LABORED FORM: DOMESTIC FOLD

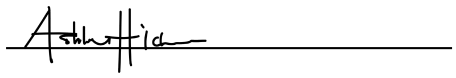
A Thesis Submitted to the Department of Architecture
Harvard University Graduate School of Design, by

ASHLEY HICKMAN

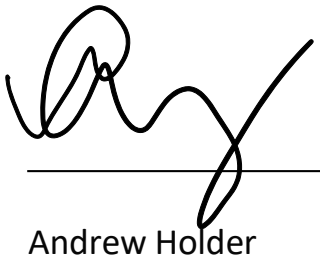
In Partial Fulfillment of the Requirements for the Degree of
[Master of Architecture]

JANUARY 2021
(Month and Year Thesis Submitted)

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Ashley Hickman



Andrew Holder

ASHLEY HICKMAN
LABORED FORM: DOMESTIC FOLD
LAS VEGAS, NEVADA



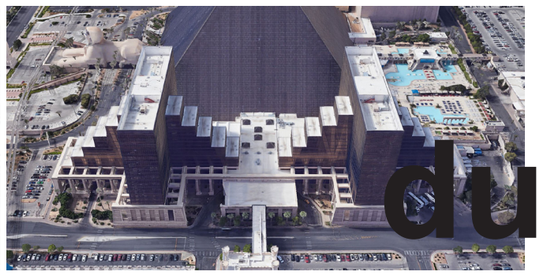


Las Vegas

Las Vegas is a city of duplicates, it appears at first only complicated. The multiplication of duplicate forms can be explicated to reveal apparently similar but differently applied interests. What we call Las Vegas is actually about half the incorporated city of Las Vegas and half the unincorporated Clark County—where The Strip is located. Transportation routes allow a multiplicity of redundant experiences along the same path. A visitor from Los Angeles can arrive via a 5 hour trip by way of a luxury party train or via an 80 minute trip along the high speed rail line, both follow similar routes along adjacent tracks. One can ride the monorail through The Strip, or be transported via autonomous vehicle in underground tunnels. The space between such near duplications is rich for inquiry, in each case implicating a folded form which might reveal misaligned interests, bureaucratic divides, and hidden reflections.



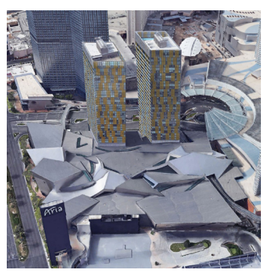




Buildings on The Strip duplicate neighboring buildings, duplicate past versions of themselves, and duplicate other cities.

duplicates

Except for only two, all buildings on The Strip are twins or triplets. The abundance is such that distinct categories can be made of their methods of replication (duplicates, near duplicates, coordinates, and replicas).

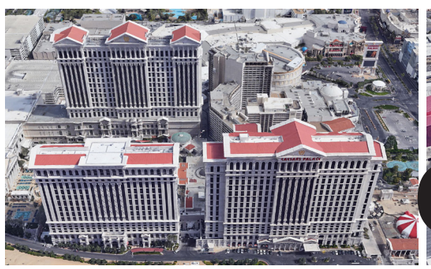




near duplicates

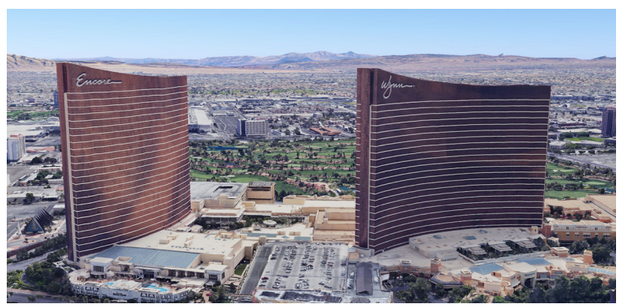
Duplicates are constructed simultaneously, near duplicates are doubles built by different corporations, coordinates might be constructed at different times but match, and replicas are constructed at different times as a modified copy of the original.

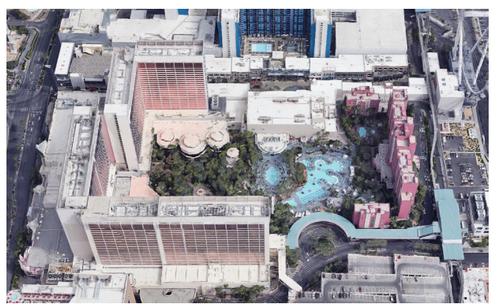
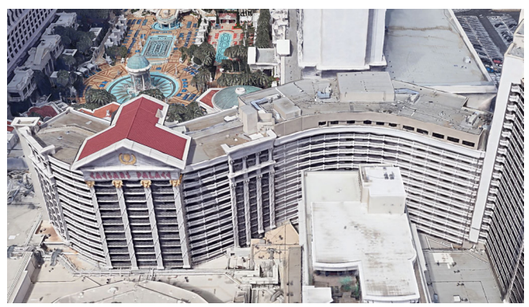



coordinates

Following a casino building boom in the 90s through early 2000s, Las Vegas has more recently focused on diversifying its tourist economy. Current projects include a medical district, a new stadium for the relocation of the Raiders to Las Vegas, a spherical concert hall, and the expansion of the convention center.



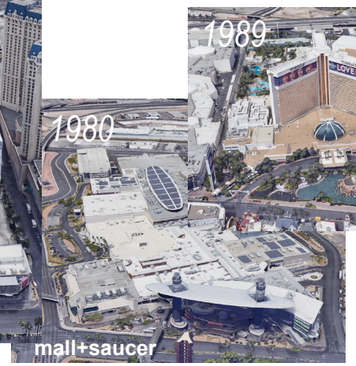



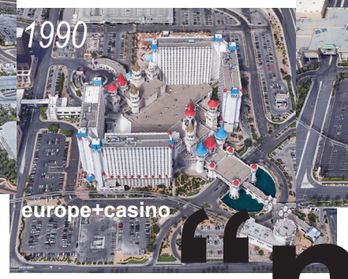
replicas

Las Vegas since Venturi + Scott Brown

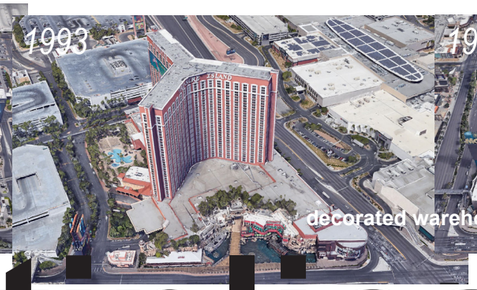
major projects built since 1970

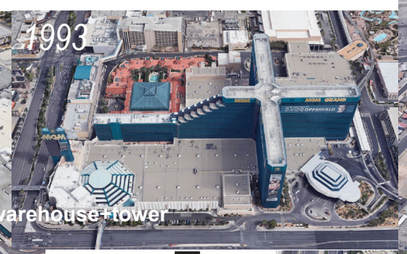




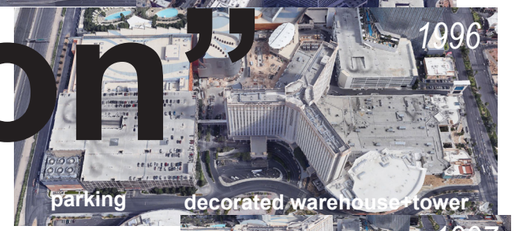






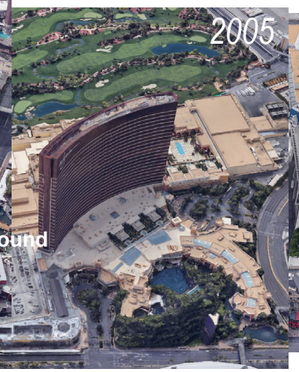






“multiplication”



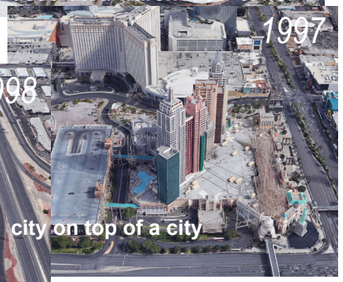


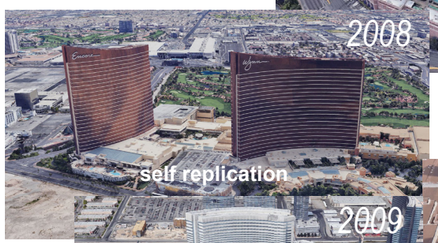




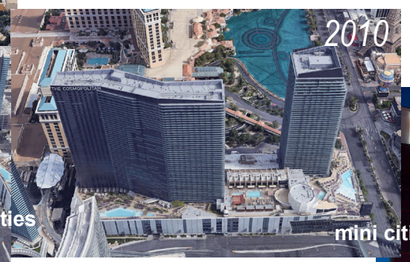


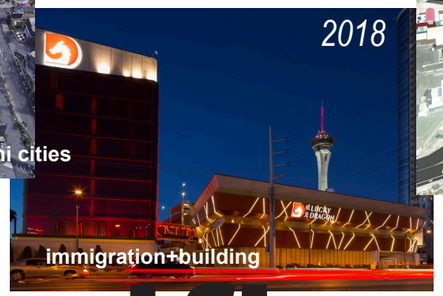


















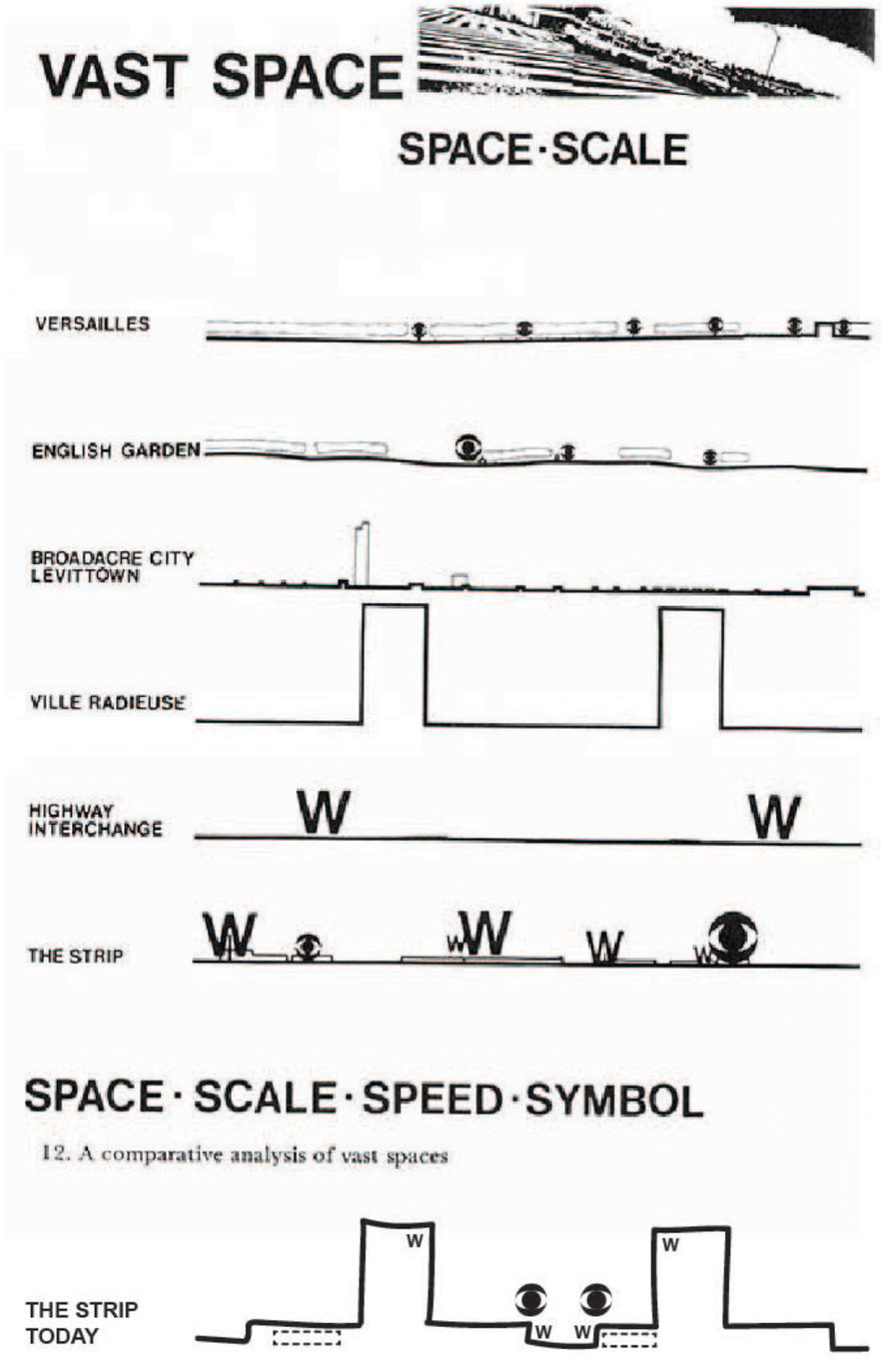


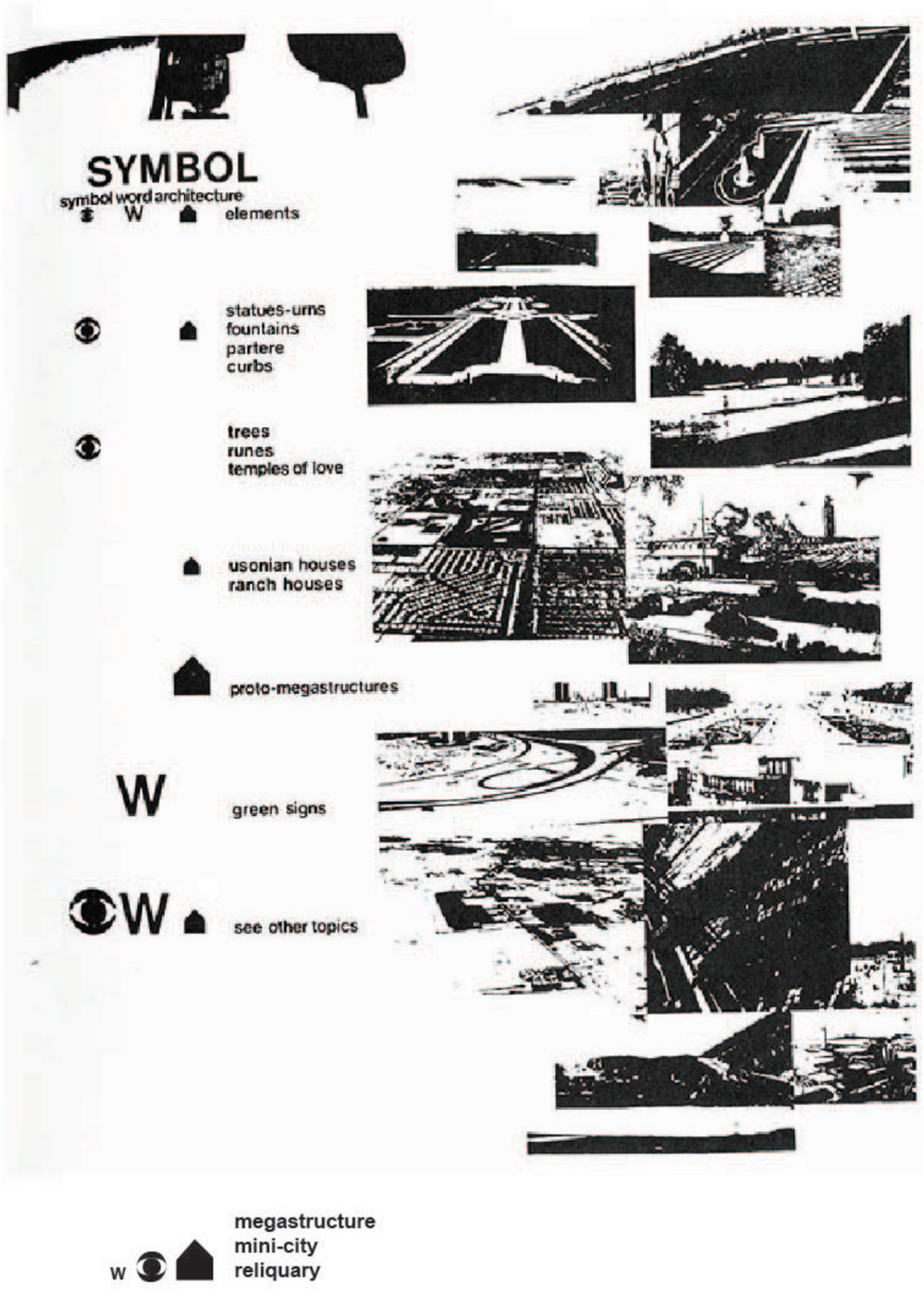
“diversification”





Las Vegas since Venturi + Scott Brown





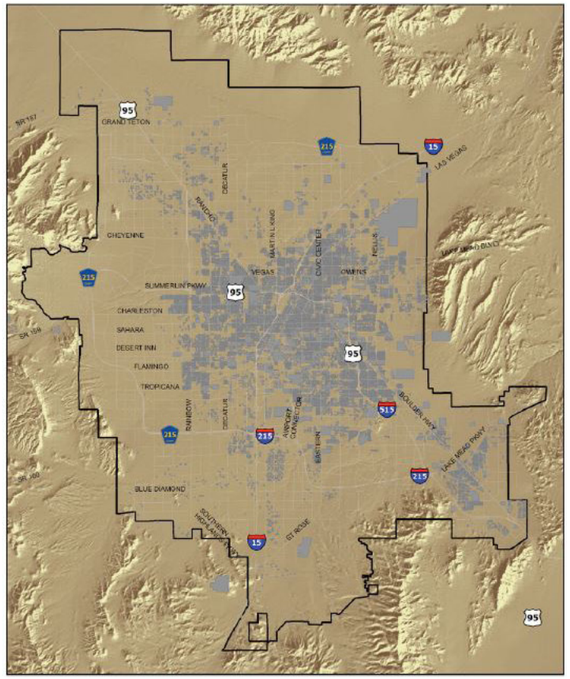
The Strip today is quite different from the Strip analyzed by Robert Venturi and Denise Scott Brown. Recent expansion has seen the endless combination of casino and commercial programs into continuously connected mat buildings and the addition of soaring hotel and condo towers reflects a period of "manhattanization" on the Strip.

Diagram From Robert Venturi and Denise Scott Brown, Learning From Las Vegas with additional diagram "The Strip Today."

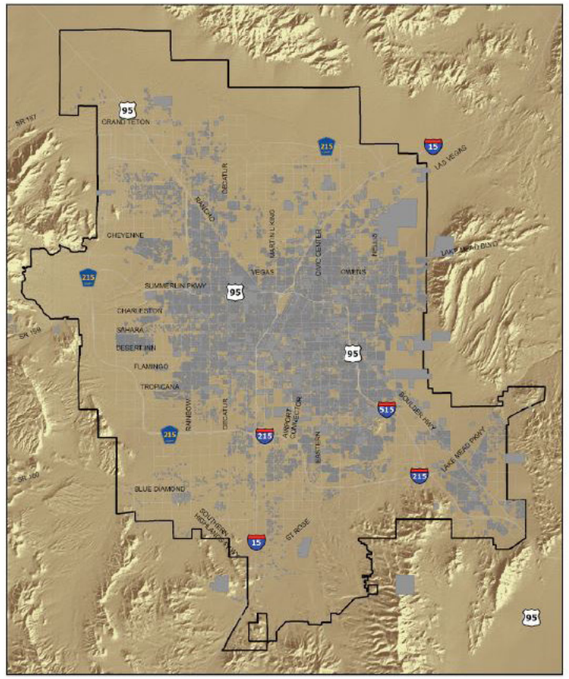
When Learning From Las Vegas was published in 1972 the population of the metropolitan area was 292,400. Today, the city has expanded to over 2.26 million. The strip saw a construction boom of casinos in the 1990s which transformed the Vegas known to Robert Venturi and Denise Scott Brown. The situation described at the time is often one of unexpected adjacencies “...the gasoline station beside the multimillion-dollar casino. These show the vitality that may be achieved by an architecture of inclusion or, by contrast, the deadness that results from too great a preoccupation with tastefulness and total design.” Today, these adjacencies have merged into massive amorphous mats, each with some resemblance to the original theme “Italian Renaissance” or “New York.” The major development that had yet to come to The Strip of the 1970s was the hotel/condo tower. Today the strip has built out at ground level and vertically in every imaginable shape of extrusion.

Between each casino is filled out with agglomerations of single story building types, so closely pushed together that their roofs form surfaces of continuity despite extreme differences in function, form, type, and reference. This architecture of inclusion has mixed together buildings into a single stew. The casino is no longer an autonomous building type, it is scrambled with shopping, living, dining, the car, the monorail, the theater, and the hotel. The combination is so thorough that individual parts escape description. Form becomes the default method for analysis when individual programs within the mass are no longer discernible.

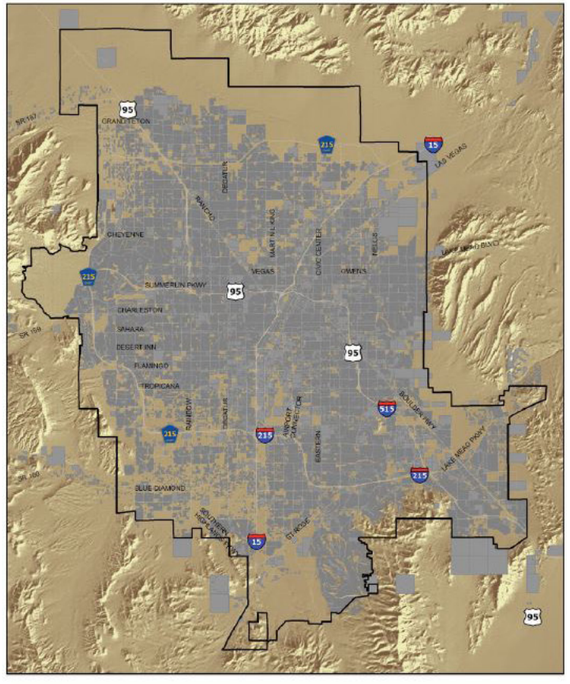
Robert Venturi and Denise Scott Brown analyzed Vegas through the imaging of its reality. What was of interest to them was exactly what existed—it was possible at the time to draw a section through The Strip and easily represent the reality of the built environment. Today, Vegas looks increasingly urban, tall, combined, and interior. The photograph is no longer sufficient to analyze its parts, they have been mixed into the continuous fabric. Representations of folding provide a method of abstraction for understanding the city. The drawing of the direction to fold a shirt does not represent every fold of the fabric because the complexities are so multiplicitous they become meaningless. The drawing of the shirt folding process focuses on action, alignment, and order through only the minimum lines necessary. The diagram does not pay attention to exact geometries. In employing this method it creates a shorthand notational system for describing complex forms.



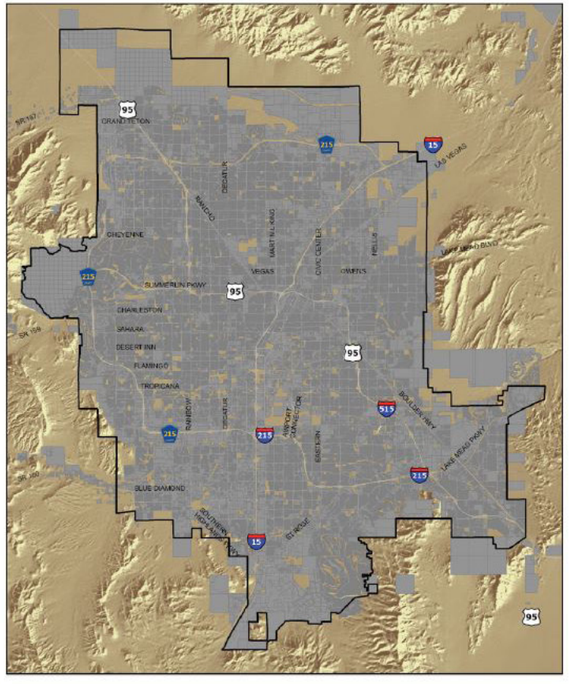
1980



1990



2008



2030

Figure 2-9: Las Vegas Valley Development: 1980-2030

Maps from Clark County Assessor

1980-2030
population growth

Las Vegas is a popular relocation destination because of its affordability for the service worker and middle class professional, in particular for those coming from California where wages are often the same but cost of living is exorbitantly higher. Since 2010 Las Vegas has seen its population grow from 1.9 million to 2.7 million, by almost one million new residents. In the same period the number of available housing units grew by only 50,000. Initially, this growth was accommodated by the surplus of housing after the 2008 financial crisis. Today, this surplus has been absorbed and the city has reached lower vacancy rates than pre-recession numbers.

The demand for new housing is high with projected supply only accounting for one quarter of the new units required to accommodate this population. While the city has seen rapid expansion of single family housing historically, a comparison of the trends on the Strip tells a slightly different story. Most jobs in the city occur on or near the Strip, housing vacancy rates are the lowest around the Strip, more people live in apartments near the Strip, rent prices are the lowest on the Strip, and the housing stock is the oldest near the Strip. To summarize, the housing on the Strip is both the worst quality and in the highest demand.

Map 1: Residential Construction Year

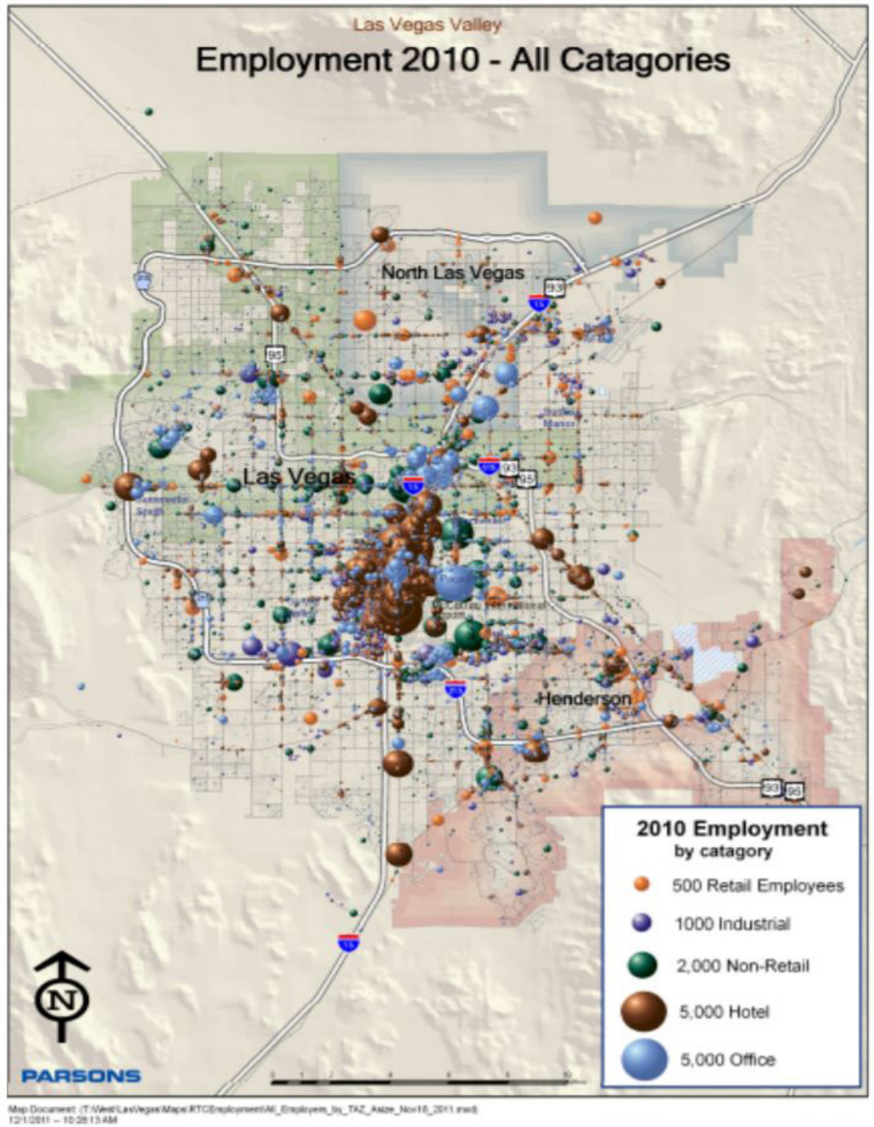
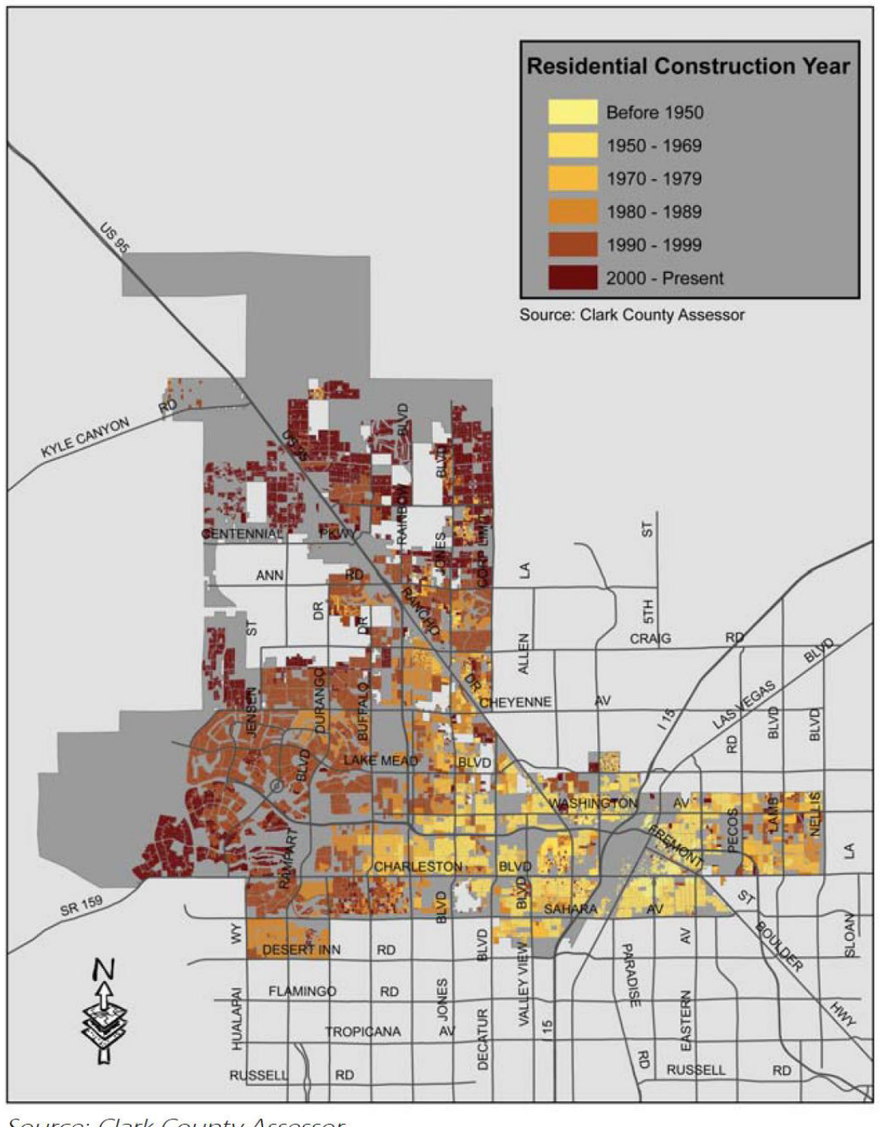
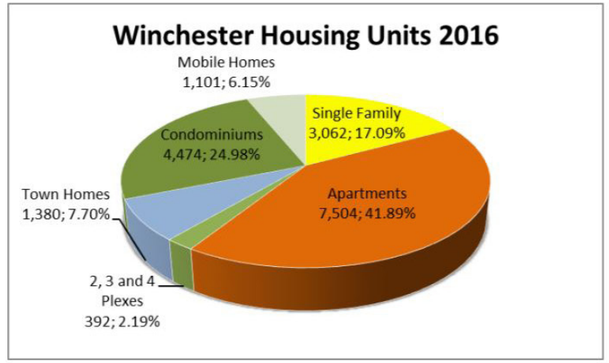
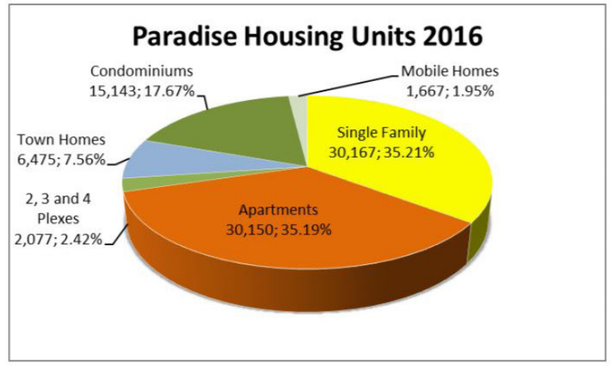


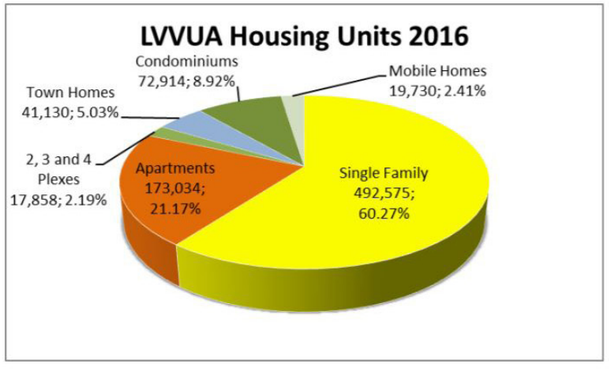
Figure 2-8: 2010 Employment Density



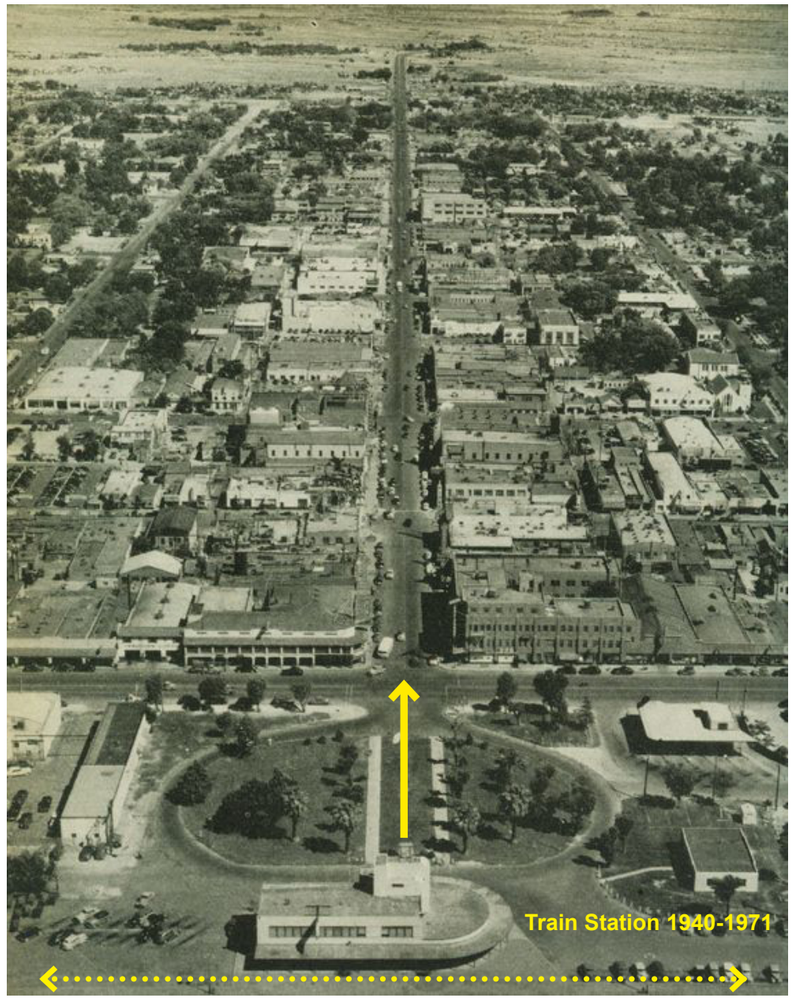
Source: Clark County Assessor

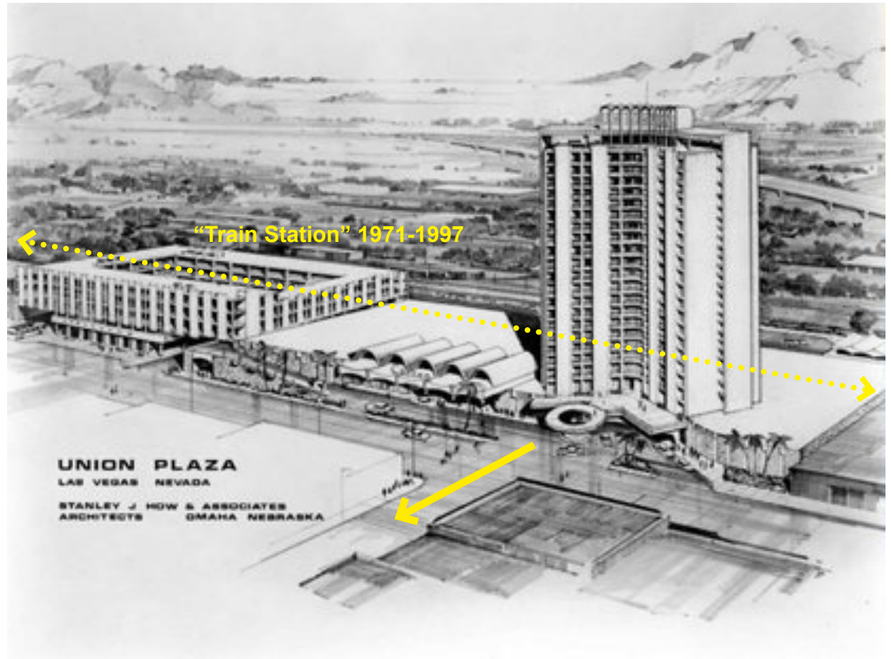






Las Vegas Train Station





Las Vegas is the largest metropolitan area in the United States without passenger rail service. The city was originally founded as a refueling stop for the train but has not provided passenger rail service since 1997. The train station was once an autonomous building, built in Streamline Moderne style, which stopped in Downtown Las Vegas. In 1971 the autonomous station was demolished and replaced by the Union Plaza Hotel which contained a small waiting room for the train. In 1997, Amtrak stopped passenger service to Las Vegas. Despite being formed around this transportation hub historically, there is little obvious trace of the train station today.

Las Vegas Current Projects

partially complete



The Boring Company



planned





existing

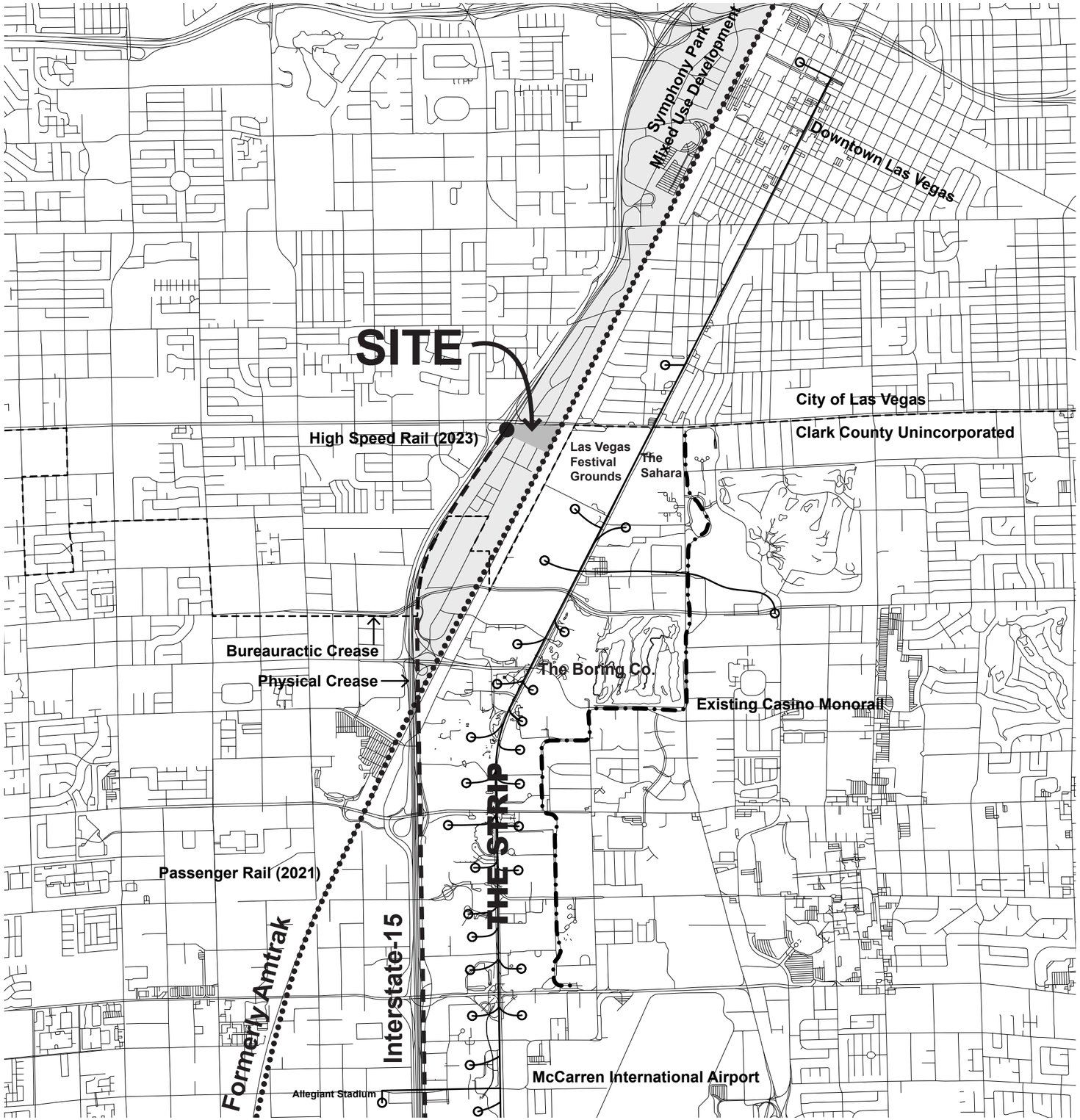




Current projects in Las Vegas reveal a renewed interest in transportation in response to the growing population, severe traffic congestion along interstate 15, and broader state wide ambitions of improving West Coast mass transportation options. The monorail constructed in 1995 serves tourists on the Strip, the high speed rail plans to bring travelers from Los Angeles, and the Boring Company has recently completed a series of underground tunnels which link the convention center to the Strip and aim to eventually connect beyond the city.

Project Brief

housing + train station



This project aims to fold together similar but previously misaligned interests. It pairs adjacent but disconnected modes of transportation with the demand for new housing, creating a mixed use transportation center. The site is located at the North end of The Strip, just West of the Sahara Hotel and Casino and adjacent to the Las Vegas Festival Grounds. The site is bound on the west side by interstate 15 and the high speed rail, on the east by the Amtrak train line, on the north by highway 589 and on the south by an industrial and research park. The site is within the city limits of Las Vegas though by proximity more related to The Strip (in the unincorporated area of Clark County). It is adjacent to the parallel running Las Vegas tourist monorail and the Boring Company's underground shuttle service.

