Defining Permanence: Structuring Housing for Incremental Change

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Abstract: Housing must accommodate change from shifts in individual lifestyles to demographics across a city. The ability to accommodate change must be anticipated, structured and intentionally integrated into housing if the current environmental and economic degradation and placeless nature of the built environment is to be reversed. Incremental change in housing includes the ability to renovate, alter and extend existing spaces for new uses, services and technologies or the addition of entirely new spaces to an existing building. Incremental change accommodates the varying needs of individuals and societies over time, eliminating the wholesale demolition or abandonment of "useless" buildings. By providing opportunities for individuals to assert control over their portion of the built environment within a shared urban fabric, incremental change combats the placeless quality of contemporary housing developments. As the change is incremental, the continuity between dwellings will still be recognizable even after a series of transformations. Incremental change requires a systematic analysis of construction not in terms of how things are built but in terms of how they can be transformed after they are built. Consequently, dimension, access and assembly are used to discuss how incremental change can be structured.

1 SUSTAINABILITY AND PLACE

In contemporary cities, those parts of the built environment that cannot accommodate change are demolished or abandoned. Even when new housing is constructed, little or no thought is given to how the needs of individuals, neighborhoods and societies could shift over time, while architects focus too much on the client's current requirements and initial construction costs. As natural resources are increasingly precious, economic resources are increasingly limited, and as people are increasingly alienated, architects and developers must abandon this first-use, first-cost thinking and a reliance on cycles of use and disuse, demolition and construction, to accommodate change in housing. Current patterns of development only degrade the quality of environments in which we live until we can no longer define them as places. Without the ability for housing to accommodate change, the danger lies in large portions of the built environment becoming useless, abandoned, and neglected to the point they are worthless to all and without significance. Consequently, this paper explores the potential of incremental change to transform housing.

1.1 DEFINING SUSTAINABILITY

The benefits of sustainable design and technologies have become increasingly recognized in contemporary architecture. However, these benefits are negated when sustainable design and technologies are misused. If a "sustainable" building by any definition needed to be replaced every 20 or even 40 years because it can no longer accommodate the dynamic needs of its users, the environmental cost of this replacement in terms of deconstruction, raw materials and reconstruction could undermine any energy or other resource savings achieved during the occupation of the building. Disuse and demolition of the built environment is not only a waste of environmental resources but economic resources, as well. Paralleling the sustainability argument, the continued inhabitation of existing buildings and housing conserves economic resources by eliminating the cost of demolition and reconstruction, not just of the housing itself but the infrastructure needed to support that housing.

1.2 DEFINING PLACE

In order to discuss how the built environment has become increasingly placeless, place or the quality of place must be defined. First and foremost, as Kingston Heath states, "buildings, alone, do not define place; *people*, in their interactions with the natural and built environment, define place."[1] Taken a step further, this paper argues people are a part of what defines a place. The agency of memory, history, individual expression and structured change all define place and require people to be active participants with and within the built environment.

As most contemporary housing cannot accommodate change, people are forced to move when their needs alter significantly. This movement feeds into the continued commodification of housing, which in turn creates housing devoid of personality and further decreases the ability for individuals and families to make any alterations. Consequently, as Christian Norberg-Schulz puts it, the loss of place is now "a well-established fact" as places "have lost and continue to lose their identities, both in terms of demarcation and of character."[2] Essentially, contemporary housing has lost any sense of boundary both in terms of what is normally criticized as "sprawl" and that housing has no connection to the environment, natural or built, of which it is a part.

