Breaking the Code: A Prototype for Single-Stair Housing

Zhan Chen
Kansas State University

Abstract

In the United States, code requirements for two means of egress have contributed to the widespread implementation of double-loaded corridors in multi-family housing.[1] This configuration results in constrained unit layouts, limited natural light and ventilation, and circulation spaces that function purely as utilitarian passageways. In contrast, single-stair housing, commonly known as point-access blocks, offer greater spatial adaptability and improved living environments. Yet, despite their benefits, this typology remains largely restricted under US building codes.

However, recent policy shifts to allow single-stair housing in some cities have gained attention and support. The project presented in this paper speculates how these emerging regulatory changes could impact housing in the U.S. The Geode House is a prototype that explores how the stair can break out of its mono-functional role and facilitate various forms of human contact. By integrating shared programs, outdoor spaces, and varied circulation patterns, the Geode House challenges conventional housing models and creates new connections between private and communal domains.

Introduction/Background

In the US, code requirements for two means of egress have contributed to the widespread implementation of double-loaded corridors in multi-family housing.[1] This spatial arrangement maximizes efficiency in large-scale developments, but creates a rigid spatial arrangement. The hallway connecting egress stairs creates a fixed building depth, restricting unit layout possibilities. With only one face of exposure, units have limited access to natural light and ventilation.[1] The result is an exercise in balancing efficiency and regulations rather than designing for human needs.

Fig. 1. Geode House: A Prototype for Single Stair Housing. Competition Project by the author for the Denver Single Stair Housing Challenge Competition

Outside the US, point access blocks solve many of the shortcomings inherent in the double-loaded corridor. With a single stair and elevator core serving a smaller number of units, this typology allows for a variety of unit

configurations. By eliminating the central corridor, point access blocks allow multiple exposures, enabling cross-ventilation and more generous daylighting. Furthermore, the absence of the corridor network reduces the building footprint, making point access blocks well-suited for smaller lots and mid-scale developments.

Currently, point-access blocks are not allowed in most US cities for buildings over three stories.[1] However, cities like Seattle and New York have recently amended their codes to allow point access blocks under specific conditions, such as a maximum of six stories, with four units per floor, and a 75-foot maximum egress travel distance.[2] As these regulatory changes gain momentum, many other cities are considering similar revisions. This paper explores how these emerging regulations could catalyze new housing strategies. Through the case study of Geode House, a prototype for single-stair housing designed by the author, the project examines the spatial and social opportunities inherent in the point-access block model.

Fig. 2. Physical Model. Conceptual study of the building as a geode rock formation.

Old Stair: A Mono-Functioning Component

The conventional stair is a utilitarian device that moves users vertically within a building. Since it does not contribute to the leasable or saleable square footage, it is often reduced in size as much as possible. Stair dimensions are determined by egress code requirements. The width is calculated based on the occupancy of the spaces they serve, and the length is determined by the fewest number of treads necessary to connect each level. As a result, these stairs almost always adopt a U-shaped switchback configuration in order to minimize their footprint.[4] The same reductive logic governs the corridors that connect stairs —just wide enough for two-way traffic and as long as needed to serve the maximum number of units.

Beyond their dimensions, the utilitarian nature of these stairs is further reinforced through their spatial characteristics. They exist as independent and enclosed spaces, isolated from both the city and the living environment. Surrounded by solid walls, these stairs are devoid of natural light, preventing views to the outside or other parts of the building. Likewise, corridors are fully insulated by units on either side and sandwiched between floor slabs, reinforcing their status as non-places.

This approach creates several issues. First, circulation is entirely severed from the social domain. The process of arriving and departing one's residence happens in a vacuum, detached from both the private realm of the home and the public life of the street. Second, these stairs prevent natural patterns of movement. The switchback configuration forces residents into tight, abrupt turns, requiring them to complete 360-degree turns on each floor. The mono-functioning stair compels users to be in constant motion, with no opportunities to stop, pause, or interact.