Project Brief

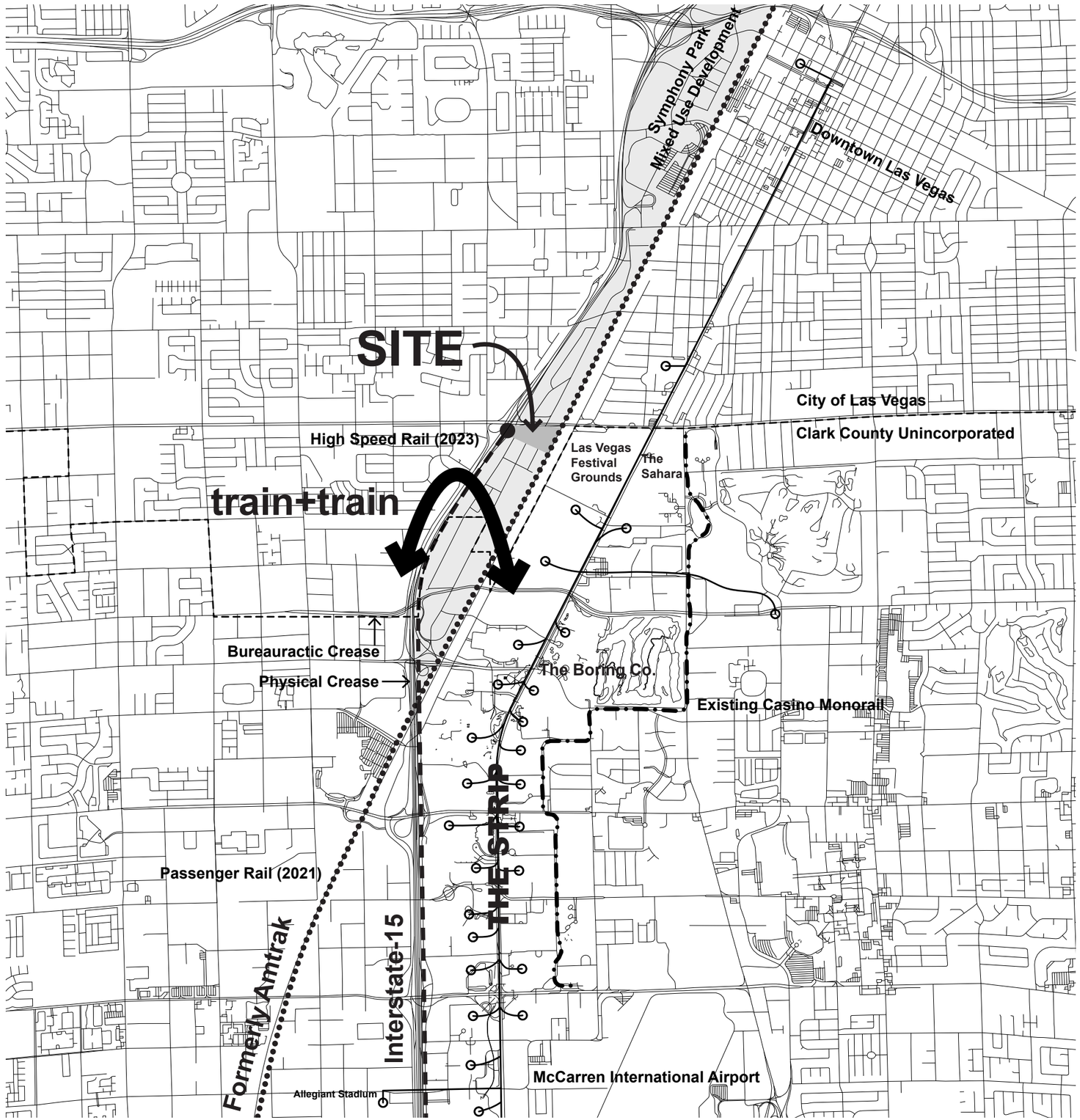
housing + train station

PROGRAM
1/2 Housing + 1/2 Train Station

950,000 sf Housing
950,000 sf Train Station

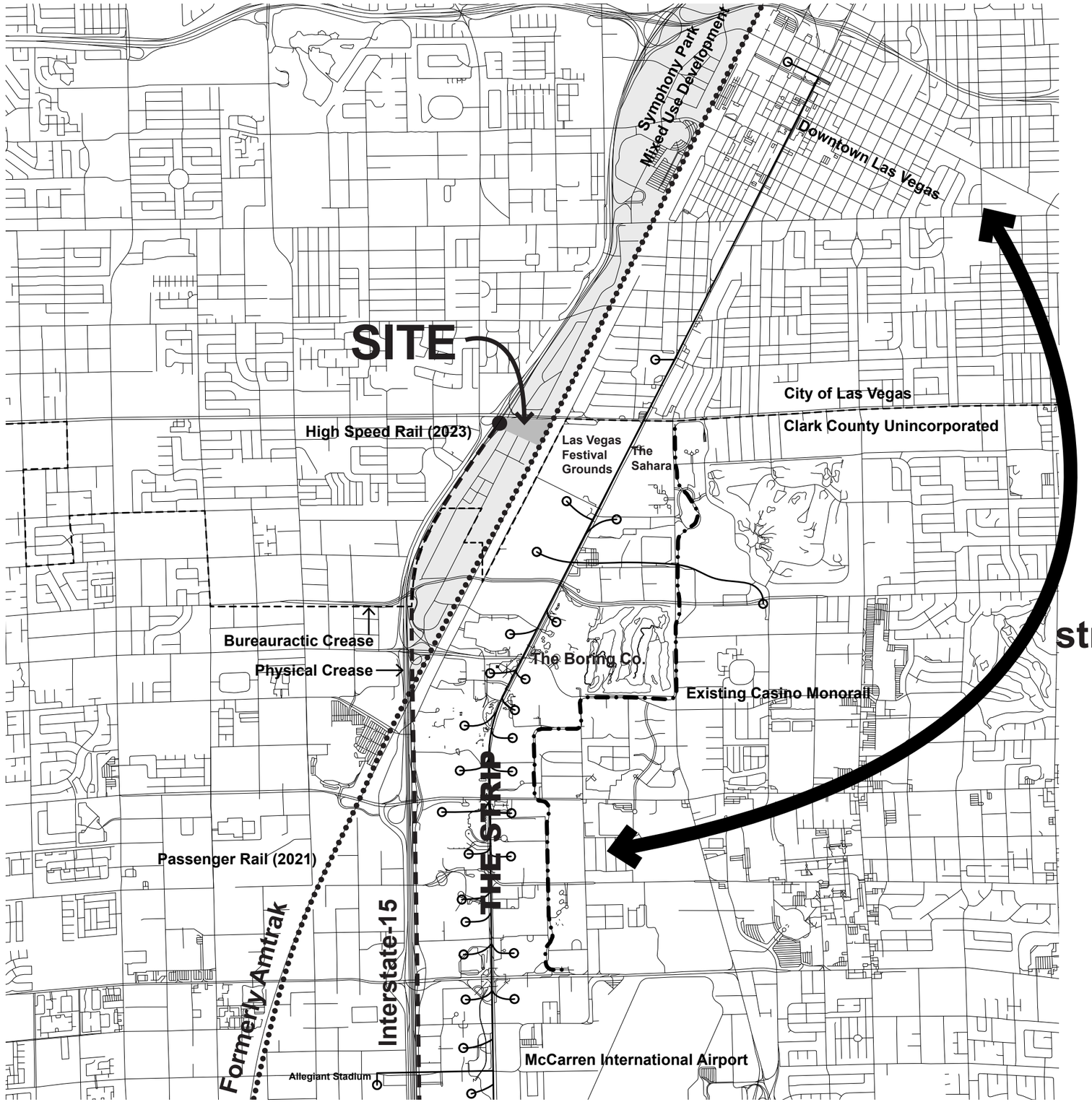
Train Station includes:
-High Speed Rail Platform 100,000 sf
-Amtrak Stop 50,000 sf
-Train Station 120,000 sf
-Parking Garage 180,000 sf

Housing includes:
-2000 units (studio, 1 and 2 bedrooms)
-2400 parking spaces
-open space 200,000 sf
-amenities 100,000 sf



Project Brief

housing + train station



TRAIN+TRAIN

Existing and future transportation methods are close but not yet connected, operating primarily North-South. The duplication of the existing Amtrak line by the new high speed rail line creates the adjacent but not yet related opportunity for a multiplied train station. The project employs folding as an organizational strategy for the relocation of disparate parts into a unified center. A folded will acts as a management strategy for the relation of near duplicates at all scales of the project. Beginning at the urban scale acting to relate the new high speed rail train station to the existing Amtrak station.

strip+city

STRIP+CITY

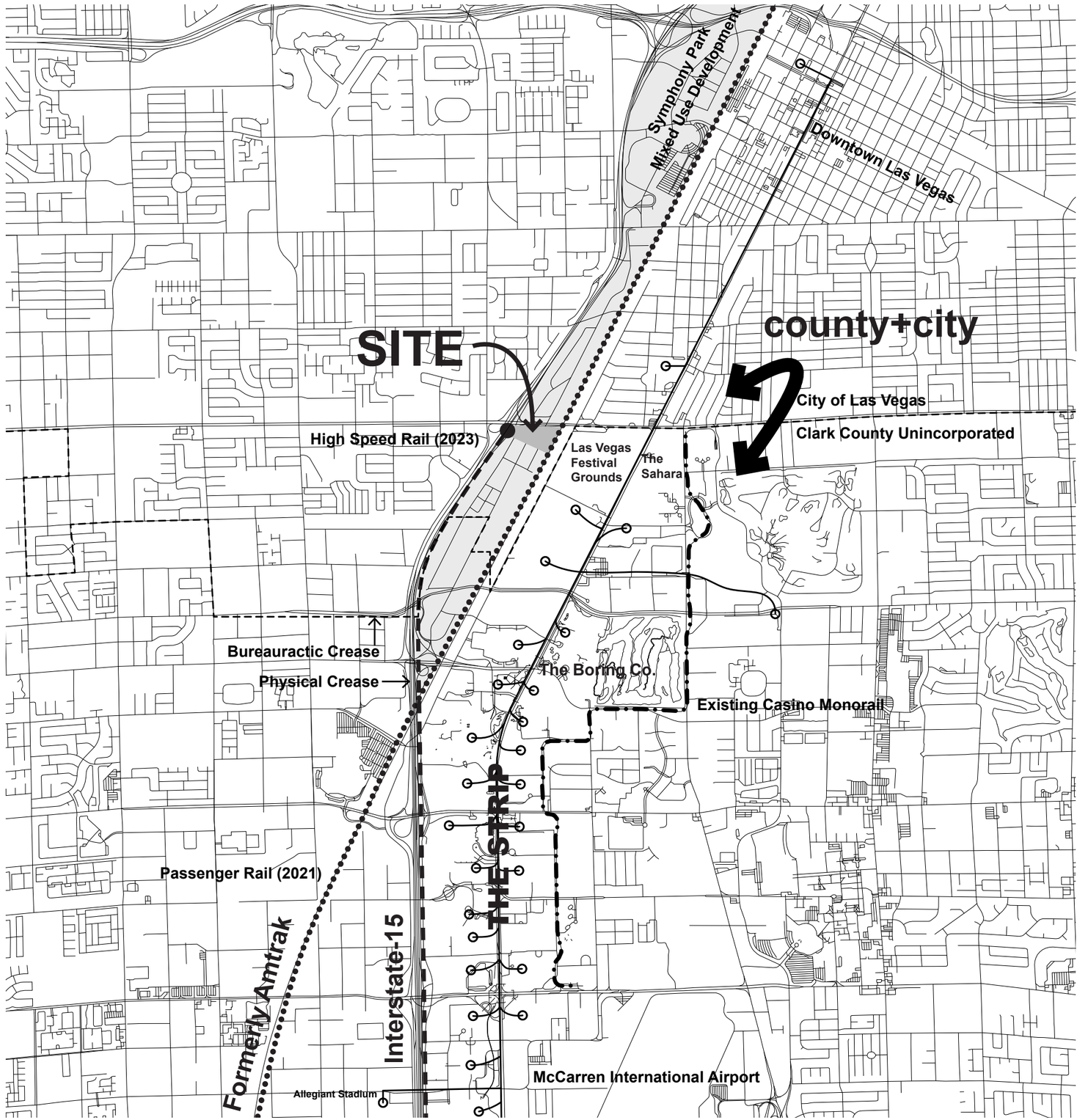
The project aims to fold together the civic interests of the city of Las Vegas with the commercial interests of the strip.

Project Brief

housing + train station

COUNTY+CITY

It aims to fold together the civic interests of the city of Las Vegas with the civic indifference of Clark County unincorporated.

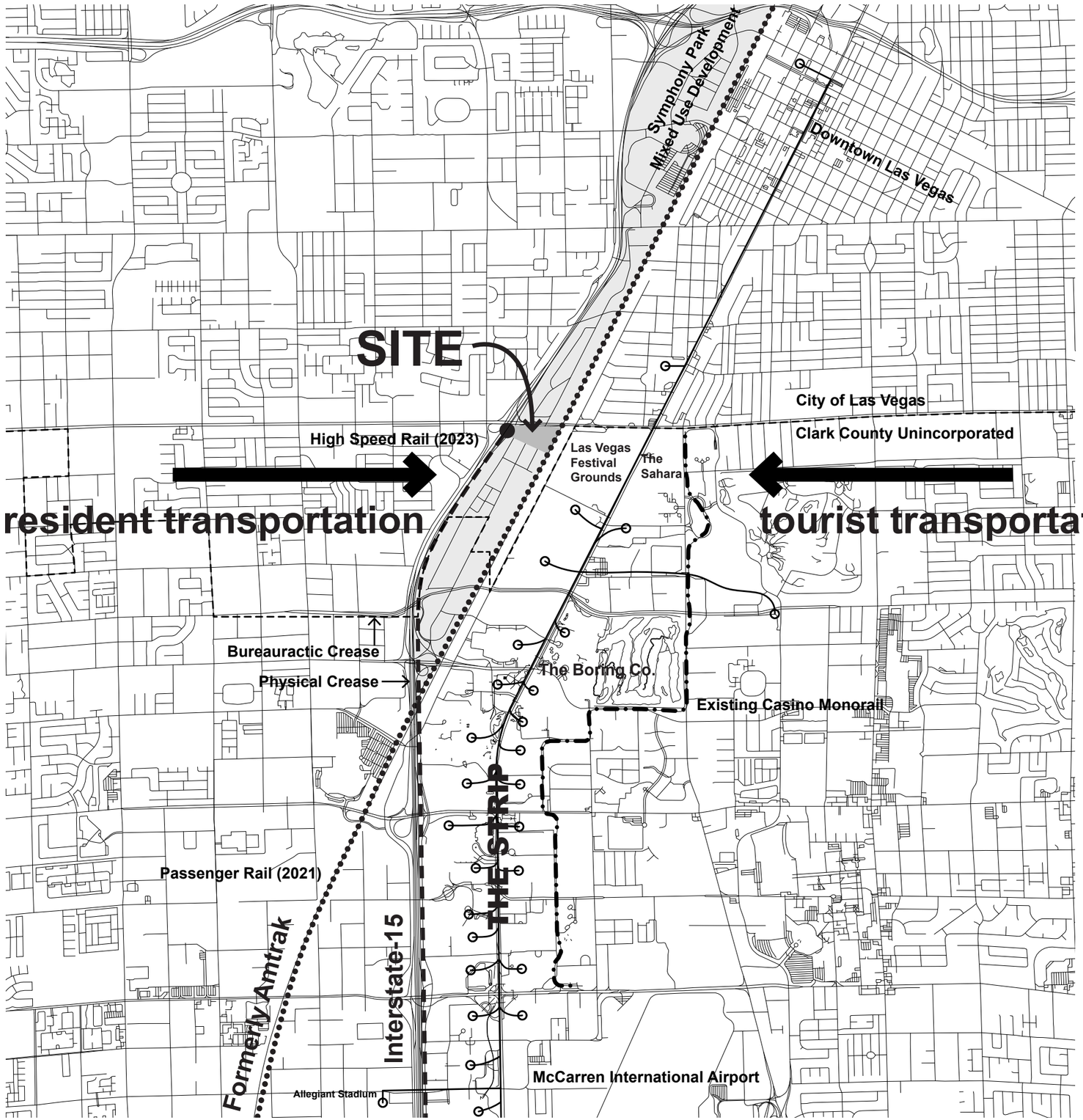


Project Brief

housing + train station

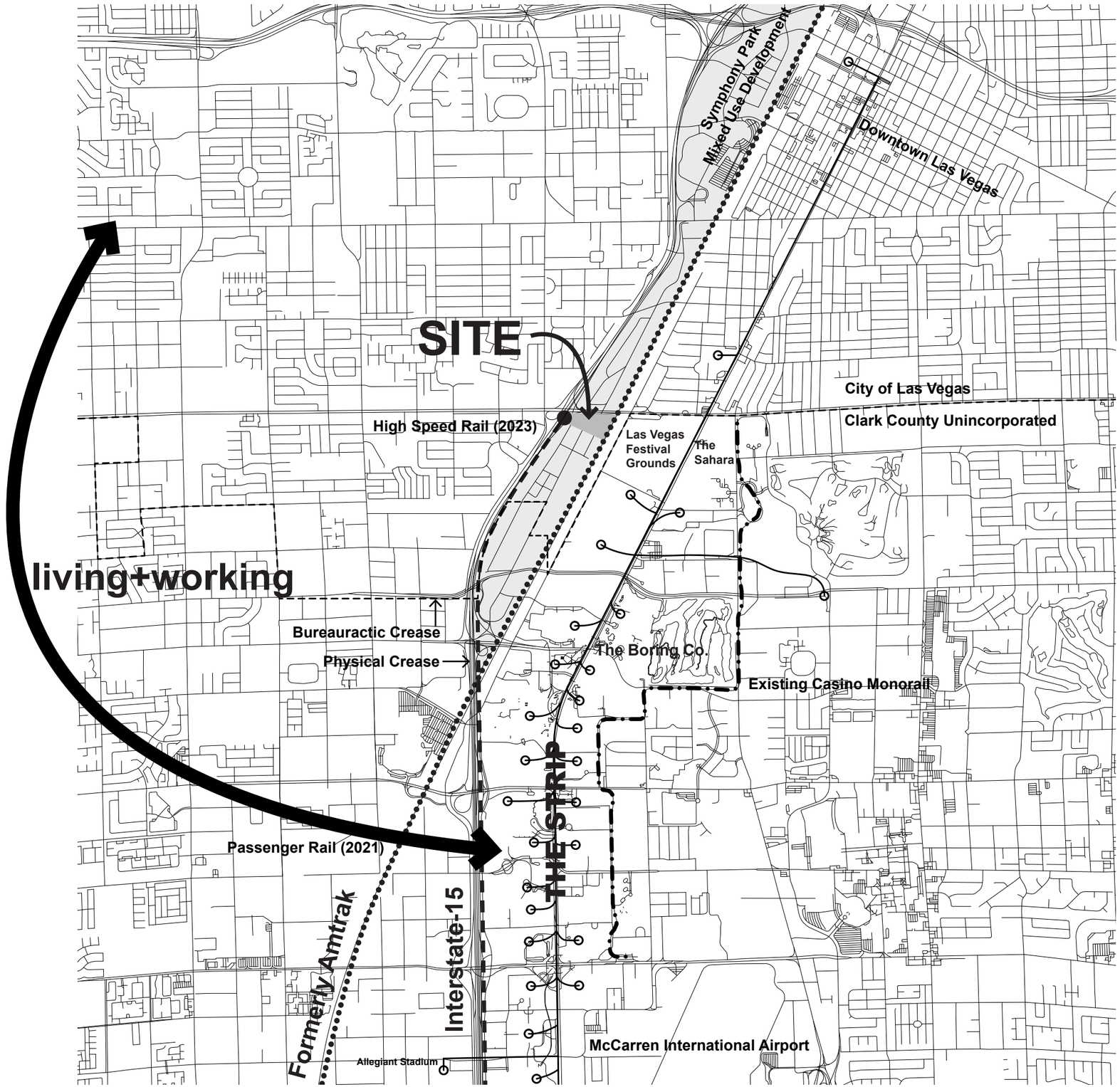
RESIDENT+TOURIST

It aims to fold together modes of transportation for the resident with modes of transportation for the tourist.



Project Brief

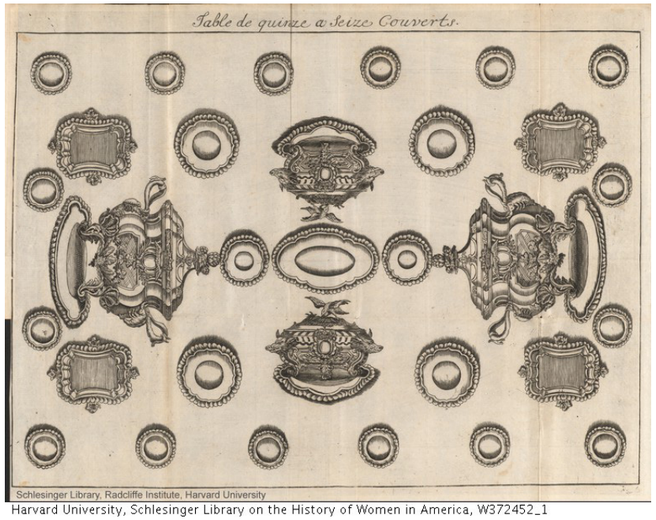
housing + train station



RESIDENT+TOURIST

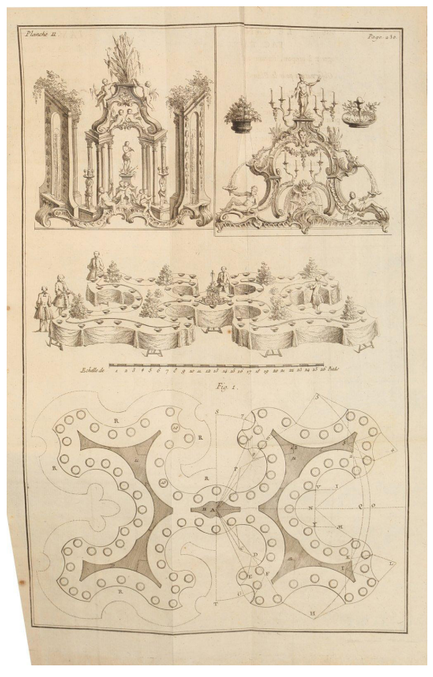
And perhaps most importantly to fold together the workplace and the home to create a closer connection between those who serve the strip and those who enjoy the strip. The folding together of the domestic space with the workplace would decrease commute times, increase connections to modes of public transportation, and provide a reflection on the embedded role of the service economy within a tourist destination.

DOMESTIC FOLD



Harvard University, Schlesinger Library on the History of Women in America, W372452_1

La Chapelle, Vincent. Table De Quinze a Seize Couverts, 1742.



Gilliers, Joseph. Le Cannameliste Français Ou Nouvelle Instruction Pour Ceux Qui Désirent D'apprendre L'office, 1751.

The culmination of domestic form and labor appears at the dinner table. The work of the domestic laborer is represented in the thoughtfulness of the presentation, the arrangement of plates and other objects, and the coordination of the courses as they emerge from the kitchen. The importance of the set table can be seen in the presence of the dinner party throughout history in paintings, books, and manuals. Since the origin of the act of eating a meal at a table, the act of setting the dishes has been an organizational act. Matters of symmetry, proportion, and function are integral to the placement of the food in front of the consumer. Being an organizational act that lasts only one night, the history of the dinner party is ephemeral and hard to track down. The available references prior to 1850 tend to provide a history of the bourgeois, a dinner party not available to everyone.

The importance of the organizational principles of the dinner party are apparent from 18th century texts on the subject where the only illustrated plates are top view drawings of the table arrangement.[1] The engravings from *Le Cuisinier Moderne* are a unique example in their use of elevation drawings in combination with a plan. The elevations are used to show the largest and most important dishes from the perspective of the person in front of which they are placed. All found examples use symmetry as a guiding organizational principle, this engraving is unique in the appearance of the cruciform in plan. It seems as if the principles of symmetry are more important than the accurate representation of a cruciform plan which would provide a longer "apse." The hierarchies in this dinner plan suggest the locations of the most important guests. It seems probable that those of higher status would be placed at the short ends of the table, directly in front of the largest dishes. While placed in locations of different hierarchies, the individual serving plates are distributed equally along the edges to all parties provided a seat at the table.

The idea that the dinner party is a form of institutionalized knowledge is apparent in the engravings of Joseph Gilliers which depict a Rococo dinner party in 1751.[2] The oblique drawing of the set table is accompanied by a plan which shows the geometric construction of the shape of the table. In the way it is represented the drawing begins to suggest a false symmetry in the way it is represented. The geometrically constructed half appears smaller or modified when contrasted with the half that marks out space for the chairs. It appears as if the construction lines are not only for marking out the geometries of the table but are for constructing a view toward the center of the table where the largest three dimensional decoration is shown.

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1 La Chapelle, Vincent. Table De Quinze a Seize Couverts, Engraving from Vincent La Chapelle's Le Cuisinier Moderne, Volume 6, 1742.

2 Gilliers, Joseph .. Le Cannameliste Français Ou Nouvelle Instruction Pour Ceux Qui Désirent D'apprendre L'office , Rédigé En Forme De Dictionnaire... Par Le sieur Gilliers,.. Lunéville, 1751.

The positions of the guests have been constructed to direct their gaze toward different centers of the table depending upon their location around its edge. In this instance the gaze is used to construct the hierarchy of participants, rather than solely their location at one edge of the table. The juxtaposition of the table setting with fragments of architecture, sculpture, and ornament construct the analogy to architecture.

To consider this gaze at the scale of the city considerations might include who is looking at it and from where, how high are they in elevation. Would the "gaze" of the tower have a gaze producing pressure on the form of the massing. At the Rococo dinner party it appears as if the gaze of the guest is an equally important organizational tool in constructing the form as the centerpiece has on determining the guests position. Somewhere between these positions, the radii are constructed.

Publications such as *Table De Quinze a Seize Couverts* and *Le Cuisinier Moderne* construct the disciplinary frameworks for the art of setting the table historically. The texts set out the organization of the event at the highest level and would be likely read by the top ranks of people organizing such elaborate events. Other texts during the same period begin to depict the other types of people participating in these affairs. Each object placed on the table has a unique history of its embedded labor, emergence of use, and eventual adoption into the culture of the everyday. Take the spoon for example which is carved with the labors of the silversmith, represents both the taste and wealth of the host, and when used properly shows the refinement of the guest. I am particularly interested in the role of the napkin as it contains an embedded and transformed representation of the laborer. The napkin is particularly interesting when approached from a perspective of education. In tracing this history I look for evidence of who is doing the teaching, in what instances was the knowledge formalized, and who is given the chance to learn.

The origin of the word napkin in English comes from the French *nappe*, a cloth covering for the table and adds the diminutive suffix -*kin*. The napkin serves as a representation of etiquette in its functional purpose of keeping the hands and lap clean. In addition to preserving the cleanliness of its user it is representative of the service of the housekeeper. Whomever is responsible for the upkeep of the napkins has ensured that all previous food stains have been removed, their labors represented in the new appearance of the napkin when offered to the visitor.

The often cited first known instance of napkin folding are a series of plates in the *Trattato dell piegature [Treatise on Folding]* published by Mattia Giegher in 1629. Giegher came from Bavaria, Germany originally and proclaimed himself a German master of the table arts operating out of Padua, Italy. The art of folding and meat cutting appear as related subjects in several publications during the time. The presence of other similar manuals in Padua around the same time suggest the location as a center for the art of the dinner party.[3]

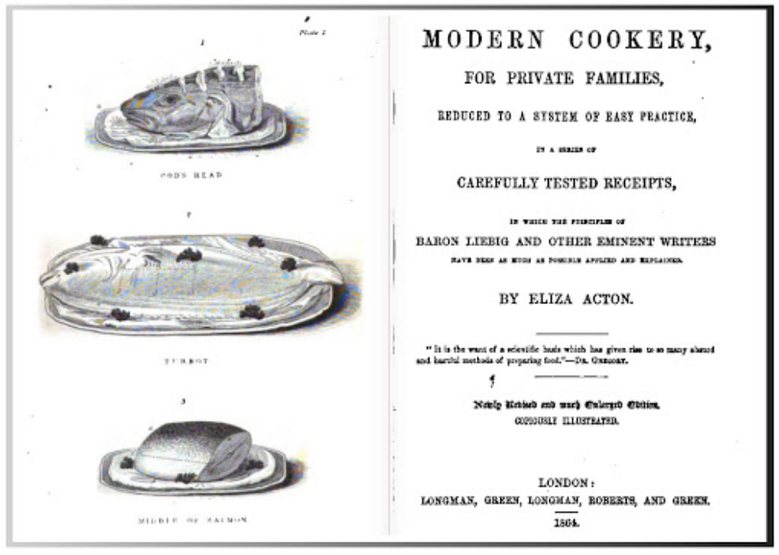
The use of the napkin is intrinsically tied to the performance of manners, as evidenced by the documentations of Leonardo DaVinci, who is often credited with inventing the napkin in 1491. I am unable to track down exactly the source of this claim but see it repeated across literature and exhibitions. A translation by Santiago Iniguez is posted in an online humanities blog as follows,

"A really hilarious note is the one describing 'indecent behaviors at my Master's table':
– 'Nobody should sit on the table, nor on the lap of another guest'.
– 'Nobody should take food from another's guest plate, unless he first asks for permission'.
– 'Nobody should clean his knife with his neighbor's clothes'.
– 'Nobody should take food from the table and put it in his pocket for later consumption'.
– 'Nobody should pinch or beat his table neighbor'."

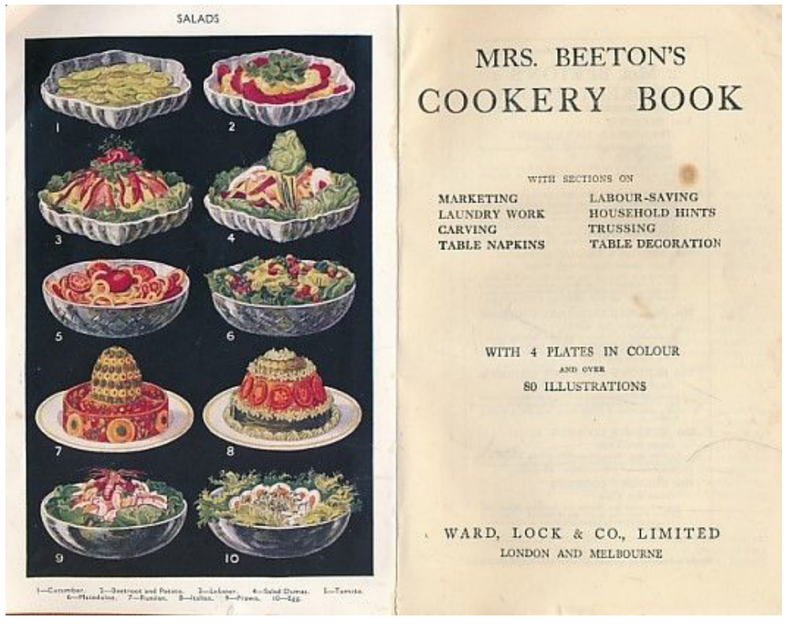
I'm not sure whether the claims of DaVinci as an expert in the dinner party are true or whether they exist as some illusory truth since the academic literature substantiating the claims does not exist. Some of this evidence appears to have "emerged" from an exhibit on DaVinci held by Venetian in Las Vegas and curated by Grande Exhibitions. Given the unproductive nature of tracing down the movement from tablecloth to napkin, one can approximate that around the 1450s people were wiping their hands on table cloths and eventually moved to wiping their hands on napkins (i.e. mini tablecloths).

By the end of the 17th century the napkin had transformed from a tool of the dinner party to a teaching device in the field of recreational mathematics. Recreational mathematics is a field of study that encourages the participation of the learner in the methods being taught rather than a more passive mode of engagement. Jacques Ozanam, a prolific French mathematician uses the napkin, or paper, as one type of exercise in the study of math. In a most basic description the book is concerned with the teaching of math as not only the learning of calculation, but in its application to real world objects. The folding of a flat material or the drawing of a math problem acts as a more engaging format and engages the learner in play.

3 Krohn, Deborah L. "Carving and Folding by the Book in Early Modern Europe." Journal of Early Modern History 24, no. 1 (2020): 17-40.



Acton, Eliza. Modern Cookery for Private Families, 1864.



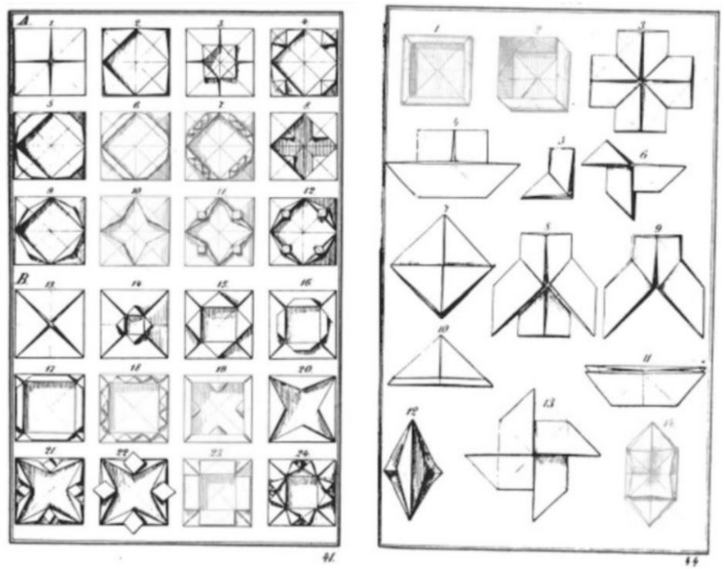
Beeton, Isabella. The Book of Household Management, 1880.

By the mid 19th century napkins appear to be widely common in homes as evidenced in Eliza Acton's *Modern Cookery for Private Families*. The housewife reading this book would have had a certain social standing in that they could read and also had enough disposable income to acquire books. The book is directed at the housewife as the manager of the home and is meant to contain all the information necessary to do so. Acton's book is not concerned with the forms of napkin making and is primarily a cookbook. Acton is often credited as being the first to write a cookbook in the contemporary sense and her book was widely distributed. Numerous recipes call for the serving of foods either on top of a napkin or covered by one. It is also frequently suggested that the napkin be warm. Acton's illustrations focus heavily on the carving, trussing, and serving of meats and the identification of various fish. The few plated dishes she shows are refined and pure geometries, such as the spherical pudding. Other dishes include methods for stacking foods to form a pyramid or using molds to create complex jelly forms.[4] Acton's forward to the book describes her position as one of practicality, she is concerned with the healthy and proper preparation of food as opposed to the elaborate or fanciful. She states her audience as being all classes, and hopes to make the publication accessible by assuming no prior knowledge of her readers. To emphasize this point she begins the book with a glossary, defining terms potentially unknown to the home cook. The book was widely purchased in England and spurred numerous other similar publications.

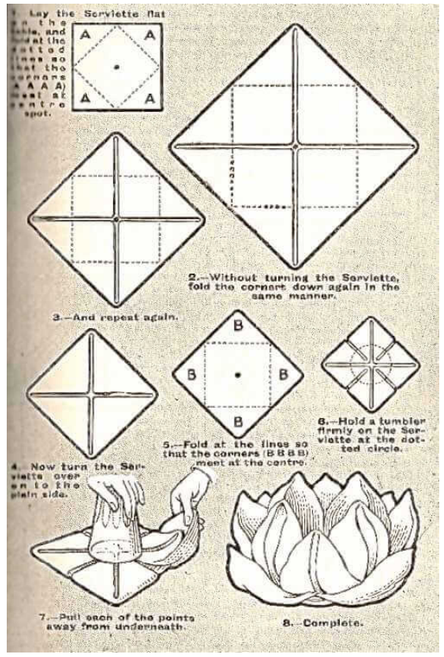
The history of the cookbook is a relevant thread to follow since it points to the dissemination of folded knowledge in the United States. *Mrs. Beeton's Book of Household Management* was widely distributed in the United States and Europe since its initial publication as a series of magazines in the 1880s. Mrs. Beeton's book is over 1000 pages and can be seen as a massive consolatory work of common knowledge of the time. Mrs. Beeton was bad at citing her sources and is often accused of plagiarism, in particular of the previously mentioned Eliza Acton. Beeton's napkin folds are represented using a method akin to that seen in recreational mathematics, rather than earlier publications about the dinner party. The steps to fold are clearly represented with diagrammatic techniques such as arrows, dashed lines, and lettering to show the movements necessary to make.[5]

4 Acton, Eliza. Modern Cookery for Private Families : Reduced to a System of Easy Practice, in a Series of Carefully Tested Receipts, in Which the Principles of Baron Liebig and Other Eminent Writers Have Been as Much as Possible Applied and Explained. Newly Rev. and Much Enl. ed. London: Longman, Green, Longman, Roberts, and Green, 1864.

5 Beeton, Isabella. The Book of Household Management ... Also, Sanitary, Medical, and Legal Memoranda; with a History of the Origin, Properties, and Uses of All Things Connected with Home Life and Comfort. Entirely New Edition, Revised and Corrected. ed. London, New York: Ward, Lock and, 1880.



Friedrich Fröbel from Michael Friedman A History of Folding in Mathematics, 2018.



Beeton, Isabella. The Book of Household Management, 1880.

Recreational mathematics at around the same time is found in primary education, in particular in the kindergarten.[6] Many of the folds found in Mrs. Beeton's illustrations are also found in the publications of Friedrich Fröbel, the educator who is credited with the conceptualization of kindergarten. It is unclear whether the methods of folding can or should be attributed to any party at this point, it is likely that neither Beeton or Fröbel are responsible for their invention. The appearance of similar patterns in the different areas of education and home making might indicate their position as one of common knowledge.

Mrs. Beeton's Book of Household Management can be credited as a major influence in the unification of household knowledge. The book was a bestseller long after the death of Isabella Beeton and grew to over 2000 pages as a product of the publishing company. By 1868 two million copies had sold (the United States population was around 31 million at this time) and it remains in print today. While Beeton's book claims to be accessible to any housewife, the intended reader can be inferred by reference to her housekeeper and cook. The manual serves as a dictionary for the housewife to collect conceptual and practical knowledge about the keeping of her home. It is assumed that depending upon her position in society and wealth that this information may then be passed on to other laborers in the home. The formalization of the knowledge of the home allows the housewife to remove herself from performing much of the labor but in doing so passes it down to others including slaves and low paid laborers.

The home as a topic of study can be found both in informal knowledge such as Mrs. Beeton's books and in the highest ranks of academia. Notable figures include the chemist Ellen H. Swallows Richards who was the first woman admitted to MIT—though she was prohibited from receiving her Masters degree due to her gender, despite achieving the qualifications—and is considered the founder of home economics. She founded the American Home Economics Association in 1908 which is today operated as the American Association of Family and Consumer Sciences. Another important figure who created for herself a career that spans the gap between matters of the home and matters of the architect. Gray obtained a Bachelor's of Science from MIT in 1901, a Master of Arts degree from Columbia in 1914, and a PhD from Yale in 1926. She went on to a number of important positions including a Professor of Home Economics and Chairman of the Department at the University of Wyoming, Professor and Chairman of the Department of Home Economics at UCLA, and several government committees.

6 Friedman, Michael. A History of Folding in Mathematics. Vol. 59. Science Networks. Historical Studies. Cham: Springer Basel AG, 2018.

Setting the table, folding the laundry, and directing the activities of the house return to academia in the emergence of the study of home economics in the United States. Home economics began as a part of a young girl's primary education in which she would learn primarily about sewing. By 1920 a majority of the United States had made home economics compulsory for girls in primary school.[7] At approximately the same time home economics became a path of study for women in academia. In 1903 Cornell began offering classes in home and family life and by 1919 had established a school of Home Economics. Over time the college evolved into what is today the College of Human Ecology and includes the departments of Design + Environmental Analysis, Division of Nutritional Sciences, Fiber Science and Apparel Design, Human Development, Policy Analysis and Management, Public Affairs, and Health Administration.

In the 1970s Home Economics as a field of study began to be required for both men and women in the United States as educational opportunities started to become more equal for both genders. Today the study has been re-branded as Family and Consumer Science as is an elective course in secondary schools. Where home economics was taught and to whom is reflective of local attitudes and biases. In the southern states home economics was first included in segregated Black schools. In northern states home economics was a study found only in white schools and aimed at a housewife's refinement.[8] Dependent on the context and time in history home economics can be seen as a career training path for Black students with extremely limited employment options or for white housewives to develop positions as the manager of the house. Randolph's publication only begins to account for the racial and social implications of the teaching of home economics and the history is undoubtedly more complex as the United States became more diverse.

Dolores Hayden is perhaps the first to suggest that the study of home economics might be considered inside the discipline of architecture. Hayden puts forward Catharine Beecher, an American educator known for her vehement support of education for women, in particular on matters of the home. Hayden argues that Beecher was far more socially influential than the only superficially social work of Andrew Jackson and Frank Lloyd Wright.[9] Though best known for her work as a domestic economist, Beecher publishes numerous cottage plans in Greek and Gothic revival styles in her manuals. While Beecher has mostly been ignored in architecture for her irrelevance to the subject, a 1977 exhibit by the Architectural League of New York titled "Women in American Architecture" includes her work.

7 Randolph, Elizabeth. A Brief History of the Teaching of Home Economics in the Public Schools of the United States. Graduate Thesis Collection. Butler University, 1942.

8 Ibid.

9 Torre, Susana, and Architectural League of New York. Women in American Architecture : A Historic and Contemporary Perspective : A Publication and Exhibition Organized by the Architectural League of New York through Its Archive of Women in Architecture. New York: Whitney Library of Design, 1977.

The study of home economics, labor dynamics in the home, and the development of the American education system are all integral parts of the development of a concept of labored formalism. A revisiting of the labored form seems ripe for a contemporary discussion of the role of labor in the home, in the city, and as informed by history. A labored form, the dinner table, is deeply embedded with matters of custom, class, gender roles, and economy. I would put forth an idea that a form might be labored, or politicized prior to it ever having emerged on a particular site or in the context of a city. The context as political would not be denied by such political form but intentionally complicated by it. In the home, the proof of a day's labor might emerge from the set table which appears at dinner time or the cleanliness of the house. A labored form would reveal the exertion required through its folds. The fold seems to be a compelling method for the representation of labor due to its close mapping to the hand. In analyzing a folded form one is forced to consider the number of times the object has passed through the hand, the degree of knowledge possessed by the folder, and the value of such act of transformation.

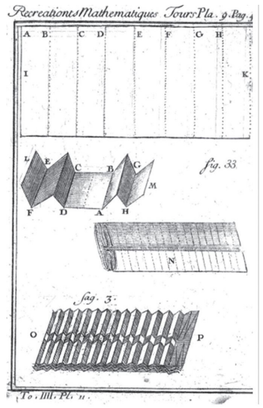
Genealogy

history of domestic folds

The fold has an interesting double history as both a product of domestic labor and a subject of intellectual inquiry. The lineage of the fold includes its appearance in recreational mathematics as a teaching device, as a method of decorating tables with folded napkins in early contemporary cookbooks, as a branch of home economics study, and as a theoretical framework in Deleuze's The Fold.



1629 Napkin Folding
Mattia Giegher, University of Padua
Bavaria, Germany



1694 Recreational Mathematics
Illustrations of the 27th trick in Jacques Ozanam's posthumous edition of Récréations mathématiques et physiques.



1919 Cornell School of Home Economics
For credit classes in home and family life were taught from 1903 and formalized into a school in 1919. In 1969 the school is renamed the College of Human Ecology to reflect the expanded nature of the education .

1905-1917 Home Economics in Education
In the first two decades of the 1900s the majority of the United States made home economics training mandatory as part of their curriculum, from Elizabeth Randolph "A Brief History of the Teaching of Home Economics in the Public Schools of the United States."

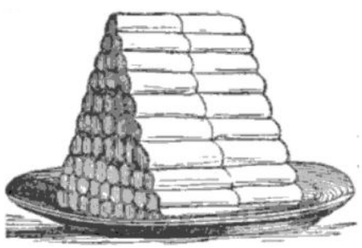
1970 Home Economics for Men & Women
As part of the movement toward gender equality in education men are taught home economics and women are taught more than just home economics.

1988 The Fold Theorized
Deleuze, Gilles, and Tom Conley. The Fold : Leibniz and the Baroque. Minneapolis: University of Minnesota Press, 1993.

in the university

in the home

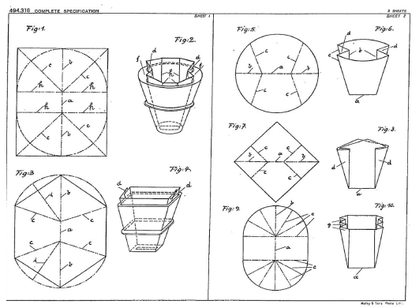
1847 Modern Cookery for Private Families
Eliza Acton's book is often cited at the first contemporary cook book. While no folded napkins appear in the book, several recipes contain instruction to "dish them on a napkin," or to cover with a hot napkin.



1888 The Book of Household Management
Isabella Beeton's book is a widely published and distributed manual for housewives with over 1000 pages. The frontise piece of an early edition shows a set dinner table with folded napkins, each containing a bun.

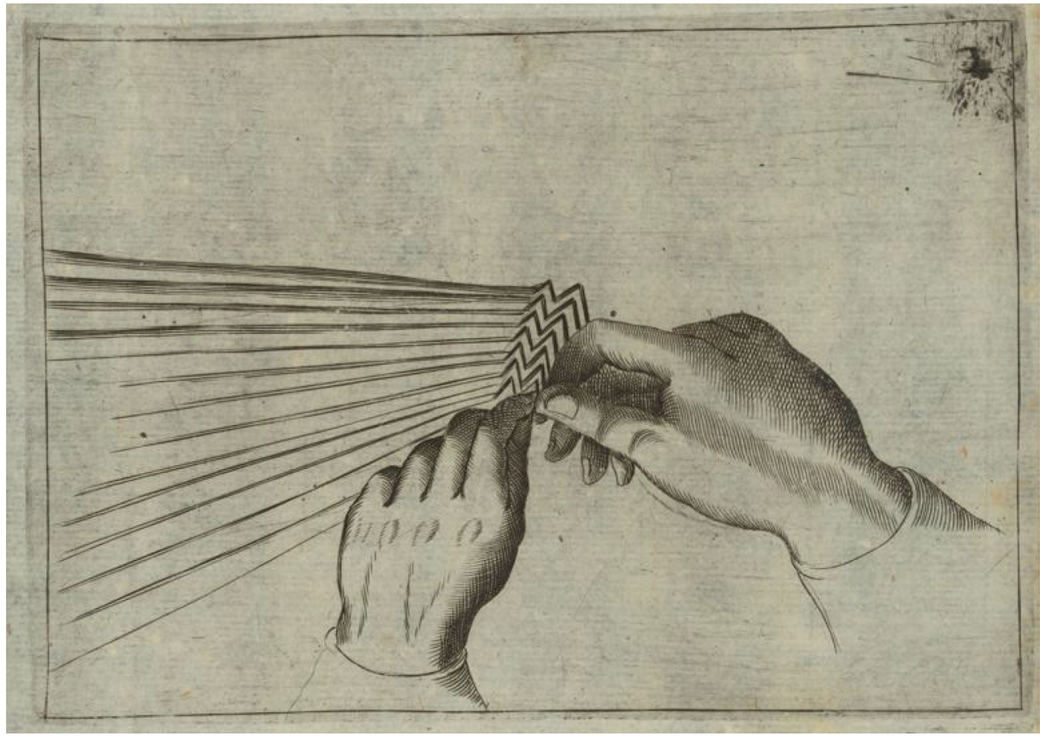


1908 Coffee Filter Invented
Amalie Auguste Melitta Benz invents the coffee filter brew system and founds the company Melitta in Germany.



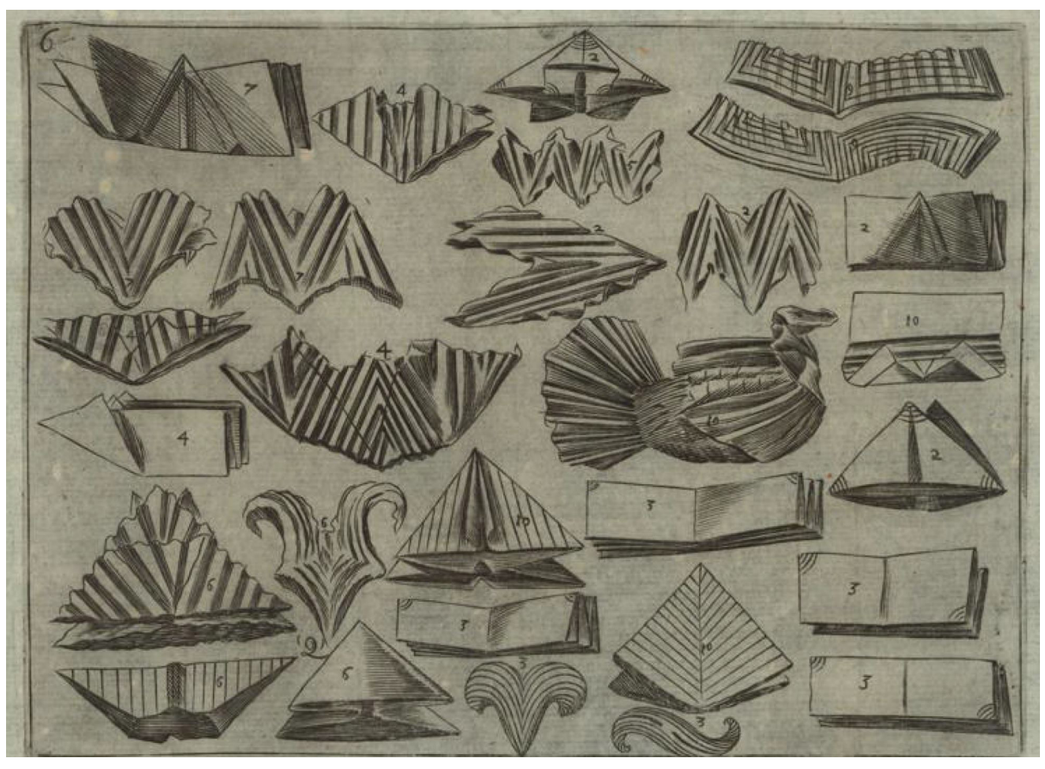
The Present Informal Knowledge
While Home Economics continues to be taught as an elective course in some schools, the study of home economics as a career, formalized by higher education has disappeared. Today knowledge is passed down by family members, blog posts, cook books, or through celebrities of the home such as Martha Stewart.

in the university



1629 Napkin Folding
Mattia Giegher, University of Padua
Bavaria, Germany

Mattia Giegher's napkin folding plates are often cited as the first known representation of folding instructions. They are meant not as a linear set of rules to be followed as in origami, but rather as a collection of possibilities to inspire unique combinations.



in the home

1830-1877 Godey's Lady's Book
Napkin folds for the dinner table published in the American women's magazine which was the most widely circulated magazines before the Civil War.

The fold can also be found disseminated in publications for women such as Godey's Lady's Book which act as an instructional manual for the labors required of a homemaker.

Fig. 3.

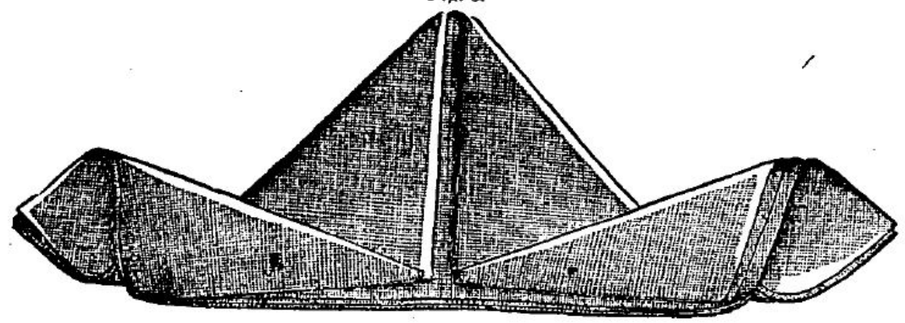
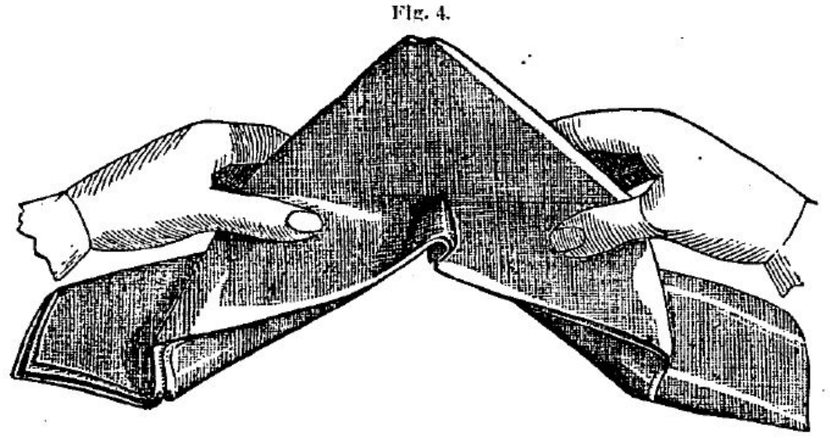
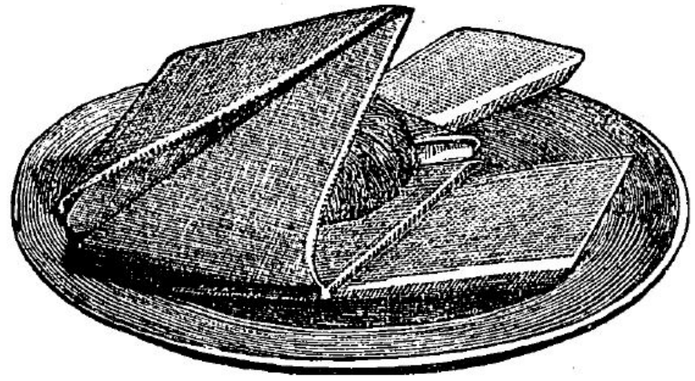


Fig. 4.