2 FLEXIBILITY AND ADAPTABILITY

While the value of accommodating change in the built environment, and housing in particular, is clear, this discussion must now focus on how housing can accommodate change. This is not a new topic in architectural discourse. As a reaction to the strict functionalism of modern architecture, a number of "failures" like Pruitt-Igoe in St. Louis and an increasing awareness of the environmental impact of buildings, many architects in the 1970s took on the issue of accommodating change. Many of these architects, including Andrew Rabeneck and his colleagues, analyzed existing housing considered flexible or adaptable, much built speculatively in the late 19th century, looking for design attributes or spatial characteristics that could explain how they could be continuously inhabited for over a century.[3] Ultimately, the approaches both turn of the century and in the 1970s ranged widely. "Flexible" designs allow users to readily move or transform spaces at will through the use of moving partitions or more permanent alterations. On the other extreme, "adaptable" spaces do not undergo any significant physical change over time but are designed to accommodate a number of uses through their initial design, dimension and organization. No matter which approach is taken, all spaces that accommodate change must deal with the issue of how to anticipate these unforeseen changes. This paper proposes that a method of incremental change has the potential to meet both current and future needs of inhabitants, neighborhoods and cities.

Incremental change encourages both flexibility and adaptability as neither alone can adequately incorporate a wide range of needed variations. Adaptability provides opportunities for both personal and collective activities to accommodate personal choice but cannot provide for more dramatic shifts in lifestyle, demographics or technology. Flexibility, and in particular longer-term additions and alterations, must be explored to avoid obsolescence. However, concerns about the wholesale change and loss of identity often associated with flexibility are valid. Incremental change gradually phases alterations into an existing urban fabric without erasing the characteristics that define place.

3 DEFINING INCREMENTAL CHANGE

Incremental changes include the ability to renovate, alter and extend existing spaces for new uses, services and technologies or the addition of entirely new spaces to an existing building. It accommodates the varying needs of individuals and societies over time, eliminating the wholesale demolition or abandonment of "useless" buildings. Designing for incremental change challenges the commodification of housing by accommodating the varying needs of inhabitants over time instead of forcing them to move from one inflexible dwelling to another. It also allows for the continued investment in the largest asset of most individuals and families, their house. By providing opportunities for individuals to assert control over their portion of the built environment within a shared urban fabric, incremental change combats the placeless quality of contemporary housing developments. As the change is incremental, the continuity between dwellings will still be recognizable even after a series of transformations.

Incremental change requires a systematic analysis of construction not in terms of how things are built but in terms of how they can be transformed after they are built. The relationship of program to spaces must be considered as some parts of housing are more difficult than others to change over time, including bathrooms, kitchens and other spaces associated with plumbing and other services. This approach also requires analyzing exterior spaces and the relationship of houses to one another. The incremental changes must be structured and legible across an entire neighborhood. The dimension of spaces as well as how they are accessed both relate directly to how housing could be used, reused and altered over time. Consequently, dimension, access and assembly, as defined by Renee Chow[4], are used to discuss how incremental change can be structured.

3.1 ASSEMBLY

Of the three lenses, assembly is often most neglected by other theories for accommodating change. Consequently, it is the main focus of this paper. It is unlikely that light wood platform framing is going to be replaced by another building system for housing in the United States within the next decade or perhaps even longer. Instead of complaining about the status quo, one can work within the current conditions to improve the built environment. One of the largest disconnects between housing design and its subsequent inhabitation is its construction. As architects place too much emphasis on first use and first cost, decisions are made about how housing will be framed based on efficiency and the initial program. Little thought is given to how the placement of services or load bearing walls will impede or facilitate future alterations. Architects must consider from the early stages of design how housing will be constructed if they hope to structure incremental change in any meaningful way.

3.2 ACCESS

Access, as defined by Renee Chow, "is the space of moving – between, into and through other spaces."[5] Architects typically address access in housing by minimizing corridors and hallways, valuable square footage wasted on circulation, or seemingly eliminating circulation altogether by evoking the modernist open plan. What this limited view of access neglects is that space to travel between activities will always be needed and consequently should be structured. Access is not limited to how people travel between rooms in a house but includes the threshold of moving between interior and exterior, stairs, and spaces within rooms set aside for movement. The role of the automobile must also be considered with respect to how people access both lots and houses. As is the case with assembly, access must be designed with both present and future uses in mind. The position of stairs, the ability to access the depth of a site, and organization of spaces with respect to one another all influence the ability of housing to accommodate incremental change.

