

Creating Livable Streets

Street Design
Guidelines
for 2040

November 1997



METRO
Regional
Services

*Creating livable
communities*

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“Great streets do not just happen. Overwhelmingly, the best streets derive from a conscious act of conception and creation of the street as a whole. The hands of decision makers are visible.”

Allan B. Jacobs

I. Introduction

What is the Purpose of this Handbook?

The purpose of this handbook is to provide the Portland region with appropriate regional street design guidelines to support the goals in the Metro 2040 Growth Concept and the Regional Transportation Plan (RTP). These goals seek to promote community livability by balancing all modes of transportation and by considering the function and character of surrounding land uses when making transportation decisions on streets of regional significance.

This handbook crosses traditional boundaries between land-use and transportation planning. The conventional functional street classification system focuses almost exclusively on two street functions: vehicular movement and access to adjacent property.

The design guidelines in this handbook focus on a broader set of design considerations that support the 2040 Growth Concept through multi-modal street function, community livability and economic growth. The guidelines serve as tools for improving existing streets and designing new streets. All of the guidelines are consistent with RTP street design concepts, making the handbook an important tool for local governments that will implement design concepts through state and local codes.

The design guidelines are not standards; they are recommendations intended to complement existing standards and guidelines in the implementation of the conceptual street system in the RTP. Guidelines and sources of information referenced in the bibliography are intended to encourage engineers and street designers to consider design elements beyond the minimum requirements, and to integrate streets more closely with the adjacent land use. Design of streets and intersections is performed by registered engineers, and the experience and judgment of those individuals is essential. Guidelines in this handbook are appropriate in many cases, but are not intended as a substitute for engineering experience and judgment.

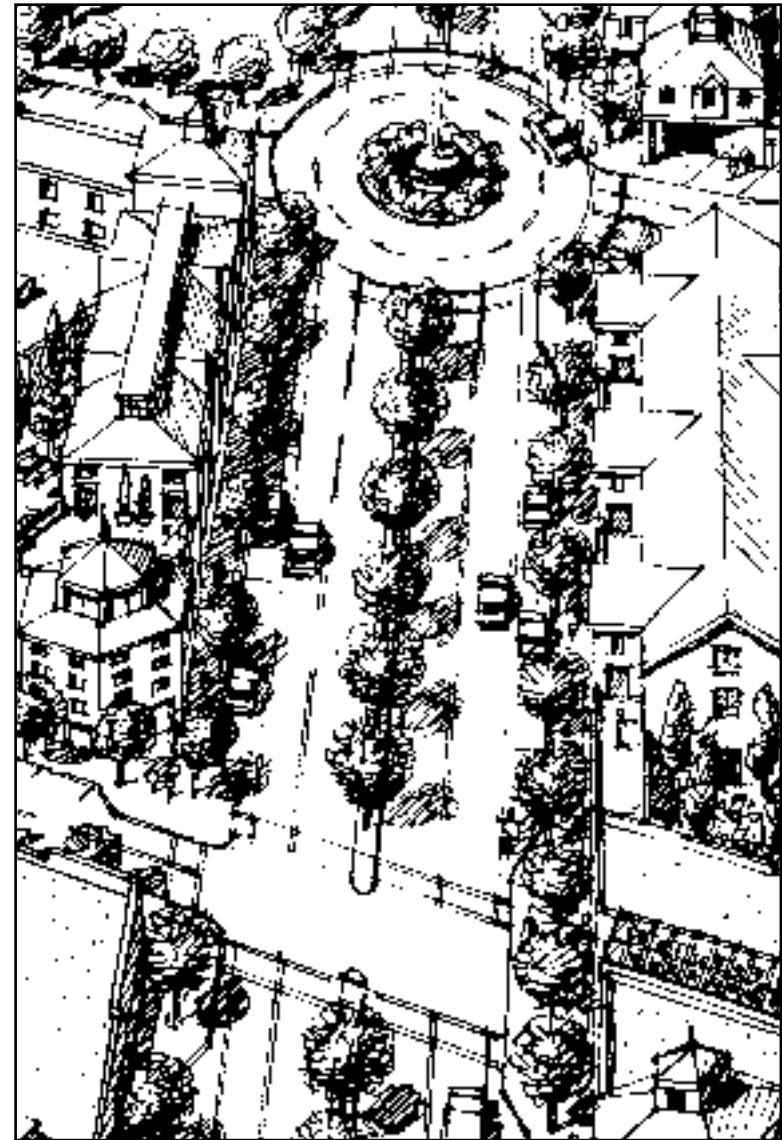


Figure 1. The regional transportation system seeks to promote community livability.

