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PRACTICE SETBACKS

The Significance of the Setback

By C. Quattro

Since the adoption of the first comprehensive zoning ordinance in New York City, it has become standard for building and zoning codes to include minimum and maximum setback requirements. In today's codes, setback size often depends on the zoning district or surrounding spatial concerns.

Though the setback existed in the first zoning ordinances, it was not thought to be an essential component in the early 20th century. The Standard State Zoning Enabling Act of 1924 [revised 1926] says of setbacks, "As it is … of doubtful legality and has not as yet been sustained by the courts, this power has not been included here. If it should be desired…it can readily be done" (Advisory Committee on Zoning 1926). It is therefore surprising how ingrained it has become in zoning ordinances a century later.

As cities fight to control sprawl and strive for infill, the setback has come under scrutiny as a regulation that results in underutilization of valuable space. Calls for increased density, more affordable housing, and sustainable cities are all leading to the question of whether setback requirements should be eliminated.

This article is an exploration of the setback and its purpose in spatial planning and zoning ordinances. It presents a brief history of the setback, summarizes the key factors to consider when altering setbacks, and presents a case analysis of setbacks in West Philadelphia.

HISTORY OF THE SETBACK

Laws requiring spacing around buildings and uses have existed since ancient civilizations. This space was reserved for many purposes including sanitation, fire safety, stormwater, and even aesthetics.

The setback served as a sanitation feature in cities around the world for centuries. Human waste would flow freely in these spaces after being tossed from buildings and would continue into natural waterways. Gutters and other infrastructure were installed to channel the flow, with enough space needed for walking, carriages, and cleaning.

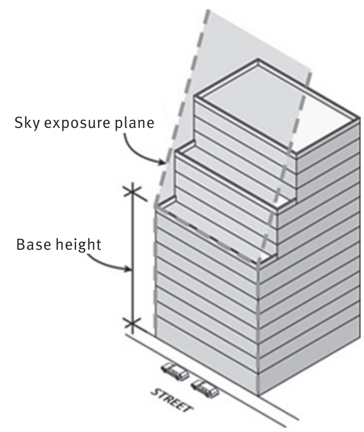
The Twelve Tables in ancient Rome required varied spacing between structures and property boundaries based on the use of the parcel. The existence of olive and fig trees required a protective setback of nine feet (Nolon and Salkin 2017). Following Rome's Great Fire in 64 AD, city leaders called for wider streets and space to be maintained between all buildings to protect the city from future fires. These new wider spaces permitted the construction and use of aqueducts throughout the city for water transport, particularly in wealthier areas (Klitzke 1959).

In ancient Byzantium, the need to codify space between buildings was driven by frequent earthquakes as well as fires. In 406 AD, an open perimeter of 15 feet was required around all public buildings. This requirement was expanded in 469 AD to include a 10 foot privacy gap between all buildings. Balconies, galleries, and patios were not permitted to be constructed in this gap and were removed where existing (Klitzke 1959).

Additional setbacks between certain land uses, such as between pottery kilns and residential buildings, were required to prevent the impact of smoke and fire on these properties. Oil was mandated to be stored at least 25 feet from the property line and two arrowshots of space had to be maintained between a new building and a sowed field to protect crops. Later laws cited protection of light and view for neighboring properties as reasons for building orientation restrictions.

The need for setback space in case of fire was also found in London after the great fire of 1666, including a royal proclamation compensating property owners who were restricted from building due to the open space requirements (Nolon and Salkin 2017). Similar codes were drafted after the Boston Fire of 1872 and the Great Chicago Fire of 1871 (Hirt 2014).

The motivation for the 1916 Zoning Resolution of New York City is often attributed as being the Equitable Building in Lower Manhattan, completed in 1915. This building's mass cast such a large shadow that constituents complained of its blocking out their sunlight. Consequently, the 1916 Zoning Resolution included a *sky exposure plane* requirement, which has become common in many codes across the country.



New York City Department of Planning

Sky exposure plane requirements often lead to buildings with tiered setbacks.

DISTINGUISHING FRONT, SIDE, AND REAR SETBACKS

Front setbacks form the public domain facing the street. Side and rear setbacks are within the private realm away from the front façade. Each plays an essential role in planning design and city management.

In today's world, front setbacks are given priority because of their interaction with the public realm and their role in safety and quality of life. The presence of space and how that space is utilized shapes the experiences of those engaging with the right-of-way (ROW), including travelers on any mode, people occupying the public space for work or play, and even those looking out their window onto the street.