SERVIETTE COMPLETE.

in the university

1919 Cornell School of Home Economics
For credit classes in home and family life were taught from 1903 and formalized into a school in 1919. In 1969 the school is renamed the College of Human Ecology to reflect the expanded nature of the education .

The domestic fold as a type of knowledge transferred is closely related to the development of home economics, which has its own long history as an early option for the education of women and its later force in creating equal education opportunities for men and women.



in the discipline



1993 Bad Press: Dissident Ironing
Elizabeth Diller and Ricardo Scofidio.

The domestic fold's relevance to architecture is implied by Elizabeth Diller and Ricardo Scofidio's ironing project which applies labor so rigorously that it transports the task of ironing from the home and into the discipline of architecture.

Domestic Folds

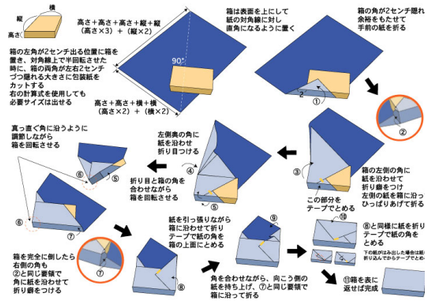
history of domestic folds

This project draws upon the study of domestic folds for their ability to represent labor as a force acting to shape form. The domestic fold organizes, decorates, conceals, and wraps. Here, the various types of domestic folds are categorized formally from surface to volume in an attempt to reveal their relevance to an architectural project of folding. Their categorization in this way begins to project how a wall or a mass might be specifically folded.

VOLUME



pre-folding, then folding to fit a form



folding gift wrap around a gift



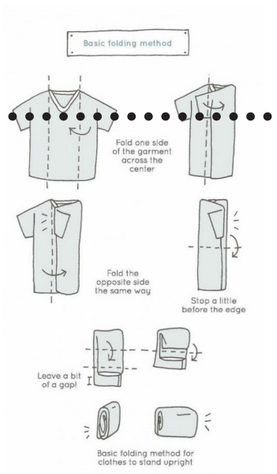
folding to fit a form



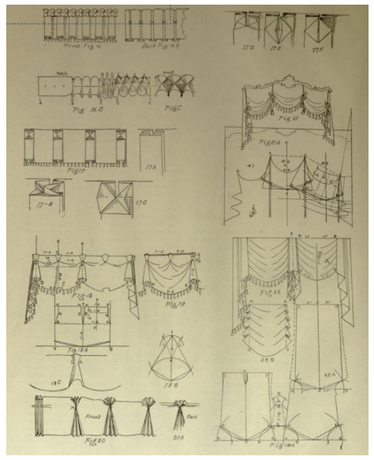
arranging a folded form in relationship to other stuff

LABORED FORMALISM

LABORED FLATTENING



folding clothes into a stack



folding to articulate a flat surface



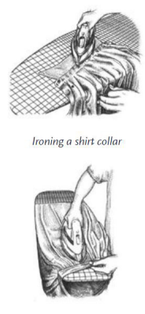
folding bread while it rises



folding edges to connect them



folding a rounded rectangle into a orthogonal rectangle



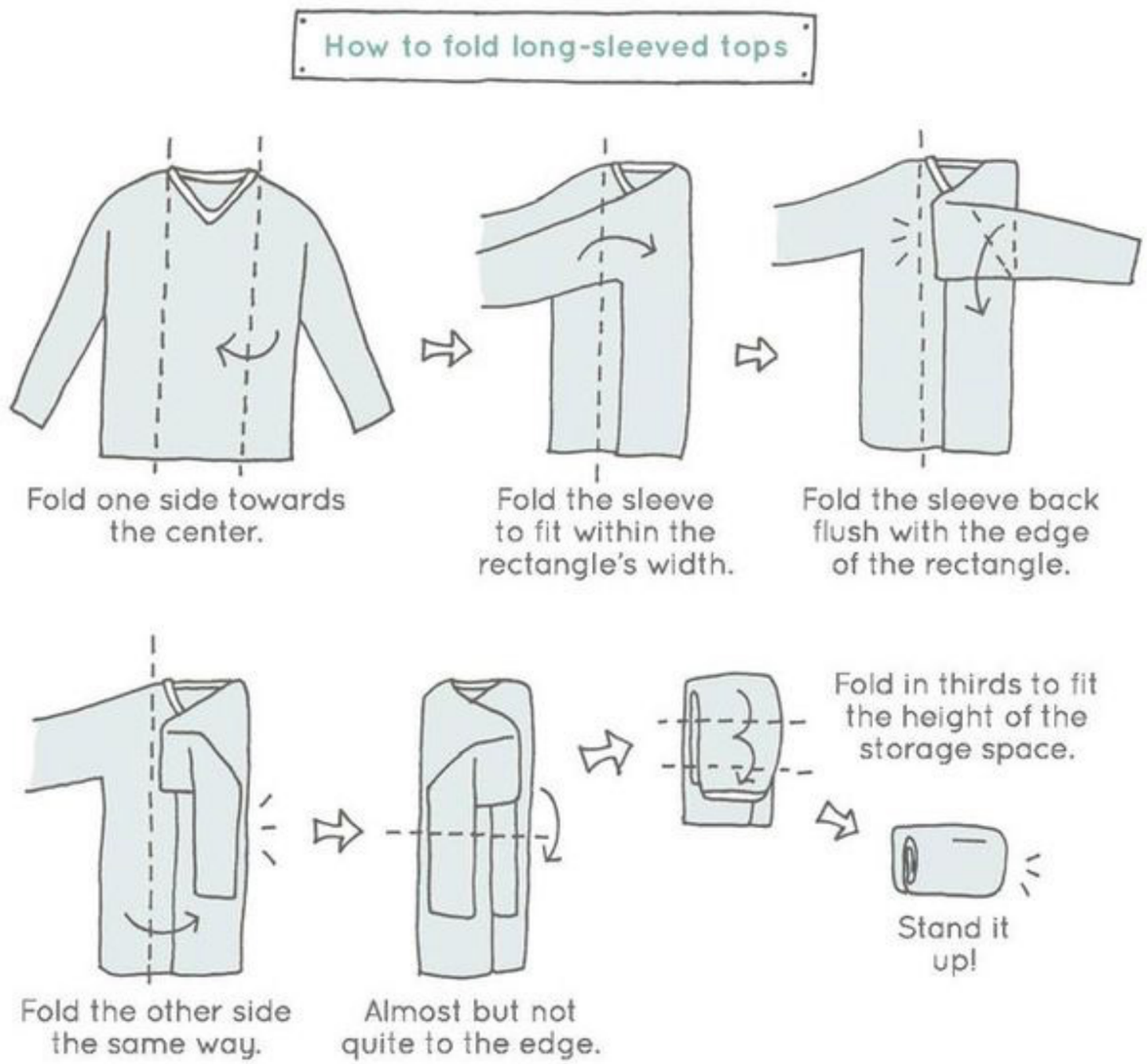
using heat to add additional folds

SURFACE

Domestic Folds

2019 Marie Kondo Folding Method
Innovation in folding methods popularized by Marie Kondo's Netflix show on household organization.

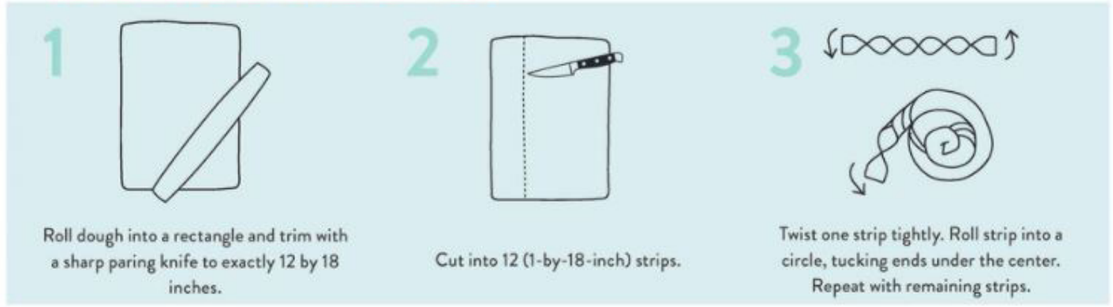
This categorization of domestic folds includes folds which might have not been formally taught such as folding your clothes, folding dough, and folding to wrap a gift. Many of these folds are compelling for their diagrammatic and formal clarity when explained retroactively in steps, one fold at a time.



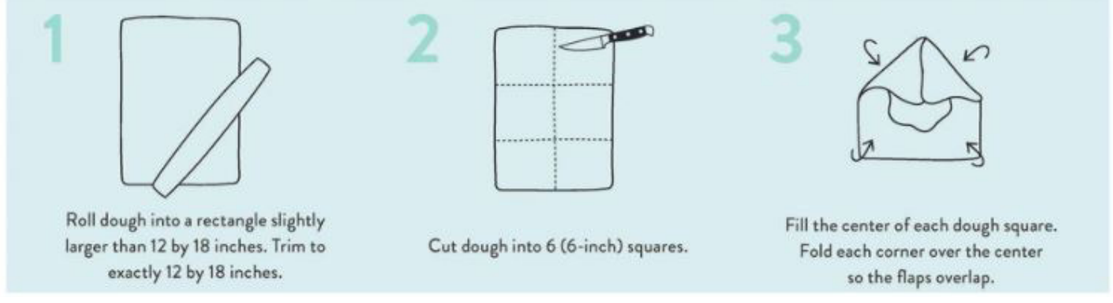
Domestic Folds

2015 Russell van Kraayenburg Making Dough: Recipes and Ratios for Perfect Pastries
Folding, cutting, and twisting diagrams in the cookbook describe processes to be undertaken using your hands and kitchen tools.

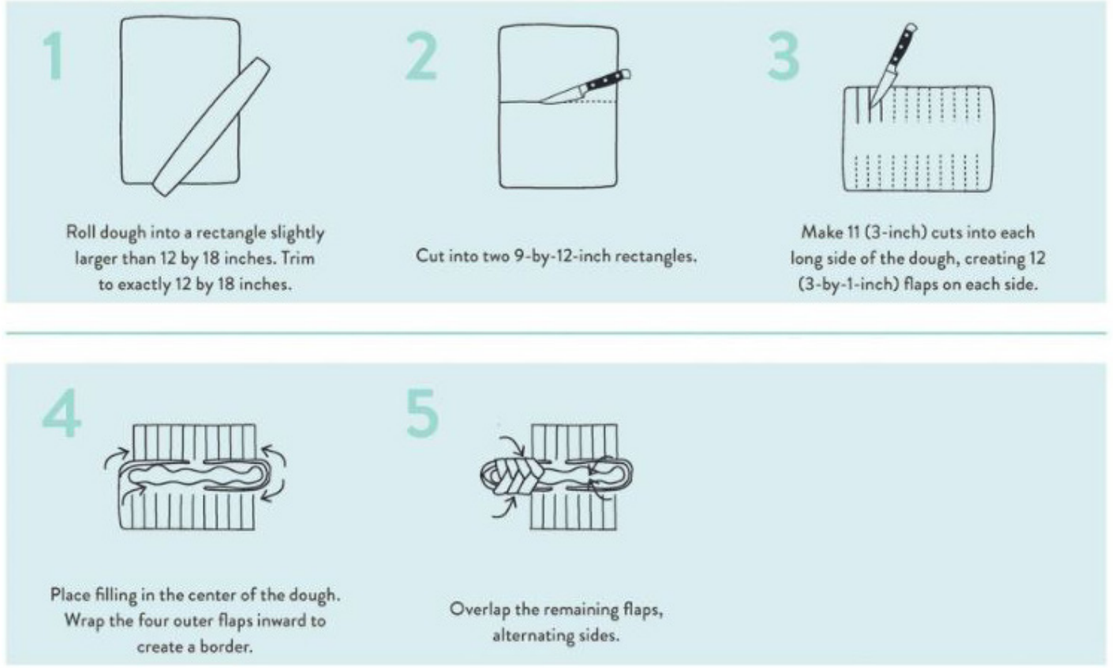
OPEN-FACED CIRCULAR DANISH



DANISH POCKET



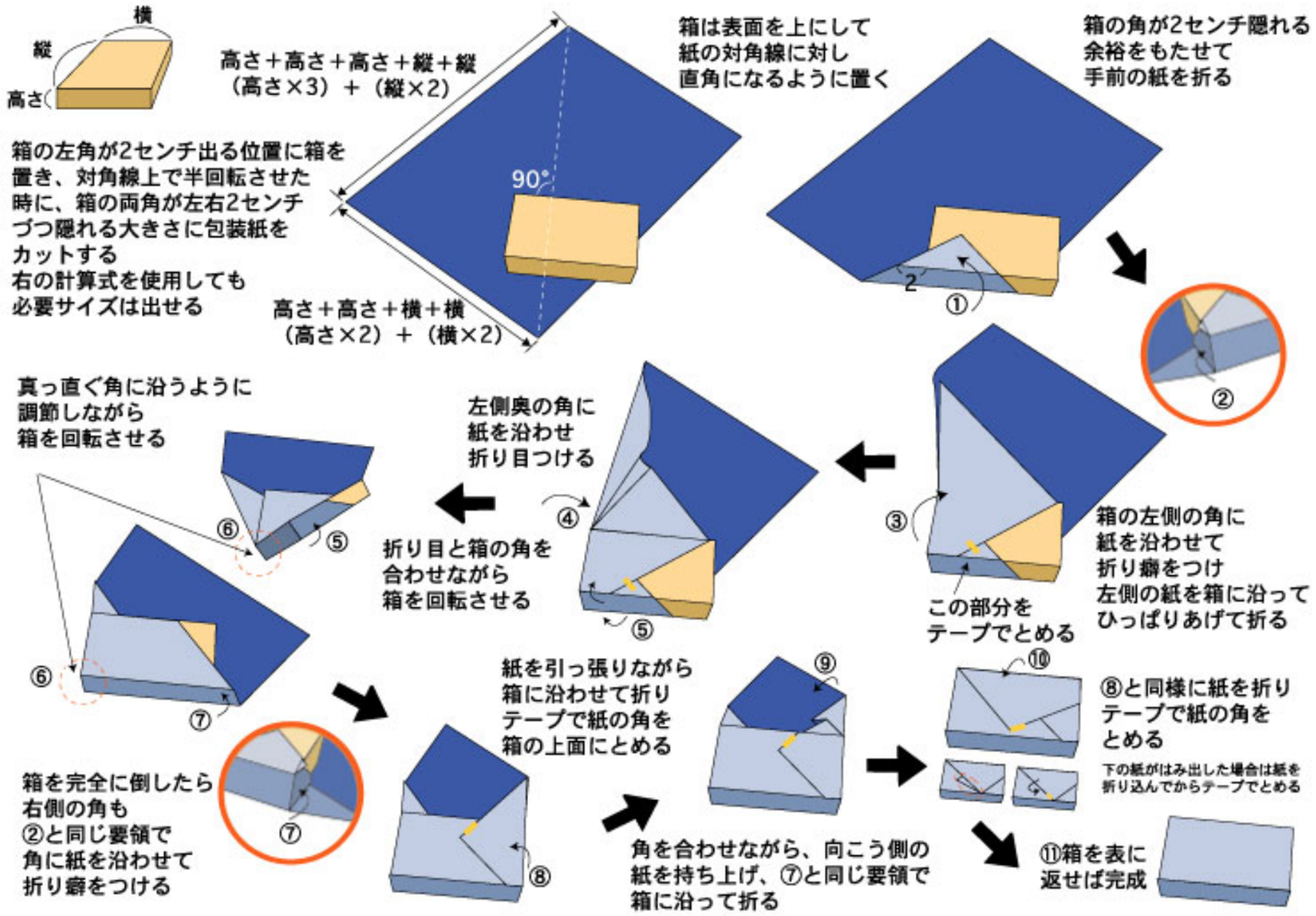
STRUDEL



Domestic Folds

Furoshiki Source Unknown

Steps for wrapping a rectangular gift in a cloth fabric square.



Folding in Architecture

a history of the labored fold in architecture

Greg Lynn's *Folding in Architecture* is an often cited moment of clarity within the digital turn in architecture which links architectural practice, emerging technology, and philosophy.[1] Through Gilles Delueze's text *The Fold: Leibniz and the Baroque*,[2] the formal project is linked to a specific moment in history, the Baroque. Lynn argues that the emergence of folding in architecture did not come solely from the rise of digital technology but was part of a broader aesthetic shift among like minded architects of the time. In this paper I will attempt to reveal a latent politics in the project of folding, by inserting new references outside of the original theorization of folding.

In revisiting the 1990s project of folding I aim to address questions of embedded labor within these forms. Who does the folding, what medium produces folds, and historically how did we learn to fold? These questions are intrinsically linked to issues of scale. Folding is a project easily accomplished by the computer and not so readily constructible using building materials. Much like the ease of folding a single sheet of paper with your hands, the computer can easily fold, bend, and inflate surfaces of any thickness. The computer cannot, however, inform one of the best material out of which to build a folded form. A fold might in some cases be constructible by a computer, by way of CNC technology, but only to a certain scale. The complexity of constructibility tends to increase as the folded form grows in size.

The fold contains a huge range of workability at the scale of the text as evidenced by Deleuze's *The Fold* and the subsequent relevance of this text to architects such as Greg Lynn, Peter Eisenman, Frank Gehry, and others. Deleuze's incorporation of a historic model (the Baroque) with a mathematical model (calculus) make the text an apt source for theorization. Architects dealing with the sudden arrival of digital technologies found Deleuze to be a clear scholarly source through which to conceptualize the link of the computer to the generation of form.

In its entirety, the writing of Deleuze is impenetrable to the average reader. It requires a combined knowledge of mathematics, philosophy, art, and science. Some parts of the text, however, are highly accessible and provide a structural framework for the translation of Deleuze's fold into an architectural fold. Lynn takes hold of Deleuze's use of the root word *-plic*, to fold, and deploys the language in the discussion of architecture. The fold as a root word brings with it a number of readily architectural terms including multiplicity, complexity, supple, pliant, and compliant. The linguistic link between theory and architecture becomes highly generative in the discussion of possible applications of the fold to architecture. I would consider the text as the smallest possible construction of the fold, one which takes no consideration for the material out of which it is constructed.

1 Lynn, Greg. Folding in Architecture. Rev. ed. Architectural Design (London, England : 1971). Chichester, West Sussex ; Hoboken, NJ: Wiley-Academy, 2004.

2 Deleuze, Gilles, and Conley, Tom. Fold. London: Bloomsbury Publishing, 2014.

The fold is perhaps the most flexible in its conceptual realization where a seemingly simple action can become extensively philosophized.

The 1990s project of folding is seen as a generative design process rather than the creation of a final product which appears folded.[3] While this may in some cases be true, many projects of the period also appear folded in their built form. Mario Carpo understands fracturing and breaking as a discontinuity that contradicts the continuously folded surface promised by the method. I would consider this breakage simply a layering mechanism which is one potential outcome of many folded parts side by side. By this definition, folding as a process does not necessarily produce folds. Is it possible that folds could emerge independently, without having been subject to a generative folding process.

To consider the smallest possible scale of folding, I would like to look closer to home and consider the types of folding we are all familiar with. A turn toward a domestic history of folding would necessarily include Elizabeth Diller and Ricardo Scofidio's Dissident Housework, Bad Press. This folded form serves as a poignant example of the association of folding with labor. The architects have produced the project through their physical labors and made this explicitly clear in the staging of the exhibit. The badly pressed shirts are displayed on ironing boards and with irons nearby to remind the visitor of the labors of the architects even when they are not physically present. The shirt, like the piece of paper, is a readily foldable material as a result of its scale. It avoids problems of constructibility faced by thick materials which might be used to create the appearance of folding without actually doing so. The fabric is pliant and bends easily when pressed by an iron. Diller and Scofidio's project explicitly addresses issues of labor in the home and in particular the issue of invisible labor. The project renders visible the labor of the ironer through excessive and intricate ironing. By laboring over the shirts folds for so long the labor is completely embedded in the final product. The project suggests a lineage of folding which is taught informally in the home through tasks such as ironing, folding laundry, and making the bed.

At the scale of the home folding might be traced through cookbooks such as *Mrs. Beeton's Book of Household Management*[4] and Eliza Acton's *Modern Cookery for Private Families*[5] which describe in minute detail the many tasks to be performed by the housewife. Included

3 Carpo, Mario. The alphabet and the algorithm. Writing Architecture. MIT Press, 2011, 87-88.

4 Beeton, Isabella. The Book of Household Management ... Also, Sanitary, Medical, and Legal Memoranda; with a History of the Origin, Properties, and Uses of All Things Connected with Home Life and Comfort. Entirely New Edition, Revised and Corrected. ed. London, New York: Ward, Lock and, 1880.

5 Acton, Eliza. Modern Cookery for Private Families : Reduced to a System of Easy Practice, in a Series of Carefully Tested Receipts, in Which the Principles of Baron Liebig and Other Eminent Writers Have Been as Much as Possible Applied and Explained. Newly Rev. and Much Enl. ed. London: Longman, Green, Longman, Roberts, and Green, 1864.

in several editions of the widely disseminated publication by Isabella Beeton are detailed drawings for the folding of cloth napkins to decorate a dinner table with. The illustrations use drawings and diagrams to indicate how the hand and iron should be rigorously applied to the napkin to achieve the desired form. The intricacies of the complex geometries formed by these folds approach the appearance of an architectural concept model. The complexity of fabric which is held taught in some locations and allowed to droop in others would require a high level of skill in 3D modeling to be replicated digitally. As a cultural artifact, Mrs. Beeton's book is interesting for its ability to indicate what labors are required of the individual and the people employed by them. The text lays out the job description of the housewife as household manager and details the jobs required by the employees of the home, including how much they should be paid. The cookbook can only suggest the labors to be performed and is not an accurate document of the labor performed by any individual.

The cookbook is relevant to the digital project of folding because it evidences a latent knowledge of folding that is transmitted via informal methods such as being taught by one's parents. Mrs. Beeton's book is of particular relevance because of its widespread use across households in the early 1900s in the United States. Many of the folds found in Mrs. Beeton's illustrations are also found in the publications of Friedrich Fröbel, the educator who is credited with the conceptualization of kindergarten.[6] It is unclear whether the methods of folding can or should be attributed to either person, it is likely that neither Beeton or Fröbel are responsible for their invention. The appearance of similar folding patterns in both might indicate their position as one of common knowledge prior to the existence of either publication. Through the appearance of folding in both cookbooks and elementary curriculum I would like to suggest that the formal project of folding could have a broader range of influences that previously conceived of.

Moving beyond the scale of the home and into an architectural scale, Martin Bechthold's *Innovative Surface Structures: Technology and Applications* presents one potential narrative for the enlargement of the folded form. The projects discussed by Betchold can be broadly defined as surface projects which are not always folded, but are often creased. The surface projects have a tendency to scale inversely to the material they are constructed out of. A small building might be constructed out of several inches of concrete while the large scale building is best suited for a thin, fabric-like membrane structure. The pursuit of thinness as presented by Bechthold manages to avoid the problem of the constructibility of the fold through the attempt of the material to become thin as possible.

Building scale materials attempt to replicate thin surfaces such as fabric and paper which fold and form easily. The most technologically advanced materials such as ETFE exist at the scale of paper in terms of thickness but manage to operate at the large building scale through carefully calibrated details and tensioning.

The engineered surface creates the opportunity for the labor of architects in collaboration with engineers. While the computer undoubtedly automates certain tasks, the human still undertakes the majority of design efforts. For example, the computer modeling of the Sydney Opera House's shell required 2000 computer hours and 350,000 man-hours after 7 years of design development.[7] The number of "man-hours" required quite clearly outnumbers the efforts exerted by the computer. In this case, years of efforts were exerted on the conceptualization of the construction method before the computer could even become involved in its calculation.

Bechthold describes the process of digitally constructing Frank Gehry's Stata Center as one of folded surface first, then interior. The folded exterior surface was subject to complete digital construction prior to its fabrication. The digital model consisted of five separate models of geometry, framing, pattern, concrete, and steel, which combined formed the master building model. In this case, it was accepted that the architects alone could not be responsible for the complete creation of this master model.[8] The individual parts of the model were instead constructed by the subcontractors (facade, steel, skylight, etc.) and integrated with help from the architects. This case provides an example of the limitations of the 3D model. The concrete contractors were unable to work with the 3D modeling software so still relied on the architects to provide a two-dimensional interpretation of the model. Given the inability of certain contractors to understand the technology, the architects created an additional burden of labor on themselves as the translators of such digital information. At a certain scale, it is necessary to revert to what Mario Carpo would call the Albertian condition where notation and construction are again separate. Perhaps this is representative of an intermediary position where all trades have not caught up to changing technology and the architect is at once working digitally and reconstructing using old notational methods for some parts of construction. The myth or hope that underlies the work is that eventually the architect becomes a digital artisan who works with the digital technology to directly produce the entire final building.

6 Friedman, Michael. A History of Folding in Mathematics. Vol. 59. Science Networks. Historical Studies. Cham: Springer Basel AG, 2018.

7 Bechthold, Martin. Innovative Surface Structures : Technologies and Applications. (Abingdon, Oxon ; New York: Taylor & Francis, 2008), 30.

8 Bechthold, Martin. Innovative Surface Structures : Technologies and Applications. (Abingdon, Oxon ; New York: Taylor & Francis, 2008), 64-65.

Bechthold's historical account of surface structures provides evidence to Greg Lynn's claim that folding was happening in architecture prior to the emergence of digital technologies. Lynn chooses not to reference any architectural precedents in his publication, though similarities can be seen in the work presented in *Folding in Architecture* and the work of Felix Candela presented by Betchold. The folded surface as a form quite clearly predates any theorization of the fold when linked to these early innovative surface structures. Similarities can be seen in the way the projects combine structural requirements with the aesthetic desire to fold. The fold in the case of Candela is compelling when it can support or enhance the typically expected structural performance of a material like brick or concrete. The folds allow for visual continuities to appear in surfaces despite structural requirements for the scaling up of certain elements. The folded surface can conceptually support some of its ornamental features with structural requirements making it appear not too arbitrarily created. While pre-dating the digital turn in architecture, Candela's buildings can tell us something about the desire of the architect to be involved in the labors of their creation. Many photographs depict Candela and teams of construction workers onsite, building and testing their constructions. The desire for the architect to perform labor is both wrapped up in stories like those of Candela and predates the architect as a digital laborer.

What is troubling about the architect as a digital artisan is the transference of additional labor onto the architect through the effects of the digital. Digital tools seemingly hold the promise for the architect to understand and be able to manipulate the construction process, increasing their creative control over the project. This tends to generally be seen as a positive factor and it is assumed that the resulting design would be more accurate if more control is asserted over it. What is not often considered is the role of the architect as digital laborer, such as in the case of the Sydney Opera House. In blurring the line between designer and builder, as in Gehry's Stata Center, the architect has created additional problems to be solved and more hours required. Carpo is optimistic about the role of CAD-CAM softwares as removing the need for the artisinal craftsperson, suggesting parallels to John Ruskin's claims that Renaissance architecture created the demand for enslaved labor. The problem with this hope is that the computer has never quite managed to operate as autonomously as we might have earlier predicted and that the hours of labor have only added to those performed by computer operators rather than alleviating labor elsewhere.

The folded and wrinkled projects presented by Bechthold, Carpo, and Lynn all intertwine the transformation of the surface with an intellectual digital project. The surface is perceived as a form meant to be calculated, computed, and calibrated by the architect's digital tools. The folded surface is no longer that of Felix Candela which is directly manipulated on site by the hands of many laborers to achieve seemingly impossible structures. The digital surface is designed and drawn by digital laborers who in some rare cases interface with its actual construction.

At the largest scale folding at home makes an unexpected return to the home through the digital. One of the world's fastest computing systems today is known as folding@home. Its processing power is generated by the remote collaboration of volunteers donating their computing power. The supercomputer is used as a simulator for protein dynamics, aiding in research related to diseases including Alzheimer's, cancer, and COVID-19. After downloading the folding@home software the program does not require the participation of the user and it can operate as a background task. Users can track their personal contributions through an online database which encourages their continued contribution.[9]

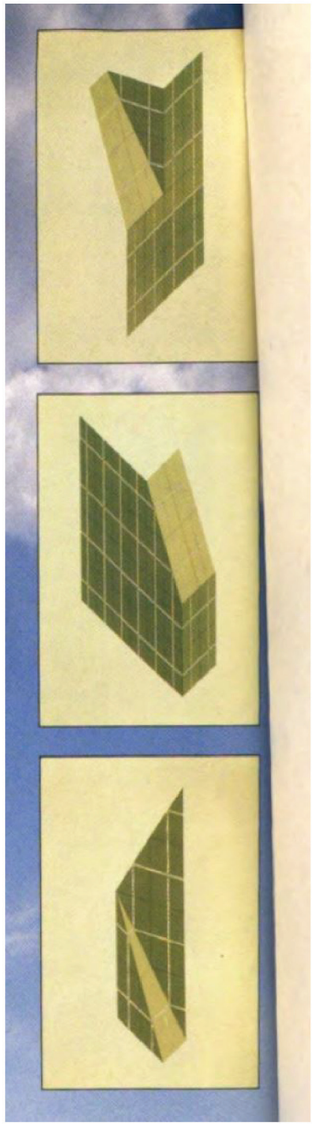
Folding@home is perhaps the full realization of Mario Carpo's projection for a future without the labor of the drafter or crafter. It is possible that this achievement is only possible in an adjacent discipline which requires computational power over intellectual labor. It seems unlikely that such a procedure could be replicated in architecture where remote computing power could be mined for the design of buildings. Folding@home escapes problems of scalability since there is no requirement for it to ever become physical, as in the case of a building. To follow this model toward a less labored architecture might mean an architecture which never becomes physically realized. An architecture which is immaterial, fully digital, and experienced only through simulations.

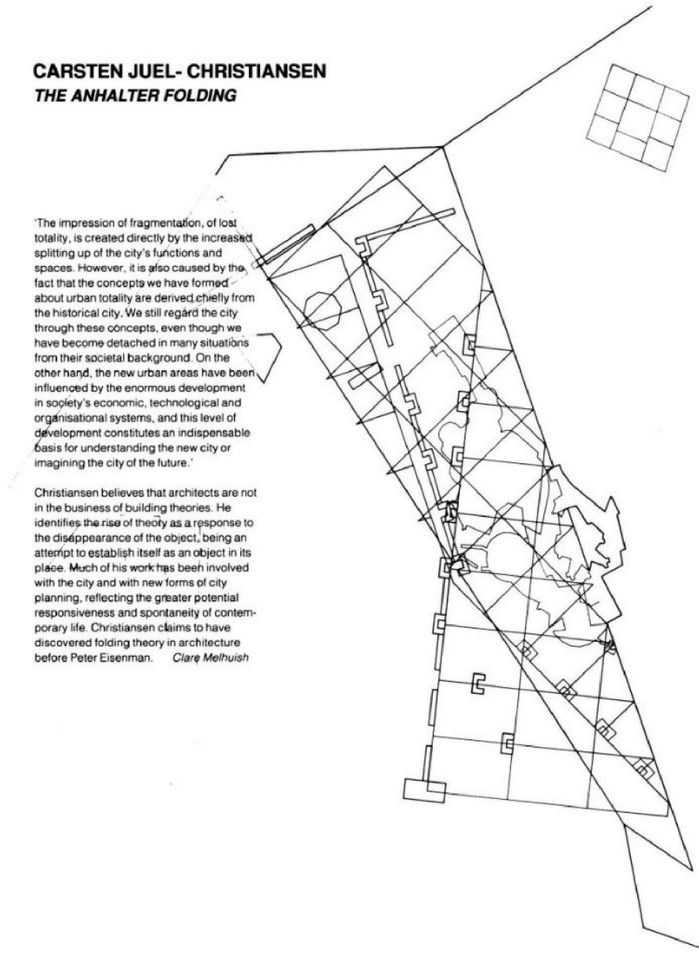
9 https://foldingathome.org/

Folded Surface

history of domestic folds

I see the domestic fold as bringing forward a new potential history for the 90s project of folding, clearly marked as a moment in time by Greg Lynn's curation of the publication Folding in Architecture. One possible reading of these projects would separate them into formal categories of folded surfaces and folded solids. Another group of projects might be categorized as pliant surfaces. And a final group, as continuous surface projects.





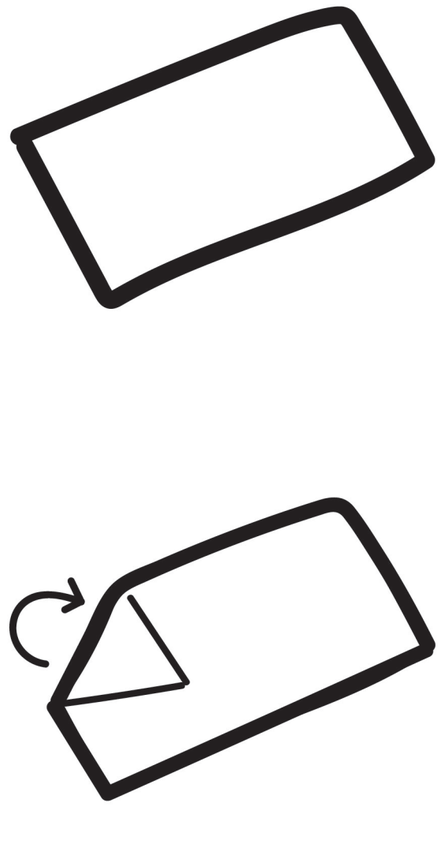
CARSTEN JUEL- CHRISTIANSEN
THE ANHALTER FOLDING

'The impression of fragmentation, of lost totality, is created directly by the increased splitting up of the city's functions and spaces. However, it is also caused by the fact that the concepts we have formed about urban totality are derived chiefly from the historical city. We still regard the city through these concepts, even though we have become detached in many situations from their societal background. On the other hand, the new urban areas have been influenced by the enormous development in society's economic, technological and organisational systems, and this level of development constitutes an indispensable basis for understanding the new city or imagining the city of the future.'

Christiansen believes that architects are not in the business of building theories. He identifies the rise of theory as a response to the disappearance of the object, being an attempt to establish itself as an object in its place. Much of his work has been involved with the city and with new forms of city planning, reflecting the greater potential responsiveness and spontaneity of contemporary life. Christiansen claims to have discovered folding theory in architecture before Peter Eisenman. *Clare Melhuish*

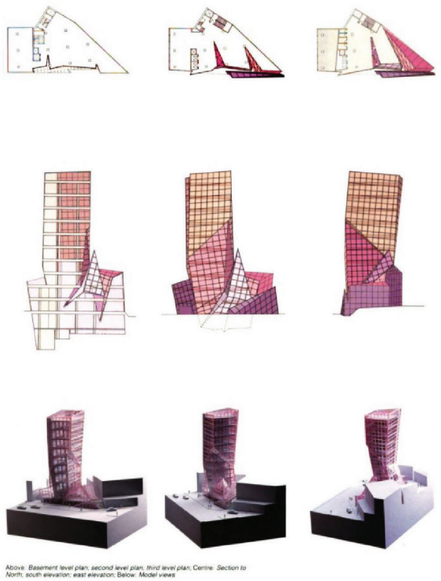
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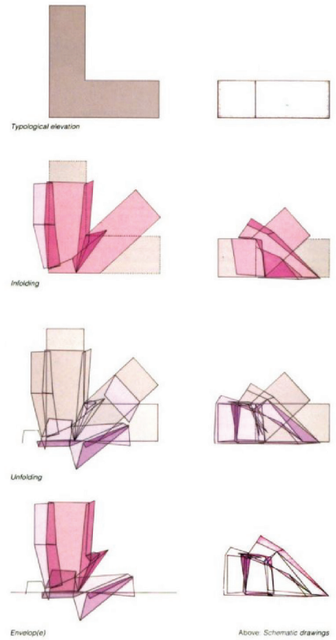


Lynn, Greg, and Academy Group. Folding in Architecture. Architectural Design Profile ; 102. London: Academy Editions, 1993.

Folded Solid

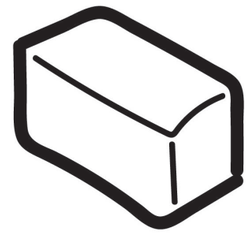


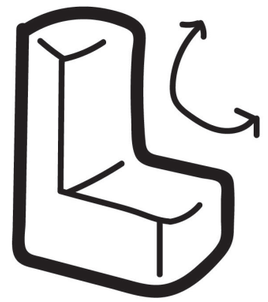
Above: Basement level plan; second level plan; third level plan; Centre: Section to North; south elevation; east elevation; Below: Model views

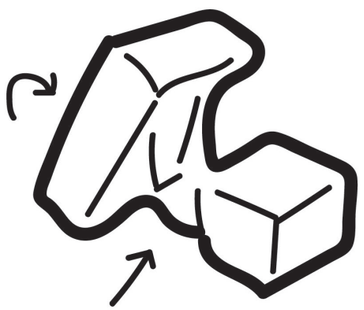


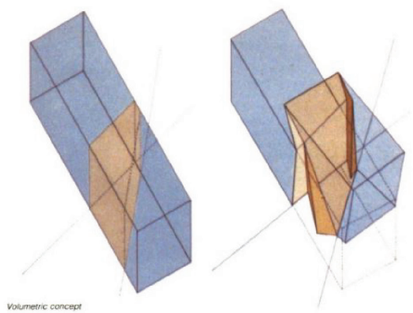
Above: Schematic drawings











Volumetric concept

BAHRAM SHIRDEL
SCOTTISH NATIONAL HERITAGE
A Living Museum

Our design concept for the Scottish National Museum is directed towards a Living Museum. The traditional role of the museum is enhanced as a place for objective contemplation of the past by expanding the presence of the museum in the intellectual, political and spiritual texture of everyday life.

The presence of the Living Museum is asserted through a careful consideration of the symbiotic character of the building. Topography and landscape are deeply rooted in the heritage of Scotland and we have drawn therefore both from Scotland's natural history and her architectural history to achieve the appropriate image. While the organisation of the plan alludes to that of the existing museum, the footprint of the building suggests the three regions of the country. The general massing echoes features such as the Great Glen, the Grampian Mountains, the Caledonian trend and the ancient and mysterious Standing Stones. The spatial organisation is derived from a synthesis of the complex geometries of the Broch with the vernacular architecture of Edinburgh, such as its bridges and feus. Through such gestures we seek to embody a unique component of Scottish Heritage in form and in space.

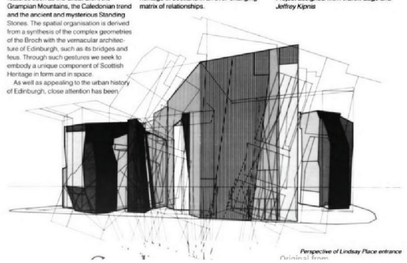
As well as appealing to the urban history of Edinburgh, close attention has been given to integrating the museum into the city's urban fabric. A 'breathing space' has been preserved on the street as an amenity for pedestrians, rather than confronting Lindsay Place with a massive wall. The geometry of the building highlights notable features local to the context such as the theatre and Greyfriars Church. Dramatically framed views draw the city into the museum as if it were part of the collection.

An important innovation found in the Living Museum is the Microcosmic Gallery. This occupies the circulation bridges organising the amphitheatre-like Great Hall. Here, significant examples from the collection of each department are located and views into the main galleries can be seen, along with changing glimpses of the city. Thus, the visitor progressing through the gallery surveys a microcosm of the entire heritage of Scotland in an ever-changing matrix of relationships.

The Microcosmic Gallery is conceived as an environment that stages complex and changing interactions between viewers and items in the collection. While respecting the traditional role of the collection, the space encourages a questioning of the identity of objects in a manner resonant with Hume's epistemology. This serves to elevate the status of the collection beyond the chronological and the categorical, in exploring its transformative capabilities.

Another innovation is the Rays of Thought. Each ray is dedicated to a great thinker of Scotland such as Hume, Maxwell, Smith or Adam. The rays create a network of form and light suffusing the museum. They interact with and transform the perception of the collection, rendering physical expression to the world-shaping force of Scotland's intellectual heritage.

Project designed with Andrew Zago and Jeffrey Kipnis



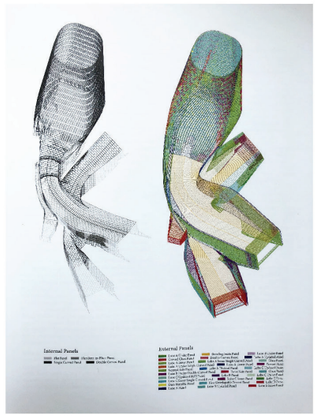
Perspective of Lindsay Place entrance

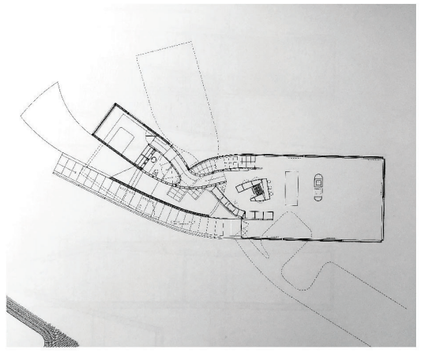


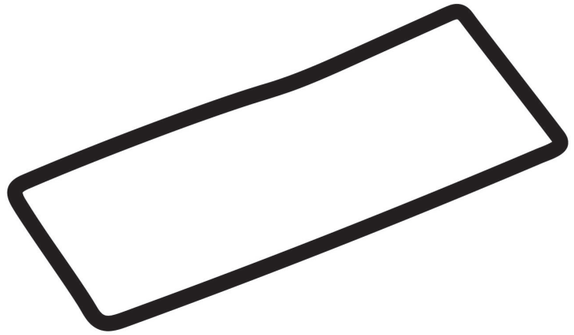
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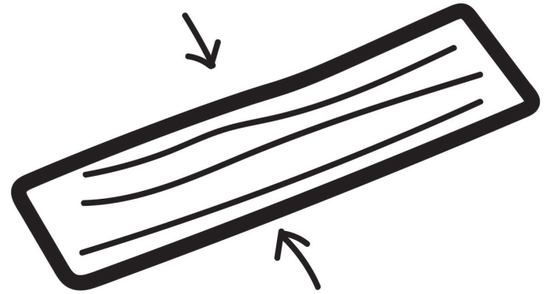
Pliant Surface

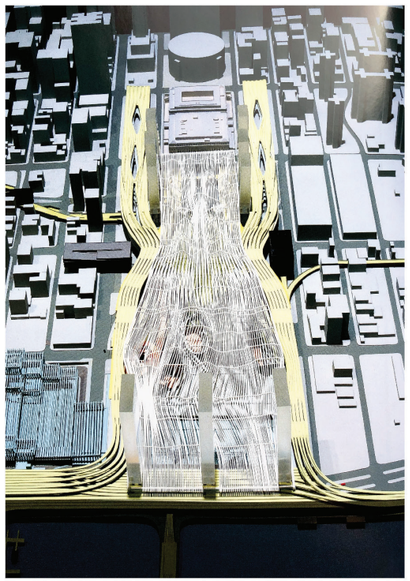


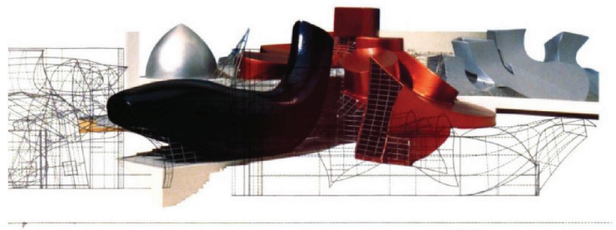


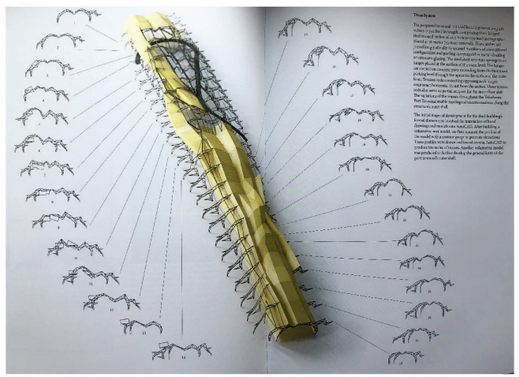


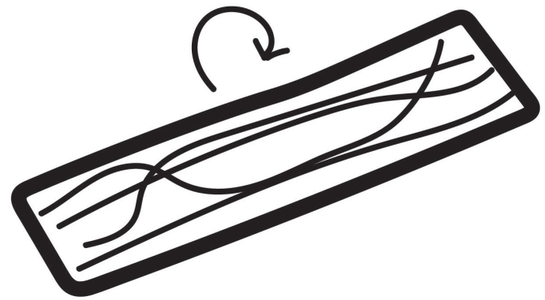






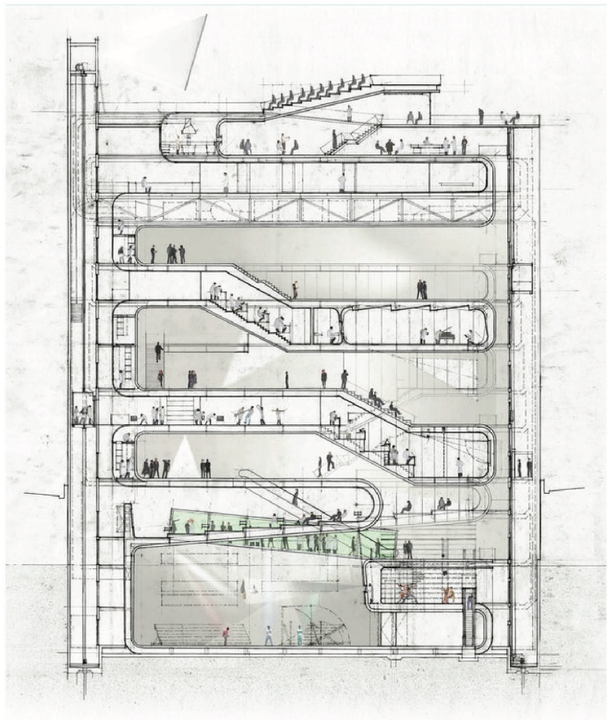




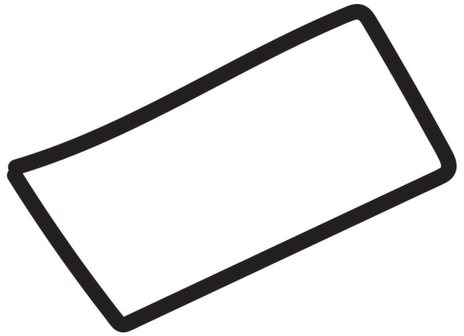


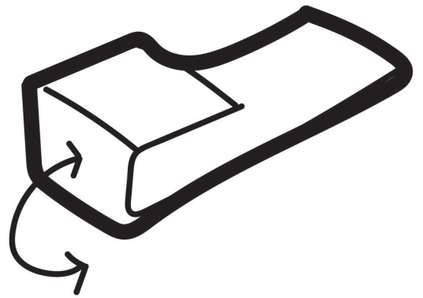
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Umemoto, Nakano and Jesse Reiser. Projects and Their Consequences, 2019.

