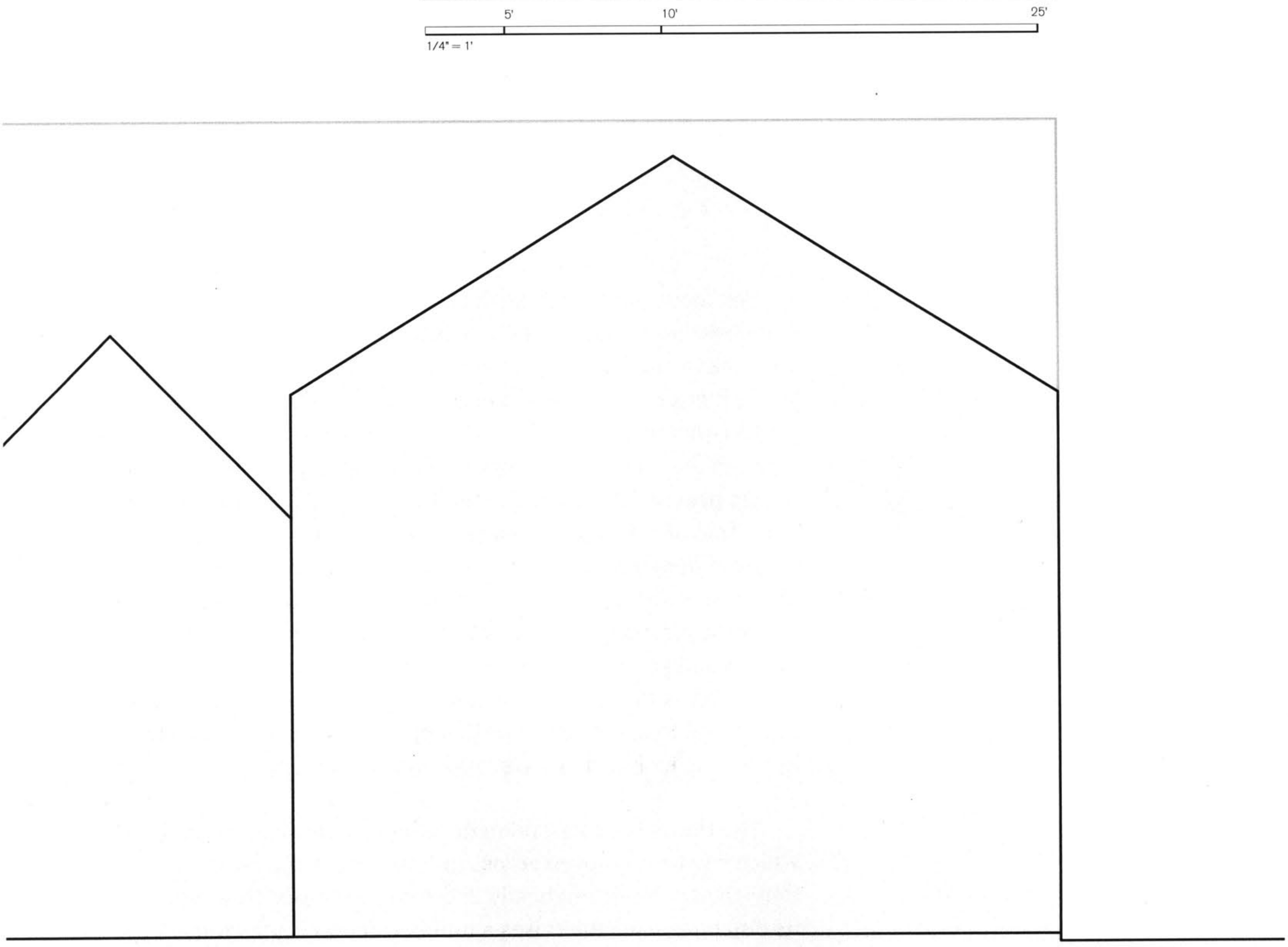
1/4" = 1'







SBO CROSS SECTION



CONCLUSION

The focus on describing design processes, architectural languages and translating them into a protocol is both an alternative and unusual thesis proposal for a March degree. While it is a scenario-based exercise, its intention is to display a convincing argument about novel ways of designing through the interrogation of the relationship between the design process and the object of its outcome. The explicit definition of a design language and connection to a design protocol demonstrates how one can arrive at descriptions of complex artifacts. It reveals the power of this concept generating dynamic design solutions to meet variable conditions and geometries through the use of a singular method as well as the ability to seamlessly critique, evaluate, refine, add to and reshape design proposals instantaneously by altering its informative syntax and vocabulary.

The thesis is successful in developing a design protocol, which can be employed across different sites and conditions to achieve dramatically different proposals. However its outcome leads the raises a number of other questions regarding its refinement and application. Once achieving a proposal, what are the specific methods to evaluate it in order to identify weaknesses within its informing protocol and language? There are moments where It steps out of the expertise gained from an architectural education into fields of real estate development, financing, computer science and structural engineering, while it is exciting to discover where architecture overlaps with other fields and expertise, its realistic development and application requires an interdisciplinary knowledge base and demonstrates its importance early in the design process.

While more sophisticated design communication tools exist in aiding the profession based on similar concepts, this demonstrates the how the wide array of open source resources and data allow once complex tools to be produced easily based on designers personal needs. This empowering method has the ability to shift the relationship between designers, products, and the way in which architects operate in the built environment, and I am excited to see others explore this direction.