

Building Housing Over Single-Story Retail in Downtown or Main Street: Code Challenges and Alternatives

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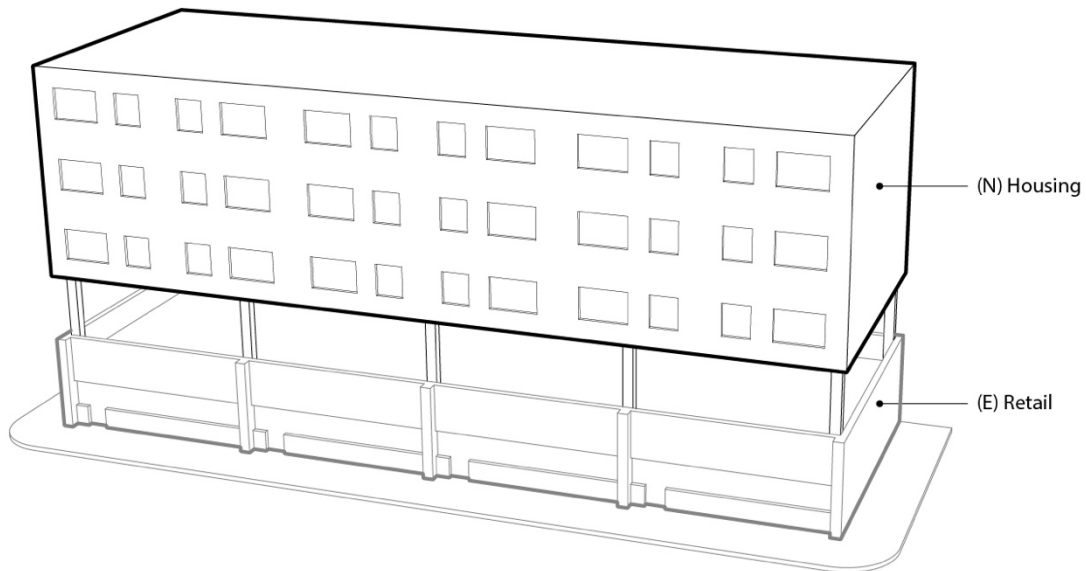


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Why Build Housing Over Existing Retail?

Scope

Single-story retail is a common building typology in many downtowns or Main Streets in the United States. While not problematic in and of itself, the single-story retail can limit the type of density that is beneficial to the local economy. Furthermore, with housing shortages in many parts of the country, creative solutions are beginning to emerge for addressing the shortage. Providing housing in proximity to commercial uses downtown can also sustain a vibrant downtown by offering additional disposable income nearby. More residents downtown can also contribute to a car-light or car-free lifestyle by allowing walking or biking trips to retail, restaurants, and other amenities. Finally, many existing multistory buildings in legacy downtowns have vacant upper stories that could be used for housing. This memo seeks to clarify the challenges from a building code, constructability, and logistic standpoint for designing and constructing housing above retail.

Purpose

This memo is intended for municipal planners and officials who may not know all the details of building code but have an interest in promoting housing built over or within commercial uses. We seek to distill essential considerations for constructing housing above retail in a straightforward, singular document. Small municipalities do not always have architectural support in their planning departments, and this can get in the way of due diligence for complicated code and constructability projects. This memo seeks to clarify the litany of challenges that such a decision would create. We would always recommend that local planners and officials also consult with code enforcement officers and fire code experts in looking at this complex issue.

New Mixed-Use Developments

Scope

There are very few successful examples of new housing constructed over existing retail, at least not without significant disruption to the existing retail. For some communities' new mixed-use developments may be impossible due to the lack of available temporary retail space for the existing retail during new construction or community support to displace retailers temporarily. Ultimately, it is often cheaper to tear down existing retail and construct new mixed-use housing with ground-floor retail. The cheaper cost is attributed primarily to removing the complications of working with the existing retail below and allowing for an efficient structural system. Additionally, working with a clean slate allows for underground parking to be constructed, whereas, with existing retail, underground parking would be nearly impossible.

