# By Others:
# Architecture as Mediation, Collaboration as Context

by

Sebastien Sarrazin

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

at

Dalhousie University
Halifax, Nova Scotia
March 2020

# Contents

# Abstract

This thesis investigates architecture as a mediation in the context of collaborative housing production in Havana, Cuba. Given that these processes occur whether architects are present or not, this study demonstrates the value of architecture as mediation of the heterogeneous others who come together to make a building project.

Architecture as mediation is alternative to the current approaches to so called “participatory architecture” in Cuba, some of which are overly formulaic and neglect the diversity of urban residents. Rather than propose a new method to assist self-help construction of housing, architectural projects are instead regarded as inherently collaborative. Thus, the architecture primarily seeks to discover how disparate parts might work together in a bricolage assembly. This approach attempts to support differences among autonomous parts to make high-quality architecture from pragmatic solutions to housing.

# Acknowledgements

This thesis is defined by the supportive efforts of many people. I was fortunate enough to visit Havana for a total of four weeks under the guidance of Susan Fitzgerald. The first trip took place in the fall of 2018, when I was a student in Susan's traveling design studio. In 2019, I was funded by the Rossetti travel research scholarship with Susan as my advisor, and so I again joined her subsequent studio on the trip. Susan connected us to a robust network of local experts in Havana: Jorge Peña Díaz and Joiselen Cazanave; Anadis and Fernando of Infraestudio; and Kiovet Sanchez. Their participation largely defined our learning experience in Cuba. Brainard Fitzgerald patiently chaperoned the class on both trips, offering advice, insight, and quiet support along the way. The input and perspectives of all these people, my fellow students, the students at CUJAE, and many other generous Habaneros we met were invaluable in developing my own perspectives about the city.

Notable among these were the perspectives and direct collaboration with Cuban students of architecture at CUJAE. There are far too many to name, but Karla and José both stand out for their contributions. They helped me obtain information that would have been very difficult to come by otherwise. Karla came with me to the offices of the community architects to act as an interpreter, and also connected me to the work of other students, who had done extensive documentation of my chosen site as part of a school project. Because I built heavily upon their documentation, I've included their project in the references section of this document, and have cited their work throughout as Pérez et al. 2019. Without their efforts, the specificity of my design work would not have been possible.

Back in Canada, thanks are also due to Ted Cavanagh for holding my feet to the fire in the early days of this thesis. There are too many of my peers to name who helped in small ways putting the work together, but Morgan took on the lion's share and continues to support my efforts.

Finally, this work would not be possible without the expertise of my thesis committee: Susan Fitzgerald as supervisor, and James Forren as advisor. Susan's expertise and guidance were foundational to the success of this project at every step, punctuated at regular intervals by James' insight and support. I could not have asked for a better team.

# Chapter 1: Introduction

## Summary of the Background

Self-building is one of the most important modalities of Cuban housing production, yet the government is struggling to adequately support this activity. Most housing units in Cuba have been produced by residents rather than the state, despite the fact that housing has been a human right for Cubans since 1959 (Coyula and Hamberg 2003, 2).

It is well recognized that in order to provide support for residents, the state should enable collaborations between experts and self-builders, and has successfully done so in the past (Coyula and Hamberg 2003, 26-30). When solutions are initiated by experts, residents need to have more of a voice as the intended beneficiaries (García Pleyán 2001, 333). When residents are solving their own problems, experts need to provide technical solutions without compromising the residents' autonomy (Turner 1976, 9).

Cuba has tested programs built on these principles: the *microbrigadas* were state-organized collectives of self-builders released from their regular employment who produced large projects under the supervision of experts, and the community architects collaborated on designs with individual households. Despite early successes, these programs eventually became overly bureaucratic, making them difficult for many to access. They also adopted uniform solutions for housing which were not adaptable to the complexity of Centro and Old Havana.

These areas have historically been neglected by the revolutionary government's anti-urban policies (Sennett 1970, xv; Scarpaci, Segre, and Coyula 2002, 141). Complex

urban contexts suffer when oversimplifying order is imposed (Jacobs 1961, 142; Kroll 1986, 5). Therefore, Centro and Old Havana require diverse and adaptable approaches to support self-built housing. Standard solutions formulated for the suburbs or rural conditions will not easily translate.

Without viable access to expertise, self-builders will continue to do things on their own. Meanwhile buildings collapse in the old city every few days on average (Coyula and Hamberg 2003, 19), accelerated by inexpert adaptations and lack of maintenance to the structures due to material shortages.

## Methodology: Parts and Assemblage

I propose that architects can better serve self-builders by regarding architecture as inherently collaborative. In any architectural project, collaboration occurs between human actors, such as residents and experts, but also between more diverse autonomous parts, human and non-human, which work together to create things. The latter interpretation is built on the perspectives of anthropologists who have observed architects and designers at work (Yaneva 2009; Murphy 2012; Ingold 2013).

As a collaborative assemblage, architecture primarily seeks to manage and mediate different parts. Parts can come from anywhere as long as they can work together in context (that is, with each other). Thus, the resulting assemblage is a bricolage. The job of the architecture is to make sure the diverse parts “work together” aesthetically as well as functionally.

Viewed this way, the boundaries between architecture and context become blurry: for instance, parts of the building are also parts of the city. Thus, the method involves a

balance between autonomy of parts and organization of the assemblage.

## Parts of the Methodology

The methodology itself has been created in a sympathetic way to the proposed architectural intervention; ideas are assembled from many different sources and work together as parts. The resulting theoretical bricolage is partially rooted to housing in Havana, and partially connected to more global, general conversations about architecture theory and practice. Below is a brief introduction to the ideas recruited to function as parts of the methodology; their roles are detailed in Chapter 3.

## Architecture as Mediation

Gray describes collaboration as “the constructive management of difference” (Gray 1989, 1). She offers insights into how organizations of human actors might navigate collaborations. One of her tools for doing so is mediation by outside parties, and I propose that architecture itself can be this mediation. Yaneva’s interpretation of architecture grants human and non-human actors similar agency in an open network (Yaneva 2009, 16). The degree to which actors (parts) are enabled to work together, minimizing conflicts in the assemblage, may serve as an indicator of a successful mediation (Yaneva 2009, 154).

## Organization and Autonomy

Habraken developed conceptual tools for architecture as a collective undertaking. The supports-and-infill concept distinguishes between the parts of a building which must be done by experts and the parts which users could do themselves (Habraken 1972).

Habraken went futher to conceive of the built environment more broadly as a collective project, and proposed the concept of levels to distribute control over parts by required expertise and the hierarchy of collective or individual concerns (Habraken 2002, 5).

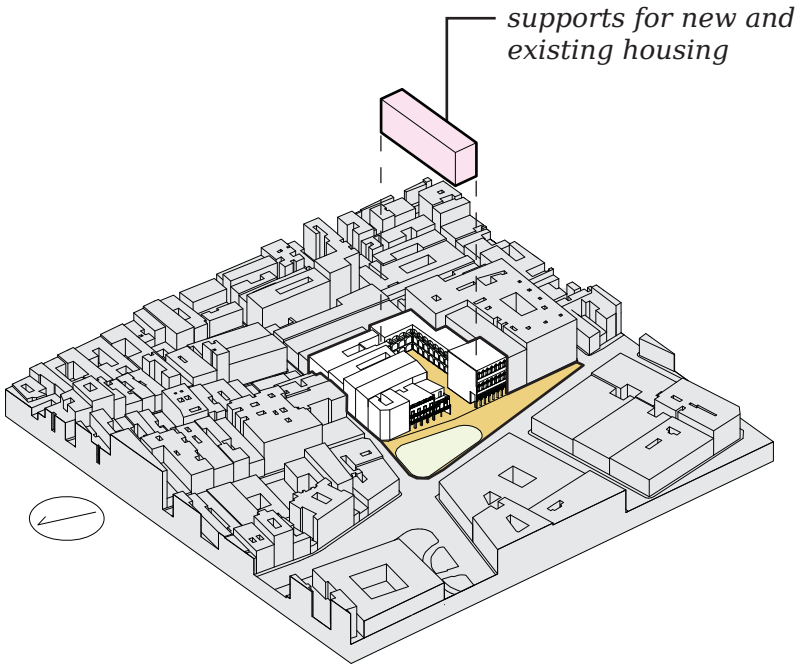
Habraken's concepts have informed a lineage of investigations into expert-assisted self-built housing, including Turner's investigations in Latin America and Kroll's participatory architectures of complexity (Turner 1976, Kroll 1986). The concepts of levels and supports specifically have positively influenced the architecture of affordable housing, notably in Chile, by balancing user autonomy with the provision of adequate resources (Habraken 2002, 15; Vale et al. 2014, 35).

Turner described this as the need to balance autonomy and heteronomy; to enable users self-determine their housing solutions on the one hand, while considering the system of governance and resources within which they reside on the other (Turner 1976, 9).

To further translate this into architectural terms, I borrow Ford's definition of good architectural detailing as an autonomous design activity (Ford 2011, 46). This concept strikes a similar balance but with emphasis on the non-human actors in the architectural assemblage: between the autonomy of parts and their overall assembly in the building.

## Architectural Proposal

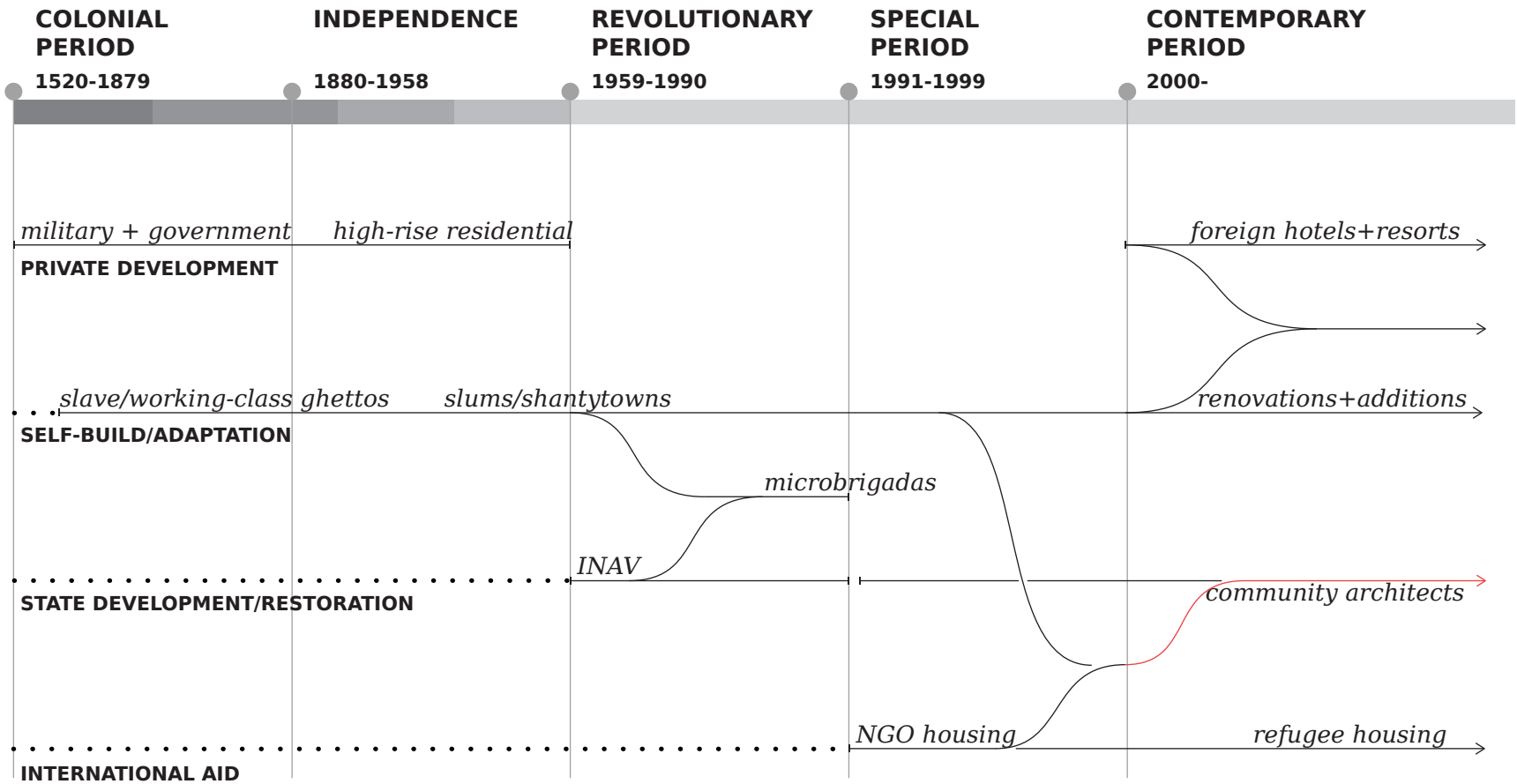
I propose to deploy this methodology in a simple scheme: to support new and existing self-built housing on a characteristic site in Old Havana. Each part will be highlighted for its role in the collaborative assemblage.



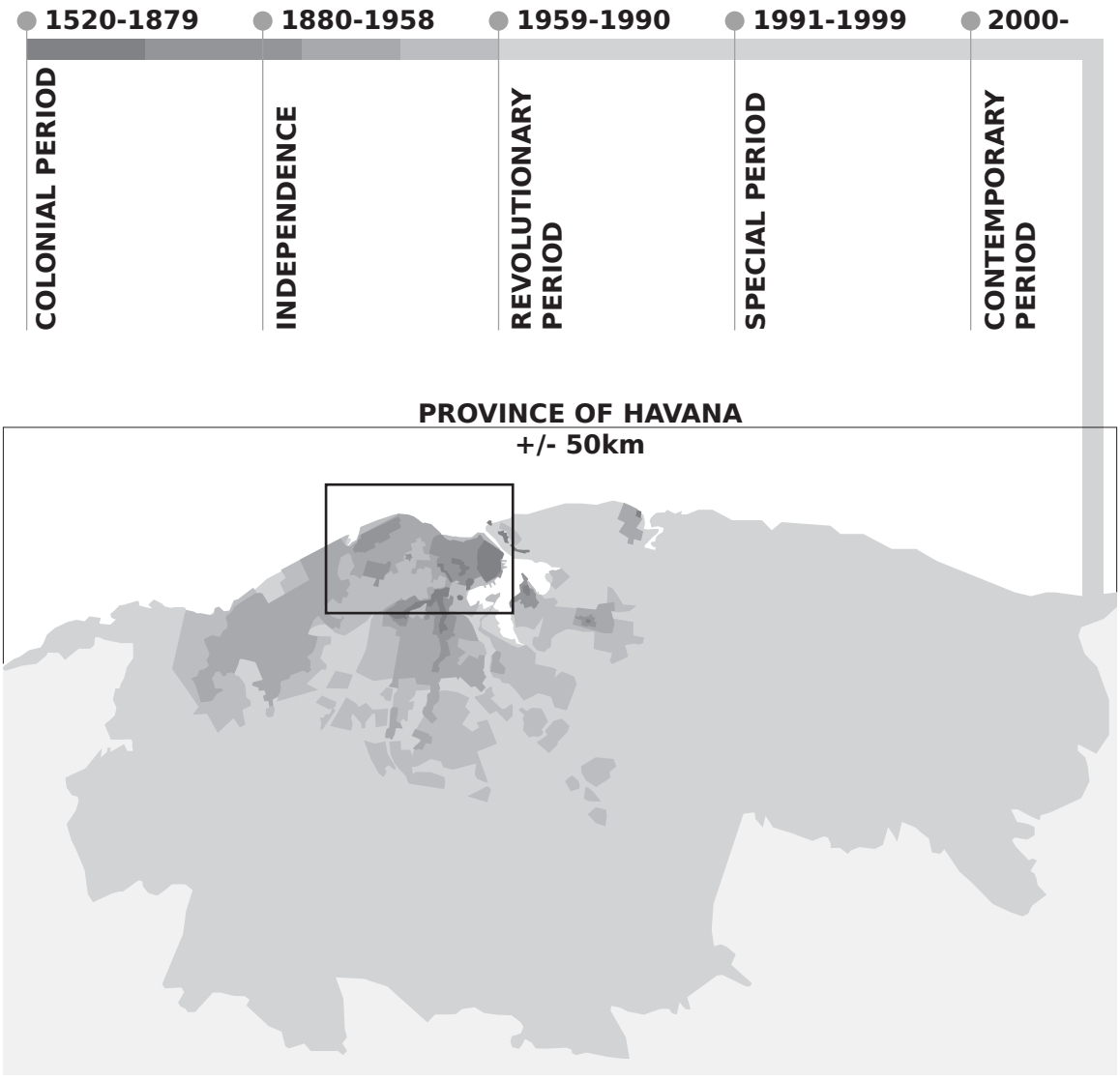

Proposal to support new and existing self-built residences at a site on the edge of Old Havana.

The method by which I propose to test this theory begins with assembling parts, which Yaneva describes as a project shaping its own context. These parts will be organized according to Habraken's levels to determine where architectural action should be directed and who should be undertaking the work.

In order to avoid the pitfall of uniformity I identify in chapter 2, the parts include detailed information about specific human actors inhabiting the infill level. My access to this information was limited while I was conducting research on site, so in this case I build upon a documentary film: *Suite Habana* by Fernando Pérez (2003). The documentary extends my understanding of how people live in Havana, as interpreted by a Cuban filmmaker. This allowed me to suspend my own tourist gaze, at least partially, as I studied the lives represented in the film. The resulting context is thus a plausible fiction, depicting collaborations between specific human and non-human characters.




Timeline overview of housing production in Havana, organized by key periods of the city's history.




The sequence of Havana's growth, starting in the 16th century with what are now the most urban districts. The vast majority of Havana's growth occurred in the 20th century: mostly suburban sprawl with heavy reliance on car infrastructure.

# Chapter 2: Self-Help Housing

Housing by self-builders. From top to bottom: Alamar from above (DuFour et al. 2016); Alamar at ground level (DuFour et al. 2016); Improvisation by Microbrigadas (Bejerano, 2016); a cluster of informal dwellings in Old Havana.

## People Build on Their Own

Since 1959, most housing units in Cuba have been produced by residents rather than the state (Coyula and Hamberg 2003, 2). There are many social, political, and economic factors affecting this trend, and they interact differently in situations across the country. In Havana the situation is no less complex, but there are a few major characteristics worth highlighting as background:

### The Housing Shortage in Old Havana and Centro

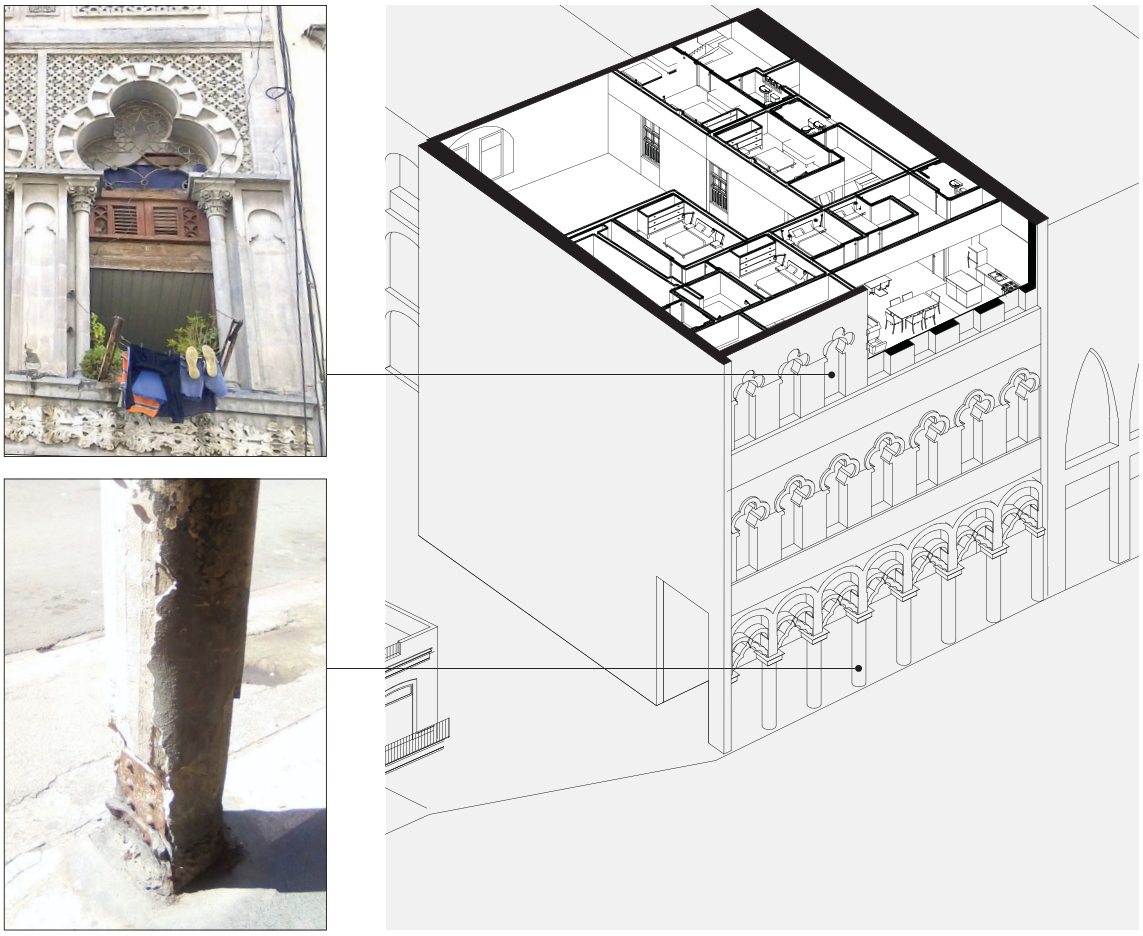
Havana suffers disproportionately from a housing shortage compared to the rest of the country. Major efforts by the state to provide adequate housing have mostly missed the inner city, except for a few disastrous examples of prefabricated housing blocks in traditional neighbourhoods, such as in Centro (Scarpaci, Segre, and Coyula 2002, 214). Even after large complexes were built in the suburban municipalities, development slowed in general due to the blockade first imposed by the United States in the 1960s (Scarpaci, Segre, and Coyula 2002, 206).

### The Character of Self-Building in Havana

Residents have continued to build on their own since then, but have not developed the kind of informal settlements found in other Latin American cities. Shantytowns, for example, are not common in urban Havana. (Coyula and Hamberg 2003, 18).

Especially in the old city, it is more common to see larger buildings such as mansions subdivided by self-builders. These properties were redistributed after they were left

behind by members of the wealthier classes who emigrated following the socialist revolution (Coyula and Hamberg 2003, 18). Now they are divided into many small homes of varying quality; some are very unhealthy and precarious.



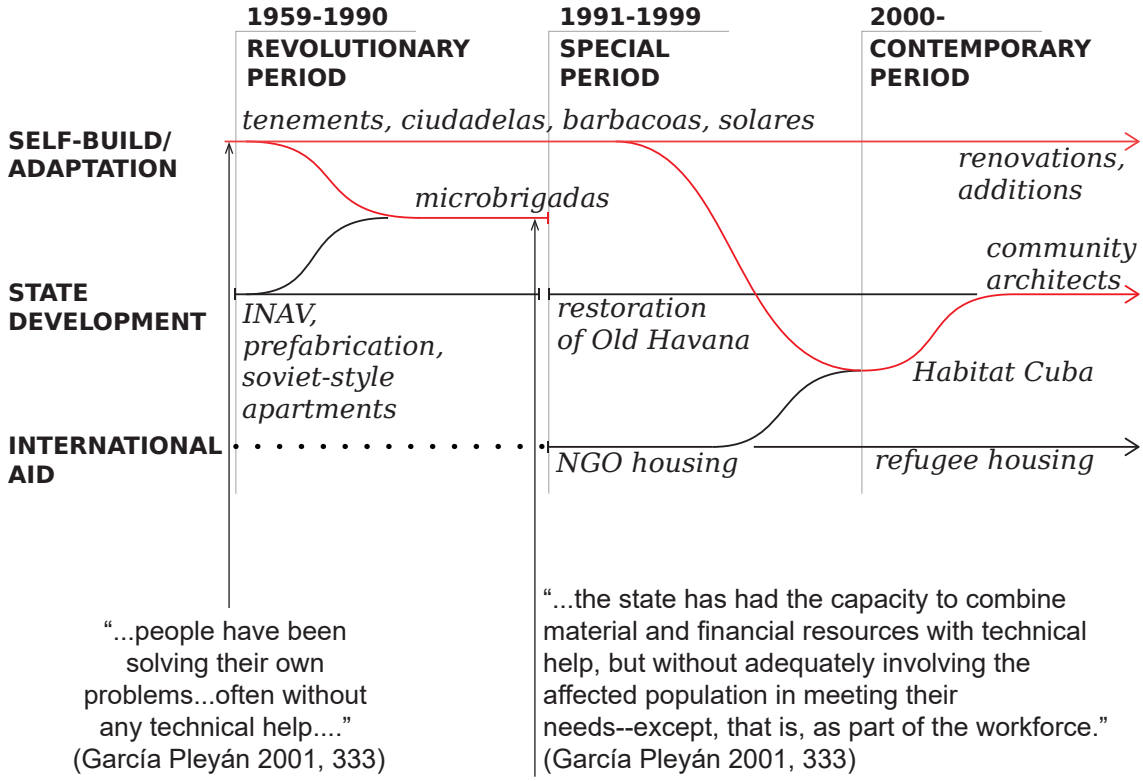
Conditions in a building on the chosen site: self-built vertical subdivisions or *barbacoas* can be seen facing the street, adding load to the deteriorating structural columns below. 3D model and photos provided by Pérez et al. (2019).

