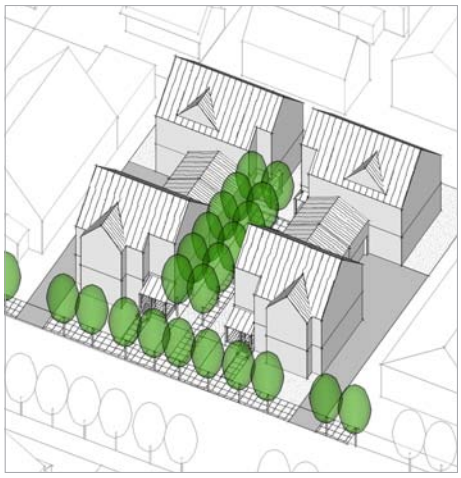
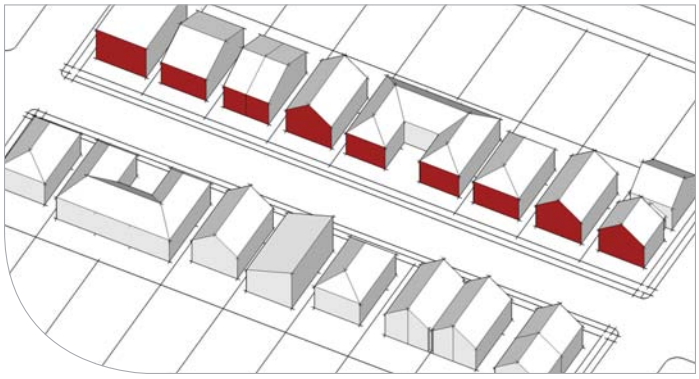
The Infill Design Toolkit:

Medium-Density Residential Development








A Guide to Integrating Infill Development into Portland's Neighborhoods

December 2008

CITY OF PORTLAND
BUREAU OF
PLANNING

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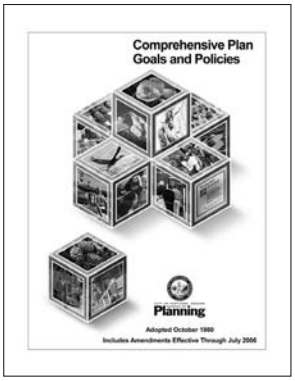
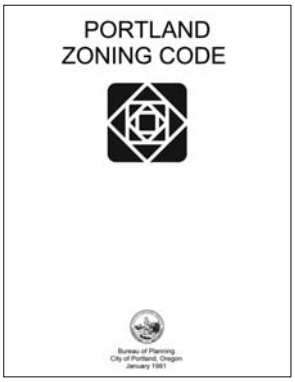




Design Principles for Residential Infill Development

Based on design guidance from the Comprehensive Plan, Community Design Guidelines, Zoning Code, and other City documents

Bulleted statements listed below the basic principles are included to clarify the potential ways of implementing the principles.

1 Contribute to a Pedestrian-Oriented Environment

- Use architectural features (such as façade articulation, window and entrance details, and porches or balconies) that provide a human-scaled level of detail
- Avoid large areas of blank wall along street frontages
- Minimize the prominence of parking facilities
- Provide strong connections between main entrances and sidewalks

2 Respect Context and Enhance Community Character

*(While the continuation of existing community character may be a priority in established neighborhood areas, contribution to a desired **future** character may be more important than compatibility in areas where change is expected and desired, such as in mixed-use centers)*

- Arrange building volumes and use setback patterns in ways that reflect neighborhood patterns or that contribute to its desired character
- Consider utilizing architectural features (such as window patterns, entry treatments, roof forms, building details, etc.) and landscaping that acknowledge the surrounding context and neighborhood
- Use site design that responds to natural features of the site and its surroundings
- Minimize solar access impacts on adjacent properties

3 Consider Security and Privacy

- Orient windows and entrances to the public realm to provide opportunities for "eyes on the street" and community interaction
- Minimize impacts on the privacy of neighboring properties

4 Provide Usable Open Space

- Maximize the amenity value of unbuilt areas, providing usable open space when possible
- Make usable open space, not surface parking, the central focus of larger projects

5 Design for Sustainability

- Use durable building materials
- Use energy-efficient building design and technologies
- Minimize stormwater runoff

The Infill Design Toolkit

A guide to integrating infill development into Portland's neighborhoods

This guide is intended to serve as a resource for community members—builders, designers, neighbors and others—all who are involved in designing, building, or participating in dialogue about the new development that continues to shape the form of Portland's neighborhoods. Its focus is on new "infill" development in established neighborhood areas, particularly where continuation of positive aspects of existing character is a community priority. Infill development can take place as construction on vacant land or as redevelopment that replaces pre-existing buildings.

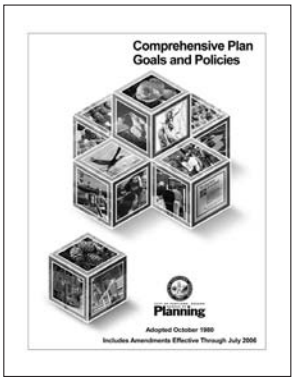
The various components of this guide serve as problem-solving tools, highlighting strategies for achieving context-sensitive design in infill development and ways of overcoming some of the unique design challenges of infill development on small sites.

The initial components of the *Infill Design Toolkit* are focused on medium-density residential development (such as rowhouses, plexes, courtyard housing, and low-rise multifamily development). Future additions to the Infill Design Toolkit will focus on other types of infill development, such as development along main streets and other higher-density corridors, and new housing in single-family zones. For guidance on appropriate design for mixed-use centers (for example, Hollywood, St. Johns, Gateway), see area-specific policy plans and design guidelines.

The *Infill Design Toolkit* is composed of the following sections on:

- **Strategies—**highlighting "best practices" for integrating new development into neighborhood patterns and showing how to identify these patterns.
- **Prototypes—**illustrating "approvable" housing types and configurations that are suitable for common infill situations, meet City regulations and design objectives, and are market feasible.
- **Technical Pages—**providing more detailed, technical information on strategies that can contribute toward quality infill design.
- **Project Profiles—**providing information on completed projects with design features that contribute to meeting the community's design objectives. The profiles are followed by examples of historic Portland housing and international precedents.
- **Neighborhood Design Policies—**a compilation of policies and other design guidance from Portland's adopted neighborhood and community plans.

Note that information included in these sections should be considered to be suggestions only. The design strategies and other materials included here do not hold any standing as design policies or as design review criteria. Nor do they supercede the area-specific standards and guidelines that apply in historic districts and plan districts. The Zoning Code *and other regulations, as well as City staff from relevant regulatory bureaus, should be consulted regarding details related to the regulatory provisions referred to in this document.*



Portland's Comprehensive Plan

Goal 12.6 ("Preserve Neighborhoods") objectives:

1. Encourage new developments to respond to the positive qualities of the place where they are to be built and to enhance that place through their development.
2. Respect the fabric of established neighborhoods when undertaking infill development projects.
3. While accommodating increased density build on the attractive qualities that distinguish the area. Add new building types to established areas with care and respect for the context that past generations of builders have provided.

Compatibility: More About Patterns, Less About Details

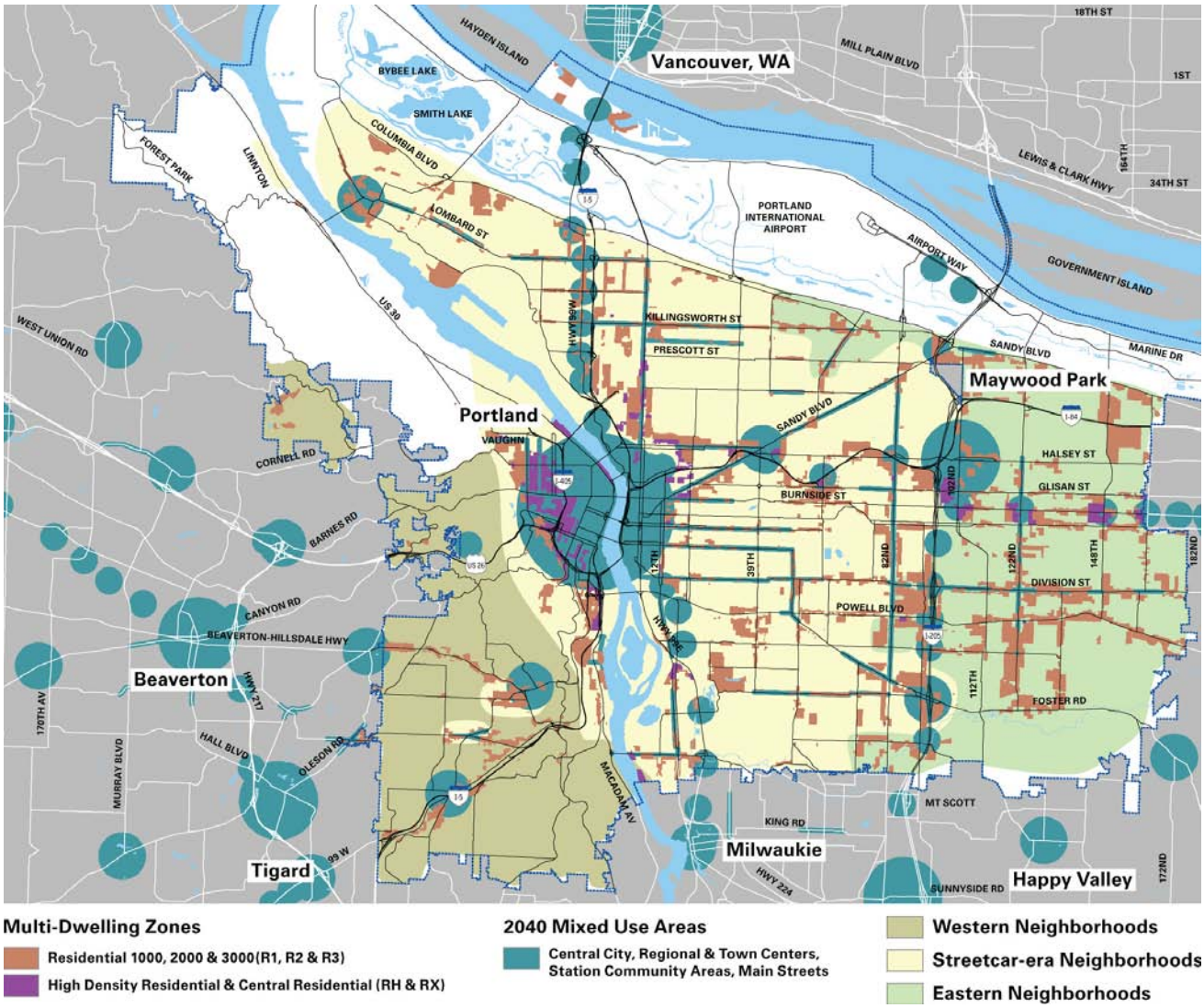
Portland's design policies, including *Comprehensive Plan* Goal 12.6, call for infill development in established neighborhoods to be designed to respect positive aspects of neighborhood context. Reinforcing this emphasis, nearly all of Portland's adopted neighborhood plans call for new development in established residential areas to be "compatible" with existing community character *(see section on Neighborhood Design Policies)*. While it is one of the most frequently recurring terms associated with community objectives for the design of infill development, the vagueness of "compatibility" has also been the source of much contention, especially as it relates to new, higher-density infill development that is typically larger in scale than existing housing.

How to achieve some measure of compatibility is the primary focus of the Infill Design Toolkit. Compatibility, as treated in the Toolkit, is not about replicating existing scale or reproducing the architectural styles of nearby buildings. Rather, the focus is on highlighting how higher-density infill development can be designed to respond to more basic neighborhood ***patterns,*** whose continuation allows change to be accommodated while preserving cherished aspects of neighborhood character.

The housing in most neighborhoods display a variety of architectural styles. A single street in an older neighborhood may have styles ranging from Victorian, Craftsman, English Cottage, Colonial, to Modern. The architectural styles and details of new buildings change over the years, but basic patterns are more lasting. These patterns are defined by recurring characteristics—such as the green street edges of front yards and street trees and by the frontage patterns, forms, and orientation of buildings—the specifics of which vary by neighborhood, street, and block. The continuation of these patterns can accommodate a diversity of architectural styles, while providing an underlying sense of cohesion and "place" that helps define the character of neighborhoods.

Neighborhood Patterns

Portland can be characterized as having three fundamental residential neighborhood geographies, each with its own distinct development patterns and characteristics. The following map indicates, at a very general level, the locations of the inner "Streetcar-era" neighborhoods and the outer neighborhoods toward the west and east. The characterizations described here apply primarily to residential areas with multidwelling zoning, outside Downtown Portland.



Multi-Dwelling Zones

- Residential 1000, 2000 & 3000(R1, R2 & R3)
- High Density Residential & Central Residential (RH & RX)

2040 Mixed Use Areas

- Central City, Regional & Town Centers, Station Community Areas, Main Streets

- Western Neighborhoods
- Streetcar-era Neighborhoods
- Eastern Neighborhoods

Western neighborhoods

Streets are sometimes curvilinear, following contours of the area's hilly terrain. Lots in multidwelling-zoned areas are typically larger and more irregularly shaped than those in the inner neighborhoods. Multidwelling-zoned areas, primarily located adjacent to major arterial streets, also often lack the rectilinear block structure of other parts of the city. Trees and lush vegetation are unifying aspects of neighborhood character, particularly along neighborhood side streets.

Inner neighborhoods

Characterized by a fairly regular pattern of residential lots approximately 50'-wide by 100'-deep. This original platting established during the streetcar era provides a fine grain pattern of relatively small-scale buildings. The shallow lots facilitate buildings oriented to the street.

Eastern neighborhoods

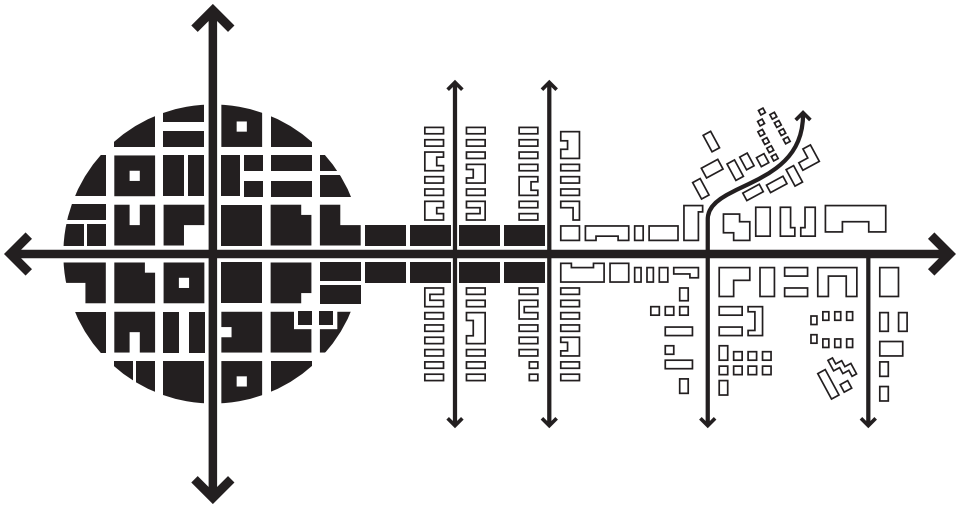
Residential areas have far less consistent lot and block patterns than the inner neighborhoods. Lots in multidwelling-zoned areas are relatively large, but disproportionately deep (often 200'-300', and sometimes even 400', deep). Rather than consistency in built patterns and architecture, trees and other vegetation are often key character-giving elements of residential areas.

Context

Medium-density zoning and development occurs in areas of diverse architectural character that require differing design approaches if new development is to be compatible or contribute to their desired character. While the diversity of neighborhood contexts can be difficult to categorize, represented below are four basic types of neighborhood contexts typical of where medium-density development occurs.

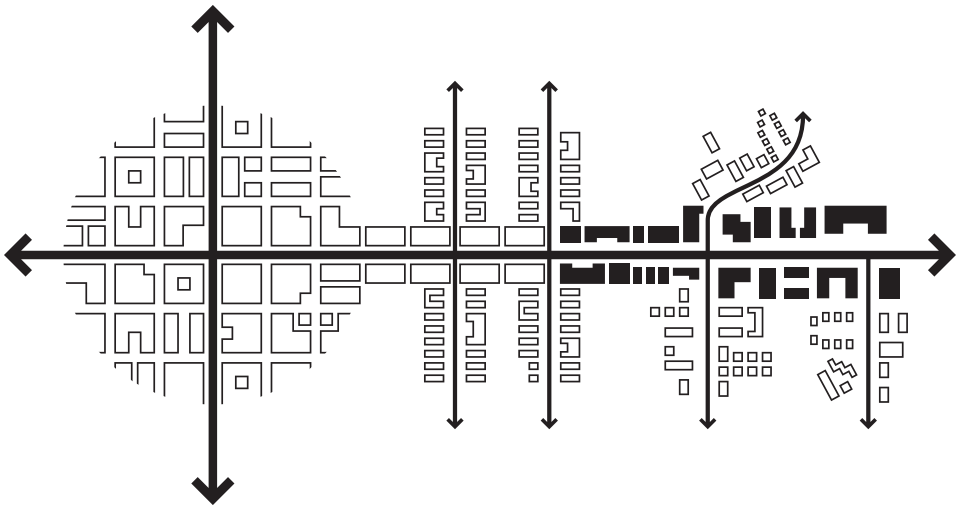
Mixed-use centers and main streets

Buildings are typically located close to sidewalks, with little or no front setback. A relatively continuous streetwall of multistory buildings provides a strong street edge, creating a sense of enclosure that defines the urban space of the street.