3.3 DIMENSION

Dimension, like access, does not solely focus on the size of rooms but on the size of activity spaces, both collective and individual. While the size of rooms is typically determined by the collective activity occurring there, the potential of analyzing dimension and avoiding the normative 10-foot by 12-foot descriptor allows spaces to be structured to hold multiple readings, or opportunities, for use. As Hertzberger and Chow point out, the ability for a setting or form to be read in variety of ways is the essence of adaptability. Demarcating boundaries between activities, rooms, or interior and exterior spaces, dimension can also be organized to set up zones that run the through the depth or width of a house. In terms of incremental change, the size of spaces as well as the larger organization of dimensions is critical.

4 CASE STUDIES

Two case studies help identify strategies that both accommodate and impede incremental change with respect to assembly, access, and dimension. In order to explore issues of construction and accommodating incremental change in greater depth, the case studies used to discuss incremental change are all rowhouses. This is not to say the strategies discussed in this paper could not be applied to single-family detached houses or denser multifamily housing. However, as land is increasingly scarce and expensive, new housing will have to be designed to accommodate higher densities. While potentially accommodating higher densities than single-family detached houses, rowhouses offer a level of privacy and amenities that many Americans now associate either with how they want to live or how they should live. Without the buffer of the side yards typically associated with single-family detached homes, the design of rowhouses, with respect to incremental change, also requires a more careful consideration the initial assembly and subsequently alterations with respect to neighboring houses.

4.1 PADDINGTON TERRACE HOUSE, Sydney, Australia

As one of the first suburbs of Sydney, Paddington started as housing for craftsmen, stonemasons and carpenters, working on the nearby Victoria Barracks during the 1830s. The craftsmen built their own houses out of local sandstone based on 18th century English rowhouses that housed the working class there. These houses had flat, unadorned façades, placed along the sidewalk edge. As the climate of Sydney is radically different than that of England, the rowhouse typology was quickly adapted by adding a verandah to the front of each house, providing

shade and an exterior space connected to the main living and bedroom above. At the same time, the terrace houses were set back ten to twenty feet from the sidewalk to provide a front garden. The bulk of these two to three story rowhouses, called terrace houses after the distinctive verandah, were built speculatively between 1850 and 1890. Land speculators would by a large lot, typically from the ranchers who owned the rolling hills around Victoria Barracks, and divide it into small, narrow lots. As some speculators believed they could make more profit by selling more lots, they divided their parcels into dimensions as narrow as 12 feet. However, the typical terrace house ranges from 15 to 25 feet in width. Instead of reselling the smaller lots and allowing individuals to build their own house, developers would build a series of terrace houses to rent or sell. Not only have the terrace houses been continuously inhabited for over 100 years, the demographics have changed drastically over that time. From the skilled craftsmen, to new arrivals from England at the turn of the century to European immigrants after World War I and II to artists and students to young, wealthy families, the terrace houses have accommodated a variety of lifestyles.

Built before indoor plumbing and electricity, the terrace houses are only two rooms deep to allow for daylighting and ventilation. The houses were originally organized with a formal parlor facing the street and space for dining or living opening onto the backyard. The upper floor mirrored the lower floor with two bedrooms spanning the width of the lot with one opening on the verandah and one with windows or even a rear balcony to the backyard. If a terrace house was more than two rooms deep, the third room, typically a scullery, would not be the full width of the lot, leaving a five foot gap for the middle room to have a window. Occasionally, the scullery and water closet would be a separate structure sited three to ten feet away from the house itself. Similar to the addition of a third room, the scullery would not span the full width of the lot, and the water closet attached to the rear of the scullery would be narrower, extending the house along one of the two bearing walls and thinning as it progressed deeper in the lot.

The assembly of the terrace houses is straightforward. Load bearing walls, of brick or stone, ran parallel to one another along lot lines. In many cases, these walls extended past the roof and enclosure to emphasize the boundaries of each individual house. Floor and roof joists run between these bearing walls, and as the spans were usually less than 20 feet, no interior load bearing walls or columns were needed. Therefore, the front and rear facades as well as all interior walls are non-loading bearing. This assembly allows for a range of transformations within the interior as well as extensions and additions to both front and rear of the terrace houses. Consequently, indoor plumbing was easily incorporated, allowing for the addition of bathrooms and a more connected kitchen. One of the more typical alterations is the removal of the wall between the former parlor and dinning/living space. The assembly also lent itself to the often-steep streets of Paddington as individual houses did not have share the same foundation and could “slip” vertically between the load-bearing walls that clearly divided them.