Mixed-use developments offer the chance to add housing units in the most economical way possible by increasing density in previously developed areas. The new retail space is also more energy efficient and can be fully electric to meet climate goals. Furthermore, by having housing above retail, the retail spaces will be more active and create a livelier street experience.

It is important to note that for many smaller towns, retail spaces may be part of historic landmarks or buildings with significance to the community. This status makes tearing them down for mixed-use developments not possible or, at the very least, very challenging. Building new housing above historic or significant buildings might not be desirable or financially feasible.

Phased Construction Approach

In some cases, if a town has space to relocate existing retail temporarily while the mixed-use development is constructed, a phased approach is best. The phased approach allows for existing retailers to be relocated, existing retail demolished, new mixed-use development constructed, and the existing retailers moved back in. This is sometimes referred to as the game of musical chairs, as retailers are relocated to space for a short period before they move back. Within this approach, there can be construction emphasis upon completing the retail space before the housing above to allow retailers to move back sooner. There will be some construction noise concerns, but a temporary certificate of occupancy for the retail may be possible if a community allows for such.

If the entire block of the street is going to be demolished for new mixed-use, then a different phased approach might be beneficial. In this case, the length of the block can be divided in half and allow for two phases of construction to keep half of the retail space open. After the first half of the development is complete, the other retail that would be demolished next can move into the new retail. However, in this case, there is not a perfect transition between old and new retail spaces since the first half would be demolished without new retail to occupy. Depending on the retailers and their desires to stay, this may not pose an issue, but compensation for displaced retailers could be explored.

Compensation for Existing Retailers

If a town is committed to tearing down existing retail to build mixed-use, then the town needs to ensure that business owners are not displaced without guarantees and financial protection. The businesses that occupied the existing retail should be allowed to secure leases within the new retail spaces at the same prices. Building the mixed-use development is primarily to add housing units, not to garner higher retail rental prices. Not only is this the fair thing to do, but it will elicit public support for the mixed-use development.

In addition to priority leasing of the new retail spaces, existing business owners should be compensated for the time that their businesses are closed. The developer and the city should fund the compensation. This puts pressure on the city and the developer to prevent unnecessary delays during design and construction. Lastly, existing business owners should be provided with secure storage for their inventory, furniture, and supplies during construction. Combining these guarantees and financial protections alleviates the burden of temporarily displacing existing retailers and affords the community an opportunity for more housing units.

Building Code

Many jurisdictions use the International Building Code (IBC) for their building code requirements. In addition to the IBC, municipalities often adopt the International Code for electrical, plumbing, and mechanical. When there are municipal-specific additions, supplemental codes are issued that the local authority having jurisdiction creates. These codes are referenced to the applicable International Code section, which they seek to modify. These supplemental codes are commonly found on the building department's website for each municipality.

Some of the requirements of the building code have interpretations for special or unique circumstances, and the authority having jurisdiction has much latitude to request that their interpretation of the code is followed. This is especially true for a local or state fire official, who will review and approve all drawings. The fire official also must approve the fire truck access strategy for the building, which may pose some challenges in the case of housing over existing retail. However, as long as the fire official approves the fire truck access plan, then the project can continue. It is recommended to hold preliminary conversations with fire officials before going too far to ensure that their input is incorporated into the early design or feasibility studies.

Building Over Existing Retail: Building Systems Challenges

Heating, Ventilation, and Air Conditioning

Existing rooftop-mounted equipment will pose the biggest HVAC challenge to building new housing above existing retail. The existing retail will have some combination of air conditioners, air handlers, fan coil units, vents, exhaust fans, and other small equipment pieces. All these equipment pieces have clearance requirements to either ensure enough space for supply air or prevent re-entrainment, which is when the supply vents pull exhaust air in before it has a chance to mix with fresh air and dissipate any contaminants (see Figure 1). The most significant concern for re-entrainment would be equipment that is mounted furthest away from the edges of the roof since there will be less airflow.