Guidelines in this handbook are intended to assist in the design of new and reconstructed streets. They are not intended to be applied to maintenance projects that preserve and extend the service life of existing highways and structures. Existing width of lanes and shoulders are almost always maintained in maintenance projects. These projects are not constructed with the intent of improving the level of service or accommodating additional multi-modal design elements.

This handbook addresses the following design issues:

- how regional street design can support the Metro 2040 Growth Concept
- how regional street design can link land-use and transportation planning
- how regional street design can enhance the identity and livability of the region with principles and design guidelines for multi-modal street design
- how streets can be retrofitted and upgraded with pedestrian-oriented amenities to promote walking, bicycling and transit use
- how streets should integrate bikeways consistent with the regional street design types
- how to ensure that pedestrian improvements do not preclude reasonable truck and bus movement at major intersections and that truck and bus improvements do not inhibit pedestrian movement
- how to incorporate regional street design elements where right of way constraints limit desired design elements
- how regional street design concepts can provide continuity and consistency among the three counties and 24 cities of the region

- how site access along regional arterials with continuous commercial or mixed-use development can be controlled to improve safety, function and appearance.

What are Regional Streets?

Under the traditional functional street classification system, regional streets are major and minor arterial streets. Regional streets accommodate both regional through traffic as well as local traffic. Through traffic has longer trip distances, needs higher speeds and less land-use access than local traffic, which has local destinations, slower speeds and lower traffic volumes. Through traffic includes both transit, commuter traffic and freight traffic. Local traffic uses the street for site access, on-street parking, or loading and unloading people or goods. Providing for both regional and local traffic needs distinguishes regional streets from collectors or local residential streets.

In summary the regional street design types can be defined in three broad categories:

Highways and roads – motor-vehicle-oriented facilities serving regional mobility

Boulevards – facilities oriented to pedestrian, bicycle and transit modes of travel

Streets – facilities that provide a balance between all modes of travel.

About the Street Design Project

This handbook is one of several work products undertaken as part of the Metro Regional Street Design Study sponsored by the Oregon Department of Transportation through a Transportation Growth Management grant. Design guidelines are compiled from current regional transportation practices in metropolitan areas throughout the United States as well as the 2040 Growth Concept priorities for linking land use to transportation.

This handbook was developed with a collaborative effort from the Street Design Work Team, a multi-jurisdictional effort of state, county and city representatives working during a two-year period to define the regional street system and the guidelines in this handbook.

This handbook is consistent with the Regional Street Design Goals and Objectives identified in the RTP approved in July 1996. The regional street types are based on policy direction established in the RTP. These policies were approved by resolution by the Metro Council on July 25, 1996, and served as the starting point for a major update to the RTP.

Street Design and the 2040 Growth Concept

The 2040 Growth Concept has established a broad regional vision that will guide all future comprehensive planning at the local and regional levels, including development of the RTP. The growth concept contains a series of land-use building blocks that establish the basic design types for the region.

The regional street design concepts are intended to serve multiple modes of travel in a manner that supports the specific needs of the 2040 land-use components. One of the needs of the 2040 land-use components is to ensure the livability of the region. The street design concepts fall into four broad classifications for regional facilities:

- throughways that emphasize motor vehicle travel and connect major activity centers
- boulevards that serve major centers of urban activity and emphasize public transportation, bicycle and pedestrian travel while balancing the many travel demands of intensely developed areas

- streets that serve transit corridors, main streets and neighborhoods with designs that integrate many modes of travel and provide easy pedestrian, bicycle and public transportation travel
- roads that are motor-vehicle oriented with designs that integrate all modes but primarily serve motor vehicles.