## The Need for Collaboration with Experts

The need for experts to support self-builders is well recognized in Cuba (Coyula and Hamberg 2003, 26-30; García Pleyán 2001, 333). Self-builders are more efficient at producing housing that suits their needs than the state, but the quality of housing they produce cannot be ensured.

## Case Studies

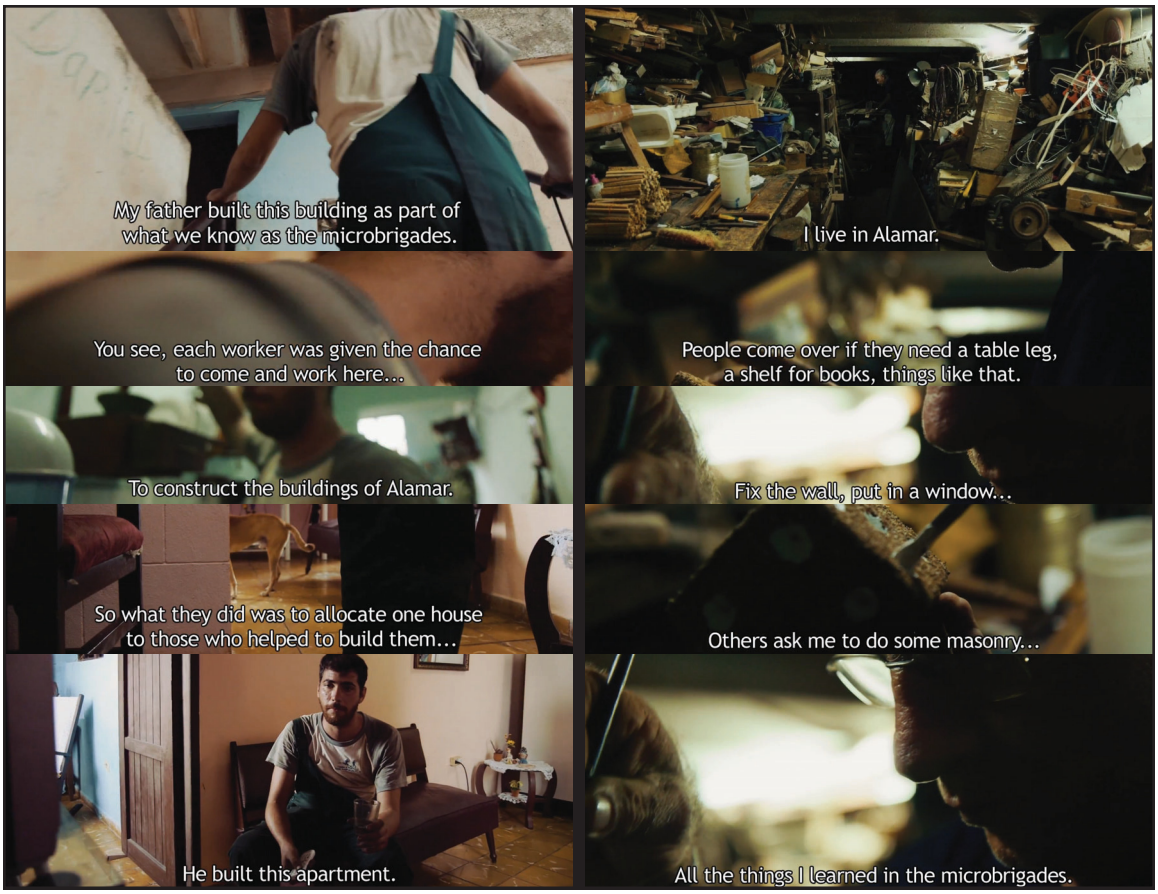
Rather than ensuring quality by taking over production, Cuban architects have developed methods to provide guidance to residents producing their own housing, both at the level of neighbourhoods and buildings (Anguelovski 2014, 197; Scarpaci, Segre, and Coyula 2002, 162). I researched two such programs, the *microbrigadas* and the community architects.




Timeline of post-revolutionary housing.

### *The Microbrigadas*

*Microbrigadas* were state-organized collectives of self-builders who produced large projects. Workers were allowed to leave their permanent government occupations for a period of time while keeping their full salaries. In exchange, they built mass-housing for themselves under supervision of experts.




Stills from a documentary film, *Havana Vignettes*. Telling the story of a self-builder who worked in a *microbrigada* to build his family's apartment in Alamar (DuFour et al. 2016).

This collectivization solved two common problems with self-building: access to expertise, and the elimination of “double worker exploitation”, where time spent building one’s own housing is added onto the time spent earning a living, even though both efforts will ultimately benefit the state (Scarpaci, Segre, and Coyula 2002, 217). The transfer of skills to maintain the buildings and a sense of ownership over the final result were additional benefits of the program.

### *Community Architects*

The community architects were developed to collaborate directly on designs with individual households. They used a linear method including role-playing exercises to facilitate

*1. site analysis*

*2. design games*

*3. technical design*

*4. present options*

Four stages of the community architects' method, prescribed by Rodolfo Livingston, explained in English by Valladares (2017).

design by non-experts, emphasizing that even children should be encouraged to participate in the process.

The program started as a collaboration between the NGO Habitat Cuba and a few municipal governments; their method was developed by the Argentinian architect Rodolfo Livingston (2006). The program was highly successful in the first few years, winning recognition in the form of international development awards (Coyula and Hamberg 2003, 30). Valladares characterized the system as a "hybrid building system", combining the expedience and quality of state construction with the flexible utility of informal self-building (Valladares 2017, 66).

## Shortcomings

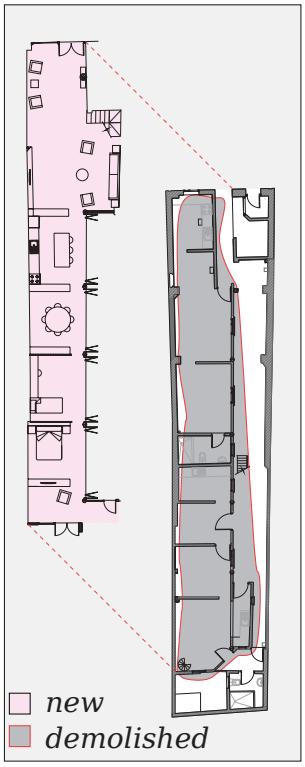
Despite early successes, both of these programs eventually became overly bureaucratic and uniform. Although the *microbrigadas* involved users in the production of their own housing, the designs followed the provider paradigm of mass-housing common at the time (Habraken 2002, 3). Rather than focusing on enabling users to find their own solutions, buildings by *microbrigadas* sought simply to house people regardless of their differences, as can be seen in the uniform apartment blocks of Alamar.

A successful outcome of the community architect's process in Old Havana, now listed as a short-term rental. Left: before intervention (Menéndez García 2007, 78); Middle: self-built informal addition (Valladares 2017, 133) Right: Participation with community architect to upgrade the facade to meet heritage regulations (Valladares 2017, 133).

Alamar's characteristic uniformity (DuFour et al. 2016)

The community architects program was intended to address people's differing needs, capabilities and priorities in housing, and for a time it worked well in this capacity. However, after the program was incorporated as a government office, community architects stopped filling this role. They became hidden behind bureaucratic structures, limiting access and wasting their potential as an enabler of self-builders (Muñoz Hernández 2018, 138). In Old Havana, Valladares also documented instances of the program breaking down (Valladares 2017, 140). These outcomes now appear to be far more common than successes. Based on my conversations with experts in Havana, public sentiment around the community architects is very low today.

Both programs succumbed to the centralization of decision making power, a trend that Davis warns is unhealthy for

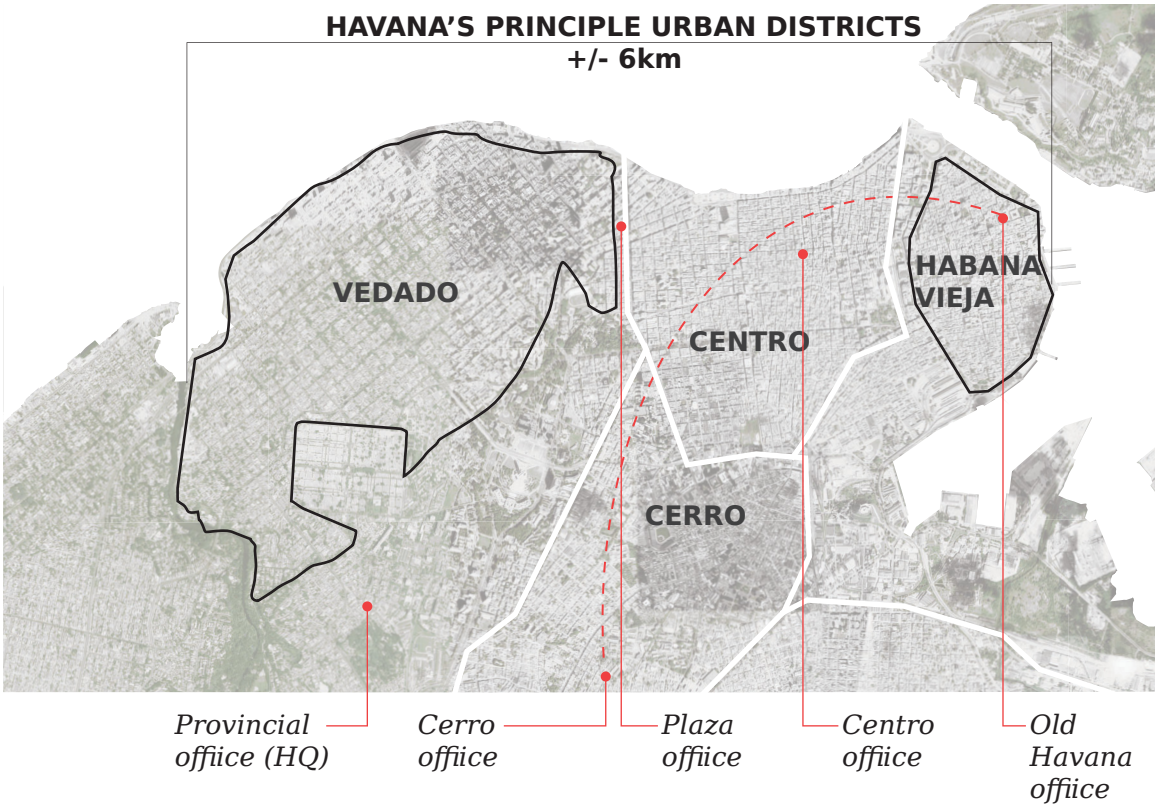



Left: An example of a project by community architects in Old Havana, demolishing many subdivided apartments and unifying them into one. Right: An example of a sub-divided apartment building or *solare*.

building cultures generally (Scarpaci, Segre, and Coyula 2002, 219; Davis 2006, 16). The bureaucratization of collaboration led back to a top-down approach by the government, with differences between resident-beneficiaries going un-serverd:

> Plans executed by microbrigadas did not take advantage of the implicit possibility of alternatives: 'typical' projects fell victim to facilism, norms found nationwide, and a deeply ingrained bureaucratization of problem solving. In turn, architects became mere construction laborers, without any positive consequences for buildings and designs. (Scarpaci, Segre, and Coyula 2002, 221)

Government antagonism against self-builders continued in the form of strict urban regulations, which caused community architects to turn away from design and focus on administrative tasks (Coyula and Hamberg 2003, 30).




Locations of the community architects' offices. Each office serves one municipality of around 100,000 people, with the exception of Cerro which provides architectural services for Old Havana residents as well. The map on the following page juxtaposes example projects provided by the Cerro community architects office against those structures identified as in danger of collapse. Their effforts do not make a great impact on the rate of decay, especially in the south of Old Havana where almost no example projects are located.


*Emergency action required to prevent collapse*
*Locations of projects provided by Cerro offiice*

These were symptoms of an attitude that sought to impose order on the diverse ways that people were solving their own problems.

### *Urbanity Needs Complexity*

> ...an order can arise out of group intentions, depends on urban instincts about proximities and scale relationships, and can ultimately knit together a whole territory. This new order depends on new practices, new relationships: it cannot be imposed as a rational procedure. (Kroll 1986, 5)

Centro and Old Havana are complex urban areas; the single-solution approaches to housing by the state have done little to help these contexts. This is at least partially due to their inability to adapt to anything other than a suburban or rural context.


Top: A typical street in Vedado, one of Havana's more suburban districts.
Bottom: contemporary housing prototypes, from a document provided to me by the community architects in Cerro as an example of efforts to address the housing shortage (Saavedra Ayrado 2015, 78)

Revisiting the example of the community architects: it is a system wherein residents approach an architect as an individual household looking for advice on how to improve their private domain (Valladares 2017, 151). This necessarily prioritizes the needs of single-family detached or semi-detached buildings, and neglects the maintenance and renovation needs of the multi-family, multi-storey buildings more commonly found in the older parts of the city.

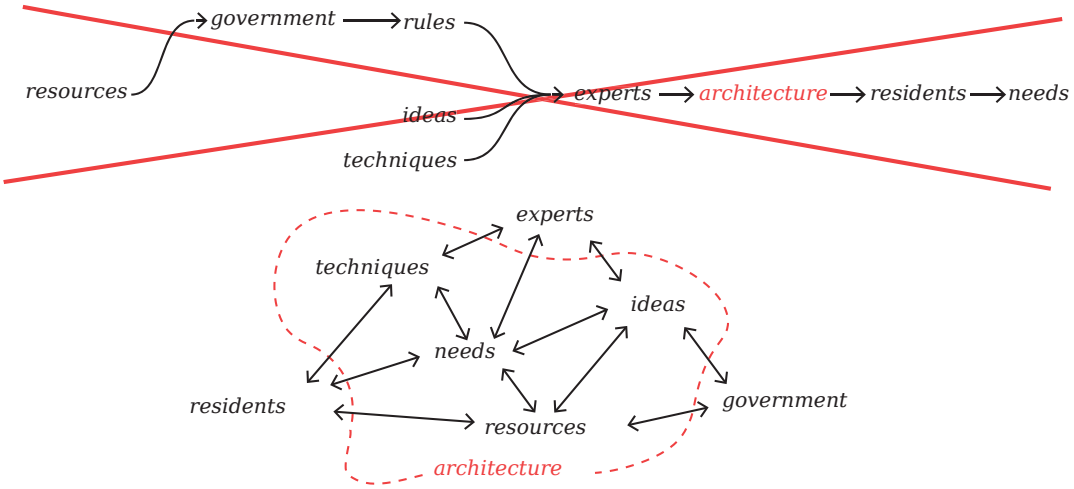
This is consistent with the government's bias against urbanity in general (Sennett 1970, xv; Coyula 2002, 141); in the most generous terms, this attitude is a rejection of disorder, but it results in the erasure of difference. I argue that this anti-urban position is a flawed premise for a policy of expert-assisted self-help housing. Imposing order upon diverse contexts will ultimately fail to accommodate diverse needs (Turner 1976, 118).

Without viable access to expertise, self-builders continue to do things on their own, circumventing regulations. Meanwhile buildings collapse in the old city every few days on average, accelerated by the inexpert adaptations of untrained residents and a lack of maintenance to vulnerable structures due to material shortages (Coyula and Hamberg 2003, 7).

# Chapter 3: Theory and Methodology

> How to harmonize unity and diversity? On the road to equity, in Cuba, we stumble upon homogeneity and fall into monotony, into the typical project. Undoubtedly, the centralization of decisions and projects has some responsibility. The process of economic and social adjustment that we are now going through is diversifying the subjects of change in the city and this undoubtedly brings greater diversity. But up to where? How to harmonize this multiplicity and disparity of decisions and particular interventions in the collective sphere of the city? What should be regulated and what not in the remodeling of the urban space and landscape? (García Pleyán, 2019)

A common shortcoming of the *microbrigadas* and the community architects is their standardized method, enabling only a limited range of outcomes. An urban strategy for self-help housing in Havana needs to support an indeterminate number of outcomes to avoid erasing differences (Turner 1976, 104; Habraken 1972). Methods must be driven by diverse combinations of users and contextual parameters in order to support different circumstances throughout the city.




Comparing a hierarchical approach, where only one process is designed to produce a preconceived architecture, versus an open network approach, which can accommodate many different production sequences, many different network nodes, and thus produce an indeterminate number of outcomes. Adapted from Turner (1976, 10).

## Theoretical Background

Anthropologists have developed ways of understanding human-made artefacts, including architecture, as complex socio-technical assemblages (Yaneva 2009; Ingold 2013; Murphy 2012). These readings identify the human and non-human participants of these assemblages as having an autonomous agency. This favours production processes that function more like open networks than so-called “top-down” or hierarchical processes.

### *How Context Becomes Architecture*

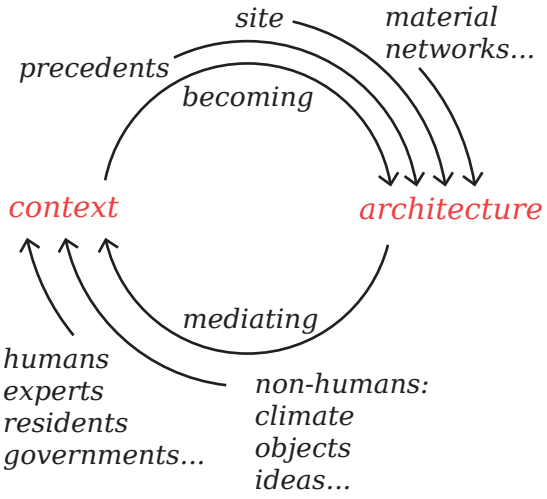
> ..[Projects] assemble numerous humans and non-humans and mobilize them to act together to try and make the project a success. Projects shape their own context (instead of being mere projections of it) and create their own networks by recruiting new crowds of allies... (Yaneva 2009, 16)

The architectural project itself is a network of human and non-human actors collaborating in its own becoming. Collaboration is thus inherent to the practice of architecture. Context changes it and it changes context incrementally, and it does so by involving others. This turns architecture into an active agent of its own design, rather than a collection of passive objects to be acted upon by human subjects (Latour and Yaneva 2008).

### *How Architecture Becomes Context*

> In fact, by building and rectifying the city, shaping the landscape, we build ourselves. It is us and our landscape. (García Pleyán 2019)

Identifying a point of completion for architecture is conceptually problematic (Brand 1994, 2). Since architecture and context influence each other long after the architects have left or the last brick has been laid, there isn’t a singular moment when we can say the architecture project is finished. It is always becoming, in the sense that as new




How architecture becomes context and context becomes architecture. Adapted from Turner (1976, 67).

users engage with it, a whole new set of uses may emerge; or that as it moves through time, new understandings of its history will develop.

Thus architecture becomes context, not just for itself in process, but also for others to project new visions of a future, to construct new histories, to design new architecture. These new creations, in turn, create their own contexts.

## Theory-Informed Methodology

Viewed through this lens, architecture is inherently both collaborative and incremental. It might best be described as a bricolage: diverse parts are brought together haphazardly, based on whatever extant parts of the context are affected and whatever new parts might be able to mitigate conflicts that arise.

The methodology I am developing here has a similar bricolage construction: ideas come from diverse sources and serve different theoretical functions. The methodology is not purely inherited from any single theorist, nor is it intended as

an optimized, unified theory of self-help housing. Instead, different ideas are recruited according to their immediate usefulness in a given situation. This is because prospective methods should be capable of synthesizing different ideas as they respond to different contextual parameters, whether intellectual or material. I propose this as an alternative premise for the production of self-help housing in Havana, different from the systematic approaches of prior bureaucratic efforts.

## Architecture as Mediation

Building on this premise, I hypothesize that architecture could best function as a mediation of ongoing collaborations between diverse participants, both human and non-human. As a mediation, architecture provides context for self-builders and professionals to better target their efforts; it establishes mutual trust among collaborators, and models optimism and openness to new ideas. It expands our understanding of what is possible by widening narrow assumptions of problems and solutions (Gray 1989, 166).

Gray's definition of a mediator includes all these roles among many others in an open-ended framework, more like a job description than a theory of mediation. It invites personal judgment of how best to aid a collaboration: "The process by which mediation is conducted is in the hands of the mediators" (Gray 1989, 162).

Adapting this concept to architecture invites a diversity of styles and approaches. Gray lays out what a mediator should achieve in their role, without explicating how they should go about it. Architecture as mediation is thus more responsive to difference and subjectivity than Livingston's participatory architecture, which generally prescribes both

who should be involved and how collaboration should be structured (Valladares 2017, 114).

Successful outcomes of collaboration occur when the autonomous parts of context and architecture work together to achieve “consensus” (Yaneva 2009, 154). The success of an architecturally-mediated project can therefore be measured by the degree to which parts work together, and conflicts between parts are mitigated. In general, architecture as mediation seeks a balance between the autonomy of parts and the organization of the whole project.

## Using Levels to Organize Context

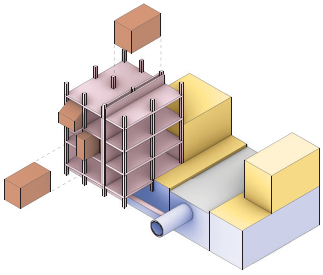
> How to combine socialization and privatization? It is clear that the city is a fabric of public and private spaces, but what are their respective limits? What spaces can be privatized and which not? We must redefine what is legitimate and what is not in citizen coexistence. (García Pleyán 2019)

Habraken’s theory of open building offers a way to intentionally organize diverse parts as they become architecture. He shows how different parts of a building can become context for other parts incrementally, and can be structured by their level of collective or individual concern:

> The architect designs a building within the context designed by the urban designer....We may talk about architects designing buildings and urban designers designing street patterns, or we may talk about home owners owning buildings and the municipality maintaining the public streets; in both cases we make the same distinction in the physical world between those parts that belong to one level (the streets) and other parts belonging to a lower level (the buildings). (Habraken 2002, 6)

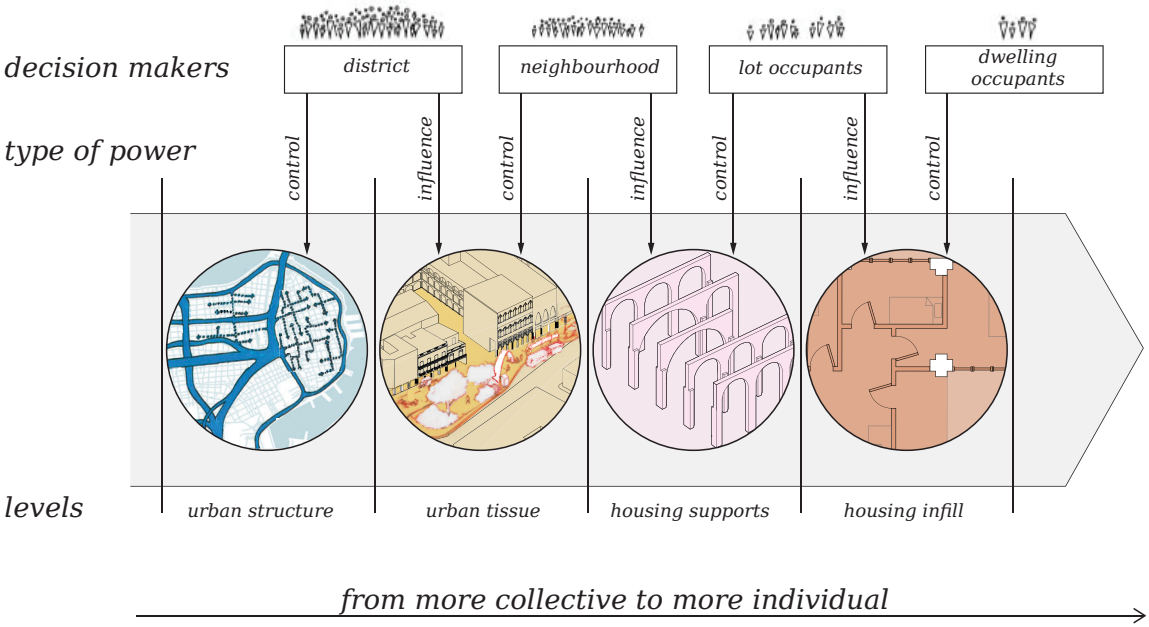
Habraken’s levels are explained as a tool to break down the built environment as a collective project, capable of being acted upon by a multitude of others. Of particular interest in this project is his introduction of the support level.