Clearance space is also required for the eventual removal and replacement of equipment on the retail rooftop. Additionally, the acoustics would pose a challenge for the housing floor directly above the retail since the equipment on the roof of the retail can be loud. Lastly, during the construction of the housing, there would need to be a construction debris mitigation plan to prevent construction waste and dust from entering the HVAC equipment of the retail buildings, whether they are occupied during construction or not.

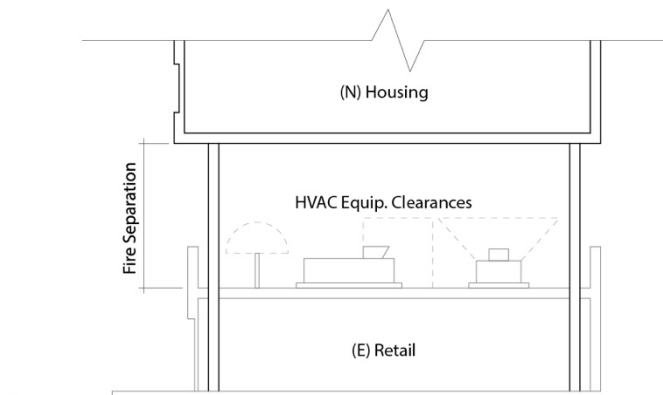


Figure 1 – Retail and Housing Sectional Relationship

Scale: Not to Scale

Fire Ratings

Code-required fire ratings will present challenges for the required separation between the surface of the roof and the surface of the housing structure above. As is required with the vertical exterior face of two buildings, a minimum separation distance would be required between the retail and housing to prevent expensive 3- or 4-hour rated exterior walls (see Figure 1). In the case of building over existing retail, this would be incredibly challenging if the fire marshal required an increased fire rating for the roof structure of the existing retail, which would be cost-prohibitive.

The best action to mitigate the costs of additional fire ratings would be to ensure that the code-required separation is met. The separation will result in a large gap between the retail and the housing above and may be unsightly. However, this can be improved by implementing lighting or art installations on the underside of the housing or adding a screen to the top of the retail to close the gap visually. If choosing to close the gap with a screen, there would need to be ample perforations in the screen to allow for adequate ventilation for the rooftop equipment. Additionally, there might also be a desire to have the vertical face of the housing set back from the vertical face of the retail. This would create a hierarchy of volumes and ensure that the retail is not completely overpowered by the new housing.

Fire ratings for columns will also be a challenge since the construction type of the housing would require fireproofing on the columns (assuming steel for the columns penetrating the retail to support the housing above). Additionally, in the retail spaces, there would be a desire to conceal the fireproofing and add furring walls to the columns to make them appear finished.

The housing will also require fire sprinklers, and this will require a fire pump control room on the ground floor with direct exterior access for the fire marshal. The fire pump control room is not very large, but the requirement for direct exterior access means more of the retail storefront will be taken away. Strategies for co-locating the fire pump control room in the elevator lobby should be explored and discussed as an acceptable option with the fire marshal. It is important to note that the fire marshal will likely not want the fire pump control room access to be in an alleyway or narrow side corridor between buildings.

Structural

Structural concerns are one of the most apparent considerations when building new housing above existing retail. The structural system of the existing retail will likely be masonry or wood construction and, therefore, insufficient to be built on top of. Therefore, the structural system of the housing will need to penetrate through the retail and require new concrete pad foundations. This will result in significant disruption to the retail and likely result in the retail spaces needing to be closed and emptied during construction (see Figure 2).

To reduce the number of penetrations into the retail spaces, the housing above can use deeper structural steel members. Using steel for housing is not very common, except for high-rises, which would increase the construction cost above average. However, in this case, the structural steel would provide the rigid frame for the wood construction to be built for the levels above. Concrete could be used instead of steel for the first floor of the housing, but it would require more field work because the formwork for the concrete would need to be erected on-site and concrete pumped in.