This handbook focuses on the boulevard, street and road design concepts with tools that complement both RTP transportation strategies and the individual 2040 Growth Concept land-use components. These design concepts reflect the fact that streets perform many, and often conflicting, functions and the need to reconcile conflicts among travel modes. The design classifications will work in tandem with the modal system maps shown in the RTP.

“Innovators are inevitably controversial.”

Eva Le Gallienne

What about AASHTO?

What is AASHTO? It is an acronym for the American Association of State Highway and Transportation Officials. AASHTO publishes “A Policy on Geometric Design of Highways and Streets,” often referred to as the “Green Book,” which contains nationally accepted guidelines for designing the geometric elements of streets and highways, providing a recommended range of values for critical dimensions.

The Green Book acknowledges and encourages the need to emphasize joint use of transportation corridors by pedestrians, cyclists and public transit. Many jurisdictions adopt the AASHTO design elements as standards. The intent of the Metro handbook is to complement, not replace, the AASHTO guidelines. The Metro guidelines do not challenge or supercede the AASHTO recommendations, but should be used in conjunction to design safe multi-modal streets in the Portland metropolitan area.

Who Will Use this Handbook?

This handbook is for:

- citizens and elected officials involved in local street design and codes
- public agency staff of local, regional and state jurisdictions involved in transportation and land use planning
- private developers, architects, planners and engineers involved in street and site design.

“Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.”

Margaret Mead

II. Goals

Defining Regional Street Livability

Enhancing the community livability of the region is a basic goal of Metro's 2040 Growth Concept. The design of regional streets can significantly contribute to community livability:

“A livable regional street should provide those environmental conditions that support independence and freedom of choice; provide orientation, safety and comfort; encourage a sense of community yet provide sufficient privacy; foster a sense of neighborly ownership and responsibility; avoid disturbing nuisances; and enhance the economic value of adjacent property.”

Livability Goals

How do you evaluate whether a regional street design is “livable?” Following are goals for regional street design that support livability, followed by a discussion of the community values the goal supports. The design guidelines that follow in section III support these goals.

Provide travel mode choice

The availability of travel choice gives people both independence and control over their lives. Providing choice contributes to livability by allowing people to provide for their own needs and aspirations, without dependency on others to meet their transportation needs. If people have a choice to travel independently, it encourages them to care for their own needs. This is especially true for those who don't drive, such as seniors, children, the disabled and low income citizens.