Where side and rear setbacks exist, they also play important roles for the residents and planners of a city. The lack of side or rear setbacks could push activities which may have been relegated to them into the front setback, including trash and tool storage, gardening and green space, outdoor gathering space, car and bike parking, and trees. Without any setbacks, these activities may disappear altogether or occupy the public realm (e.g., trash bin storage on city sidewalks or in the street.)

The size and functionality of all three categories of setback also shape city infrastructure planning. Cities often grow faster than their accommodating infrastructure. Without space between the buildings to easily access water mains or other utilities, updating the infrastructure becomes even more challenging. Without front setbacks, expanding the ROW in cities becomes more expensive. Preserving the ROW, including the potential for new projects such as sidewalks, bike lanes, and drainage, can be an important purpose behind requiring setbacks for new construction.

THE EFFECTS OF SETBACKS ON MICROCLIMATE

In the field of architecture, the term microclimate has been used to describe the ecological and environmental conditions in the area immediately surrounding a building. These conditions are altered by humans when the land is developed or transformed, including major changes such as a new structure or minor changes like landscaping.

The existence or absence of setbacks contribute to the microclimate by defining the space available for activities and the environmental conditions on the property. Too little space often results in negative impacts at the parcel or neighborhood scale, but too much space leads to inefficient sprawl. Each city is left to consider its own conditions and needs as it determines the ideal setback range for its code.

Setbacks affect five important conditions of the microclimate: sound, light, the urban heat island, wind and air, and soil and water.

Sound

The amplification and resonance of sounds are a direct reflection of the shapes and space on which the sound waves reverberate. In the field of study related to positive emotional stimuli, pleasant sounds (e.g., birds chirping and water sounds) were found to have a significant impact on mental wellbeing and positive emotions, leading to a reduced stress environment. Conversely, exposure to unpleasant sounds (e.g., traffic, shouting, etc.) increased stress responses and decreased overall mental well-being (Rohde et al. 2020).

The impacts of sound in urban spaces can be regulated by setting buildings back from the street. This space not only removes the buildings from the immediate adjacency to the public realm, but also allows space for porches, trees, and other sound mitigating growth and building adornments. Setbacks become more important on busier roadways. Smaller setbacks could be permitted in quieter areas, such as in single-family neighborhoods.

Light

Cities who strive for sustainable design should encourage maximizing optimum daylight hours for low-energy buildings. Occupants of low-energy buildings are more comfortable, content, and productive (Hong et al. 2017). Researchers who study indoor occupant behavior and the impacts of sunlight have been able to quantify this measure in terms of well-being, comfort, and health (Rohde et al. 2020). The presence of sunlight is a positive stimulus, which increases psychological well-being and improves physical health.

To promote the health, safety, and welfare of residents, urban design principles could be employed to improve the natural light of buildings. While architects should include thoughtful window selection and design into their construction, for these windows to work as intended, it requires that the sun be able to shine on them unimpeded (Steane 2012). Trees and other greenery can create gradations of light without blocking out the sun altogether, unlike the shadows cast by buildings. Shadows can be calculated based on the height of buildings in relationship to the time of day, season, and even altitude of the city (Plant 1908). A code looking to maximize sunlight access to buildings could base their setbacks on this calculation.

The Urban Heat Island

The urban heat island (UHI) has been shown to have negative health impacts by increasing the temperature in urban areas. Significant impacts to the health and well-being, particularly of vulnerable populations, warrant zoning regulation to combat them (Heaviside et al. 2017).

While buildings play an important factor in the detriments of the UHI, so too do asphalt, short grasses, and even bare soil (Kim 1992). Introducing setbacks into the built environment can combat the effects of the UHI, but only if the open space they create is filled appropriately. Setbacks which are used for zeroscaping (i.e., landscaping using gravel and dirt without greenery), lawns, or pavement would likely increase the impacts of the UHI. Codes which encourage greenery would decrease the temperatures of both the surface and air in immediate and downwind locations (Loughner et al. 2012).

Reducing temperatures is important to reducing energy consumption, particularly in warmer climates or summer months. This reduced energy consumption can improve air quality. Tree canopies which are taller than the surrounding buildings have the greatest effect. To encourage and sustain mature tree canopies, large setbacks are required to permit the root system of the trees to grow and hydrate. Plant life as a mitigation strategy improves the quality of air for those living along the corridor, and improves airflow and ventilation for those living on local streets beyond.