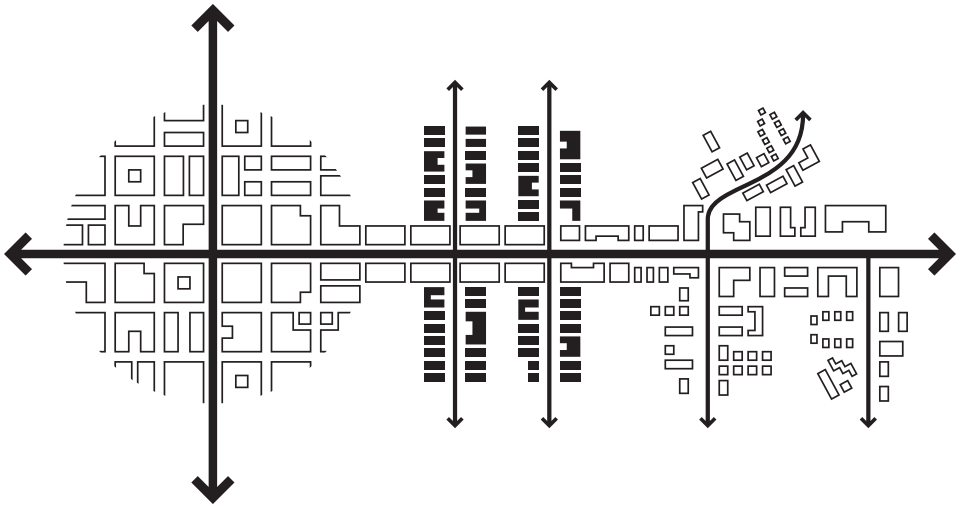


Residential corridors

Located along major streets, development in multifamily-zoned corridors should contribute to creation of a strong street edge of buildings, but with landscaped front setbacks that highlight their residential character and provide a buffer for residences from street traffic.

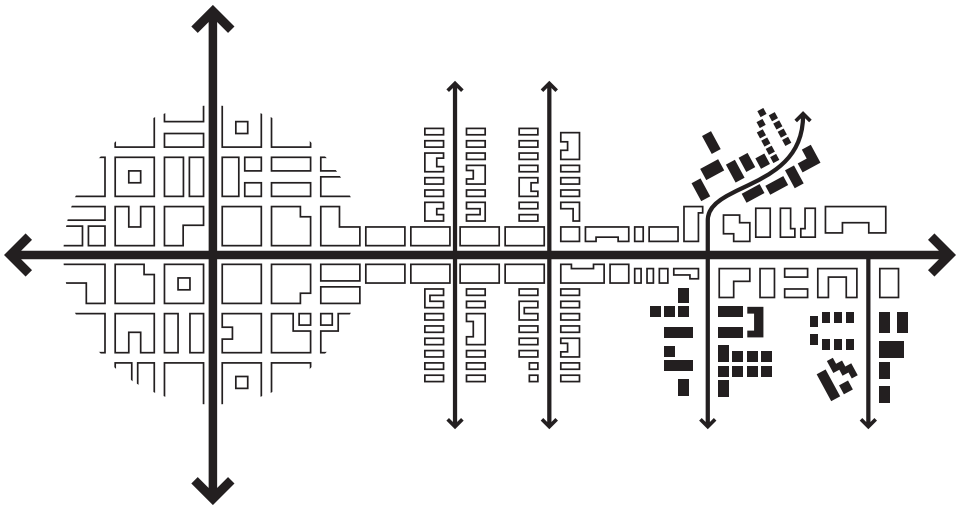


Note that in many cases, these typologies refer more to desired ***future*** character, rather than existing character. This is particularly so regarding areas where growth and change are intended to be concentrated, such as mixed-use centers, main streets, and corridors; where the low-lying buildings that predominate in some areas will be replaced by more intense development over time. Outside of these areas, along nearby residential side streets, the continuation of ***existing*** character tends to be a greater community priority. ***The focus of this guide is on the design of development along the residential side streets, and therefore places an emphasis on strategies for responding to existing context.***



Residential side streets—inner neighborhoods

A green edge of landscaped setbacks and courtyards, combined with a less continuous street wall of buildings, differentiate these streets from the hardscape of mixed-use centers and main streets. The rhythm of buildings along these streets typically reflects patterns established by houses on 50'-wide lots.



Residential side streets—outer neighborhoods

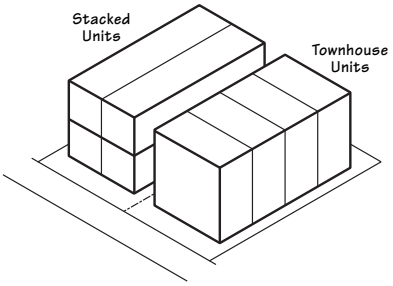
Trees and vegetation define the cherished character of these areas, often to a greater extent than building-defined street edges or architecture.

What is Multi-dwelling Development?

The following summarizes the terminology used in reference to the different housing types that constitute "multi-dwelling development" or that are being built in the multi-dwelling zones. Portland classifies a wide range of residential development types that feature more than one dwelling unit on a shared lot as "multi-dwelling." Multi-dwelling development includes:

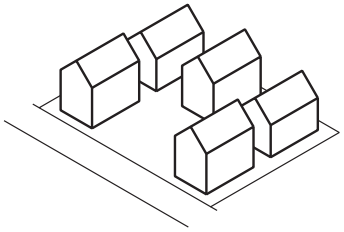
Plexes (most commonly triplexes and fourplexes)

Often have a house-like form, can be in stacked-unit ("flats") or townhouse configurations.



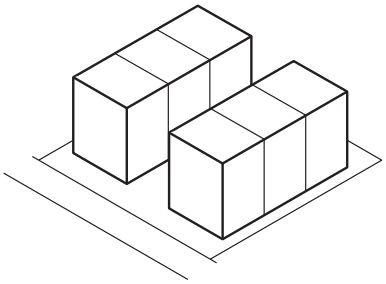
Cottage Clusters

Detached houses on a shared lot, often oriented around a common open space.



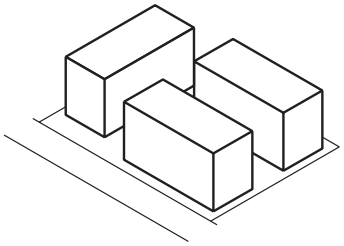
Courtyard Townhouses

Units similar to rowhouses, but feature a shared driveway and are often oriented around common open space, rather than to the street.



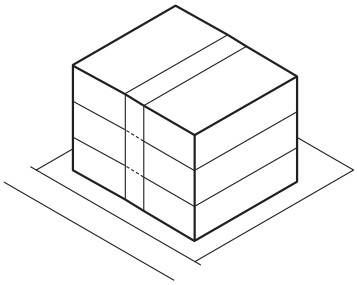
Apartment Complexes

Clusters of low-rise apartment buildings. Only possible on larger sites.



Block Apartment Buildings

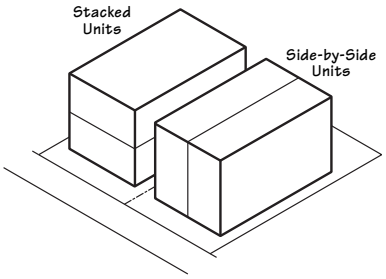
Multi-story apartment buildings with a shared main entrance and with stacked units accessed by interior corridors.



Other housing types, not classified as "multi-dwelling" housing, but commonly built in the multi-dwelling zones include:

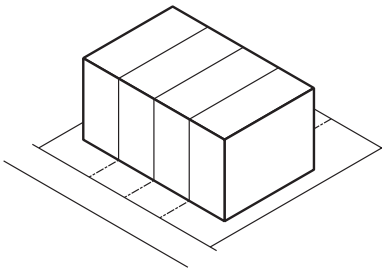
Duplexes

A two-unit structure on a shared lot. Two attached units on separate lots are classified as rowhouses.



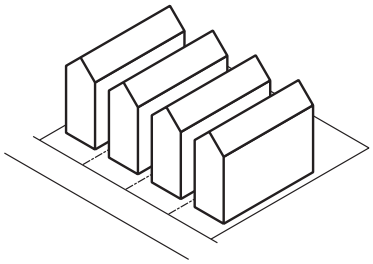
Rowhouses (also "attached houses")

Attached units, each on a separate lot, and each with its own entry from a public street.



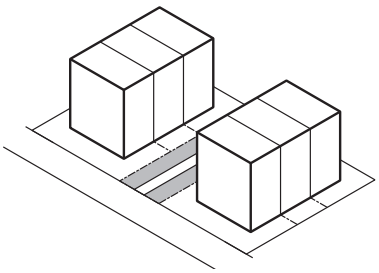
Narrow Lot Houses

Detached houses on narrow lots, with density similar to that of rowhouses.



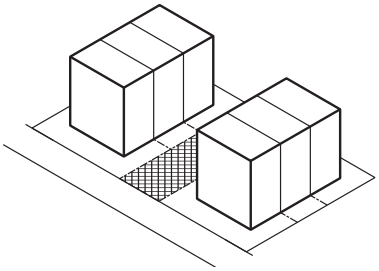
Common Green Housing

Housing units, on separate lots, oriented to a landscaped courtyard that provides pedestrian access.



Shared Court Housing

Housing units, on separate lots, oriented to a courtyard-like street shared by pedestrians and vehicles, with special paving and other features that highlight prioritization of pedestrians and community activities.



Medium-Density Zones: What Can Be Built?

The medium-density multi-dwelling zones—R3, R2 and R1—allow a wide-range of residential building types. Below is a summary of some of the basic regulatory parameters governing the intensity and scale of development allowed in the medium-density multi-dwelling zones. The images are examples of projects built in each zone—the upper images highlighting development at the upper limit of allowed building scale and the lower images showing projects at the lower end of intended development intensity.






R3	
Allowed Density*	
Max:	1 unit per 3,000 SF of site area
Min:	1 unit per 3,750 SF of site area
(3 units on a 10,000 SF site)	
Building Height	
Maximum 35 feet	
Minimum Building Setbacks	
Front:	10 feet
Side/ rear:	5–14 feet (depending on size of building wall)
Building Coverage	
Maximum 45% of site area	
Landscaping	
Minimum 35% of site area	

R2	
Allowed Density*	
Max:	1 unit per 2,000 SF of site area
Min:	1 unit per 2,500 SF of site area
(4–5 units on a 10,000 SF site)	
Building Height	
Maximum 40 feet	
Minimum Building Setbacks	
Front:	10 feet
Side/ rear:	5–14 feet (depending on size of building wall)
Building Coverage	
Maximum 50% of site area	
Landscaping	
Minimum 30% of site area	

R1	
Allowed Density*	
Max:	1 unit per 1,000 SF of site area
Min:	1 unit per 1,450 SF of site area
(7–10 units on a 10,000 SF site)	
Building Height	
Maximum 45 feet	
Minimum Building Setbacks	
Front:	3 feet
Side/ rear:	5–14 feet (depending on size of building wall)
Building Coverage	
Maximum 60% of site area	
Landscaping	
Minimum 20% of site area	

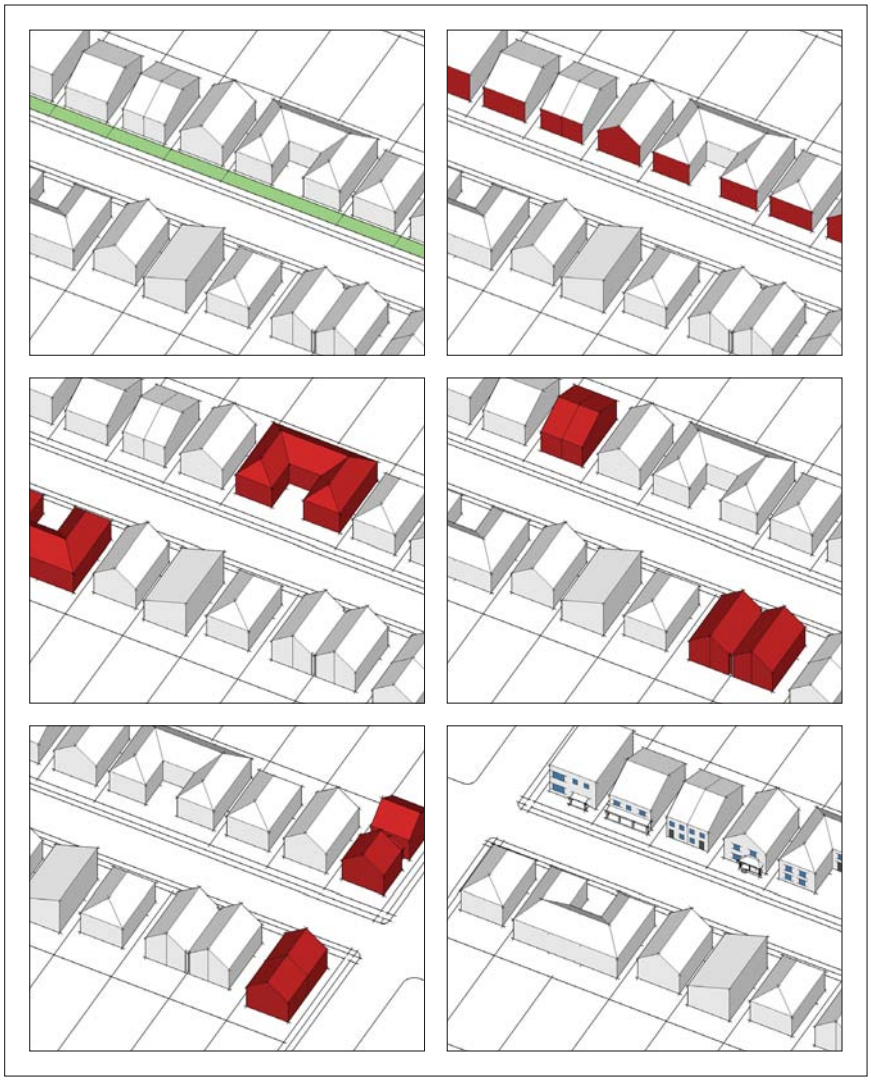
**Note: Accessory dwelling units (ADUs) can exceed the maximum allowed density. Also, minimum required densities for sites smaller than 10,000 SF are less than those shown here.*

Infill Design Strategies

Best practices for context-responsive infill design

This section presents a summary of best practices for integrating new medium-density housing into the fabric of existing neighborhoods. The strategies presented are particularly oriented to development in the R1, R2, and R3 multidwelling zones, but can also be relevant to infill development in the R2.5 and RH zones and to medium-density residential projects in commercial zones.

Components



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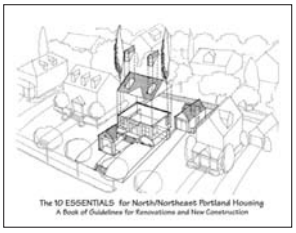
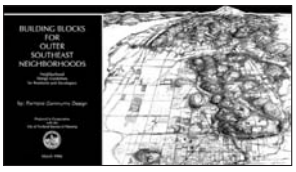


The 10 Essentials for North/Northeast Portland Housing (1991)



Building Blocks for Outer Southeast Neighborhoods (1996)

Focus on Patterns, Spaces, and Housing Types

The residential streets of Portland's neighborhoods often include a diversity of architectural styles and housing types, yet present a sense of cohesion due to recurring patterns—such as street-oriented buildings, fine-grain "rhythms" of development, and green street edges created by front yards and gardens. *The focus of this section is on strategies for continuing these and other fundamental neighborhood patterns,* with particular attention paid to the integration of parking and minimization of scale contrasts—which are often key challenges to integrating higher-density development into neighborhoods. This section also focuses on challenges resulting from the space limitations typical of higher density infill development, highlighting strategies for limiting privacy impacts and creating usable outdoor spaces. Finally, this section highlights alternative types of medium-density housing appropriate for infill situations. For information on other, more detailed, aspects of design—such as those related to architectural details, entrance treatments, roof forms, etc.—other Planning Bureau documents should be consulted, including *The 10 Essentials for North/Northeast Portland Housing* (1991) and *Building Blocks for Outer Southeast Neighborhoods* (1996)

Respond to Basic Neighborhood Patterns

Basic neighborhood patterns to look for to inform the design of infill development, explained further below, include:

The inclusion here of these aspects and the related design strategies that follow are not intended to suggest that these patterns must be continued in all cases. Rather, they should be read as suggestions for context-responsive strategies if these aspects are important to the community. Neighborhood plans and community members should be consulted to determine their relevancy to any specific site and neighborhood.