See the following guidelines

1. The Street Realm 3. Travel Lane Widths 8. Street Connectivity 13. Public Transit 16. Adjacent Land Use

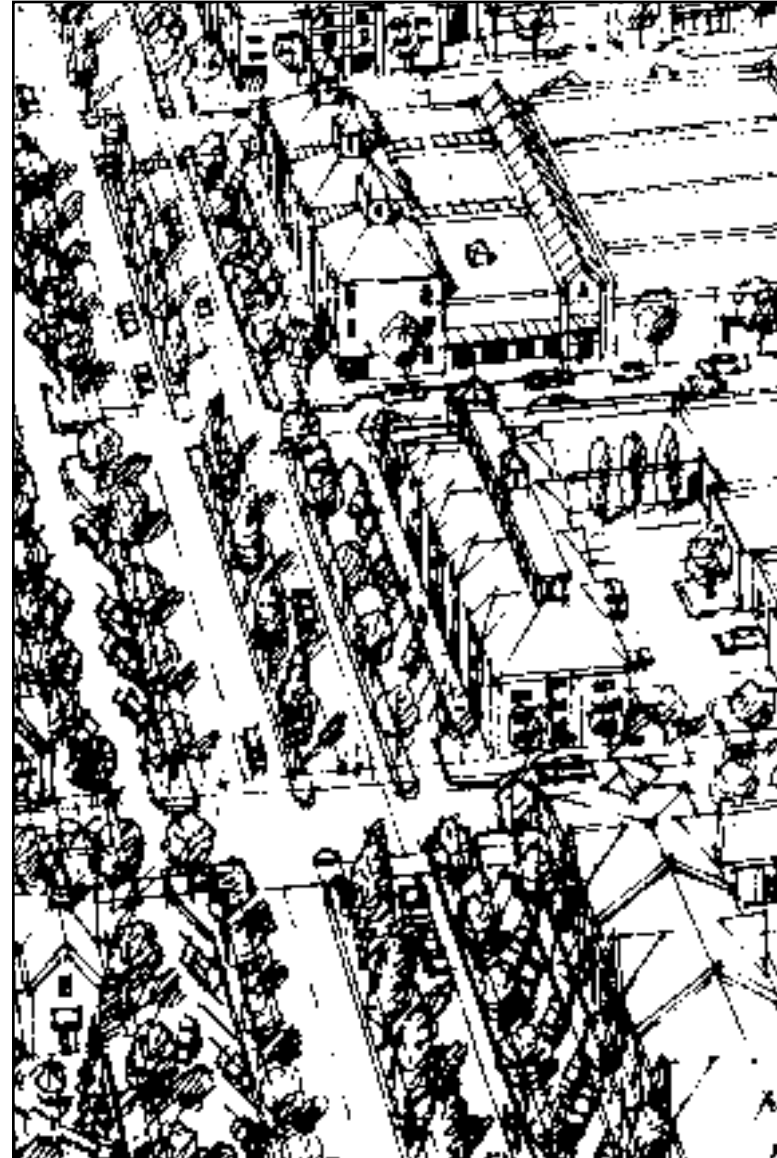


Figure 2. The design of regional streets can contribute to community livability.

Support regional multi-modal travel

The regional street system provides regional mobility and accessibility for the Metro 2040 land-use components. The system should provide through travel on major routes that connect major regional destinations. The system should provide access from local areas to nearby regional or community-scale activity centers. Regional street design should provide a system that fully integrates and balances automobile, public transportation, bicycle, pedestrian and freight needs as they relate to the 2040 Growth Concept land-use components.

See the following guidelines

2. Travelway Realm 3. Travel Lane Width 6. Bicycle Lanes
10. Sidewalks 13. Public Transit 16. Adjacent Land Use

Support the economic vitality of the region

Maintaining the economic vitality of the region as it relates to the mobility and accessibility of goods and services is an essential aspect of the regional transportation system. Regional streets are vital for day-to-day operation of the region's employment centers, industrial areas and commerce centers. Therefore, street design must accommodate the accessibility and movement of goods by truck as well as people by other modes.

See the following guidelines

2. Travelway Realm 3. Travel Lane Widths 7. Intersections
8. Street Connectivity 12. On-Street parking

Create pedestrian and bicycle accessibility

Pedestrian and bicycle accessibility provides the ease and convenience to reach a destination by walking, bicycles or transit. If streets provide pedestrian and bicycle accessibility, including access to transit, people will have the freedom to choose how to travel to take care of their needs and aspirations. Pedestrian access is useful for people of all ages and walks of life. A primary goal of the 2040 Growth Concept is to redirect private investment to support balanced multi-modal transportation solutions.

See the following guidelines

8. Street Connectivity 9. Pedestrian Realm 10. Sidewalks
13. Public Transit 18. Building Street Frontages

Support public social contact

Public social contact shapes our personal identity, fosters learning and influences our social behavior. Creating street environments where people have the opportunity to formally organize, such as for a public outdoor market or festival, or informally gather, such as to pursue recreational, leisure or social activity, are both necessary and desirable. For example: social greetings, conversations and passive contacts, where people simply see and hear other people, are those social activities that shape our personal identity by how we choose to respond. This type of social activity depends on the presence of people in the same physical environment, whether it is a street or a public park. For this to occur spontaneously, these activities need to be in a safe and comfortable environment that supports open public social contact.

