

MODULAR AND MOBILE, SUSTAINABLE AND AFFORDABLE

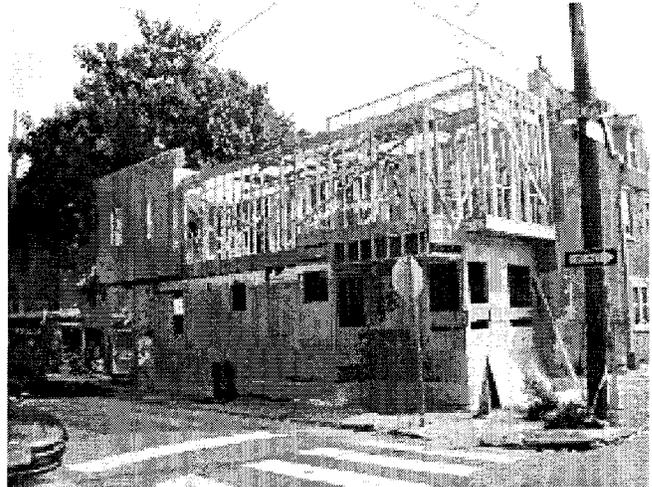
Truly Affordable Housing: practical techniques for urban housing design

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To many architects and developers, the words 'affordable housing' and 'design' are mutually exclusive. Once the goal of providing quality design enters the discussion, it is generally assumed the price will automatically increase. On the other hand when production techniques are developed to provide genuinely affordable housing, effort is so often focused on the practical issues that design is overlooked. It has proven very difficult to strike a harmonious balance.

While recently there have been notable developments in housing design that demonstrate our greater understanding of social issues and construction techniques, there still exists a lack of quality design in low-income housing. There have been many explanations given. Most often it is first blamed on a lack of funding; there is not enough money to produce quality architecture. However, another underlying reason may stem from the public perception of what affordable housing should look like. Some well-designed projects "make people uncomfortable because they are 'too nice'". The underlying belief is that people who do not have a lot of money do not deserve to live in nice housing".¹ I contest this notion because I feel good design is critical to instill a sense of pride in the occupants. "It must also bestow on its inhabitants a sense of dignity...To ignore this aspect of housing, or to consider it a prerequisite for only those who can afford market-rate housing, is to invite both social and financial disaster"². People need to have a personal psychological investment in their house and are well aware when asked to live in bland impersonal housing. Unattractive housing directly affects the self-respect of the occupants. "All people want to see themselves reflected, to express themselves on paper or canvass and in speech, dance, and their choice of car, clothing or built environment."³ If people are consistently told, through the kinds of housing offered, that they are only worthy of a certain level of quality, they may come to believe it. Quality design gives architects the chance to create a



sense of individual expression and thereby pride. Although hard to prove its benefit through tangible economic results, good design none-the-less is a valuable tool for improving our living environment. "Poor design puts us in a no-win situation. We have to establish a long-term set of standards that ensure that people will not want to move out of the house as soon as they move in."⁴

It will take time to change the public's opinion of an acceptable level of quality for affordable housing. However, we can address here and now the first reason given for poor design: low budgets. Some question the value of design in so basic a building type as affordable housing. When dealing with projects of extremely tight budgets, it is usually assumed that very little can be done to improve the stark quality of low-cost construction. Too often design is thought of as extraneous and must be left out as a consideration. "A common view is that design costs more, and that while architects add value and quality to buildings, they rarely add economy."⁵ This paper provides a direct challenge to the notion that "there is no budget for design". It was developed from results of a Design/Build Studio I coordinate and teach at our university. Our local Habitat for Humanity chapter served as the client and presented our student teams the challenge of conceiving and building a single-family rowhouse addressing the issues listed below. The following ideas were developed through discussions with the students during the design process. As you

will see, many were incorporated in the actual building construction of this project while the rest were contributed by other teams.

The common thread between all of the proposed strategies is that they address the challenge of improving the level of quality without substantially raising construction costs. The basic strategy can be generalized as "using what you've got". In other words they derive from taking advantage of the inherent materials and systems that are essential to the construction and cannot be interpreted as unnecessary. Every building employs a large amount of material just to provide basic shelter. It is the way these materials are combined that determines the success or failure of the design. By manipulating the proportion, size, location and scale of walls, roofs, windows and finishes of a design, we utilize necessary elements that can not be "value engineered" away when the money becomes tight. By taking advantage of timeless architectural principles of proportion, scale, color, solid/void, light/shadow, etc. we only bear the cost of consideration. While some of the strategies described below may increase the construction cost a modest amount, I feel the improvement in design quality, and thereby human dignity, is exponential in comparison to the monetary expenditure.