Due to the narrow lots, access through the terrace house into the depth of the lot occurs along the same load-bearing wall that the terrace house “grows” along. The access through subsequent additions often passes through the middle of these spaces, as access is often displaced into the center of the house by the stairs. However, there is no one position for vertical access, which often depended on the width of the lot. Typically the stair was located along the same bearing wall as the primary access either as a single run or switchback, although occasionally the vertical access was placed between the two ground floor rooms perpendicular to the load-bearing walls. As access passes along the side of most rooms, even the space originally used as the parlor could be easily transformed into a bedroom. While an alley system exists that occasionally allowed for the addition of garages to the rear of lots, the alleys are usually limited to a few feet in width and originally served for cleaning water closets. Consequently, automobiles cannot access the lot and relegated to the streets. Fortunately, many streets are generous enough in width to allow for cars to park perpendicular to the direction of traffic.

The dimensional structure follows the pattern established by the access. The width of the terrace house divided into a three-foot zone for access with the remaining width for activities. The fireplaces, located on the wall opposite the access, create capacity for personal choice within their depth. The four to six foot depth of the verandahs offers the opportunity to use these spaces as exterior, enclose the upper balcony as a separate space off the main bedroom, or extend either front room to edge of the balcony. Hertzberger would argue continuing the bearing wall past the enclosure and edge of the verandah, enclosing it on three sides, offers an “incentive” to transform the space.[6] However, the local city council in recent years has declared Paddington part of a historic district. If an individual wishes to renovate or make any alterations to his or her terrace house, they must restore the front façade to its original 1880s appearance, removing any extensions or additions. The boundary between the historic district is clearly visible between the forced restoration to almost unrecognizably transformed façades down the street.

4.2 TUNNEL HOUSE, San Francisco, United States

As the last neighborhood developed in San Francisco, the center of the Sunset District stands today as one of the least altered built environments in the city. Produced in the 1930s and early 1940s by a relatively limited number of developers using similar plans across numerous blocks, the single-family rowhouses served as “starter homes” offering suburban amenities, such as attached garages and back yards, with easy access to downtown. Despite 65 years of use and shifting demographics over that time period, relatively few of the houses show any sign of alteration. This suggests that either the houses as-built have fulfilled the changing requirements of San Francisco’s population or, more likely, people move when the Sunset house can no longer meet their needs. It is clear that the design and assembly of these houses seriously impedes incremental change.

Despite the a range of floor plans, all of the houses in the Sunset District share some basic design attributes. The Sunset District consists of long narrow blocks, all platted 25-foot wide and 125-foot deep lots, and the houses are typically set back ten to fifteen feet from the sidewalk and span the entire width of the lot. As designed, all of the living space is on the upper floor, and due to this, each two-story house has an exterior stair to the entry. Collective spaces, such as the living and dining room, open onto the street while individual spaces, namely bedrooms, open onto the backyard with Service spaces, like the kitchen and bathrooms, in between. Primarily used as a garage, the entire ground floor is labeled as a “basement” in the original plans and is accordingly unfinished with studs and floor joists exposed with only an eight foot height between the rough concrete slab and the bottom of the floor joists. The houses are typically more than two rooms deeps and require lightwells and skylights to ensure each room has adequate ventilation and daylight. As over three quarters of the rowhouses in a twelve-block study of the Sunset district are tunnel houses, named after the tunnel-like entry, the analysis of assembly, access and dimension will focus on this typology.