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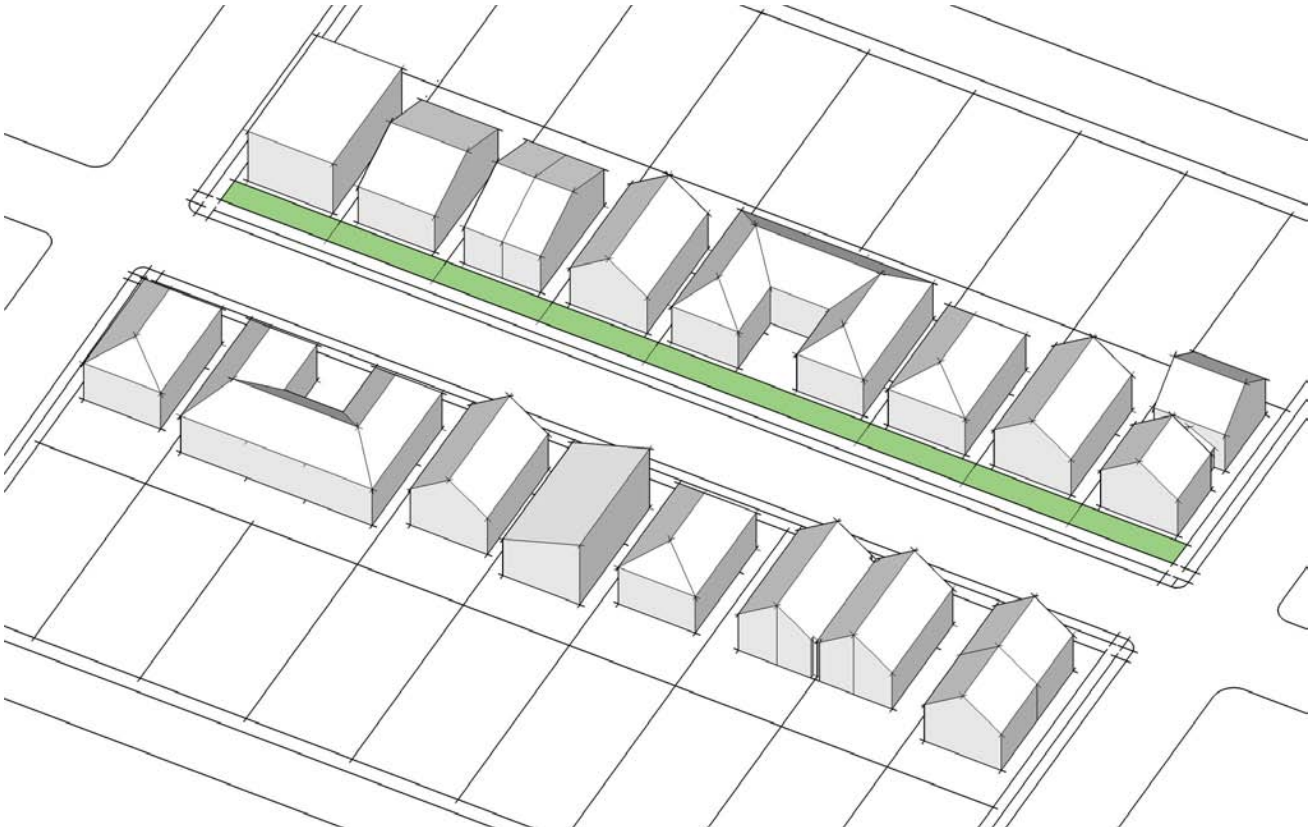
STREET FRONTAGE CHARACTERISTICS

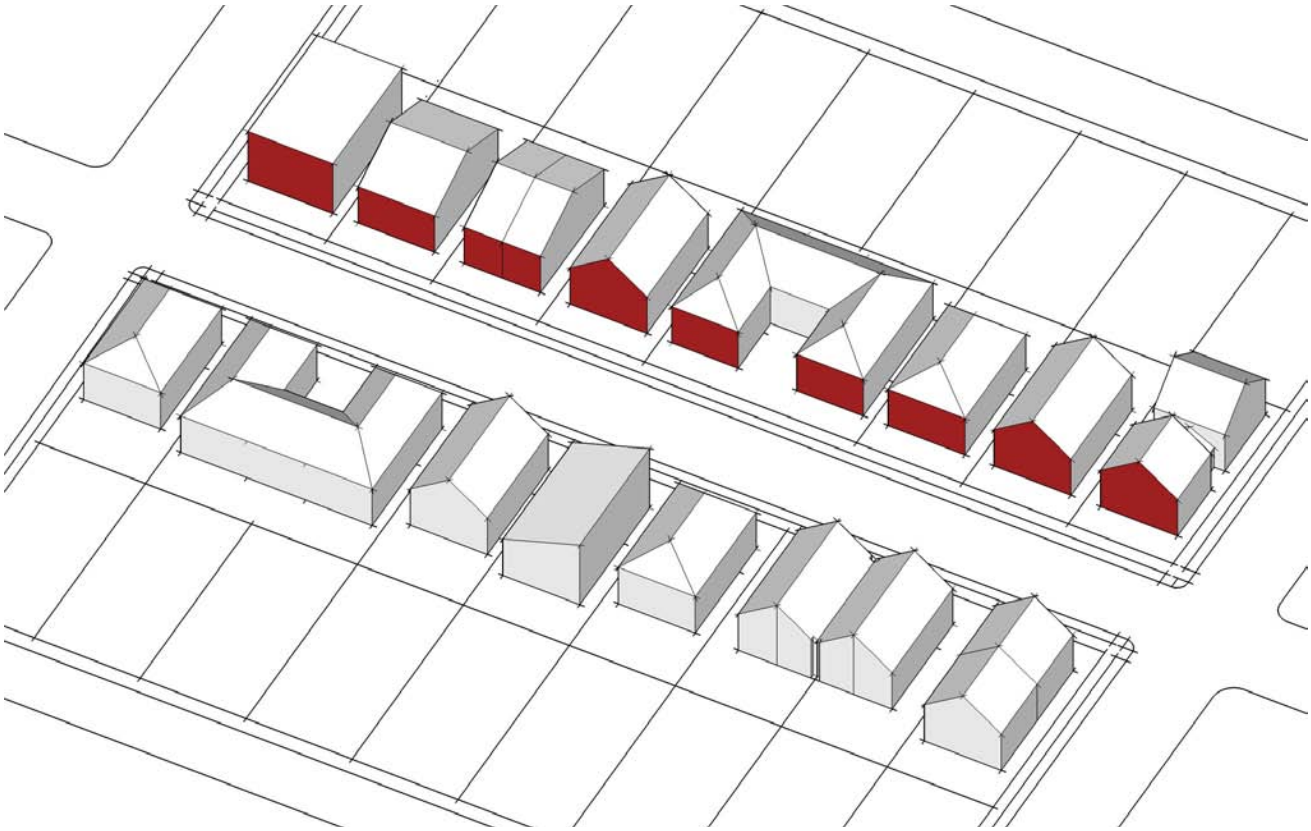


Green street frontages

Most neighborhood residential streets in Portland are characterized by landscaped setbacks between the fronts of buildings and sidewalks. This "green edge" provides residential streets with a clearly-identifiable character that serves as a counterpoint to the "hardscape" of commercial main streets. In many areas, this green edge is reinforced by planting strips and street trees.

Principle: Along residential side streets, limit interruptions to front setback landscaping. A key way of achieving this is by minimizing the amount of frontage devoted to paved vehicle areas *(see pages 15–28).*

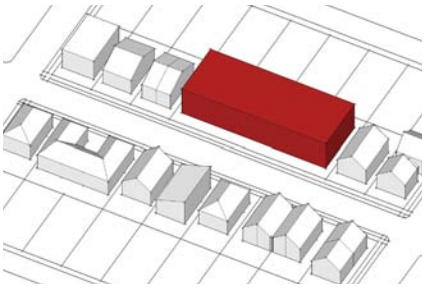
Contemporary infill (upper)—front landscaping ties these attached houses into the neighborhood fabric (City Life demonstration project—1995). This provides a stronger contextual fit than the rowhouses (lower), despite the latter's more traditional architectural details. That shed roof forms are used instead of gables is of less consequence than the continuation of neighborhood street frontage arrangements.



Rhythm of development along the street

Neighborhood block frontages are often characterized by a consistent rhythm of development created by recurring building patterns. In inner neighborhoods this is typically defined by development patterns established by the original platting pattern of 50'-wide lots.

Principle: Continue established building rhythms along street frontages.



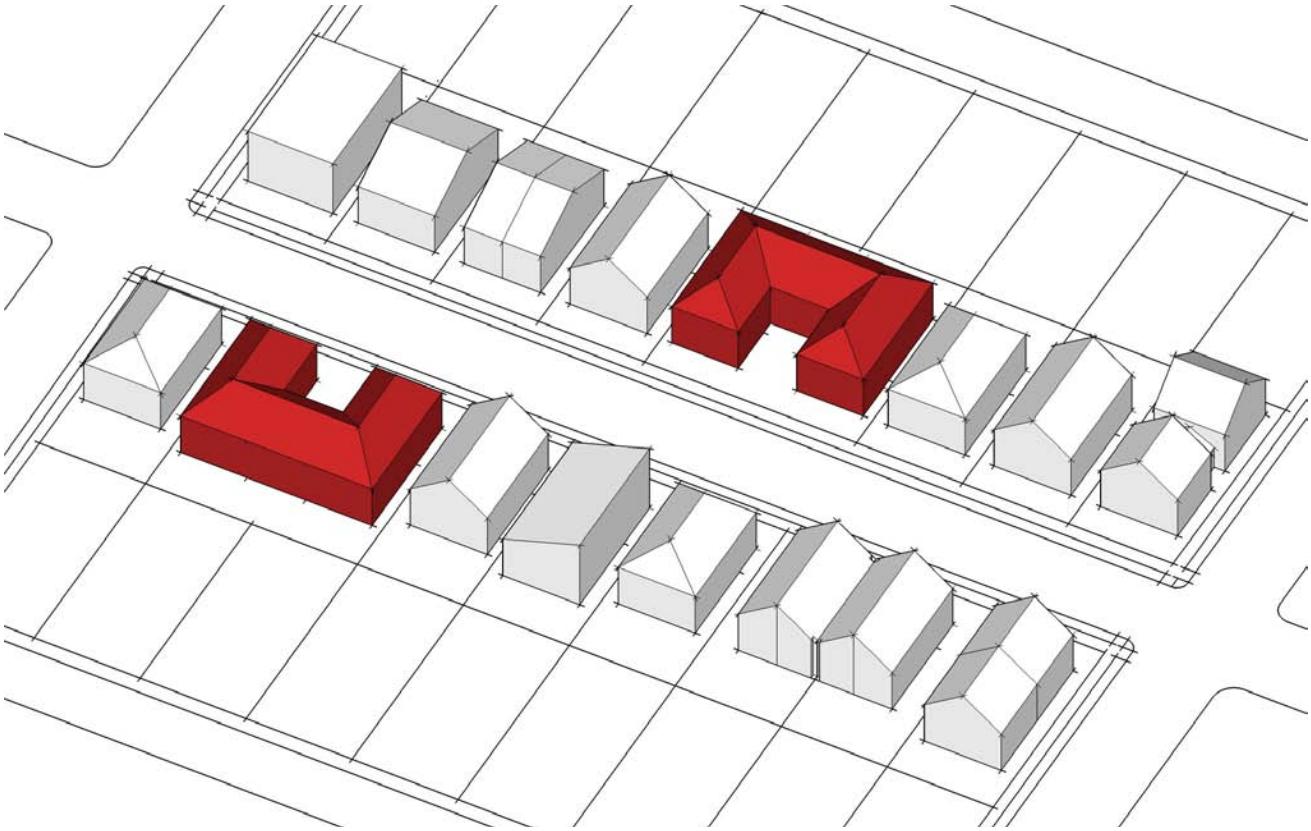
Avoid *monolithic massing—disrupts fine-grain neighborhood pattern*

Street lined with houses, duplexes, and fourplexes built in the early 20th Century. The rhythm of development along the street is consistent, despite differences in density.

Contemporary infill continues street frontage rhythm

Projects on sites larger than nearby houses can continue such patterns by dividing buildings into volumes reflective of the established building rhythm. Conversely, projects of small-lot land divisions (such as those comprised of 25'-wide lots) can often best respond to neighborhood context by including attached houses, instead of using of narrow houses on each lot. In older neighborhood houses, paired attached houses can achieve a much more successful continuation of established patterns than is possible with narrow, detached houses, which can disrupt established neighborhood patterns characterized by houses on 50'-wide lots.

RHYTHM OF DEVELOPMENT ALONG THE STREET | COURTYARD HOUSING

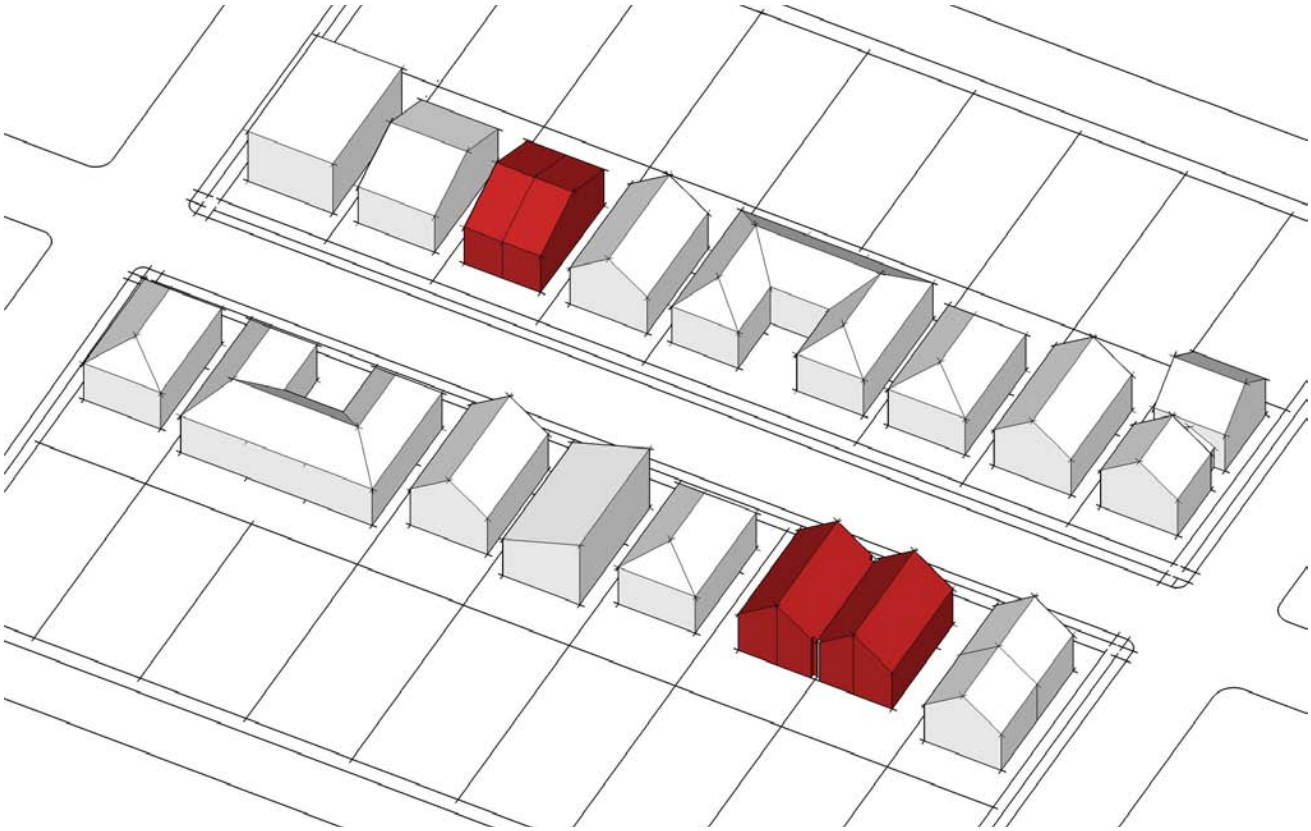


Courtyard housing. The divided massing of courtyard housing, especially when street-fronting units have house-like forms, provide opportunities to integrate higher-density housing into neighborhood patterns where detached houses predominate.

1920s courtyard apartments. Form of end units reflects neighborhood context of detached houses.