See the following guidelines

9. Pedestrian Realm 10. Sidewalks 11. Street Trees
18. Building Street Frontages

Provide orientation and identity to the region

Creating identifiable streets within a region provides the framework or "mental map" that orients people as to where they are within the region. To a large extent, regional streets establish the character and identity of the region. They are a major element that produces the urban form of the region. Providing identity and orientation to the region requires regional street design to support adjacent land use. Providing identity is considering the design implications of changes in land-use and street types. Regional street design provides these opportunities, as well as to create places where people want to be, be seen and meet others. It is an opportunity to enhance the economic value of particular locations within the region.

See the following guidelines

1. The Street Realm 16. Adjacent Land Use
19. Edge Treatments 21. Buffers, Fences and Soundwalls

Provide a safe environment

A safe environment minimizes exposure to vehicle accidents and other hazards, and contributes to livability by enhancing people's sense of comfort and giving them freedom to choose to walk without any danger. Creating a safe environment requires controlling negative impacts of traffic, pollution, crime and other undesirable impacts. A safe environment also supports people choosing an alternative to the automobile and fosters public social contact, as described.

See the following guidelines

2. The Travelway Realm 5. Mid-Block Crossings 6. Bicycle Lanes
7. Intersections 12. On-Street Parking 13. Public Transit

Provide for physical comfort

Design for physical comfort is fundamental to livability. It requires attention to human sensory experience. If an environment is physically uncomfortable and unattractive, people will choose to travel by car or choose to do only those outdoor activities that are absolutely necessary. Other desirable activities that create pedestrian places, such as window shopping, will not take place. Providing physical comfort requires considering temperature, wind, rain, sun and shade for human comfort. It also requires controlling physical nuisances such as traffic, noise and pollution.

See the following guidelines

6. Bicycle lanes 9. Pedestrian Realm 10. Sidewalks 11. Street Trees
13. Public Transit

Provide spatial definition by orienting buildings to the street

Spatial definition is the orientation of buildings and building entries to face the street. Providing spatial definition supports walking and pedestrian accessibility, as well as supporting public social contact. It also creates an attractive physical environment that enhances the status and economic value of adjacent properties, as well as providing identity to street.

See the following guidelines

1. The Street Realm 9. Pedestrian Realm 17. Buildings Facing the Street 18. Building Street Frontages

Provide high quality of construction and design

High-quality design and construction requires attending to human scale, function and sensory experience. It is creating an attractive and functional pedestrian environment. High-quality design and construction provides many benefits: it enhances the quality of the physical environment; it supports human comfort and safety, it can enhance the status and economic value of adjacent properties, it can provide identity to a street and it can support public social activity.

See the following guidelines

14. Streetscape Features 15. Landscaping and Planter Strips
18. Building Street Frontages

Maintain the quality of the environment

Maintenance is what ensures that the pedestrian and street environment does not lose its quality or function over time and with use. Maintenance preserves current public investment for future public use. It is the caring for and repairing of street trees, construction materials and buildings. Maintenance contributes to livability: it supports neighborly responsibility and action, it enhances the quality of the physical environment, it supports human comfort and safety, it can enhance the economic value of adjacent properties, and it maintains the identity and public social activity of the street.

See the following guidelines

11. Street Trees 14. Streetscape Features 15. Landscaping and Planter Strips

“When I’m working on a problem, I never think about beauty. I think only how to solve the problem. But when I have finished, if the solution is not beautiful, I know it is wrong.”

R. Buckminster Fuller

III. Design Guidelines

What are the Design Guidelines?

The following design considerations and guidelines identify the elements that make up regional street design and present ideas to consider and specific recommendations for designing balanced multi-modal streets.

How to Use the Guidelines

The guidelines can be used to assist in the preparation of street cross sections and street improvement plans. The guidelines can be used to assess whether a jurisdiction's street design standards are consistent with Metro transportation policy. They can be used as a basis for deciding what to emphasize where reduced available right of way leads to conflicts between design elements.