The assembly of the tunnel houses is complex and severely limits incremental change. The Sunset houses primarily use light wood platform framing, and consequently, the party walls are actually just two stud walls built on either side of the lot line and not a shared wall. Most joists run between three load-bearing walls, one along each of the lot lines and the third dividing the width of the house into a 14-foot and 10-foot wide dimension. In the basement, a series of posts and beams are used for all interior supports, and the floor joists at the front and back of the house are turned parallel to the first set of load-bearing walls, in order to create three-foot cantilevers, which require both the front and rear façade to be load bearing as well. As the entire perimeter of the tunnel house is load bearing, extensions, alterations and additions to both the front and back are difficult. The location of the existing living spaces on the upper floor as well as the cantilevers further complicated any extensions or additions. Services and the walls that contain plumbing are perpendicular to the load-bearing walls, blocking any attempt to significantly transform the interior spaces. The height and design of the basement makes any alterations to this space difficult. Transforming any part of the ground floor into a habitable area would require the addition of a floor and ceiling, reducing the height of the space further, and would be limited to the space adjacent to the rear wall as it provides the only windows on this level. The post and beam system used on the ground floor also drops the ceiling another foot imposing a boundary on any attempt to renovate the basement. Furthermore, the proximity of the house to the sidewalk and lack of sectional change between the sidewalk and ground floor would make any transformation of the front part of the basement awkward.

Access is equally problematic for incremental change in the tunnel house. First and foremost, there is no way to access outdoor spaces directly from the living spaces. A narrow, unfinished back stair leads into the basement, so one must always pass through the ground floor to access one of the most treasured amenities in the Sunset, the back yard. While a handful of houses have added decks and stairs to the rear of the house, people must still pass through bedrooms, typically individual and private spaces. There is also no way to access the backyard from the street without passing through the house. The consequence of this restricted access is that the back yards in the Sunset District are grossly underutilized on just a day-to-day basis and to accommodate change. In a likely effort to minimize the amount of space used exclusive for access, the entry tunnel delivers inhabitants to the center of the house and the front door opens onto the narrow corridor linking the living and sleeping spaces.

Reinforced by the assembly and access, there is little capacity for personal choice within the dimensional structure of the tunnel houses. As mentioned, the tunnel house is primarily divided into the 14-foot width of the garage and 10-foot width of the tunnel, which corresponds to the living room and dining room dimensions above. Beyond the

three-foot cantilever of the dining room, the tunnel house has no spaces dimensioned for individual activities as all other narrow dimensions are given over to closets or bathrooms.

As a result of all these limitations, only one-quarter of the houses in the 12-block survey of the Sunset District show any sign of incremental change. Furthermore, any alterations made are limited to finishing the basement or enclosing the tunnel on the ground floor, adding entire rooms to the rear of the house on the upper floor, or adding a third story. With each of these transformations, the quality of the original spaces is compromised, particularly in terms of daylighting and view. As there is no way to structure the incremental change that is actually taking place in the Sunset District, one individual can make it virtually impossible for his neighbor to construct a similar transformation as well as reduce the quality of his neighbor's spaces, for example, by blocking lightwells and skylights from receiving any direct sunlight with a third story or rear addition.

5 STRUCTURING INCREMENTAL CHANGE

Building on the existing dialogue of accommodating change through flexibility and adaptability as well as the lessons learned from the case studies of the previous chapter, specific strategies for how assembly, access and dimension can be structured to accommodate incremental change in housing are clear. Assembly must be ordered not in terms of how a house is constructed, but how it can be altered once built. To ensure both the house and lot can be used to their full potential to accommodate change, the access must both allow for housing to be divided and the entire depth of lot to be utilized. Dimension must be structured to accommodate both collective and individual activities within the same space.

5.1 ORDERING PERMANENCE

By considering construction as the assembly of elements with varying degrees of permanence, conventional construction techniques, such as light wood platform framing, can be used to structure the built environment to better accommodate incremental change. How a house is built influences how it can be changed. Seemingly simple decisions during construction, such as which direction to run joists in a given space, can assign some walls to be more permanent, either through structure or services, and less likely to be altered than other walls. The larger organization of permanent and less permanent elements influences how a house can be transformed. Consequently, a hierarchy based on how a building can be changed is necessary.