Affordable housing design, like any architectural design, is a complex process that requires consideration of many factors at once. Issues of codes, zoning, site, program, construction methods and so forth all must be addressed. However this paper never pretends to be a comprehensive guide to housing design. (There are many excellent writings on the subject already. The book "A Pattern Language", which influenced the format of this paper, serves as one example.)⁶ Rather it concentrates on three major challenges of affordable urban housing design and provides specific suggestions to increase design quality without significantly raising costs.

Three Major Challenges of Affordable Urban Housing Design

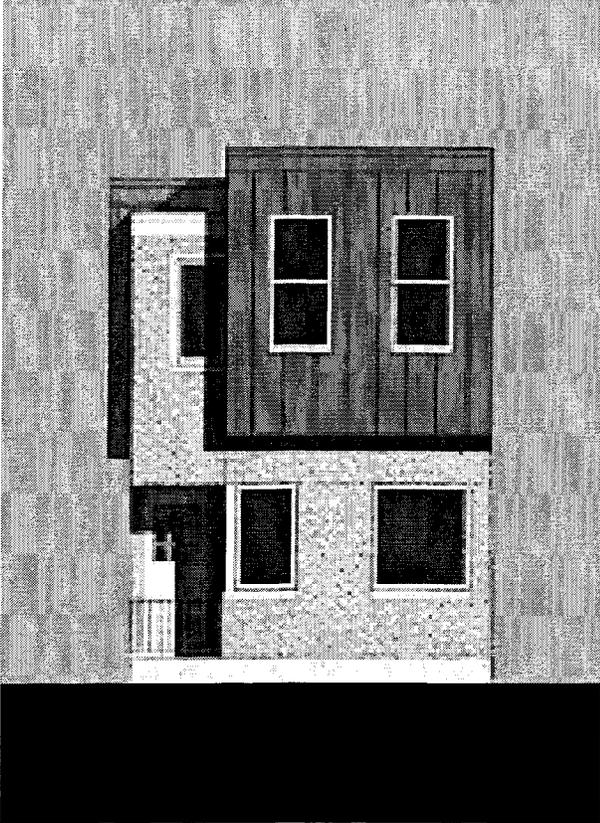
Affordable housing comes in a wide range of building forms. While defining these three challenges it is important to note that I am concentrating on the housing type addressed in our Design/Build Studio: the 2-story urban rowhouse on a very small and narrow lot.

However, this is not an uncommon urban typology, so the basic concepts behind these problems can also be applied to a range of affordable housing types. Three major concerns of this housing type are:

LACK OF LIGHT – Most urban housing is tightly spaced together on narrow lots to increase density. They either are separated by a narrow alley or are joined directly by a common party wall. Because of this arrangement windows are often limited to the front and back facades. Therefore central core spaces of these houses are often dark and uninviting. But "houses...need to have virtually all major rooms on an outside wall with access to light and ventilation. In fact the more rooms that have plentiful natural light, the more livable the home becomes."⁷ Getting light into the middle of the rowhouse is a vital issue.

SMALL SPACES - Most urban housing is located on tight inner city lots, in our case fifteen feet wide or less. These narrow sites create cramped rooms and hallways whose minute size is exacerbated by the lack of light. Each square inch of floor space is at a premium, not to mention each cubic foot of open space as well. "Poor use of space, particularly awkward and inefficient circulation, is the most recurring criticism of affordable housing."⁸

BORING BOXES - Limited budgets lead architects to believe that the house must be a simple unrelieved box shape to be affordable. "Obviously the most efficient structure is a simple form without variation, jogs or complex roofs".⁹ These box shaped houses create bland massings, shallow exterior facades and mundane, unexciting interior spaces. "Even the simplest plan needs some relief from the tyranny of minimal structure and cost concerns-it needs to 'break out of the box'".¹⁰ Because of the need to use inexpensive construction materials, surfaces are often overrun with the same finish material. For example extensive stucco as an exterior finish can create homes inappropriate to the surrounding context which often uses a variety of finish materials. Another assumption is that all floor plates must be stacked in a single plane like pancakes to save construction costs. This creates rooms with very regular and unrelieved heights whose widths vary in a way unrelated to the scale of the room.