The design elements are organized into four areas:

The street realm – the overall environment of the street

Travelway realm – the travelway elements devoted to motorized and non-motorized vehicle movement

Pedestrian realm – the areas where pedestrian use is a priority

Adjacent land use – the elements that abut the street and define the street's character and use.

Design guidelines are presented in two sections:

- general considerations address choices of elements to include in regional street design to provide livable multi-modal streets
- design guidelines provide preferred dimensions within a minimum and maximum range for specific design elements.

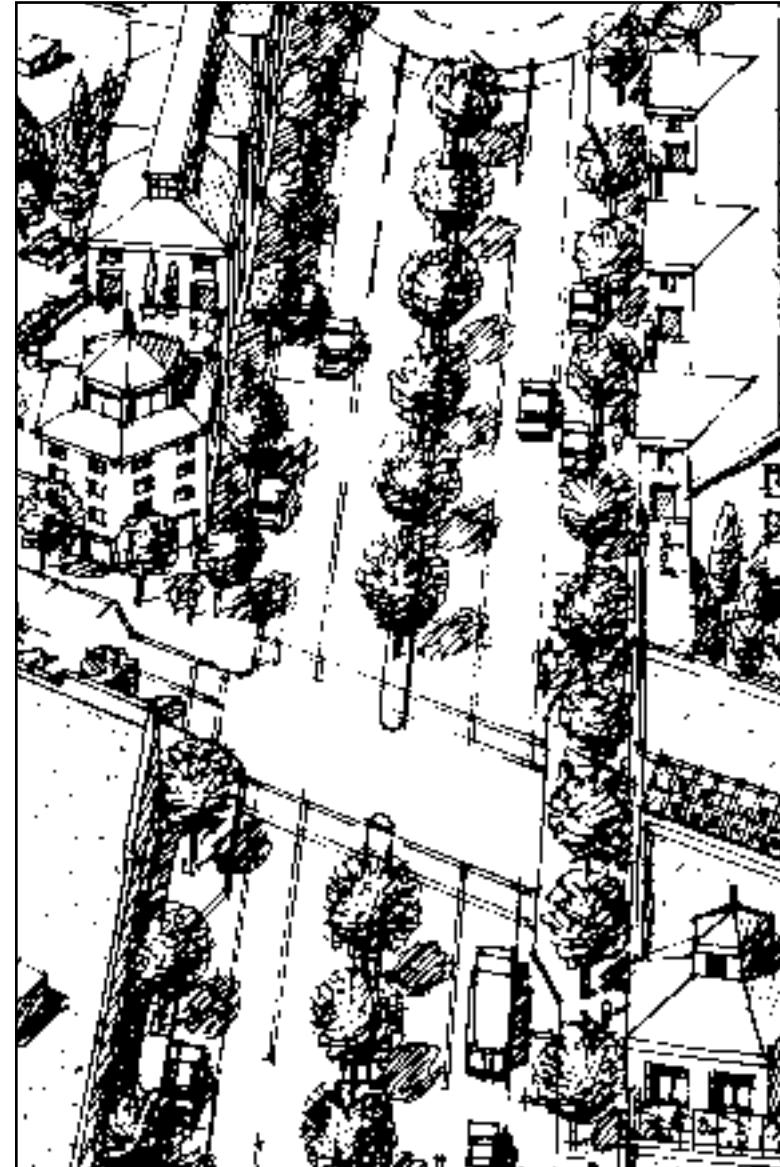


Figure 3. The regional transportation system supports multi-modal travel.

1. The Street Realm

The street realm is the overall setting in which people experience the character and use of a street. It is composed of the travelway, pedestrian and adjacent land-use realms. Regional streets are complex systems that support diverse travel modes, traffic movements, uses, activities and social interactions.

The travelway and pedestrian realms usually occupy the public street right of way. Within the travelway are the vehicle travel lanes and bicycle lanes. Within the pedestrian realm are on-street parking and sidewalks. The adjacent land-use realm is closely related to the pedestrian realm, because adjacent land-use influences the regional street type, as well as the character and intensity of the use of the street.