Using light wood frame platform construction, an order of permanence can be developed and used to structure incremental change. In a two-story house, the foundation, vertical load-bearing walls and floor joists are the least likely to be changed and are considered primary assembly elements. The floor joists are considered primary because the direction they span determines which walls below are load-bearing. The second floor load-bearing walls and ceiling joists or trusses are dependent on the walls and floor joists below but can be altered without having to alter any primary assembly decisions. These elements are considered secondary. Finally, the tertiary elements refer to all non-load-bearing walls on either the first or second story as they can be altered without disruption to primary and secondary elements. In places with extreme lateral loading, such as seismic zones, walls not carrying vertical loads, tertiary in the order of permanence, may be needed to carry lateral loads. This does not mean they cannot be altered, but after any transformation, the capacity of the altered structure to resist lateral loading must be reassessed. Any lateral support removed must be compensated for with another transformation.

While not used in contemporary housing, light wood balloon framing has a different order of permanence and offers a useful comparison to how permanence is ordered in platform framing. The foundation and load-bearing walls are primary. In balloon framing, the stud walls run the entire height of the house, so the order of permanence is not tied to a vertical hierarchy. Secondary elements includes all floor and ceiling joists which could be raised, lowered or completely removed without altering the load-bearing walls. Finally, all non-load bearing walls, including single height interior partitions and the double height non-load bearing exterior walls, are all tertiary elements. It is clear through ordering permanence that floor joists can be more easily altered in a balloon-framed house than a platform-framed house while a platform-framed house has greater potential for horizontal transformation and additions.

The order of permanence for the Paddington terrace houses is straightforward. The foundation and shared party walls are primary. The floor and ceiling joists are secondary, and all remaining non-load bearing walls are tertiary. Consequently, transformation to the front and rear of the terraces houses are straightforward and relatively

uncomplicated. It is obvious from documenting how the terrace houses have changed over time, that the primary and secondary elements have remained constant while the tertiary elements have been significantly transformed in some cases. However, it should be noted that in some cases the local government will not allow the wall dividing the original parlor and dining space to be removed because too many neighboring houses have removed that wall, potentially compromising the overall lateral stability of the houses. Again, the overall structure must be reassessed after alterations have been made.

In contrast, the order of permanence for the Sunset tunnel house is more complex, despite being platform framed, and impedes incremental change. The primary elements include the foundation, ground floor load-bearing walls, which include all perimeter walls due to the cantilevered joists at the front and back of the house, and upper floor joists. Instead of load-bearing walls, the interior vertical supports are a post and beam system and are also considered primary. On the upper floor, the three parallel load-bearing walls, the rear façade, ceiling joists and service walls, which run perpendicular to the load-bearing walls, are all secondary. Only the interior non-load-bearing partitions are tertiary in the tunnel house, and there are very few of those. Consequently, a secondary or primary element must be altered in order to make an addition or extension. This is the primary argument for why the Sunset District has changed so little. Finishing the rear portion of the basement and enclosing the tunnel are the only easy transformations, as they do not require altering any existing part of the tunnel house. These moves simply add more tertiary elements.

It is not enough to offer legible opportunities to alter tertiary elements and, by doing so, accommodate incremental change. There must be a shared understanding of how additions and alterations could be realized. Structuring incremental change across lot lines ensures that each house can be transformed in the same way without sacrificing the quality of existing spaces, those of the house being altered or those of a neighboring house, or impeding any transformations a neighboring house might undergo. In the Paddington terrace houses, the positions of the original sculleries along one of the bearing walls, the “growth” or addition wall, offers a shared understanding of how subsequent additions and extensions could be structured. Looking at the larger urban fabric of Paddington, it is clear that additions have been made along these walls. Two neighboring terraces can share the same addition wall creating mirror image plans or use different walls where each house has the same plan and windows from the additions look onto the blank, back side of the next addition wall. As the perimeter driven Sunset tunnel houses leave no clear, shared reading about how to structure incremental change, the alterations made show little respect for existing spaces and in some case obstruct a neighboring house from making the same alteration.

5.2 ACCESSING DEPTH

To make the most of natural and economic resources in both detached or row housing, the entire depth of a lot must be used to accommodate incremental change. Consequently, this depth must be accessible. Charleston has been able to increase in density without drastic changes to the historic urban fabric because the structure of access in the single house allows for the entire depth of the lot to be accessed without the need to pass through the house itself. Where the alleys are wide enough in Paddington, the depth of the lot can be accessed and is often used for car parking and garages, which could eventually be transformed into housing.