Continuous Surface

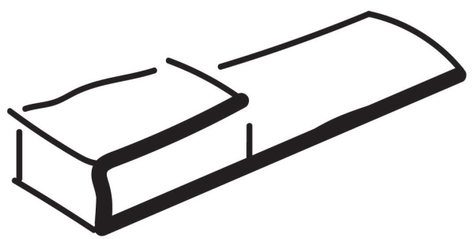




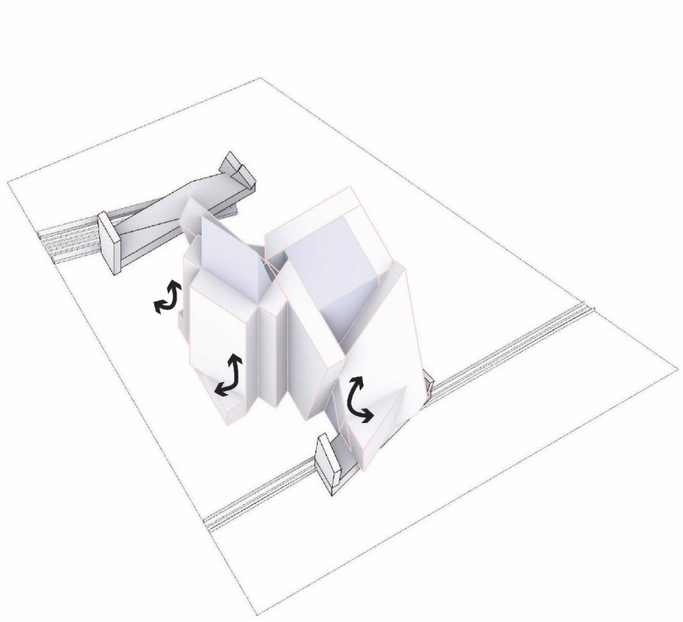


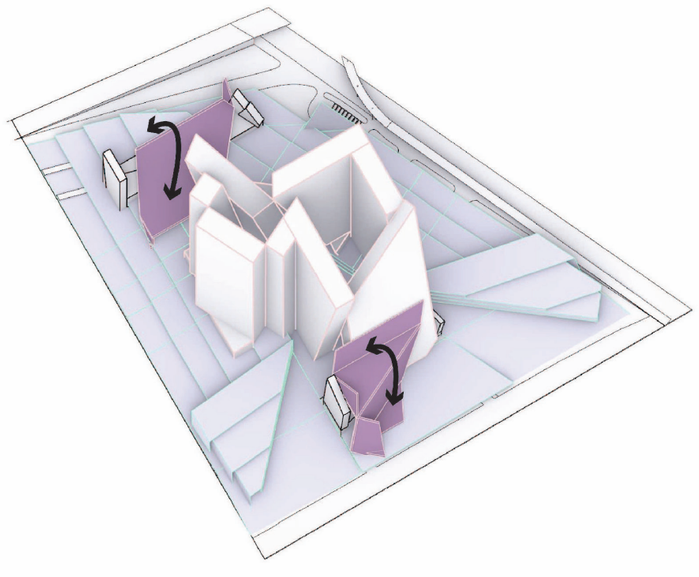


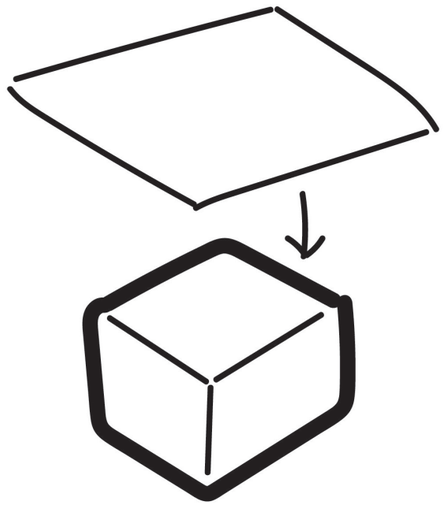


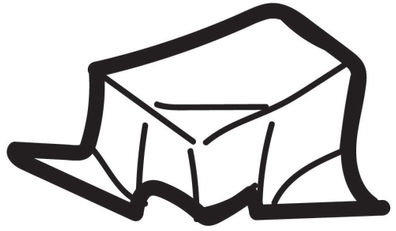


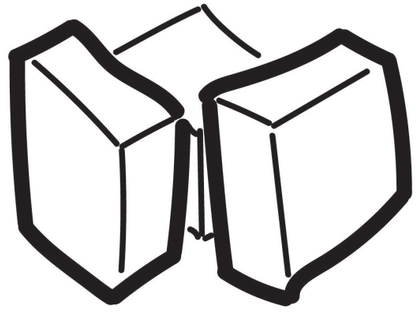
Diller, Scofidio+Renfro Continuous Surface
Neil Denari Continuous Surface









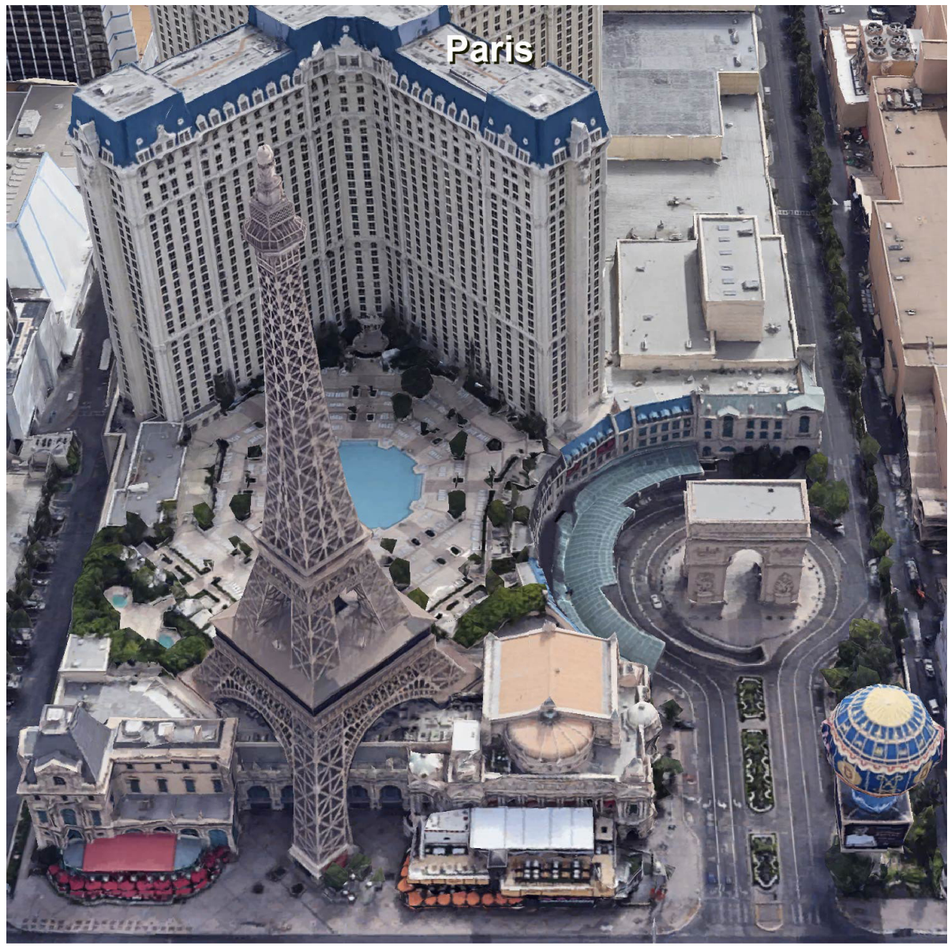


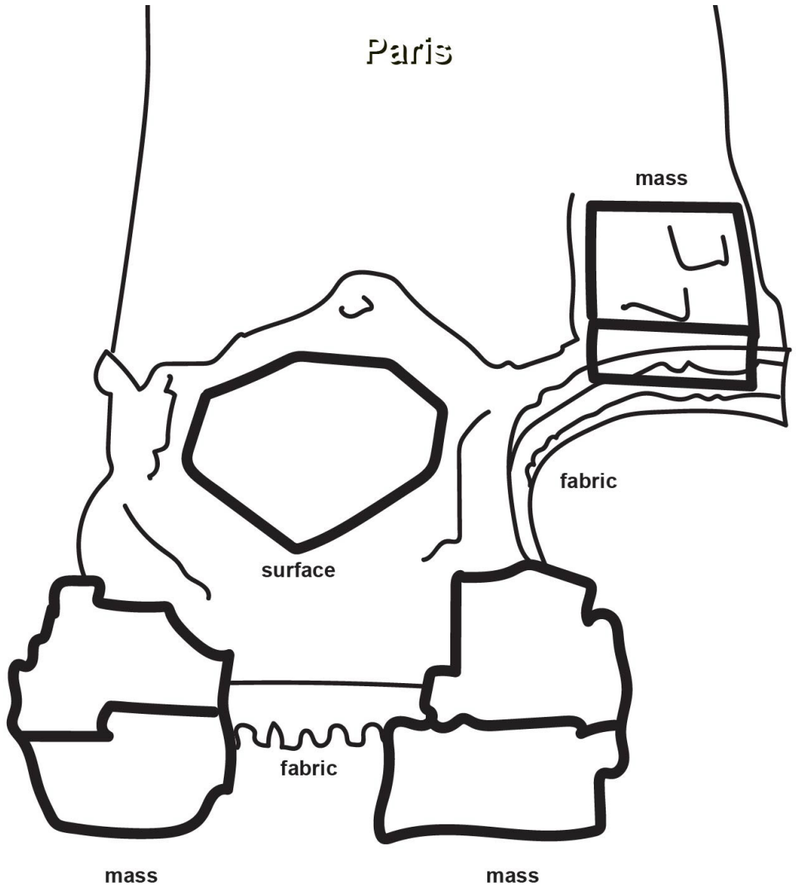
Folded Around Solid

history of domestic folds

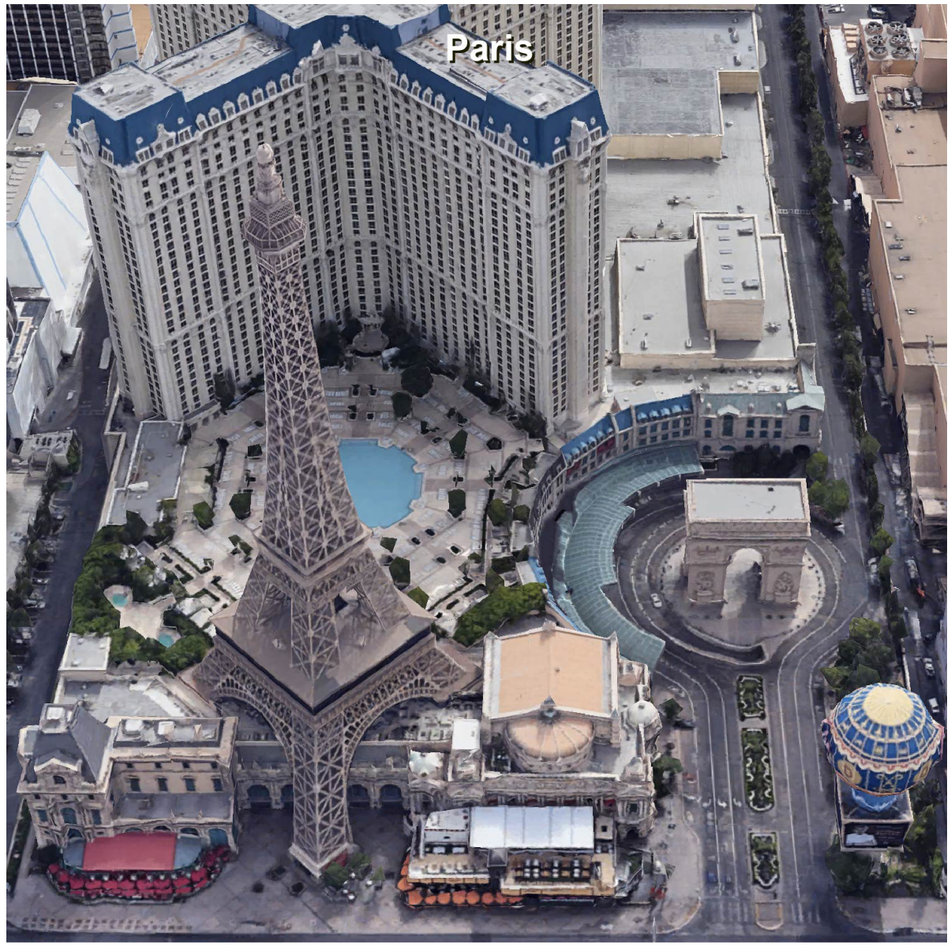
While the previously mentioned projects are inevitably influential when talking about folding I would classify my project as being about folding around a solid, a slightly different approach which emerged from the study of domestic folds as well as an analysis of existing folded forms in Las Vegas.

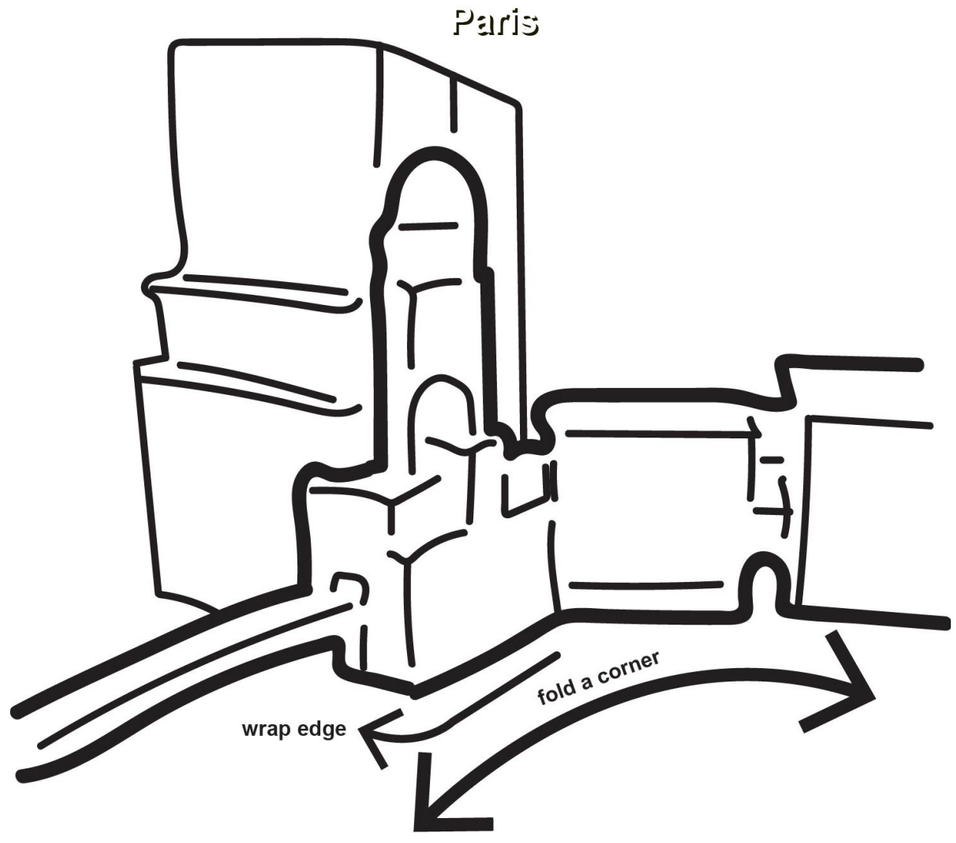
LAS VEGAS FOLDS





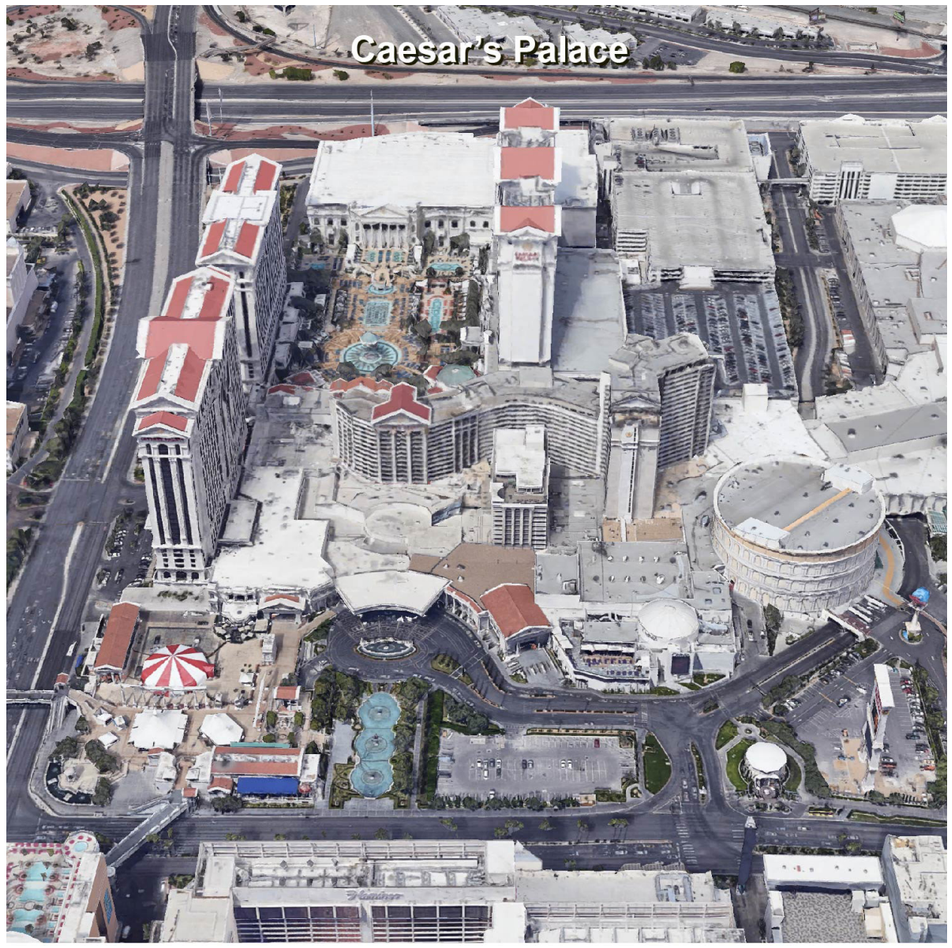
Folding does a lot of work in Las Vegas. It acts to combine differentiated programs into single continuous masses. It creates formal continuity between solids and surfaces. Masses might be embedded in the continuous folds of a facade, such as at Paris Las Vegas.

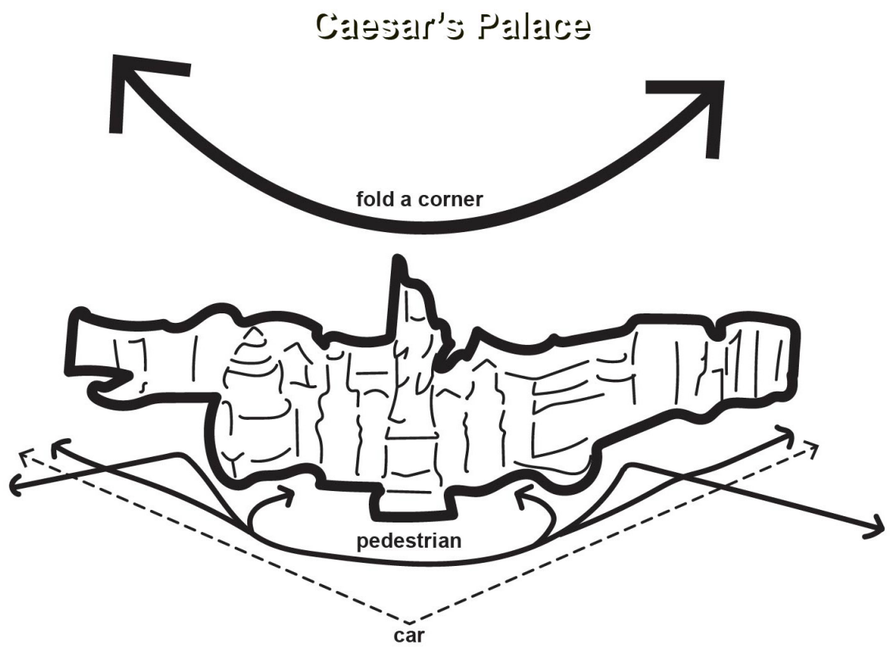




double wrapped corner

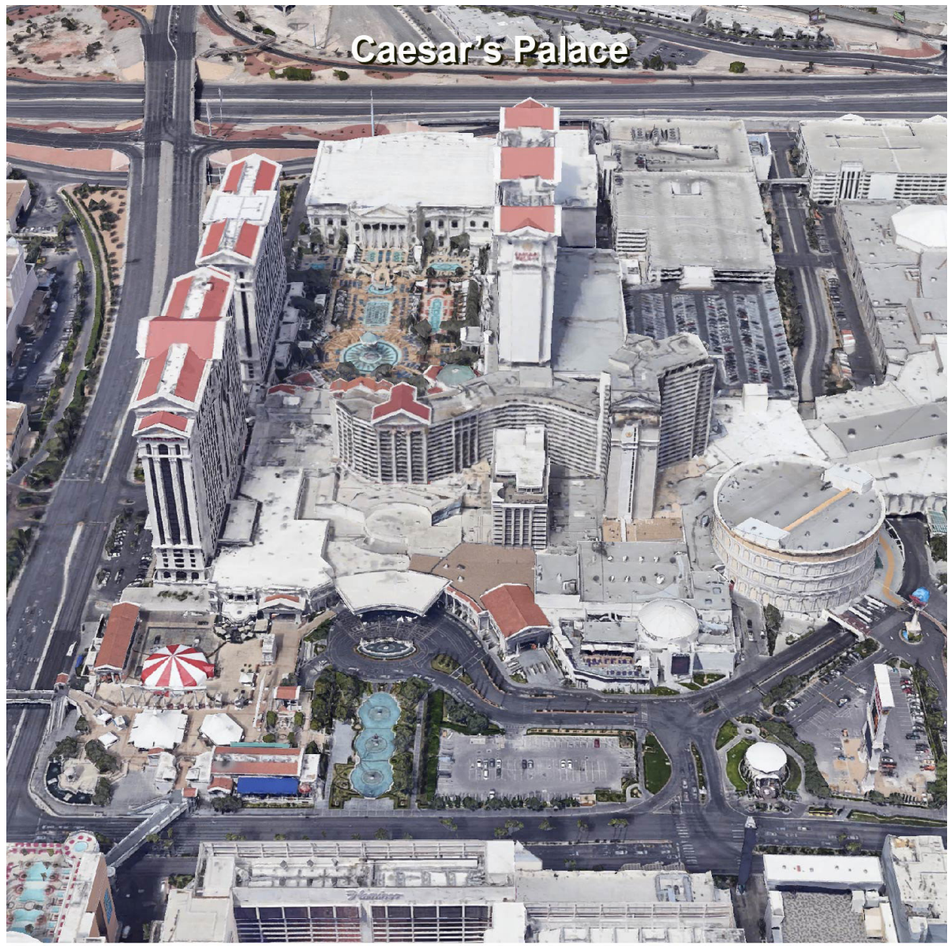
Here, a wrapped corner is used to adjust the angle of view.

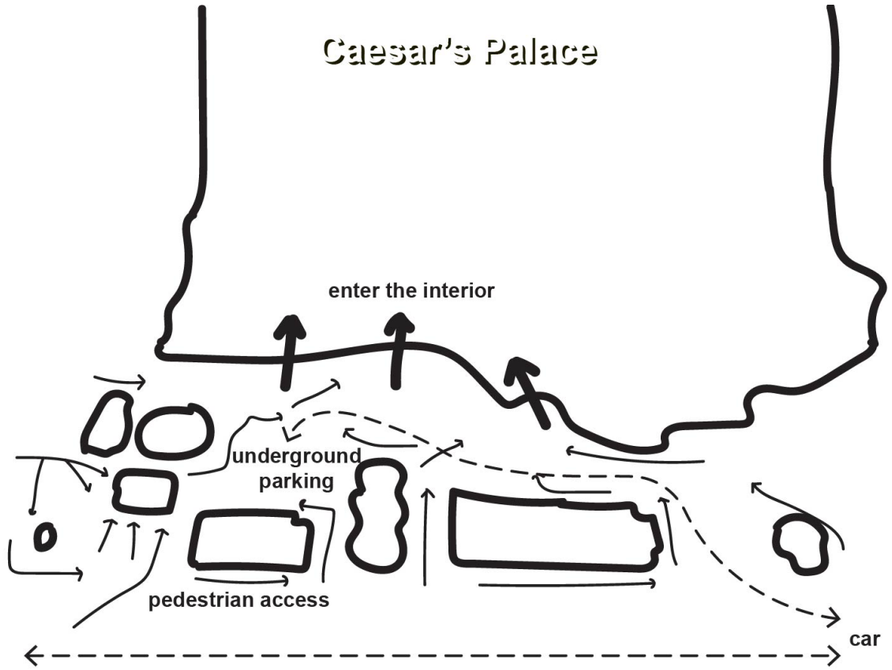




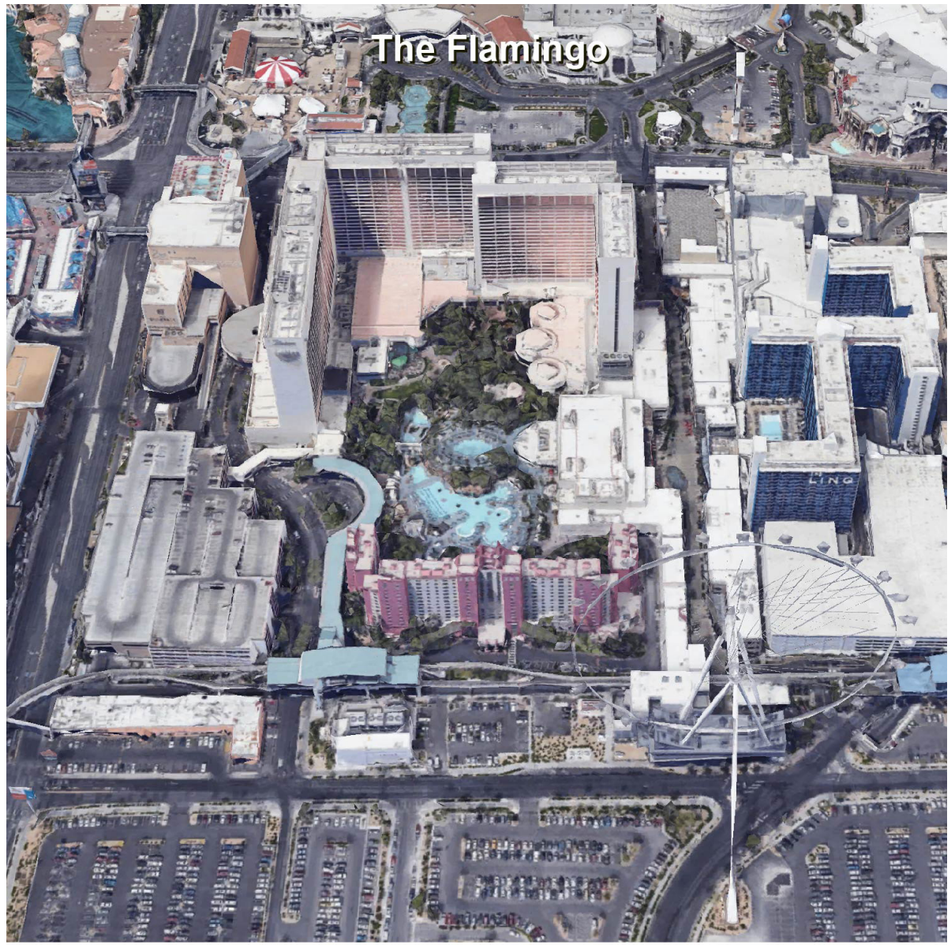
pedestrian corner

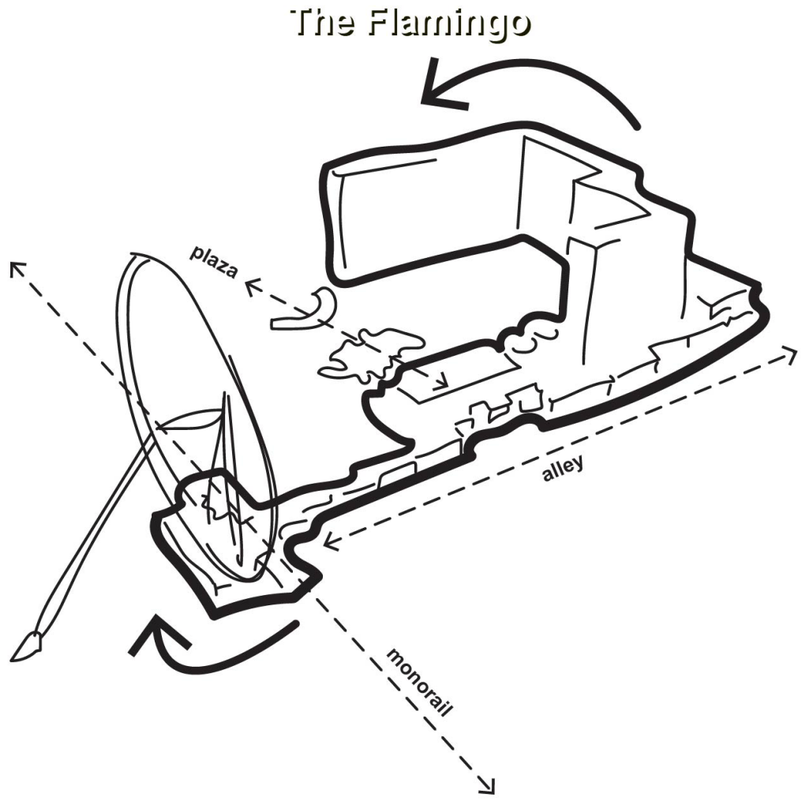
Folding at another corner allows pedestrian access into specific pleats of the fold while symbolically marking the entrance.





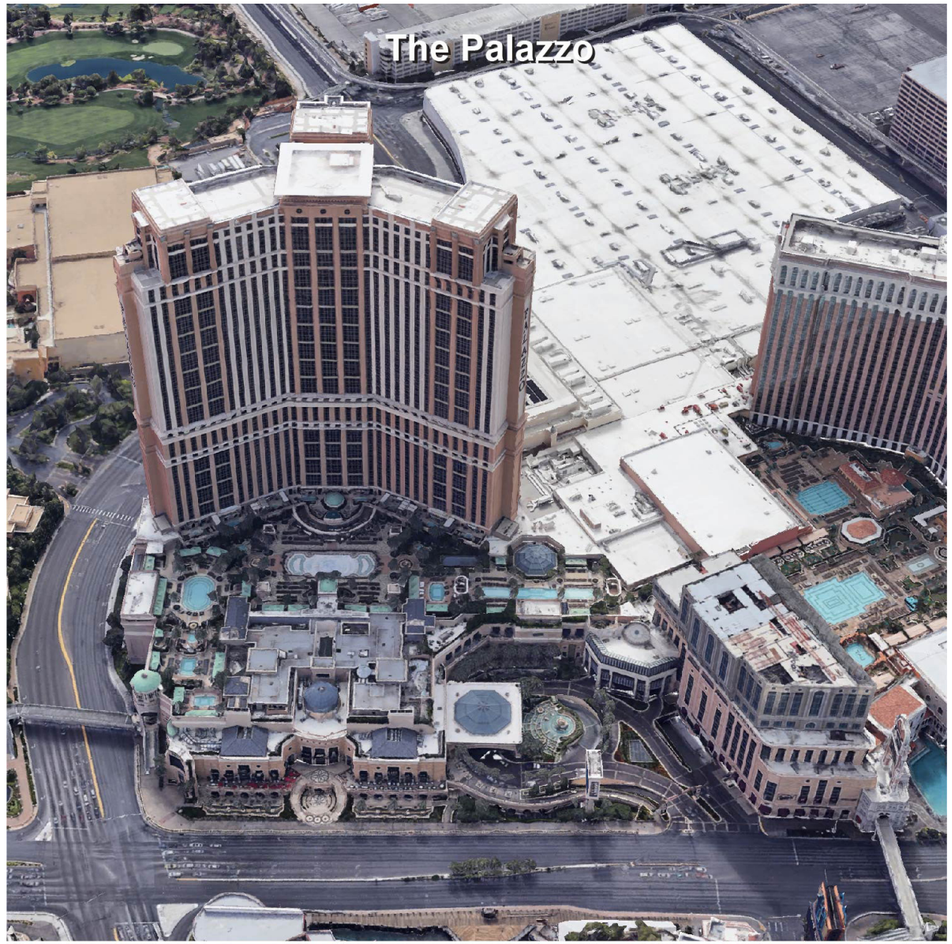
At Caesar's Palace a folded facade closely follows the car drop off roundabout.



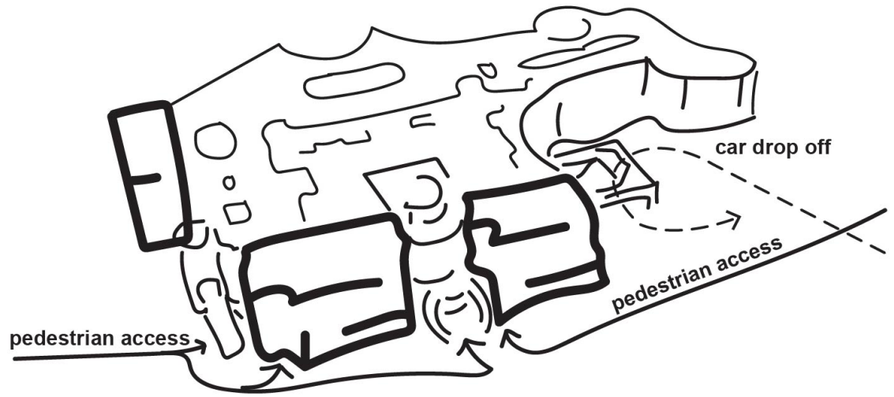


surface mediates axes

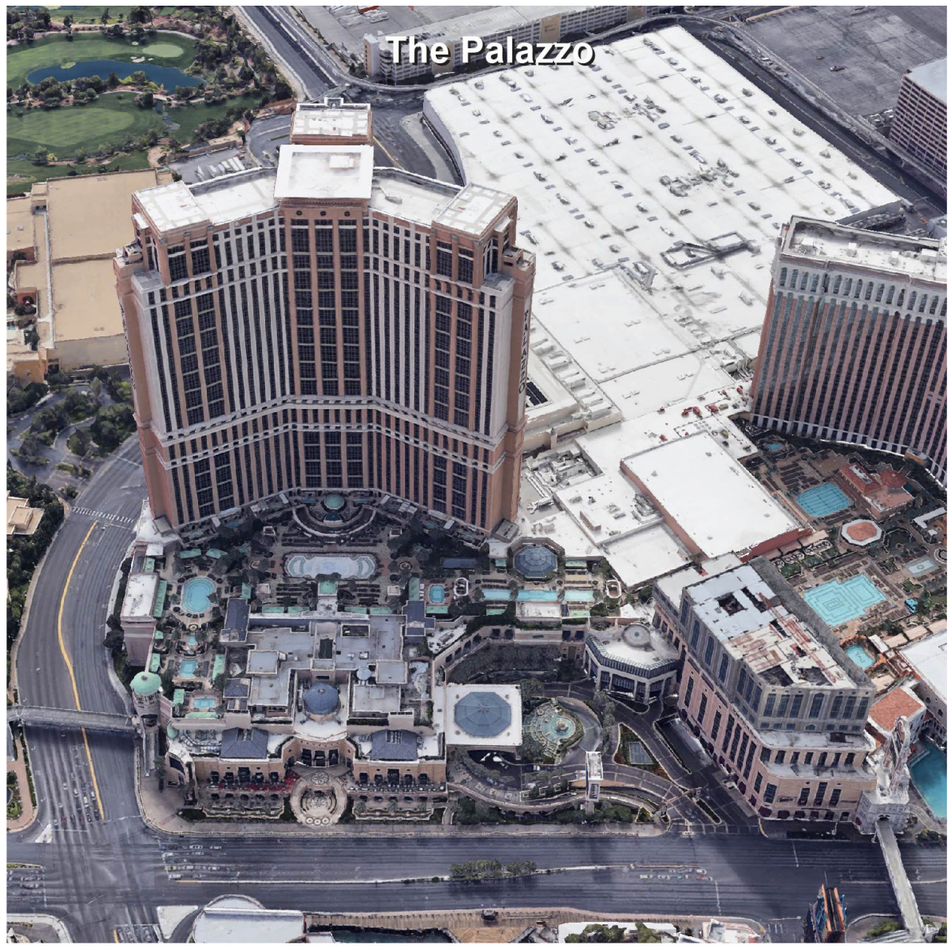
At the Flamingo a continuously folded mass creates highly differentiated experiences on either side of the surface.



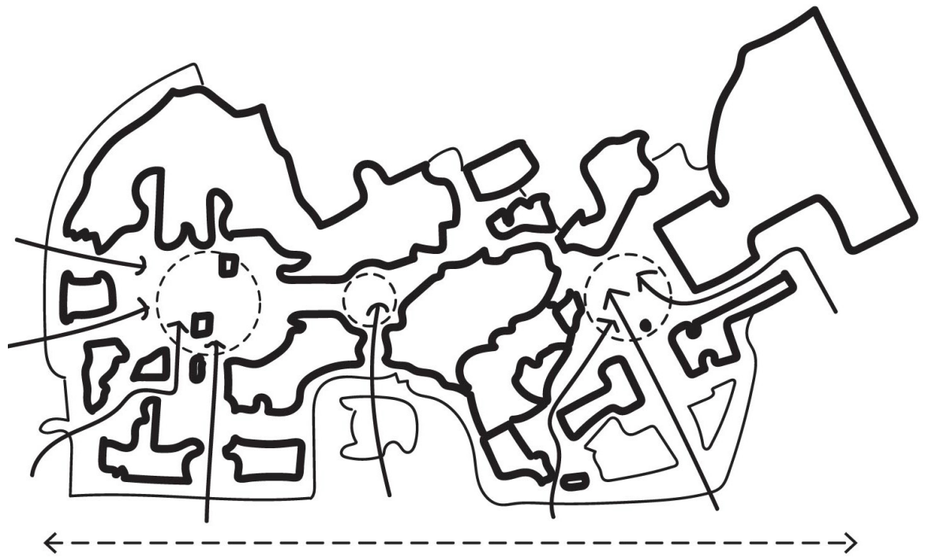
The Palazzo



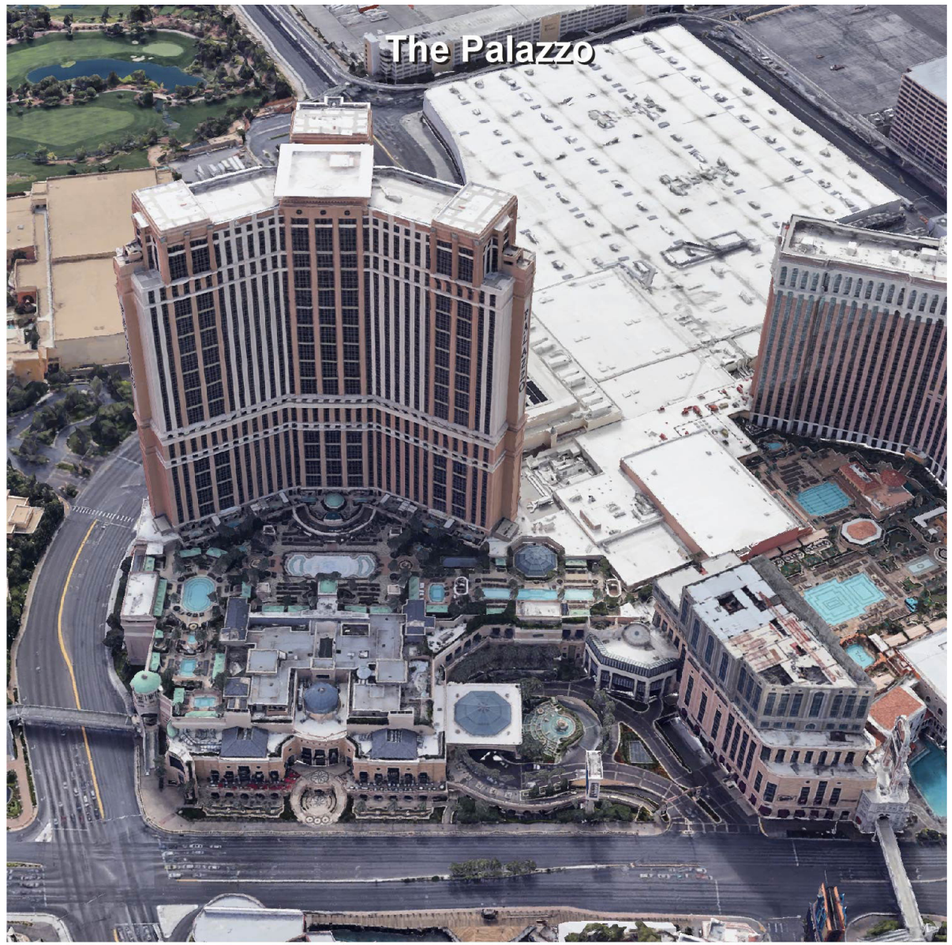
The embedding of masses in surface at the Palazzo begins to organize the plan of the otherwise continuous mat building.



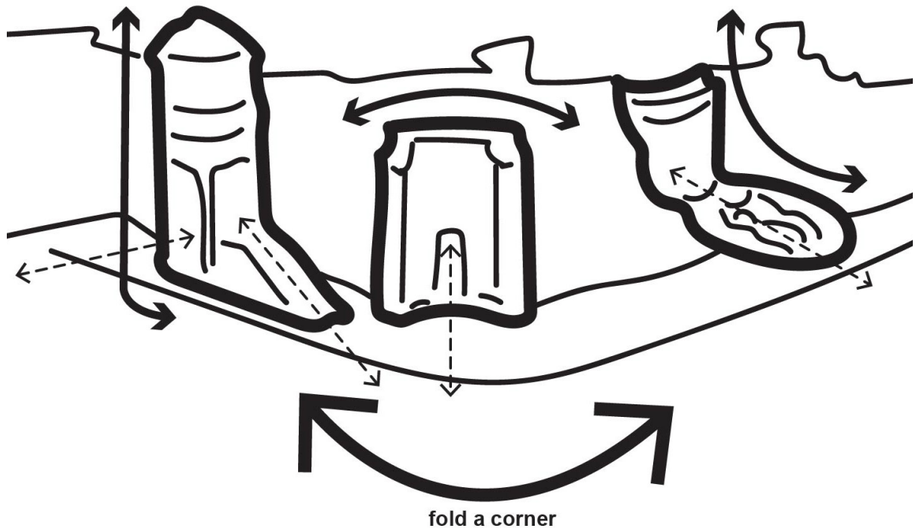
The Palazzo



Embedded masses are clustered to separate spaces of passage from open spaces for occupation.



The Palazzo



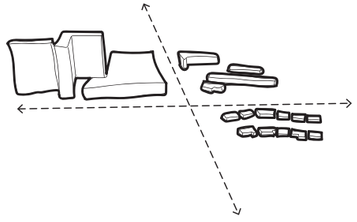
concave masses mark entry to a convex corner

Entries are marked by doubly folded surfaces which signal access to the pedestrian.

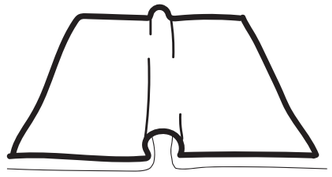
SOLID
SURFACE
VOID
CORNER



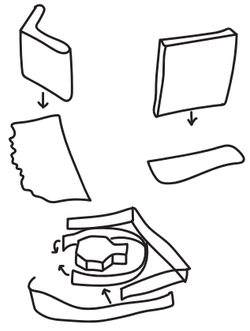
ding produces programmatic separation



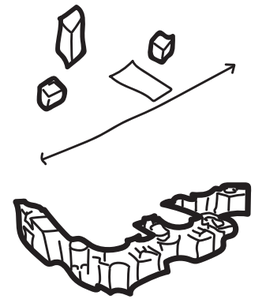
a fold creates typological divides



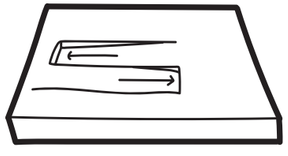
existing folds in Downtown Las Vegas mediate between
the pedestrian and the environment.



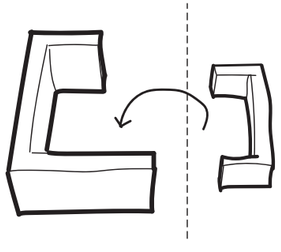
existing folds are layered and discontinuous.
the layers of the aladdin casino reveal an original relic.



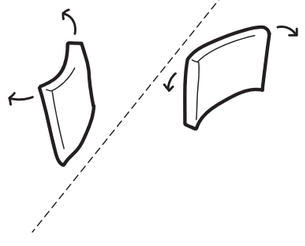
“mixed use” versus mixed use



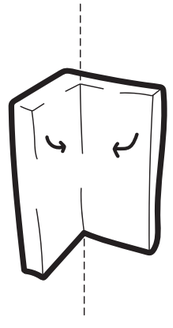
the parking garage is by nature a continuous fold



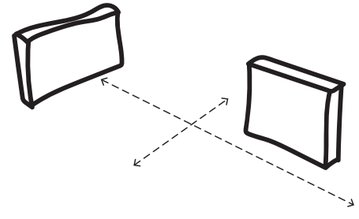
a near duplication (replica) might indicate a fold



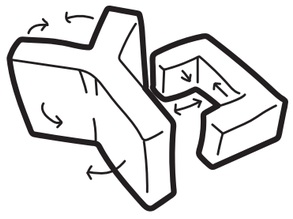
a near duplication (replica) might indicate a fold



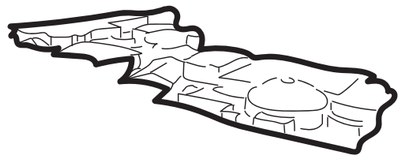
a fold creates awareness of the exterior of
what is occupied.



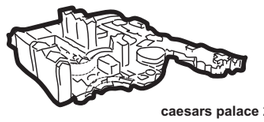
duplication of parts can indicate an unexpected fold.



the tower is always looking at itself.



reading a cluster of masses as a continuous surface.

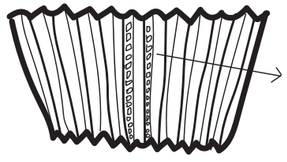


caesars palace 2020



caesars palace 1970

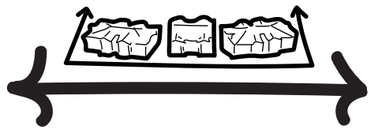
the continuous surface emerged on the
Strip in the past 50 years.



pleating controls the direction of view.



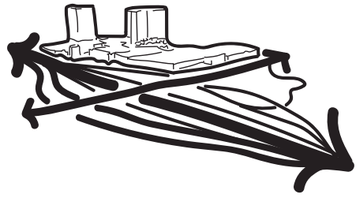
a continuous surface wraps mass and makes mass.