Recent courtyard housing examples with house-like forms at street frontages

RHYTHM OF DEVELOPMENT ALONG THE STREET | PAIRED ROWHOUSES



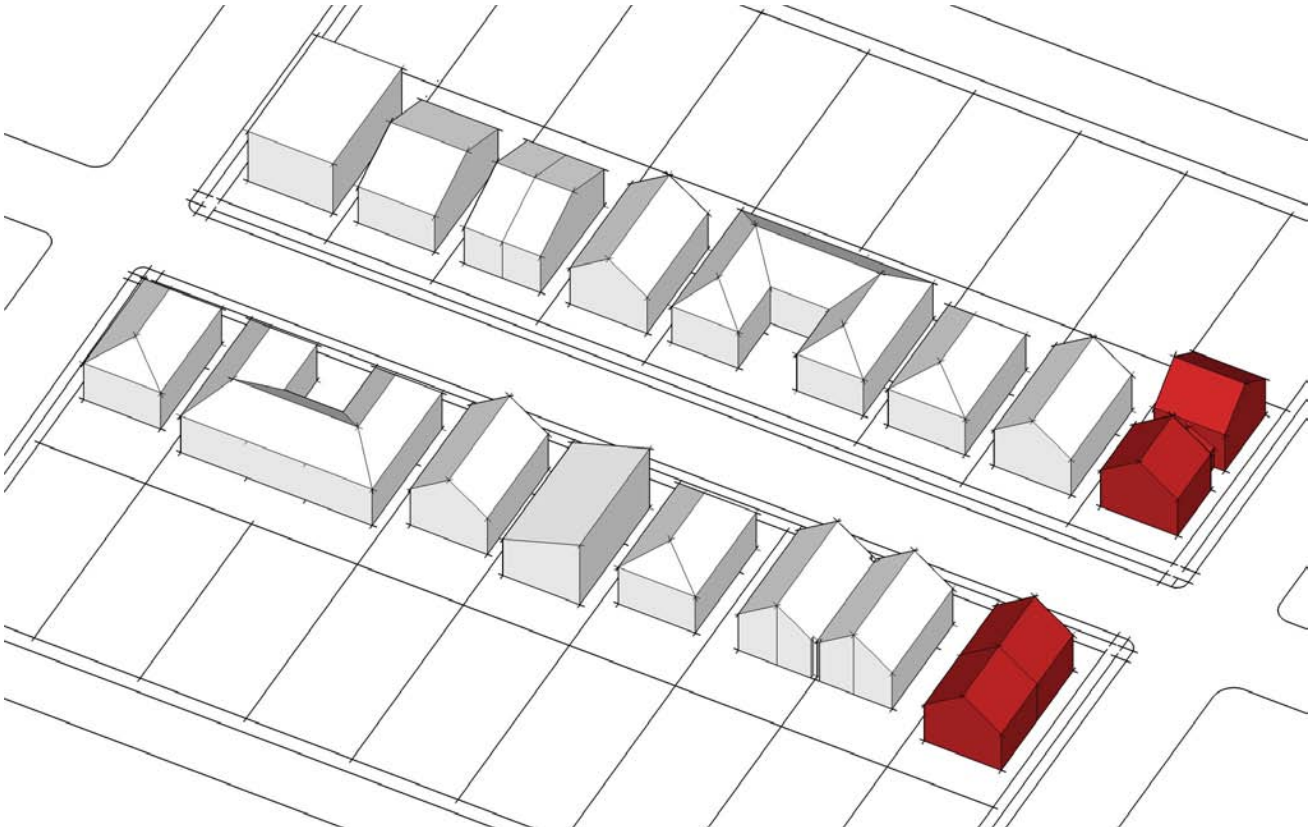
Paired rowhouses. Divide rowhouse projects into paired units, with massing reflective of nearby detached houses. Contextual fit can be optimized by pairing units under the same roof form, instead of using separate gables for each unit.

Four-unit rowhouse project divided into distinct building volumes, with two units under each gable, that reflect massing of nearby houses (pre-existing house visible to right)

"House" at center is actually two side-by-side rowhouse units, each only 10' wide. Their combination into a single house-like form avoids any appearance of being overly narrow and continues the neighborhood rhythm.

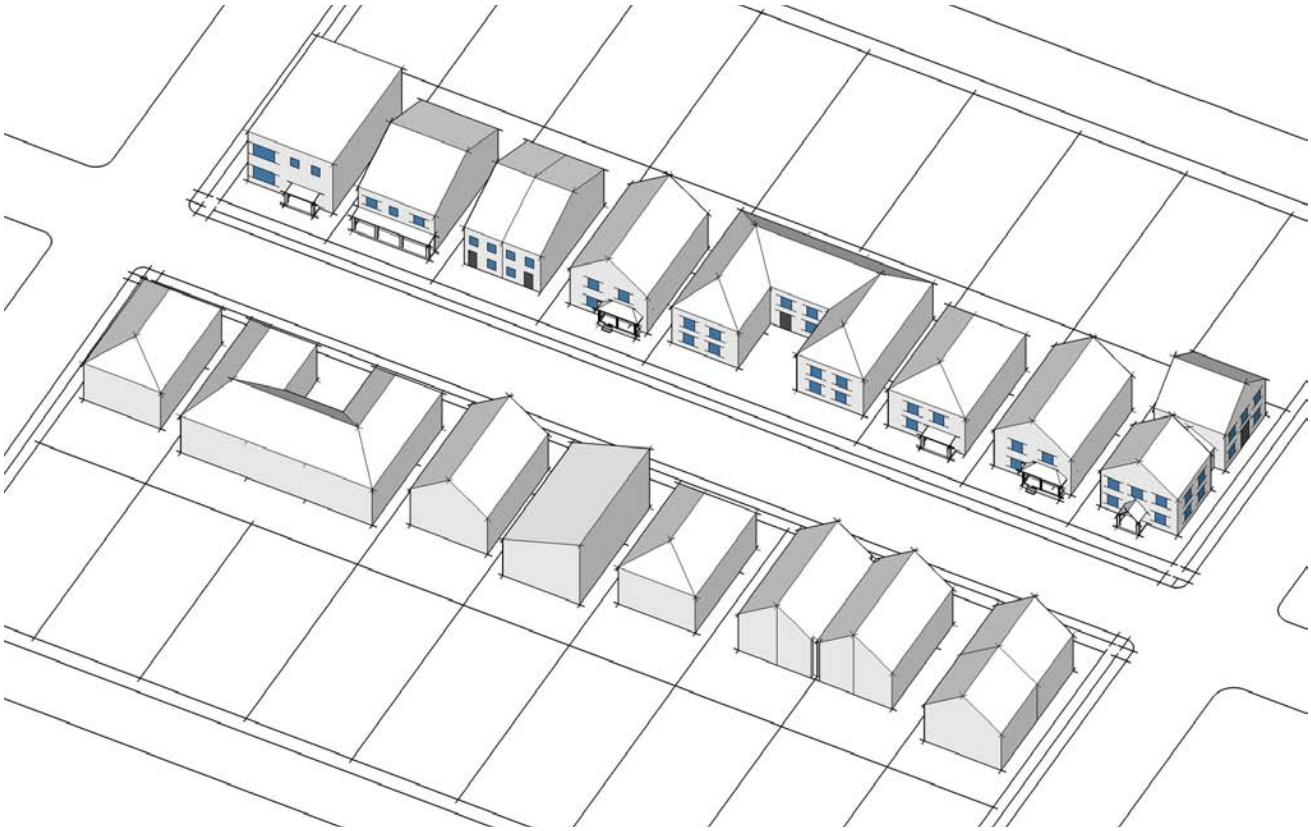
Examples of paired rowhouses (also called semi-detached houses)—continue patterns established by houses on 50'-wide lots

RHYTHM OF DEVELOPMENT ALONG THE STREET | CORNER ATTACHED HOUSES



Corner Attached Houses. Corner sites provide opportunities for attached houses to reflect neighborhood patterns, by enabling units to be oriented to different street frontages, providing the appearance of distinct houses.

Attached houses (joined at garage visible in top image) divided into volumes similar in form to nearby detached houses.



Street orientation

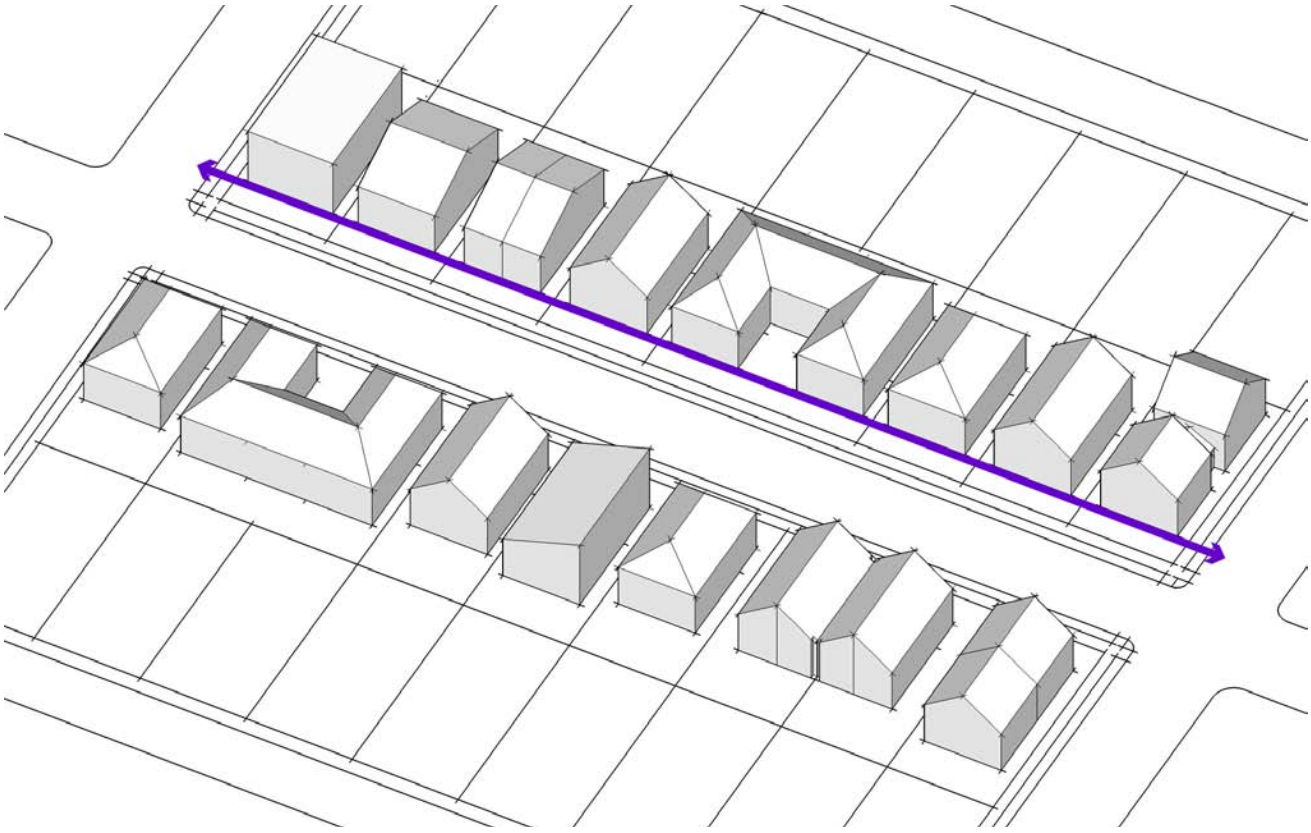
Buildings oriented toward streets are a key characteristic of Portland's neighborhoods. This orientation is achieved by having features such as windows, main entrances, and porches oriented toward the street. This street orientation also contributes toward a pedestrian-friendly street environment, providing a visually-rich street edge; and contributes to safety by allowing residents to survey street activity (the "eyes-on-the-street" concept).

Principle: Along street frontages, orient windows, main entrances, and other primary building façade elements toward the street. Care should be taken to avoid the appearance of buildings turning their backs or sides toward the street. Courtyard buildings can contribute to this by orienting main entrances toward courtyards that serve as a semi-public extension of the public realm of adjacent streets.

Triplex with "front" doors and most windows oriented toward side, away from street.

Contrasting images of similarly-configured apartment developments, but featuring very different street orientations. *Left example includes main entrances and many windows oriented toward the street. Porches bring additional prominence to the street-facing entrances, while architectural details and façade articulation provide additional visual interest that contributes to a pedestrian-friendly street environment. Right example appears to "turn its back" to the street, with no main entrances along the street frontage and large areas of blank wall.*

Triplex with main entrances, windows, and porches oriented toward street.



Front setback patterns

Some streets feature consistent front building setbacks that help define neighborhood character.

Principle: Continue established building setback patterns, where this is a neighborhood priority and is practical. Note: deep front setbacks can compromise the ability to provide backyard space and/or rear parking, particularly at higher densities.

Shallow setbacks along a Lair Hill street

Generous setbacks along an Irvington street lined by a mix of apartment buildings and houses

Landscaping and trees

In outer neighborhoods the predominance of landscaping and trees are often more central to neighborhood character than the architecture and building frontage patterns.

Principle: Use landscaping and trees to achieve compatibility in areas where these are unifying elements of community character.

An urban neighborhood is almost invisible beneath a vast green canopy—created, in large part, by street trees.

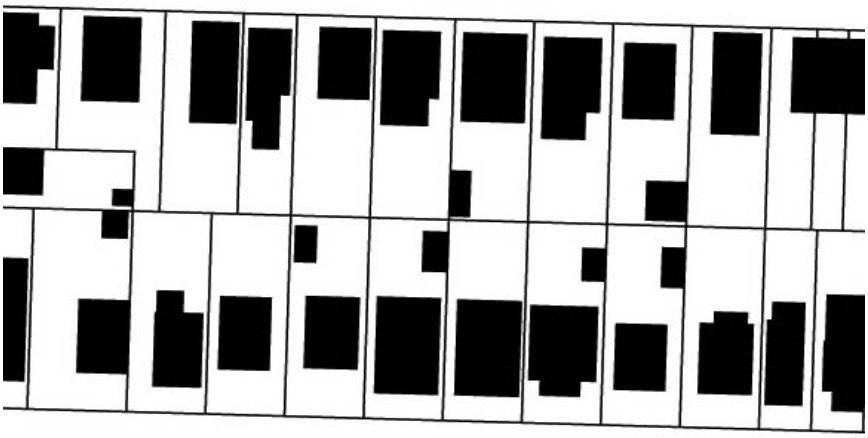
Street trees and neighborhood character. Street trees can be as central to neighborhood character as development patterns or architecture, as these views of Northeast Portland highlight. To help continue this tradition when undertaking infill projects, minimize driveway widths and curb cuts to maximize opportunities for street trees. Careful consideration should be given to selecting tree species appropriate for the planting strip width, site conditions, and surrounding context (contact the City Forester for more information).

Backyard patterns

Most residential areas zoned for medium-density development have established patterns of backyards, which create a much-valued "private realm" of outdoor spaces that contrast functionally with the "public realm" of street frontages. Infill development which intrudes significantly into the backyard realm can have substantial privacy and solar access impacts and is often a key concern of neighbors *(see pages 35–37)*.

Principle: Respect the backyard realm by minimizing intrusions by larger structures, where this is a priority.

Note: Courtyard housing, which provides opportunities for reflecting established street frontage patterns through courtyard landscaping and divided building volumes, tend to intrude into the backyard realm (see page 48). *Such trade-offs need to be considered.*

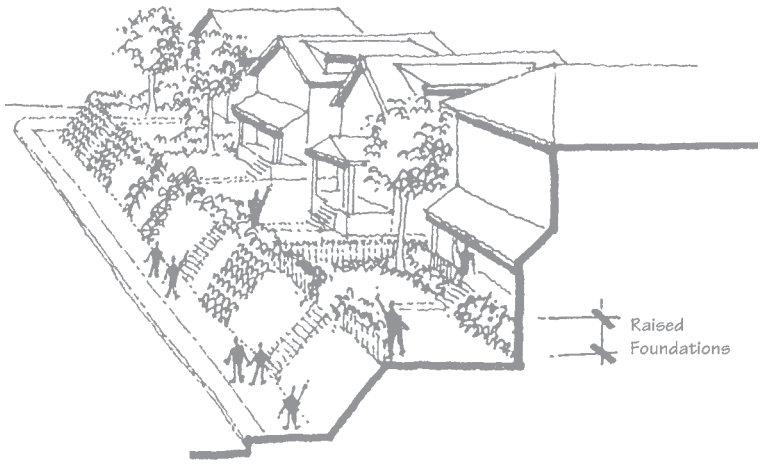


Topography and Grade

Raised lots are a character-giving feature of some neighborhoods, as are patterns established by the predominance of houses with raised foundations.

Principle: Continue characteristic aspects of neighborhood topography, such as raised lots and the relationship of buildings to grade, in areas where these aspects form prevalent patterns.

Note: Providing for the accessibility needs of residents needs to be considered when designing buildings with raised foundations.



From The 10 Essentials for North/Northeast Portland Housing

Architectural features

Some neighborhood areas are characterized by recurring architectural features (such as porches or other entry treatments, window patterns, roof forms, building details, materials, etc.) that are valued by community members as key aspects of community character.

Principle: Consider designing buildings to respond to prevalent architectural features of the surrounding neighborhood context, especially in areas where patterns established by recurring architectural features are well-established and valued.

Note: Consideration should also be given to avoid mimicry of existing buildings, so that opportunities for the continuation of the evolution of architectural style are not stifled.