Fig. 3. Aerial View showing "vertical street". Project is situated on an infill site in Denver's Capitol Hill neighborhood

New Stair: A Vertical Street

The Geode House breaks away from the utilitarian logic by reimagining the stair as a vertical street. Rather than enclosing the stair within a solid core, the stair occupies the open void between the building's two halves. The stair builds on postwar modernism's ambition to create "streets in the air," demonstrated at Lynn and Smith's Park Hill Estate or the Smithsons' Robin Hood Gardens. But whereas the open galleries of the 50's and 60's remained disconnected from the city and other floors, the Geode stair operates as a vertical thoroughfare, connecting units, communal spaces, and outdoor terraces along a continuous route. As residents ascend, they remain engaged with their environment - hearing the sounds of the neighborhood, feeling the climate, and seeing the life of the city unfold around them.

Strategy for Program

Just as city streets are lined with diverse building types and functions, the stair at Geode House is interwoven with shared programs and outdoor spaces. While such amenities are common in housing developments, the direct access to these amenities from the stair makes this relationship unique. As seen in the section, on floors 2, 4, and 6, programmatic volumes protrude into the atrium from both ends of the building. These spaces accommodate a variety of communal functions, such as a children's playroom, a laundry facility, a greenhouse, and a co-working office. The stair and its landings span between these volumes, creating a co-dependence: the stair provides access and exposure to these spaces, while the programmatic volumes serve as structural anchors that support stair.

This arrangement yields mutual benefits. The act of climbing the stair is punctuated by moments of activity and interaction rather than a monotonous ascent. Simultaneously, the communal spaces benefit from their

placement along a high-traffic route, providing greater visibility and usage activity to the programs.

Fig. 4. Left: Section Perspective showing distribution of communal programs and outdoor space

Strategy for Outdoor Space

The sectional organization of the Geode House also challenges conventional ways of incorporating outdoor spaces in housing. Typically, shared outdoor spaces are concentrated at the ground level or on designated building setbacks, making them exposed to the elements and far away for most residents. In comparison, the Geode House distributes these spaces throughout the building, on every other floor. Located on the first, third, fifth, and rooftop levels, these outdoor areas occupy the roof planes of the communal programmatic volumes, making no unit more than one floor away from an outdoor space. Their adjacency to unit entries and openings enhances natural ventilation and daylight access while also providing a transition between private and communal realms. And unlike conventional cantilevered balconies, which often feel precarious due to wind and lack of protection, these terraces are nestled within the building's section. Surrounded on multiple sides and covered by the floor above, they function more like outdoor living rooms, offering both shelter and connection to the surrounding context.

Patterns of Movement

Another way in which the Geode House stair functions as a vertical street is through its gradual patterns of movement. Unlike the rigid, repetitive circulation of a conventional stair, the stair design creates a varied and incremental experience. Rather than continuous vertical runs, the stair is broken up by generous landings and bridges, creating a combination of horizontal and vertical movement. Every 10 feet of vertical ascent is followed by 15 feet of horizontal passage, introducing stretches of rest that require less effort.

Stair landings intersect with outdoor walkways at every level, forming circulation nodes. Much like intersections within a city grid, these are moments of choice—residents can continue ascending, pause to interact, or opt to veer off into a communal space. As a result, even with only one stair serving the entire building, the route remains dynamic and varied, offering more possibilities for movement and activities.

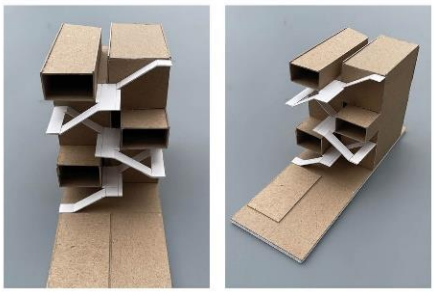

Fig. 5. Physical Models showing stair configuration

Fig. 6. View from 5th floor communal outdoor space with stairs, bridges, and landings

Shaping the Stair for Interaction

Stairs in Baroque architecture were designed to stage human encounters and highlight social relationships. Their trajectories were often intentionally prolonged and made visible from multiple angles.[3] By contrast, the rigid compartmentalization of mono-functioning stairs discourages human interaction. The combination of stairwells and corridors creates an entry/exit sequence that occurs in a vacuum, cut off from both the public and private domains. Functioning like a sorting device, shuttling inhabitants to and from their units. This strategy for circulation creates a sense of isolation rather than fostering community.