Supports are a concept for designing multi-unit residential buildings as infrastructure projects: three-dimensional



Habraken's levels, colours correspond to diagram below.

streets supporting the building activities of others. Habraken suggests that these should be similarly resilient to street construction, built to last centuries and withstand the deteriorating effects of changing infill (Habraken 1972, 61). Infill, in Habraken's nomenclature, is the most individuated of his levels, typically referring to the unit dwelling in a support structure.




Habraken's levels, adapted from an existing diagram (Cuperus 2001, 3).

### *Detailing as Autonomous Design*

Following Habraken, Turner argued for the promotion of user autonomy in housing, though he further expressed this as a need to identify the limits of autonomy and heteronomy. On one hand, the goal is to enable users to self-determine their housing solutions. On the other, we must define the limits of the governing system within which users reside (Turner 1976, 9). Presently, this means returning some control of the design of housing to the residents themselves, enabling

them to solve their own problems with the provision of some resources and support from experts.

Asking experts to turn control of design over to self-builders inevitably raises concerns about architectural coherence. Granting users autonomy over their housing may mean dispensing with some higher-level architectural concerns, such as style, economy of scale, or typical design for expedient mass production. These are problems which individual users are often not concerned with in the production of their own housing.

I argue, however, that user autonomy does not need to come at the cost of coherence. Ford offers a supporting concept of good architectural detailing as an autonomous design activity:

> The good detail is not the part from which the whole is generated, not the idea of the whole carried into the part, not the consistent application of a set of principles, not the paradigm for the totality of the building....At its best it is an autonomous activity, and, at times, even subversive. (Ford 2011, 46)

Autonomous detailing allows the design of parts to solve their own problems, while being critical of whatever order is governing the whole. Autonomous details are allowed to cross many of the lines established by the ordering devices of the whole:

> In the autonomous detail, information that has for the most part been suppressed is suddenly brought forward, even exaggerated. The autonomous detail crosses a line between these two languages of expression, between the abstract and the representational. But it crosses many other boundaries as well between the primary and secondary elements of a building, between the structural and the non-structural, between furniture and architecture. (Ford 2011, 237)

According to Ford, autonomous details may even be at their best when they subvert or negate their context, standing out as a counterpoint to an otherwise consonant architectural

statement (Ford 2011, 237). Though this might seem to contradict the imperative of consensus among parts which I called for earlier, I argue that parts do not need to be saying the same thing in order to agree, nor do they need to agree completely in order to work together. Autonomous detailing is therefore an argument in support of difference within architecture.

Ford's concept addresses a theoretical tension that exists between the separate categories of parts in Habraken's levels and the interconnectedness of all parts in Actor Network Theory. For example, while the concerns of a support project occupy a higher level than the infill project, the design of the support elements can be allowed to blur the boundary between the two levels via autonomous detailing. Therefore, as I will demonstrate later, a large inverted transfer beam can be designed with the intention of defining a countertop; or conflicting structural languages can be combined, such as compression-optimized vaults that use collar ties to capture thrust forces, reducing the overall depth.

This makes autonomous detailing useful for self-builders infilling a support structure, especially for individuals who might be operating at more than one level simultaneously. It offers a way for an architecture which solves diverse pragmatic problems to achieve a high standard of architectural quality by creating a critical relationship between the part and its context.

# Chapter 4: Design Applications

> People are social beings. Their identification is endangered not only by being subjected to uniformity, but also by taking a position too extreme in relation to those whose judgment they value. (Habraken 1976, 39)

## Method of Testing Theory

I test this methodology by working through a simple scheme: to support new and existing self-built architecture on a site in Old Havana. As I will explain in detail below, there are a number of aspects to the site that are characteristic of Old Havana.

As a method, the exercise begins with assembling parts, which Yaneva describes as a project shaping its own context. These will be organized according to Habraken's levels to determine their influence, and ultimately their role in the assembly.

## Shaping and Organizing Context

Parts of the context are presented and organized in four levels: urban structure, urban tissue, building supports, and building infill. I have already explained supports and infill in the previous chapter: the former being the domain of experts to provide a stable building infrastructure within which dense, autonomous housing infill can be developed by non-expert users. Habraken elaborates on the two higher levels:

> The terminology may be familiar with exception, perhaps, of the word 'tissue'. The so called 'urban tissue' is the level of the streets and related urban elements on the scale of the neighborhood, most directly related to the building. The term is introduced to make a distinction with the 'urban structure' of major roads and other infrastructures of the city. (Habraken 2002, 8)

## Urban Structure

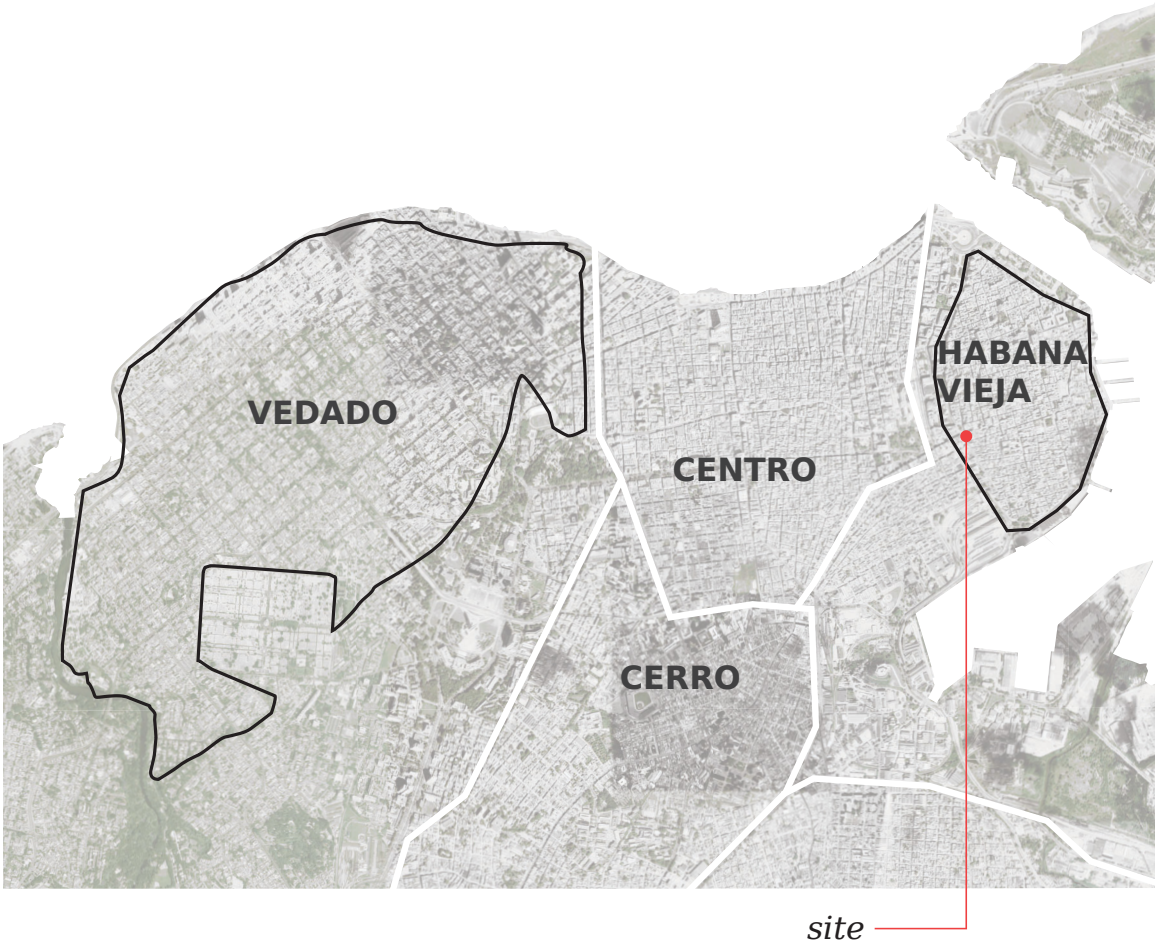
The selected site is on the edge between Centro and Old Havana, still in the UNESCO heritage district. It contains characteristics of both municipalities.

The heritage district is governed by a separate bureaucratic authority, the Office of the Historian, who publish extensive information about the conditions and goals for Old Havana (Pardo and Montiel 2016). This includes information about the physical condition of buildings, architectural styles, the state of municipal services, population density per block, and program distribution in the district.

In general, electricity and water are unreliable and so require on-site strategies (diesel generators, gas motors, and water storage tanks). Gas for cooking is more reliable.

Rooftop containers for domestic water supply (Pérez et al. 2019)

The site is just within the area known as intramural Old Havana, facing the location of the gate in the now demolished defensive wall. The wall was replaced by a major road, and a public transit node occupies the minor plaza directly to the west of the site.

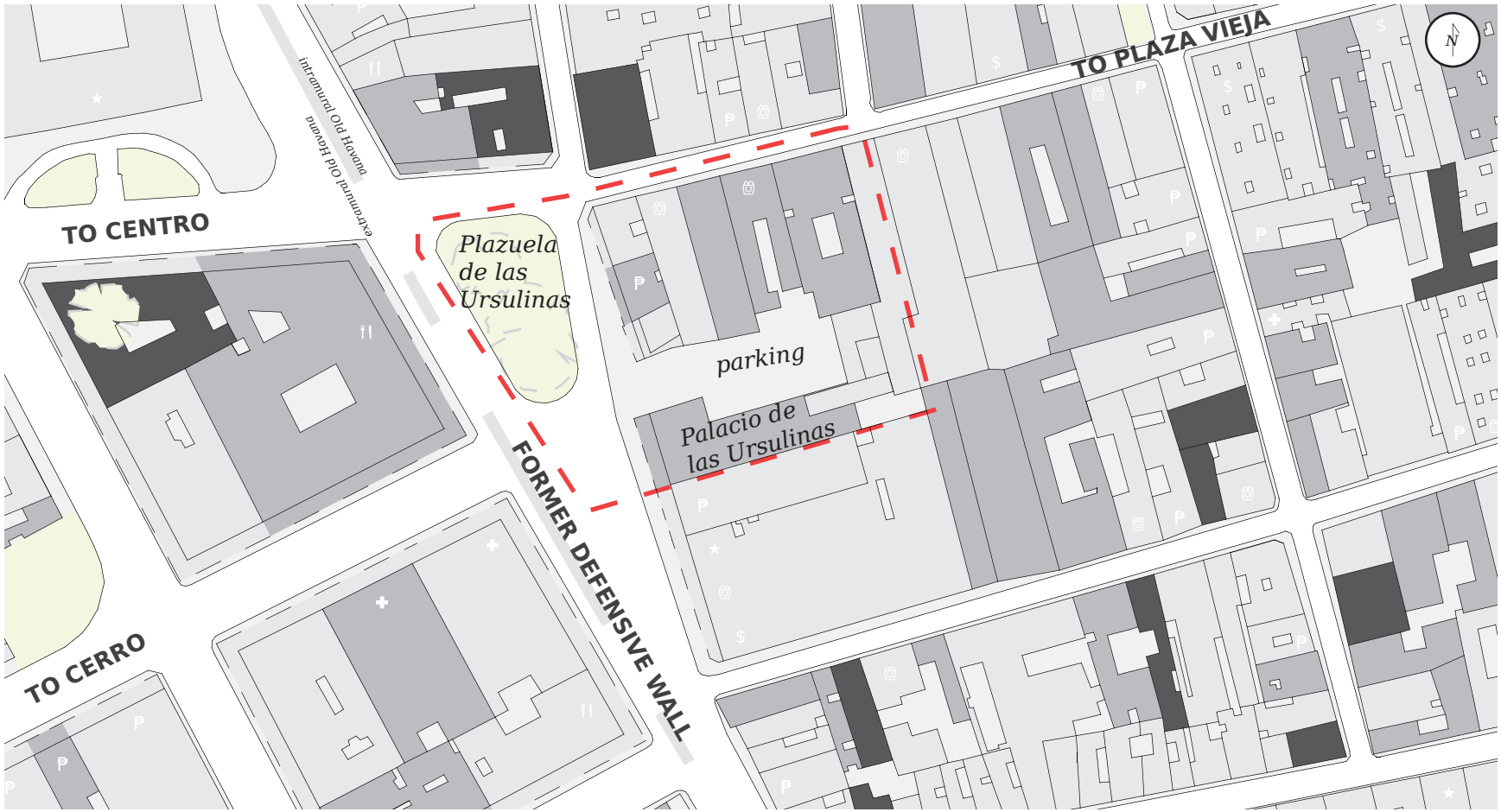



Map of Havana's urban municipalities, showing the location of the site.

## Urban Tissue

The minor plaza is surrounded by roads on all sides, and a network of porticoes shades their sidewalks. Porticoes like these are commonly found along avenues and major roads, especially around the perimeter of Old Havana and throughout Centro.

The site itself is on two lots: the northern lot is open where a building collapsed and was cleared, now occupied by parking for bicycle taxis (*bicitaxis*). They provide transit within the narrow streets of Old Havana and Centro, where buses and cars are mostly absent.




Map of the neighbourhood, including program, physical state of buildings, and layout of sidewalks and roads.

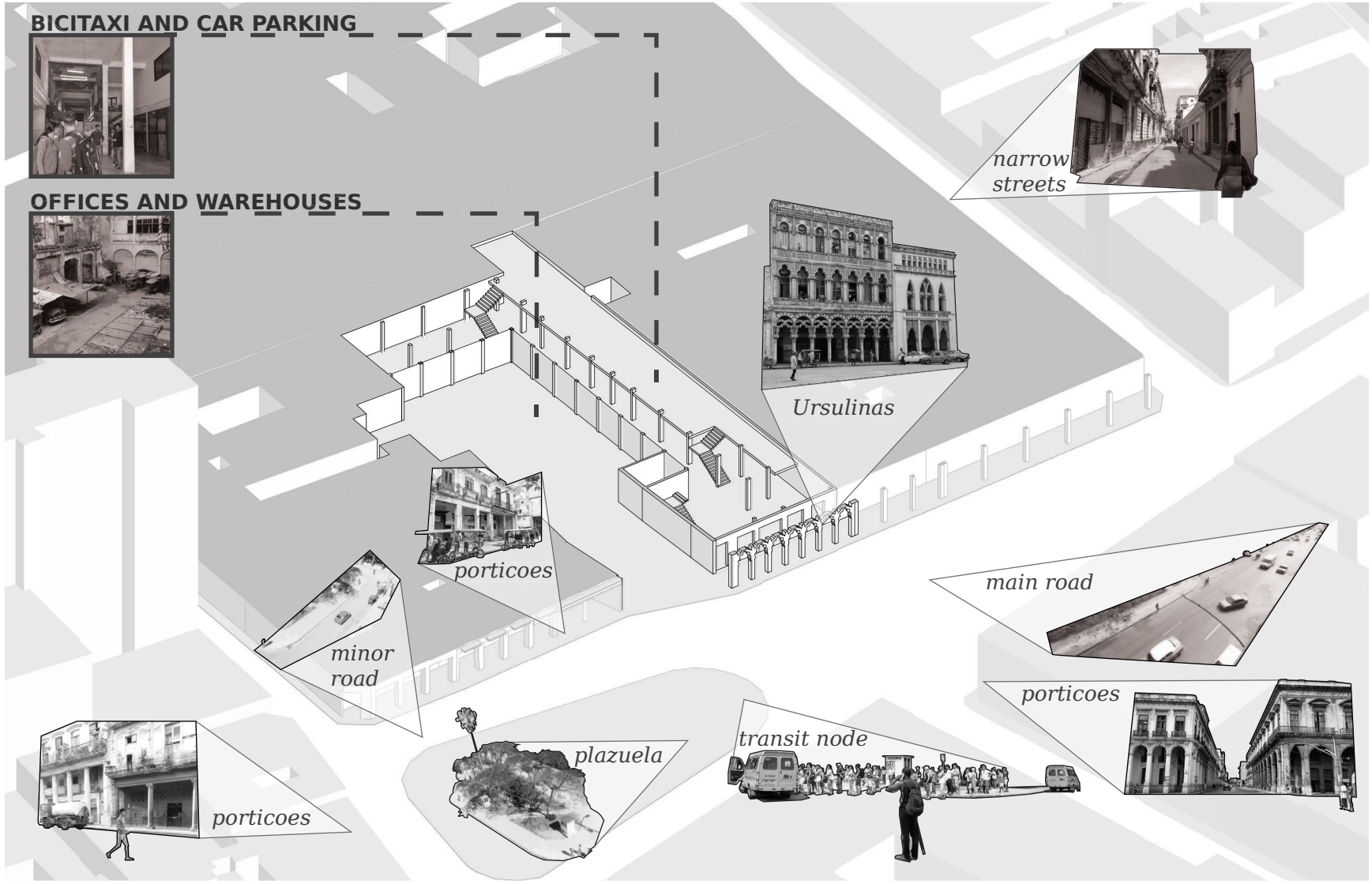
*Bicitaxis* provide their transit service within the narrow streets of Old Havana. Even though they are more expensive per distance, they survive because busses cannot fit down these streets, and taxis are less effective due to the volume of pedestrians.

*Bicitaxi* maintenance and storage in the open lot portion of the site.

## Building Supports

The southern lot is occupied by a 100-year-old, mixed-use residential building, a typology commonly seen in this area. This building was initially a convent for the *Ursulinas,* the Ursuline nuns from New Orleans. It has since been appropriated to fit almost 30 small apartments.

This appropriation is a common scene in Havana. Following the 1959 Revolution, many larger buildings, even non-residential uses, were nationalized and distributed to




Close up map showing the ground floor of the site and its immediate surroundings.

Conditions in the *Palacio de las Ursulinas*: self-built vertical subdivisions (*barbacoas*) can be seen facing the street, adding load to the deteriorating structure below.

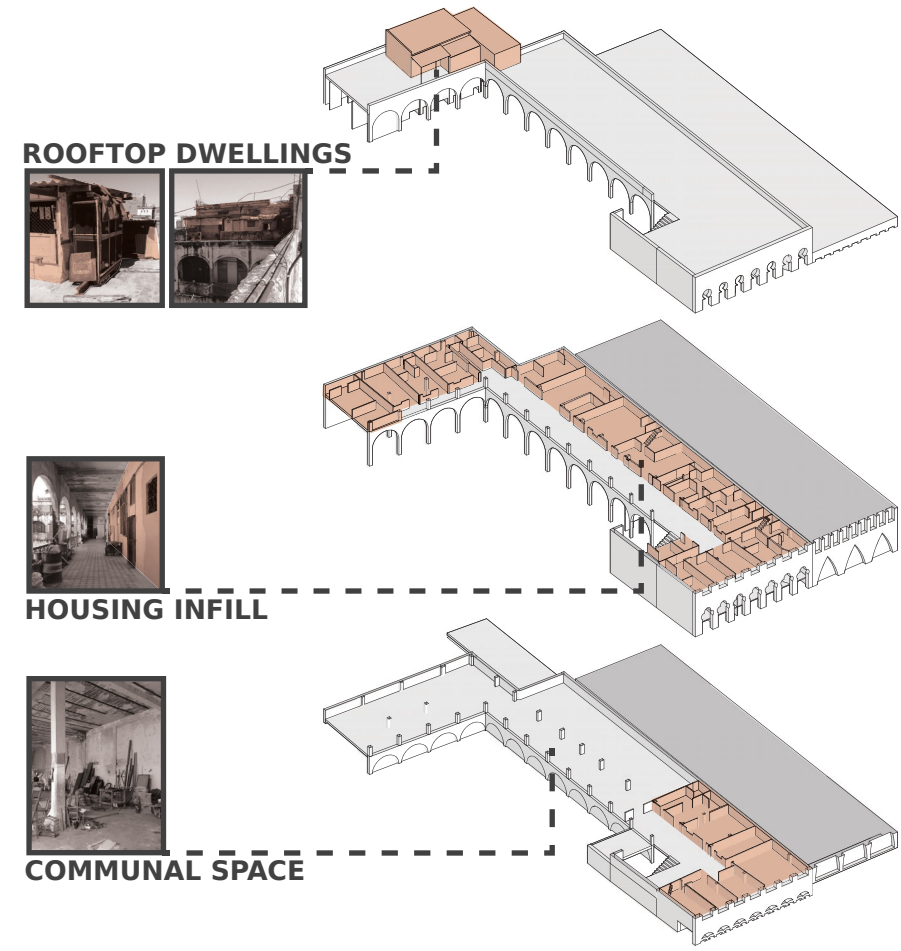
those with inadequate housing. In order to accommodate as many people as possible the buildings were subdivided into tenements with many small apartments (Coyula and Hamberg 2003, 7-8). They essentially function as supports, though they were not designed for this purpose.

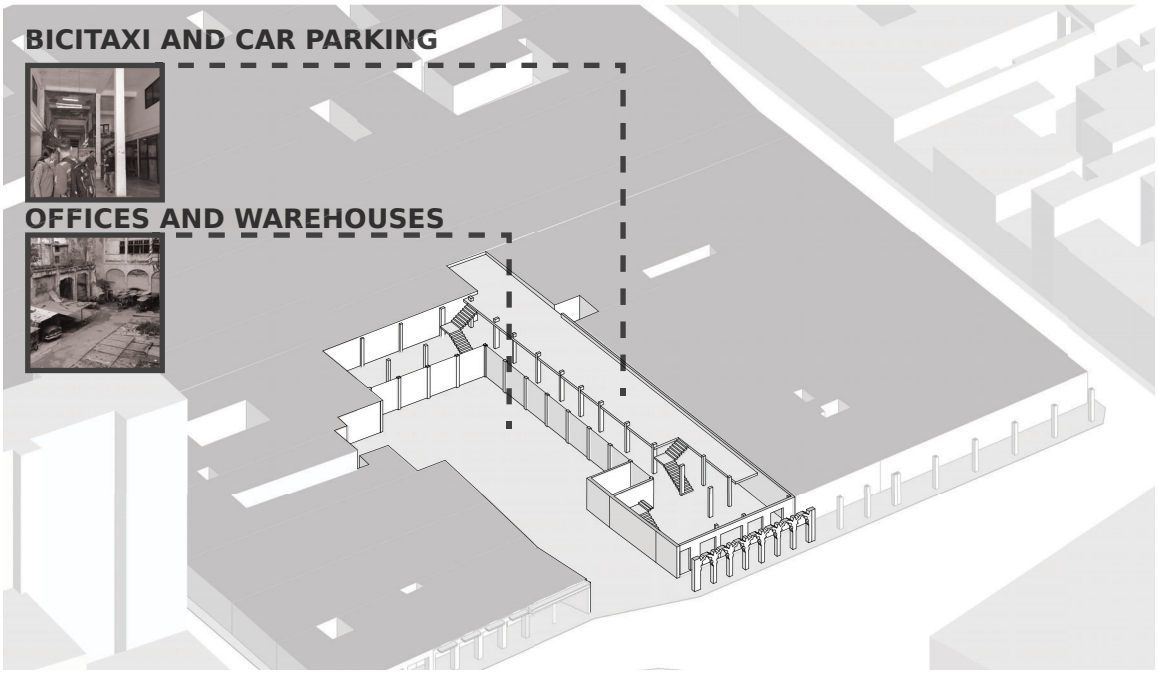
The floors have high ceilings, a common thermal comfort strategy seen in the old city. Many of these high spaces have been subdivided by residents into lofts or *barbacoas* to gain a little extra floor space. *Barbacoas* are common in Old Havana and Centro:

> The barbacoa is generally the first major self-built transformation of the home for those who live in Havana. It expands the living potential of a single room. These transformations are prompted by necessity and centered on the person and the family, as is manifest through the spatial reorganization of the home and its functions. (Del Real and Scarpaci 2011, 67)

The building has a central courtyard or *patio*, which is another common strategy for cross ventilation that has evolved with the densification of Old Havana and Centro

Front facade of the *Palacio de las Ursulinas* (Pérez et al. 2019).




Exploded isometric showing the layout of the existing building.

The common utility area on the second floor of *Ursulinas* (Pérez et al. 2019).

(Tablada et al. 2009, 1945). Covered balconies facing into the *patio* provide circulation between apartments. Because the *patio* opens into the empty lot which formerly contained a building, the *bicitaxi* drivers have claimed the ground level of the *patio* for more parking and storage. The second floor has no secondary ventilation due to the height of the neighbouring building, which may be why no apartments have been created here. Instead it is used as a common utility room for the residents.

*Bicitaxi* parking appropriating the ground level of the building's central *patio* (Pérez et al. 2019).

## Building Infill

Many people in tenements live in single room apartments, often sharing a bathroom with their neighbours. People gradually retrofit their small space to claim a little more autonomy by adding private bathrooms or kitchens (Coyula and Hamberg 2003, 7). This can be seen in the ad hoc installations of plumbing, electrical wiring, and gas conduits running along the outer walls of apartments.