In order to divide multistory houses into multiple units, the existing vertical access or means to easily add new vertical access must be addressed. As highlighted in the previous chapter, the single house piazza allows for the addition of a stair so that multiple floors can be accessed from the exterior of the house. The vertical circulation in the terrace houses, however, is usually located within the depth of the house and there is no easy way to add a stair to the front of the house. Accordingly, very few terrace houses are divided into flats or multiple units. While having a similar access structure, a band of access running the depth of the house with rooms opening off it, the San Francisco Victorian rowhouses, studied in detail by Anne Vernez Moudon and Renee Chow, are organized with the staircase near the entry, originally to make this “hall” more grand. The access dimension is roughly six feet wide in the Victorian rowhouses versus three feet in the terrace houses, which allows people to pass along side the stair in the Victorians and forces the stair to be placed at the end of the access zone in the terrace houses. The more generous access dimension and stair location permits the Victorian rowhouses to be converted easily into flats with the addition of a second door in the non-load bearing front façade.

The automobile cannot be neglected in any analysis or structuring of access. Commenting a series of studies on housing densities, Sam Davis concludes, “In terms of the magnitude of impact on the physical form, car storage was

shown to be the single most important determinant."[7] Both the driveway and typical attached garage associated with lower density housing take up a significant amount of space. To be more efficient, the garage is placed as close as possible to the street and minimizing space dedicated to the driveway, while allowing for enough depth to park a car. As lots narrow, the garage becomes the dominating feature of the front façade, leaving no dimension for any habitable space opening to the sidewalk and street. The alternative is to structure opportunities to bring the car into the depth of the lot.

5.3 VARIED DIMENSION

In order to accommodate a range of activities, both personal and collective, dimension must be structured to accommodate personal choice as well as offer incentives for future alterations. If the width of the lot allows, leaving at least a ten foot wide zone open through the entire depth of the lot allows for the entire lot to be accessed and can accommodate an automobile anywhere in that depth. As highlighted earlier in the San Francisco Victorian rowhouses, a generous interior access dimension with a collective activity zone adjacent is one way to structure dimension to accommodate incremental change. The internal dimensions should allow for tertiary additions and subtractions. For example, the addition of a few walls can transform a living space into a bathroom, closet and bedroom or the subtraction of a wall can turn a bedroom and hall into a living room. As seen in the Paddington terrace houses, the width of porches, verandahs and piazzas determines how they could later be transformed into separate additions or extensions of existing spaces.

While incremental change focuses primarily on flexible means (i.e. significant transformations) to accommodate change, housing structured for incremental change must still adaptable in the ways Hertzberger and Chow discussed. This means providing dimensions for personal and collective activities that can be read in a variety ways. For example, the bay window of San Francisco rowhouses is usually three feet deep, roughly the dimension for an arm chair or desk, and can be used for a personal activity looking onto the street or that same space in the bay window can be considered part of the larger front room and accommodate a couch facing toward the interior of the house. With the dimensions of rooms drawn directly from their intended program in the original tunnel house, there were few spaces dimensioned for personal activities, in other words, little capacity for personal choice

6 CONCLUSION

Architects need representational tools in order for the capacity for personal choice and change over time can be analyzed and compared to successful precedents before the housing is constructed. While there will continue to be accidental flexibility and adaptability within the built environment, we cannot rely on it. The ability to accommodate change must be anticipated, structured and intentionally integrated into housing if the current environmental and economic degradation and placeless nature of the built environment is to be reversed. Incremental change in housing has the potential to accommodate unforeseen shifts in demographics, new technologies and radically different lifestyles. As a result, the natural and economic resources invested in these constructions will not be wasted. At the same time, incremental change allows a major portion of the built environment to endure while allowing for individuals to interact in significant and meaningful ways to define place. Through ordering the permanence of assembly, accessing the depth of housing and lots, and generous, varied dimensions, housing can be structured to accommodate incremental change.

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