Stair Configuration

At the Geode House, the stair is designed to facilitate human connection. This begins with the configuration of the stair and its position in relation to the residential units. In plan, the stair and outdoor walkways delineate the building into four distinct quadrants, each containing a unit and a share of communal space. This organizational strategy implies affiliations between communal and private areas. Although the terraces and landings are communal, they are territorially charged by their proximity to the units. Each quadrant of the common function as "front porches" for the nearest residence, extending each unit's domestic domain into the shared space.

Each floor positions the stair within a different quadrant, and as residents ascend, landings and bridges create "cross-overs" that shift them from one quadrant to another. This pathway generates possible moments of interaction by guiding residents into spaces affiliated with other units—an experience akin to stepping onto a neighbor's front porch. These transitional spaces are intended to diffuse boundaries between public and

private zones and serve as a catalyst for social exchanges.

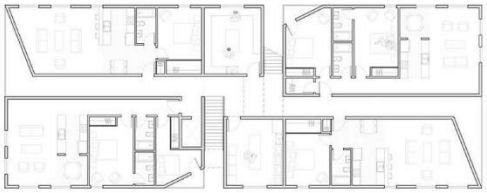

Fig. 7. 4th floor plan showing 4 quadrants created by stair and walkways.

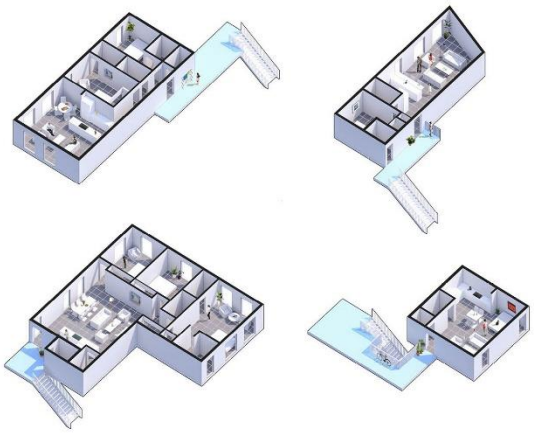

Fig. 8. Units Types with highlighted corresponding "front porch" spaces. The stair route takes residents through these semi-private zones.

Visual Connections

The stair also facilitates human interaction by establishing a 3-dimensional network of sightlines. Unlike the singular, tunnel-like perspective of double-loaded corridors, the stair at Geode House offers an array of crossing, diagonal, and vertical views across different levels. Whereas switchback stairs stack directly above each other, the Geode House's stair and communal spaces alternate positions in both plan and section. This organization provides users views of communal spaces above, below, and adjacent, creating a dynamic visual field.

For example, a multidirectional vantage point occurs on the landing of the fourth floor. (Fig.9) From this position, a resident can look down to the third-floor terrace, glance through the outdoor walkways to the front and back streets, and gaze up toward the fifth-floor stair and terrace. These intersecting sightlines encourage both direct and peripheral awareness of other residents, reinforcing a sense of collective habitation.

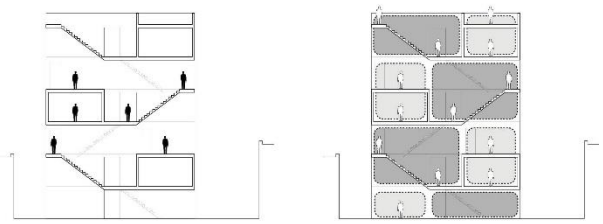

Fig. 9. Left: Section Diagram showing visual connections. Right: Diagram showing stair and communal programs alternating in section.

Fire Safety

The Geode House offers advantages for fire safety compared to the typical point access blocks where the stairway is fully enclosed. A primary rationale behind allowing point access blocks only up to six stories is that fire truck ladders can reach all units, allowing for window rescues if evacuation is not possible.[5] However, window rescues come with limitations. First, they require residents to remain inside their units, which is dangerous, as units often lack fire suppression systems such as sprinklers, fire-rated walls, pressurization, or active ventilation. Second, window rescues are only possible from street-facing windows. In many cases, especially on infill lots, only one facade faces the street, meaning a limited number of units are accessible for window rescue.