General design considerations and guidelines

- Facilitate alternative travel mode choice by integrating the design of all three sub-realms. Design the street as an integrated whole, considering the inter-relationships among the travel way, pedestrian needs and adjoining land use.
- Provide identity and orientation to the region by integrating the design of all three sub-realms. Consider how the adjoining land uses are an area or district with a coherent identity consistent with the Metro 2040 Growth Concept. Define specific lengths and segments of the street as a fundamental part of the adjoining land-use areas. Use streets (segments and intersections) to accentuate “gateways” or entries to land-use areas. Use intersections as opportunities to transition from one land-use area or street type to another. Maintain consistent regional street design types and streetscape features through these areas.
- Support pedestrian access to transit from adjacent land use, as well as outdoor pedestrian activity, by providing sidewalks scaled to the intensity of adjacent land use, as discussed in the pedestrian realm. All regional streets should be multi-modal in design, providing sidewalks for pedestrian access to transit and to adjacent land uses, as well as transit improvements and bicy-

cle lanes. Under constrained right of way conditions, trade-offs among design features should be considered based on the discussion in Section V. Constrained Right of Way.

- Connect, rather than separate, uses, neighborhoods and districts across regional streets. Design pedestrian crossings for ease and frequency of use to connect uses and neighborhoods across regional streets. Design interconnected networks of streets to encourage walking and bicycling, reduce the number and length of vehicle trips and conserve energy.
- Conserve and enhance neighborhoods by reducing regional traffic traveling on neighborhood streets. Provide an interconnected local street network to allow direct connections to local destinations, reduce local traffic on regional streets, and provide more regional street capacity for longer distance and through traffic.

“Streets and their sidewalks, the main public places of a city, are its most vital organs.”