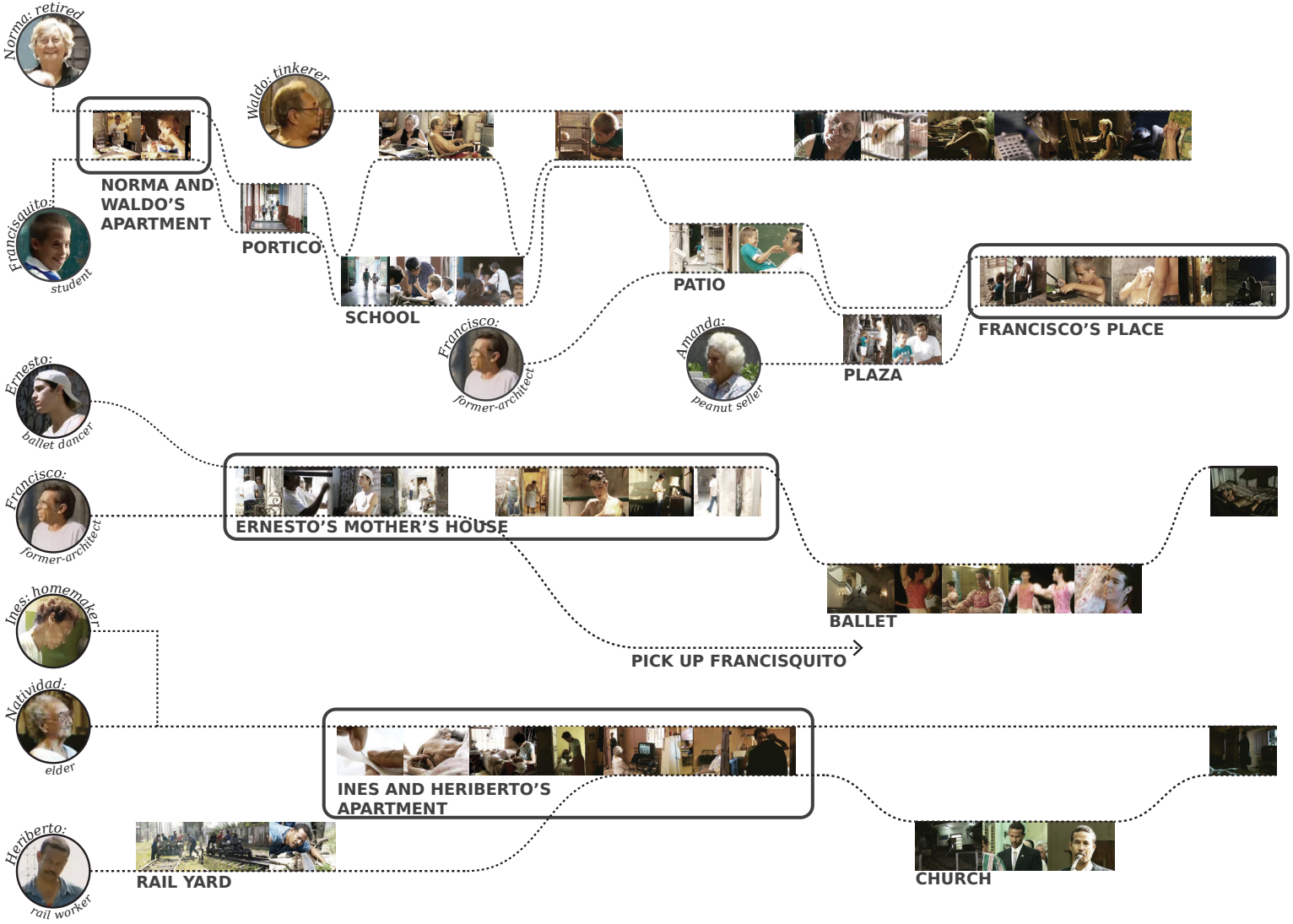
Ad hoc installations of gas and electrical conduits in the building (Pérez et al. 2019).

## Informed Speculations on Infill

In order to avoid developing a uniform approach to design, the method requires much more specific information about the way people live than the context surveyed thus far. However, this is also where the information I was able to collect on site (most of which was provided by Cuban students), reached its limit. Surveys of this site did not extend into the residents' apartments to document their modes of habitation.

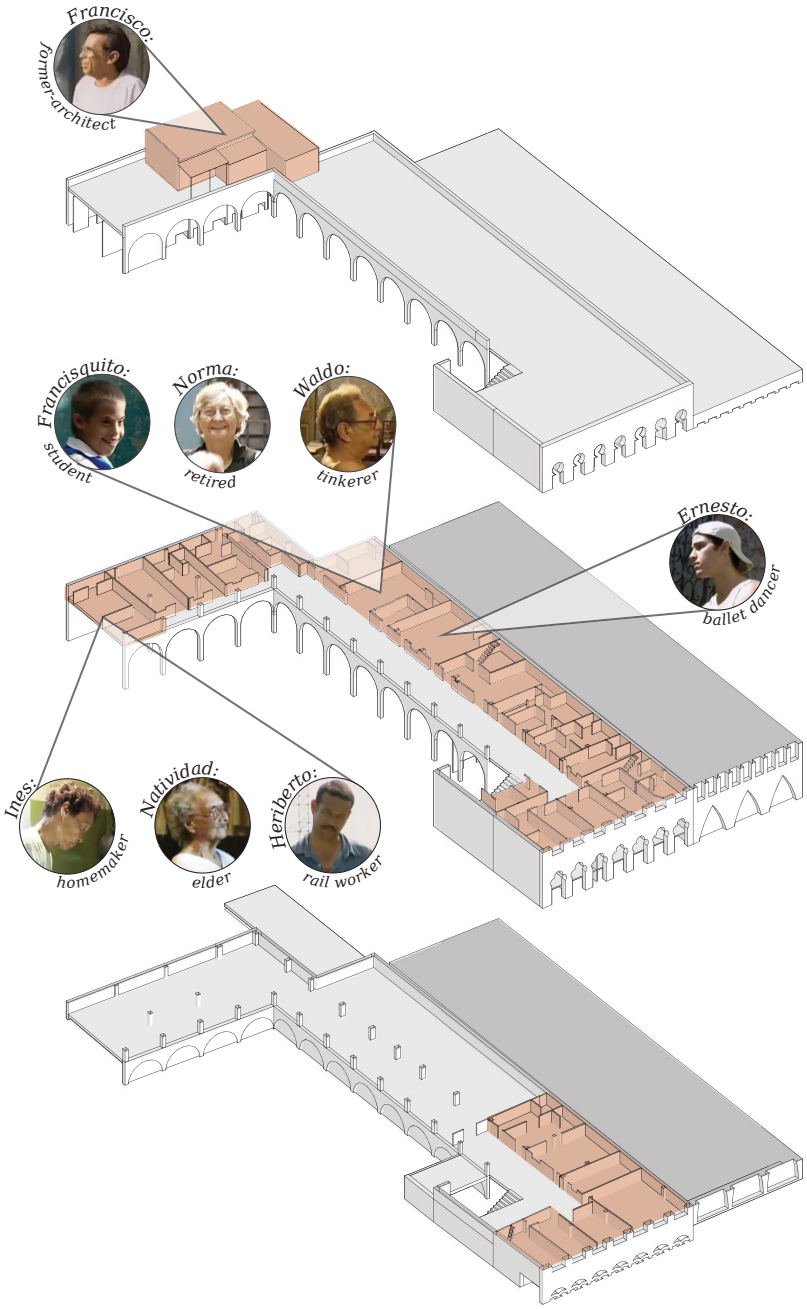
To acquire information of this type to work with, I analyzed a documentary film: *Suite Habana* by Fernando Pérez (2003), which documents a day in the lives of 13 people living in Havana. Referencing the film allowed me to borrow the gaze of this Cuban filmmaker, supplementing my own tourist gaze. Many of the characters live in Old Havana and Centro, so it was easy to imagine them interacting with this chosen site.

Therefore, I analyzed the film, transcribed the narratives of individual characters as they interacted, and drew the spaces they inhabited. I then synthesized this analysis with the other levels of context above, speculating on how the specific characters in the film could collaborate within this




Analysis of the documentary *Suite Habana* (Pérez 2003) visualizing the interactions of characters.

specific site. The result is a plausible fiction, an alternate reality, representing an extensively analyzed context. Graphically this analysis and synthesis are influenced heavily by *¡El tiempo construye!* (García-Huidobro, Torres Torriti, and Tugas 2008), in both format and substance. Due to the granularity of the film analysis, I intersperse it here within my narration of the resulting design.




Exploded isometric showing a synthesized alternate reality: the locations of apartments within *Ursulinas* inhabited by the characters from *Suite Habana*.

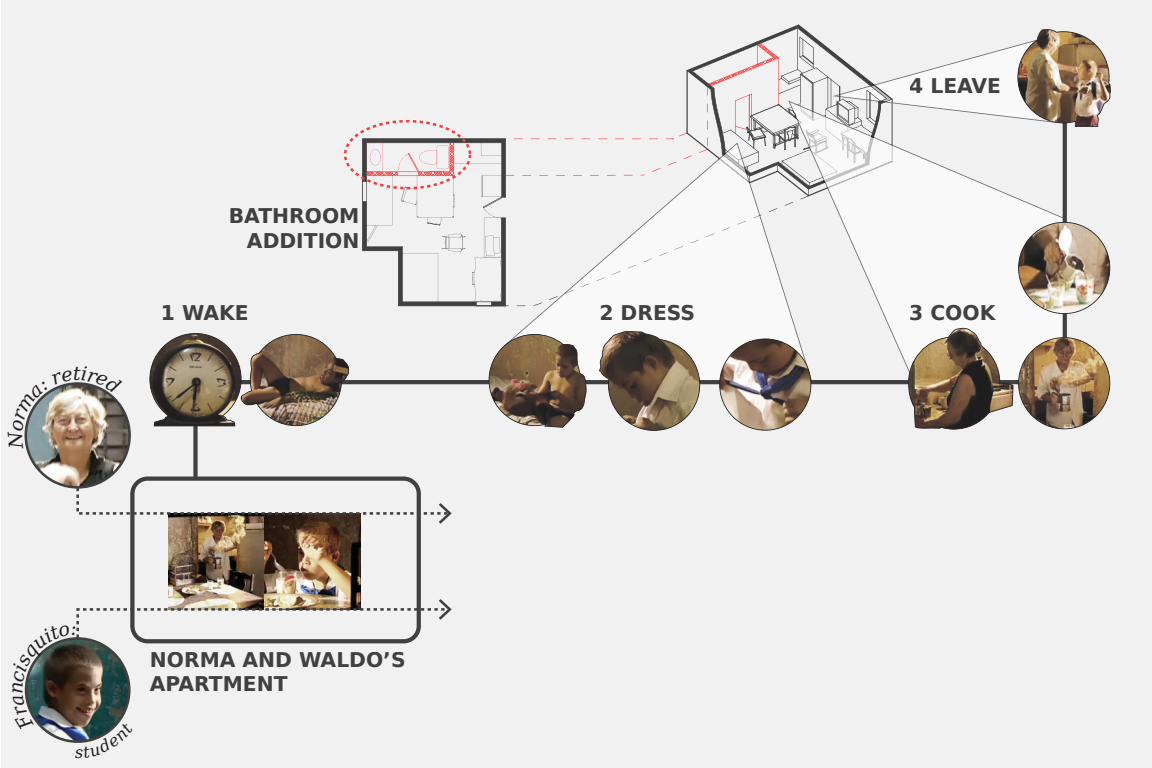
### *Francisco*

A central character in the documentary is Francisco: He's a former architect who opted to leave his state job and work informally as a builder, so that he could take time as needed to be with his son, Francisquito, who has Down's syndrome. The grandparents, Norma and Waldo, help care for Francisquito since his mother passed away. Francisco appears to live in a rooftop dwelling he has built for himself.

In the alternate reality, Francisco lives in a rooftop dwelling in *Ursulinas* and serves the building as a resident architect, procuring resources from the government and designing the architecture that will support people's infill projects.

### *Francisquito's Day*

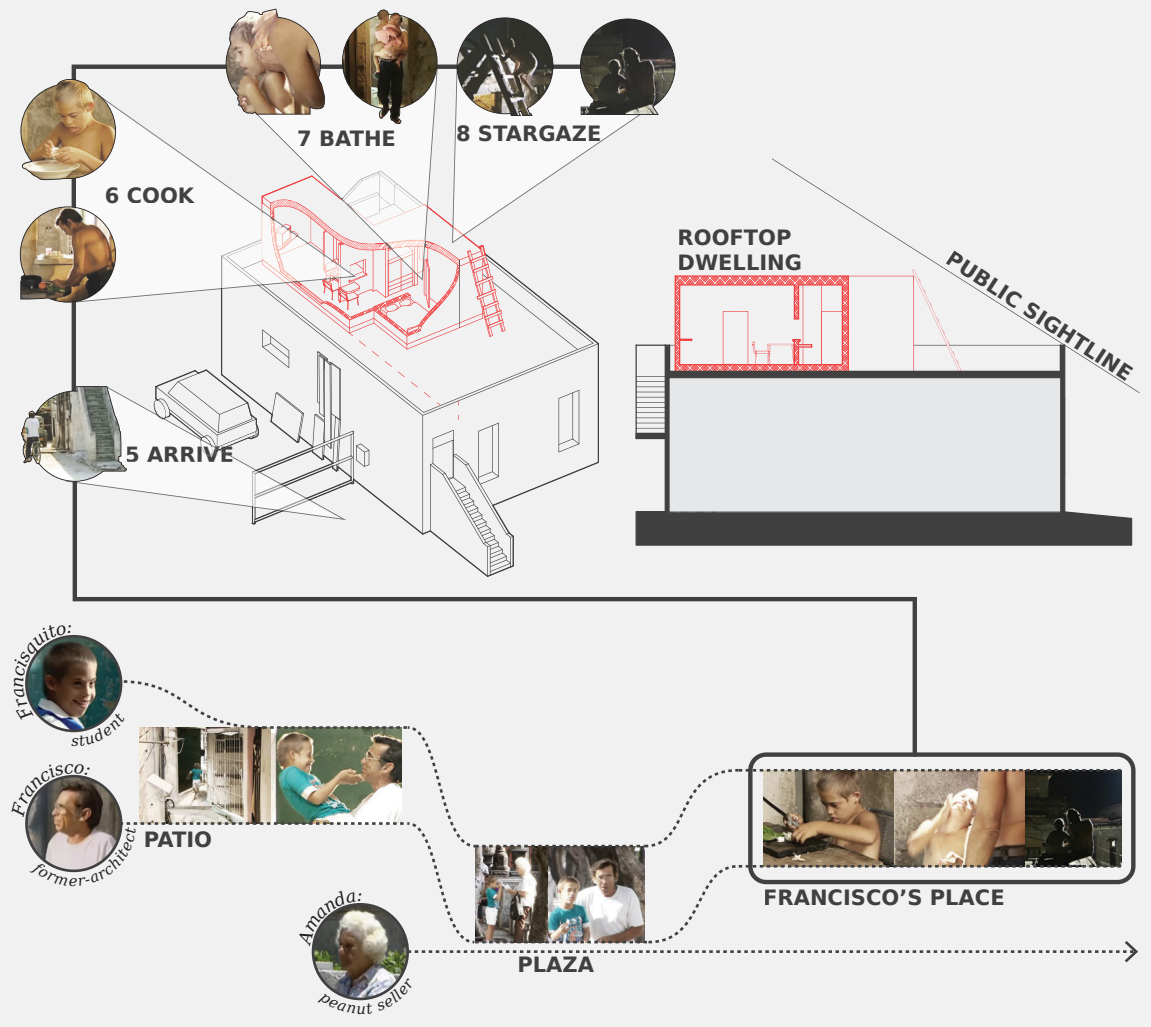
First, the documentary follows Francisquito as he wakes up, gets dressed, and has breakfast. Norma helps him get ready and walks him to school, and Waldo emerges from




Film analysis: Francisquito's morning in Norma and Waldo's apartment.

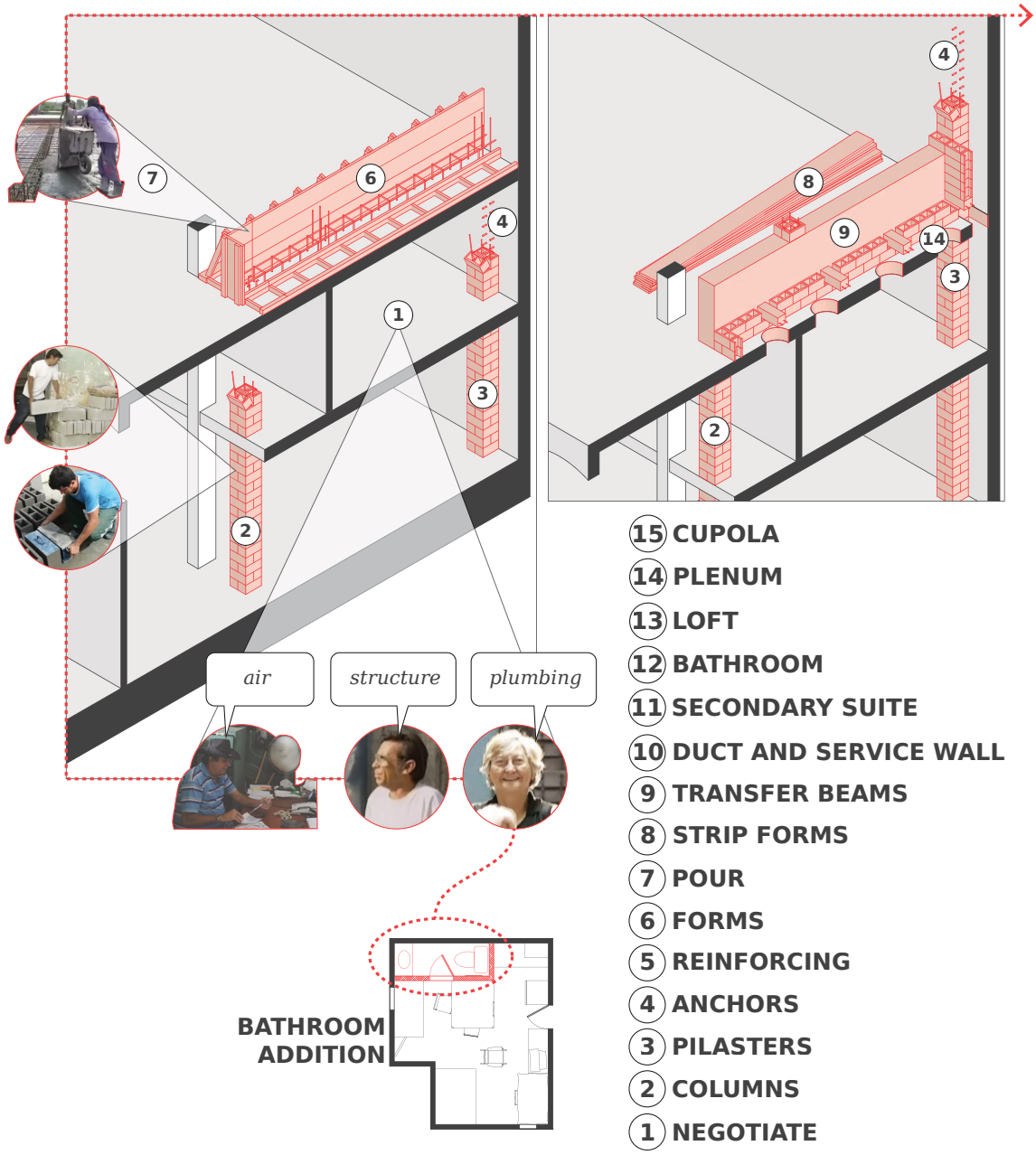
the bathroom as they leave. We see the efficient layout of their small room, and that they've squeezed in a very small bathroom, likely so that they can stop sharing a communal bathroom with their neighbours. Francisquito then carries on with his day, gets picked up by Francisco after work, and they go to his place to cook dinner, wash up, and watch the stars from the roof.

The alternate reality rewinds to when Norma and Waldo are still preparing to put in the bathroom. They'll need a connection from their third floor apartment to the ground for plumbing. Francisco might advocate for Francisquito to have some privacy by putting in a *barbacoa*.




Film analysis: Francisquito`s evening in Francisco's apartment.

The decaying structure below cannot support more weight, and because they don't have access to the existing columns from inside their apartment, they will have to add new columns as well as transfer beams to avoid the programmed spaces below them. This involves a negotiation with the office owners to trade a connection to fresh air through the apartment, in exchange for space to put in pilasters and a soil stack.

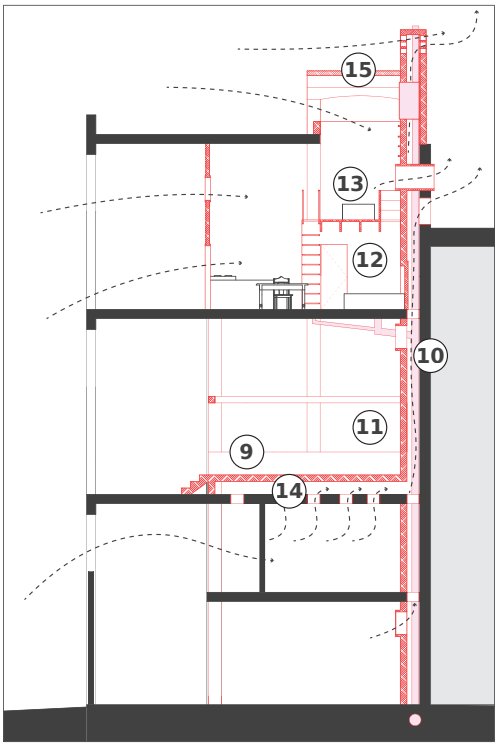



Alternate reality: first steps in the project to add a bathroom to Norma and Waldo's apartment.

The columns are concrete block, reinforced with short lengths of rebar and filled with concrete in short lifts. Blocks can usually be delivered or fabricated on site if cement is available. Rebar is abundant, and these columns can even make use of short or bent scraps tied together.

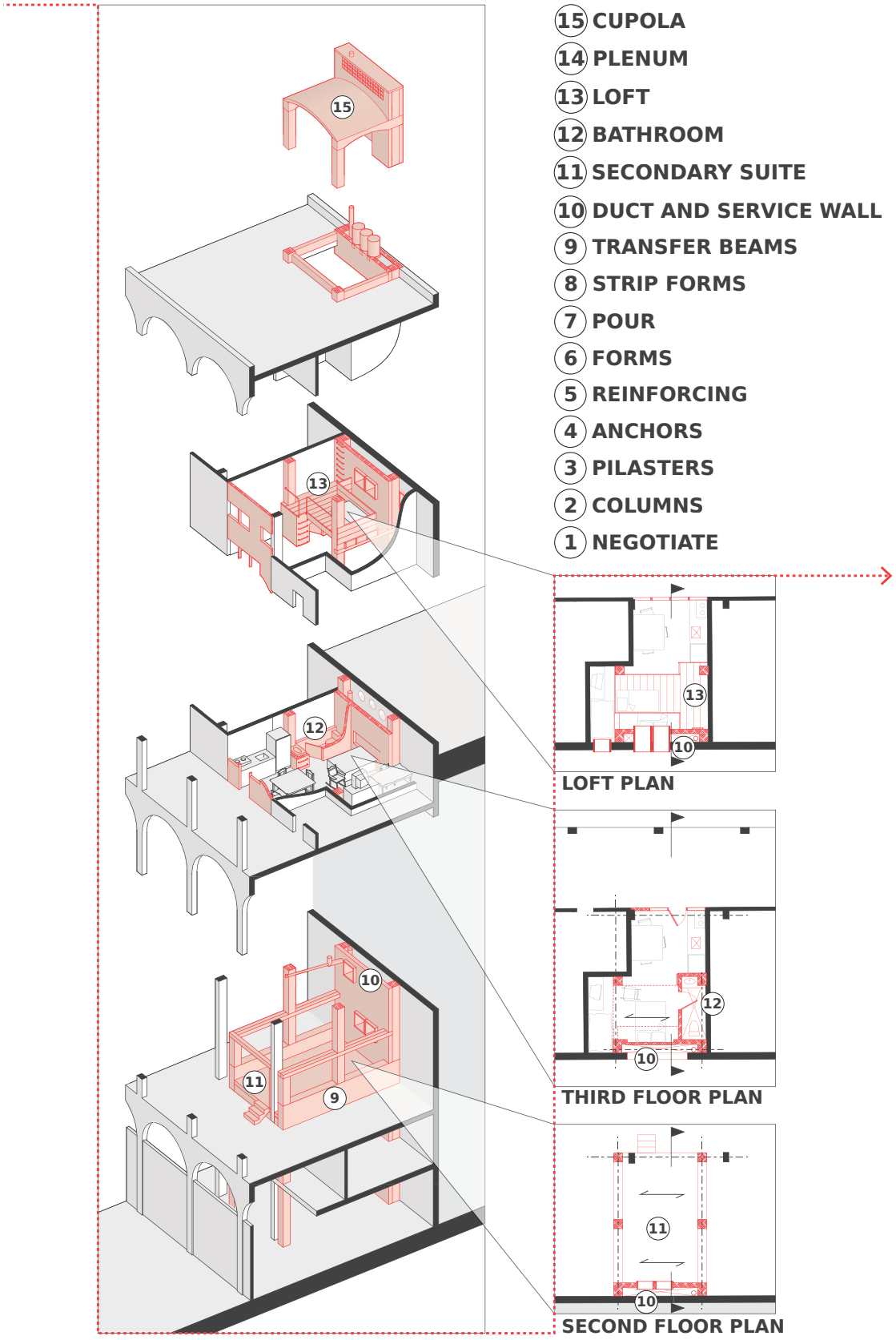
The transfer beams are of conventionally reinforced site-cast concrete, which is a major undertaking. For Francisco and a small crew, likely the easiest way to add these beams is directly on the second floor, picked up by new columns below. He drills and grouts rebar dowels into the floor to tie them in, then forms a box on the floor using wooden boards. The new beams support the columns he has planned for the unit above, and he uses the space created by the inverted

15 CUPOLA
14 PLENUM
13 LOFT
12 BATHROOM
11 SECONDARY SUITE
10 DUCT AND SERVICE WALL
9 TRANSFER BEAMS
8 STRIP FORMS
7 POUR
6 FORMS
5 REINFORCING
4 ANCHORS
3 PILASTERS
2 COLUMNS
1 NEGOTIATE




CROSS-SECTION

Alternate reality: cross section of the building at Norma and Waldo's apartment, showing the cross ventilation strategy.