11 CRITERIA

Below are listed eleven problems and possible solutions that each address one of the three issues listed above.

Sliding Walls

Issue Addressed: BORING BOXES

The cost-efficient rectangular box form creates flat unrelieved facades. In addition, thin walls require windows to be set flush with the exterior skin. This has led to the disappearance of shadows. Buildings that lack shadow do not successfully balance solid with void or light with dark, and tend to be monotonous and often out of scale with the surrounding houses. Another result of the bland box is an abrupt transition from the public space of the street to the private space of the house. With walls pushed out to the edges to maximize floor area, porches are often eliminated from the design.

Approach: Every building must have walls but there are no laws that require they all be flush with the property line. Important shadow is added by carving into the building mass or cantilevering over the edge while adding little material to the construction.

- Slide walls back from the street plane to create recesses that add valuable shadow to the massing of the building. Recessed porches also ease the transition from out to in and create a place for people to sit and interact with their neighbors.

- Slide walls over the street plane to create cantilevered overhangs. Bays are effective at breaking down the scale of a long facade to suit the surrounding context.

Surface Variety

Issue Addressed: BORING BOXES

People tend to be attracted to buildings with an abundance of visual detail. When brick was the major building material there was inherent detail in its construction system through the multitude of mortar joints. Bricks also could be manipulated (angled, corbelled, etc.) to create shadow lines and scale-defining banding within the confines of the construction method. Budgets limit the palette of both exterior and interior finish materials. There is rarely money available to upgrade to finer materials. However the use of only one material can be monotonous and inappropriate to the neighborhood buildings which often are composed of a rich palette of materials.

Approach: Vary the types and treatment of exterior finishes to break down over-scaled massings and highlight special features.

- Color is a key no-cost ally to break up large surfaces. A change of color is the least expensive method but it is more effective when combined with a change in texture and/or materials.

- Use medium-priced, texture-rich materials in smaller amounts as highlights and set them off against inexpensive background materials over the majority of the surface.

- To add texture and visual interest, use materials whose assembly joints create smaller level of detail such as Standing Seam metal siding, Hardi-plank (concrete clapboard) and limited areas of brick.

Window Patterns

Issue Addressed: BORING BOXES

There seems to be an assumption that to be affordable, windows must all be smaller, of consistent size and operation, and located in the middle of a room. Often the results are one-size, double-hung windows regardless of the scale of the room. They are often too small in scale for the proportions of the house and may float isolated in the middle of a broad wall.

Approach: Windows are vital to allow for light, ventilation and egress. Often they require a minimum size by code that cannot be reduced or eliminated by budget cuts. Therefore they are a major inherent design element on a façade.

-Use a variety of window shapes and operations. Let them represent the function of the room behind. Many window manufacturers make windows to order as they do not want to maintain a large inventory. Therefore they do not charge much more than stock windows for "custom" made.

-If you must use small windows do not isolate them on a broad façade. Group them together where possible and use the broad surface of the skin as a background to a well-proportioned facade.

-Where appropriate, place windows where they can help reduce the massing of the building, such as placing them next to a void to make it appear larger.

Roof Profile

Issue Addressed: BORING BOXES

The roof has traditionally been a prime area for individual design expression. "The roof profile of a house is frequently the most distinguishing feature of a particular design signature"¹² But the typical flat roof profile used on much affordable housing lacks character and may not be the most appropriate solution in a historic neighborhood with a rich collection of cornice design.

Approach: Beyond drainage, the roof is relatively free of functional constraints. Because no one typically inhabits the roof, it is the only horizontal plane that can tilt off the horizontal; in fact to drain rainwater it must slope.

-Slope roof edges to create a distinctive cap to the house that helps the building mass meet the sky. Coordinate the profile with roof

drainage slope to make it less susceptible to budget cuts. Sloped roof also benefit the rooms below by creating unique spaces with high sloped ceilings.

Inherent Detail

Issue Addressed: BORING BOXES

Most cost-effective materials, such as stucco, lack much detail or possibility for manipulation. The meeting of different materials is often clumsy and abrupt.