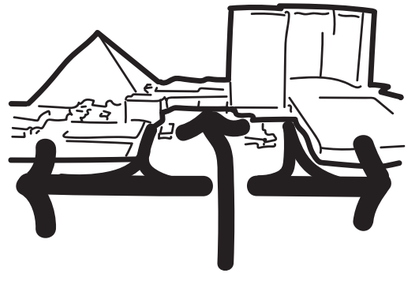
housing next to highway



new center established adjacent to interchange



continuous surface addresses the highway



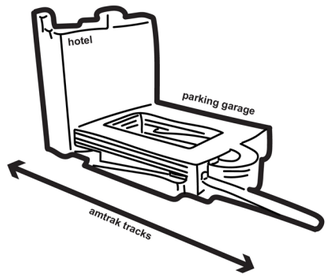
continuous surface accepts access from highway



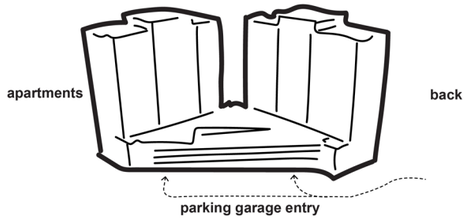
the stadium is shaped by the highway interchange

SOLID

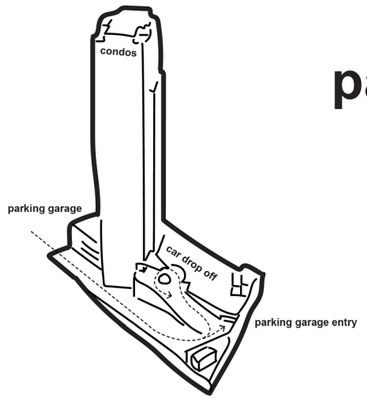
found solids



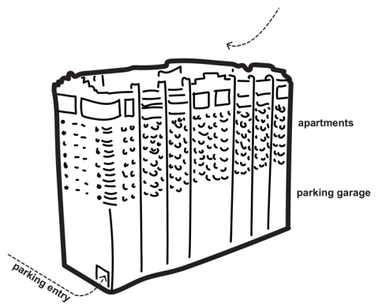
parking garage



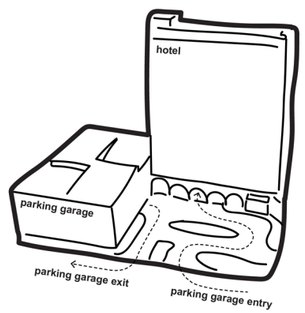
parking garage



parking garage



parking garage

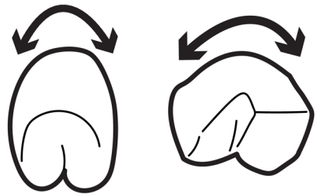


parking garage

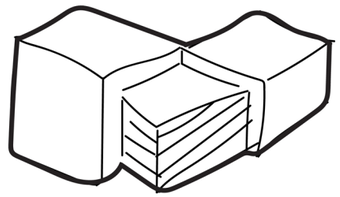
SOLID

folding solids

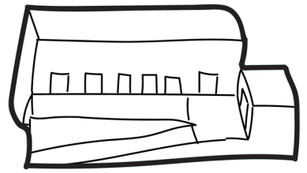
folding gives a single mass two fronts



programmatically the station and the apartment overlap at parking

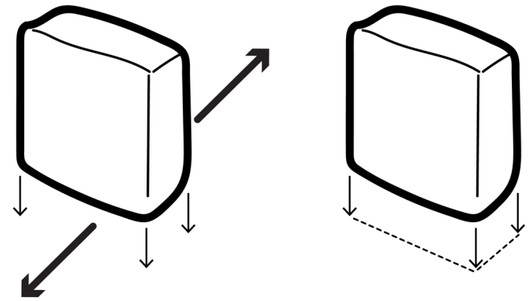


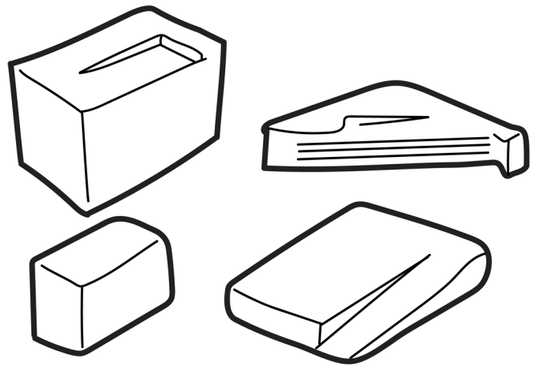
both the station and the apartment require direct vehicular access



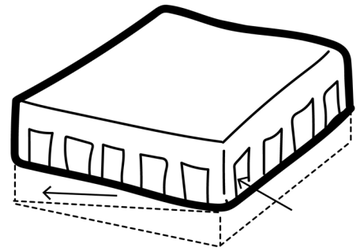
train station lifts for train

housing lifts for parking/commercial

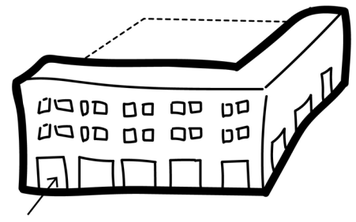




solids that have already been folded



parking hides under the station



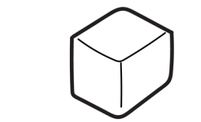
parking hides behind the apartment



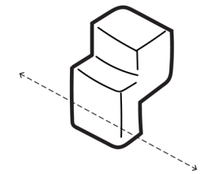
the ground floor corner disguises the entrance
in both the apartment and the train station

SOLID

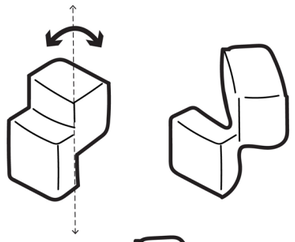
folding instructions



massing



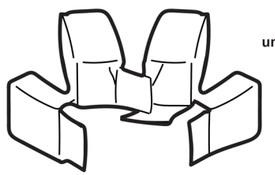
chop it



fold along chop

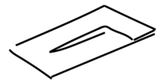


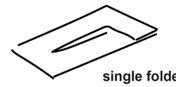
structural unfolds



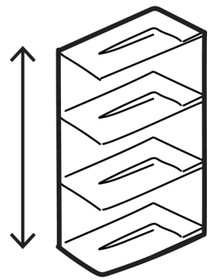
unfold to combine

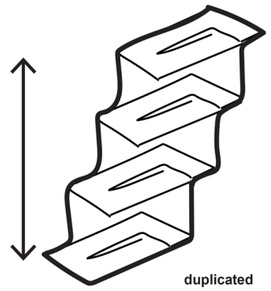
unfolding a parking garage reveals a continuous surface



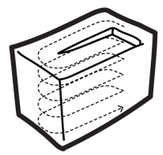


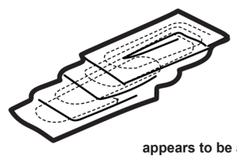
single folded floor



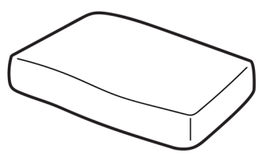


duplicated

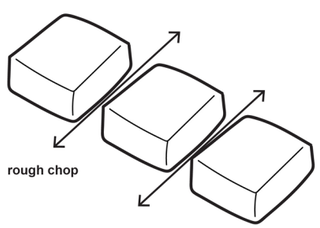




appears to be a solid mass

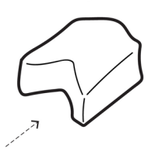


super solid

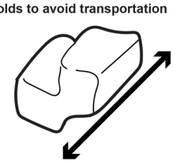


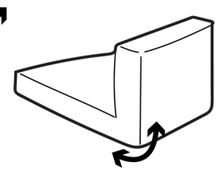
rough chop

deformed by entries



folds to avoid transportation

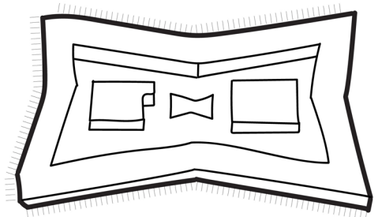




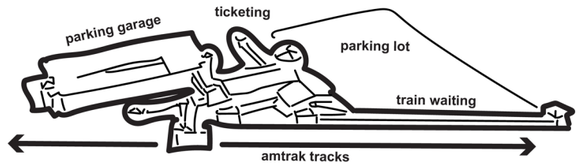
folding distinguishes housing from station

SURFACE

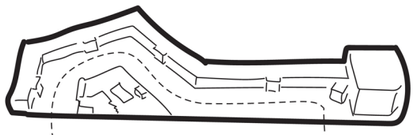
found surfaces



real apartment

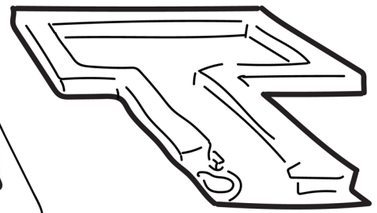


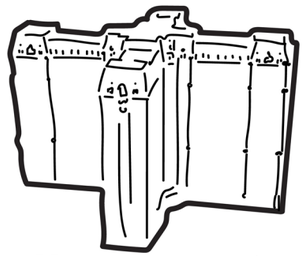
real train station



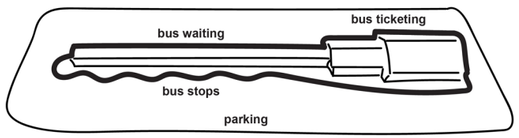
real apartment

real condo

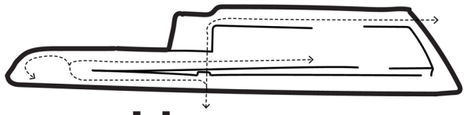




replica apartment

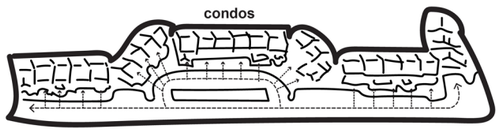


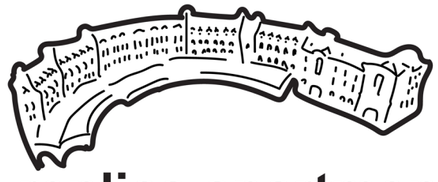
bus stop



parking garage

real condo

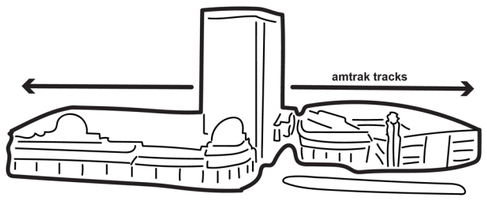




replica apartment

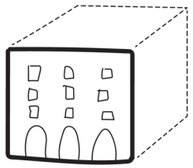


replica train

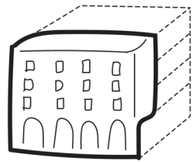


SURFACE

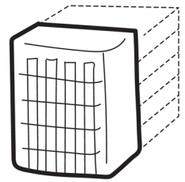
folding surfaces



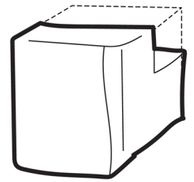
thin surface
(entrance)



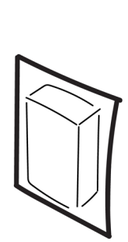
thick above/thin below
(head house)



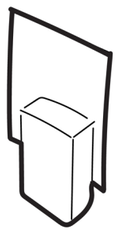
thick surface
(apartments)



solid surface
(apartments+parking)



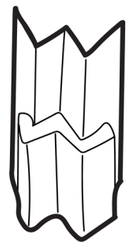
thin surface+thick surface
are loosely related



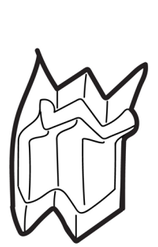
can easily fall apart



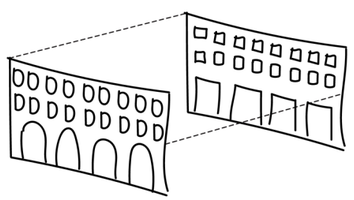
folded together



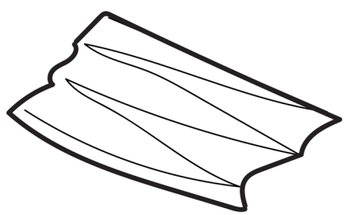
not fully joined



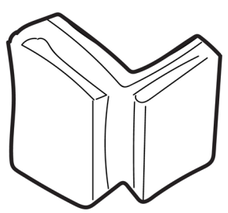
double folded



head houses follow similar facade
requirements to aparment units



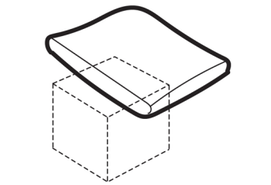
ground folds to accomodate
additional parking levels

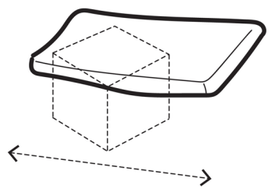


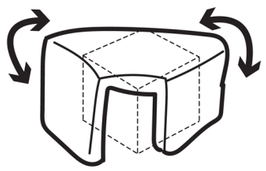
folding a two-ply surface

SURFACE

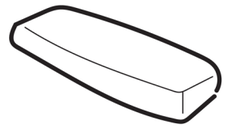
folding instructions

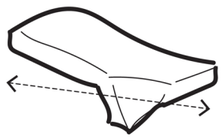




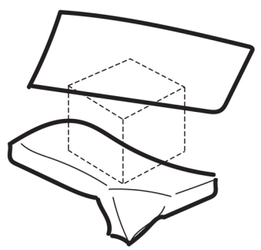


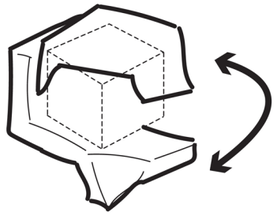
thick surface folding around a solid



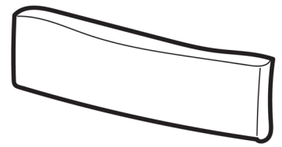


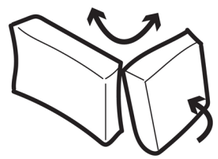
folding to accomodate circulation



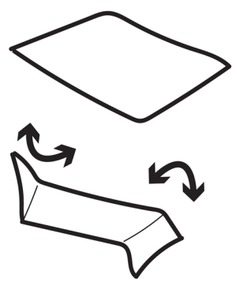


surfaces of varying thickness
folding around a void

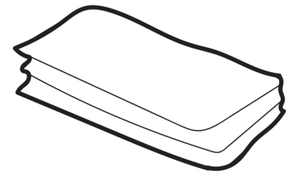


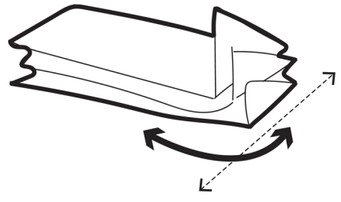


thick surfaces break at folds

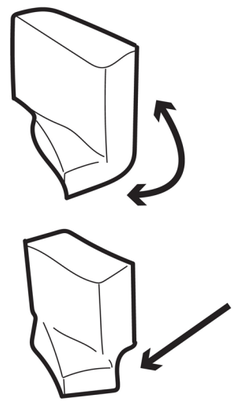


thin surfaces are continuous at folds





laminated surfaces fold together

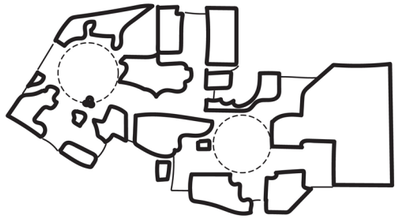


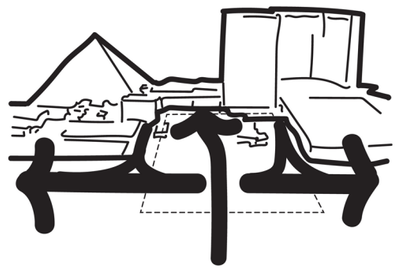
small folds introduce rotation to
a thick surface

VOID

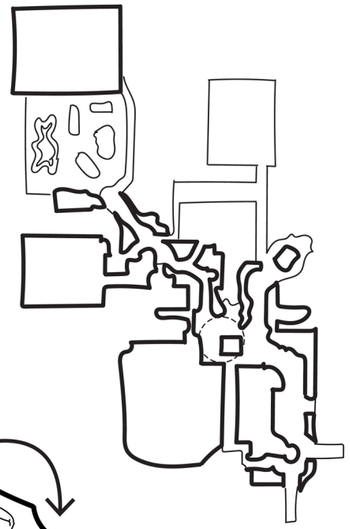
found voids

outdoor space

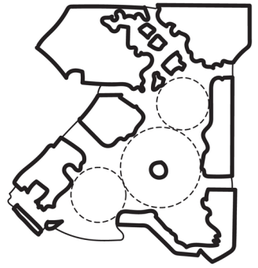




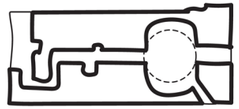
casino

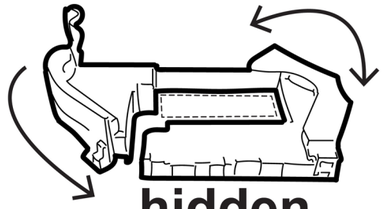


train waiting

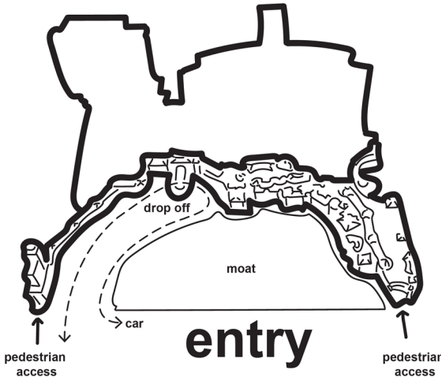


courtyard



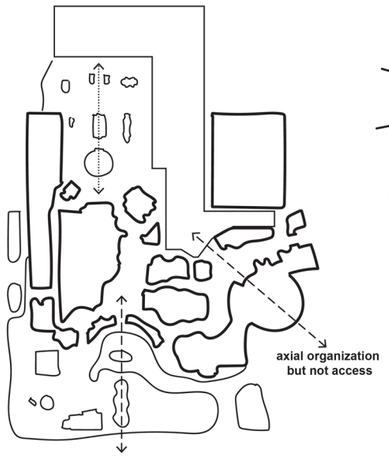


hidden

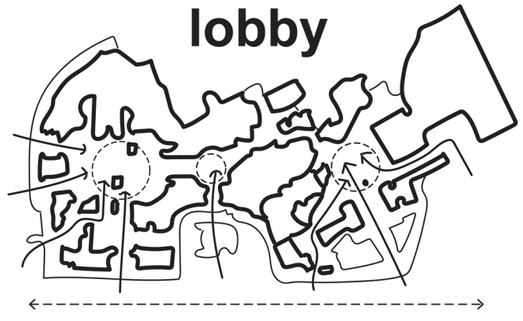


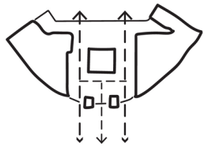
entry

pool



lobby



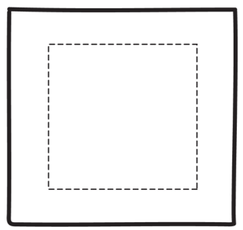


VOID

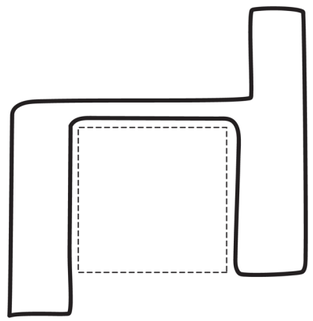
folding voids



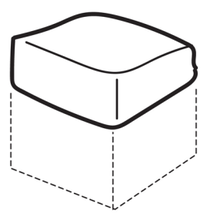
the station void platform is
surrounded by services



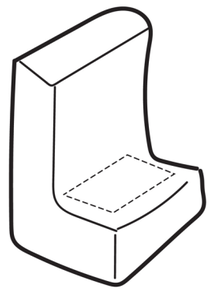
the apartment void is
surrounded by apartments



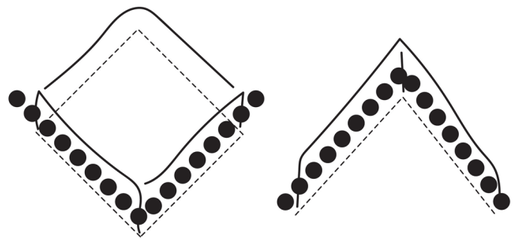
voids separate mass without
breaking it apart



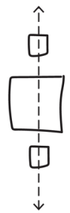
the station void is
always beneath a mass



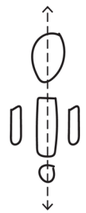
the apartment void is
often on top of a mass



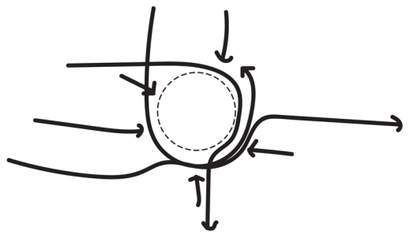
small scale commercial line
the edges of the void



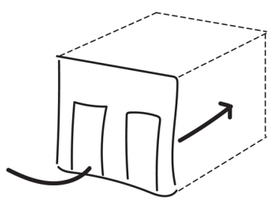
vertical circulation occupies the
void along a central axis



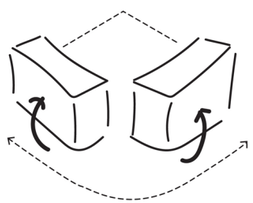
pools occupy the void
along a central axis



voids are good for organization
complicated multiples of circulation



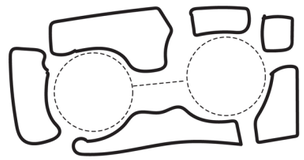
the station void is a
continuation of the street



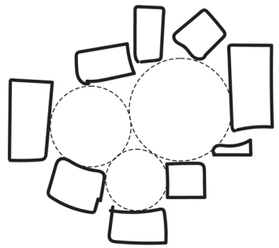
the apartment void is
hidden from the street

VOID

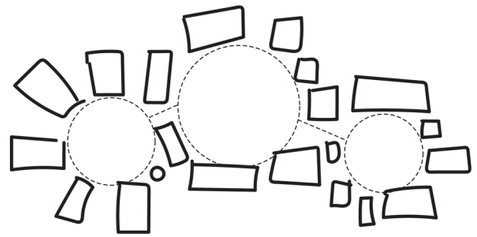
folding instructions



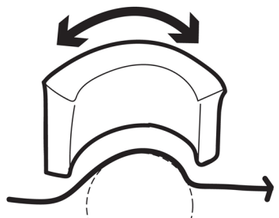
mass clusters around linked voids



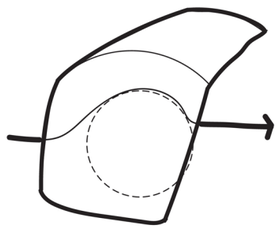
single lines indicate circulation



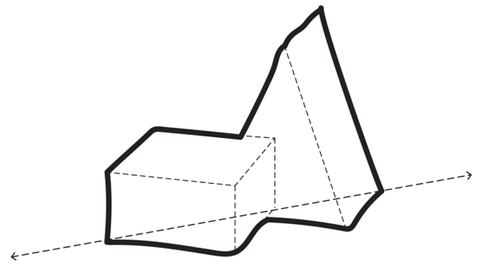
masses might fit loosely or follow curve of void



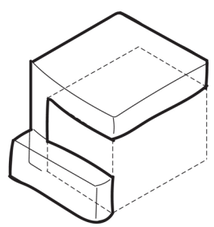
void created by circulation causes masses to fold

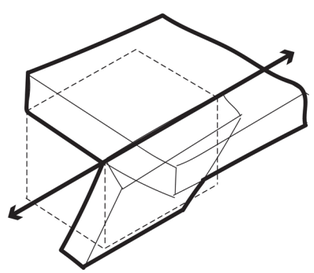


void created by circulation causes masses to fold

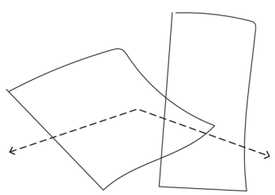


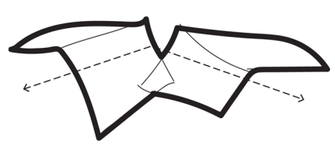
voids link to create circulation oppurtunities





void locates inflection points of folded surfaces

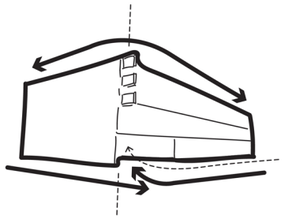


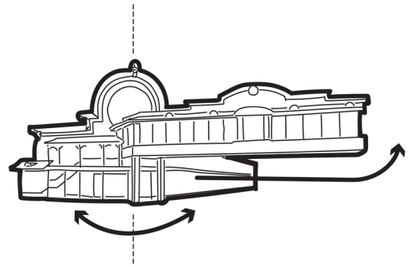


unrelated surfaces can be related by voids

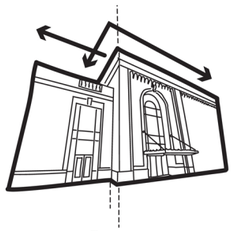
CORNER

found corners

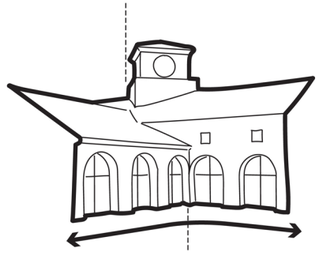




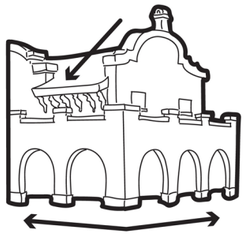
train station

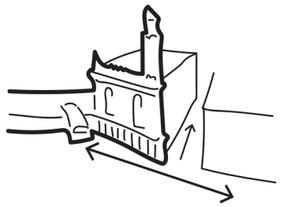


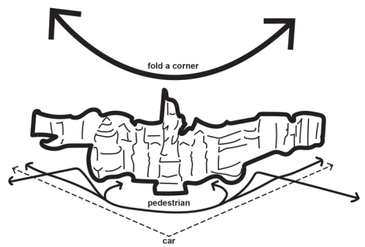
train station



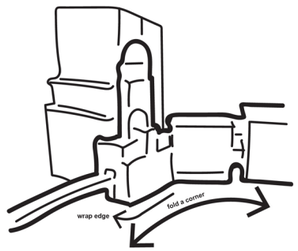
train station



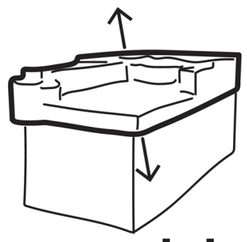




commercial

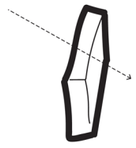


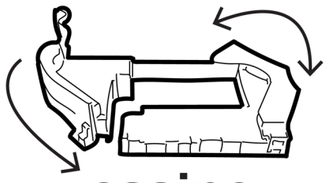
commercial



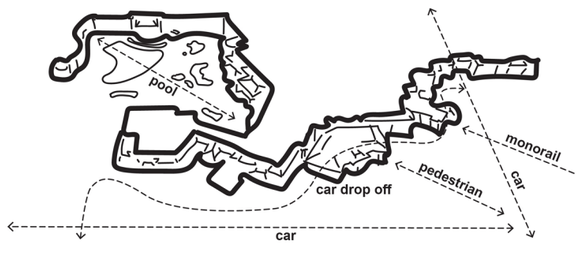
commercial

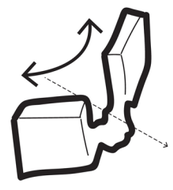






casino

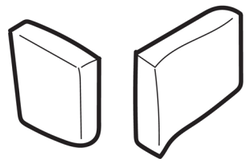




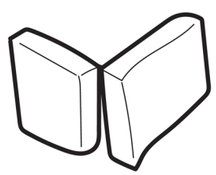
casino

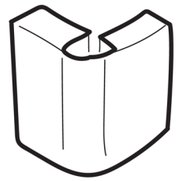
folding corners

CORNER



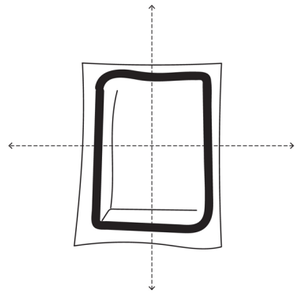
thick surfaces
break at corners



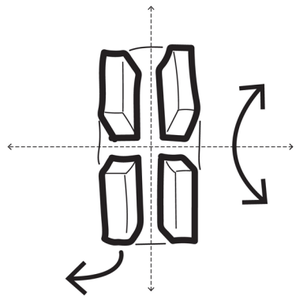


thin surfaces can
bend at corners

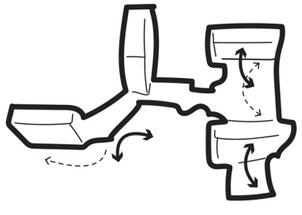
4 corners

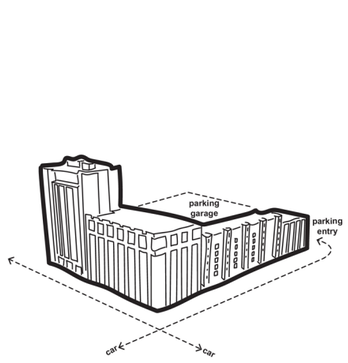


16 corners

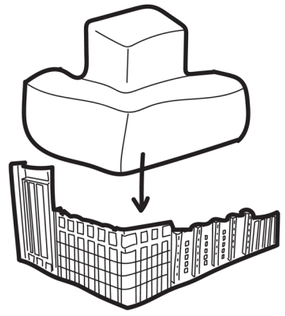


22 corners

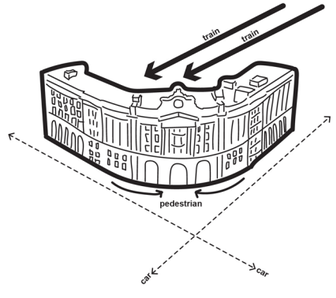




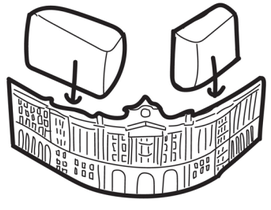
apartment corner



thick surface folds at corner
and conceals a solid



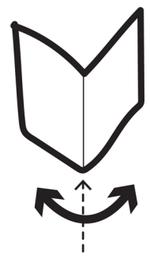
train station corner



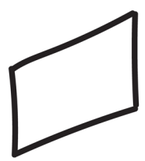
thick surface breaks at corner,
thin surface connects the bend

folding instructions

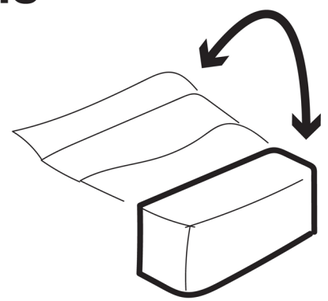
CORNER



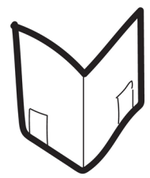
locate station surfaces at corners met by a central axis



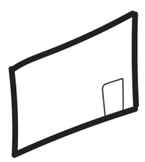
locate housing surfaces at straight segments



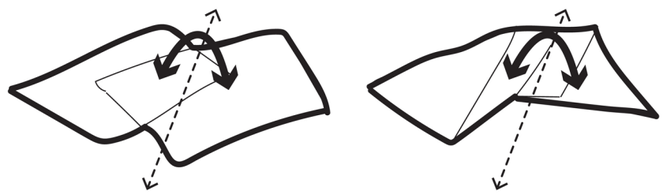
unfold to accomodate large, open programs



cut holes at corners for cars



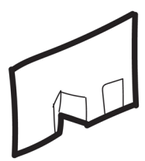
cut holes at corners for cars



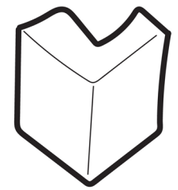
fold together overlapping surfaces with site lines



fold back to create entries



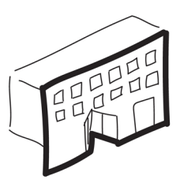
fold back to create entries



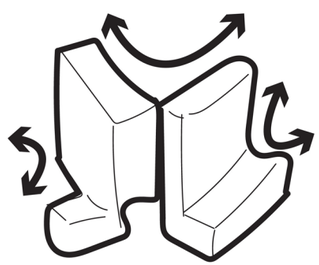
corners maintain continuity when folded



add thickness to upper floors

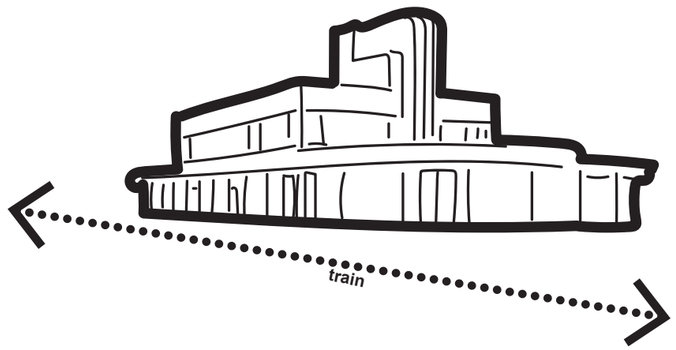


add thickness to upper floors



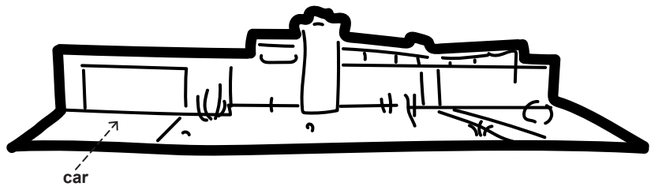
leaning and touching corners work to create continuities

train



Las Vegas is founded adjacent to the Union Pacific Railroad tracks in 1905

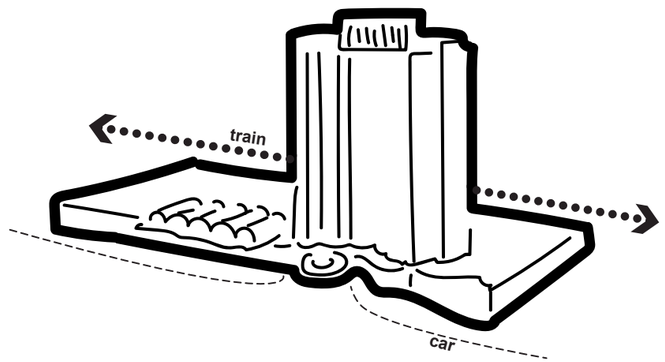
house



First master-planned community of single family homes is Paradise Palms in 1960

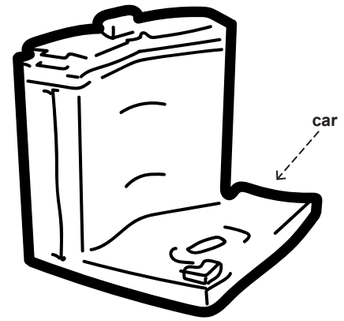
In Las Vegas the train station and house can be traced throughout a similar history though they have never been previously folded together. They began small, functional, and modest. They were transformed by the car into an efficient plinth plus tower. Their relationship to the Strip is always adjacent and never fully integrated. Their symbolic appearances have been appropriated by the casino. And they have been reduced to a surface which mediates different kinds of pedestrian, car, and service access.

train



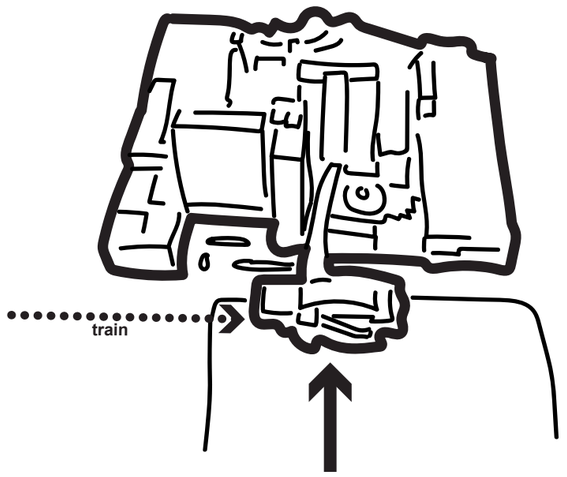
The Union Plaza Hotel absorbs the train station platform inside a casino and hotel in 1971.

house



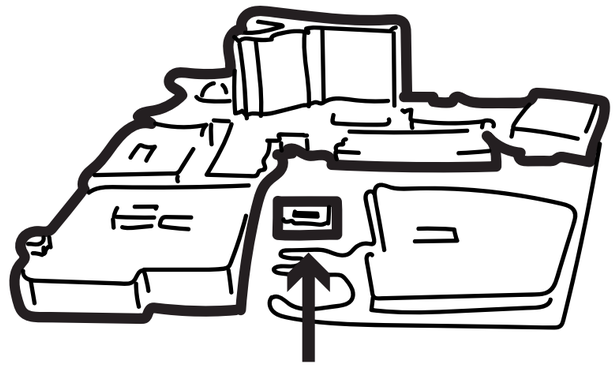
First high rise condo is built in Las Vegas in 1974, is intially a failure and only 8 of 226 units sell.

train



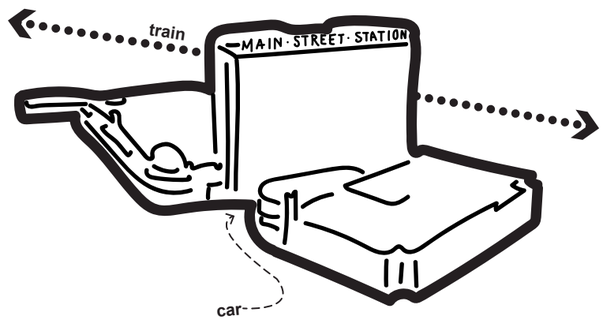
In 1995 a casino monorail is constructed as a transporation mode exclusively for the tourist

house



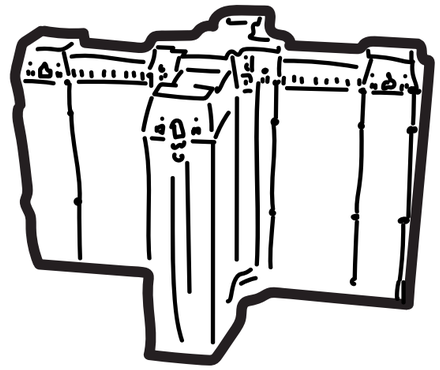
A multi-family building owner adjacent to The Mirage refuses to sell, impeding its further growth

train?



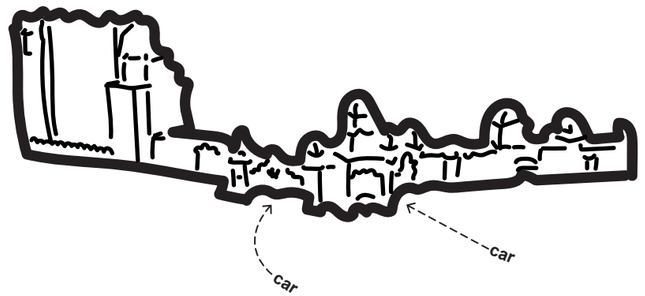
Main Street Station Hotel and Casino (1978) takes the train theme and spins it into a “locals casino” chain

house?



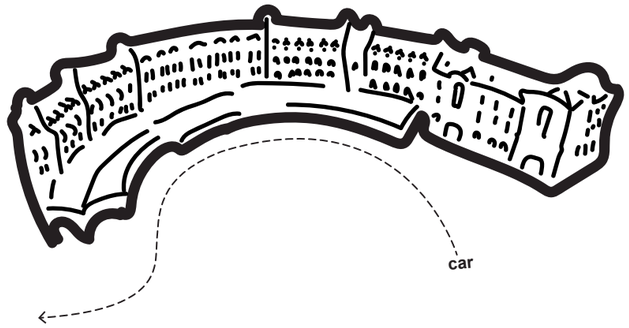
A replica of a Parisian apartment block is extruded to create 3,000 hotel rooms at Paris Las Vegas

train?



Station Casinos expands to dominate the locals casino market in Las Vegas, all are train themed without trains

house?



A replica of a Parisian apartment block is pasted across the front of Paris Las Vegas Hotel and Casino

Project Brief

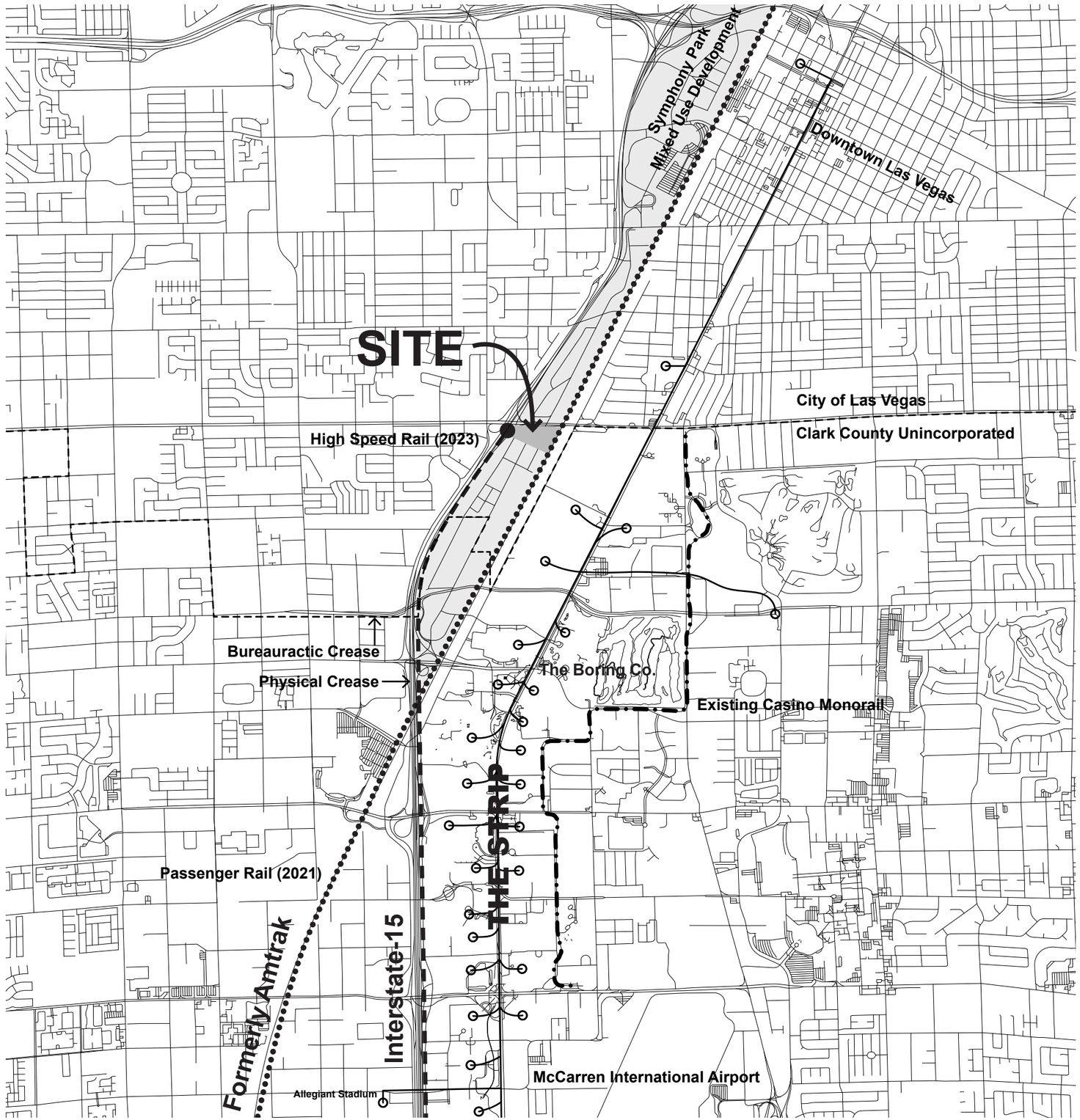
housing and train station in Las Vegas

1/2 Housing + 1/2 Train Station

950,000 sf Housing
950,000 sf Train Station

Train Station includes:
-High Speed Rail Platform 100,000 sf
-Amtrak Stop 50,000 sf
-Train Station 120,000 sf
-Parking Garage 180,000 sf

Housing includes:
-2000 units (studio, 1 and 2 bedrooms)
-2400 parking spaces
-open space 200,000 sf
-amenities 100,000 sf



Labored Form

The study of the folds of domesticity is useful in the conceptualization of a labored form. In its creation, and during the time of labor, it can be definitively understood as political. Whether a form can retain such an embedded concept is the primary question of this thesis. The labored form seems compelling in its scalability, it can be a way of reading the production of a housewife or understanding the collective politics of a city. To read the city of Las Vegas through this lens reveals the key investors, places emphasis on particular edges, and provides the guidance for the conceptualization of a project.

The labored form is compelling for the multiplicity of possible readings it provides. The Tokyo Olympic Stadium—probably the only architectural project I have ever had the chance to observe over several years of construction—is quite obviously labored when seeing the workers on and around the site. During its time of construction I am able to consider the numerous trades, cities, and private parties integrated in this act of construction. Whether the form retains traces of this labor once the building is delivered is less clear. To draw a comparison with the unbuilt stadium project designed by Zaha Hadid it might seem that considering geometric complexity alone, the resultant form has greater embedded labor. I don't think the comparison can be so simple, Hadid's stadium could be considered too smooth, too easy, to have a labor embedded other than the cost. The constructed stadium by Kengo Kuma could be seen to have a greater embedded labor in that its individual parts have revealed, thus suggesting the hand and machine that had to interface with them to construct. Hadid's stadium appears as if it has not been touched by the hand, and that all labors are contained within the processing power of the computer.

The civic scale project is a significant consideration in the reading of embedded labor, it suggests a direction of the city's leaders and is quite literally where the labors of the citizen are directed, in the form of their tax dollars. The Tokyo Olympic Stadium as a civic project is representative of labor through its funding. In the United States many civic projects such as courthouses, train stations, and state capitols can be considered as labored forms regardless of their style. Las Vegas is unique when compared to many other American cities in that its most labored form are not civic spaces. Having skipped a foundational moment of money directed to civic projects upon its founding, the labored forms are instead embedded in the Strip. Las Vegas is probably the only city to have allowed a casino to quite literally swallow and then dissolve their only passenger train station. One of the only civic buildings built prior to the explosion of casinos was the Union Pacific Station, built in 1940 in Streamline Moderne style. In 1971 the site of the train station was rebuilt and the passenger portions located on the ground floor of the Plaza Hotel and Casino which operated above.

Looking at the development of Las Vegas in the past 10 years through this lens tells an interesting story about the focusing of efforts. The city has focused its energy on the development of its Downtown and the county has focused on the development of the strip. The suburbs can be seen rapidly growing and the fringe of the city is in a constant state of change as it continues to be built out with single family houses. An absence of efforts can be seen at the divide between the city of Las Vegas proper and unincorporated Clark County—where the casinos are. The city has been split in two in such a way since its early origin when casino owners who held a lot of power in the government decided they didn't want to pay city taxes. By remaining unincorporated, the casinos would have to pay taxes only at the county level, significantly increasing their profitability. This crease between the north and south halves of what appears at first glance to be a single city is visible from a very distant aerial view. This divide corresponds approximately and often exactly with Sahara Avenue. Despite being one of the first constructed casinos on the strip the Sahara and its surroundings appear in a state of retirement. The struggle of being located at the North end of the strip is reflected in the Sahara's recent bankruptcy and several planned casino projects which never began. The continued focus of the separate efforts of the city and the strip have created two centers of the city, with a dead zone between. It would seem obvious for the two centers to develop toward each other, if it weren't for the sprawling suburbs which infiltrate the space between them.

The Las Vegas Plight

The problems in Las Vegas can be identified through an investigation of its seams. The first such investigation focuses on the line which separates the North and South halves of what appears at first look to be a single city. Since its inception Las Vegas has been split into two entities—the North, an incorporated city holding the name Las Vegas—and the South, a series of unincorporated towns including Paradise and Winchester where the strip is located. This division is based on the interests of the casino owners who fought to avoid paying city taxes to receive significant savings. The complexity of addressing this division becomes apparent when reviewing the planning documents of each area. The documents contain no coordination and each half stops their plans at the city border, with no consideration at its edge. Only the regional transportation plan manages to address both cities simultaneously by developing bus routes both crossing and along the divide. The lack of attention paid to the line between cities is apparent from both sides, each half focusing on the development of their cores while ignoring their extents. The result is a city with two centers, one The Downtown and the other The Strip. This disjunction is apparent across zoning maps, housing quality, and most significantly the amount of money dedicated to public projects. Despite its substantial effect on the city, this line has been drawn on paper and only a bureaucratic wall stands in the way of crossing it. Both the city and county are implicit in creating this crease.

Physically, the city of Las Vegas is divided by the Interstate-15 and an existing cargo rail. These two lines have physical impact, particularly on the pedestrian experience of the city. Both rail and highway are resistant to crossing and when possible inefficient and inaccessible solutions are created. Crossing this divide has proved to be a major challenge for the city which has primarily developed only toward the North and South. Recent projects which attempt to cross the divide created by Interstate-15 include the almost complete Allegiant Stadium (the new home to the Raiders) and the mixed-use development Symphony Park. Neither project has proposed an elegant solution to crossing the divide. Allegiant Stadium visitors arriving on foot from the nearby strip would be required to use a small sidewalk along a large pedestrian artery. Those going from Downtown Las Vegas to Symphony Park would have to enter into a parking garage, move to an upper level, and then use a pedestrian bridge to cross. In both cases, despite stating numerous interests in pedestrian walkability, the solutions have catered to the car.

Both the divide produced by the Interstate-15 and that produced by the Amtrak rail are going to be complicated in the coming years. Brightline, a high speed rail company has made significant progress toward the construction of a railway connecting Las Vegas to Los Angeles in 80 minutes. Brightline has already received approval to operate both along and in the middle of the interstate. California and Nevada have granted bonds totaling over one billion dollars to the company. Coming even sooner than the Brightline project will be the X line which plans to start operating in 2021. The train will act as a traveling party that slowly moves passengers from Los Angeles to Las Vegas while providing a luxury experience. This project is in the final stages of development and plans to move forward with a delayed opening due to the COVID-19 pandemic. Both of these projects will be bringing rail transportation to a city who has been without it since 1997.

The connection of Las Vegas to Los Angeles will lead to a transformation of the economy and travel to the city, though it is unpredictable exactly to what extent the cities will be affected. Someone living in Los Angeles might be able to access expanded education and employment opportunities in Los Angeles while enjoying the significantly lower rent prices. Alternatively, someone working in Los Angeles might choose to work remotely in a much larger home in Las Vegas and commute into Los Angeles several times per week. More tourists might come to Las Vegas from Los Angeles for the weekend. A sports fan could conceivably attend a Raiders game without having to spend the night in the city and could head immediately back to Los Angeles the same night. The scenarios presented lead to opposing possibilities which could cause increased tourism in the city or skyrocketing housing prices. It will be critical for the city to evaluate and expand its housing availability if it continues to seek tourists and outside investment.

Site

The site exists at the coalescence of bureaucratic and physical folds in the city. It is located in an area neglected by the city but of interest to developers. It provides both a complication of access for the pedestrian and a multiplication of access for train passengers. It is ambivalent to the car which has until now been given enough attention. The location implies an enormous collaboration between self interested parties including the Boring Company, Brightline Trains, X Trains, the City of Las Vegas, and Clark County. Given all party's desire to attract and impress the tourist it seems viable for such a collaboration to exist. It is the job of the city to model good manners and set the table for the interested developers. The city should proactively seek to define a train station that best serves its population. It should direct tax payer money toward a project that has already peaked developer's interests, rather than waiting for them to appear.