The focus of this design guide is on fundamental neighborhood patterns, rather than on the details of architectural features. For more information on the latter, see The 10 Essentials for North/Northeast Portland Housing *(1991) and* Building Blocks for Outer Southeast Neighborhoods *(1996).*

This duplex includes features common to nearby Craftsman-style houses (such as extended roof eaves supported by brackets, covered entries, pitched roof, lap siding, and window trim), while using more contemporary forms, providing the neighborhood with additional architectural variety within the framework of the neighborhood's urban fabric.

A word on "pedestrian-friendly" design . . .

Portland's neighborhood plans and design-related policies frequently call for new development to contribute toward a pedestrian-friendly street environment, which also helps achieve objectives for transit-oriented design. While the focus of this document is on infill design strategies that respond to surrounding neighborhood context, a few rules-of-thumb are listed below regarding pedestrian-friendly design because of its key place among Portland's design values and because of its frequent overlaps with issues related to neighborhood context. Besides the essential provision of sidewalks*, some ways of achieving pedestrian-friendly design as part of residential infill projects include:

- **Provide visual interest and a human-scaled level of detail, avoiding large areas of blank wall or garage doors.** People are attracted to walking along streets that provide visual interest and include elements that relate to the human scale. This can be achieved by using architectural features such as: façade articulation (breaking up larger building volumes that might otherwise appear monolithic), quality building materials that provide visual interest, window and entrance details, and porches and balconies (these provide residents a means to personalize the public frontage of their residences, particularly in higher-density situations); as well as by locating garages toward the rear of sites or by minimizing the prominence of front-accessed garages. For these strategies to be effective in contributing to a visually-rich street environment, buildings should be located close to sidewalks, which also helps to provide an inviting sense of enclosure and defines the "urban space" of the streetscape.
- **Provide convenient pedestrian access to destinations, with strong connections between main entrances and sidewalks.** This can be achieved by locating buildings and their entrances close to sidewalks, avoiding situations in which pedestrians must cross parking lots to reach buildings from sidewalks. At a larger level, concentrating destinations and residences within a community also contributes toward pedestrian accessibility.
- **Use trees and vegetation, particularly along residential streets.** Besides providing pedestrians shelter from the sun during summer months, studies have shown that people respond positively to environments rich in trees and landscaping. Street trees and planting strips also help buffer pedestrians from vehicle traffic.
- **Minimize disruptions to sidewalks.** The safety of sidewalks is diminished when there are frequent interruptions by driveways, which bring more potential for vehicle-pedestrian conflicts. These disruptions to the pedestrian environment of sidewalks should therefore be minimized, such as—in the case of rowhouses—by providing a single point of access to parking, instead of separate front driveways for each unit.
- **Provide places to rest and gather.** Particularly in larger projects, it is important to provide comfortable places along pedestrian circulation routes for residents to sit, rest, and interact.

** See the Office of Transportation's "Portland Pedestrian Design Guide" for standards and guidelines for public sidewalks*

Integrate Parking

The prominence and extent of parking and other vehicle areas along the frontages of residential infill projects should be minimized. Not only is this important for continuing neighborhood patterns of landscaped front setbacks and street-oriented buildings, but this helps contribute toward pedestrian-friendly streets; while limiting the number and width of driveway curb cuts preserves on-street parking. Strategies for rear parking arrangements and for minimizing the prominence of front parking are outlined on the following pages. As only a small portion of residential areas in Portland have existing alleys, these strategies focus on the challenges of providing parking access from street frontages.

Integrating parking in ways that do not dominate the site is one of the greatest challenges of designing infill projects

Street-oriented buildings and front landscaping typically define the character of Portland's residential streets. Prominent front vehicle areas disrupt this character.

The Infill Design Toolkit:
Medium-Density Residential Development

A Guide to Integrating Infill Development into Portland's Neighborhoods

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December 2008

Structured parking

Shared structured parking, such as in the form of basement parking garages, has multiple benefits. It is the optimum higher-density parking solution in terms of meeting multiple objectives, such as:

- **Parking—**accommodates more parking than otherwise possible on small, higher density sites;
- **Outdoor Space—**allows more site area to serve as an outdoor space amenity for residents, instead of being devoted to driveways and parking;
- **Environmental—**allows less site area to be devoted to paved vehicle areas, while increasing opportunities for landscaping; and
- **Privacy—**provides an opportunity for residential units to be raised above grade, increasing privacy along busy streets.

While construction costs can be a drawback of structured parking, there are cost-efficient strategies that make structured parking practical in many situations *(see Technical Pages, Structured Parking section).*

Note: Care must be taken so that structured parking does not dominate the ground level of street frontages. This can be achieved by excavating the parking, so that living space above is brought closer to ground level, or by wrapping the front of structured parking with active building spaces.

Duplex (2003) to left, shared basement parking facilitated its development on a small urban lot.

Fourplex (1997) with basement parking (see case study, page 28).

Townhouses (Victoria Townhomes, Seattle—1999), basement parking shared with adjacent building

Rear parking

Locating parking toward the rear of sites, while less space efficient than structured parking, also facilitates opportunities for pedestrian-friendly, context-responsive street frontages. Other advantages of rear parking arrangements, particularly in regard to rowhouses, include:

- **Maximizes parking opportunities** by preserving on-street parking and often allowing two side-by-side garage parking spaces (e.g., on 20'-wide lot, a rowhouse with an alley-accessed garage can have 2 side-by-side garage parking spaces, instead of the single-car garage to which a rowhouse with a front garage is limited). At higher densities, rear parking arrangements can allow 3 parking spaces (two in rear garages, one on street), versus the 2 parking spaces (one in garage, one in driveway) common with front parking arrangements.
- **Allows ground floor living space and good entrance arrangements** (no need for tall stairways or narrow entrance corridors typical of front garage rowhouses).
- **Facilitates two-story height** (no need to stack living space above front garages).

Trade-offs to consider: rear parking can limit opportunities for back yards and can result in larger amounts of site area devoted to vehicle maneuvering space, if not carefully designed.

Rowhouses with clearly contemporary design (left), whose rear parking allows preservation of landscaped setbacks, achieving a more meaningful contextual response than is provided by the rowhouses (right), despite the latter's more traditional gabled roofs.

Rowhouses with rear-accessed parking, highlighting how this allows for continuation of the surrounding neighborhood's pattern of landscaped setbacks.

REAR PARKING

This paired rowhouse project, with only 50 feet of street frontage, illustrates that rear parking can be achieved on even very small sites. Note, however, that this results in most of the backyard being paved. The designer of these rowhouses indicated that it was only marginally more expensive to do rear parking.

Triplex (above) with rear parking on a 5,000 sq.ft. lot in the R1 zone, built to a standardized plan (see Plex Profile 2). *Note contrast with triplex with front garages (5,000 sq.ft. lot), pictured right, which highlights the very different impacts on neighborhood context resulting from their respective parking arrangements.*

Contrasting pairs of narrow-lot houses. Left, shared driveway provides access to rear parking, allowing strong street orientation (with ground-level living space and porches) and minimizing curb cuts and disruptions to front landscaping; in contrast to the examples with front garages (right).

Regulatory Tips

Rear parking arrangements are relatively easy to achieve on larger sites and corner locations. Rear parking is more challenging on small sites in mid-block locations, where it becomes imperative to use narrow driveways to provide enough room for both structures and vehicle access as well as to minimize the proportion of site area devoted to the impervious surface of driveways. Regulatory options that help facilitate rear parking include:

- Driveways of small multidwelling projects can be as narrow as 10-feet wide on sites up to 50-feet wide, as well as on larger sites when the driveway provides access to no more than 10 parking spaces and access is from a local service street.
- Multidwelling driveways serving up to 5 parking spaces can be located adjacent to side property lines if screened by a fence (minimum 3-feet high).
- Vehicle and pedestrian access can be combined within the same driveway space if paving blocks or bricks are used, as an alternative to grade-separated walkways for access to buildings without street frontage.
- Rear alley easements as narrow as nine feet can be used to provide shared access to rear parking for attached and detached houses for up to five lots (alley access to more lots requires an alley tract, which must be wider).
- Rear parking should be designed to provide a back-out distance of at least 20 feet to allow vehicles to maneuver out of parking spaces. However, vehicle area not needed for such maneuvering can be narrower.

Driveway (above), surfaced with paving blocks, providing shared pedestrian and vehicle access to rear buildings and parking—a space-efficient alternative to requirements for grade-separated walkways (top).

For other information related to driveway requirements, see Transcription and Fire Access Requirements (beginning on page B-9).

Rear Parking—solutions to potential pitfalls

The following strategies can be used to address potentially negative aspects related to rear-accessed parking arrangements.

Landscaping and trees should be used, whenever possible, to break up expanses of rear vehicle areas.

Note: While a 20' vehicle back-out distance is typically needed behind parking spaces or garages, spaces between rear garages can be landscaped or used for trees.

Whenever possible, avoid designing alleys as a paved "no man's land" (right) by including landscaping (below, left) and trees (below, right) between garages.

Use water-permeable paving (right) to help minimize the negative environmental impacts of the additional amount of paved vehicle area needed for rear parking arrangements.

REAR PARKING

Avoid rear parking arrangements that result in blank walls along street frontages. A mistake which takes away some of the design advantages of rear parking is having the "backs" of rear-accessed garages line ground-level street frontages, resulting in blank walls and a poor relationship to the street. This can be avoided by:

- **Including ground-level living space in front of garages,** or by
- **Partially excavating the garage level or berming up land in front of the garage wall,** so that living space above garages becomes the primary, street-fronting part of the building.

The lower-level, rear accessed garages of these rowhouses are partially-excavated below grade, allowing the upper living space to relate strongly to the street (providing a street relationship similar to historic patterns of houses built over partially-excavated basements).

Front Parking

Front parking arrangements, such as rowhouses with front-accessed garages, are typically more disruptive of neighborhood contexts and pedestrian-friendly street frontages than are rear parking arrangements. However, there are various ways of minimizing these impacts and the prominence of front garages:

- **Recess the garages**

- **Use other building elements, such as porches, that take "center stage."** Extending features such as porches or trellises over garages takes the focus away from garage doors, making them visually subservient to other elements.

- **Excavate into grade.** Locating garages partially below grade allows living space above to be closer to ground level, providing a stronger relationship to the street.

  This arrangement also reduces building height, allowing less of a contrast in scale in many neighborhood contexts and continuing patterns of raised foundations prevalent in older neighborhoods.

FRONT PARKING

- **Mask with landscaped berms.** In this example, integrating stairways with the berm landscaping also "grounds" the units, in contrast to the tall, raised stairways of some rowhouses that can result in an appearance of disconnection with neighborhood context.

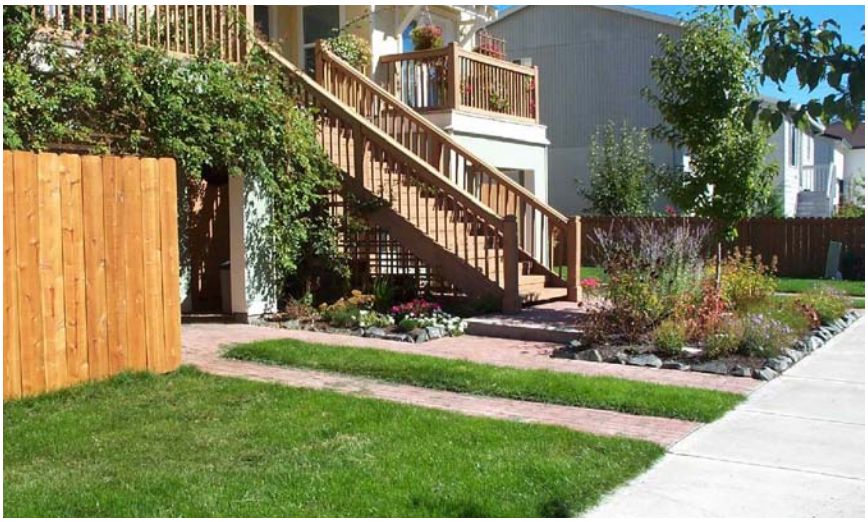
- **Combine and narrow driveways where they cross sidewalks.**

- **Use dark, subdued colors for garage doors** to minimize their prominence.

FRONT PARKING

- **Use windows in garage doors** to increase visual interest and avoid "blank wall" appearance.

- **Incorporate greenery within the driveway** (such as tread paving or grasscrete).



For optimal effect, use as many of these strategies as practical.

Parking Pads

Parking pads are a low-cost off-street parking option that allows front-accessed parking and backyards, while avoiding the negative impacts caused by garage doors on the streetscape.

Paired rowhouses with separated parking pads, allowing landscaping to be central. The Office of Transportation generally requires driveways to be paired, but will often allow separated driveways if an on-street parking space is preserved between driveways.

Narrow-lot house with parking pad (left), instead of the more usual front garage configuration (right).

Note: projects without garages should incorporate storage areas to meet needs otherwise met by garages.

No Off-Street Parking

A final option that optimizes potential for context-sensitive design is to include no off-street parking. This option is made possible by Zoning Code provisions that waive minimum parking requirements for projects located within 500 feet of a street with frequent transit service (20 minute peak hour service). The no parking option very much simplifies the design of infill development, with no need to find space to fit vehicle areas onto small infill sites, and entirely avoids the problem of how to minimize the visual and environmental impacts of parking. Not including parking also significantly reduces the cost of new housing units. In the case of rowhouses, the lack of driveway curb cuts maximizes opportunities for on-street parking; sometimes allowing as much parking as would be provided by front-accessed garages (which sometimes result in the loss of all on-street parking). Some builders have found that there is a market niche for new housing without off-street parking, with several financially successful projects recently being built.

Left: Paired rowhouses with no off-street parking. Right: Stacked duplex (built 2004) with no off-street parking on a 2,500 sq.ft. site.

Fourplex (built 2002) with no off-street parking on a 5,000 sq.ft. lot. Represents a solution for accommodating density on small infill sites, allowing a strong street orientation and a house-like form reminiscent of Streetcar Era plexes.

7-unit structure (built 2004) with no off-street parking on a 4,000 sq.ft. site. Includes 4 townhouse condominium units (over 3 ground-level studio units), which sold quickly. Developer related that buyers were more concerned about adequate bicycle storage than the lack of off-street parking.

Trade offs: Increasing competition for on-street parking is often a key concern in some neighborhoods. Proposals for infill projects that do not include off-street parking can therefore be contentious.

Case Study: Clinton Street Lofts

Small condominium project with no off-street parking

Housing type	Four townhouse units (condominiums) over three ground-level studio apartments
Neighborhood	Hosford-Abernethy
Address	2021 SE Clinton St.
Zoning	CN1
Site size	4,000 SF
Units	7
Density	1 unit per 571 SF (76 units/acre)
Parking	None
Size of units	900 SF townhouses
Year completed	2004
Developer	Robert Ross
Designer	Kevin Burgee

KEVIN BURGEE

While its contemporary design and flat roof are a departure from the architecture of nearby houses, the Clinton Street Lofts continue the neighborhood's small-lot development pattern and tradition of pedestrian-oriented building frontages.

The Clinton Street Lofts are an example of ownership housing built without off-street vehicle parking that achieved market success. This arrangement allowed the project to accommodate seven units on a small (4,000 square foot) mid-block site, which would not have been practical if on-site parking spaces were to be provided for each unit, and resulted in significant savings in construction cost. Not including vehicle parking on the 40'-wide site also helped contribute to a pedestrian-oriented street environment by allowing avoidance of driveway interruptions to the sidewalk and enabling ground-level building frontage to be occupied by living space, rather than garage.

The project consists of four two-level townhouse units over three ground level studio units. The townhouse units sold quickly as condominiums for $20,000 more than their original asking prices, with sales prices ranging from $226,000 to $246,000. Buyers were drawn to the urban amenities and pedestrian-oriented environment of the surrounding neighborhood and were more concerned about adequate bicycle storage than about car parking. This project also serves an emerging market niche by providing new low-maintenance housing with contemporary design and sustainable building features (including an ecoroof)—qualities provided by few other properties in a popular inner-eastside neighborhood where older detached houses are the predominant housing options.

Case Study: Eliot Neighborhood Fourplexes

Basement parking for small multidwelling structures

Housing type	Fourplex
Neighborhood	Eliot (Eliot Conservation District)
Address:	145 NE Sacramento Street (similar projects elsewhere)
Zoning	R2a
Site size	7,500 SF
Units	4
Density	1 unit per 1,875 SF (23 units/acre)
Parking	4 spaces in basement level (additional at rear)
Size of units	1,368 SF (3 bdrms)
Year completed	1997
Developer	William Reed/WCR Company
Designer	Michael Dowd, AIA

The Eliot neighborhood fourplexes, built by developer Bill Reed, are an example of how partially-excavated basement parking can be an economically-feasible part of small projects, when cost-efficient construction strategies are followed. Reed indicates that key to making this basement parking arrangement cost efficient was not excavating more than 4' below grade, which allowed him to avoid the need for engineered walls and associated costs. Simple poured concrete walls up to 4' high are used, with wood framing above. The parking structure is naturally ventilated, avoiding the need for mechanical systems. On top of his structured parking, Reed usually pours a 12" concrete slab with a waterproofed roof, so that it can be used as a podium. This usually does not have to be engineered, but the slab is designed to use a simple pattern of rebar that is repeated throughout the structure. The simple pattern allows for the use of less skilled labor, with no commercial contractors needed.