Approach: Every meeting of materials is an opportunity for design. Express the coming together of materials in the joint. Do not assume that all details must be "standard". With limited opportunities for design, every joint should be considered as potential detail. Make use of required objects with inherent detail that can not be value engineered off a project.

-Railings, gutters, downspouts, expansion joints, etc. are all necessary items that are sometimes treated as a nuisance or afterthought. For stucco walls, expansion joints need not be blindly placed but can be a design tool. New stricter codes that require closer spacing of railing balusters increase the number of members which actually helps increase visual interest. Even a mundane electric meter can be located in a manner that helps compose an elevation.

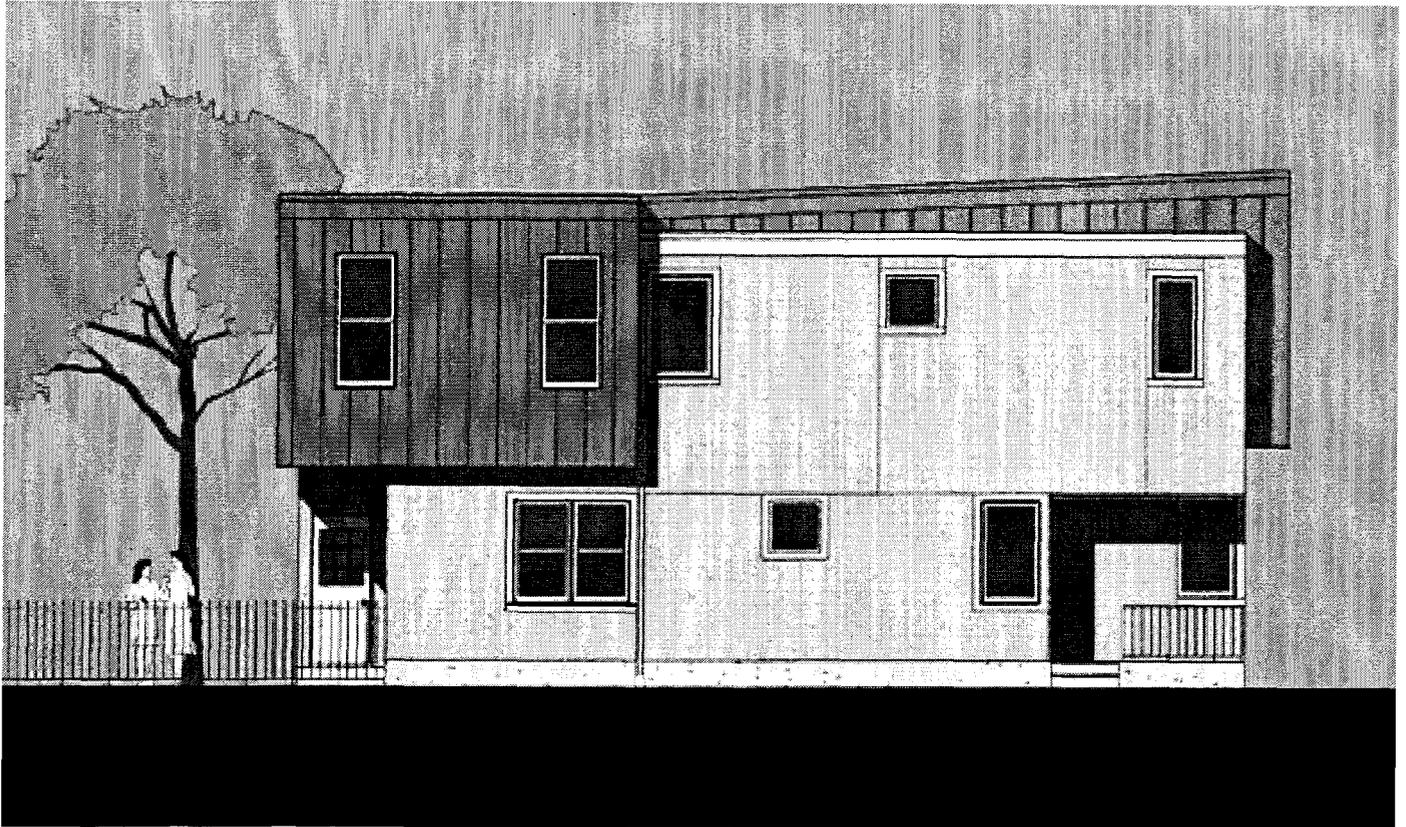
-Every time a wall material meets another system, like the foundation or the parapet, is another opportunity for design. Materials that are used to keep water out of the house can also be fashioned to provide visual detail. "The relationship between the roof and the balance of the home is another area of detailing largely omitted in new homes."¹¹