Lateral supports will also disrupt the retail spaces below. Housing often uses shear walls for lateral supports, which could still be used for the wood construction portion of the housing. As discussed previously, the first floor of housing will need to be supported by concrete or steel because of the interaction with the retail structure. If using concrete, shear walls can still be used, but steel would need to use moment frames or brace frames. Deciding which structural system to use will depend on the state of the existing retail structure, budgets, and schedules. The lateral supports must also fill the full height of each structural bay it is needed for, which means that there would need to be lateral support members in the space between the roof of the retail and the underside of the housing. The location of these lateral members will need to work for the retail spaces and be considered for their aesthetic placement if visible from the street.

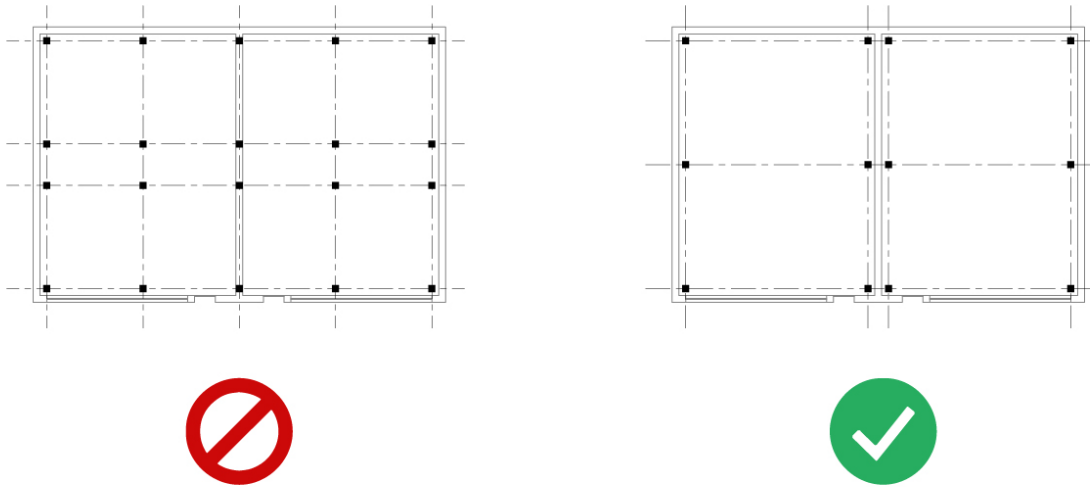


Figure 2 – Structural Grid Alignment

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Plumbing

Plumbing systems will need to be routed through the retail below or in an adjacent space, if possible. The locations of major vertical plumbing lines will need to be coordinated carefully to avoid unnecessary penetrations into the retail spaces. Because there will be space between the underside of the housing and the roof of the retail, the space should be utilized to congregate as much of the plumbing lines as possible. This would allow all pumping to go directly down through the underside of the housing and then slope toward one or two locations that penetrate through the retail. Special attention will need to be paid to the acoustics of the pumping penetrations to ensure that they are not creating any noise in the retail spaces.

Stormwater management will also need to be managed from the roof and balconies of the housing above. Because the housing will be covering the roof of the retail entirely and the retail has gutters for stormwater to be managed, in theory, the housing can divert its stormwater to the retail roof. However, this will need to be confirmed by stormwater or plumbing professionals. The retail may also not be designed to the latest code applied to the housing, further complicating the use of the retail roof for stormwater. Alternatively, the stormwater can be collected into the penetrations through the retail and connected to the city stormwater management system. If the authority having jurisdiction requires that stormwater be managed on-site, then the stormwater would need to be managed with a green roof solution on the housing.

Electrical

Electrical systems will pose the same challenges as plumbing systems. Some vertical elements will need to penetrate the retail spaces, and some space will need to be allocated for a transformer and duct banks. In some cases, the transformer can be in an underground vault on the sidewalk or in an alleyway, but at other times this might not be possible. The amount of space for vertical electrical systems will be less than required for plumbing systems, but adequate space should be planned.