Downtown Las Vegas

The city proper has long found itself in the shadows of its flashier neighbor, the Strip. It has taken on numerous expensive projects in recent years in an attempt to rebrand itself as a second destination for the Vegas Tourist. The city has continuously invested tax payer money in the upkeep and expansion of their few existing attractions. Mostly recently doing so by funding almost $3 million of the $9 million dollar Mob Museum expansion and all but $25,000 of the half million dollar Neon Museum expansion. In the 90s the city completed a $70 million dollar LED light show canopy which continues to be their main tourist draw and received a $32 million dollar upgrade in 2019. The canopy connects between several casinos and creates a comfortable pedestrian experience. Since the early 2000s the city has been in the process of attempting to connect this giant canopy to the ground up development on the other side of the train tracks.

Symphony Park

Both the Strip and Downtown Las Vegas are developed to the East side of the railway, which still act as a major supply route for the city despite offering no passenger service. The West side of the railway has seen little development and is a clear boundary between commercial tourist and industrial programming. The city has attempted to bridge this crease between east and west by creating a multi-use master plan known as Symphony Park. The city has invested heavily in this area by fully funding a parking garage and contributing significant funding to an event center, children's museum, and public park. The goal in making these investments was to attract developers who would take on the project of providing housing, thus completing the intended goal as a mixed use development. The master plan has been in development since the early 2000s and likely suffered substantially from the 2008 housing crisis.

The completed projects as part of the master plan include the Frank Gehry designed Lou Ruvo Center for Brain Health (unknown city money contributed), The World Market Center (half funded by the city), a Parking Garage (entirely funded by the city), and a public park, Performing Arts Center, and Children's Museum all with significant contributions by the city. The financial crash of 2008 appears to have caused significant delays in the realization of Symphony Park's mixed use aspects. Currently 300 high end condos are expected to be completed in 2021 and several residential and office sites remain for sale. It seems likely that the current pandemic and financial crisis will again lead to severe delays for the project and it may never achieve the goal of becoming a mixed use center. What is particularly unfortunate about this fate is that the city's money has been directed into the early phases of the project and that addressing a shortage of housing is what gets delayed.

The failure of the individual pieces of the Symphony Park master plan has left the city with a sprawling and unfinished urbanism, unfriendly to pedestrian and bike traffic. Only one small connection across the train line has been

made, a pedestrian bridge which exits from the parking garage. This connection makes little sense from a pedestrian perspective since it would require someone to enter the garage to cross the train tracks and is invisible from the downtown side. Every master plan and revitalization plan, and transit plan calls for creating a better experience for pedestrians and bikes which has proven to be extremely difficult to achieve.

Mixing Uses

Symphony Park proves the complication of a planned mixed use project with little coordination between the city and potential developers. The city decided to set the table with a few projects and hope the developer would appear—they forgot to invite them to dinner. Many planning documents created by the city indicate a desire for outside investment in the city but the government has not been proactive in seeking collaboration with such projects. A train station that already holds interest as a project from private developers holds the latent potential for city collaboration. Rather than create a master plan with separated and adjacent differing uses, I proposed to mix uses on a single site. The mixing of uses would require intense collaboration between private and public interests but could help to achieve the transformation Las Vegas has been dreaming of.

This mixed use development will attempt to cross lines drawn between city and developer and between city and county. In uniting disparate forces the hope would be to create a project that serves both the city's residents and its tourists. Given their significant contribution to the economy the tourist experience is typically prioritized. The addition of a train station to the city has the ability to both bring tourists in and provide redevelopment of a typically ignored portion of the city.

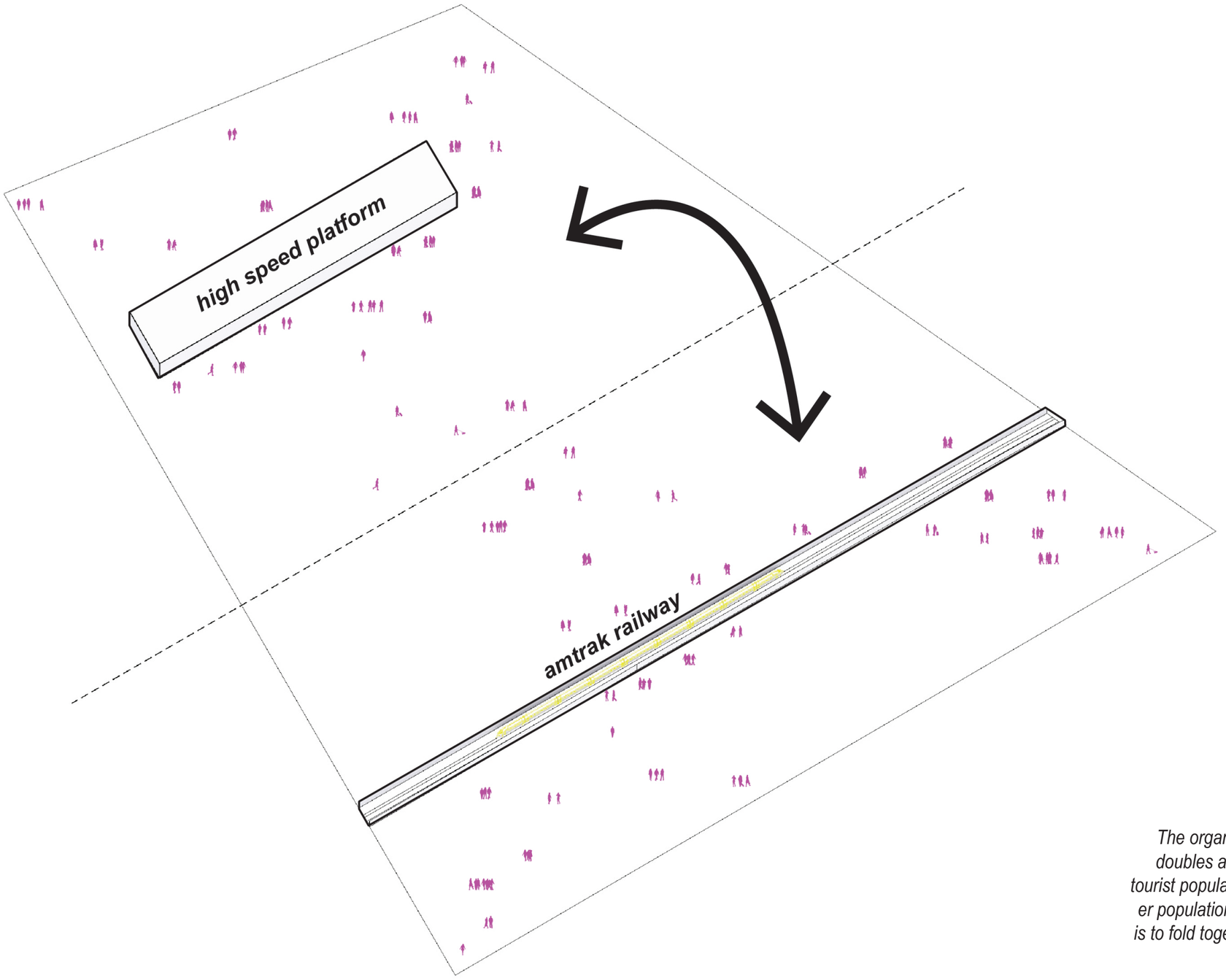
Las Vegas Train Station

Las Vegas is the largest metropolitan area in the United States without passenger rail service. The idea of connecting Las Vegas to Los Angeles appears not to interest any city departments, I could not locate mention of it in any publicly available information. The idea of making this connection proves to be highly interesting to two developers who each have a different strategy for linking the two cities. The X train is planned to start operations in 2021, running along the existing Amtrak line along which Las Vegas is developed. While the trip will take nearly 5 hours it is branded as a luxury party experience itself, rather than as a convenient mode of transportation. Brightline West is also planning to make this connection between cities but on a newly constructed train track that anticipates a trip of only 85 minutes. Brightline hopes to start construction in 2020 and likely unrealistically be in operation by 2023. The project appears to have gained significant political traction and has been awarded state bonds from both California and Nevada totaling over $1 Billion.

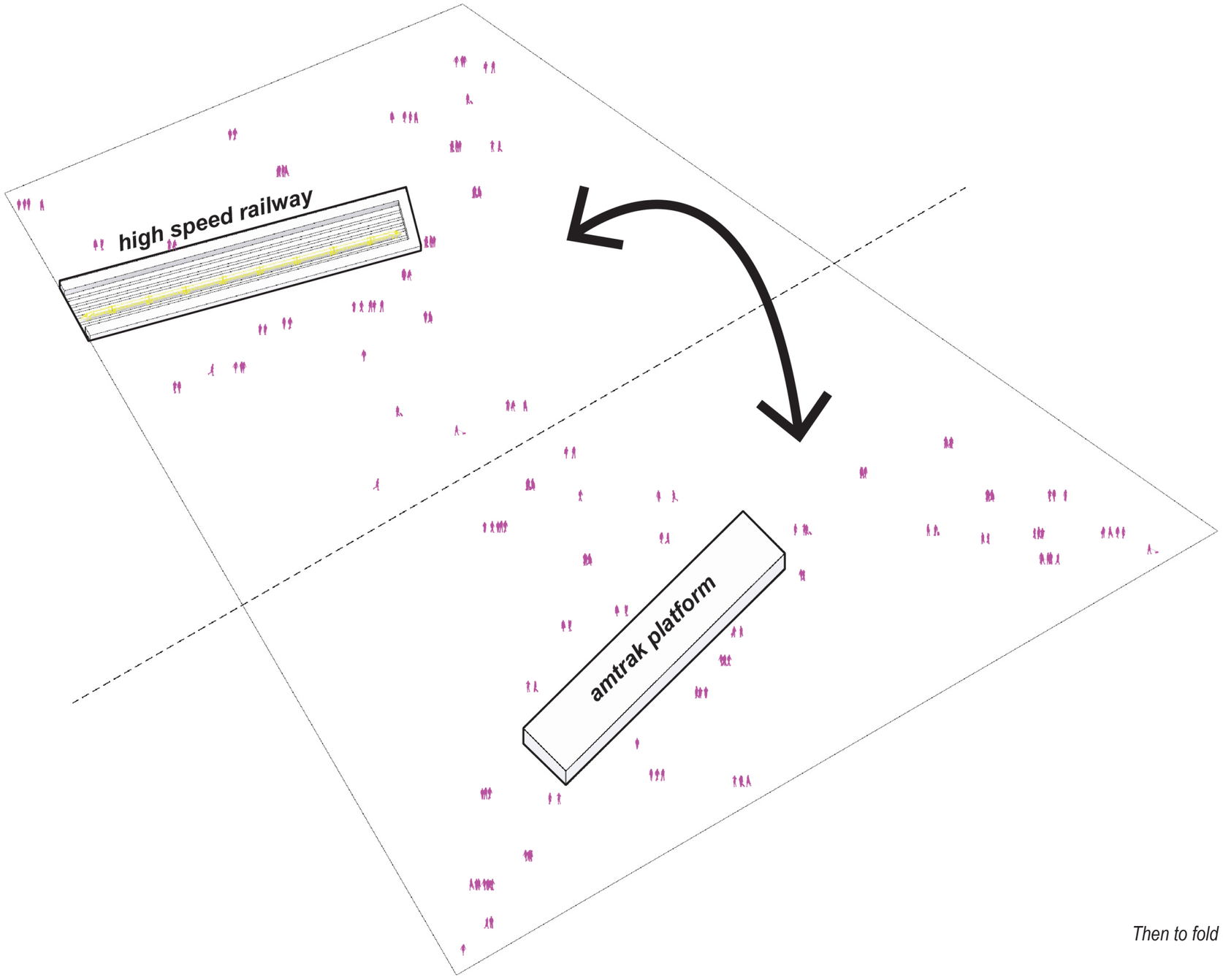
This thesis proposes a train station which exists in the space between the two train lines. The currently existing Amtrak line and the planned high speed line running along 1-15 cross each other twice when moving through the city. These two cross form an enclosed area, currently with mostly industrial programs. My proposed train station would act as a uniting force for the multiple interests working toward similar goals. The train station would exist at the overlap between two privately developed trains and two cities. The station is located at the culmination of transportation activity where Elon Musk's people mover runs adjacent in addition to an existing casino monorail.

Program

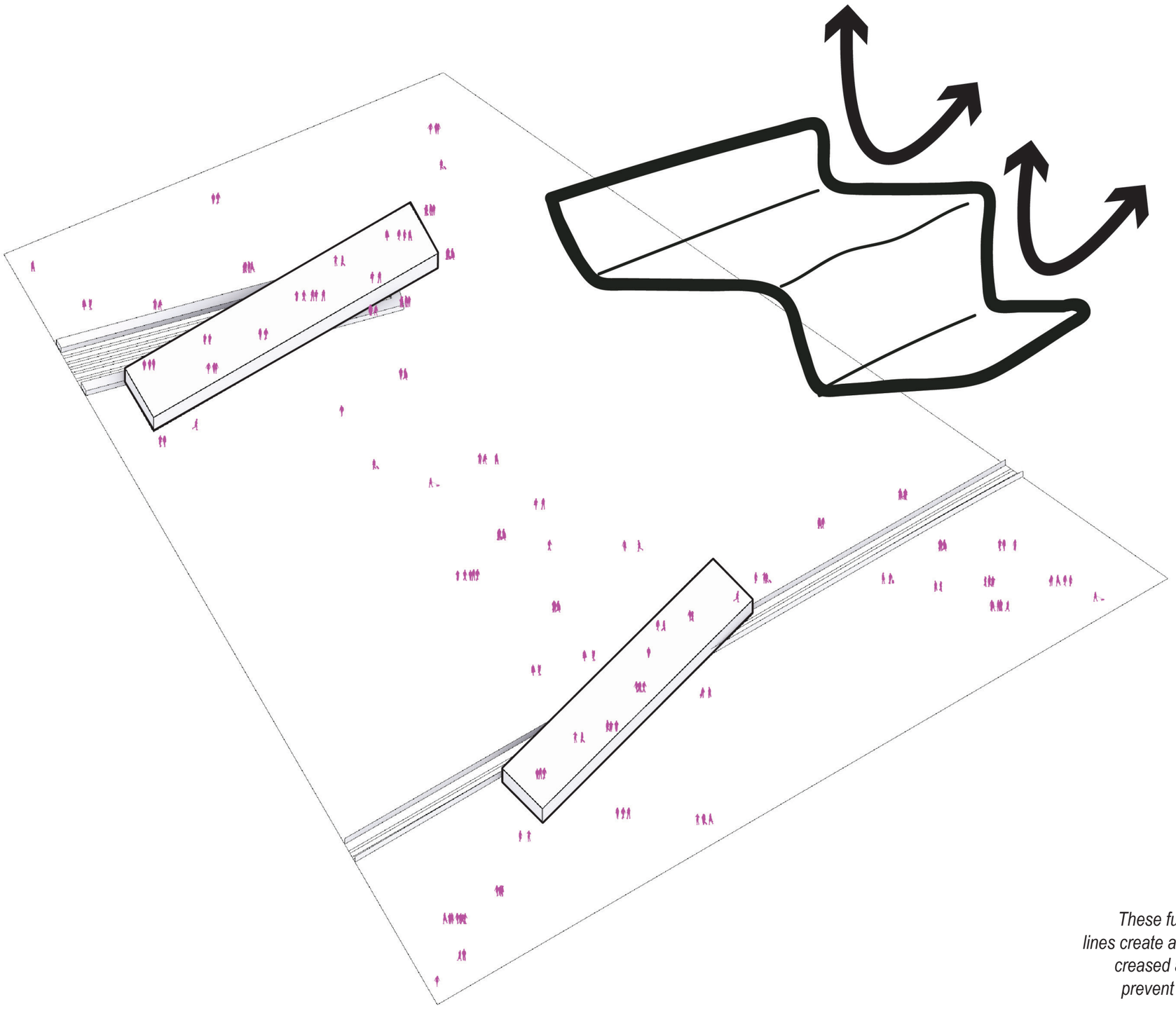
folding together tourists and service workers



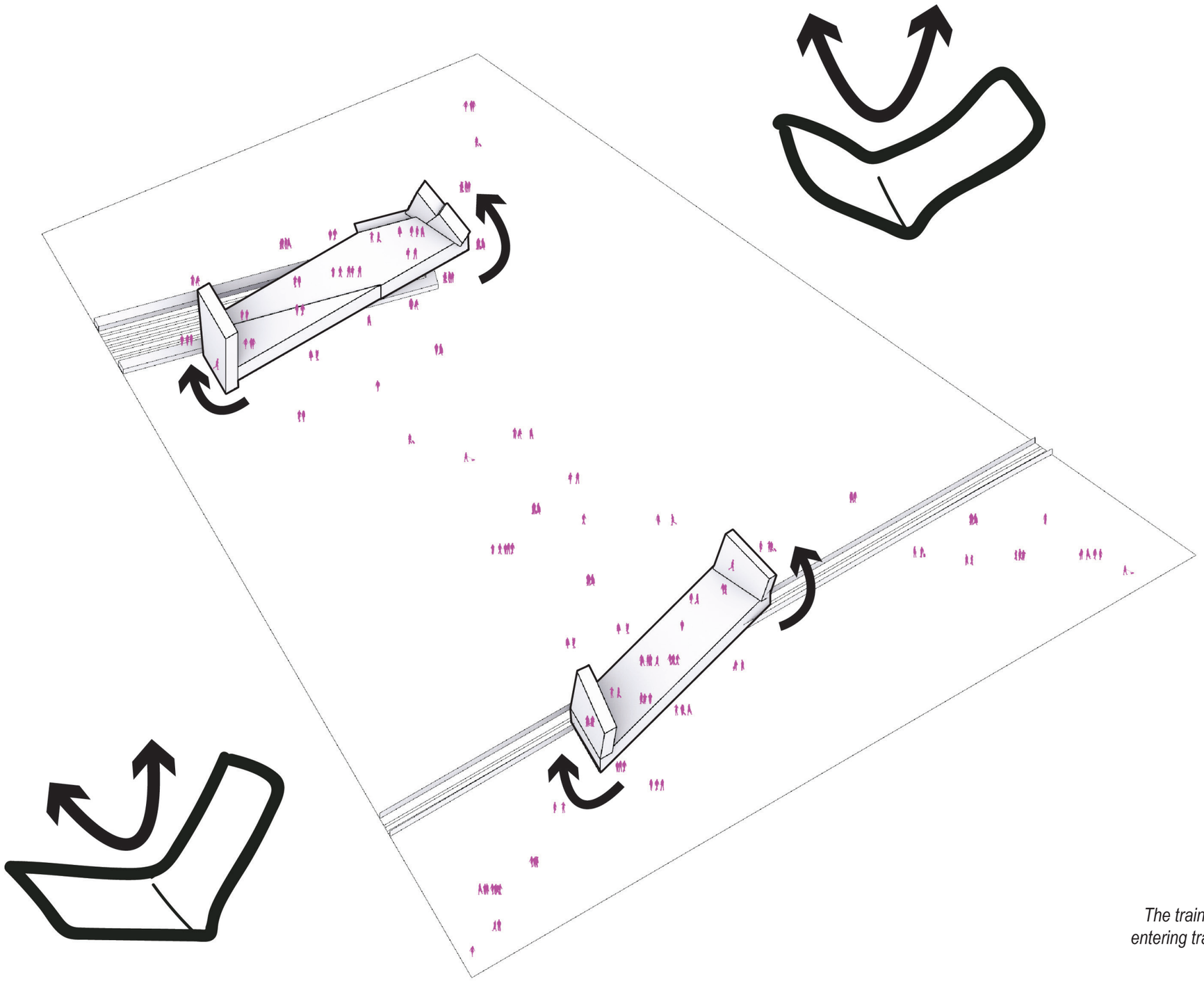
The organization of the site uses folding to pair doubles across the site and to fold together the tourist population with the residential service worker population. The first goal of a series of doubles is to fold together the new high speed rail platform with the existing Amtrak railway.



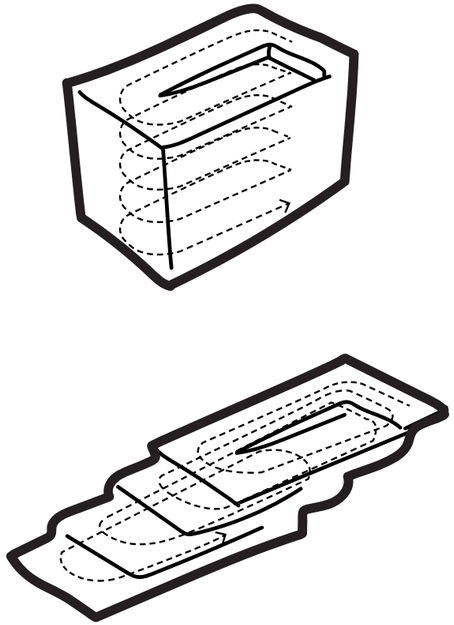
Then to fold together a new Amtrak platform with a new high speed railway.

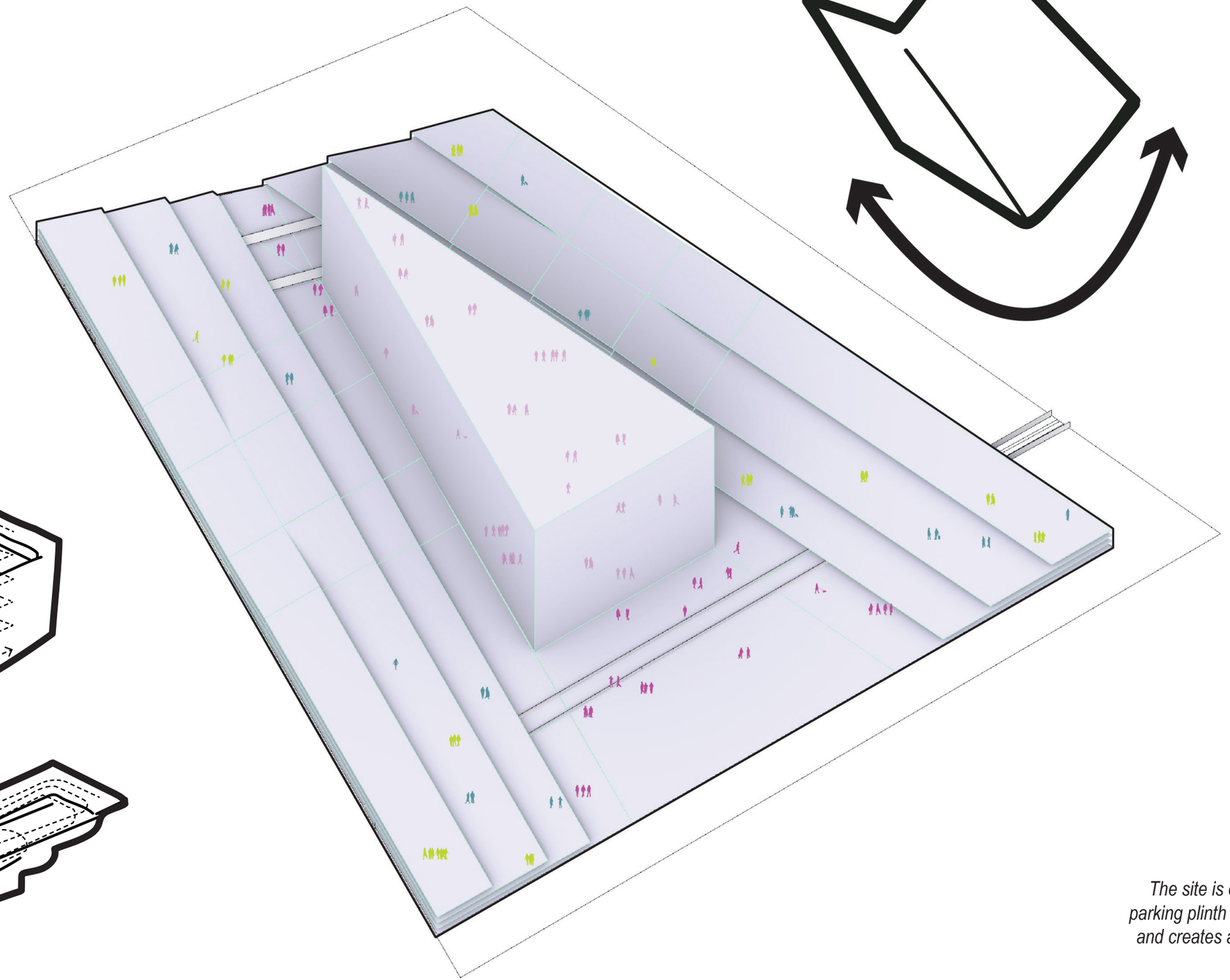


These functional requirements of the two train lines create a site condition which has been doubly creased and without building on top of it would prevent pedestrian circulation across the site.

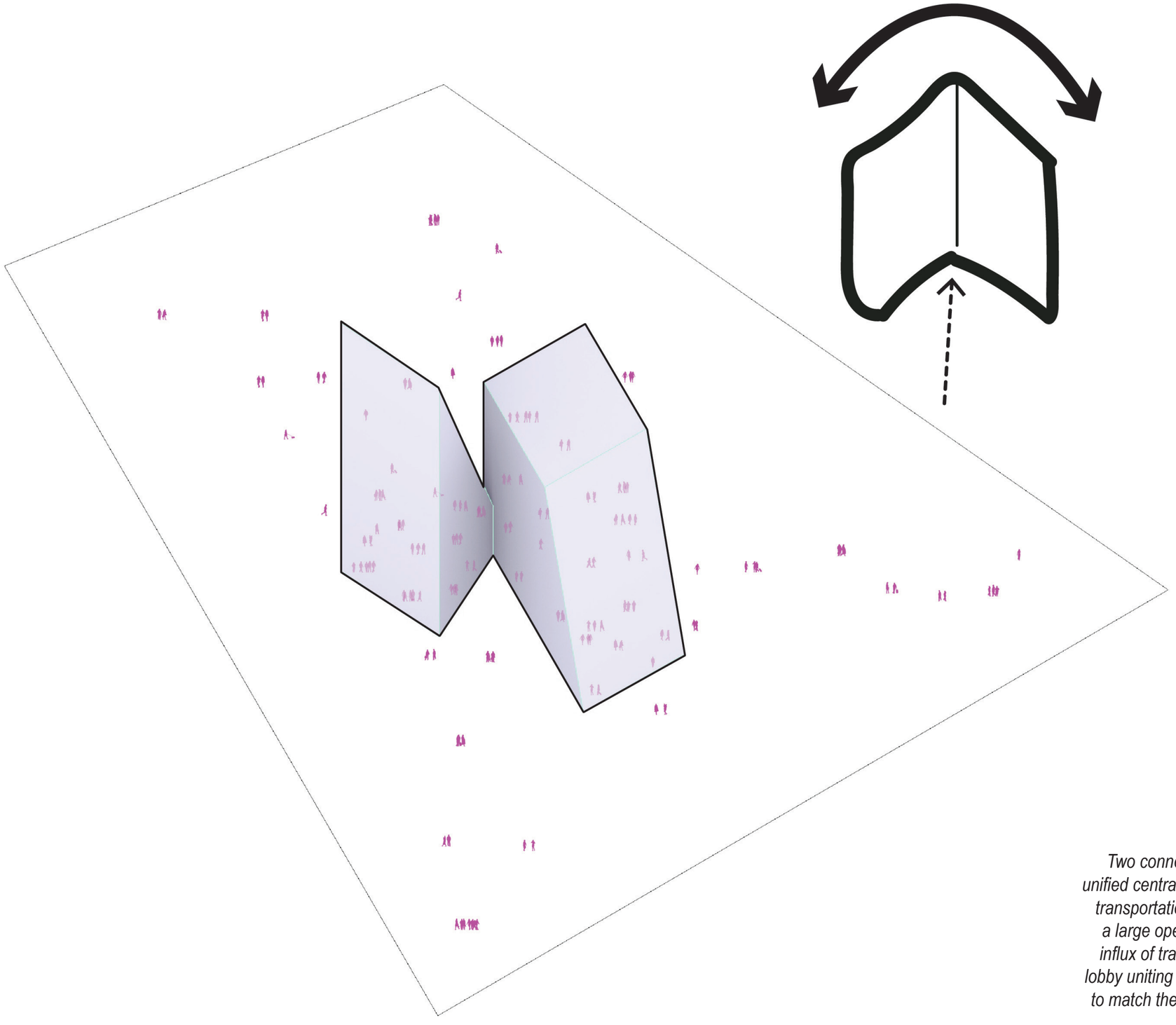


The train station platforms fold to surround the entering trains and to separate pedestrians from train traffic.

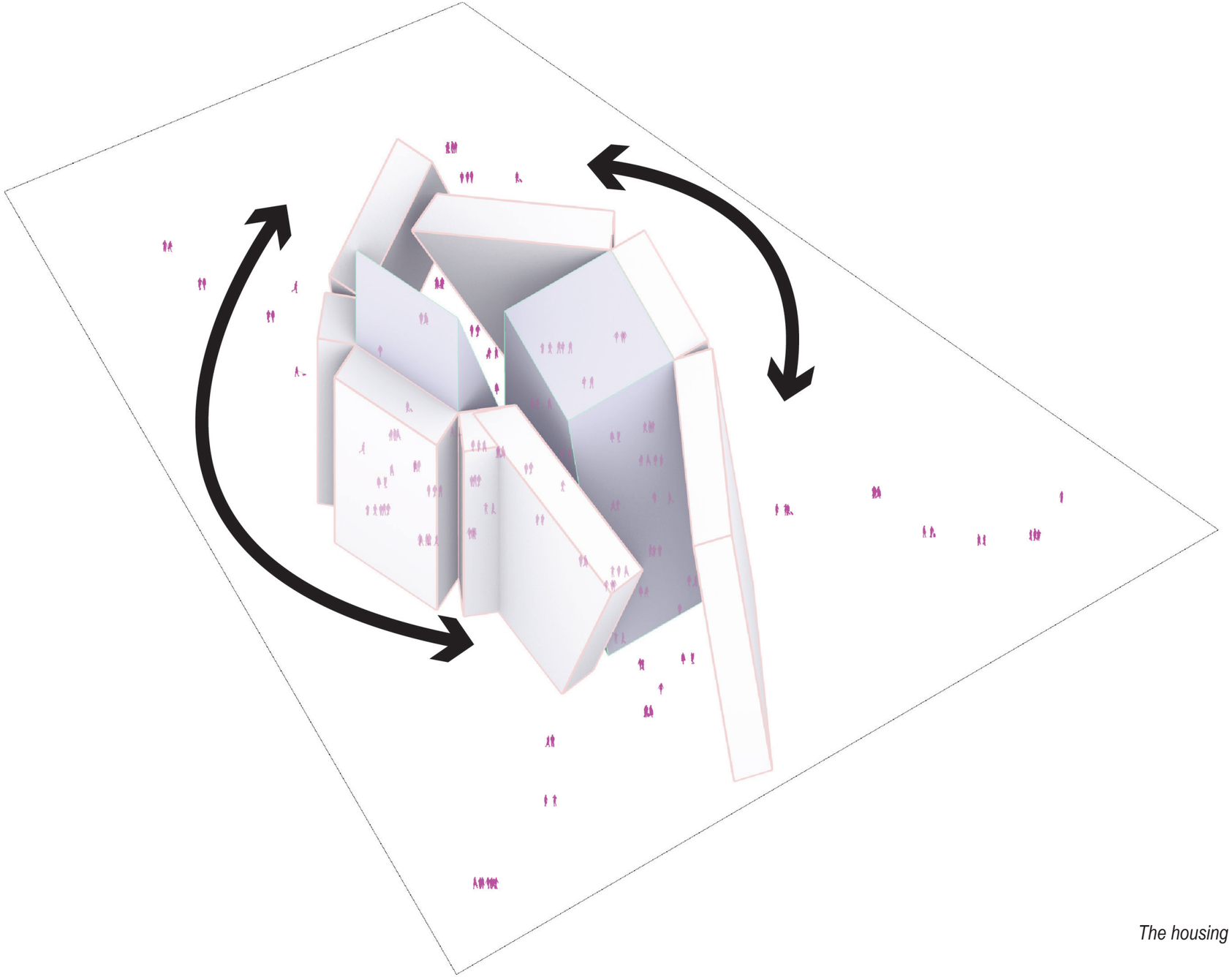




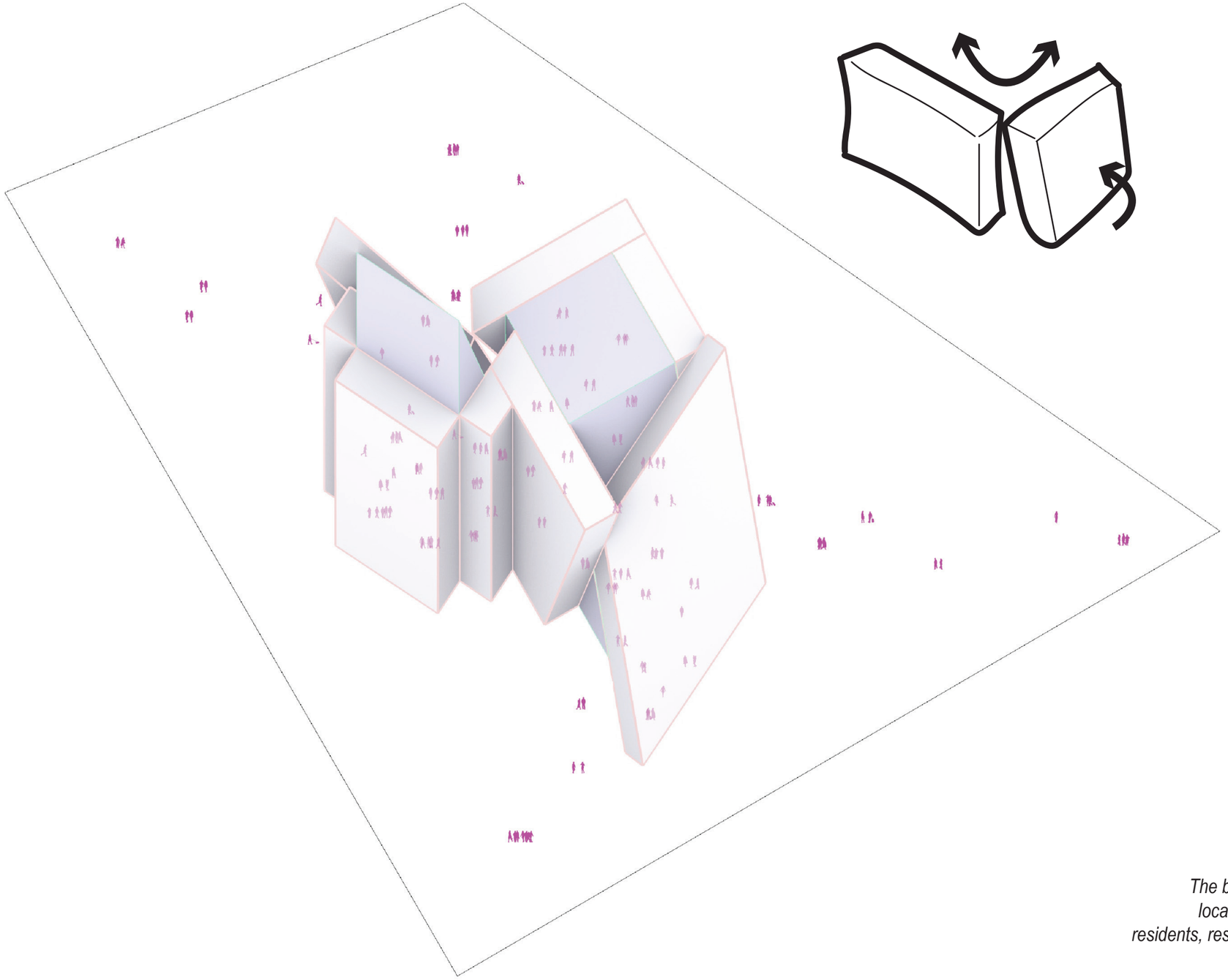
The site is creased in the opposite direction by a parking plinth which draws cars up and into the site and creates a ravine down the center of the site to direct pedestrian circulation.



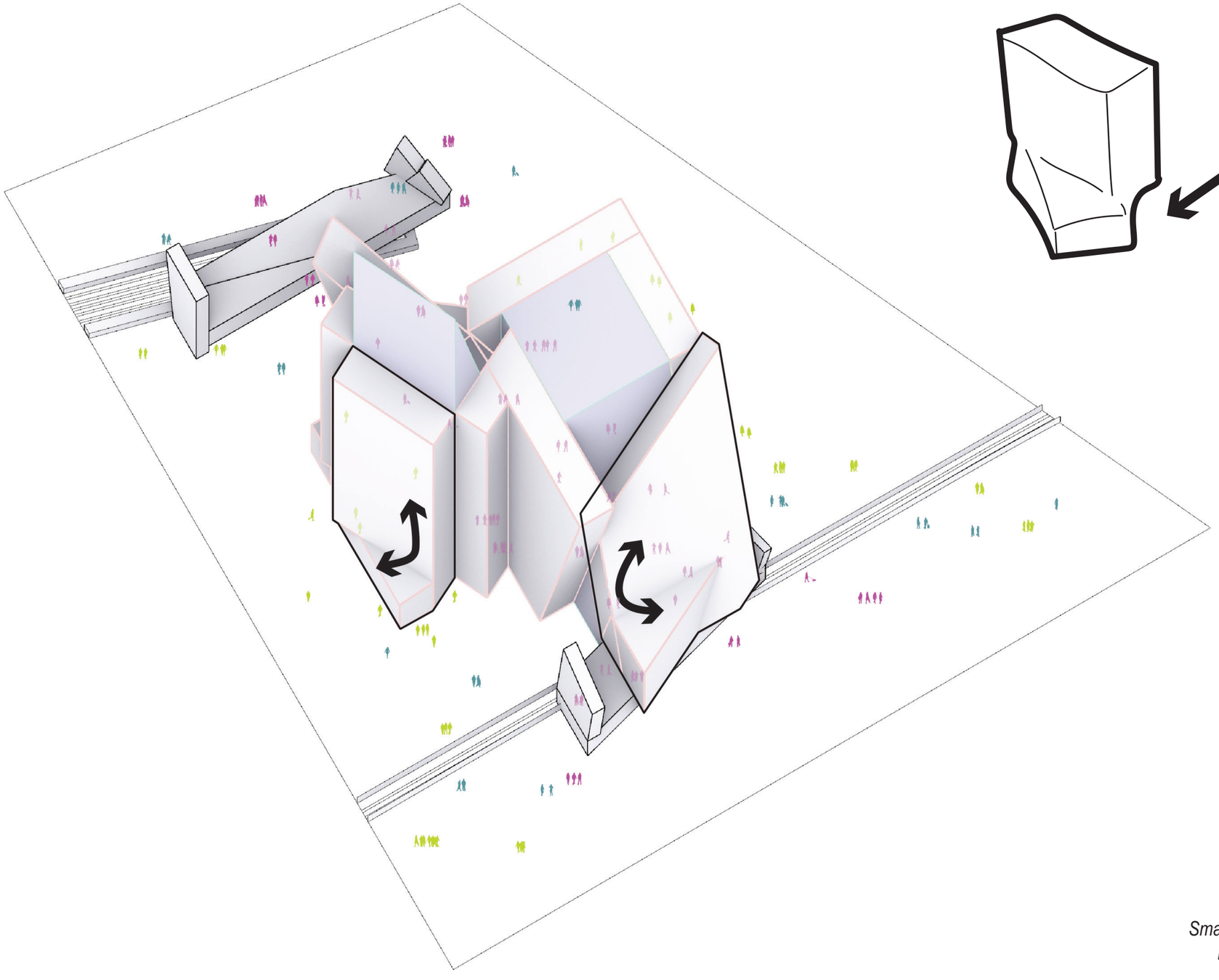
Two connected masses work together to form a unified central concourse which unites all modes of transportation and people. The concourse is both a large open space capable of accepting a large influx of travelers when a train arrives and also a lobby uniting residents with a shared atrium scaled to match the spectacle of a John Portman interior.



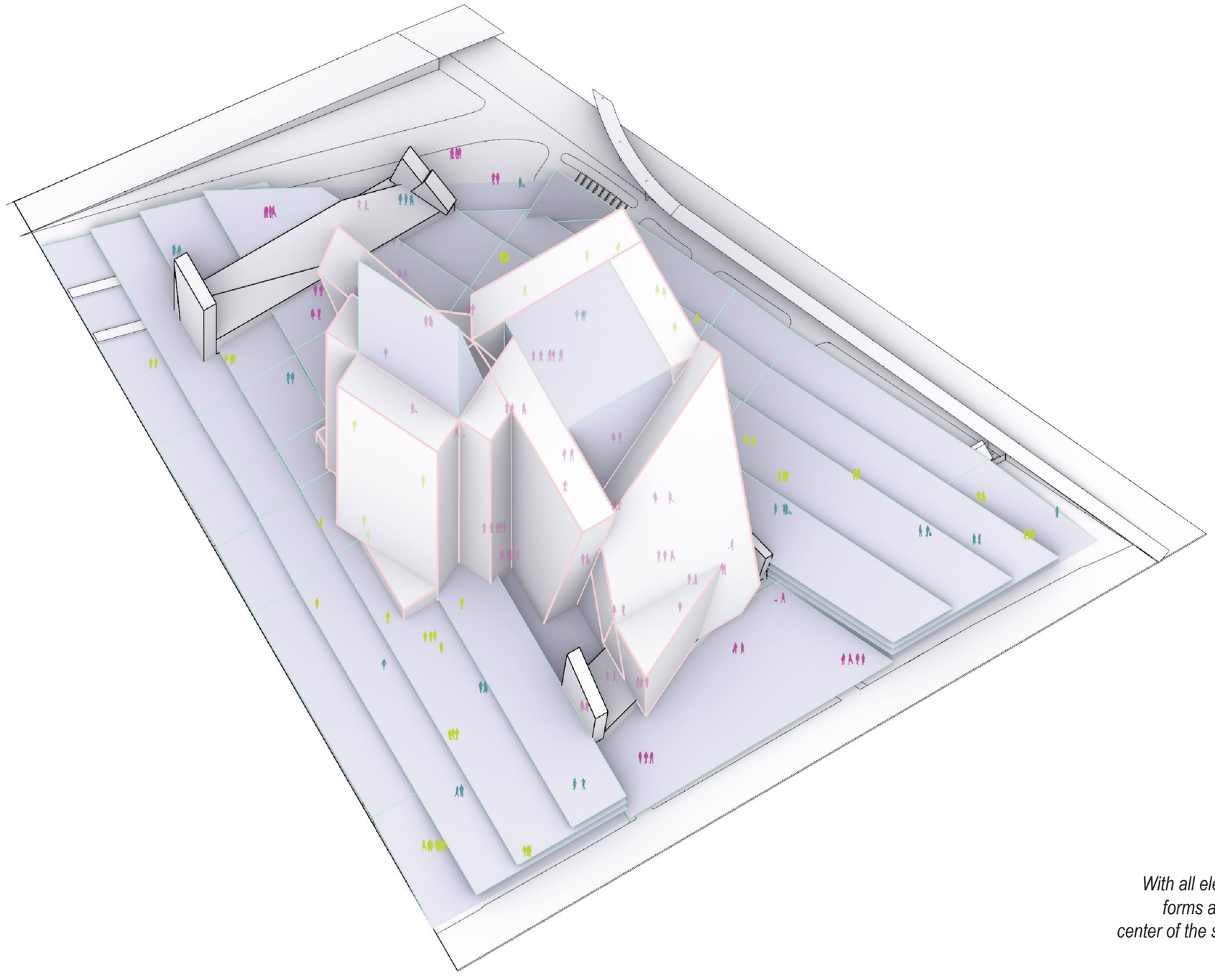
The housing towers act as a brittle surface folding around the atrium concourse.



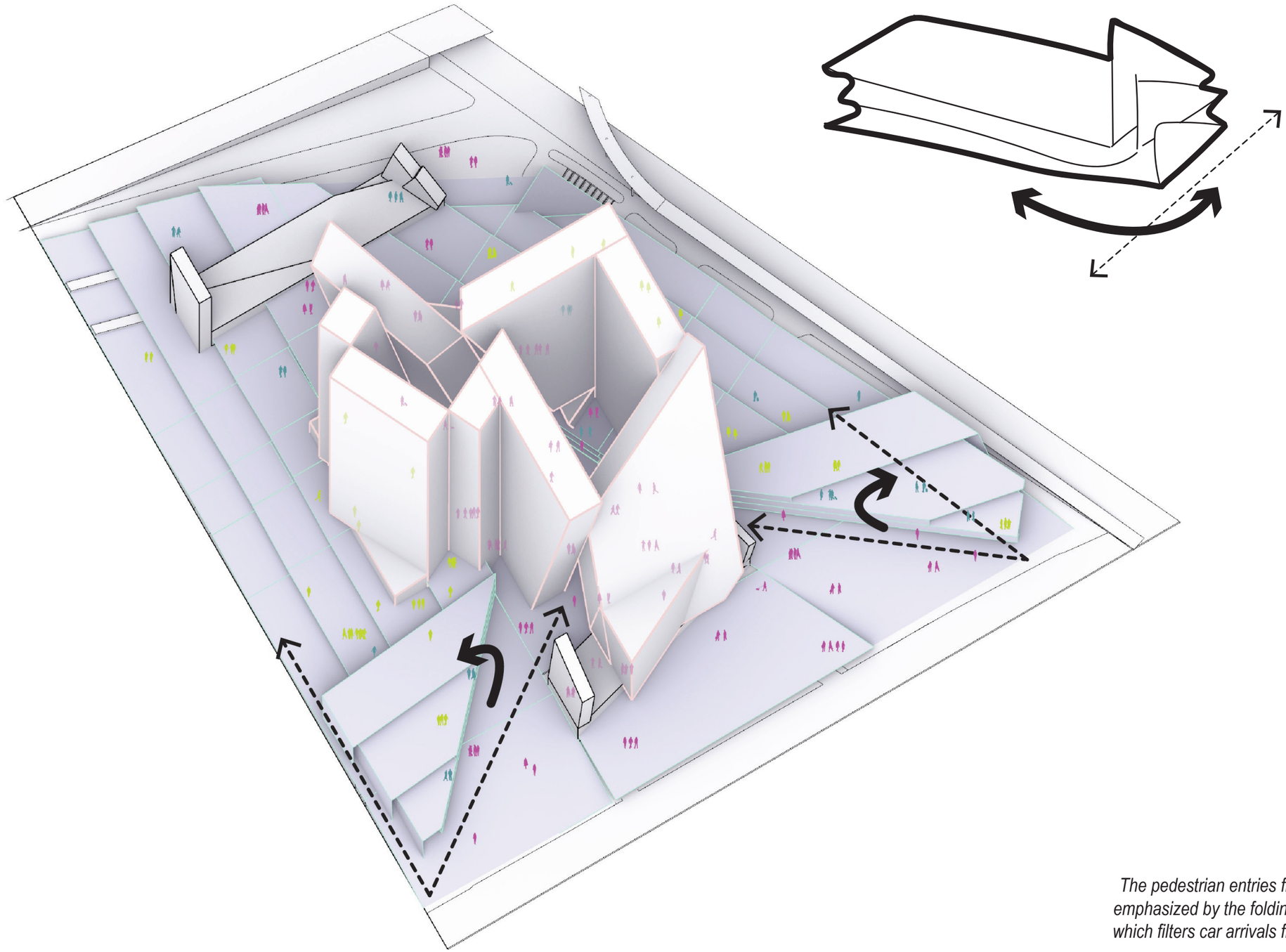
The breaks and bends of the towers set up localized instances of residents looking at residents, residents looking at tourists, and tourists looking at residents.