-The multiple layers of a window frame required to hold the sashes and screens creates its own detail. When combined with trim the window can be an area of concentrated detail set off well against a broad blank wall surface.

Expanding Upward

Issue Addressed: SMALL SPACES

Since urban lots are confined there is no room to expand horizontally. The standard eight-foot high ceiling is too low for such an already narrow room. Therefore to increase the spaciousness of a



Criteria Addressed: Expanding Upward, Ceiling Height Variety, Service Zones

room, "there is nowhere to go but up".

Approach: Make spaces feel larger by increasing ceiling heights.
 -Make ceilings significantly taller than the standard eight-foot height. The material costs for an extra foot or two or even three of height are slight but pay off exponentially in terms of spatial rewards.

Ceiling Height Variety

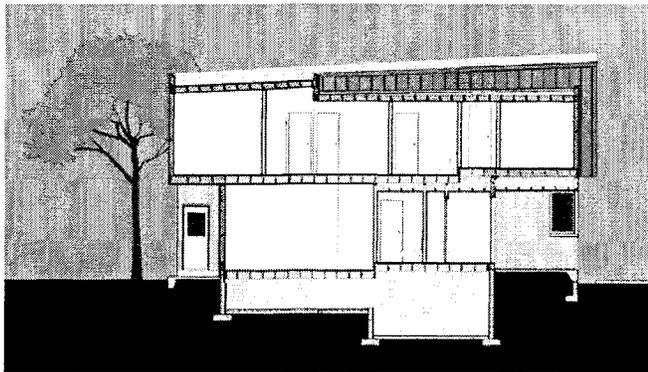
Issue Addressed: BORING BOXES

The quickest, and thereby cheapest, way to construct floor plates is on one continuous plane. However this creates flat pancake stacked floors that offer no variety of ceiling height as spatial relief. The challenge is how to offset floor plates at various points to create a

play of ceiling heights without making the construction costs too high.

Approach: Instead of treating the floor plates as single flat planes, think of the house as a series of boxes or voids that 'slide' vertically as well as horizontally within the framework of the structure. Offset these 'boxes' to create a variety of spatial heights that reflect the scale and function of the room. Where two floors or roofs shift above the same level floor, nooks and more intimate scaled spaces can be created under the lower ceiling.

- If the building is narrow the floors will likely be supported only at the side bearing walls. Floor joists can easily span these widths so that each room's floor plate can be thought of as an independent plane suspended at any height between the walls.



Criteria Addressed: Expanding Upward, Ceiling Height Variety, Service Zones.

-Take advantage of how joists bear on a supporting beam. If one set of joists is side bearing on joist hangers and those on the other side of the beam are top bearing, the result is a 3-step difference in height that adds little to no additional material. This shift creates a clear distinction between room heights and adds variety to the space.

- Slide rooms upward half a story to form rooms that penetrate the roof to gather light which at the same time create a one and a half story space below.

Stair as Atrium

Issue Addressed: BORING BOXES

On small lots, floor area is too valuable to waste on double height spaces. Therefore houses lack the spatial relief belonging to rooms that extend beyond a single story.

Approach: The stair is a naturally existing two-story space which when configured in certain manner can open up into an atrium space within the center of the house.

-Rather than planning the stair as a straight run which creates a thin slot of double height space, return the stair so that it doubles back to form a square. This will open up a two-story atrium which when combined with an opening in the roof, can become a major source of spatial relief especially when placed in the center of the house.

Opening in Roof

Issue Addressed: LACK OF LIGHT

Because of the lack of windows and/or direct sunlight, the central spaces of a rowhouse are the darkest and light is at a premium. The quick solution to drop a skylight into the middle of a ceiling may provide light but does not always relate to the overall design and often floats desolately in the center.