Wind and Air

Improved air quality and flow has been one of the primary reasons for setbacks and even zoning itself for more than a century. The experiences and research surrounding COVID-19 has emphasized the importance of ventilation and airflow within the built environment, particularly as it relates to ventilating indoor spaces. Setbacks plays a crucial role in removing buildings, particularly housing, from the immediate vicinity of auto and manufacturing pollution.

As a society, we have come to rely on artificial means of ventilation, but this requires energy consumption and often results in uniform flows and pockets of stagnant air (Clements-Croome 1997; Chen 2009). Increasing the openings along the façade (windows, doors, vents, etc.) and the setback space and airflow outside those openings can improve air flow and quality in indoor spaces.

Similarly, the space and orientation of buildings will determine the airflow across the city itself. In areas where building density is increased, the creation of dead-air zones which hold carbon and sulfur based pollutants (carbon monoxide, carbon dioxide, sulfur dioxide), as well as other forms of air pollution, can cause serious impacts on the health of individuals who live, work, and play in those buildings and outdoor spaces for extended periods of time (Boyarshinov and Balabanov 2011). While pitched roofs do allow for more light and mitigation of massing, pitched roofs along a streetscape with no side setbacks (rowhomes) will trap pollutants (Esch 2015).

When formed in a wall along arterials, buildings have been shown to hold in auto-based pollutants like a tunnel with the highest concentrations of pollutants found at the ground level (in pedestrian spaces), while trapping high wind from urban canyons. The reduction of setbacks on the arterials causes the residential area beyond to become a dead-air zone, while multifamily housing and mixed-use developments (often located on major corridors) would face the brunt of this pollution concentration (Boyarshinov and Balabanov 2011). Significant setbacks on main roads (i.e., greater than 65 feet) may improve the airflow in these areas and prevent cavities of pollution from existing along the ROW. The blockfaces created by setbacks must be balanced, including proportionality to building height, to permit some air flow without increasing the speed to uncomfortable levels. This requires careful consideration of the climate and spatial orientation of the buildings.

Soil and Water

The spatial realm operates like a layer cake where each layer influences the others. How water flows from the sky, along buildings, onto differing surface types, and into unique soil compositions underground shapes a city's hydrology. Each climate (deserts, temperate, etc.) and soil type will have a different relationship with the setback. Microclimates vary even in different areas of the same city.

Consider the water-adjacent neighborhoods of San Antonio built on silt, clay, and sand which expand when water is absorbed. This causes the building foundations to shift with each heavy rainfall, making zero-lot-line development unsustainable over time. These soil types also hold very little water, and once they are saturated, respond to rainfall much like concrete. Therefore, more open space, including space for drainage infrastructure, is required to allow water to be absorbed into the ground (USDA 1966).

Many planners would suggest underground or surface infrastructure to retain or move water, rather than relying on setbacks or pervious surfaces to mitigate potential flooding. However, these projects are expensive, particularly where the city is already built up, and often rely on bond funding and intergovernmental collaboration. Displacing water, which may be necessary to sustain plant life or aquifers, from its natural environment can have long lasting impacts on the sustainability of the city. Encouraging new development in dense areas to increase their open space through setbacks and using those setbacks for stormwater mitigation is one way to improve the water flow in city centers. Cities have also turned to xeriscaping and low-impact development as a method for increasing pervious surfaces and water absorbing plant life, which can be a useful tool in some climates.

A CASE ANALYSIS: WEST PHILADELPHIA

West Philadelphia, Pennsylvania, is a mixed-income urban community supported by public transportation, underground combined sewer-stormwater overflow systems, and a permeable soil type in the riverbed of the Schuylkill River. The following examples illustrate the differences in the spatial realm when setbacks are altered slightly.

38th Street Versus St. Marks Square

While setbacks do control the acreage available for construction, the depth of setbacks is not necessarily an indication of residential density. An example is the zero-lot-line development on 38th Street between Spring Garden and Hamilton, which is a lower density than the apartment houses on St. Mark's Square. Both streets are walkable with 0' side setbacks, street parking, sidewalk adjacent to the curb, and a building height of 3.5 stories, but there is a difference in use: single-family rowhouses compared to apartment houses. The additional setback from the sidewalk on St. Mark's permits a front porch, storage, and green space. On 38th Street there were only stoops, which extended into the sidewalk, narrowing pedestrian space and conflicting with trash, bike, tree, and utility placements.