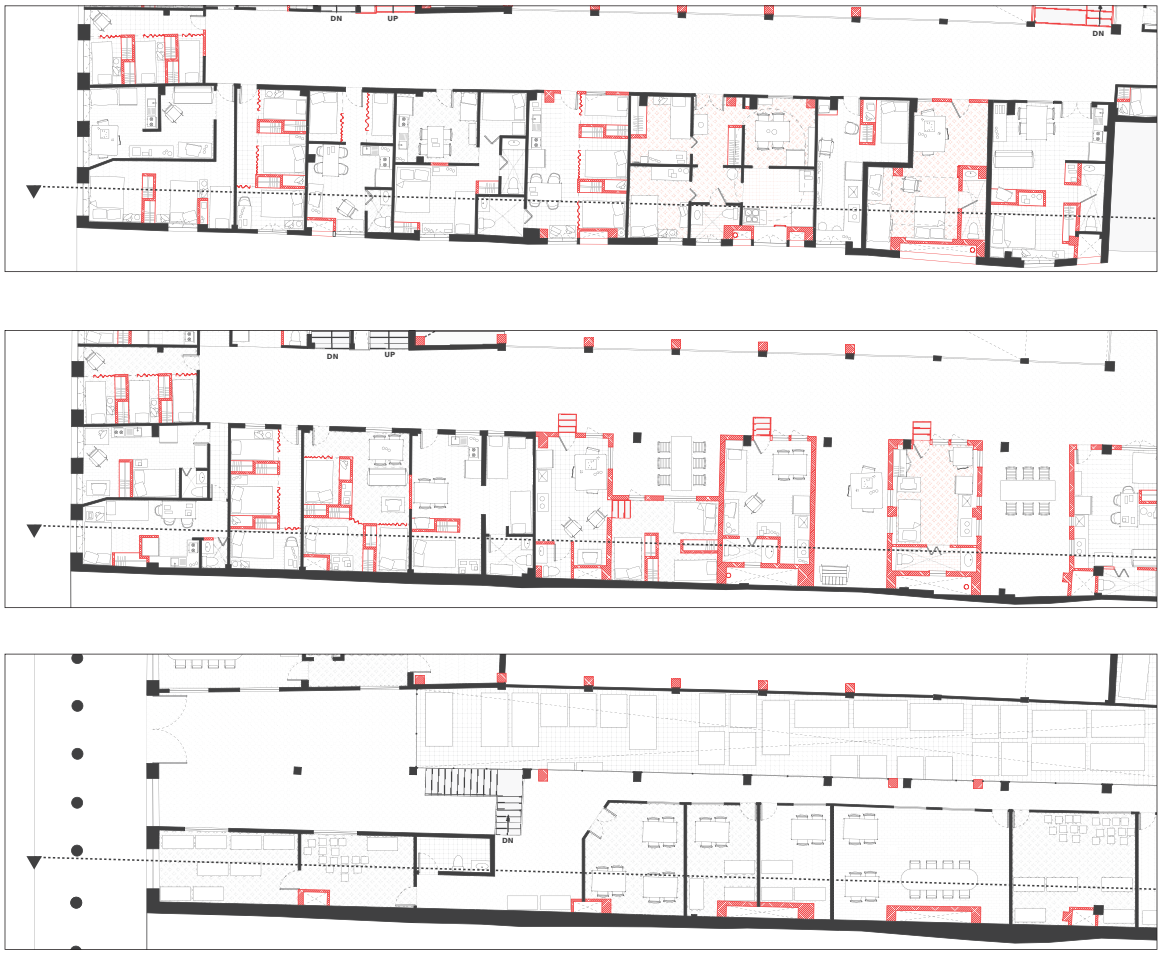



Alternate reality: exploded isometric and plans showing the overall scheme of the first project.

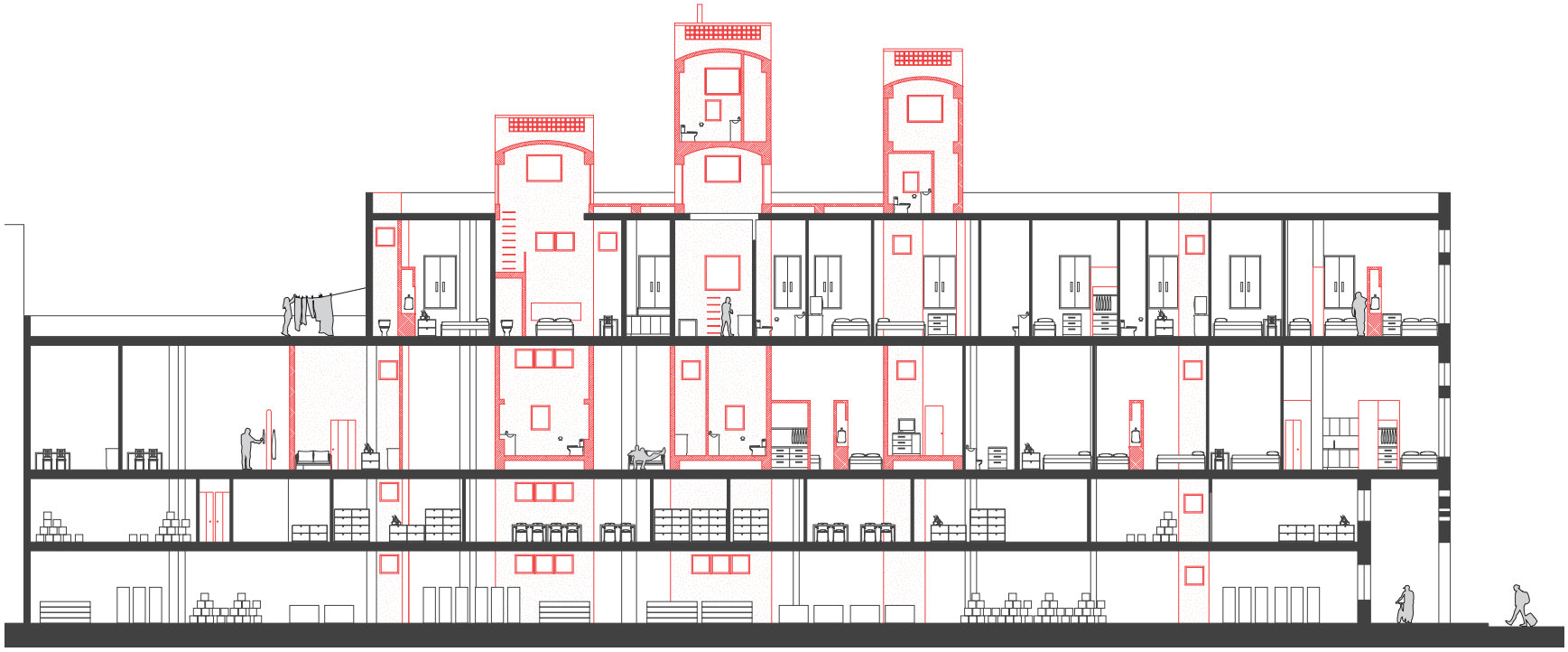
structure to form an exhaust plenum for the offices below. The resulting second floor space could be viable as a room, and potentially sold or rented to finance additional projects.

The masonry columns carry up through the floor above, which allow Francisco to build a loft out of stockpiled boards and old formwork. He then opens up the roof to create more headroom for the loft, providing more air, light, and giving Francisquito access to his own stargazing platform above.

This strategy can then propagate along the southern wall, as the negotiation between residents and the office workers below continues to be relevant.




Alternate reality: partial plans showing how the approach propagates along the southern wall of the building. From top to bottom: Third Floor, Second Floor, Ground Floor Mezzanine.

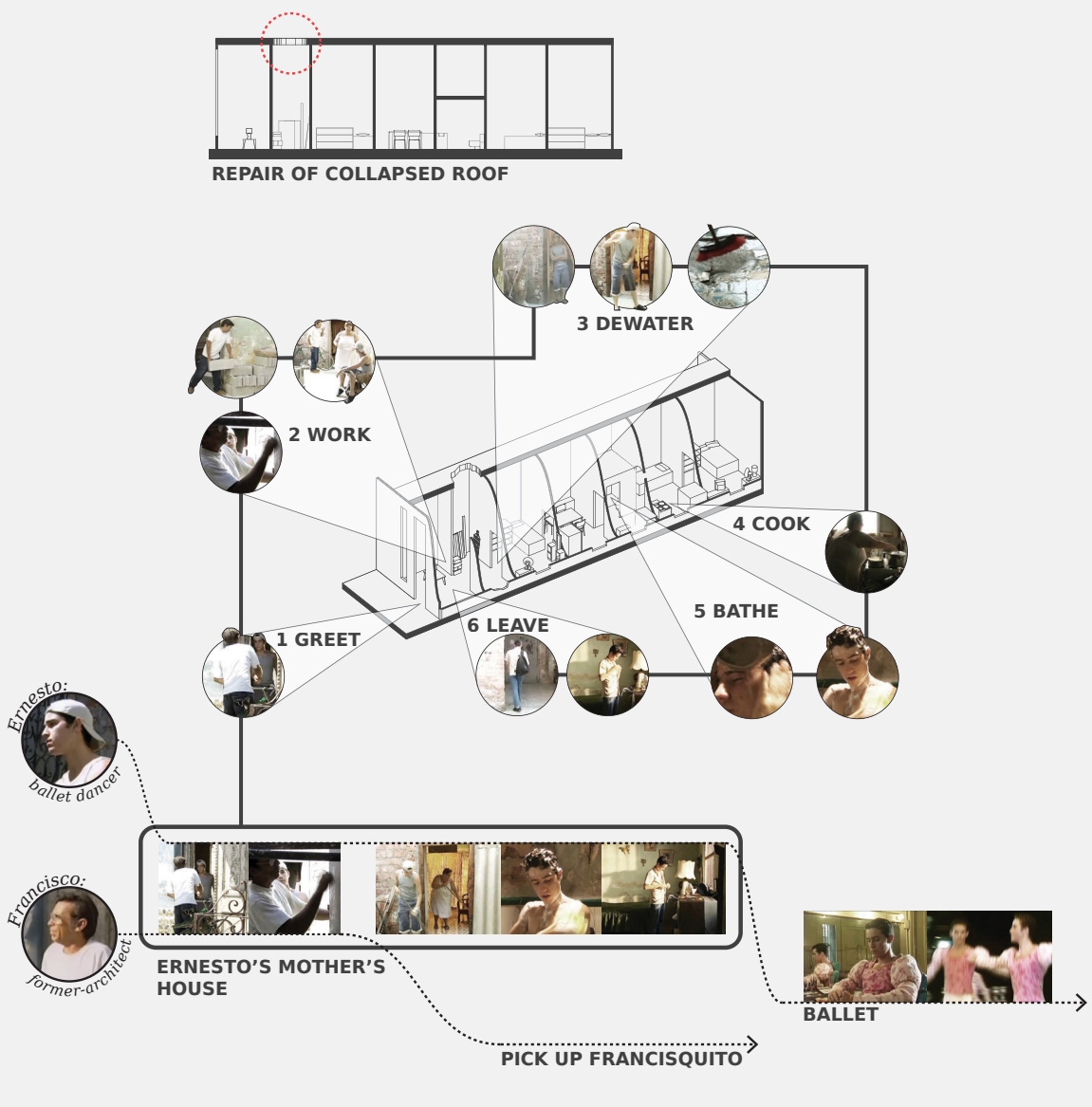


Alternate reality: Long section showing how the approach propagates along the southern wall of the building, as residents and office workers continue to make the same trade.

The idea for how to build the roof comes from Ernesto.

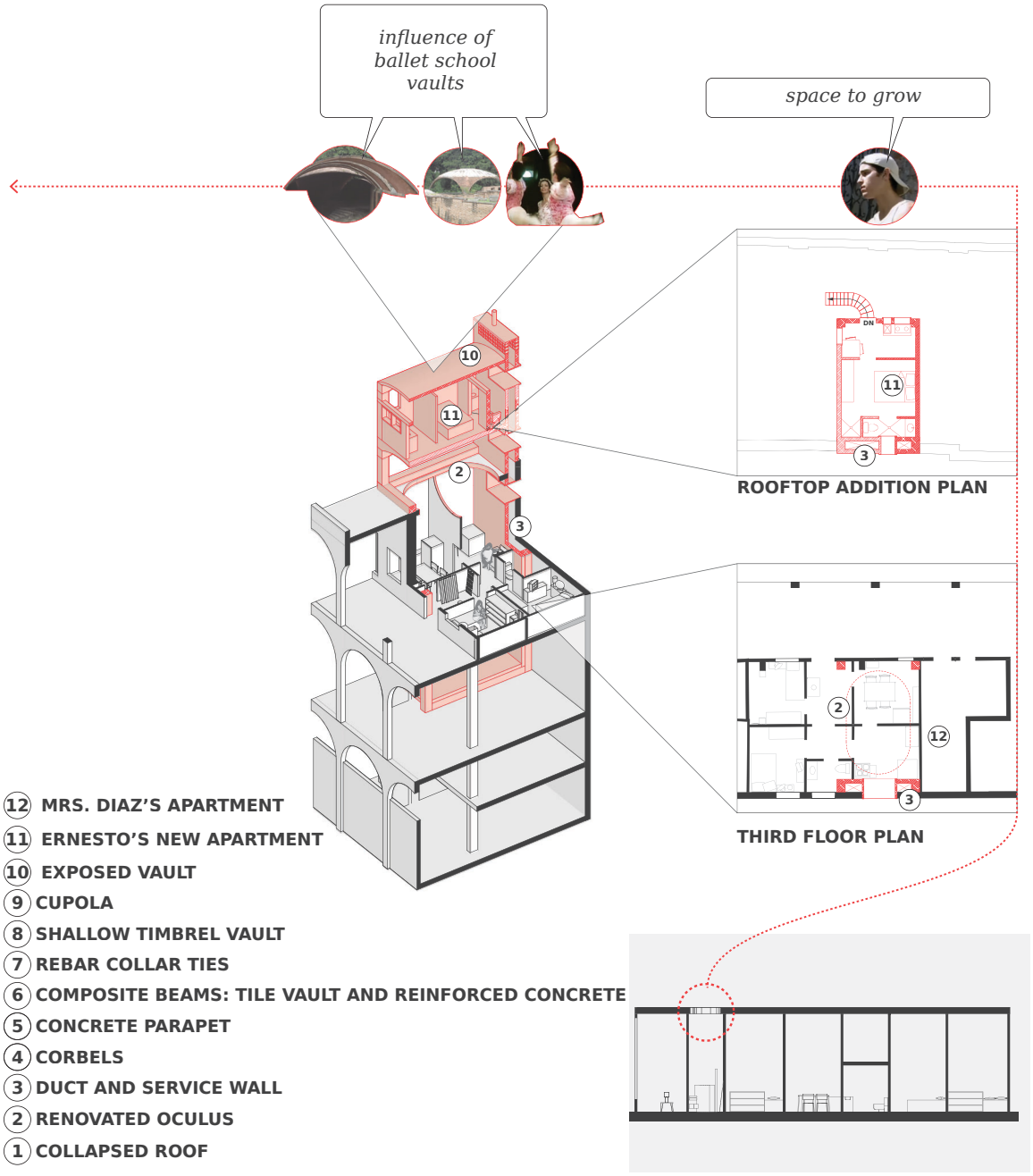
***Ernesto's day***

In the film, we see Francisco helping Ernesto to fix up his mother's place. There seems to be a hole in the roof, which lets in light and air but the kitchen floods when it rains. Later we see Ernesto performing as a ballet dancer, which prompted a speculation on my part that he was trained at the National Schools of Art.

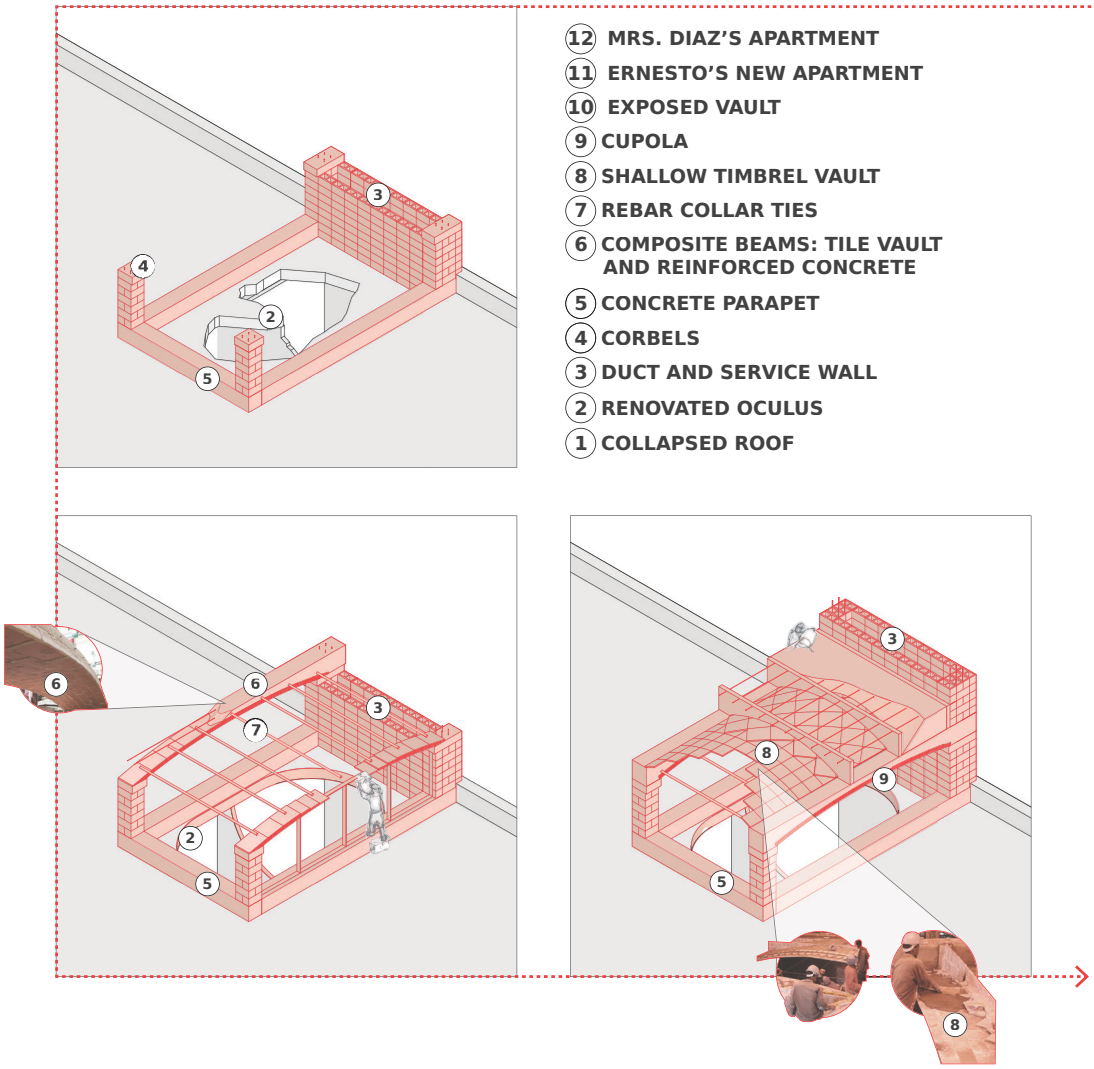



Film analysis: a day in Ernesto's family's apartment.

In the alternate reality, Ernesto lives with his mother on the third floor, and they have the same hole in their roof. Rather than completely closing the hole, the repair uses a cupola similar to Francisquito's which could also support another secondary suite up above for Ernesto to move into later.




Alternate reality: cutaway isometric and plans showing the overall scheme of the second project.




Alternate reality: sequence of isometric drawings showing the construction of Ernesto's cupola.

I'm speculating that Ernesto could connect Francisco to a technique that he might have seen while studying ballet, potentially at the National Schools of Art: making a thin vault out of clay tile, which can be built incrementally under his own power and with minimal formwork. This would potentially require Francisco's expert gaze to see the potential in the technique, but Ernesto could provide the connection.

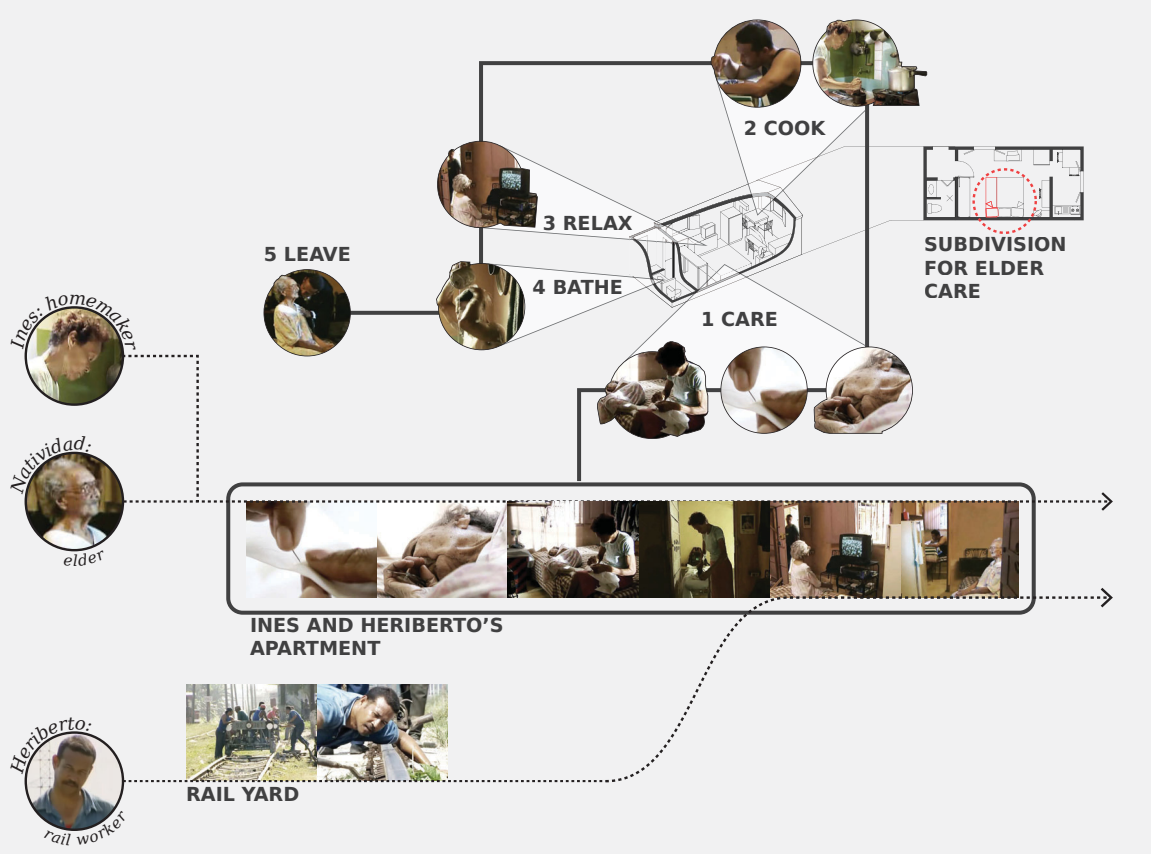
The vault can eventually be filled with reinforced concrete as a composite floor or left exposed as a roof. The composite

system is an easier way to form beams in the air, and vaults can achieve long spans.