Vertical Circulation

Vertical circulation, such as stairs and elevators, requires careful placement and analysis. The building code requires separation distances for the exit stairs, and there are requirements for the maximum horizontal travel distance to elevators. The most cost-effective strategy for the elevators would be to locate them where they have the most negligible impact on the retail, both in terms of penetration and the pathway from the elevator to the exterior (see

figure 3). Another strategy would be to have a transfer floor for the elevators, meaning the elevators would go from the ground floor to the first floor of the housing, and occupants would exit the elevator and take another elevator up the rest of the floors of the housing. This is a common strategy in high-rise buildings to control security access to all floors above. A special consideration of the transfer floor scenario is that the elevators serving the floors above would need to have an elevator pit, which is a service pit below the elevator and would be below the surface of the underside of the housing. Like the elevator pit, the elevators connecting the retail and the first floor of the retail would need to have an elevator overrun space on the second floor of housing that would result in the loss of some housing space. Regardless of what scenario is pursued, both options would need to have an elevator machine room, which is typically located on the lowest floor that the elevators serve, in this case, the retail. In most cases, the elevator machine room can be located on another floor and would be best located on the first floor of the housing.

Stairs will pose similar challenges as those posed by the elevators. There will be at least two sets of stairs coming from the housing down to the retail. The stairs will have required separation distances and will inevitably end up interfering with the retail spaces. If there is an alleyway, one option to explore on the backside of the housing would be to have an exterior stair or at least have the stair become an exterior stair for the last few flights. It is important to note that exit stairs must either exit directly to the exterior or enter a fire rated corridor leading to the exterior. Exiting directly to the exterior is the most cost effective and allowing exit stairs to discharge directly into the retail spaces is not allowed.

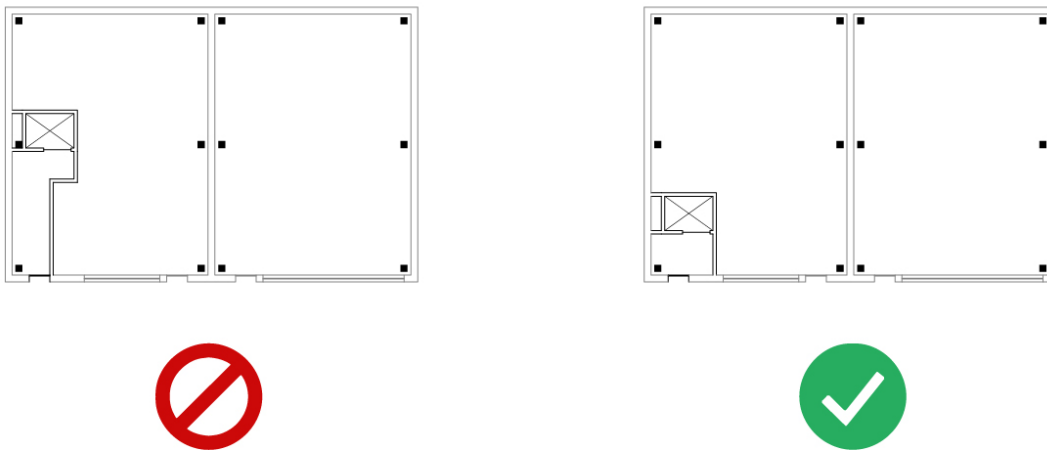


Figure 3 – Vertical Circulation Alignment

Scale: Not to Scale

Egress

In some jurisdictions, there are additional requirements to incorporate more robust and higher fire-rated structures when there is a concern for large amounts of people exiting either onto another structure or close to the exits of adjacent structures. This additional requirement is to prevent mass casualties in the event of a disaster and complications with the egressing. Because the new housing would be built over existing retail, there will need to be special attention paid to the egressing pathways. Some complications might include egressing through alleyways behind the retail or the building code limitation on the percentage of occupants that can exit through the lobby of a building. It is recommended to hire a code consultant to ensure that there are no surprises or expensive solutions necessary to meet the egressing requirements for the housing.

Building Over Existing Retail: Parking

Parking is an obvious constraint when building new housing over existing retail because there is no ability to construct underground parking. Depending on city parking requirements and the availability of nearby parking that can be used for the housing, there may be flexibility for providing all parking offsite or at greatly diminished capacity. Expanded public transit could be coupled with the new housing to prevent the need for residents to own vehicles, which would provide the basis for reduced parking capacity.