Reed also sometimes uses pre-engineered wall systems, such as Conform Blocks that can retain up to 8' of soil. Reed's serving as his own general contractor also helped to keep construction costs to $45–50 per square foot (1997 dollars) for the Eliot neighborhood fourplexes.

Context: Fourplex is second from right. To left of fourplex is another recent infill plex.

The resulting partially-excavated basement parking configuration allows the fourplexes to better relate to the scale of the surrounding two-and-a-half story structures (compared to what have resulted from building the parking above grade), while also allowing the units to better relate to the street, minimizing the visual prominence of the parking, and allowing for efficient use of site area.

Minimize Scale Contrasts

Higher-density infill projects are typically larger in scale than the single-family houses that predominate in most neighborhoods. Such scale contrasts are often central to community concerns about the impact of new development on neighborhood architectural character. In those neighborhood areas where the existing scale of development also corresponds to the desired future character, the following are various strategies for minimizing scale contrasts.

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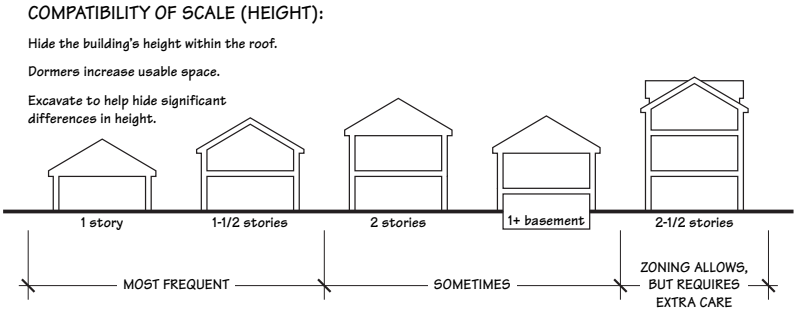
Accommodate upper-level living space within dormers. This reduces apparent building scale by concealing living space within the roof.

Duplex bungalow (1907) with upper-level living space within dormers (an arrangement common in the early 20th-century bungalows that predominate in many Portland neighborhoods).



From *Building Blocks for Outer Southeast Neighborhoods* (1996)

The effectiveness of the above approach, combined with partially excavated basement parking, is highlighted by these contrasting images of paired rowhouse projects with similarly-sized units:

Left: three-level rowhouses with no design treatment relieving their height and verticality.

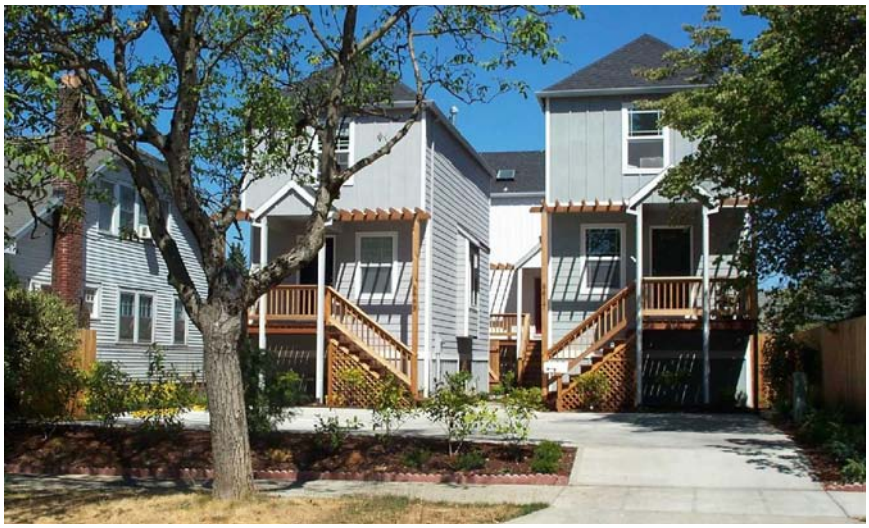
Right: three-level rowhouses with top floor accommodated within dormers and featuring excavated basement parking.

Use excavated basement level, instead of having all building area above grade.

These examples illustrate how height contrasts between three-level buildings and surrounding contexts of 1½- and 2-story houses can be minimized by lower-levels that are partially excavated (instead of at-grade).

Rowhouses with excavated lower-level garages

Fourplex with excavated basement parking



Cluster of three-level detached houses with excavated basement living space

Step back upper stories of taller structures.

Rowhouses with upper-levels set back within covered terraces, helping to mitigate their four-level height.

Three-story fourplex, with top floor stepped back.

Break-up large buildings into smaller forms reflective of the scale of nearby structures.

Apartment project in Outer East Portland, with facade divided into "house-like" building volumes.

Use porches or balconies to counteract the vertical emphasis of taller buildings.

Porches on these three-level rowhouses (above) help reduce their apparent scale, in contrast to the uninterrupted verticality of the similarly-scaled rowhouses (left).

Use single-level building volumes and horizontally-oriented building elements in areas where low-lying buildings are cherished aspects of community character.

Recent infill projects in Outer East, with design features providing a horizontal emphasis reflective of the area's characteristic low-lying housing.

Roof forms set at single-level height help mitigate the scale contrast between these paired rowhouses and the adjacent small cottage.

Use trees and landscaping to soften scale differences, particularly in areas where trees and vegetation are unifying aspects of community character. Preserving existing significant trees can be particularly effective. Note that deeper building setbacks may be necessary to accommodate plantings.

Use a change of materials and/or darker colors to de-emphasize upper levels.

The predominance of glass, combined with the subdued colors, step backs and terrace plantings of upper levels diminish apparent building scale.

PAYTON CHUNG

Upper-level step backs, differing façade materials and darker colors help focus attention on bottom two-three levels, de-emphasizing the presence of the upper stories. (Vancouver, BC)

On larger sites, provide a transition in scale to adjacent smaller houses. Sites with higher-density zoning are often located along transit streets where new development is intended to be concentrated, but at their rear often abut lower-density zoning and houses. In such situations, larger building volumes should be concentrated along the transit street, with smaller buildings toward the rear.

Limit Privacy Impacts

Privacy impacts caused by infill development, such as windows and balconies that compromise the privacy of adjacent residents, are often significant concerns for neighbors. Thoughtful design can minimize such impacts. There are many ways of achieving this, but all require careful consideration of the relationship of the proposed development to specifics aspects of adjacent properties.

The Infill Design Toolkit:
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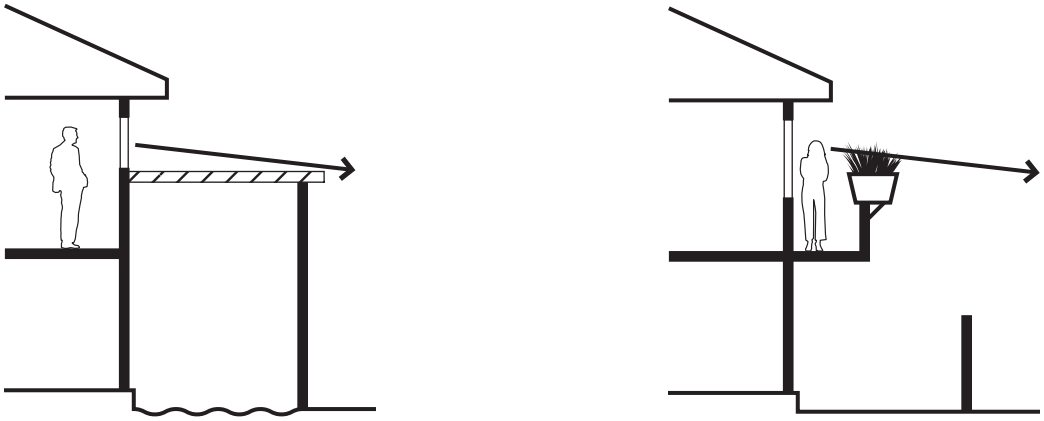
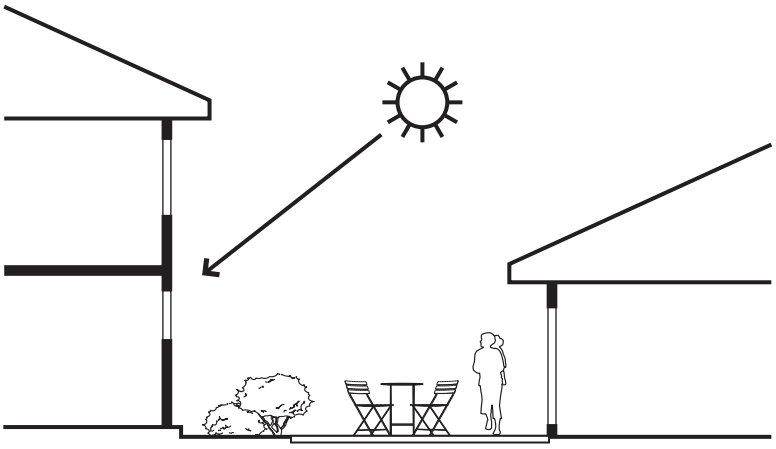


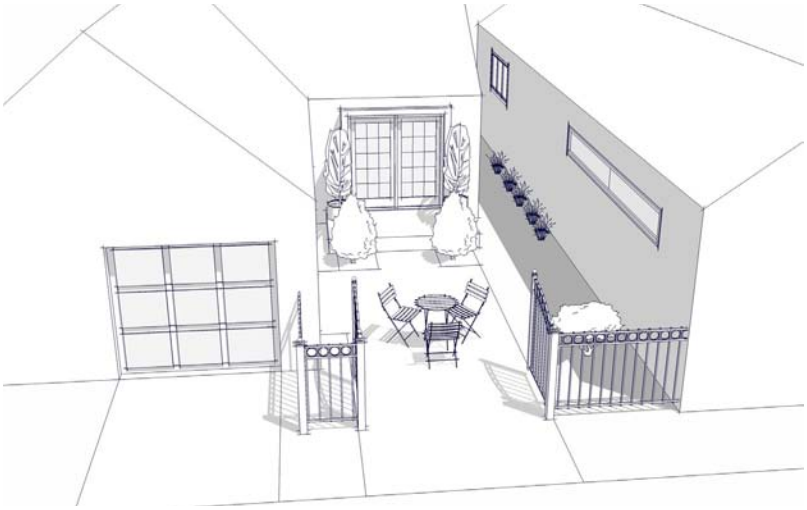
Trellises, planters, and other features can be located to obstruct views, while retaining the benefits of windows and upper-level outdoor spaces.

Locate and design windows and balconies to minimize overlook impacts on adjacent yards and residential interiors

This is especially important for configurations when sideyards are the primary private outdoor spaces for adjacent properties (e.g., sideyard easements and zero lot-line development, *see page 40*).

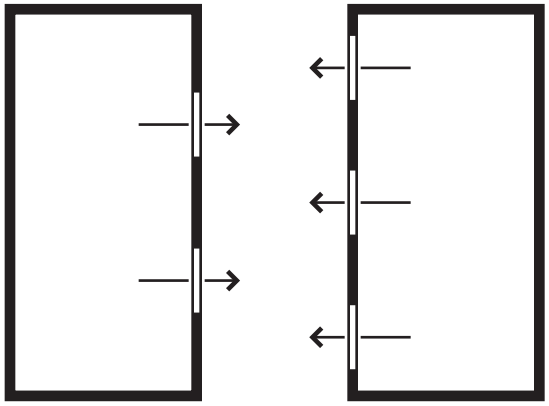


Locate windows high on walls to avoid overlook problems adjacent to neighboring outdoor space, while providing access to natural light.



For projects in which sideyards are the primary private outdoor space, walls of abutting portions of residences not using these spaces should not have windows or should locate windows high on walls

Avoid having windows align with those of neighboring residences



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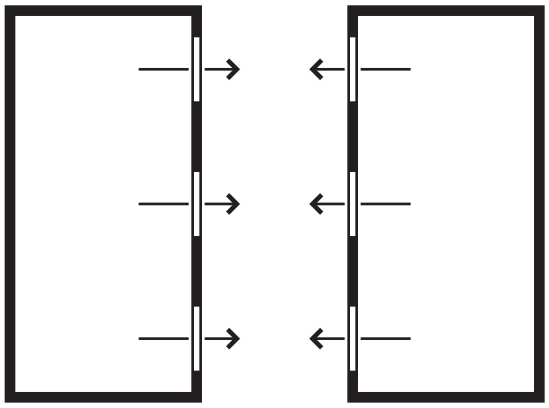


Not this

Other strategies

Step back upper portions of taller buildings away from property lines adjoining nearby residences and rear yards to limit overlook problems and solar access impacts

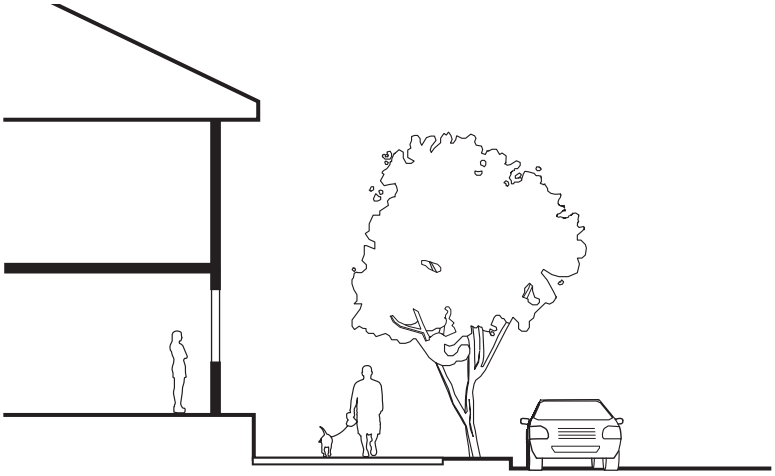
Use sight-obscuring glass or window film, if it is not practical to locate windows in ways that minimize privacy impacts. Such treatments allow access to natural light, a benefit that can be further maximized by leaving upper portions of windows unobscured.

Strategically place trees and other plantings to screen views of the private spaces of neighboring properties. If trees are intended to become large enough to screen views from upper floors, sufficient setback area must be provided to accommodate tree growth. (See the Bureau of Development Services' Tree and Landscaping Manual for the space needs of various tree species).

Consider the privacy needs of future residents

Careful attention should be paid to design that provides for the privacy of building residents and ensures livable residential environments. These considerations are particularly important adjacent to busy streets, along which much of Portland's multifamily zoning is concentrated and where residential livability can be significantly compromised without careful design. To create quality residential environments in such locations, particular care must be given to design housing so that negative impacts to the privacy of future residents are minimized. Strategies to provide a successful transition or buffer between busy streets and residential interiors include:

■ **Raise living spaces above grade**



■ **Set housing behind a landscaped buffer**

Ground-level units in this apartment building are both buffered from the street by a landscaped setback and raised above sidewalk level

■ **Locate spaces for non-residential uses or for less private household activities along ground-level street frontages**

Multifamily building with lobby/office at street frontage, with residences above

Create Usable Outdoor Spaces

At higher densities, outdoor space is too valuable to waste. The design of both the site and buildings needs to be carefully coordinated to allow for strategies that will create outdoor spaces that are usable. Not only must usable outdoor spaces be sufficiently sized, but buildings should be designed to provide convenient access to these spaces. Whenever possible, outdoor areas should be designed to be multifunctional, simultaneously serving recreational, environmental, and even vehicle access functions. Vehicle maneuvering areas, such as driveways, are an outdoor resource that often occupy a significant portion of small infill sites, but are typically used for only a few minutes each day when cars pass over them. With careful design, however, such areas can serve other valuable roles. Some strategies for creating usable outdoor space on constrained infill sites are summarized in this section.

ALLAN POLENDEY

Driveway designed as extension of patio space

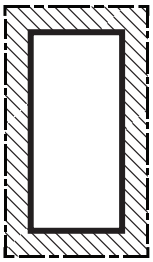
Carve out room for private outdoor space

Private courtyard on a rowhouse lot less than 1,700 square feet

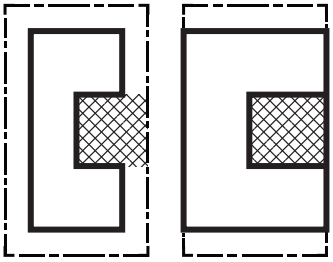
Side and rear yard setback areas are often too small to be very usable. When sufficiently-sized backyard spaces are not feasible, as is often the case on small lots or with rear-parking arrangements, alternative approaches include:

- Central courtyard space, which allows indoor and outdoor spaces to be closely integrated; and
- Side yard easements, extending over adjacent lots, which create a single usable outdoor area in place of narrow side yards, while avoiding the more expensive firewall construction requirements that would apply to structures built on the property line. Typically, one adjacent unit would use the side yard easement, with door and window connections into this space, while abutting walls of the other adjacent unit would have windows located in ways that avoid privacy intrusions *(see page 36)*.