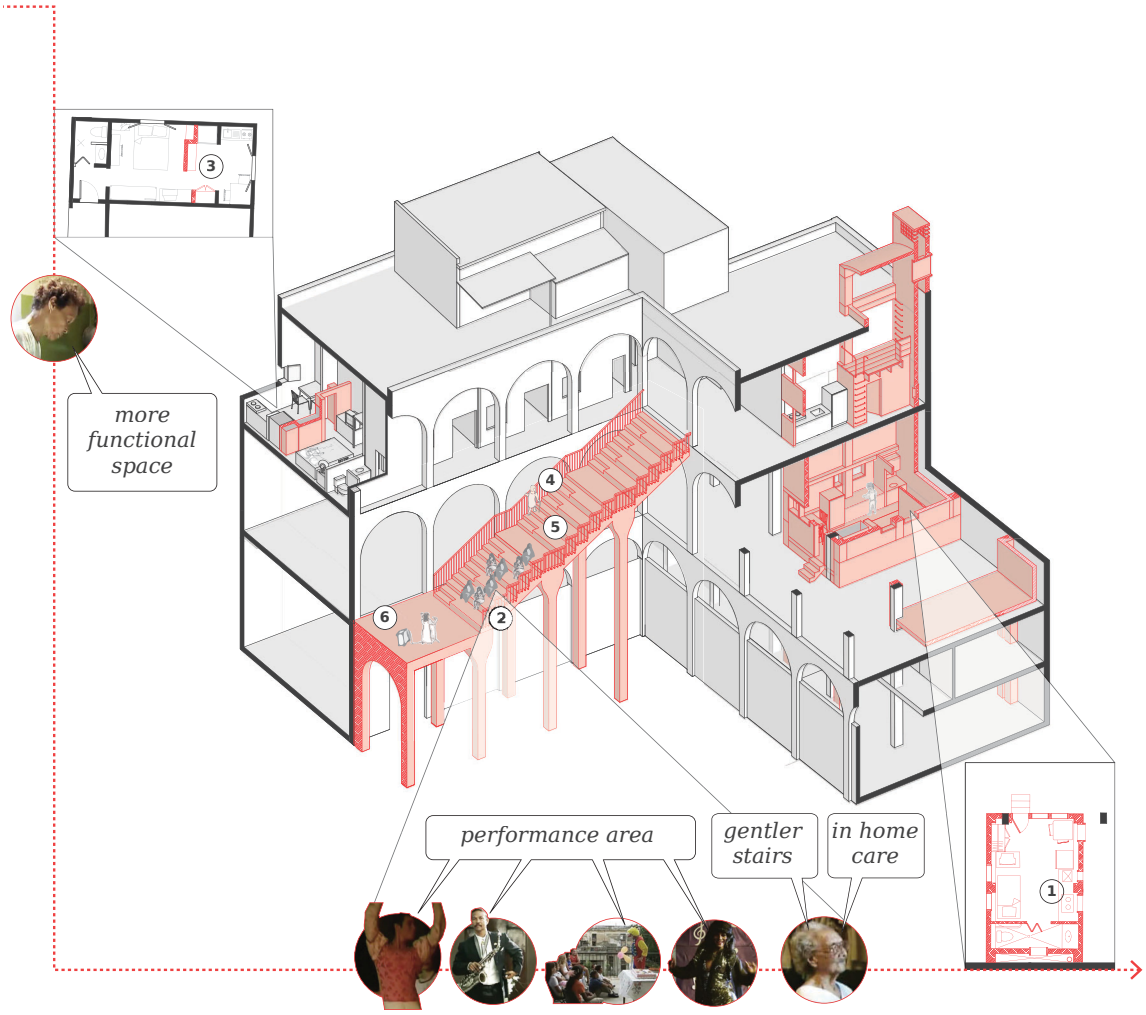
However, larger projects will need tools to move more material. These might come from Heriberto, who comes up next in the story.

### *Inés, Heriberto, and Natividad's day*

In the film, we see Inés caring for Heriberto's aging mother, Natividad, as he goes off to work in the rail yard. Within their apartment they have squeezed in an addition to their double bed, so that the three of them share the equivalent of a king size bed.



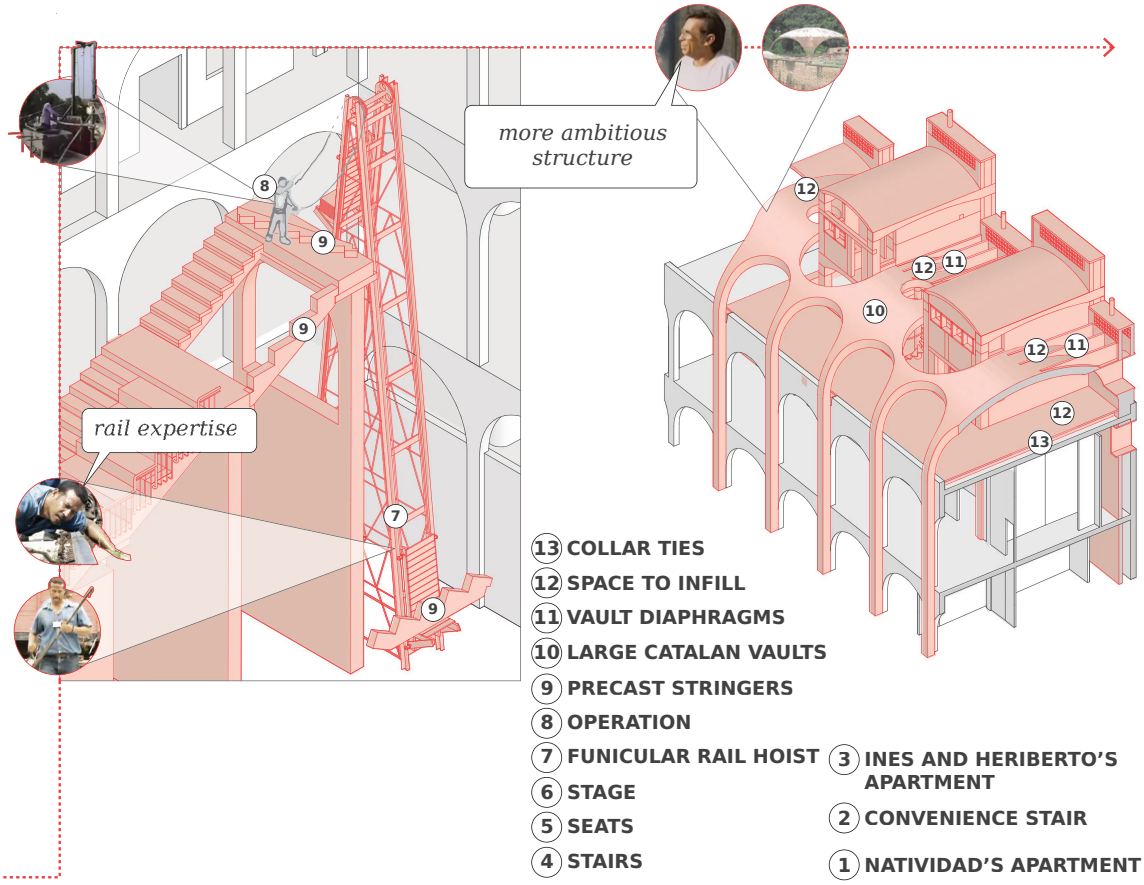

Film analysis: Inés, Natividad, and Heriberto's day in their apartment.




Alternate reality: cutaway isometric and plans showing the overall scheme of the third project.

In the alternate reality, Inés and Natividad would probably prefer to have more privacy from each other. The roof is not really an option for Natividad, due to the extra flights of stairs she would have to climb.

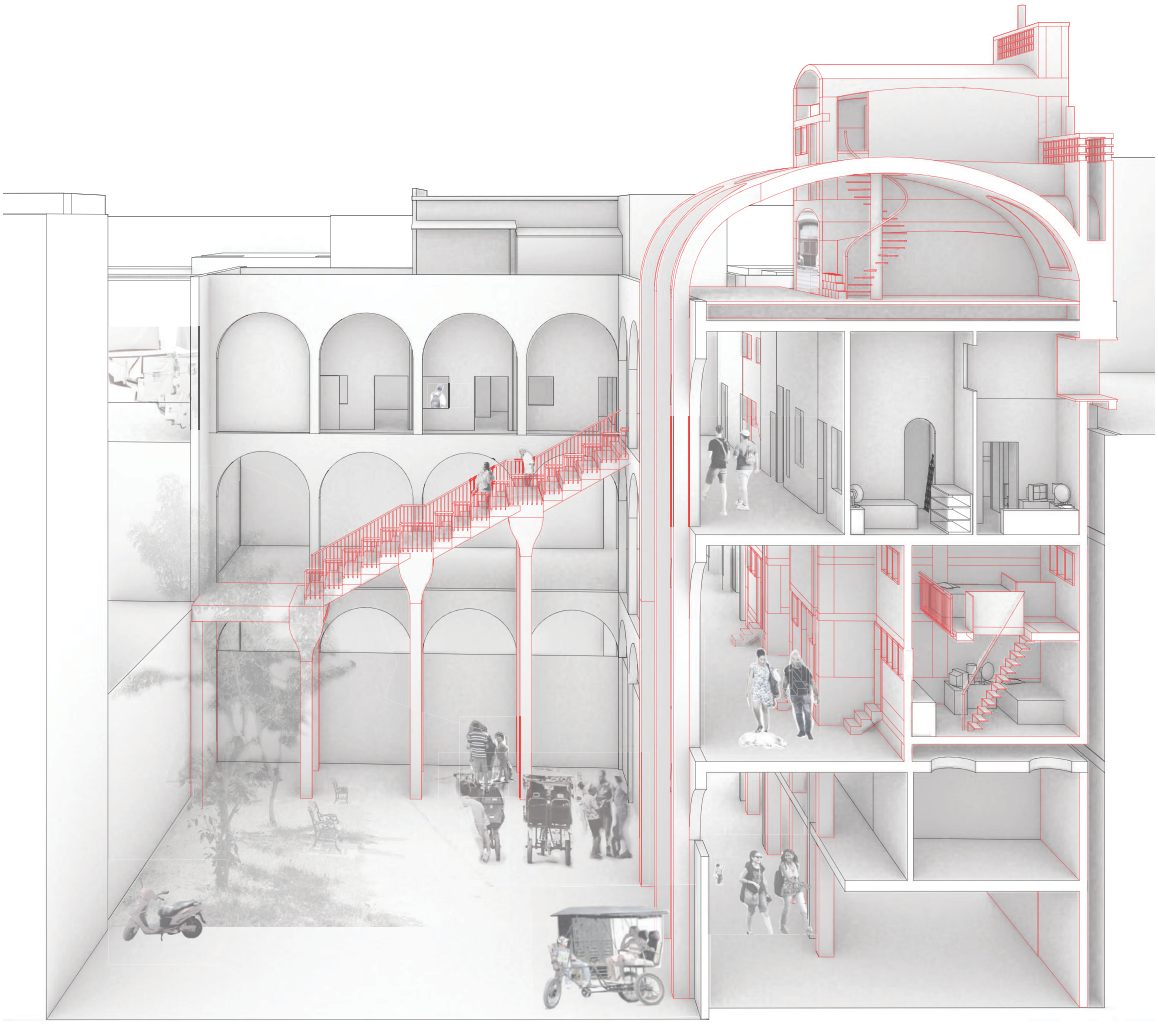
Natividad can build an apartment on the second floor, now that there is a way to tie into the air duct for cross-ventilation. This apartment can be designed for more dignified in-home care. From here she can be closer to the ground level, while Inés and Heriberto's apartment can be improved with the extra space.




Alternate reality: isometrics showing the use of the funicular rail hoist and the eventual Catalan vault intervention on the roof.

Natividad and other elderly residents would still benefit from a gentler convenience stair to have better access between apartments. With his expertise in rail, Heriberto is able to develop a funicular rail hoist that can help with more ambitious airborne beams, so that even heavier elements like pre-cast concrete can be used for stair stringers.

Beyond this stair, the hoist technology would assist them in creating a larger Catalan vault on the roof, expanding on the idea introduced by Ernesto. This could provide support for more infill units while defining the limit of vertical development.



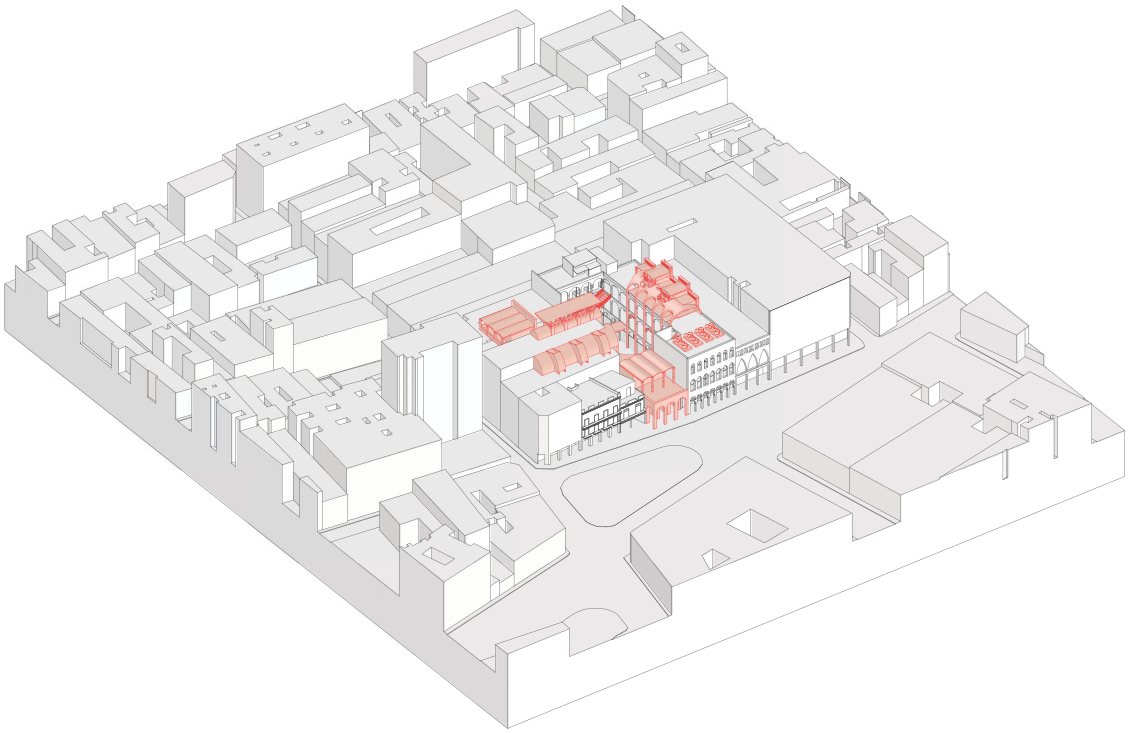
Alternate reality: perspective section showing the inhabitation of all the projects so far.

With these three examples, we can forecast developments in a less specific way. Individual needs and collective needs will continue to negotiate; ideas propagate and combine with others to form evolving collaborations.

Four characters who have a passion for performance adapt the stair to an auditorium, establishing a venue for their art, and generating an economic opportunity.

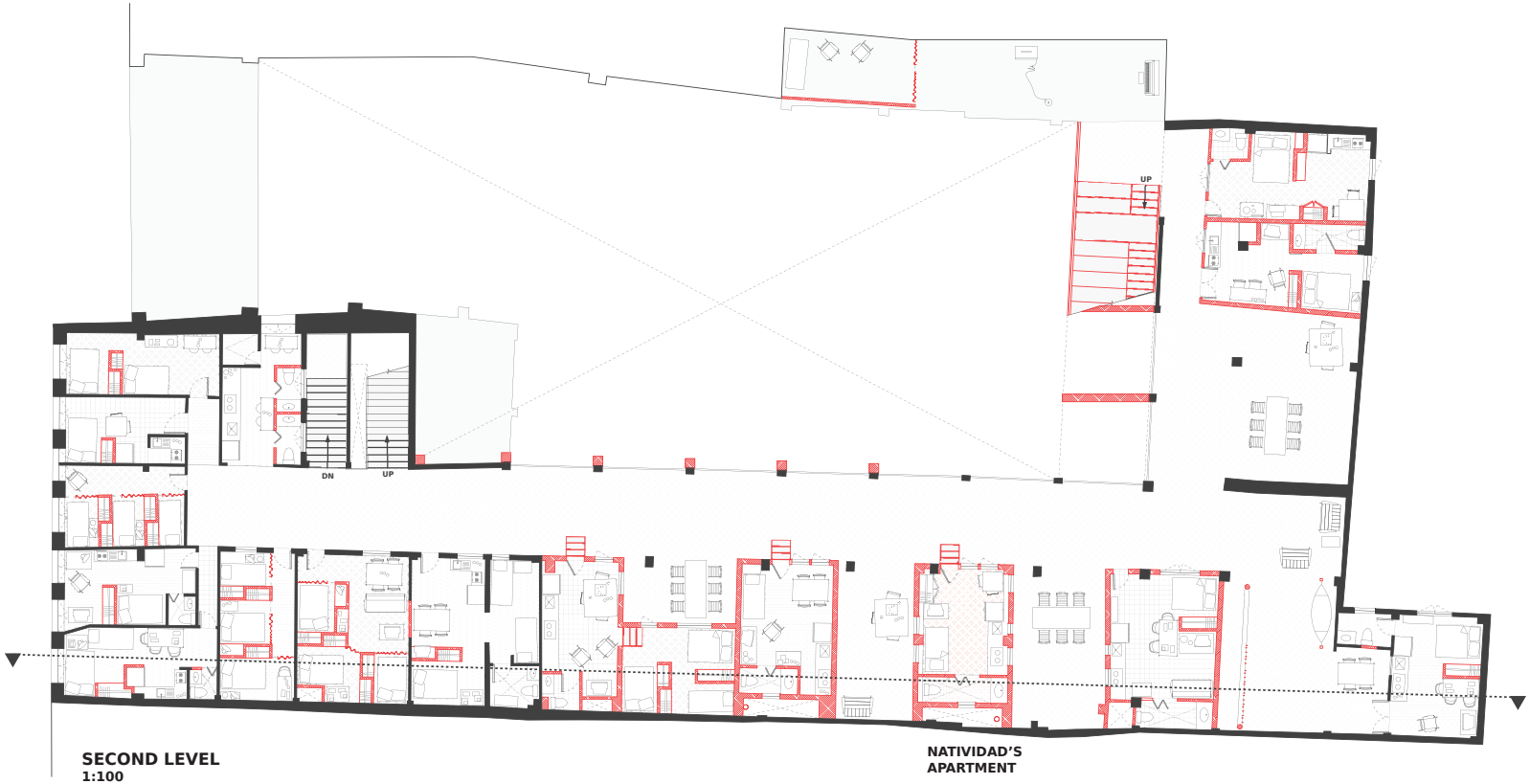
The characters who use bicycles could collaborate with the *bicitaxis* in the open lot to create a more useful courtyard for both the residents and the *bicitaxi* drivers.

The supports will continue to evolve from the most practicable ideas, designed to balance the autonomy of individuals and the best interests of the collective. The boundaries between parts of the city will become blurry as strategies propagate throughout Old Havana.

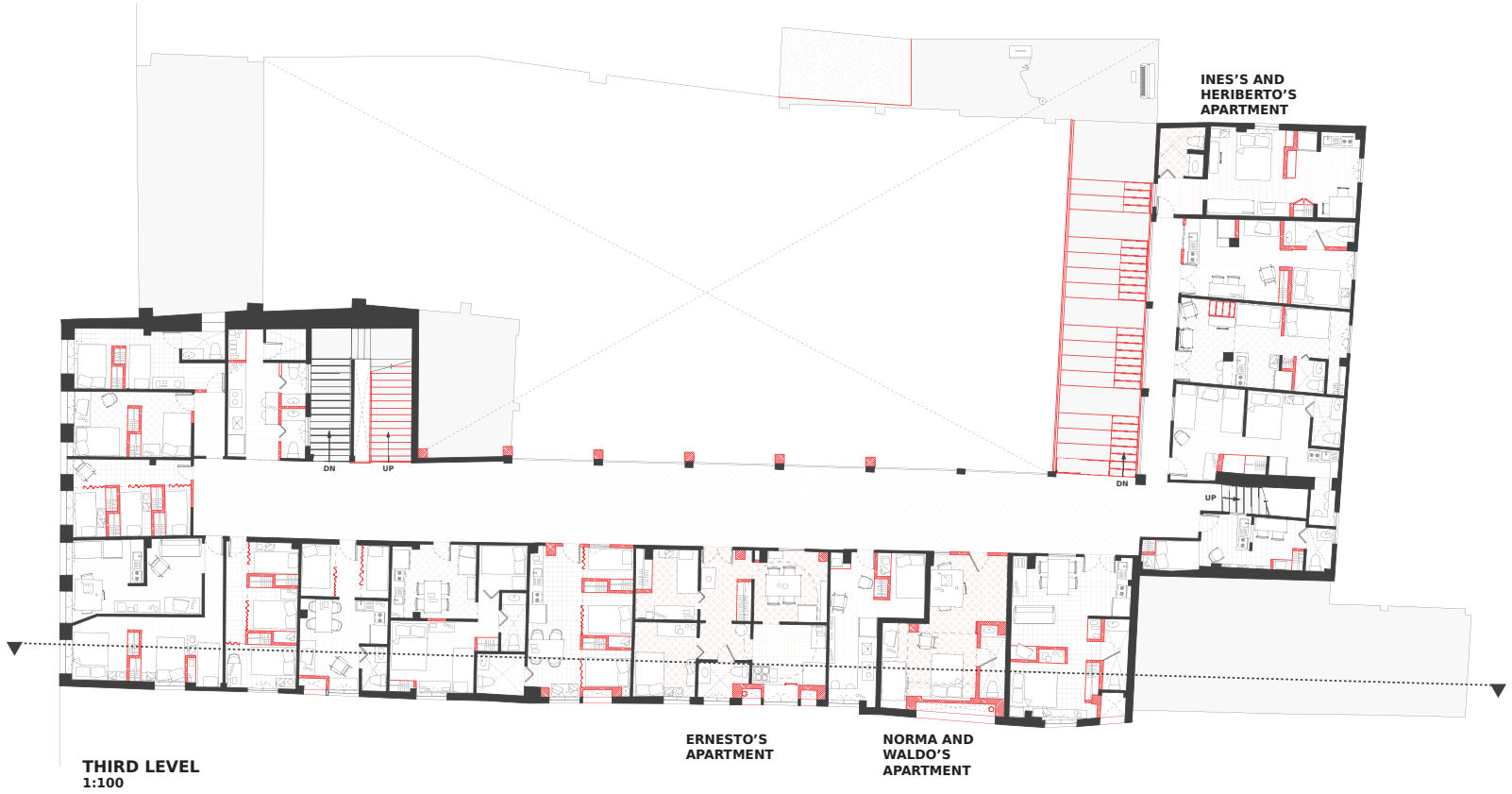


Alternate reality: isometric of the neighbourhood showing how these interactions could spread to other buildings.