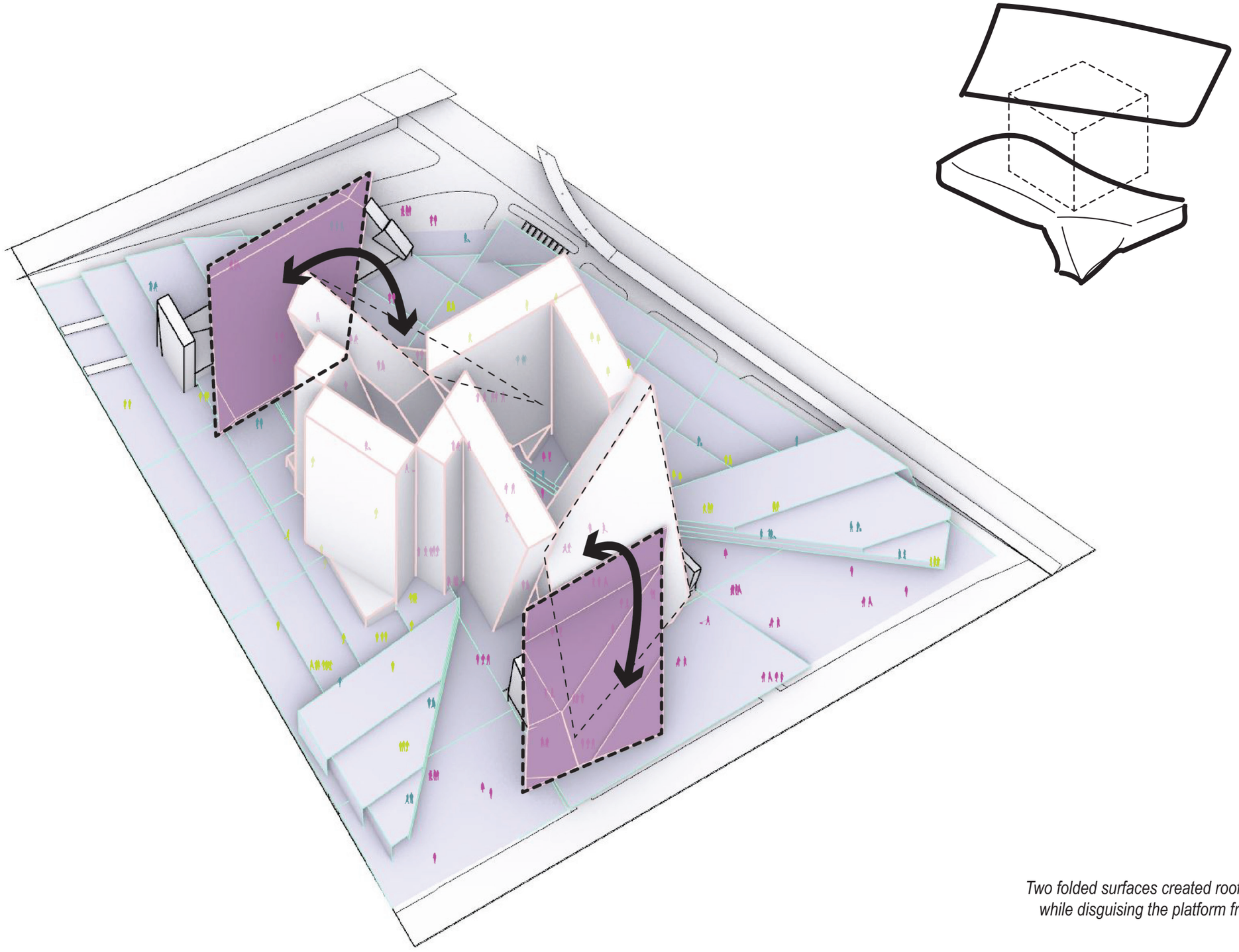
Smaller folds at the ground level separate residential entries from tourist entries.



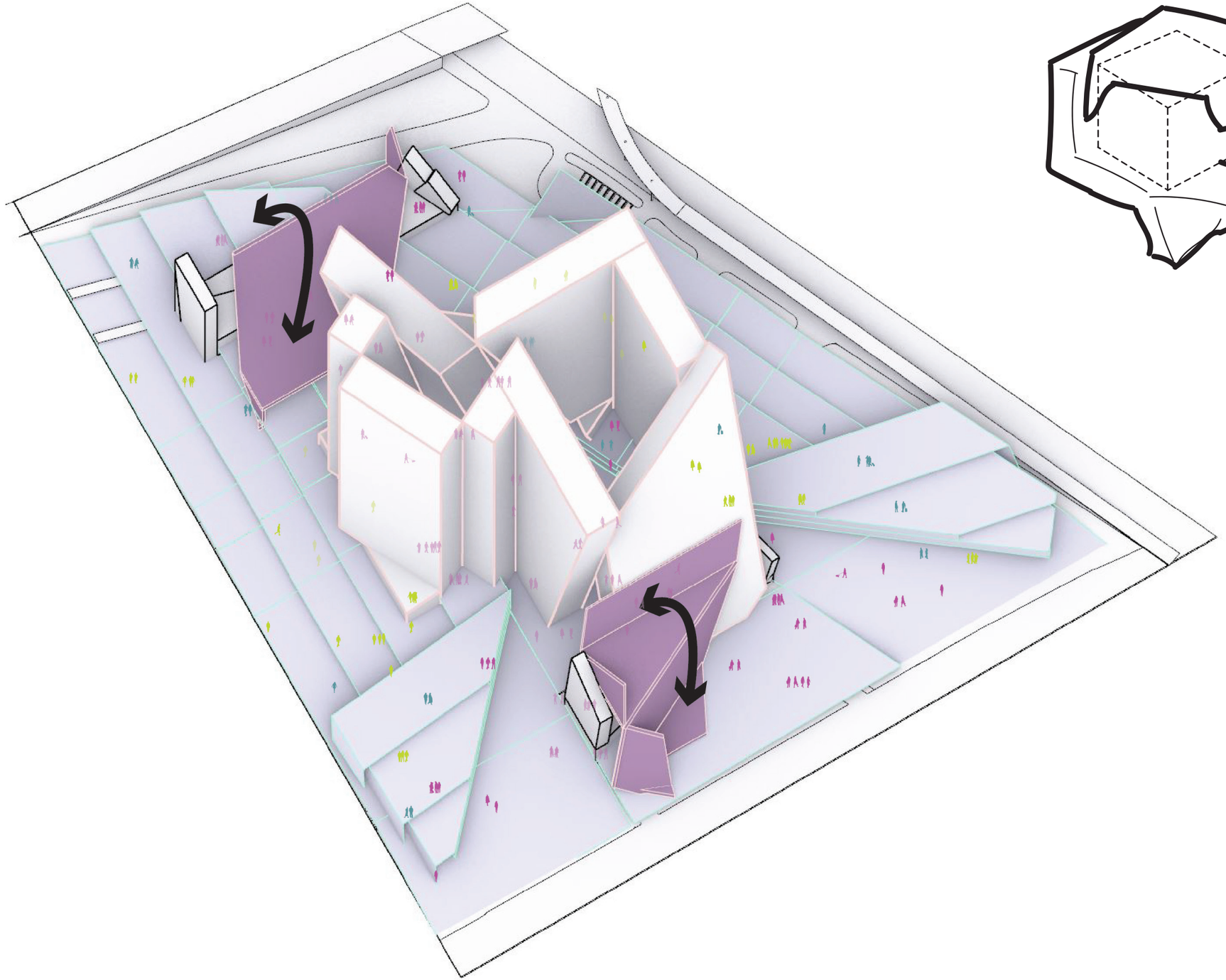
With all elements together on the site the folded forms aim to create a strong draw toward the center of the site for people arriving by all means of transportation.

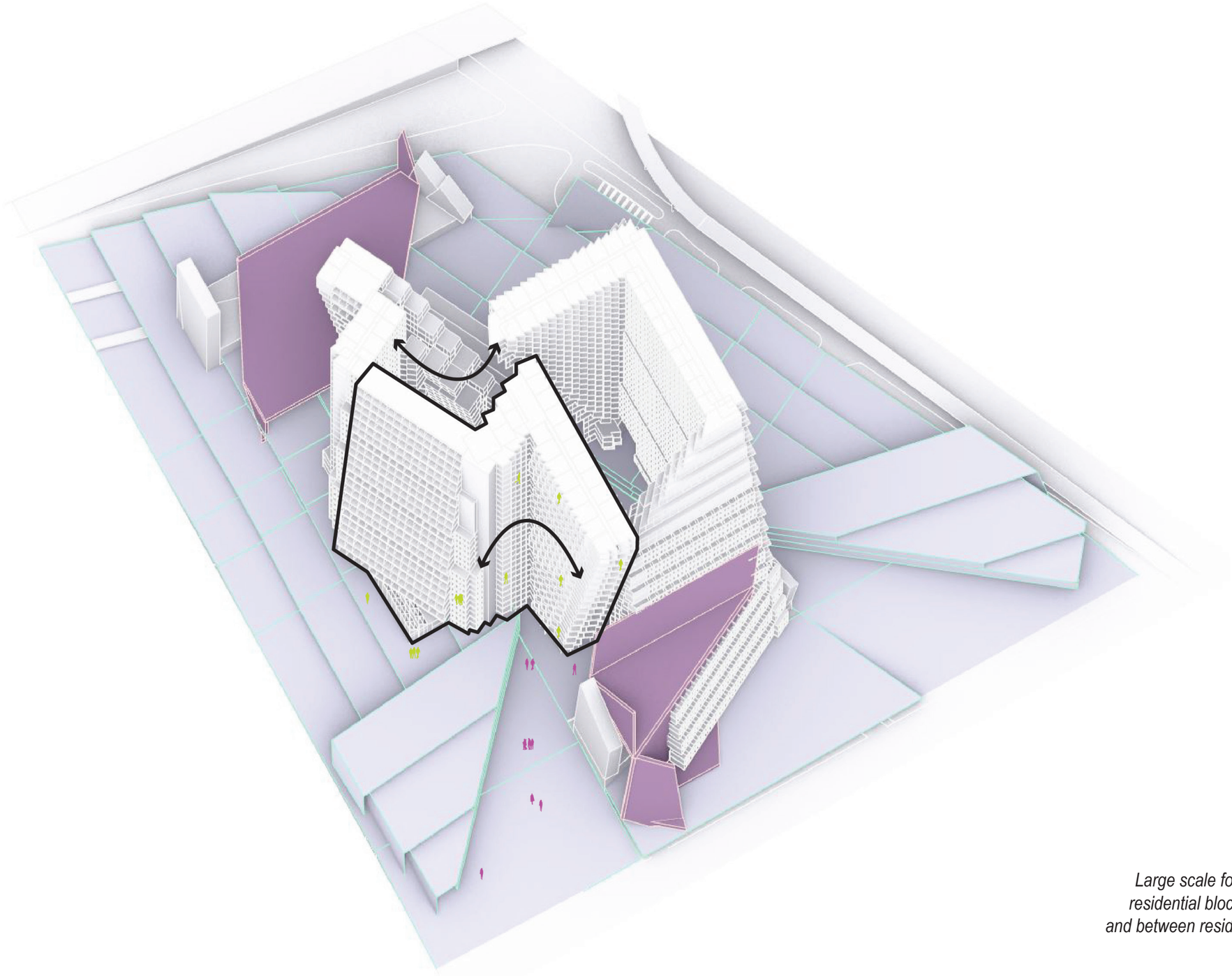


The pedestrian entries from the strip are further emphasized by the folding of the parking garage which filters car arrivals from pedestrian arrivals.

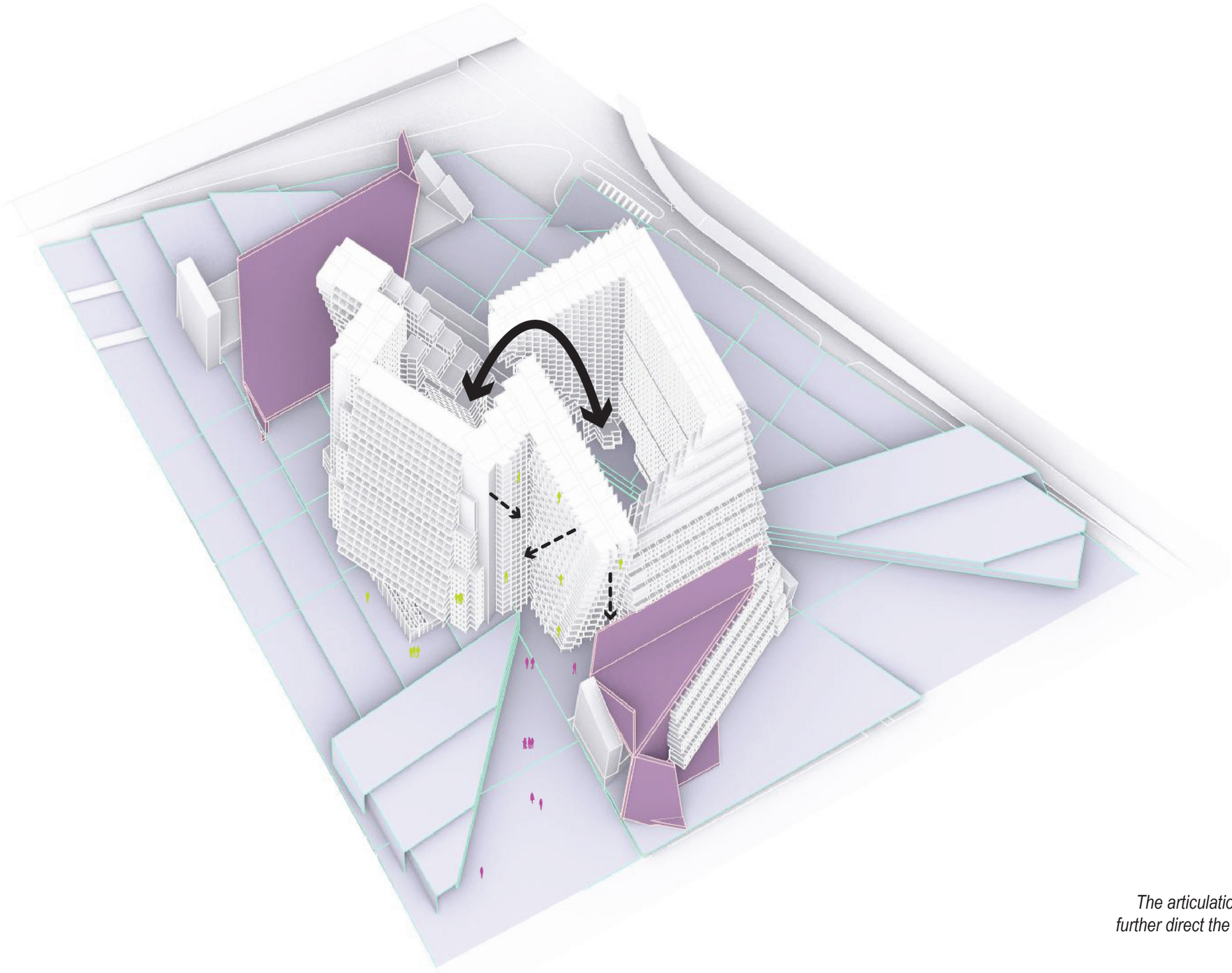


Two folded surfaces created roofs for the platforms while disguising the platform from the view of the resident.

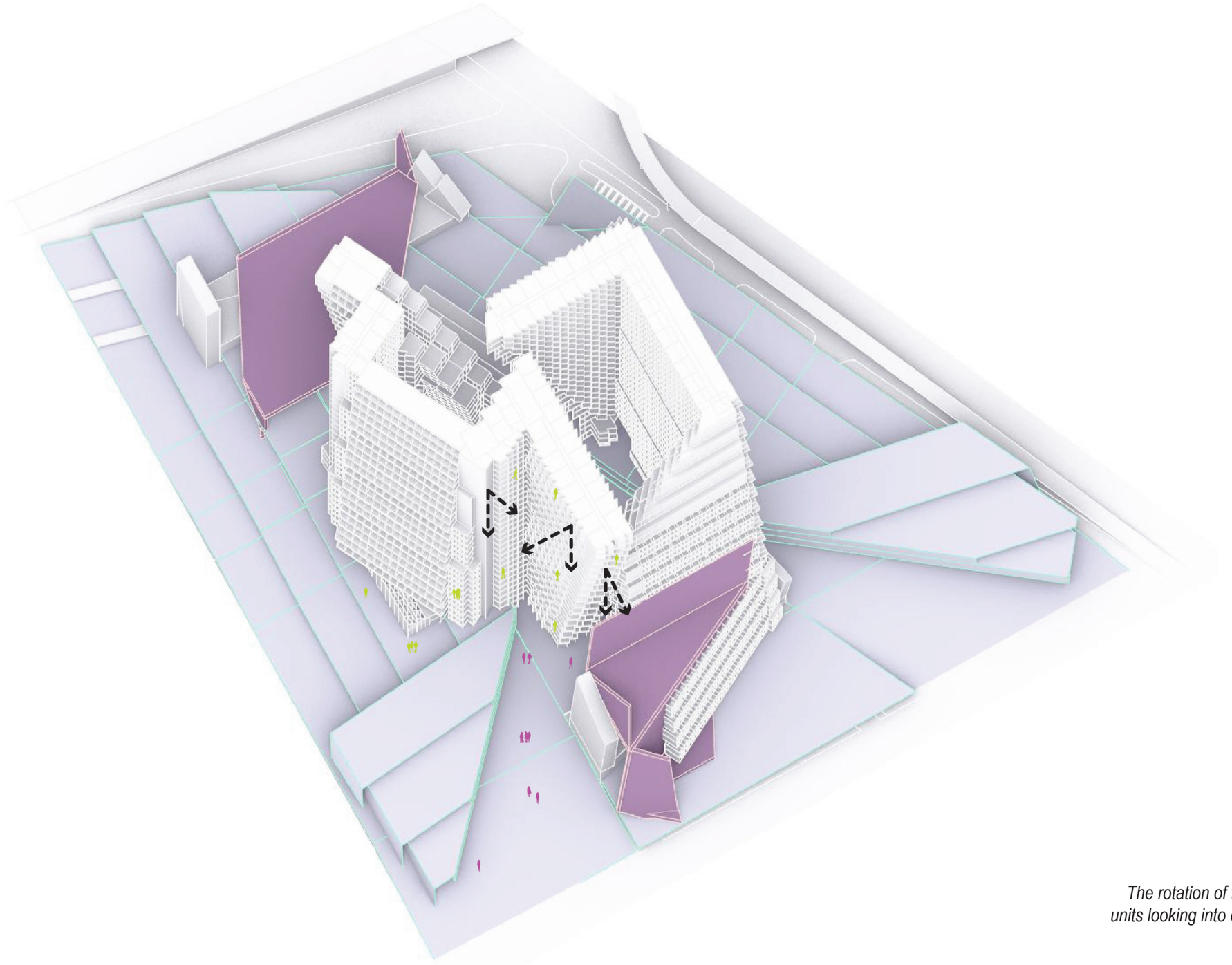




Large scale folds set up relationships between residential blocks which look toward each other and between residential blocks which look down at tourists.

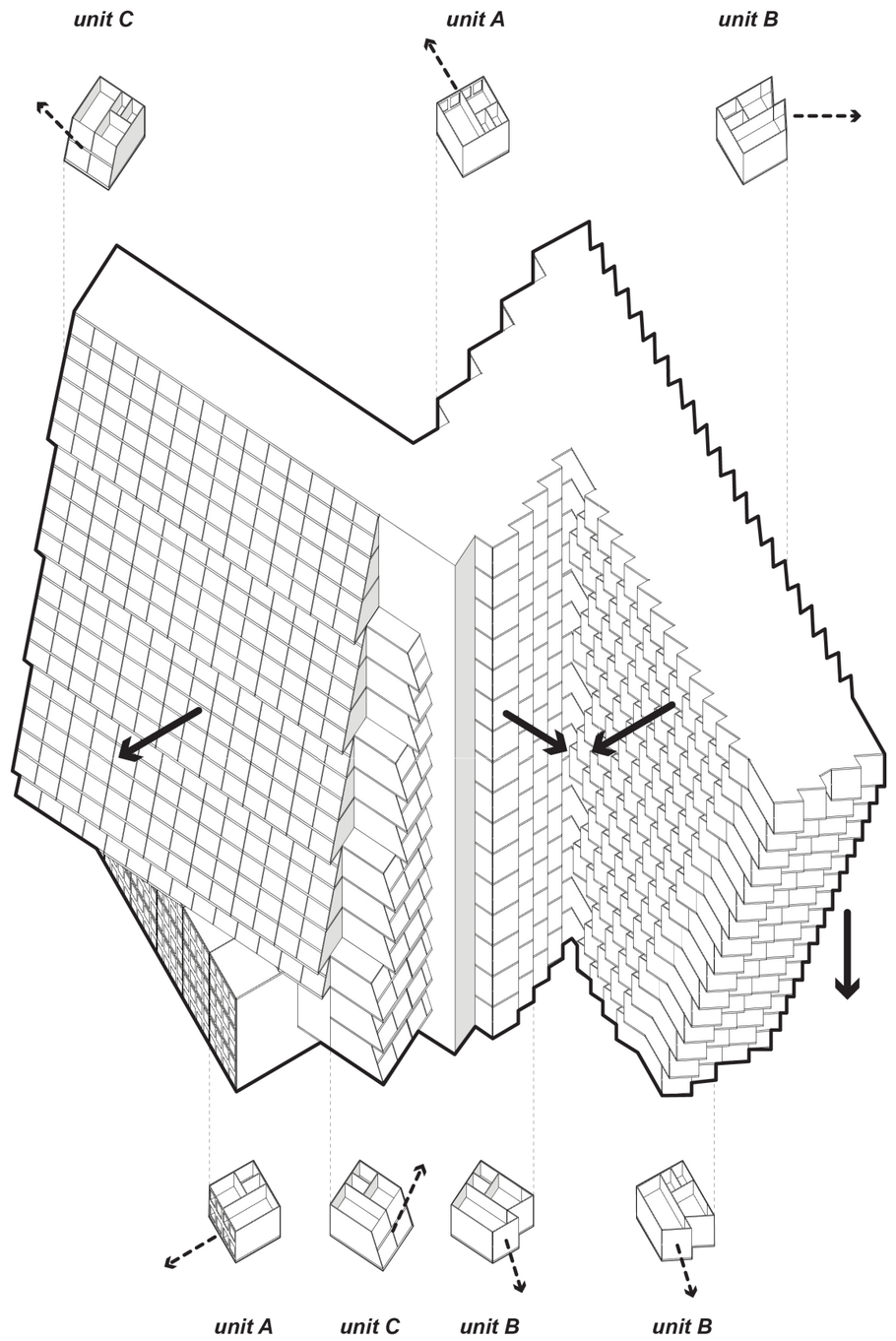


The articulation of the individual units works to further direct the view of the resident, in this case toward the strip.

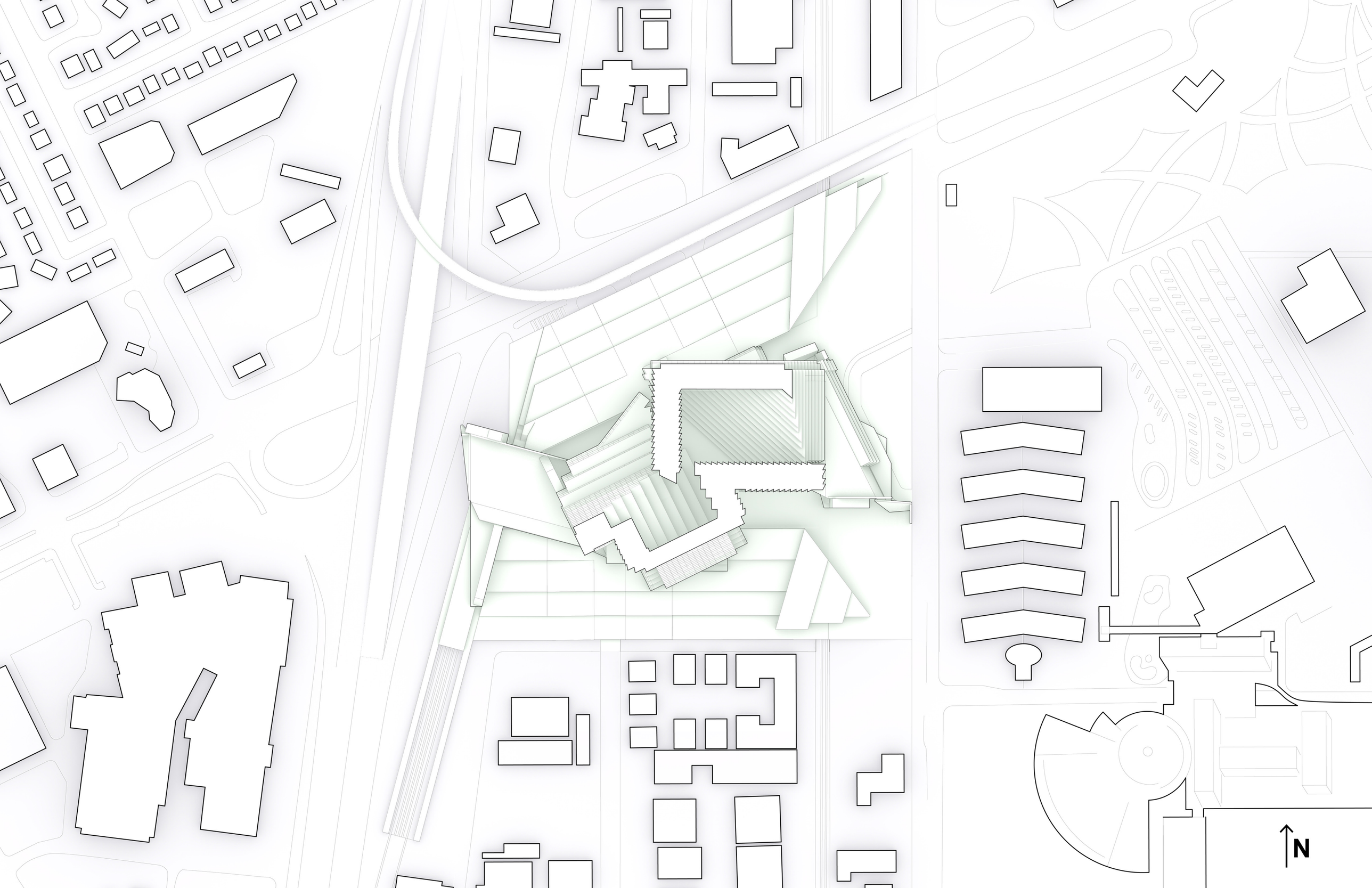


The rotation of the unit adjusts the view of two units looking into each other such that both units instead look toward the strip.

Unit Diagram



The fold at the scale of the unit is understood as a folding of two views. The large scale fold might direct the view of the unit toward an undesirable location, while the fold of the individual unit would subtly correct that view. This folding of massing together with folding of a unit plays out with three unit types, all one bedroom apartments. Type A looks straight out, type B looks to the side, and type C looks up. Each large surface is assigned a basic unit type with variations and overlaps at corners creating unique plans with studio, 2-bedroom, and 3-bedroom apartments.

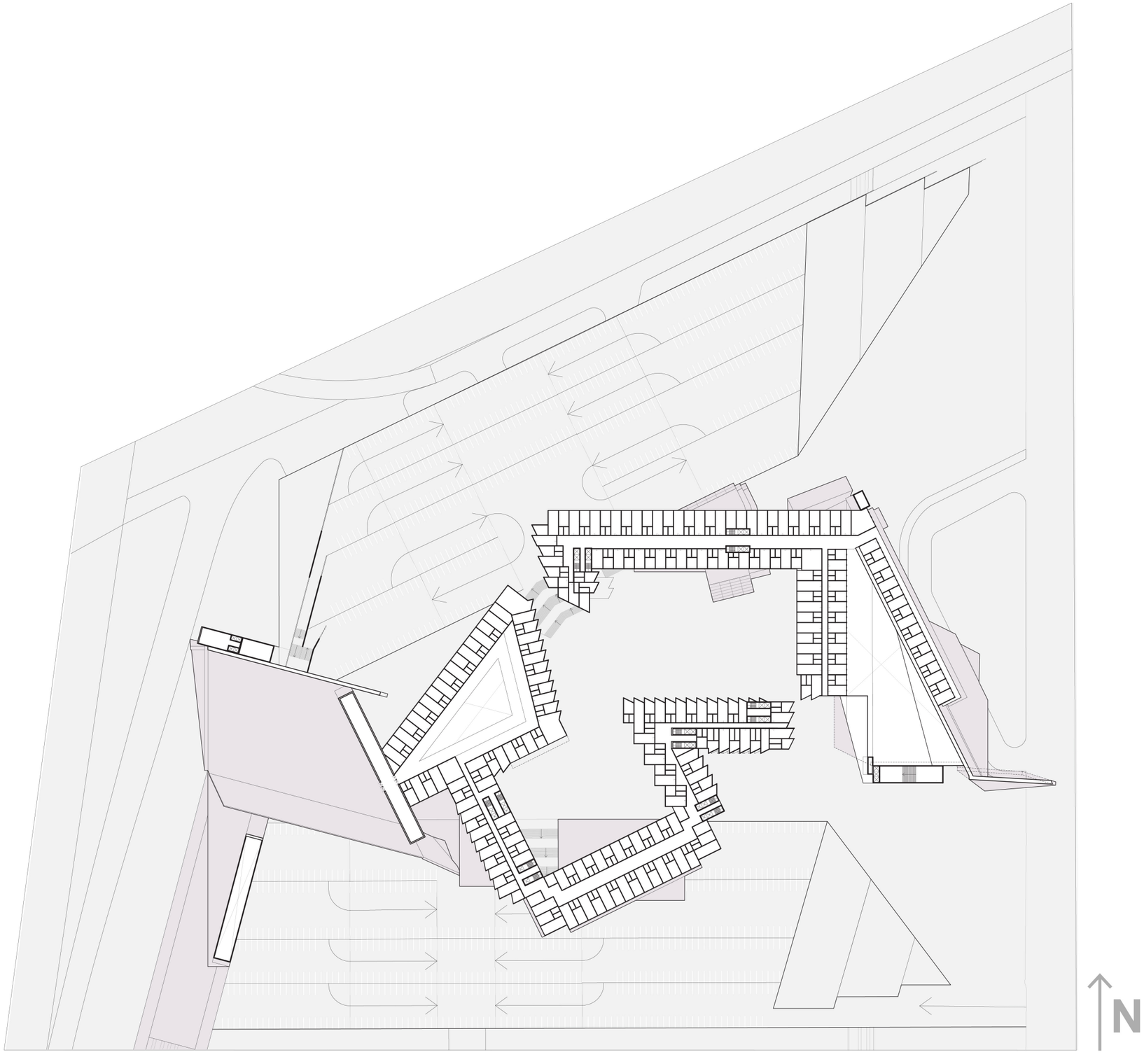

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Basement Plan

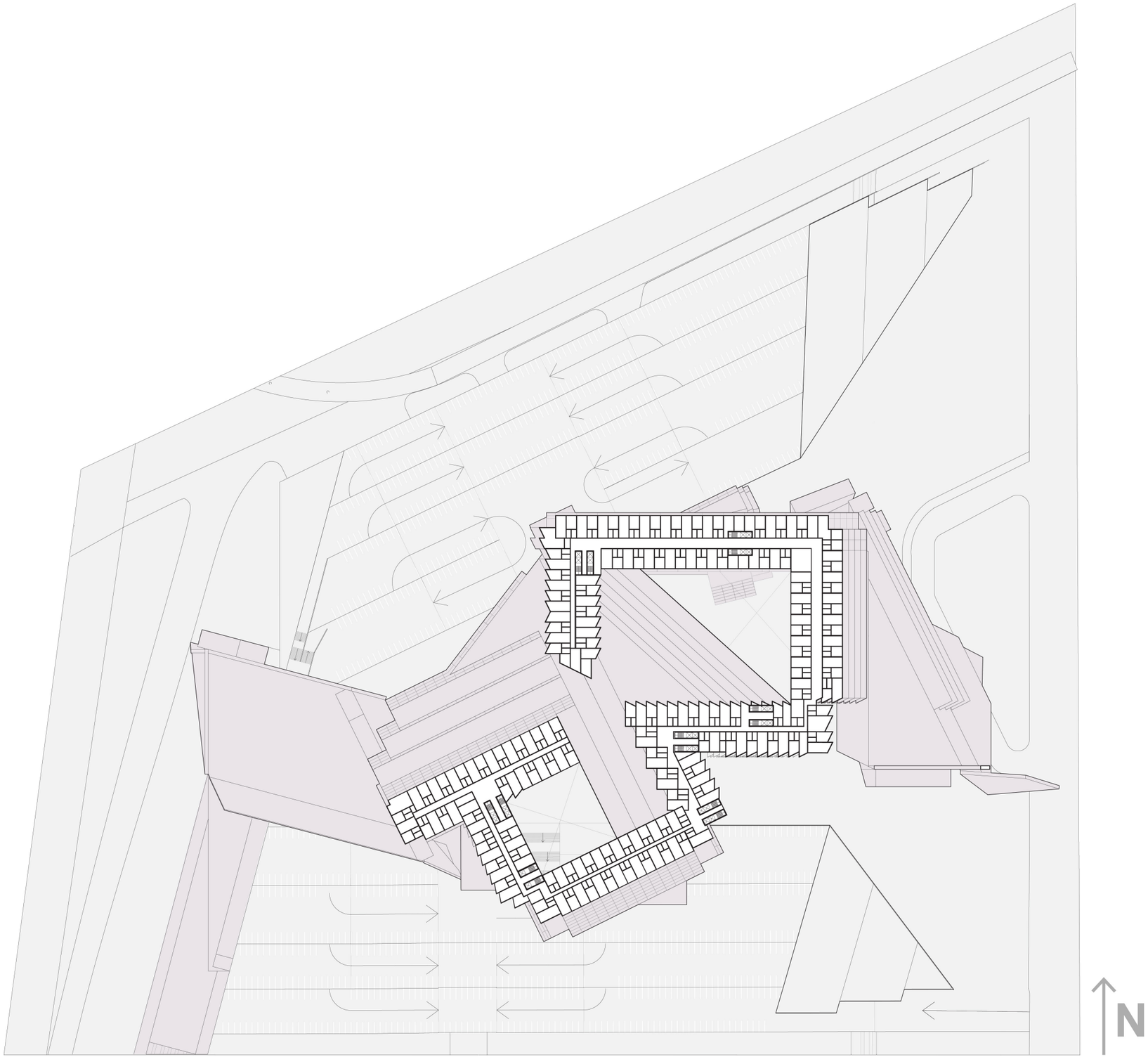


Ground Floor Plan

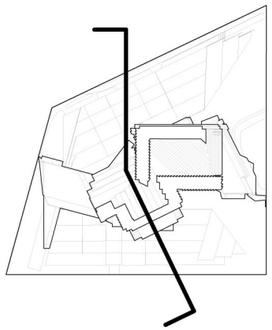


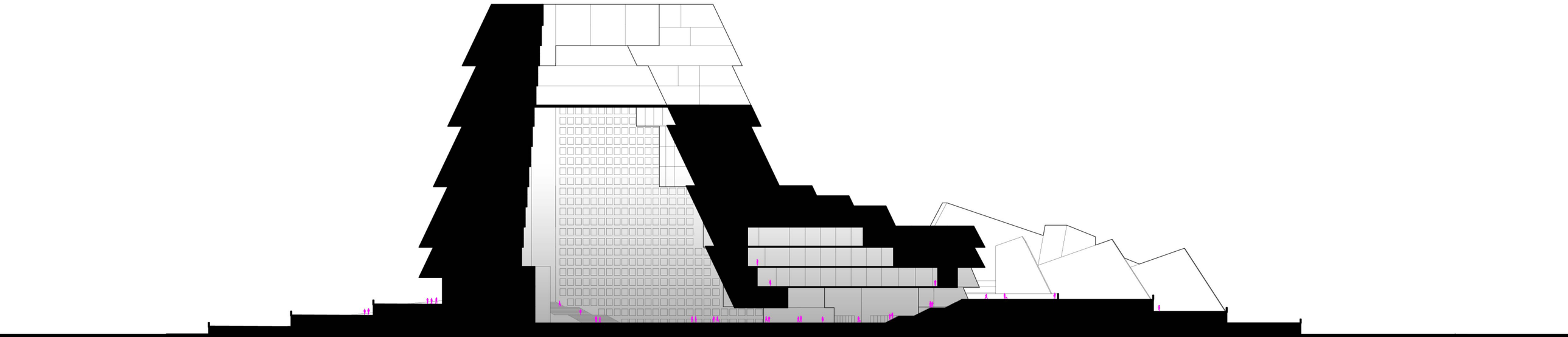
6th Floor Plan

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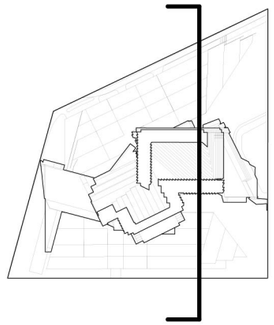


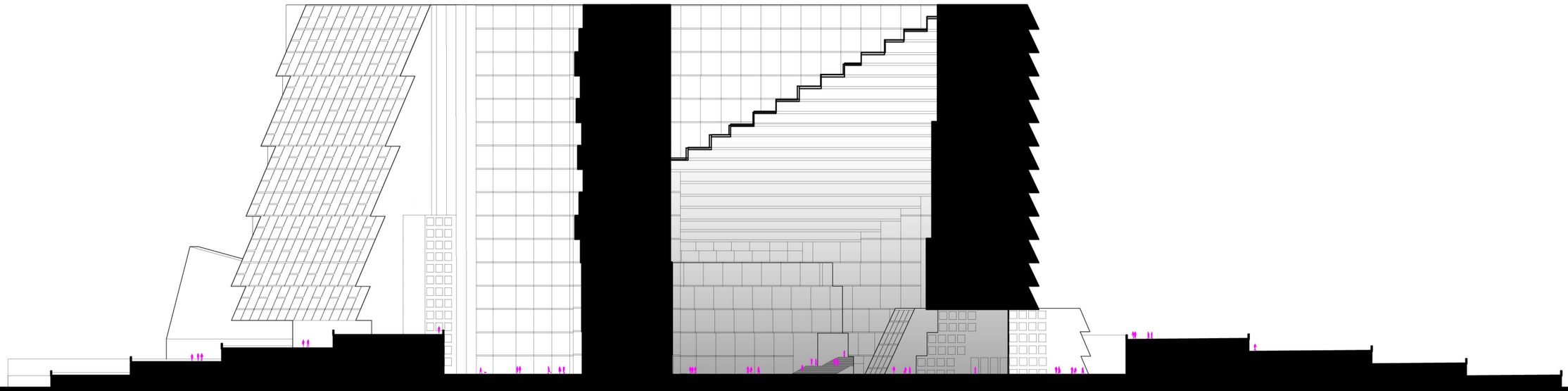
18th Floor Plan



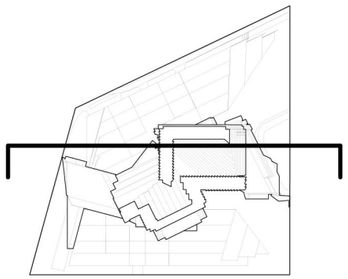


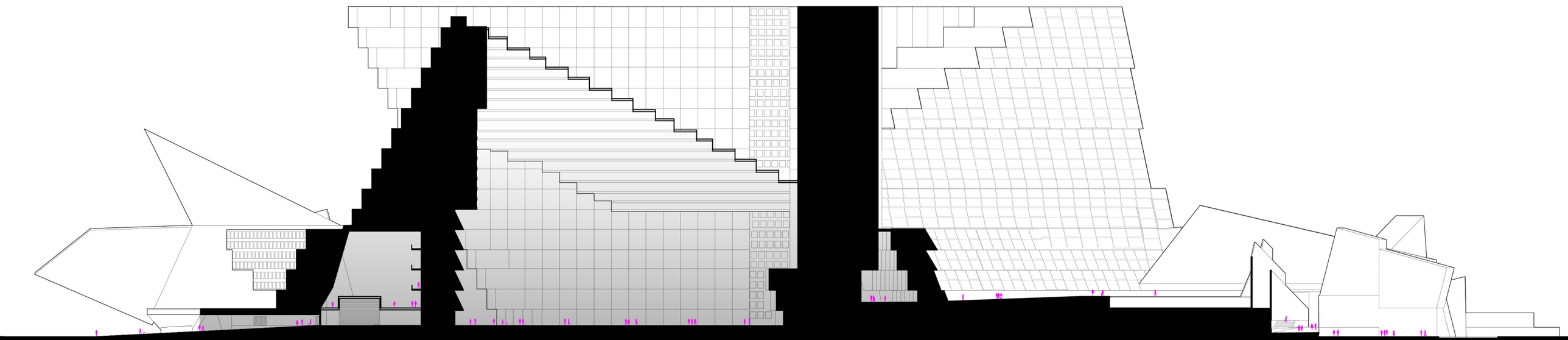
This section shows the two types of entries created by the relationship of the towers to the parking garage. On the left a resident leaves their car and enters into the mass of the building moving toward their apartment. On the right a commuter parks their car in the parking garage and heads toward the main concourse, then on to the high speed rail headed for Los Angeles.



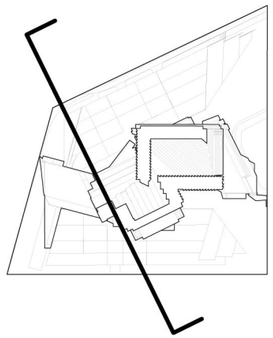


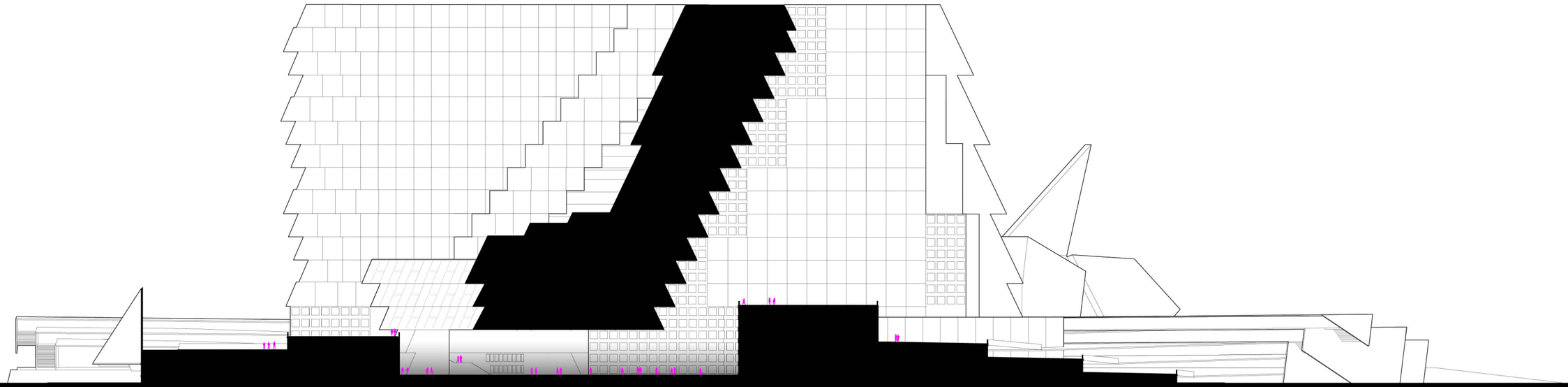
Pedestrian residential access is framed between the parking garage and tower on the left and the folded plinth on the right which separates residential tower access from tourist concourse access.



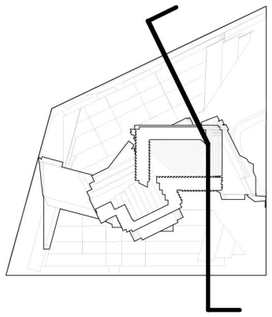


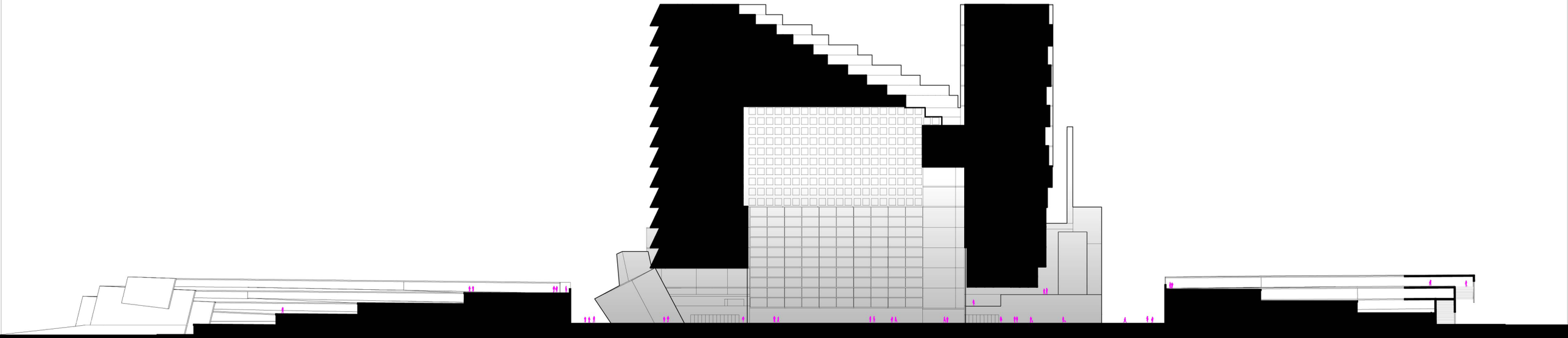
At street level cars on the left can drop off tourists directly to the Amtrak platform, cars on the right can drop off tourists directly to the high speed rail platform. At the center, housing frames an entry to the concourse from the parking garage.



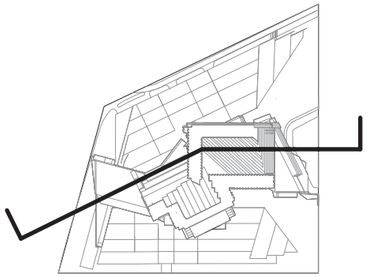


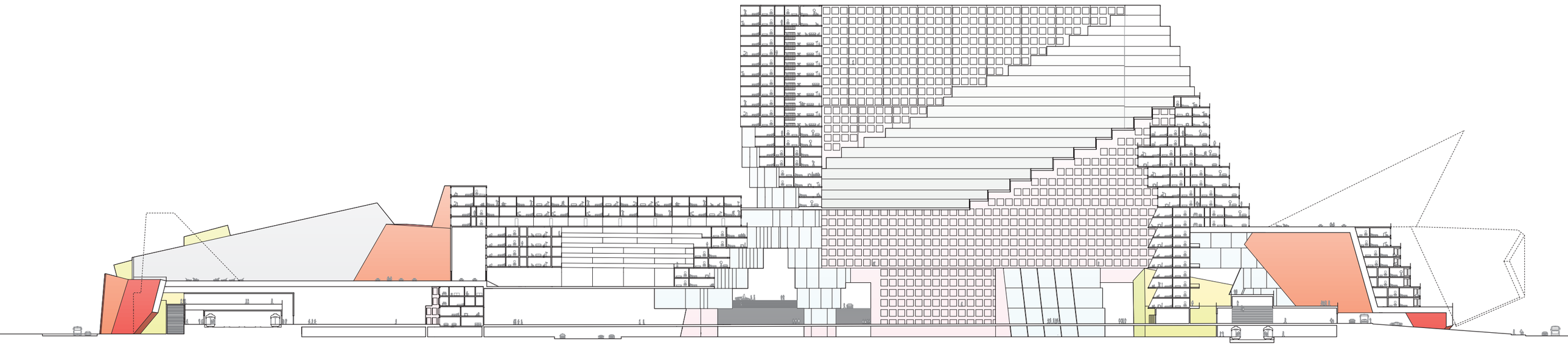
In this section a folded housing block acts as a roof over the concourse, the walls are created by the parking garage on either side.



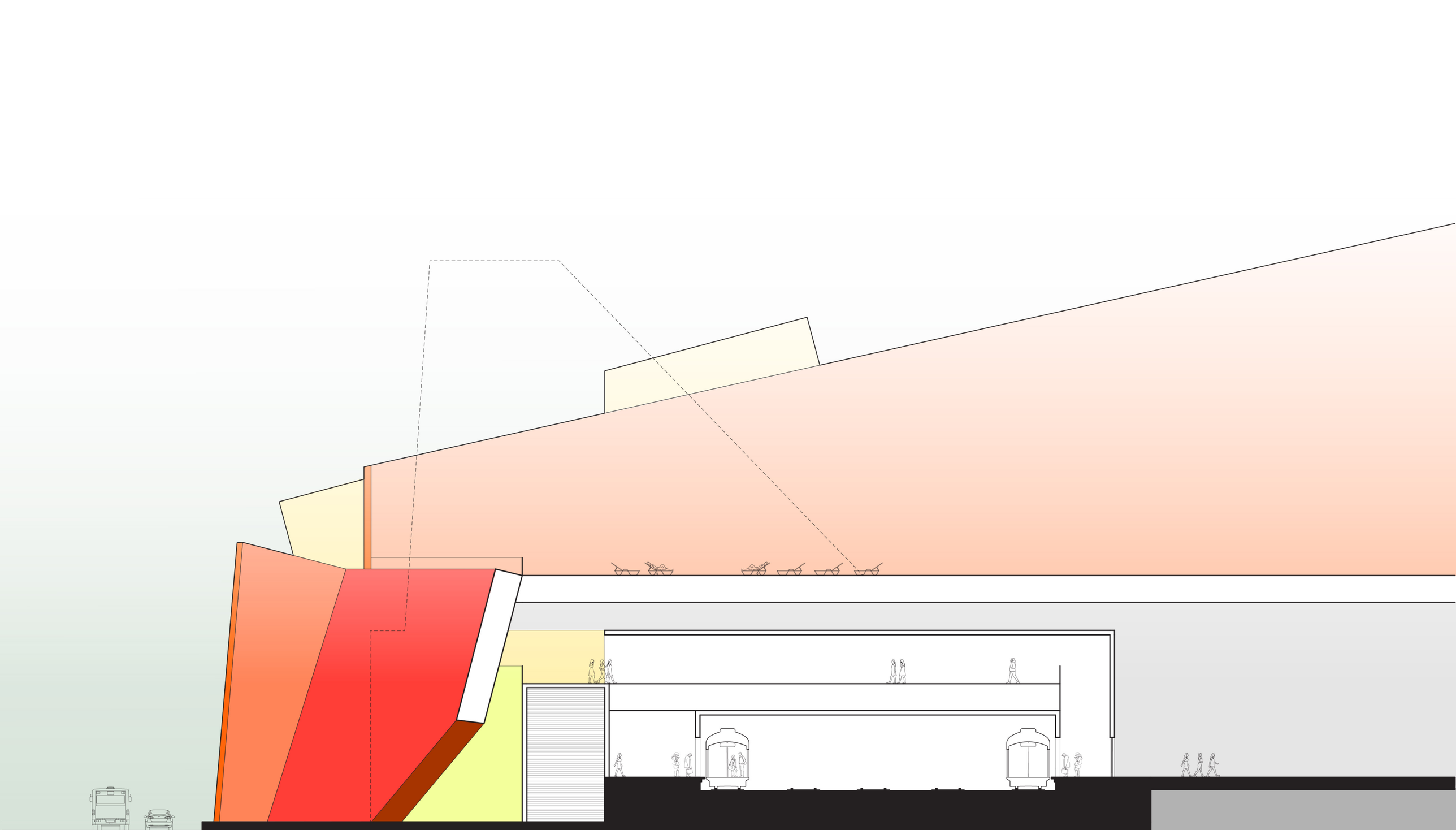


This section shows the connection to the monorail on the left, through the concourse at the middle, connection to the Boring company people mover on the right.