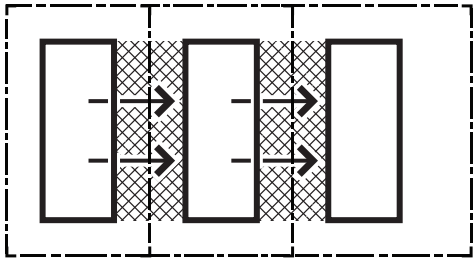
Note: central courtyards or usable sideyards are especially important when alley-accessed parking leaves little room for backyards.



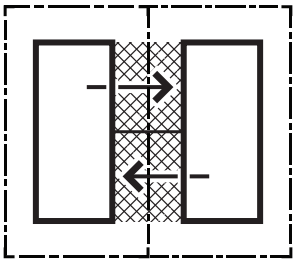
Unusable Space



Central Courtyards



Side Yard Easements



Mutual Side Yard Easements for Two Lots

Use shared courtyards

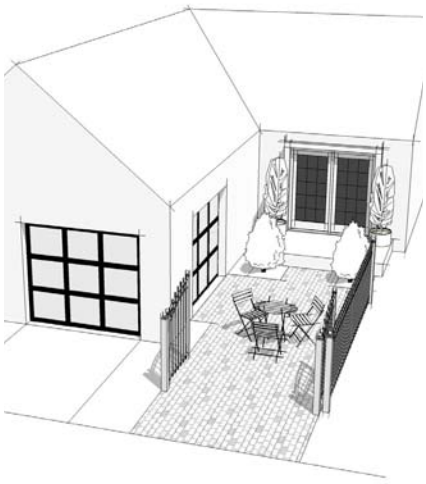
At higher densities, shared courtyards can provide larger outdoor space than would be possible to provide separately for each unit. *(See pages 46–57 for more on courtyard-oriented housing)*

Courtyard with vegetable garden and community space

Courtyards are especially useful in providing space of sufficient size to be usable by children, particularly when it is not possible to provide private yards large enough to serve as play space.

Create multi-use outdoor space

Driveways and other vehicle areas can be designed to accommodate other uses, while courtyards can both serve as a community amenity and provide a stormwater management function.



On a small lot, unbuilt area can be designed to serve interchangeably as a private patio or as a parking space, depending on the needs of residents. Surfacing with sand-set pavers highlights this dual purpose, while also limiting stormwater runoff.

ARLENE KIMURA

Avoid designing large areas solely to accommodate vehicle maneuvering. Vehicle areas often occupy a large percentage of small, higher-density infill projects and represent an underutilization of scarce outdoor space.

Townhouses fronting onto a courtyard that also provides vehicle access to garages. Use of paving blocks highlights the courtyard's function as pedestrian-oriented space.

CABE/DAVID MILLINGTON PHOTOGRAPHY LTD.

Example of space designed to accommodate cars along with a range of community activities (Pepys Estate, London)

Outdoor amenity and environmental function

This apartment courtyard includes features that manage stormwater, while also serving as an outdoor amenity for residents and providing a unifying, central design focus.

Use the roof

Flat roofs can be used to provide outdoor space, often in the form of rooftop decks, terraces, and ecoroofs. The latter also provide environmental benefits by managing stormwater, limiting urban heat island effects, and can increase the lifespan of roofs (Portland's Ecoroof Program provides information and technical assistance, see www.portlandonline.com/bes)

Roof terrace

PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

Ecoroof

Plan for trees

Careful site planning can accommodate new trees or preserve existing trees even on constrained infill sites, allowing them to serve as valuable amenities for residents and the surrounding community. Appropriately-sized courtyards, setbacks, and rear yards are key ways of accommodating trees; making room for such spaces must be considered early in the design of a project. (See the Bureau of Development Services' *Tree and Landscaping Manual* for the space needs of various tree species)

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Alternative Housing Types

Rowhouses, narrow-lot houses, and low-rise apartments are housing types frequently associated with medium-density residential development. There are, however, many other possibilities, some of which have long been a part of Portland's neighborhood fabric.

This section highlights alternative housing types that hold potential for meeting the community's design objectives as small-lot infill solutions, including:

Recent rowhouse development

Mix of housing types in an older Portland neighborhood

Courtyard Housing—General

Characteristic features of courtyard-oriented housing, such as divided building volumes (instead of the wall-like form of rowhouses) and courtyard landscaping, can make such housing a good contextual "fit" in many residential neighborhoods. Historically, courtyard apartments were a common Streetcar-Era infill housing type in Portland's neighborhoods, providing density while continuing the landscaped character of neighborhoods where detached houses predominate. Renewed public interest in courtyard housing was demonstrated by recent design preferences surveys, from which contemporary courtyard housing projects emerged as the most favorably-rated housing types, and by the market success of recent courtyard-oriented housing projects. Besides possibilities they provide for context-appropriate design, opportunities provided by courtyard housing include:

- Shared courtyards can provide larger, usable outdoor spaces that are not possible in the form of private yards at higher-densities;
- Allows space for bigger trees and larger landscaped areas;
- Provides room for managing stormwater on site;
- Fosters interaction among residents and a sense of community (courtyard-oriented housing has been a common configuration of co-housing communities and other intentional communities);
- Provides for an additional layer of "urban space," beyond the public street, supporting creation of a distinct sense of place;

Courtyard Housing—Historic Portland Precedents

COURTYARD HOUSING

- Facilitates medium-density housing arrangements appropriate for elders and others with impaired mobility, as courtyard arrangements allow for wider, single-level houses without stairways, which can be difficult to achieve with rowhouses or other narrow lot housing types.
- Allows creation of "pocket-neighborhoods" that, while integrated with the surrounding neighborhoods, have their own identity as a distinct ensemble – which can be particularly useful for marketing infill housing in areas struggling with creating a positive image attractive to potential residents.

ADRIAN WELCH

While courtyard housing historically tended to consist of rental units, Zoning Code provisions for "common greens" and "shared courts" now allow housing units on separate lots to front onto courtyards, facilitating the development of courtyard housing as an ownership housing type *(see information on pages 52–57)*.

"Cottage clusters," oriented toward shared green space, have become a popular housing option in the Puget Sound region (Ericksen Cottages, Bainbridge Island)

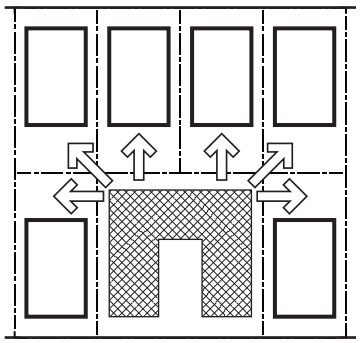
Shared courtyards provide opportunities for play space at higher densities.

Recent Portland courtyard housing project, "Hastings Green," featuring cottages oriented to a shared courtyard. Developed as condominiums, all units sold before project completion, indicating market demand for such housing.

Potential Pitfalls

The design of courtyard housing should seek to avoid or minimize potential pitfalls related to such configurations, including:

- **Potential impacts to the privacy of abutting properties,** since courtyard units are typically pushed toward the rear and side edges of a site, close to neighboring properties (in contrast, rowhouses are typically located along the public street frontages of sites, further removed from neighboring backyards). Impacts can be limited through strategies such as screening, window placement, stepping upper levels back from neighboring properties, and through additional building setbacks *(see pages 35–37).*
- **Privacy within a project.** For units that face each other across narrow courtyards (less than 50'), consideration should be given to minimizing privacy impacts, such as by careful window placement and screening. Also, it is desirable to provide a transition between shared courtyard space and the interiors of units by including small privately-controlled outdoor space in front of each unit.
- **Street-fronting end units.** Courtyard end units adjacent to public streets should be designed to have a strong orientation to the street. Avoid design that provides the appearance of turning away from the street, with large areas of blank wall.



Even though main entrances face toward the courtyard, wrap-around porches, windows and other building details enliven the street frontage of these end units, providing a strong street orientation.

In contrast, the relatively featureless street frontage of this end unit (clearly its "side", rather than a primary facade) presents a weak street orientation.

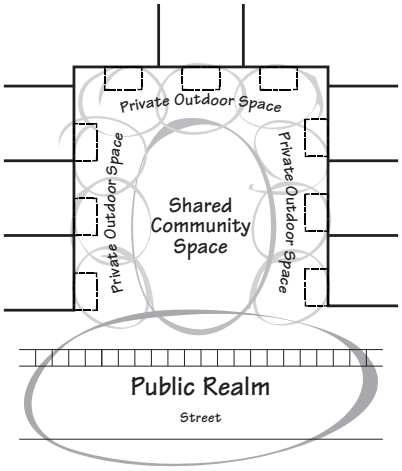
- **Inward orientation.** Since courtyard units are typically oriented toward outdoor space at the center of sites, care should be taken to avoid configurations that appear to "turn their back" to the surrounding neighborhood. On corner sites, street-facing houses or rowhouses may be more appropriate than courtyard arrangements because of the difficulty of designing units to simultaneously front onto both a public street and a courtyard.
- **Courtyard design, maintenance, and appropriateness for residents' needs and capabilities must be carefully considered,** to prevent the shared space of courtyards from becoming disused, poorly-maintained space. Courtyards must be carefully integrated with adjacent residences to maximize access and opportunities for surveillance, as well as to provide a sense of shared ownership and responsibility. Unless the courtyard is a public accessway, courtyards should typically be designed to discourage use by non-residents, in order to allow residents to feel secure and develop a sense of control over of the space.

Corner sites can be problematic for courtyard housing, and historically have often resulted in garages lining an entire block frontage (top). The example at middle and left (built 1928), with a shared parking garage excavated below the courtyard, illustrates a solution that reduces impacts to the streetscape. Another solution is to wrap the corner with street-fronting rowhouses with rear parking (see Prototype 3b), instead of a courtyard-oriented arrangement.

COURTYARD HOUSING

- **Living space, not garage walls, should front onto courtyards.** Courtyard housing units tend to be relatively shallow in depth, leaving little room to include living space in front of ground-level, rear-accessed garages. This can result in situations in which the "backs" of rear-accessed garages are the primary ground-level building element fronting onto the courtyard, with the undesirable outcome of courtyard space lined by blank walls instead of by living spaces. This can be avoided by:
- Including enough building width to allow ground-level living space alongside the garages for each unit; by
  - — Raising the grade of the courtyard or partially-excavating garage levels, so that living space above garages becomes the primary courtyard-facing part of the buildings; or by
  - — Designing courtyard-fronting portions of garages as "flex-space," suitable for use as workshop or play space, that open up to the courtyard space and provide the opportunity for active uses *(see illustration on page 42).*

Raised courtyard allows strong relationship to these rowhouse units' entry porches and living spaces, while lower-level garages are tucked unobtrusively below.



- **Outdoor space sequencing.** The sequencing and design of outdoor spaces is key to successful courtyard housing design. The shared community space of the courtyard should be distinct from the public space of the public street and sidewalk. In turn, private outdoor space (typically in the form of small gardens, patios, or porches) should be included at the interface between residential units and the shared courtyard to provide for a transition to the privacy of unit interiors and allow individually-controlled outdoor space.

JEFF PETERS/STUDIO E ARCHITECTS

STUDIO E ARCHITECTS

Courtyard housing with contemporary design, highlighting how the design possibilities of this ancient housing form are not limited to traditional architectural styles

FLETCHER FARR AYOTTE PC

Courtyards designed to provide both pedestrian and vehicle access

TENDAI CHITTEWERE

More courtyard examples

Left: Shared courtyards are common design features of cohousing communities because of their ability to foster community interaction (EcoVillage at Ithaca, NY) Right: Courtyard with naturalistic wetland plantings fed by stormwater runoff serving as the central design feature (Bo01 Housing Exposition apartments, Malmo, Sweden)

CITY OF SEATTLE

JOHNSTON ARCHITECTS PLLC

JOHNSTON ARCHITECTS PLLC

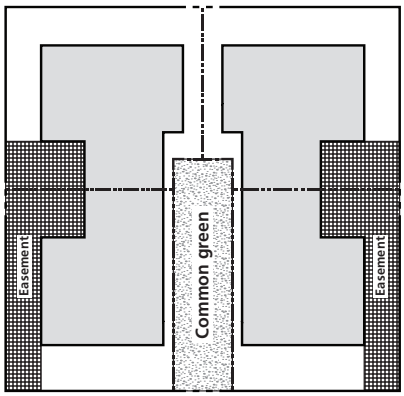
Innovative Seattle examples of detached houses oriented to shared courtyards. Left example (Ravenna Cottages), with 9 units on a 10,500 SF site, achieves a density of 37 units an acre.

Common Greens

A common green is a landscaped courtyard that serves as a pedestrian "street" providing access to adjacent units. Common greens facilitate ownership housing oriented to courtyards by allowing separate residential lots to be created that front onto the common green (as an alternative to requirements that residential lots front onto conventional streets). Common greens can be particularly useful for creating residential lots on deep sites (common in East Portland) that lack enough street frontage for conventional street-oriented housing. Besides providing pedestrian access and facilitating ownership housing, common greens are also intended to serve as a shared open space amenity for residents.

Detached houses fronting a common green with play equipment (R2 zone, New Columbia).

Common greens are particularly appropriate at medium densities, such as for development in the R2 and R3 multidwelling zones, similarly-scaled residential development in commercial zones, as well as for the R2.5 and R5 single-dwelling zones. At higher densities, such as in the R1 and RH zones, common green housing can be combined with street fronting units to achieve intended densities.



Example of how a common green can be used to create residential lots on a site that would otherwise lack sufficient street frontage for the same number of units (see Prototype 4c).

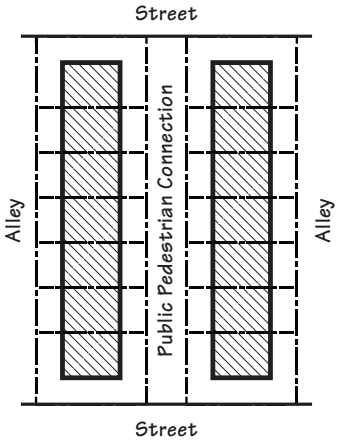
Pedestrian tract at the center of this project (Belmont Dairy Rowhouses) facilitates higher-density ownership housing, in conjunction with street-fronting units (36 units/acre)

Key Regulatory Details

- Common greens are regarded as private street tracts
- Must have a minimum with of 15 feet (including a 5-foot wide walkway)
- No vehicle access is allowed across a common green (vehicle access to parking is typically provided by rear alleys)
- Common greens are not allowed to provide through pedestrian connections between public streets (see "Public Pedestrian Connections," next page)

Public Pedestrian Connections

Residential lots can also front onto a "public pedestrian connection," allowing arrangements similar to that of common greens, but providing a through connection between streets. Public pedestrian connections are public rights-of-way that are intended primarily for pedestrians, not motor vehicles. Public pedestrian connections are especially desirable as part of development in areas with poor street connectivity (City standards call for sidewalks and other pedestrian connections at least every 330 feet).



Housing oriented toward a public walkway (example from downtown Gresham)

Key Regulatory Details

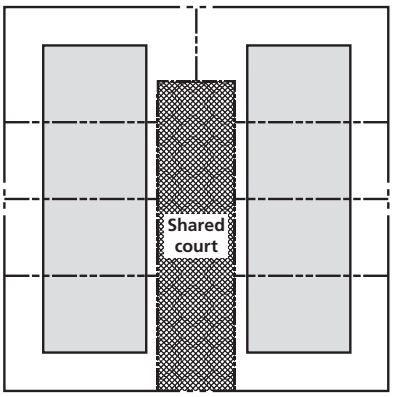
- Minimum width of 15 feet (including a 6-foot wide walkway) in most residential zones.
- Must typically be designed to provide an unobstructed view through the length of the connection (for security).

Shared Courts

Shared courts are courtyard-like streets designed to accommodate—within the same circulation space—access for pedestrians and vehicles to adjacent properties (similar in concept to the Dutch woonerf street type). Shared courts are intended to be designed so that vehicles are treated as "occasional visitors" into space that gives priority to pedestrians and community activities. Shared courts feature special paving treatments to highlight their role as pedestrian-oriented space (providing a contrast to the asphalt of vehicle-oriented roadway) and include community-enhancing features, such as street trees, landscaping, and street furniture.

Because they do not have separate roadway and sidewalks, shared courts can be narrower than conventional streets, helping to make efficient use of small sites and allowing less impervious surface. Shared courts also facilitate the creation of higher-density ownership housing by providing access to housing lots on sites too small to accommodate conventional streets. Another opportunity provided by shared courts is that they allow preservation of on-street parking and facilitate a more pedestrian-friendly street frontage by having a single vehicle access point, rather than the multiple curb cuts common with rowhouses.

Note that configurations similar to shared courts can also be used in multi-dwelling and condominium developments without a land division or separate access tract.



SOLOMON E.T.C.