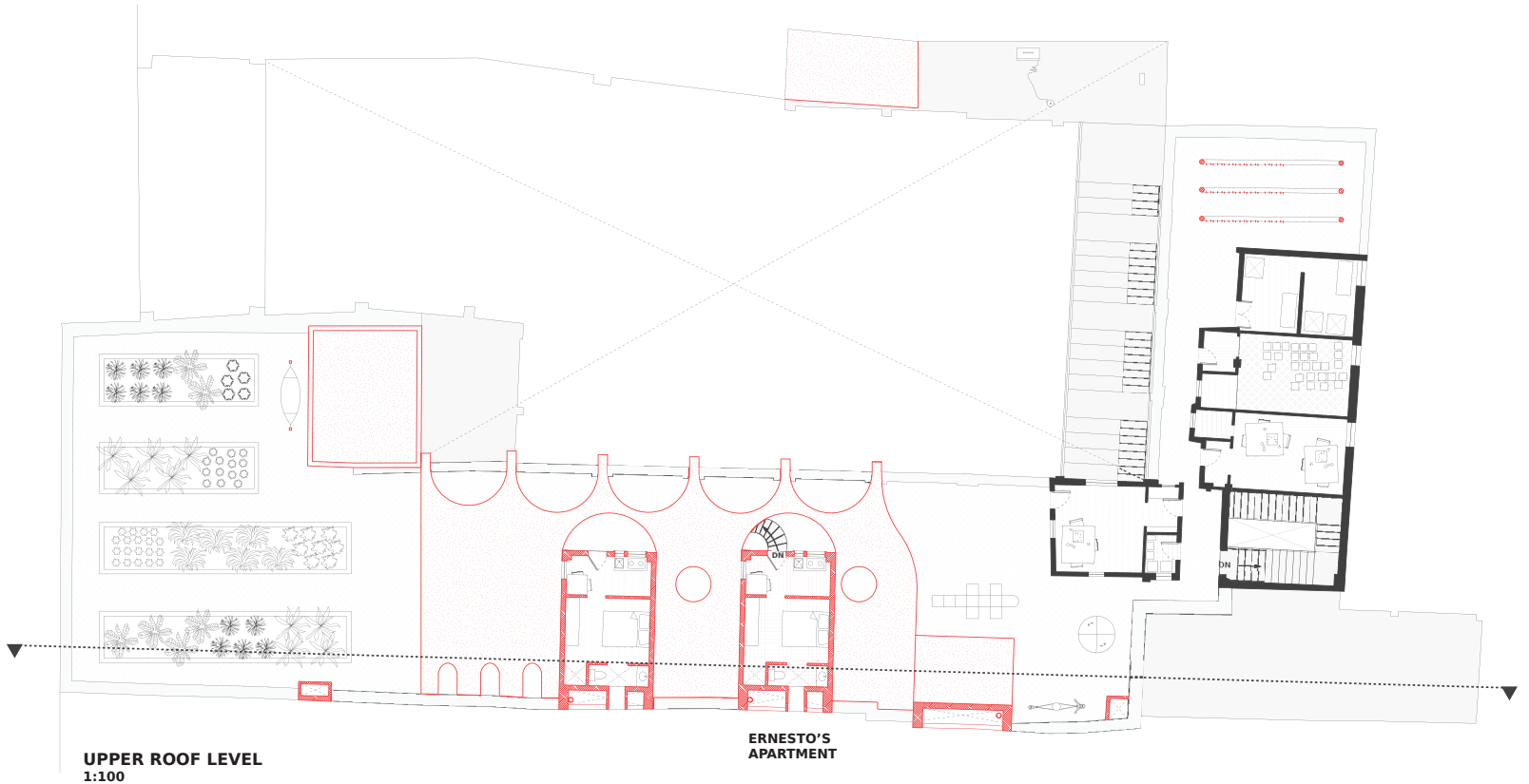

Plans of existing and new conditions (measured base plan provided by Pérez et al. (2019))




Plans of existing and new conditions (measured base plan provided by Pérez et al. (2019))




Plans of existing and new conditions (measured base plan provided by Pérez et al. (2019))




Plans of existing and new conditions (measured base plan provided by Pérez et al. (2019))

# Chapter 5: Conclusion

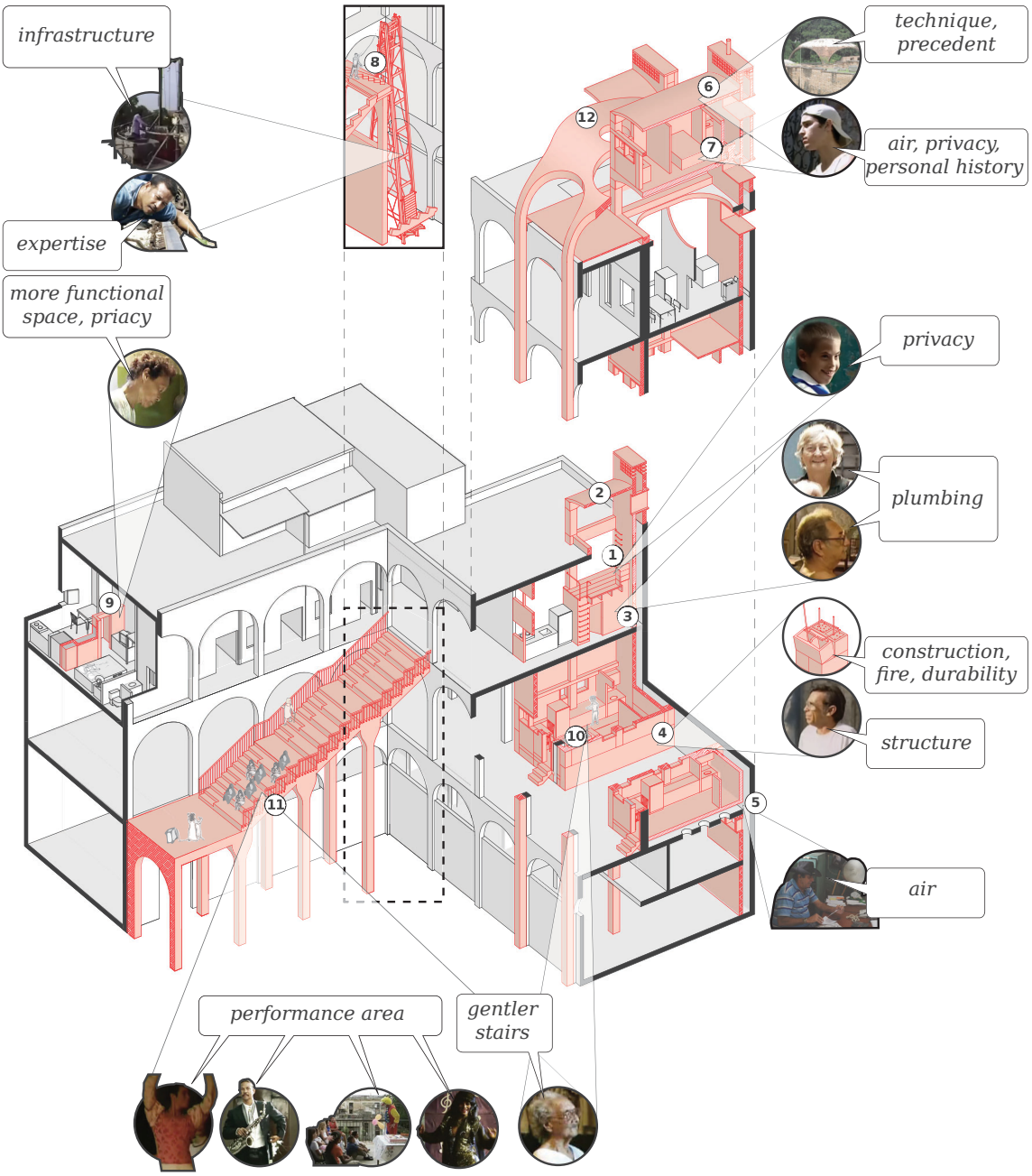
This final chapter explains how the design outcomes of Chapter 4 have tested aspects of the theory and methodology explained in Chapter 3. In doing so, the latent connections between aspects of the design and the theoretical concepts will be made explicit. Regarding sequence: the concepts in Chapter 3 are ordered by the bricolage construction of the methodology, while the design outcomes presented in Chapter 4 follow the chronological sequence of the project's becoming. In this chapter, connections between design outcomes and theory are ordered by complexity, starting with the most isolatable concept of agency. As a preface to these outcomes, it is necessary to acknowledge a generative tension that is built into the methodology, which I attribute to its bricolage construction.

## Outcomes of Design as Tests of Theory

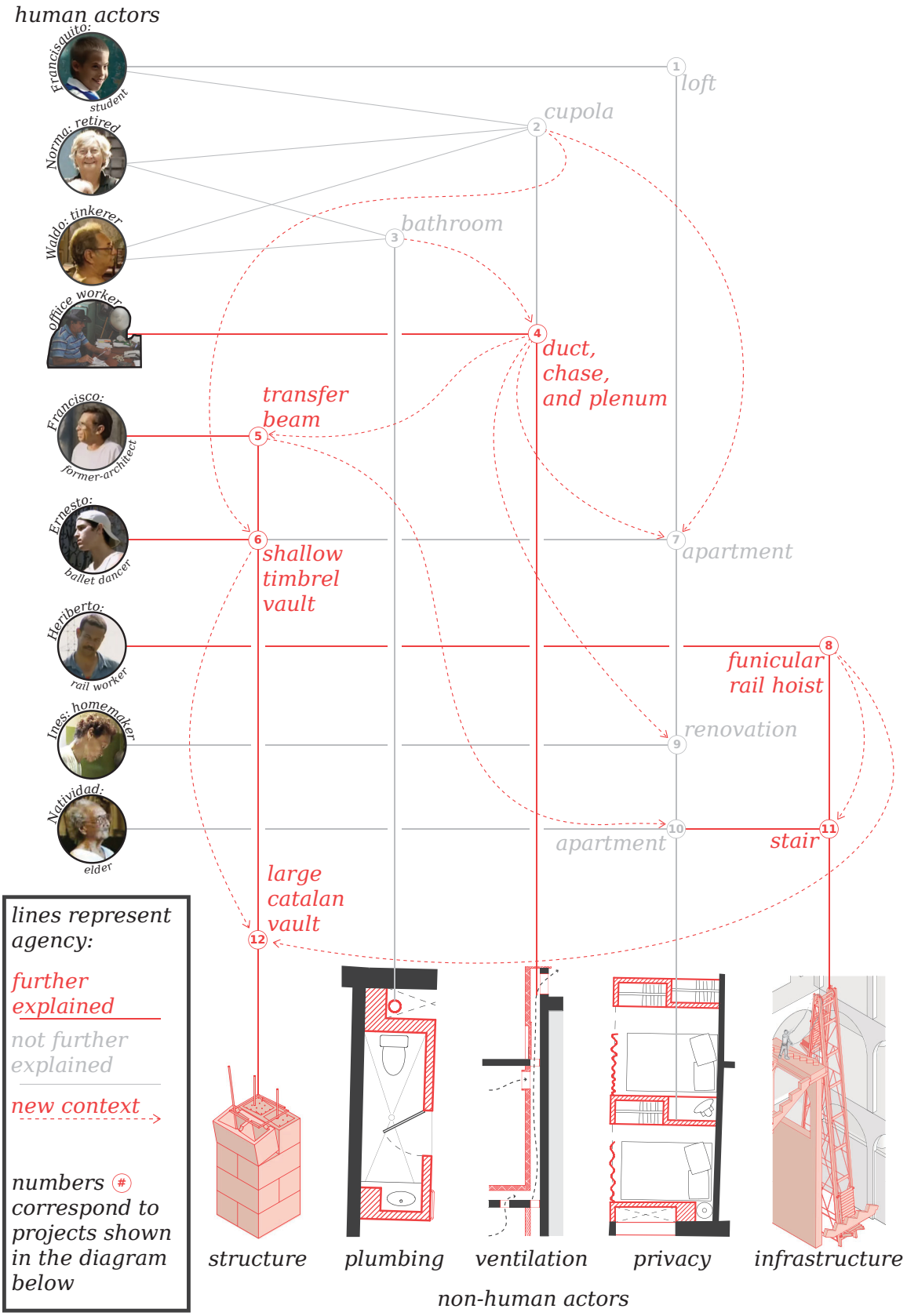
I begin by explaining how the relatively isolated concern of choosing a structural system demonstrates the agency of an individual part: the CMU block. Next, I add complexity by illustrating how the transfer beam acts as an autonomous detail in the project, crossing previously established theoretical boundaries and architectural rules in order to address local concerns. Following this: the duct, chase, and plenum, considered together as an assembly repeated throughout the project, will demonstrate the concept of architecture as mediation.

The last connection is the most general concept that undergirds the methodology of this thesis: the view of architecture as inherently collaborative. Phrased another way, this concept expands on the subtitle: collaboration

between diverse others is the context within which architecture-as-mediation is situated. This idea is embedded in the complex interaction of four assemblies: the shallow timbrel vault system, the convenience stair with performance area seating, the funicular rail hoist, and the large Catalan vault. The design outcomes are shown in the following two diagrams, which together serve as a map of those aspects




Cutaway isometric summarizing the design outcomes and a few of their contextual actors.




Matrix charting the design outcomes and their primary contextual actors.

of design which will be used to demonstrate a concept, those that won't, and their sequence in the chapter. Finally, I present some notable observations of my experience with this particular design process.

## Effects of the Bricolage Methodology

In Chapter 3 I described the theoretical framework as a bricolage: a patchwork of ideas recruited from disparate sources. This approach has produced some tensions within the methodology, which I have found to be generative throughout the design process.

Habraken and Yaneva are one such source of tension. Habraken's concept of levels attempts to organize the built environment into discrete but interdependent jurisdictions, with corresponding practitioners at each level to oversee the decisions that must be made there. He describes the organization of levels as a hierarchy, where decisions occurring in the upper levels have influence over what can happen at the lower levels, and not necessarily the other way around (Habraken 2002, 6).

Yaneva's use of Actor Network Theory (ANT), by contrast, has the opposite tendency: she argues for an interconnected view of such complex assemblages as architecture and larger built environments. ANT regards all the parts of an assemblage as having agency in the becoming of that assemblage:

> A building exists if it acts, resists, affords, compels, challenges, mobilizes, bugs, and gathers different communities of actors.... It often requires negotiations among all the participants in the design that play a part in this complex and long-lasting process (designing architects negotiate with the design history at hand, with the value and structural engineers, with scale models and foam materials, with the representatives of the client and the proto-users). (Yaneva 2009, 199)

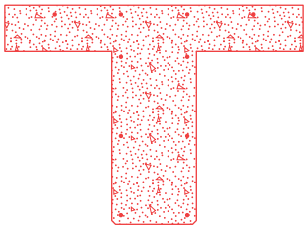
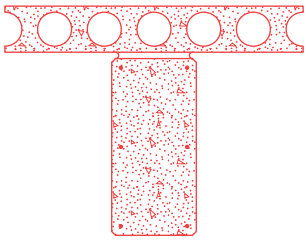
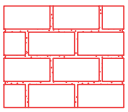
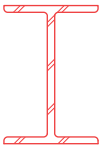
These organizational models of the built environment are therefore at odds. Yaneva would probably describe the lower levels of Habraken's hierarchy as having an agency of their own: even a piece furniture, at the lowest of Habraken's levels, has an agency which influences the placement and width of interior doors at the infill level, disallowing tight corners that would prevent the bed from being moved in. It also therefore acts upon the design of the stair and the corridor, both of which would fall within the jurisdiction of the higher support level.

## The Agency of Parts

### *Structural Systems*

The agency of the part is well demonstrated in this project by the selection of the primary structural system. To make this selection, it was necessary to evaluate different structural systems against the particular constraints of building in Havana. Some of these concerns are familiar to all architecture: fire safety, durability, structural performance, and the skills of local workers. To these are added the particular circumstances of building in Old Havana: the scarcity of certain materials, like intumescent paint for steel, resulting from the blockade on Cuba imposed by the United States; the intermittent disruptions to the supply chain of all materials due to fuel shortages; and the availability of special equipment like pump-trucks for concrete, or hoists for heavy elements. These considerations can be described as contextual parameters for material selection, illustrated in the chart on the following page.

From this survey of the benefits and drawbacks of different material systems, it became apparent that a hybrid of a few systems might be the most appropriate. Concrete masonry

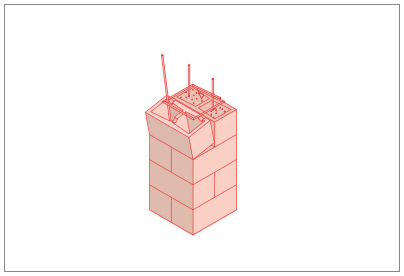
| | |
|---|---|
|  | *site-cast reinforced concrete*<br><br>*-non-combustible; durable*<br><br>*-requires strong formwork, continuous mixing and pouring to avoid cold-joints; diffiicult to pour large quantities continuously* |
|  | *pre-cast reinforced concrete*<br><br>*-non-combustible; durable; effiicient to produce*<br><br>*-heavy pieces require transportation and hoisting equipment* |
|  | *masonry*<br><br>*-non-combustible; durable; can be built incrementally as material becomes available*<br><br>*-brittle, requires additional support for shear and openings* |
|  | *steel frame*<br><br>*-very durable; effiicient strength-to-weight ratio*<br><br>*-requires special equipment to build (hoists, welding, etc); requires paint or galvanizing to resist rust; requires intumescent paint or concrete for fireproofing* |
|  | *wood frame*<br><br>*-can be built incrementally as material becomes available; suitable for temporary structures like scaffolding, formwork, and some infill projects*<br><br>*-requires paint to resist rot; combustible* |

A chart of possible primary structural systems considered for the project, their benefits and drawbacks.

units (CMU) possess many of the positive characteristics of other material systems: they use a simplified pre-cast concrete manufacturing process; they can be built into masonry structures with a high compressive strength; they can be filled solid with concrete for greater strength, and reinforced with steel for a stronger and still fireproof system; CMU structures are easy to build incrementally with only hand tools; and CMUs can be either purchased or manufactured on site, mitigating disruptions to supply chains.

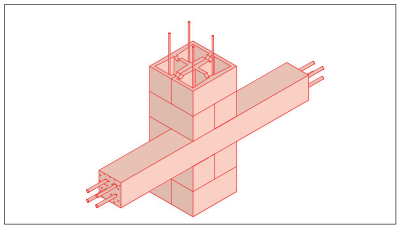
While this material selection is the outcome of various contextual parameters, it also adds a whole new set of contextual parameters to the building project. The right angles and modular dimensions of the CMU block mean that the architecture should be shaped and dimensioned to suit. The masonry system can combine easily with other cement and masonry-based systems, such as site-cast concrete and clay brick, so these are more seamlessly integrated than any wood or steel elements. It is much easier to build masonry columns incrementally than it is to build masonry spanning elements incrementally; therefore Catalan vaults, small precast elements, and the effort to build site-cast beams as simply as possible, all become responses to the context of the CMU block.

All these considerations can be seen in the typical details on the following page. These are indications of the CMU block's agency in the assemblage. This agency demonstrates how architectural decisions oscillate between two modes: context influencing architecture, and architecture becoming context, which in turn influences future architecture.

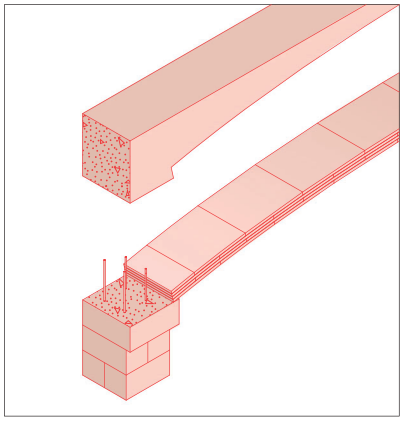


*typical columns: cmu blocks filled with concrete in short lifts, reinforced with short pieces of rebar tied together*

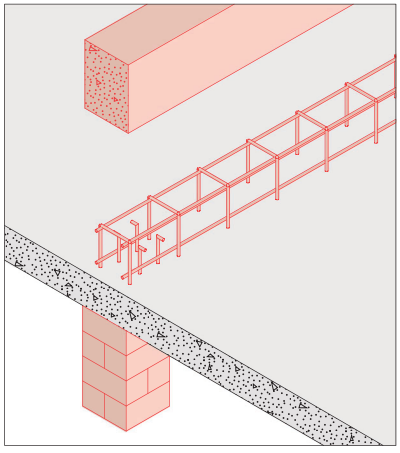
*typical properties:*
*-durable; steel-reinforced;*
*non-combustible;*
*incrementally built;*
*materials can be produced on site or delivered*



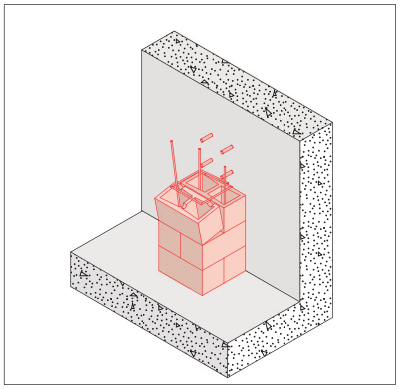
*minor beams:*
*cmu blocks + pre-cast reinforced concrete*



*incrementally-built composite beams:*
*cmu blocks + clay tile vault masonry + site-cast reinforced concrete*



*inverted transfer beams:*
*reinforced site-cast concrete anchored to existing floor with steel dowels*



*pilasters:*
*reinforced cmu blocks anchored to existing walls with steel dowels*

The primary structure chosen for the project, and the details which resulted from this choice.

## Autonomous Detailing

The agency of parts, the oscillation of context becoming architecture and architecture becoming context, and the tension between Habraken's levels versus Yaneva's use of ANT, result in another latent concept in the design. Parts of the project have a tendency to cross boundaries, such as those between Habraken's levels. I recruited Ford's concept of autonomous detailing to explore this tendency, as he allows autonomous details to cross such boundaries as they exercise the agency to solve their own problems, establishing a critical relationship to the broader context:

> The autonomous detail....crosses many other boundaries as well between the primary and secondary elements of a building, between the structural and the non-structural, between furniture and architecture (Ford 2011, 237)

### *Transfer Beams*

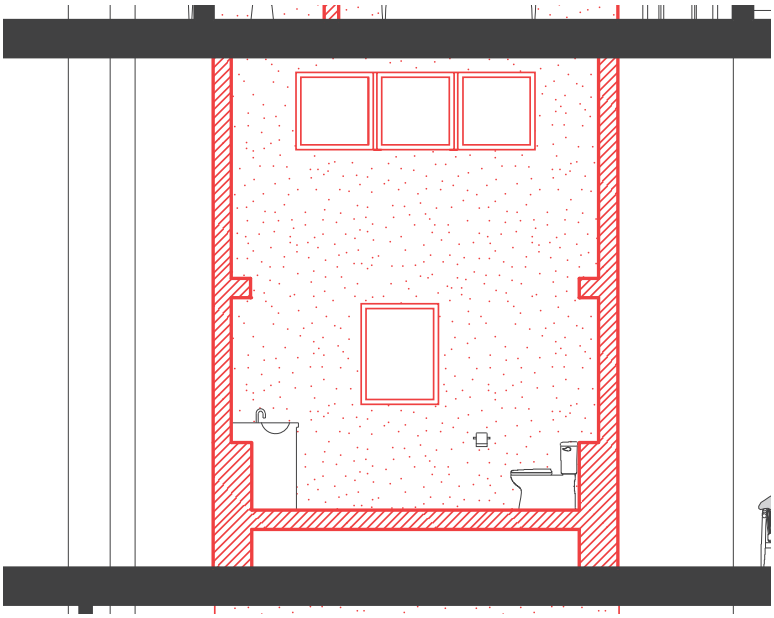
An example of autonomous detailing in this project can be observed in the design of the transfer beams on the second level. The structural system of the existing building uses reinforced concrete slabs with integrated steel joists, supported by small beams and girders below. Contrary to this system, the transfer beam is inverted, projecting up from the second floor slab.

The considerations which drove the inverted design of the transfer beam were mostly practical, and these were explored during my consultation with a structural engineer: concrete is heavy and provides no self-support before it is cured. A beam needs to be poured monolithically, so the full hydrostatic and vertical loads need to be resisted by the formwork which contains it. This challenge would be compounded if attempting to pour against the underside of an existing slab sixteen-feet in the air, leading to a very

The existing structural system of *Ursulinas*.

intensive and tall formwork. Without hydraulic pumps, concrete would need to be hauled up to the top of the formwork in buckets. In order to achieve a tight connection to the underside of the slab, the formwork would need to be nearly airtight, which would make pouring difficult without a hose and would potentially trap pockets of air at the top of the beam. Demolition following a botched pour is not likely to happen, as even collapsed buildings often remain untouched in Old Havana for years, so getting it done right the first time is important.

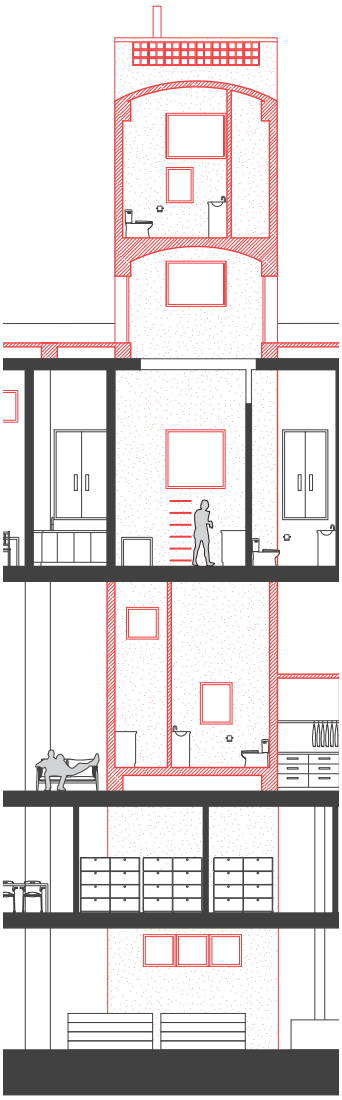
Thus, in this context the inverted orientation is much more practically achievable compared to adding dropped-beams, as a floor already exists to support the weight of a large concrete pour, and all the work can even be done without ladders. Architecturally however, it would not be valid were it not for the opportunities it creates: the inverted beams are useful for creating an exhaust air plenum for the office space below, without interference from the existing dropped beams; and the tall beams can be integrated into walls for



Excerpt of the long section, showing the inverted transfer beams integrated into the wall and casework of the apartment.

a secondary suite that can be leveraged to secure funding for the project.