Underground parking might seem like a possibility if there is available space behind the retail building that is not covered by the building. However, underground parking is incredibly expensive and drive aisles and ramps consume a large portion of the excavation. Even if utilizing a shallow slope for ramp parking, the area for the necessary ramp length to reach the first basement level would be substantial. Furthermore, underground parking requires at least two stairs and an elevator, consuming more parking stalls. There are also increased costs and logistical challenges when the area for underground parking abuts existing building. The additional costs include challenging shoring installation due to existing foundations and potential utility lines crossing through the footprint of the underground parking.

If parking capacity is a challenge, then alternate solutions for constructing a parking structure should be explored. A new parking structure could be oversized to accommodate additional capacity if the city requires it, but would need to clearly demarcate stalls for the new housing.

Building Over Existing Retail: Construction Challenges

If construction is ultimately feasible, then the next challenge will be how quickly the construction can be completed and if there is enough laydown space available. There needs to be ample laydown space for construction materials to be delivered for typical construction projects. There would also need to be street closures for cranes and semi-truck deliveries. Given the tight space constraints, construction sequencing and phasing will be similar to dense urban projects, like what might happen in Manhattan.

The existing retail would not be able to remain occupied during construction and would need to be cleared of all materials. If possible, the retailers could be relocated temporarily to other locations or use temporary trailers if there is a parking lot or other space available for the trailers. To minimize disruption of the retailers, construction sequencing would need to prioritize all work done in the retail space. This would include the structural work and other building systems that need to penetrate the retail spaces vertically. Once the work in the retail spaces is complete, the authority having jurisdiction should be able to allow the retail spaces to reopen for business. In some cases, the reopening of the retail may be allowed with a temporary certificate of occupancy (TCO), given that the construction permit includes all of the housing above, and the housing would not yet be complete. This is a common practice for phased construction, and some portions of the construction are completed before others.

Building Over Existing Retail: Other Considerations

Owner or Lease Holder Changes

If new housing is constructed above existing retail, there will be a need to amend or create new terms for access to the retail spaces if systems serving the housing spaces require attention. This might be plumbing, electrical, elevators, or stormwater management systems that pass through the retail spaces. The location of any necessary access hatches or panels should be coordinated directly with the retail space owners to ensure minimal disruption to retail operations.

Vacant Office Above Existing Retail

There are many towns with abundant vacant office floors above retail in their downtown. These floors may remain empty due to a lack of demand for office space. However, they have the potential to be converted into housing. The conversion to housing is not without its challenges and would require, in some cases, significant renovations to meet current code requirements. It is recommended to have an early conversation with the fire marshal and city code officials to determine what requirements they will impose.

One of the biggest challenges that former office space will pose for housing is the depth of the building and distance from windows. Natural light is essential for housing, and bedrooms require a secondary means of egress, achieved by utilizing exterior windows. Furthermore, office buildings that share a wall with the adjacent building will be even more challenging because of limiting windows to two exterior walls. One solution to the lack of natural daylight would be to locate utility spaces that do not require natural light in the center of the floor. A preliminary daylighting study should be conducted to determine the daylight penetration depth of the vacant office floors.

Existing Building Code

The International Existing Building Code (IEBC) provides code guidance and clarity on renovations and alterations to existing buildings. However, the IEBC has not been adopted by all jurisdictions, and code officials and fire marshals do not always abide by the IEBC if it has been adopted. This can create challenges when working with existing buildings if the authority having jurisdiction does not follow their adopted code. Reminding code officials and fire marshals that the IEBC exists for a reason is vital. The IEBC gives latitude for specific code requirements, most notably the rise and run requirements of stairs or clearance requirements. The latitude that the IEBC gives is not very wide and is often only a matter of a few inches of flexibility. The IEBC does not give latitude on the number of stairs, accessibility requirements, or other crucial life safety and egressing requirements.