At the Geode House, the stair and its connected outdoor spaces offer improved rescue options. On every floor, the outdoor stair links to terraces and walkways that extend to all four facades of the building, creating multiple points of access and egress. These outdoor terraces, while

designed as communal gathering areas, also function as designated areas of refuge where residents can safely wait if the main stair becomes blocked or inaccessible. Unlike interior units, these spaces are well-ventilated and enclosed by rated exterior walls, making them more protected from fire or smoke. The continuous configuration of these outdoor areas enables residents to move toward the safest part of the building or toward a facade where rescue is most feasible—an option not available in the typical enclosed single stair design.

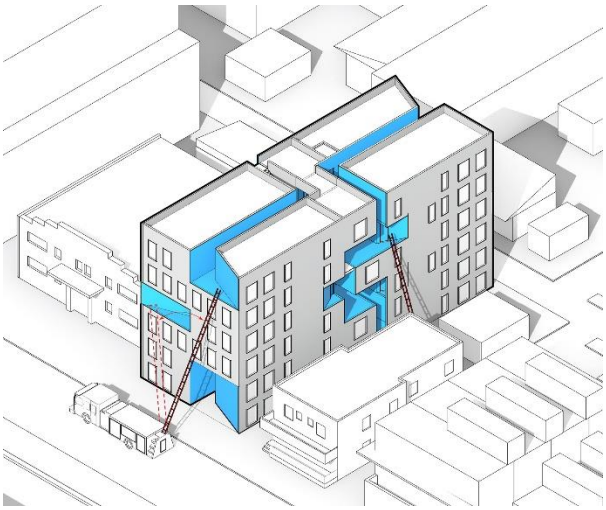

Fig. 10. Diagram showing multiple rescue points with fire truck or ground ladder access.

Conclusion

Current code requirements for two means of egress have led to a formulaic approach to housing. While developments may take on various shapes and configurations, the internal spatial arrangements follow a familiar pattern. Building blocks are made wide enough for a double-loaded corridor but not so wide that spaces are too far from a window. Apartments are configured to maximize unit count along the corridor while meeting the minimum standards for light, ventilation, access, and life safety. This approach to housing development reconciles regulations and efficiency and ignores the complexities of living in close proximity to others.

Point-access blocks offer advantages to the spatial limitations imposed by double-egress requirements. The typology allows for multiple exposures, providing cross-ventilation and maximizing access to natural light throughout the units. And without the need for an internal corridor system, the smaller building footprint is adaptable to a range of sites and parcels.

But beyond its practical advantages, point access blocks present possibilities for social interaction. In the Geode House, the stair acts as an extension of the public street. As residents arrive and depart their units, the convergence of stairs and landings function as intersections around a city block, allowing structured movement and chance encounters. The combination of straight runs, switchbacks, and landings provide overlooks and stopping points where residents can see and converse with their neighbors. Unlike internalized corridors, the path of the stair allows residents to feel connected to their neighbors and the city.

Rather than being driven by issues of efficiency and regulations, the project focuses on the micro-level interactions between humans and their surroundings. The prototype presents the point access block as an opportunity to rethink current housing practices. While most US cities are scrambling to provide enough housing, the project illuminates the simultaneous need to develop new forms of housing.

Notes:

1. Utile, Legalizing Mid-Rise Single-Stair Housing in Massachusetts: A Report on the Impact of Allowing Mid-Rise Point Access Blocks on Housing Design and Development in Greater Boston and Beyond (Boston: Utile, 2024).

2. AIA Austin, Single-Stair Fire Safety Diagrams: Technical Code Amendment (Austin: AIA Austin, February 29, 2024).

3. Oliver Heckmann and Friederike Schneider, eds., Floor Plan Manual Housing: Fifth, Revised and Expanded Edition (Berlin: Walter de Gruyter GmbH, 2017), accessed via ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/ksu/detail.action?docID=5158192.

4. Michael Eliason, Unlocking Livable, Resilient, Decarbonized Housing with Point Access Blocks: Final Report (Seattle: Larch Lab, December 28, 2021).

5. The Pew Charitable Trusts, Small Single-Stairway Apartment Buildings Have Strong Safety Record (February 2025),https://www.pewtrusts.org/en/research-and-analysis/reports/2025/02/small-single-stairway-apartment-buildings-have-strong-safety-record.