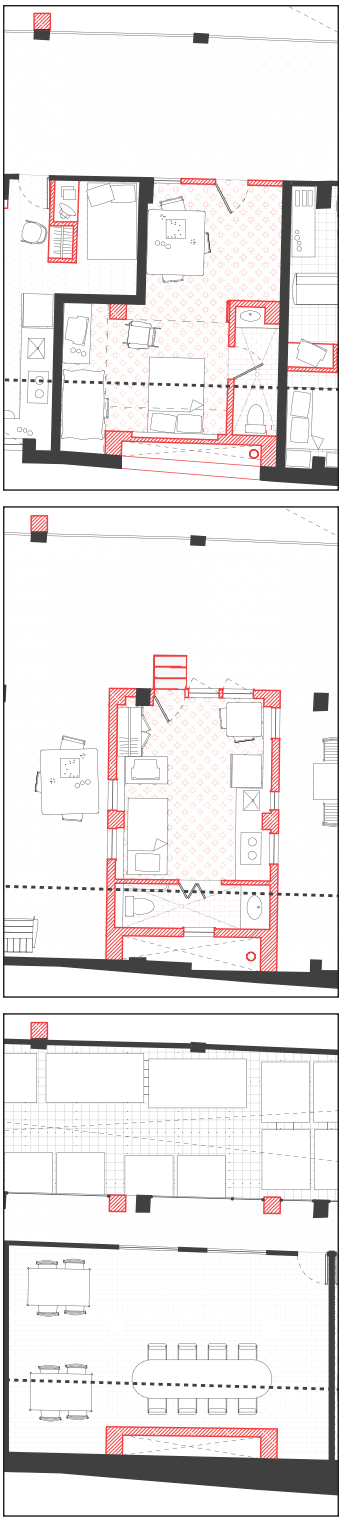
Like the selection of the structural system, there are contextual parameters which the beam must negotiate. Even the agency of the CMU block is again at play here: the width of the beam should be no greater than the width of the CMU columns which support it. As the beam creates new opportunities for infill, these opportunities add considerations affecting the design of the beam: it should be low enough that it does not interfere with the height of a counter top or window sills at the infill level.



Excerpt of the long section, showing inhabitation of spaces in one new structural bay.

As an autonomous detail, the beam is exercising its agency to negotiate these concerns while also creating local opportunities within the project. The fact that these concerns and opportunities transcend the boundaries pre-established in its context means that the detail is also subversive: it subverts the architectural order of the structure in the existing building, and it has a critical theoretical relationship to Habraken's levels in that it subverts his hierarchical structure of influence.

However, this beam only exists because someone is advocating for the concerns of structure at the higher support level. Without Francisco's sober disciplinary vision, those actors who want to infill by adding new walls and floors will simply do so, as they do now in Old Havana, disregarding the risks to the existing structure. Therefore, although Habraken's concept of levels is regularly subverted by the realities of building, and these are better described by Yaneva's use of Actor Network Theory, levels are still an essential concept in identifying what projects must be done and which actors should be involved.



From top to bottom: Norma and Waldo's apartment on the third floor; Natividad's new apartment on the second floor; office space on the first floor mezzanine.

## Architecture as Mediation

In the case described above, the design of architecture (the transfer beam) is mediating between the multivariate interests of the many parts recruited to collaborate in the architecture's becoming (the additional load above, the spaces below, the existing structure, the agency of the CMU block, the challenges to pouring concrete, the height of a countertop). All of these non-human actors have human advocates: Francisco is looking out for the structural concerns; Norma and Waldo are advocating for the utility of their apartment, and their own privacy; the office workers probably don't want more columns invading their space, but would benefit from more air changes per hour.

### *Duct, Chase, and Plenum*

This mediation is even more apparent in the design of the duct, chase, and plenum. This integrated system is the outcome of the initial negotiation between three human actors. The residents in the apartments above need access to the ground for plumbing and vertical structure. The office workers below, who are blocking access to the ground, but have an unmet need since the neighbouring building disallows them from adding secondary windows for cross ventilation. The third actor is Francisco, who would be able craft a mutually beneficial trade between the other two parties, while also using his expertise to advocate for the non-human actors: structure, the existing building, the CMU block, the interior layouts of the apartments, the location of columns and ducts in the offices. We might say that all of these human and non-human actors are determining the design of the duct, chase, and plenum; or we may say the duct-chase-plenum system is mediating the concerns of the

other actors, even recruiting them to collaborate in the first place.

As long as these input parameters remain the same, the same strategy of mediating their concerns can hold, with only minor adjustments to local circumstances. This is why the duct, chase, and plenum can propagate along the south wall and eventually become distinguishable as a major part of this project.

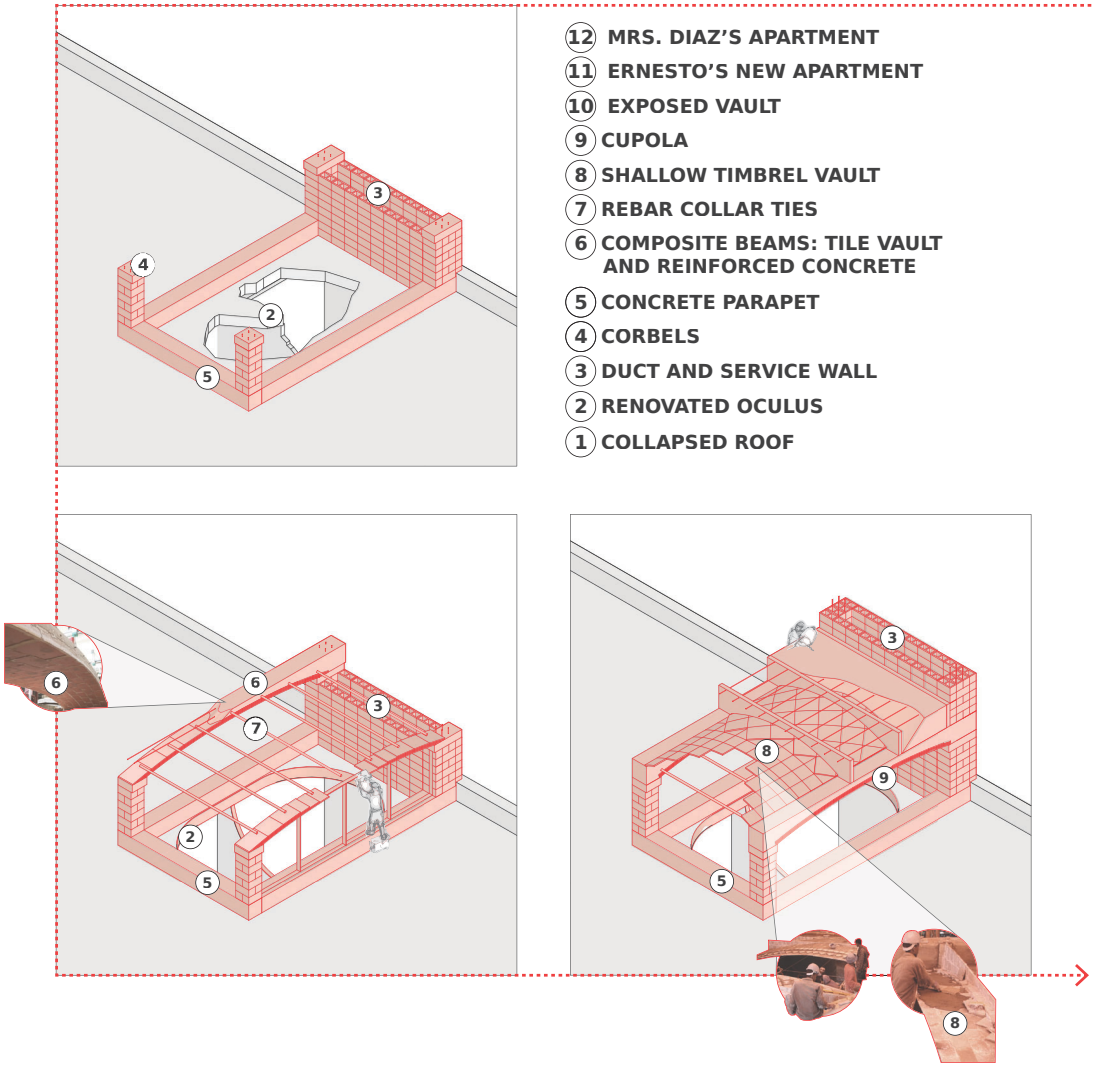
## Collaboration as Context

As suggested above, the design of architecture is a mediation in many different ways throughout the project, negotiating the agency of parts, reframing challenges and possibilities, and seeking out opportunities to add value to the project. Every time this cycle occurs, new determinants, opportunities and constraints are introduced into the context: new actors with their own agency ready to be recruited into new collaborations. We see this in the complex interactions between four systems: the shallow timbrel vaults, the convenience stair, the funicular rail hoist, and the large Catalan vault on the roof. Each has its own history of how it came to be, similar to the examples above, reiterated below.

### *The Shallow Timbrel Vault*

This is Ernesto's response to the cupola, an idea that Francisco first deployed to increase light and air in Norma and Waldo's place. I speculated that Ernesto might be able to connect Francisco's disciplinary vision for a problem that needs to be solved to his personal experience at the National Schools of Art, where he may have been taught ballet.

This is the most tenuous speculation that I made in the narrative. I did so because there are very few efficient ways I'm aware of to incrementally build spanning elements in a masonry system. The reasons why other material systems would be challenging, such as concrete or steel beams, continue to apply in this circumstance. The timbrel vault seems a good candidate, as the National Schools of Art were able to make use of abundant materials (clay and cement) and build large, thin spans with minimal formwork (Loomis 1999, 26).




Alternate reality: sequence of isometric drawings showing the construction of Ernesto's cupola.

Ernesto's cupola is a departure from the precedent of the art schools, however, because he is motivated to build another apartment on top of the vault. By pouring a reinforced concrete slab, he turns the vault into a leave-in-place formwork, which itself can be built without intensive centering and still support the distributed load of a concrete pour. I found two contemporary precedents that could prove the concept of this system: the Sustainable Urban Dwelling Unit by Block Research Group, and another research project demonstrating the use of the timbrel vault as integrated formwork for concrete to produce a composite structure.

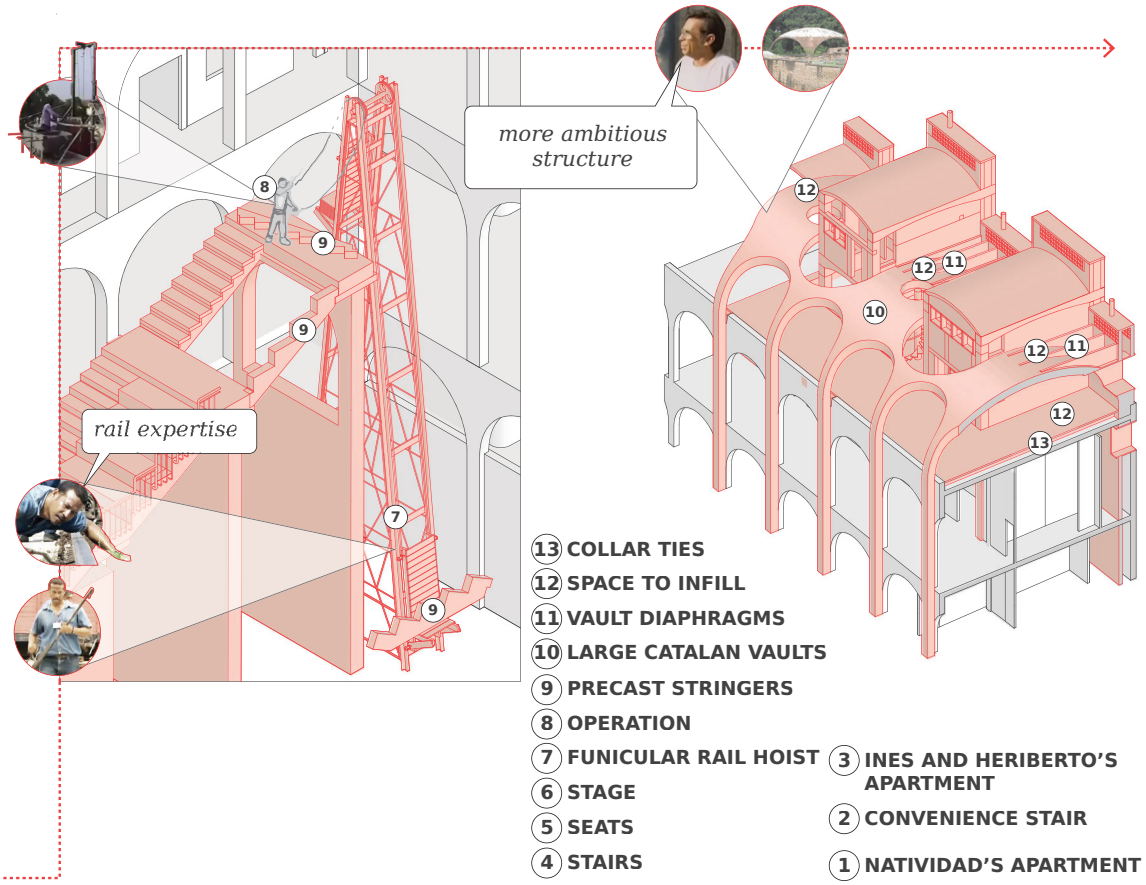
Left: research into the use of Catalan or timbrel vaults as integrated formwork for reinforced concrete, acting as a composite structure (López López et al. 2019, 240). Right: shallow timbrel vaults with collar ties in the Sustainable Urban Dwelling Unit project (Block, Van Mele, and Rippmann 2015).

***The Convenience Stairs and Funicular Rail Hoist***

While the stairs themselves mediate a collaboration between the agency of two parties of human actors (an elderly woman, Natividad, who wants easier access between her new apartment on the second floor and her son's apartment on the third, and four residents with a passion for music, dance, and theatre, who might appropriate the stair as seating for a small performance venue), they are mostly relevant here because of the ambition and ingenuity of Natividad's son: Heriberto.

In the documentary, Heriberto's job is to repair and maintain the railway. On seeing this I speculated that if he were given the standard materials of blocks and cement to improve his situation, then again the challenge of building an airborne structure for the stair would be difficult to address. However, if his expertise in rail was factored in, he might instead opt to use familiar mechanical components that would expand his range of options for building the stair.

Thus, Heriberto develops the funicular rail hoist: a triangular apparatus with rails on opposing slopes, which guide the wheels of two carts connected by a cable and pulley. One cart carries materials to the upper work platform, and the other carries a counterweight, allowing them to move heavier loads and even pre-cast concrete components.




Isometrics showing the use of the funicular rail hoist and the eventual large Catalan vault.

### *Large Catalan Vault*

Ultimately, the funicular rail hoist and the shallow timbrel vault are recruited to collaborate in the final design gesture of the larger Catalan vault on the roof. The context established by Ernesto's timbrel vaults, combined with the propagation of the duct/chase/plenum system, has resulted in a collection of haphazard rooftop additions. It is reasonable to think that as an architect, Francisco would want to bring order to all these autonomous parts. He might also want to determine a limit to vertical development while creating spaces for people to infill with their own apartments.

The design of the large Catalan vault on the roof would mediate these concerns, but the large quantities of materials it would need would only be possible to mobilize within the context created by the funicular rail hoist. Thus, the hoist and the shallow timbrel vault become key collaborators in this final project, the former as an enabling infrastructure and the latter as a first proof of concept, a way for the builders to develop their skill in the technique.

This last example demonstrates the view of architecture as an inherently collaborative undertaking. Architecture is a mediation on behalf of diverse others (human and non-human) exercising agency, who are recruited to collaborate on processes in the built environment.

## Other Observations

### Developing Plausible Fictions

Throughout the project, I found that each time the focus of the design work became more granular, the outcomes

became more plausible. The development of the transfer beam is an instance of this. Early on, the project employed far more ambitious structures: larger spans in concrete weaving through the existing building, intended to provide as much additional support and open space as possible.

Emphasizing the projects' constraints helped to refocus the design toward more achievable goals. It also added more specificity to the context. Early on in the process, I referred to this as the creation of context. In some ways, architects make choices about what aspects of context they're going address in a design project. In this case, the greatest challenges of the context ended up being the most fruitful generators of plausible architecture.

### Using Documentary Films to Study Inhabitation

The most important step toward developing plausibility was the decision to analyse the work of the documentary film, *Suite Habana,* and to synthesize the outcomes of this analysis with other site analyses. The initial idea came up during a review with my thesis committee, evaluating one of many false starts into the design process, all of which were far too generic to achieve what was intended.

This film became essential to the project as I reached the limit of what I was able to document about people's lives in person. Apart from the logistical challenges of access, language, and time, there were also ethical concerns about researching in a way that was extractive. Barbara Gray warns that unequal power balances are an inappropriate basis for collaboration (Gray 1994), and I felt that such an undertaking, primarily benefiting me and burdening the

people who I wanted to involve as collaborators, would probably trigger such problems.

Building on the documentary film became a viable way to extend my reach without the ethical pitfalls. It gave me access to the detail of information necessary to speculate on collaborations between many different people, their lives, their stuff, and their differing circumstances. In some cases, it provided a detail of information about peoples' lives that would only be accessible to someone with a close, ongoing relationship. While the graphic mode of the eventual architectural synthesis was influenced heavily by *¡El tiempo construye!,* the illustration work of Chris Ware (2012) was another point of reference for translating the detailed narrative of the film into architectural drawings. I speculate that this could be a valuable method for anyone, especially students and researchers, who are pursuing hypothetical architecture that is driven by specific people, especially when there are major physical and ethical challenges to studying their circumstances.

# References

Anguelovski, Isabelle. 2014. *Neighbourhood as Refuge: Community Reconstruction, Place Remaking, and Environmental Justice in the City*. Cambridge: The MIT Press.

Bejerano, Sarah. 2016. “MICROBRIGADAS”. http://cargocollective.com/sarahbejerano/MICROBRIGADAS.

Block, Philippe, Tom Van Mele, Matthias Rippmann. 2015. “Structural Stone Surfaces: New Compression Shells Inspired by the Past”. *Architectural Design* 85, no. 5: 74-7.

Brand, Stewart. 1994. *How Buildings Learn: What Happens After They’re Built*. New York: Penguin.

Coyula, Mario, and Jill Hamberg. 2003. “Understanding Slums: The Case of Havana, Cuba.” *The David Rockefeller Center for Latin American Studies Working Papers on Latin America* 4/5, no. 4: 1-39.

Cuperus, Ype. 2001, “An Introduction to Open Building”. In *Proceedings of the 9th Annual Conference of the International Group for Lean Construction*, edited by Glenn Ballard and David Kim Huat Chua, 116-126. Singapore: National University of Singapore.

Davis, Howard. 2006. *The Culture of Building*. Oxford: Oxford University Press.

Del Real, Patricio, and Joseph Scarpaci. 2011. “Barbacoas: Havana’s New Inward Frontier.” In *Havana Beyond the Ruins: Cultural Mappings After 1989*, edited by Anke Birkenmaier and Esther Whitfield, 53-72. Durham and London: Duke University Press.

DuFour, Tao, Iulia Statica, Tom McEnaney, Kennan Arunasalam. 2016. *Alamar: An Archaeology of Socialist Domestic Infrastructure in Havana*. http://www.projectalamar.com/.

Ford, Edward R. 2011. *The Architectural Detail*. New York: Princeton Architectural Press.

García-Huidobro, Fernando, Diego Torres Torriti, and Nicolás Tugas. 2008. ¡*El tiempo construye! : el Proyecto Experimental de Vivienda (PREVI) de Lima : génesis y desenlace = Time builds! : the Experimental Housing Project (PREVI), Lima : genesis and outcome.* Barcelona: Gustavo Gili.

García Pleyán, Carlos. 2001. “Innovations for Sustainable Development in Cities of the South: The Habitat-Cuba Approach.” *Development in Practice* 11, no. 2-3: 332-335.

García Pleyán, Carlos. 2019. “Havana: the landscape and the gaze.” *OnCubaNews*, September 4. https://oncubanews.com/en/cuba/havana-the-landscape-and-the-gaze/.

Gray, Barbara. 1989. *Collaborating: Finding Common Ground for Multiparty Problems*. San Francisco: Jossey-Bass.

Gray, Barbara. 1994. “A Feminist Critique of *Collaborating*.” *Journal of Management Inquiry* 3, no. 3: 286-293.

Habraken, John. 1972. *Supports: an Alternative to Mass Housing.* New York: Alfred A. Knopf.

Habraken, John. 2002. “The Uses of Levels: Keynote Address, Unesco Regional Seminar on Shelter for the Homeless, Seoul 1988.” *Open House International* 27, no. 2: 1-17.

Ingold, Tim. 2013. *Making: Anthropology, Archaeology, Art and Architecture.* London: Routledge.

Jacobs, Jane. 1961. *The Death and Life of Great American Cities.* New York: Random House.

Kroll, Lucien. 1986. *An Architecture of Complexity*. Cambridge: The MIT Press.

Latour, Bruno and Albena Yaneva. 2008. “‘Give me a gun and I will make all buildings move’: an ANT’s view of architecture.” In *Explorations in Architecture, Teaching, Design, Research*, by Reto Geiser, 80-89. Basel: Birkhäuser.

Livingston, Rodolfo. 2006. *Arquitectos de la Familia: El Método*. Buenos Aires: Nobuko.

Loomis, John A. 1999. *Revolution of Forms: Cuba’s Forgotten Art Schools.* New York: Princeton Architectural Press.

López López, David, Pere Roca, Andrew Liew, Tom Van Mele, Philippe Block. 2019. “Tile Vaults as Integrated Formwork for Reinforced Concrete: Construction, Experimental Testing and a Method for the Design and Analysis of Two-Dimensional Structures.” *Engineering Structures* 188: 233-248.

Menéndez García, Madeline. 2007. *La Casa Habanera: Tipología de la Arquitectura Doméstica en el Centro Histórico.* La Habana: Oficina del Historiador de la Ciudad de La Habana.

Muñoz Hernández, Ruslan. 2018. “Vivienda.” In *La Arquitectura de la Revolución Cubana 1959-2018*, edited by Manuel Cuadra, 129-144. Kassel: Kassel University Press.

Murphy, Keith. 2012. “Transmodality and Temporality in Design Interactions.” *Journal of Pragmatics* 44: 1966-1981.

Pardo, María Victoria, and Josefa Quintana Montiel, eds. 2016. *Plan Especial de Desarrollo Integral*. Havana: Plan Maestro de la Oficina del Historiador de la Ciudad de La Habana.

Pérez, Amanda Llumar, Heidy María Alvarez Mederos, Maria Karla Molinet Barrios, Ariam Alberto Vega Cintra, Yónar Lázaro Estevez Hernández, and Jennifer Zúñiga. 2019. “Informe Técnico Palacio de las Ursulinas”. Student project. Havana: CUJAE.

Pérez, Fernando, dir. 2003. *Suite Habana*. Madrid: Wanda Vision S.A. DVD.

Saavedra Ayrado, Arianna, ed. 2015. *Casas de Hoy: Diseno de Viviendas Unifamiliares Para Cuba*. Ciego de Avila: DPV.

Scarpaci, Joseph L., Roberto Segre, and Mario Coyula. 2002. *Havana: Two Faces of the Antillean Metropolis*. Chapel Hill: The University of North Carolina Press.

Sennett, Richard. 1970. *The Uses of Disorder: Personal Identity & City Life.* New York: Alfred A. Knopf.

Tablada, Abel, Frank De Troyer, Bert Blocken, Jan Carmeliet, Han Verschure. 2009. “On natural ventilation and thermal comfort in compact urban environments - the Old Havana case.” *Building and Environment* 44: 1943-1958.

Turner, John FC. 1976. *Housing by People: Towards Autonomy in Building Environments*. London: Marion Boyars.

Valladares, Arturo. 2017. “The Built Environment in Contemporary Old Havana: Building Systems in a Historic District.” PhD diss., McGill University. http://digitool.library.mcgill.ca/webclient/StreamGate?folder_id=0&dvs=1575078509325~77.

Vale, Lawrence J., Shomon Shamsuddin, Annemarie Gray, and Kassie Bertumen. 2014. “What Affordable Housing should Afford: Housing for Resilient Cities.” *Cityscape* 16, no. 2: 21-49.

Ware, Chris. 2012. *Building Stories*. New York: Pantheon Books.

Yaneva, Albena. 2009. *The Making of a Building: A Pragmatist Approach to Architecture.* Oxford: Peter Lang.