Approach: Think of the roof as a third façade and compose it as any other elevation. Create roof windows that integrate with the spaces.

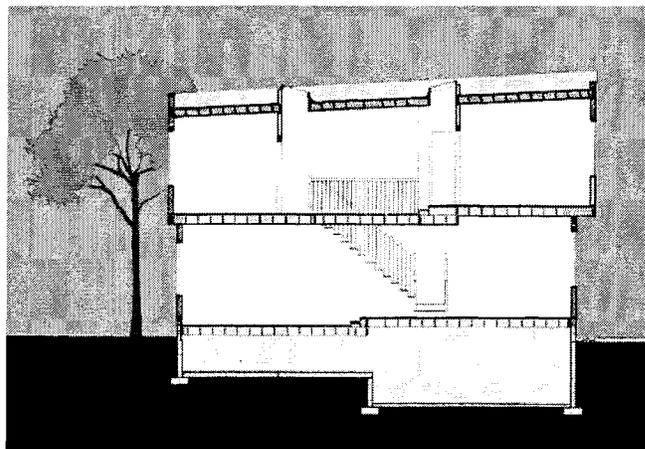
-Combine skylights with a stair atrium to bring light into the lower floors.

-Place skylights at the edge of rooms rather than in the middle to give the impression of walls and thereby space flowing past the ceiling plane.

-Sometimes a skylight is undesirable for financial or water penetration concerns. However, clerestories can be created by simply raising one piece of the roof plane above the other without much additional construction material. Then standard windows can be installed in the gap.

Borrowed Space

Issue Addressed: SMALL SPACES



Criteria Addressed: Expanding Upward, Ceiling Height Variety, Opening in Roof, Borrowed Space

The floor area of narrow lots is too small to be broken up into cell-like rooms containing only one function. Walls chop up the flow of spaces and block off valuable light. However certain rooms must have walls to maintain privacy.

Approach: Eliminate walls on all spaces except private bedrooms and bathrooms. Open up the house by combining two or more activities in one space. "Fluid space and good lighting can make even a small dwelling seem free and open, rather than confined and oppressive."¹³

- Minimize corridors by using the edge of rooms as circulation space
- Open stairwells onto rooms by using railings instead of walls. This also provides visual detail via the railing and light via the stairwell.
- Combine public functions into one space; kitchen and dining, dining and living, etc.
- Enclose basements with walls at the bottom of the stair rather than the top. This eliminates view-obstructing walls on the main living level.

Service Zones

Issue Addressed: BORING BOXES

Because floor area is at a premium, architects need to maximize the square footage of every living space. Therefore utilities such as ducts and drain pipes often are not assigned their own space and end up protruding obnoxiously into rooms.

Approach: Create service zones that group utilities together in a compact area.

- Group kitchens and baths in or near the service zone to save pipe material costs and create clear order to interior spaces
- Include closets and bathroom that can afford lower ceilings to conceal utilities overhead.

Conclusion

While these proposed solutions reflect a specific rowhouse form, they can easily be translated into other types of housing. Even though there is a great variety of housing around the world, all could benefit from more light, space and beauty. These are basic shared human needs regardless of the income level of the occu-



House design: Tyson Chamberlain, James Chambers, Warren Fisher and Jennifer Pucylowski

pants. Many of the proposals above are not new to the problem of affordable housing. However this paper is a first step in developing a practical and comprehensive set of guidelines and techniques to address the three particular aforementioned challenges of designing affordable housing. I intend to refine these ideas, and others developed by students from future Design/Build studios, into a practical booklet that can assist designers of affordable housing, especially those untrained as architects. Hopefully it will encourage them not to abandon the quest for quality building design when the budget ax falls.

Notes

- 1 Maurer, Laurie, *New Urban Housing; Fresh Thinking from the Pittsburgh Design Competition*, Community Design Center of Pittsburgh, Inc., 1994
- 2 Davis, Sam, *The Architecture of Affordable Housing*, University of California Press, Berkeley and Los Angeles, 1995
- 3 Burnham, Richard, *Housing Ourselves; Creating Affordable Sustainable Shelter*, McGraw-Hill, New York, 1998
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- 6 Alexander, Christopher, *A Pattern Language*, Oxford University Press, New York 1977

7 Wentling, James, Designing a Place Called Home, Chapman & Hall,
New York, 1995

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