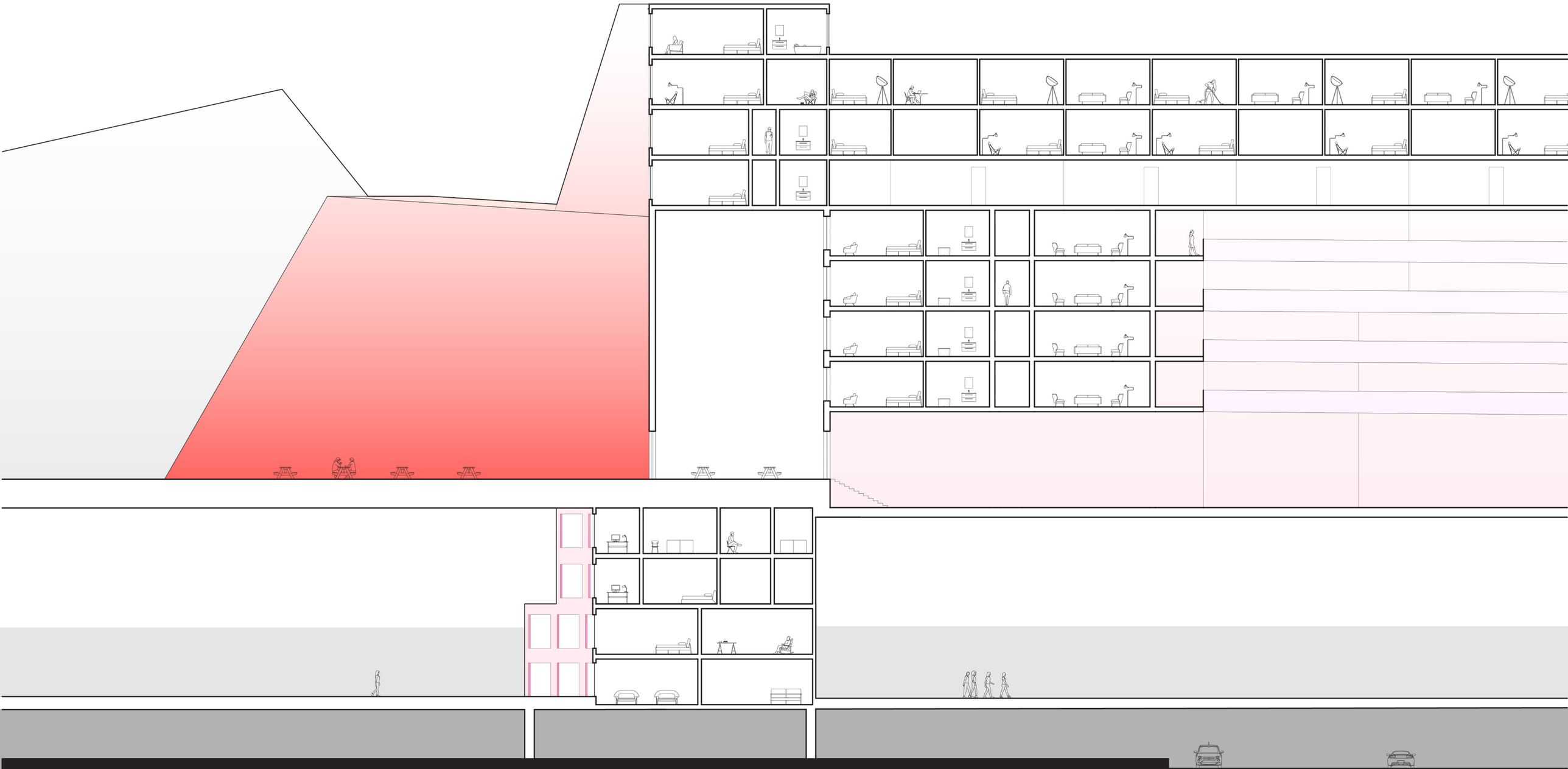




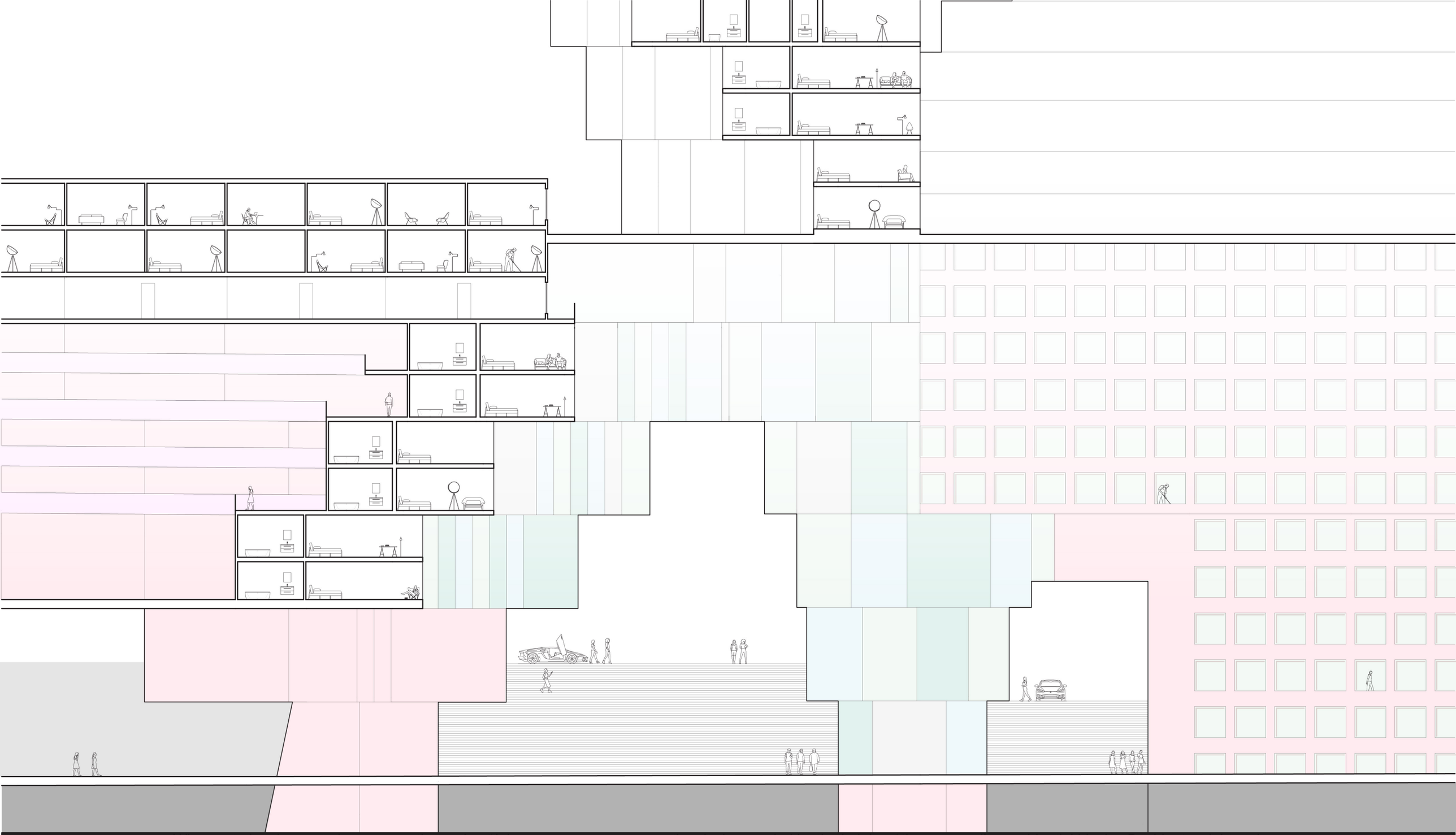
This section shows the connection between the two rail ways through the concourse. On the left someone arriving via the high speed railway would exit the train, walk under the lobby of the apartment block, seemingly just the roof of the station. Before emerging into the large, open concourse created by the surrounding apartment blocks. From the concourse, connections could be made through these large openings to the parking garage, to the strip, or to the Amtrak station.



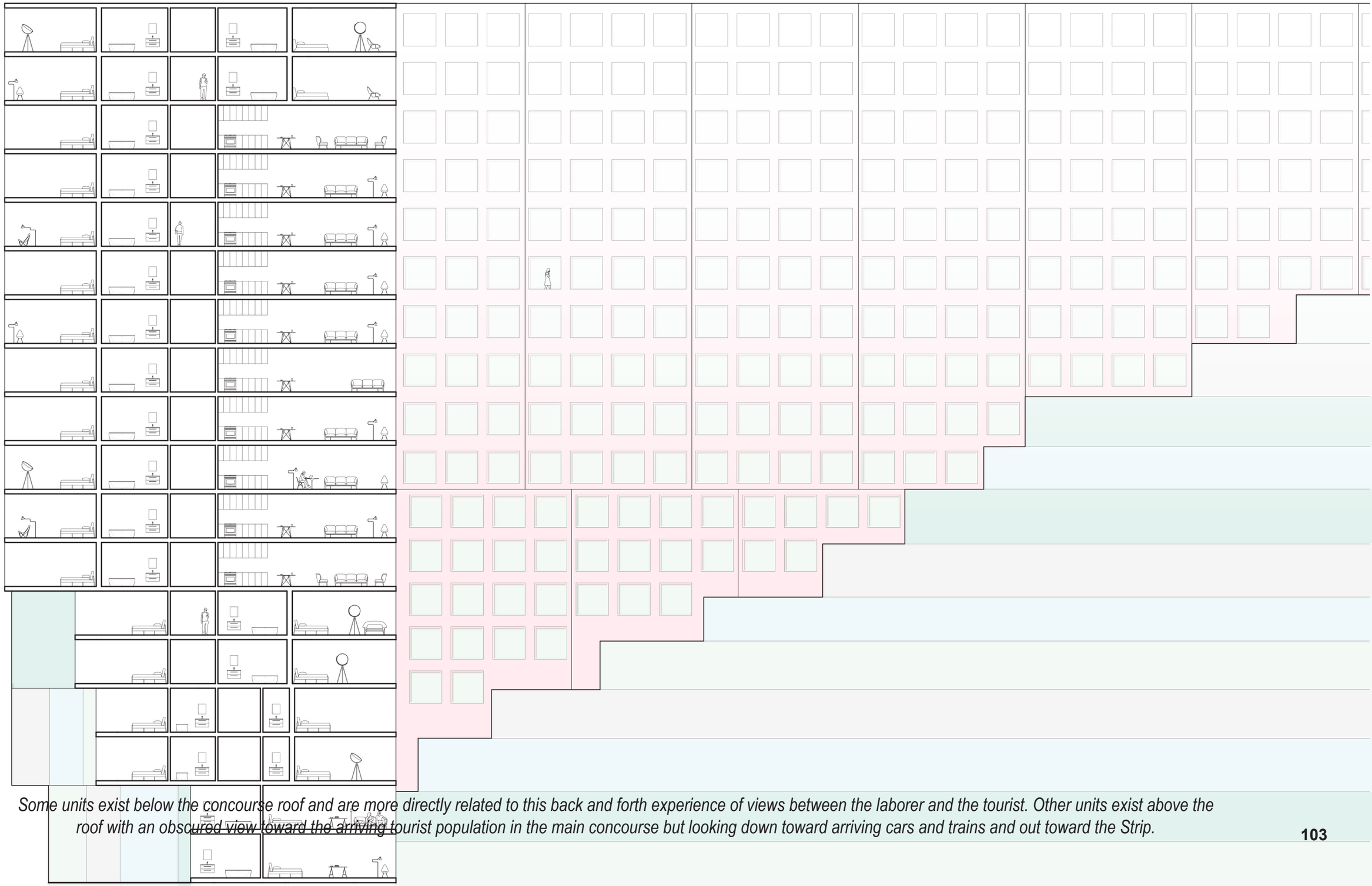
Moving through the previous section from left to right and zooming in. Here, starting at the left we see the roof folding to separate the platform from interstate 15 which runs along the edge of the site. The platform folds around the train to make a connection from one side of the tracks to the other. On the right passengers start walking toward the concourse.



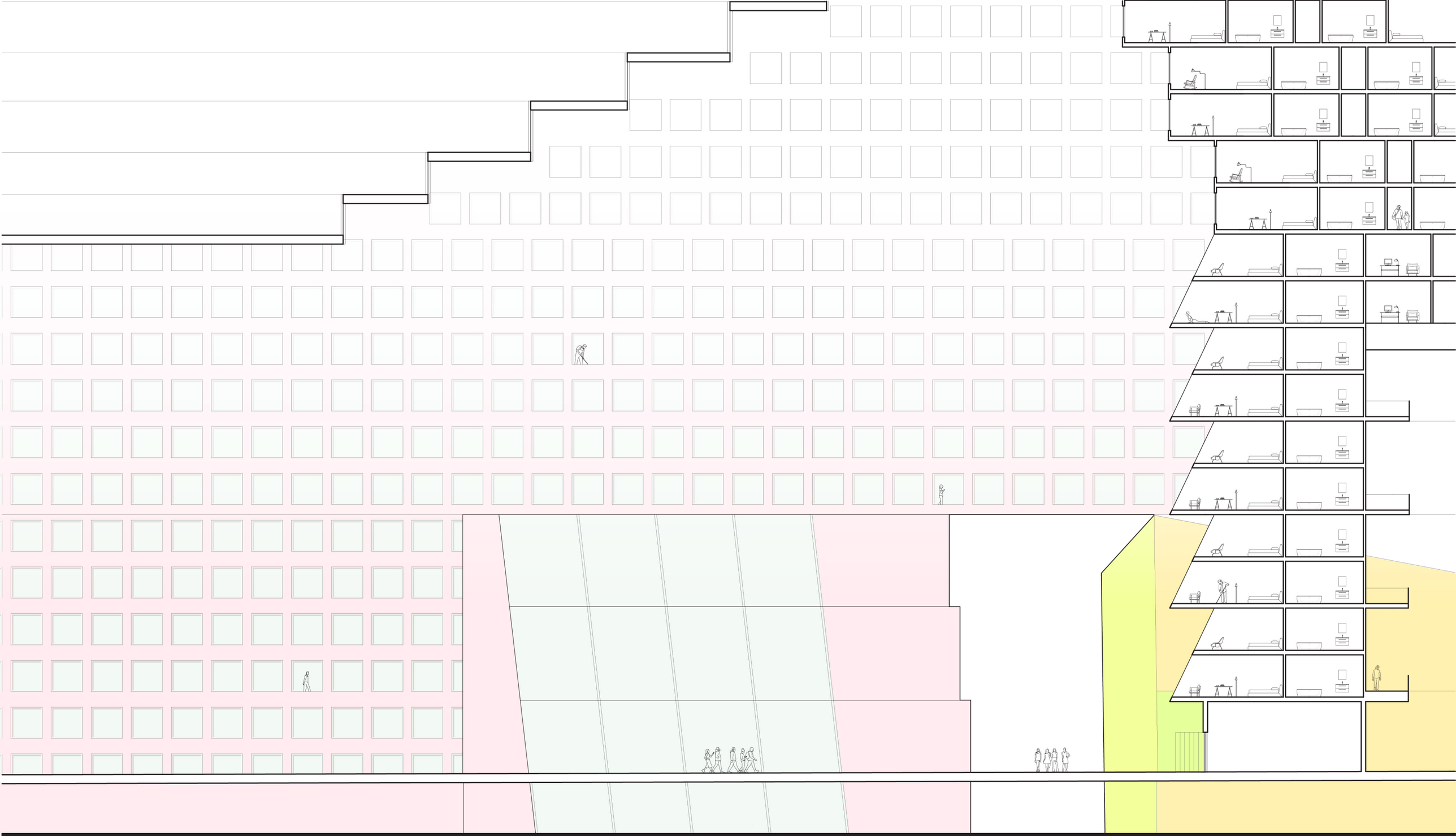
Moving toward the right, arriving tourists pass by a column made of housing units, the first indication that the city is supported by the labors of its residents. Above, the roof might appear to the tourist only part of train station, while the section reveals it to be constructed of residential units too.



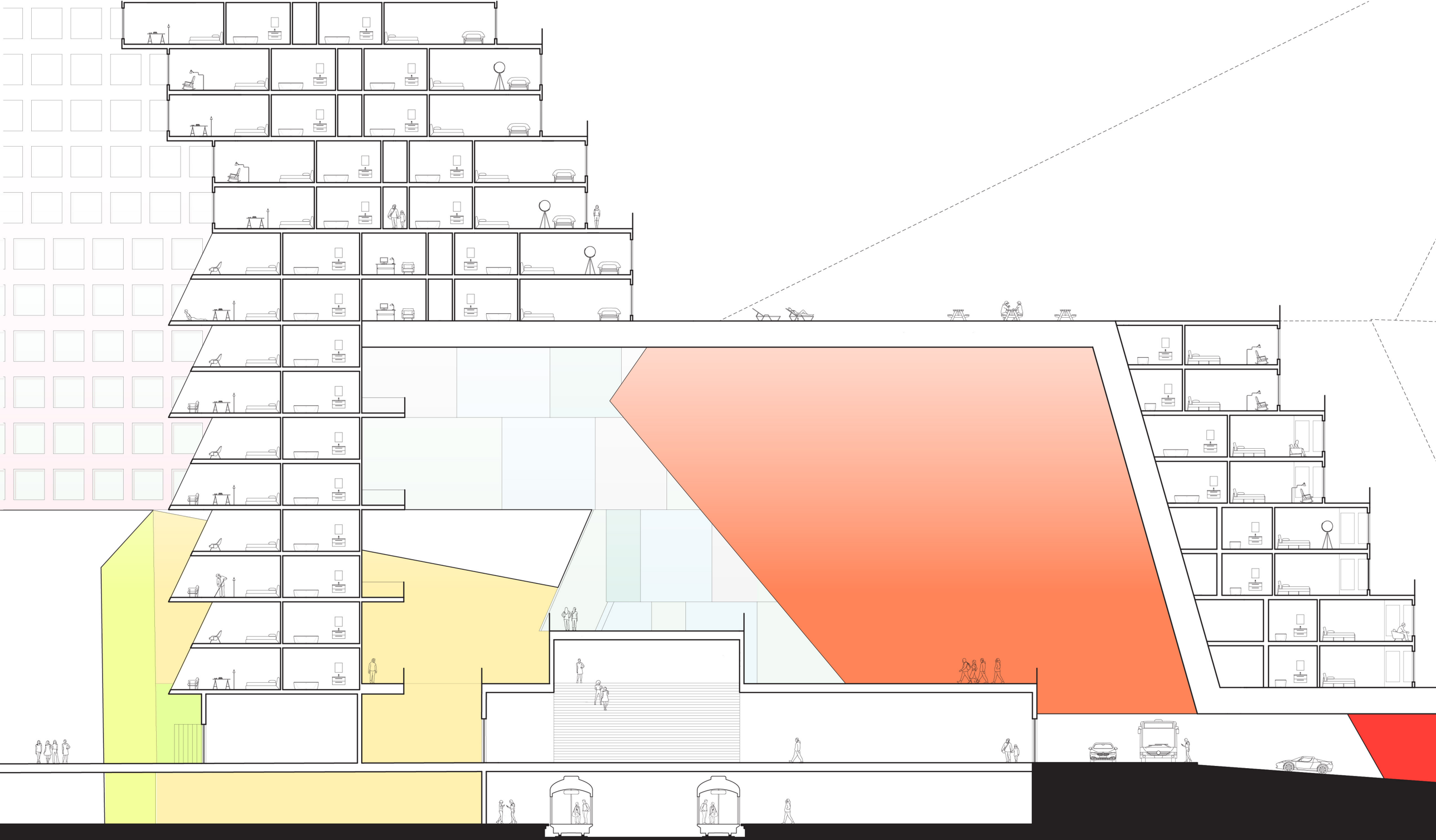
When entering the central concourse the scale of labor necessary to support the city is revealed by the height of the surrounding residential blocks. Residents might at times find themselves on display to the arriving tourist and simultaneously occupying a privileged position of height looking down upon and observing the tourists arriving. Oversized doorways formed by residential units indicate connections to the parking garage meant for the tourist or commuter.



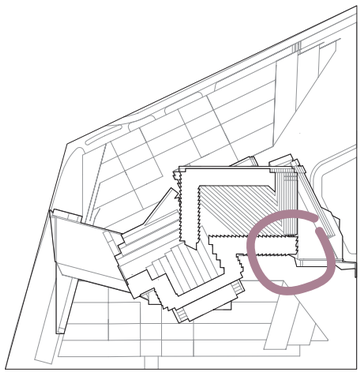
Some units exist below the concourse roof and are more directly related to this back and forth experience of views between the laborer and the tourist. Other units exist above the roof with an obscured view toward the arriving tourist population in the main concourse but looking down toward arriving cars and trains and out toward the Strip.

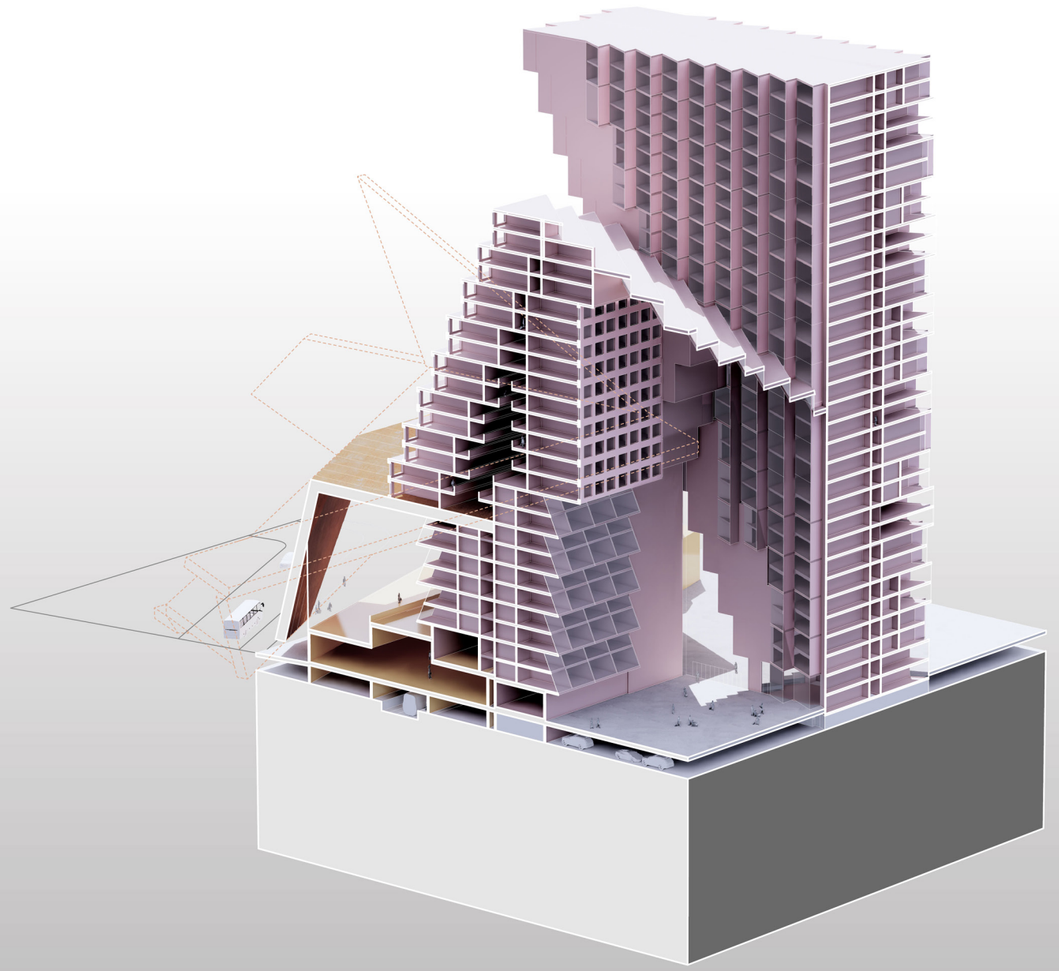


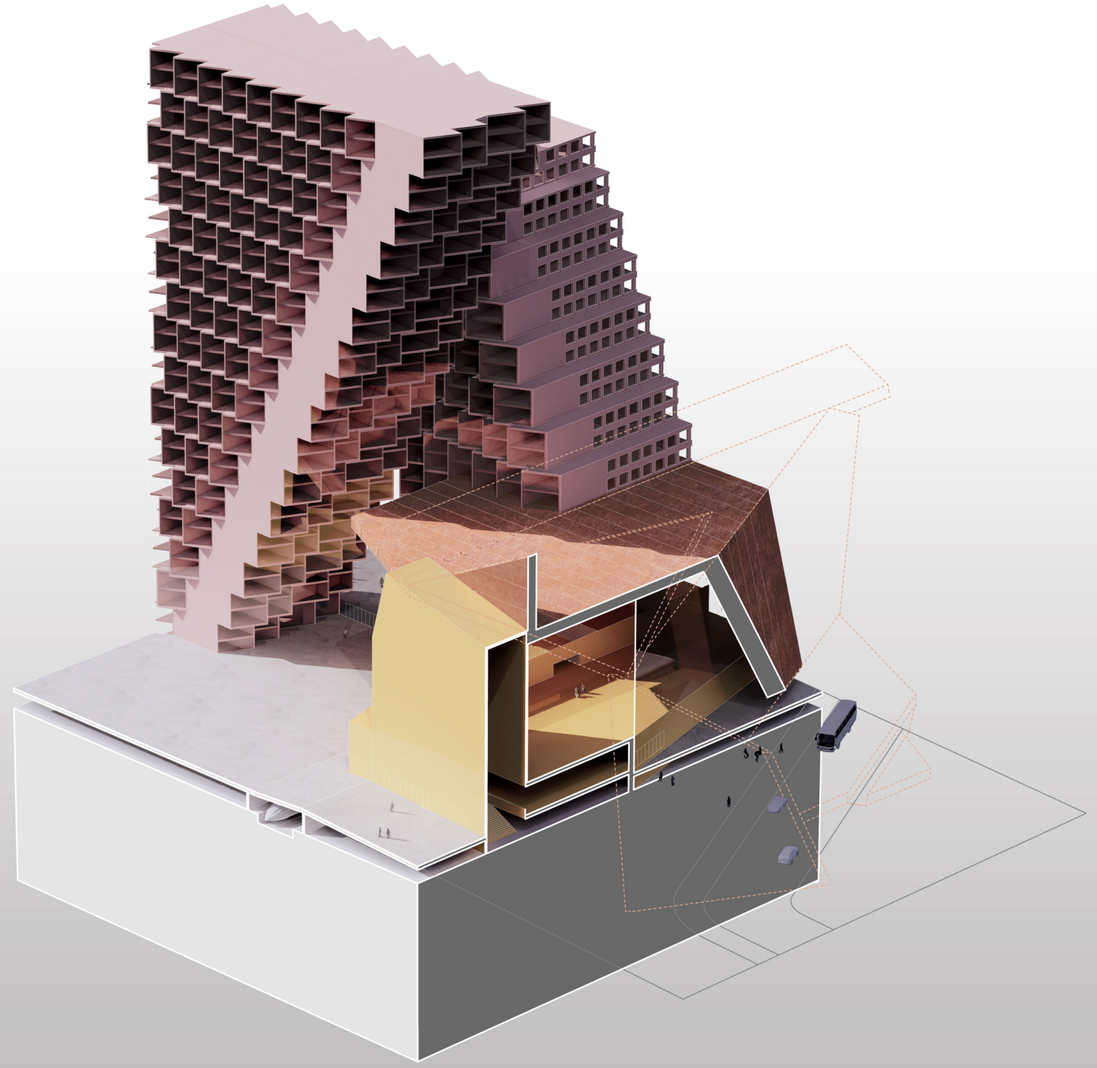
Moving again toward the right of the section shows ground floor retail as well as a large opening directing the tourist to the strip.



A waiting area is constructed by the collaboration of residential units and the folded surface of the roof, creating a separation between private outdoor space for the resident on the top side, and a large shared lobby under the folded surface. The roof extends over the drop off location for those coming by car or making connections to a bus.







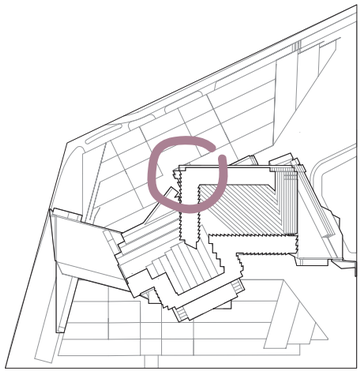
This chunk model shows the construction of this train station from the thick folded surface of the train station platform, the thin folded surface of the roof, and the wall made from apartment units. These images are two views of the same area from either side. Modeled is one of the main entries to the concourse coming from the strip where pedestrians would be arriving on foot and either entering into the train station platform or moving through this opening into the main concourse. Here, at the view from the interior on the left you can see that the concourse is constructed of housing units and covered with a roof. The units closer to the ground are folded to look up while units higher up are looking out. On the exterior all units are folded so the view is directed toward the Strip.

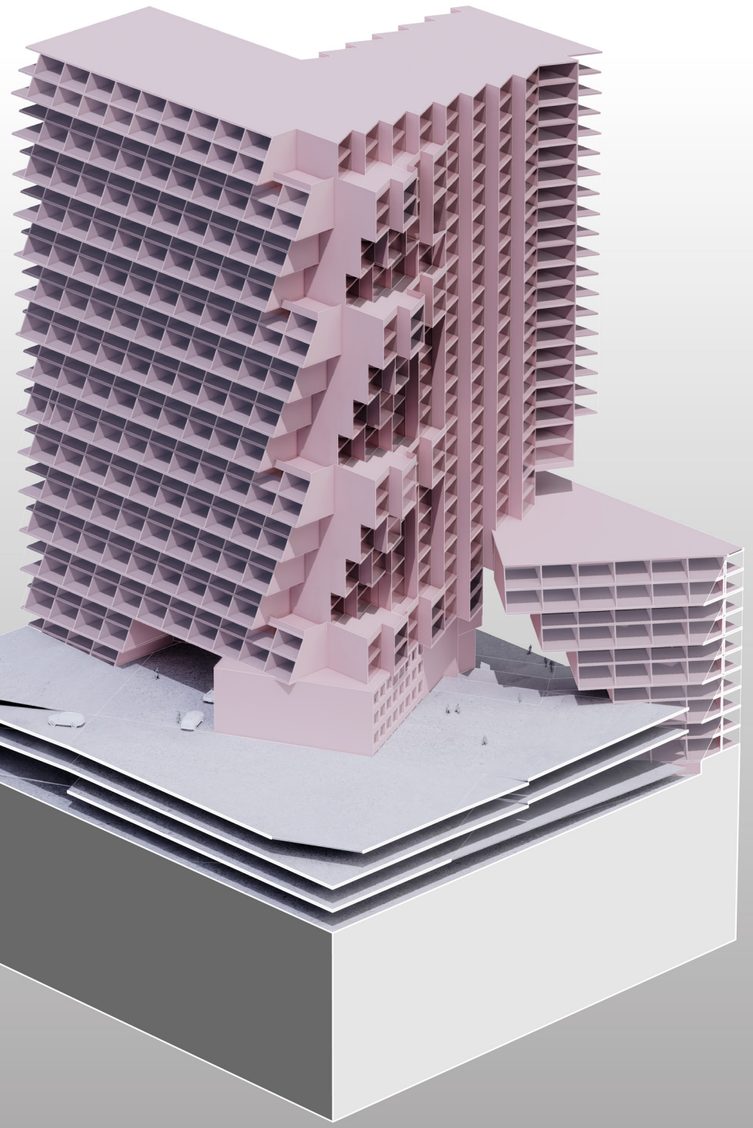


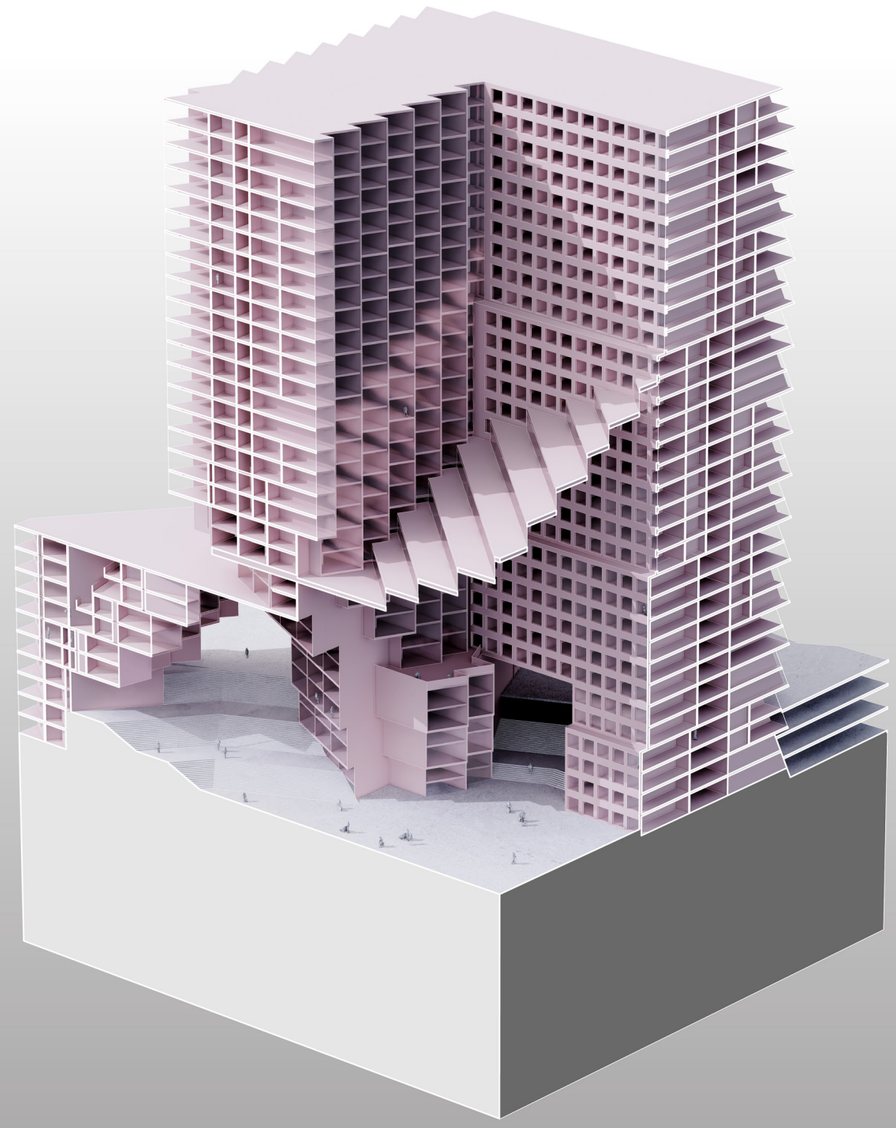
Perspective view of chunk model shows the entrance to the concourse from the exterior.



Perspective view of chunk model shows the entrance to the concourse from the interior.





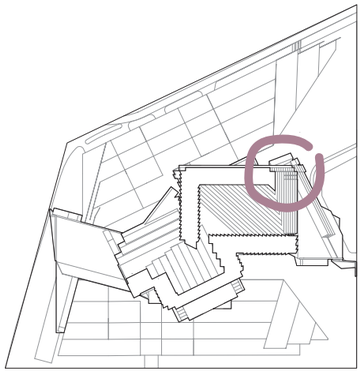


The second chunk shows two views of the location where the parking garage and apartment towers work together to create entries to the concourse. Here, on the exterior the folding of the base of the apartment block separates entries so that residents can park and enter the lobby of their building while commuters can park and enter down the stairs into the concourse. The folding of individual units works to mediate an otherwise undesirable condition at the inside corner where units are very close together.



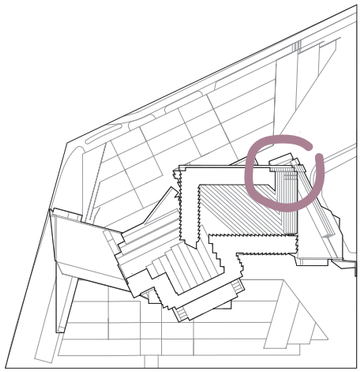
Perspective view of chunk model shows the two entries to the concourse from the parking garage.

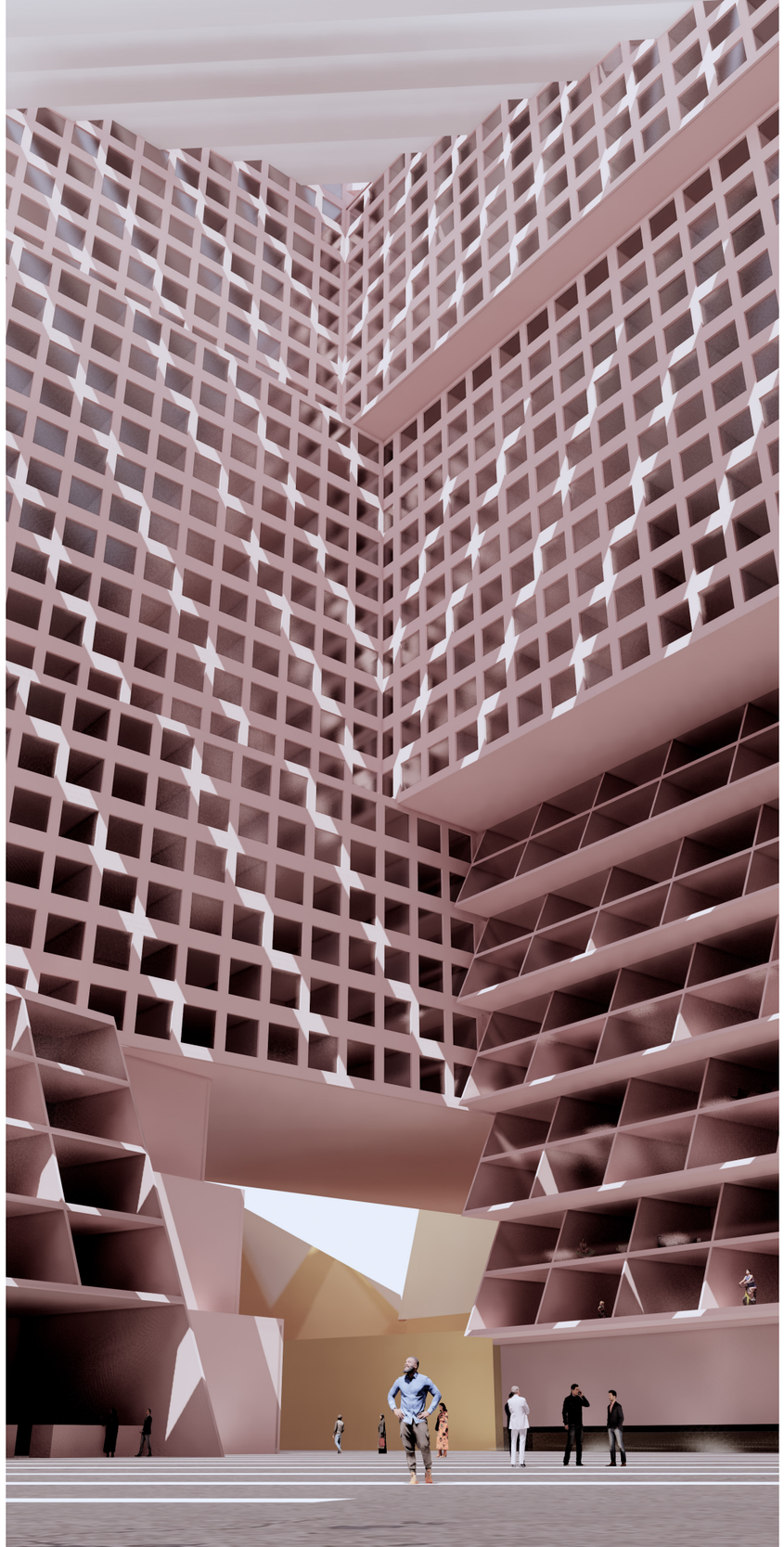
Perspective view of chunk model shows the two entries to the concourse looking from the interior.



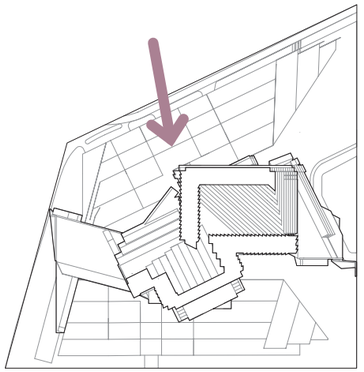


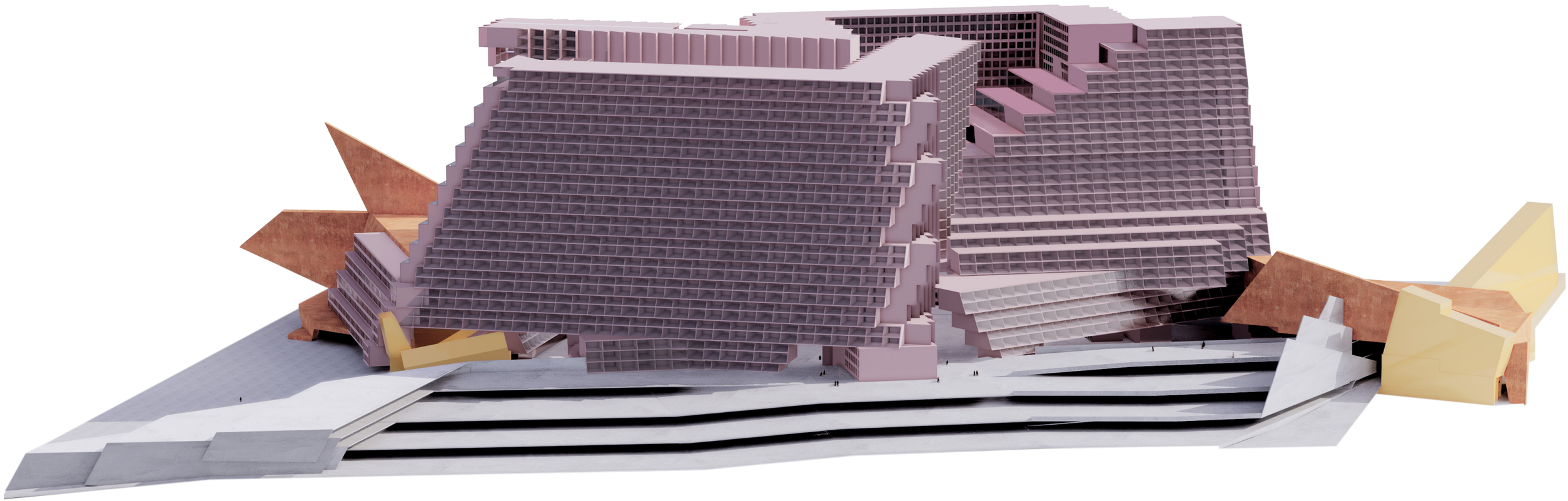
This view looks again at an entry to the site from the exterior, from the perspective of someone coming from the Las Vegas monorail or the festival grounds. Moving toward the left of the yellow Amtrak platform would bring you to the entry directly to the station while moving toward the right of the yellow platform would allow entry into the concourse.



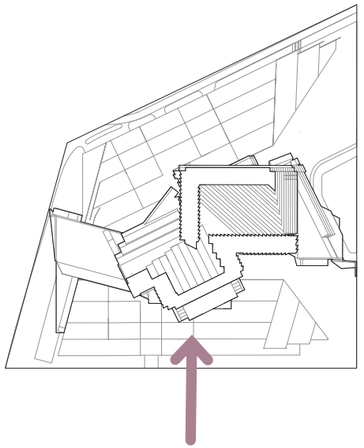


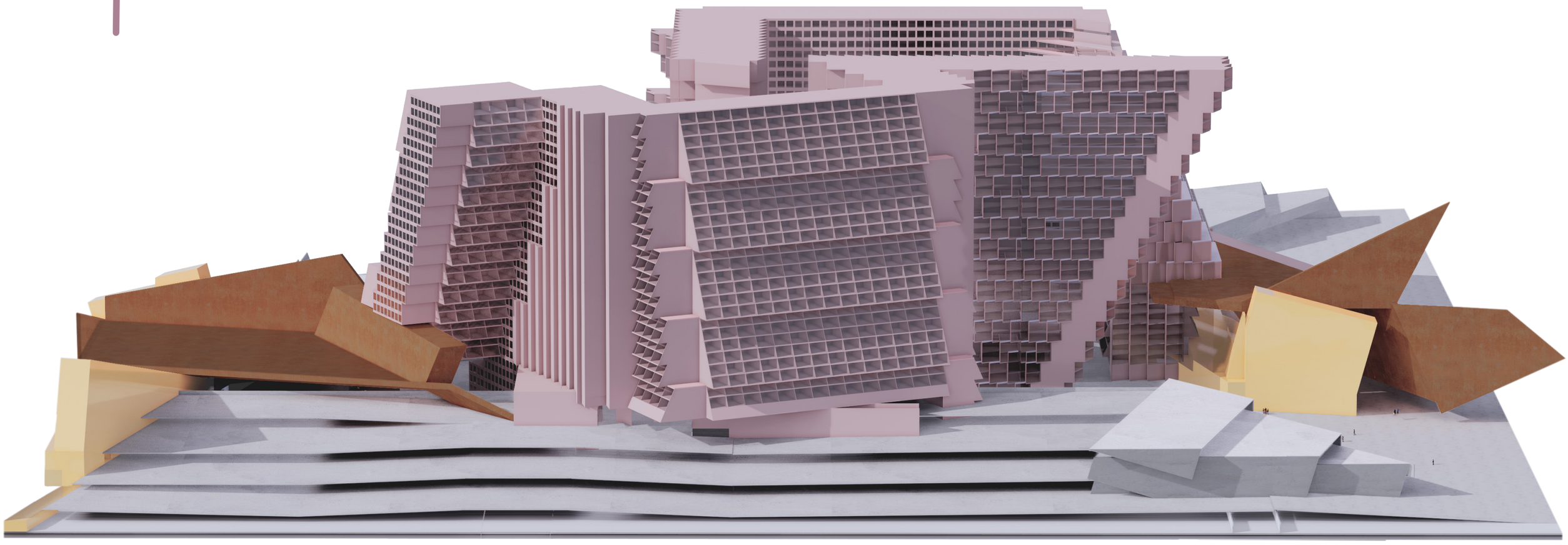
Having passed through this entry and looking back, this view shows the height of the concourse. While many units have windows opening on to the concourse the roof allows in light and provides shading for the often uncomfortably hot climate.





Finally I would like to end with the long elevation of the project from the approach in a car, which shows the stepping of the parking garage as it moves toward the center of the site. This elevation has a major highway running directly in front of it so would be a front to the car but not for the pedestrian.





In this view, the opposite side which would again not be an important entry for the pedestrian but would provide convenient access for cars.

The End

Labored Form: Domestic Fold

This thesis was completed during the COVID-19 pandemic and consequentially a complete shutdown of the Graduate School of Design's Gund Hall and fabrication facilities. The project was inevitably influenced by my location on the 16th floor of Josep Lluís Sert's Peabody Terrace in Cambridge, Massachusetts which I left only rarely.

I would like to thank my classmates for their support, conversation, and friendship throughout the completion of this thesis and my entire time at the GSD.

-Ashley Hickman