The single vehicle accessway of this six-unit shared court project minimizes disruptions to the neighborhood streetscape, while street-fronting units continue patterns established by nearby early 20th-century houses (Eastern Crossing, Seattle)

Stormwater planters integrated into the design of shared pedestrian/vehicle space (Meriwether Townhouses)

Rules-of-thumb

Because shared courts are intended to serve a wider-range of functions than conventional streets, particular care should be given to their design, as well as to how they are integrated with adjacent housing. Some issues to be aware of include:

- Community enhancing features, such as street trees, landscaping, stormwater planters, benches and other street furniture, should be included within street area not required for vehicle maneuvering or emergency access. This is important for making shared courts attractive places for residents to spend time in, encouraging their use for purposes other than just vehicle maneuvering.
- Consider locating housing up close to shared courts to maximize opportunities for rear yards, provide a stronger relationship between residences and the shared court, and allow more separation from adjacent properties (limiting privacy and solar access impacts).
- Avoid having garages terminate the view into the shared court.
- Building facades along shared courts should be given as much attention as conventional street frontages, with prominent entries, windows, and architectural details.
- In areas where greater connectivity is needed, shared courts can contribute toward this with a pedestrian connection to the next street.

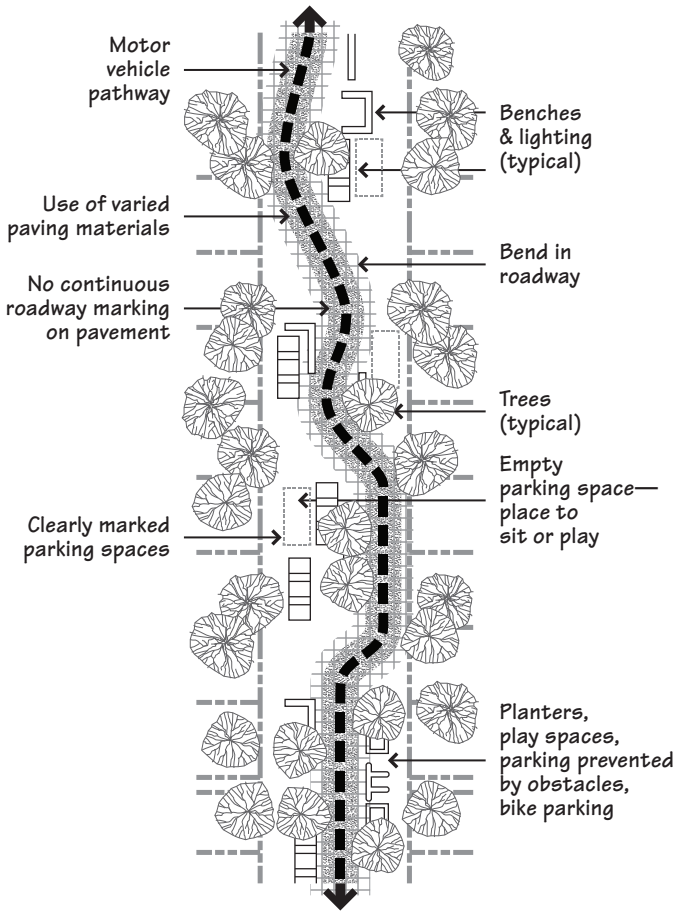
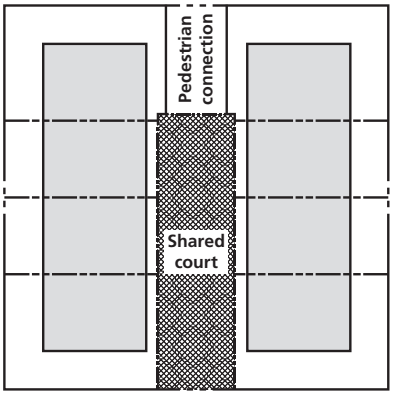


Diagram showing how trees, street furniture, and on-street parking, can be included within shared court.



Shared Court Precedents

BEN HAMILTON-BAILLIE

Dutch "woonerf"—has become a standard street type in medium-density neighborhoods in the Netherlands

Japanese shared street

NORTHMOOR URBAN ARTS PROJECT

British "home zone"—multi-use streets have been promoted by the UK's Children's Play Council as a means of obtaining additional play space in areas where outdoor space is limited.

Rowhouses front onto a portion of NW Irving Street (left) that serves as both pedestrian space and provides vehicle access to parking. Portland projects with features similar in form to shared courts (Belmont Dairy Rowhouses [middle]) and River Place [right]).

Key Regulatory Details

- Shared courts must be private street tracts
- Allowed only in the multidwelling, commercial, and employments zones (not in single-dwelling zones)
- To limit the amount of vehicle traffic on shared courts, they:
  - Must be dead-end streets no more than 150-feet long;
  - May provide frontage for no more than 16 lots;
  - Are limited to development of attached houses, detached houses and duplexes; and
  - Must be surfaced with paving blocks or other ornamental paving.
- Buildings may be located as close as 3 feet from the shared court (instead of the 10' front setback usually required in some zones)

Opportunities provided by interlocking concrete pavers

INTERPAVE

Permeable pavers

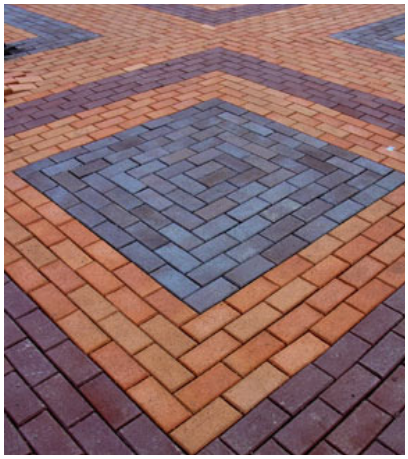
PORTLAND BUREAU OF ENVIRONMENTAL SERVICES

Shared street space, surfaced with pavers in an ornamental pattern (Nye Beach, Newport, Oregon)

Shared courts must be surfaced with paving blocks or other ornamental paving to clearly indicate their intended use as space where pedestrians have priority, providing a contrast to the asphalt surfacing of conventional roadways. Utilizing sand-set, interlocking concrete pavers is one readily-available way of meeting this requirement. While more expensive to install than asphalt, interlocking concrete pavers provide several cost-effective advantages, including:

- **Durability.** Sand-set interlocking pavers resist cracking and can withstand heavy loads, as they function as flexible pavement with loads spread through shear transfer across adjacent pavers and to the base and soil subgrade. Because of this durability, interlocking pavers have been used in bus malls, marine terminals, and airports.
- **Maintenance and re-use.** Interlocking pavers can be removed for repairs to underground utilities or tree root incursions and then replaced, allowing a visually seamless patch. The ability to reuse this paving provides cost savings and a sustainable approach to building materials.
- **Amenity value.** In other places where streets similar to shared courts have been introduced, developers have used the visual amenity of pavers along with other community-enhancing street features (landscaping, benches, fountains, etc.) as part of the sales pitch for housing developments.
- **Space and materials efficiency.** Because the use of shared court pavers allows narrower street widths compared to conventional streets with separate roadway and sidewalks, the reduced amount of site area that must be devoted to street area and the lesser amount of street and sidewalk paving provide cost savings that can make up for the additional per-square foot costs of pavers.
- **Stormwater management.** If permeable pavers that eliminate stormwater runoff are used, they can provide the additional benefit of helping to meet stormwater management requirements.

Portland Transit Mall



SOUND TRANSIT

Transit station paving inspired by Salish woven basket patterns

House-Like Plexes

Two-, three-, and four-unit plexes, were a commonly-built multifamily housing type in Portland neighborhoods during the early 20th century. Often built on small lots, these plexes were typically house-like in form, allowing them to blend in with nearby single-family houses. House-like plexes are being built once again, as they provide the advantage of accommodating density on small sites in ways that continue neighborhood patterns.

Accommodating off-street parking is one of the greatest challenges of this housing type, typically necessitating shared basement parking or tuck-under garages. Alternatively, projects in areas well-served by transit may be built without off-street parking; an arrangement which greatly simplifies their design and reduces housing costs (several projects have been built recently without parking and have achieved market success, including some built as condominiums).

House-Like Plexes—Historic Portland Precedents

Fourplex (1910)

Pair of duplexes (1908)

Plexes—Examples

Duplex at left (2,670 sq.ft. site, shared basement parking)

Duplex (1,450 sq.ft. site, no off-street parking)

Fourplex (3,133 sq.ft. site, shared first level parking toward rear)

Fiveplex (condominiums, 5,000 sq.ft. site, rear parking)

Recent plex infill project (condominiums) in Irvington, adjacent to Streetcar Era plexes. An example of how the plex type can continue established neighborhood patterns. Despite including no off street parking, this project proved financially successful.

Three-unit project in Seattle. A hybrid form of owner-occupied housing, consisting of a two story owner-occupied unit over two studio apartments (essentially a house with two ADUs). Serves as a solution for 5,000 sq.ft. lots in the R1 zone, as an alternative to purely rental projects.

Townhouse Clusters

Townhouse clusters are groupings of townhouse units on small infill sites. This housing type has become one of the most common forms of ownership infill housing in Seattle. On a typical infill site of approximately 5,000 square feet, this configuration accommodates four townhouses, with two units fronting onto the street and two other units toward the rear of the site. This arrangement allows for greater density on small sites compared to conventional rowhouses, while the shared driveway arrangement minimizes the visual prominence of parking facilities and allows building forms along the street frontage that reflect common neighborhood patterns.

Rules-of-Thumb

Opportunities and issues that should be considered when designing townhouse clusters include:

- Consider cantilevering portions of the units over vehicle maneuvering areas to make efficient use of limited site area.
- Ensure that the backs of garages do not end up lining ground-level street frontages by including living space in front of the garages or by partially excavating the garages *(see page 21)*.
- Because units in this configuration are typically three levels and extend toward the rear of sites, care must be taken to minimize impacts to the privacy of abutting properties (particularly when adjacent to rear yards). Providing additional rear yard setbacks and stepping back upper levels can help limit such impacts.
- To provide two street-facing units on small sites, it is typically necessary to minimize accessway width by combining driveway and walkway space into a single shared driveway (surfaced with paving blocks or bricks to highlight its use as pedestrian space) and by using a screening fence instead of a landscaped setback along the driveway *(see page 19)*.

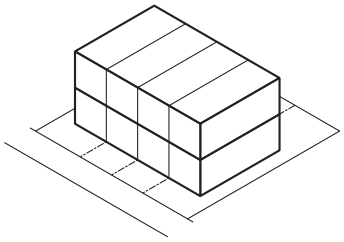
Four-unit townhouse cluster in Seattle, with partially-excavated garages.

Context

Attached Duplexes

Attached duplexes are similar in appearance to rowhouses, but feature two units (typically stacked) on each lot. Opportunities provided by attached duplexes include:

- Allows twice the density of rowhouses, while providing a similar street-oriented residential form.
- Units are clustered at the street frontage, providing opportunities for back yards.
- Provides additional homeownership/rental options, as this housing form is conducive to arrangements in which a homeowner rents out their second unit.



BRIAN ROSE/WWW.DESIGNADVISOR.ORG

Pair of attached duplexes (note four doors). Each duplex has a two-story owner-occupied unit and a second 920 sq.ft. rental flat (Sojourner Truth Homes, New York)

Accessory Dwelling units

Accessory dwelling units (ADUs – sometimes called "granny flats") can be a useful part of medium-density projects. An ADU is a small unit that is subsidiary to a primary residential unit (typically an owner-occupied house or rowhouse). Some opportunities provided by ADUs include:

- They provide additional solutions for accommodating additional density on small sites, particularly in situations in which site or market constraints make it difficult include enough primary residential units to meet minimum density requirements.
- In higher-density zones (such as R1), ADUs facilitate ownership housing types, such as houses and rowhouses, that may not otherwise meet density requirements by themselves.

ADU over rowhouse's rear garage (Fairview Village)

Secondary unit, over garage, allowed this house to meet R2 density requirements

ACCESSORY DWELLING UNITS

- Utilizing ADUs as part of projects also allows rowhouses and other housing to be built on lots deep enough to accommodate both rear parking and backyards (without ADUs, larger, deep lots often do not meet density requirements).
- Provides flexibility for homeowners, who may, for example, use ADUs for rental income or use them to provide semi-independent living space for grown children.
- Contributes to housing affordability, both by providing homeowners with supplemental income that can be applied toward mortgage payments, and by providing opportunities for inexpensive, small-unit rental units.

Project with four rowhouse units and two ADUs over rear garages, which enabled R1 density requirements to be met.

Key Regulatory Details

- ADUs can be used to meet minimum density requirements in the multidwelling zones, but not in single-dwelling zones (they do not count against maximum density requirements in any zones).
- Only allowed in conjunction with a primary unit that is a detached or attached house.
- Limited in size to 33% of the living area of the primary unit, or 800 square feet (whichever is less).
- May be either attached or detached from the primary unit.
- Must be similar to the primary unit in terms of exterior finish materials, roof pitch, windows, and trim.
- Entrance must not face the street if the primary unit's entrance does (intent is that the ADU appear clearly subsidiary to primary units, avoiding the double front doors associated with duplexes).
- No parking required for ADU units.

Case Study: Hastings Green Cottage Cluster

Courtyard Housing

Housing type	Clusters of detached cottages (condominiums) oriented to shared courtyards
Neighborhood	South Tabor
Address	SE Clinton between SE 70th & 71st
Zoning	R5 & R2.5
Site size	30,592 SF (first phase)
Units	10 (first phase)
Density	1 unit per 3,059 SF (14 units/acre)
Parking	10 spaces (in garage structures)
Size of units	1,134–1,253 SF (1–2 bdrms)
Year completed	2003
Developer	Hastings Green LLC / Patrick C. Jackson
Designer	JDA Architects & Planners

Hastings Green was Portland's first cottage cluster infill project, of small detached houses oriented to shared outdoor space. South Tabor Neighborhood Association representatives identified Hastings Green as an exemplary infill project that fit into the character of the neighborhood more effectively than typical rowhouse projects. The project appealed to a niche of buyers who wanted the strong sense of community fostered by the shared outdoor spaces, which include a vegetable garden, flower beds, and multi-use turf areas. Within the first year after project completion, residents had formed a reading group and a cooking club.

(continued on next page)

Case Study: Hastings Green Cottage Cluster

The project was financially successful, according to the projects' developer, Patrick Jackson. The first phase of 10 units sold within 6 weeks (from between $190,000 and $240,000 in 2003), while the second phase of 13 cottages were all sold before completion. This suggests there is pent-up buyer demand for such courtyard-oriented housing.

Efficient, carefully-considered unit design and outdoor spaces, as well as quality materials and landscaping, were important for making the small cottages attractive to buyers. Relatively simple construction afforded by the detached houses kept hard construction costs to $100 per square foot (2003 dollars).

Context: Pre-existing house at far right

While the Hastings Green cottages were sold as condominium units, the developer relates that zoning code "common green" provisions that now allow similar courtyard-oriented housing to be built on separate lots should encourage development of similar projects by more developers, many of whom prefer to develop ownership housing on individual lots to avoid of the high liability insurance rates often required for condominium projects. Jackson indicated that he was able to obtain favorable liability insurance rates by convincing insurance underwriters of the lesser risks of free-standing condominium units compared to stacked or attached condominiums.

Case Study: Jake's Run

"Shared Court" Townhouses

Housing type	Townhouses and carriage houses
Neighborhood	Northwest District
Address	2527–2531 NW Westover Rd.
Zoning	R1
Site size	6,720 SF
Units	5 (3 townhouses, 2 carriage houses)
Density	1 unit per 1,344 SF (32 units/acre)
Parking	5 (garages accessed from court)
Size of units	844–2,548 SF
Year completed	2000
Developer	Nick Stearns/Rural Homes, Inc.
Designer	Fletcher Farr Ayotte

Jake's Run features a courtyard that provides access for both pedestrians and residents' cars, an arrangement now facilitated by regulatory provisions for shared courts. The courtyard is fronted by the townhouses' entry stoops, with space for potted plants, reinforcing the pedestrian-oriented scale of the courtyard. Surfacing with paving blocks, as well as carefully-detailed wood garage doors, further emphasize that the courtyard space is something more than just vehicle maneuvering area. Providing a single vehicle accessway also allowed a more pedestrian-oriented street frontage, compared to the multiple front garages and driveways characteristic of many rowhouse projects; while facilitating development of this small, constrained infill site.

Similar courtyard configurations are possible both in the form of land divisions, with housing lots fronting onto a shared court street tract, and through provisions for multifamily development that allow surfacing of driveways with paving blocks or bricks to substitute for separate pedestrian facilities. The Jake's Run project architect indicated that the cost of using concrete paving blocks was similar to what would have been required for poured concrete

Sold as condominiums, Jake's Run consists of three townhouse units fronting onto the courtyard, with two smaller "carriage house" units located over the garages and fronting onto the public street. Division of the units into two structures reflects the scale of nearby large single-family houses. For the courtyard arrangement, the architects were influenced by the traditional English mews, which are narrow lanes providing access to what were originally carriage houses or stables that have been converted to residences—highly desired in part for their location on the quiet, intimate street environment of the mews.