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38th Street: 12'10" setback from façade to the street with 4'1" stairway protrusions (left); St. Marks Square: 12' sidewalk with trees; 12' setback from façade to sidewalk (including porch, stairs, and greenspace) (right).

Walnut Street

A third example is the adjacent block of Walnut Street, between St. Marks Square and 42nd Street. Unlike the previous two, this block has side, rear, and deeper front setbacks on a busier roadway across from commercial development. The sidewalk was set back from the street, permitting shade trees to be planted adjacent to the curb without infringing on the depth of the sidewalk. This increases safety for auto traffic and pedestrians by separating these realms with a buffer. Each structure had private green space with trees, grass, brush, benches, and other adornments. The side setbacks were used for either bike or car parking, gardens, or storage of trash bins, much different from the 38th street frontage, where trash and recycling bins were stored on the sidewalk or in the street between or against parked cars. The density in these structures varied from one to eight units. Some are even duplexes with a property line on the shared wall, a type of development that can be useful if a city is looking to minimize land occupation of single-family lots.

St. Agatha-St. James Versus Philadelphia Episcopal Cathedral

Two cathedrals in Philadelphia illustrate the impacts of taller buildings in relation to their setbacks. In the first example, St. Agatha-St. James, the corner lot orientation of the structure means that there is a wide gap between the buildings on three sides of the property (approximately 80' in front, 170' on the west side, and 33' in the rear). This allows the sun to shine on the cathedral throughout the day without imposition. Alternatively, the nearby Philadelphia Episcopal Cathedral has nearly zero-lot-line developments on three sides of the property, and the building is almost perpetually in shadow.

Chestnut Street

Setbacks can also be valuable spaces for outdoor gatherings, particularly in commercial areas. Consider this outdoor patio which services multiple businesses on Chestnut Street and 36th in Philadelphia. This development has an 18' sidewalk and a 14'4" raised concrete setback to the façade of a 1.5 story commercial development. The raised platform and partition contribute to the safety from the street and feeling of separation from the public realm for both

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Walnut Street mixed density housing in West Philadelphia: 6'6" Sidewalk Setback, 11'6" Sidewalk, 25'4" Sidewalk to Façade, 8' to 17'6" side setbacks between buildings [not from property lines].

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St. Agatha-St. James (left) and Philadelphia Episcopal Cathedral (right), showing the impacts of adjacent buildings' shadows. The Cathedrals, less than one block apart on South 38th Street, see very different impacts from the surrounding buildings.

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A mixed-use development on Chestnut Street in University City, Philadelphia, shows how setbacks and elevation can be used to separate domains and mitigate negative externalities.

those dining on the patio and the residential units above. The residential tower (16 stories above the commercial frontage) allows for optimized use of the parcel, but with a large setback (31'9") from the sidewalk below. This condition would minimize the noise pollution and maximize light and air flow for the residences in the building. The height of the tower setback away from the street also maintains a pedestrian scale at the street level for those walking by.

CONCLUSION

The purpose of the setback is not always immediately visible to the casual observer. It is often for reasons which occur underground or in catastrophes, such as fire or flood. Therefore, the questions become: What purpose does the setback serve given its location? And where is there flexibility when regulating setbacks?

The answers to these questions are contextual to the city and parcel location and should be assessed individually, yet they are unified through a set of conditions which should be considered in the immediate environment. These include soil, water, air/wind, heat, sunlight, climate, roadway type, density, and use of the property. Without considering these conditions prior to determining a regulation, there could be negative impacts on the microclimate and externalities on adjacent or nearby areas.

Space between buildings is an important factor in shaping the microclimate around buildings, and planners should consider holistic ecological inventories before drafting and amending codes. While some historical rationales for the setback have become outdated, such as accessing the river in case of fire and human waste removal, new concerns regarding their importance in developing sustainable cities have become more prevalent. Front, side, and rear setbacks each play an important and distinct role and should be considered individually.

As cities continue to change, climates shift, and new technologies arise, the need for setbacks will change as well. More localized research regarding the importance of a setback for individual climate types could help provide planners with specific strategies regarding how best to plan.

Continued assessment on the city's status, even at the individual neighborhood level, ensures that up-to-date regulations are in place. Setbacks can be considered a planning tool and specifically included when developing strategies while comprehensive planning. To address specific areas of a city with different needs, localized setback regulations can be created using overlay districts in addition to base zoning regulations.

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