It is important to note that if vacant upper floors are going to be converted to housing, the code officials can require that specific updates be made to meet the current code. This might include new windows or accessibility changes to the retail space below. The IEBC does not prevent the code officials from asking for these updates because code officials can ask for more code updates if the area of work is a certain percentage of the building area. Code officials can also require a certain percentage of the construction budget be allocated to accessibility upgrades unless there is an undue financial burden.

Code Challenges

Several code challenges will arise from converting vacant office floors into housing. Much of these challenges will depend on the age of the building and having early and often discussions with code officials and the fire marshal to secure their support.

Vertical Circulation

Egress may be the biggest challenge if only one set of stairs serves the vacant upper floors. This might be the case in older buildings, preventing any renovation from occurring in these spaces since two means of egress are required. If there are two sets of stairs, the distance between them must meet the code requirements. The code requires a minimum distance of separation that is a fraction of the diagonal distance of the floorplate. If the distance between the stairs does not meet the minimum distance of separation, then one of the stairs would need to be replaced and constructed to meet the minimum separation distance. The width of the stairs may not be an issue because the occupant load of housing would be less than the occupant load of an office floor and the required stair width is based on the number of occupants using the stair in an emergency. In addition, to meet these requirements, the stairs themselves may need some modifications to meet the current code. The IEBC would come into play at this point

because it allows for lenience in some key measurements and clearance requirements. Some of the modifications to the stairs may include stair railing spacing, visible stair nosing strips, or handrail refinishing.

Elevators will likely not be present in older office buildings, and the conversion to housing will require an elevator. The elevator is required by accessibility requirements and cannot be prevented by having accessible only units on the ground floor. It is also not recommended to add an elevator for only a few floors, with the intent that accessible units will only be on those floors. The elevator would also be assist the elderly, individuals with non-visible disabilities, and individuals with temporary injuries. Therefore, the elevator would need to serve all floors. Structurally, there would need to be some modifications to accommodate the elevator, but they should be minimal. Please see the vertical circulation section below regarding placement and disruption to retail.

Energy Code

Due to the age of the buildings that would convert their upper floors to housing, energy code changes may be required. These changes may include new dual pane windows, a new roof with increased insulation, or interior furring walls with added insulation on the inside face of the exterior masonry walls. Depending on the construction of the building, these changes may be very costly and would be required because the renovation is for the majority of the building area, triggering such requirements.

Fire Sprinklers

Fire sprinklers would be required for converting the vacant floors into housing. In most cases, sprinklers will not exist in these spaces. Adding fire sprinklers would not be a very costly component since there would be other plumbing work involved as part of the renovation. It might also make sense to add fire sprinklers to the ground floor retail when completing the fire sprinkler work. With the addition of fire sprinklers in the building, there would need to be a fire pump control room on the ground floor with direct access to the exterior.

Heating, Ventilation, Air Conditioning, Plumbing, and Electrical

Converting vacant office floors into housing will not significantly change the building to accommodate heating, ventilation, and air conditioning. There would be additional variable air volume (VAV) boxes because of the increased number of rooms with the need for individual controls and increased ductwork. New equipment would need to be installed on the roof and calculations would be necessary to ensure the existing roof can carry the load.

The conversion from office to housing will require more plumbing fixtures and floor slab penetrations than in the vacant spaces. Each housing unit will have a minimum of one toilet with the required floor penetration for plumbing. This will result in lower finished ceiling heights on each floor unless the ceiling is left exposed. In addition to the increased plumbing fixtures, there will need to be more space allocated for boilers to produce warm water. The boilers might be able to be installed on the roof, in an enclosed room, or would need to have space on the first floor.

In the case of electrical requirements, the office floors are often long abandoned and need entirely new wiring and electrical system upgrades. Additionally, since the floor will be subdivided into new housing units, there will be entirely new lighting. There may be formerly used data rooms or telecommunication closets that will no longer be needed. These rooms would likely have floor penetrations, which need to be sealed with fireproofing material. There may also be floor box outlets embedded in the concrete slab that might need to be removed or capped, depending on the final configuration of the housing units.