Jane Jacobs

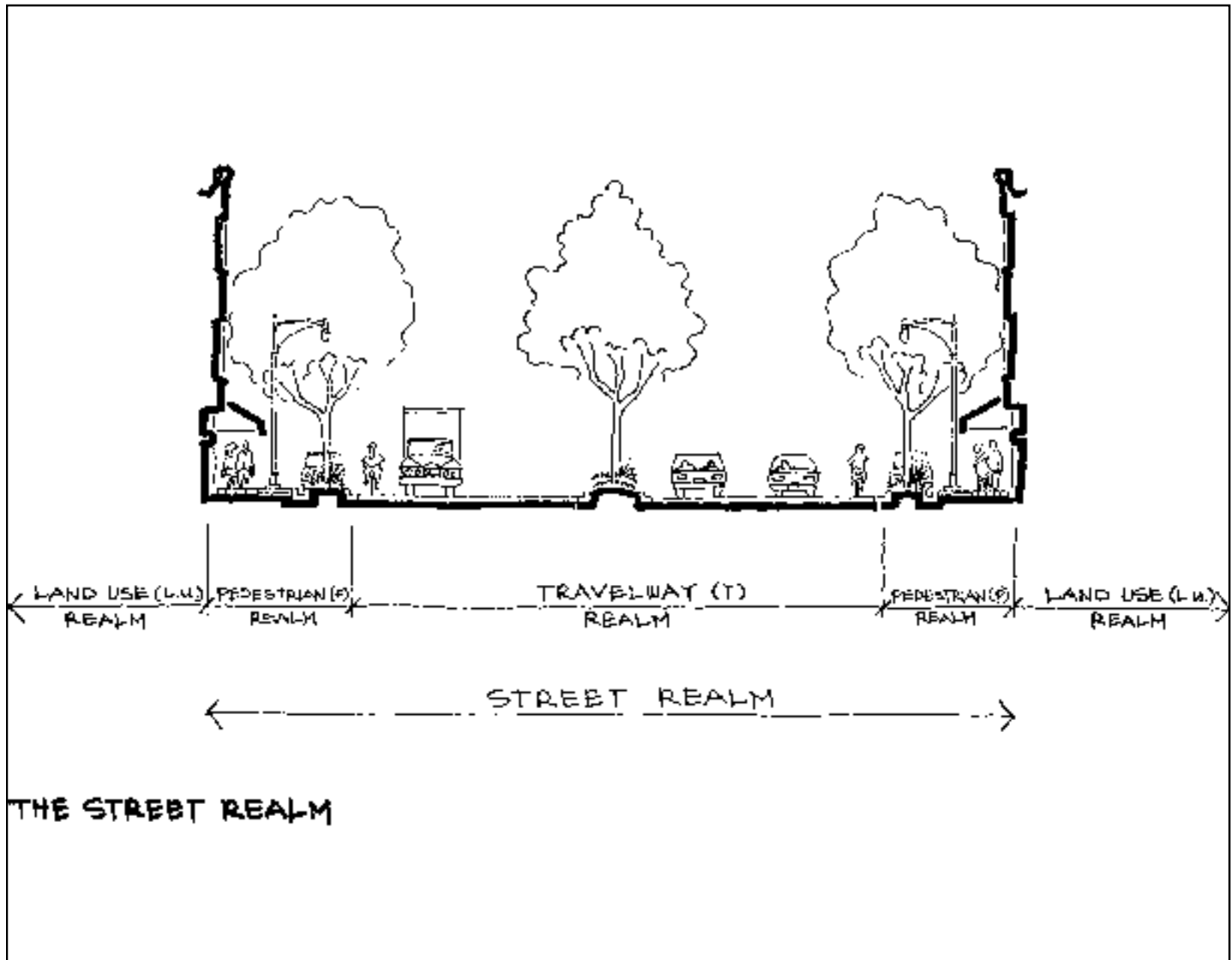


Figure 4. The street realm is composed of the travelway realm, the pedestrian realm and the adjacent land use.

2. The Travelway Realm

Design of the travelway should provide a balanced transportation system that fully integrates automobile, public transportation, bicycle, pedestrian and freight needs as they relate to the 2040 Growth Concept land-use components. Design of the travelway should minimize traffic hazards and emphasize safe travel for all modes. Design guidelines address the number of travel lanes, as well as the width and use of the travelway. The travelway realm is composed of the vehicle travel lanes, bicycle lanes, medians, intersections and other elements devoted to vehicle movement. It excludes on-street parking, which is in the pedestrian realm. Table 1 provides a summary of travelway functional widths. For each travelway function, the table provides a range of widths in feet, with a preferred design width.

General considerations

- All regional streets should be multi-modal in design, providing transit improvements and bicycle lanes. Trade-offs among design features should be considered based on the discussion in Section V. Constrained Right of Way.

Design guidelines

Street width

- Wide streets with more than two or more travel lanes in each direction are frequently desired for vehicle capacity reasons, but are barriers to pedestrian crossings. Wide streets separate commercial shopping areas with fewer pedestrians crossing the street to support commercial activity. Wide streets reduce crossing the street for transit connections.
- Wide street designs may not be possible in built-up areas. Implementing multi-modal regional streets in limited right of way may require accepting trade-offs such as narrower or fewer travel lanes.

- Overall width of the travelway needs to balance considerations of the available right of way, needs of the pedestrian, traffic capacity, and overall street function.

Use in narrow right of way

- It is possible to have traffic asymmetrically divided, where there are three travel lanes, with two in one direction and one in the other.
- It is possible to reduce the number of travel lanes to one lane in each direction, depending on the volume of traffic, the available right of way, the function of the street, the level of pedestrian crossing and the intensity of adjacent land use.
- Traffic can move in one direction, as with paired one-way couplet street designs.

Travelway width

- Consider use of parallel alternative routes to reduce traffic volumes on any one street and to minimize the number of travel lanes.
- Consider reducing the total number of travel lanes to decrease the width of the street for pedestrian crossings.
- Preferred travelway width for a two-lane regional street is 46 feet without a median left-turn lane (34 feet without on-street parking), and 57 feet with a median left-turn lane (45 feet without on-street parking). On streets without curbs, bicycle lanes can be reduced to 5 feet. Travelway widths vary when raised medians are provided (see Medians section).
- Preferred travelway width for a four-lane regional street is 68 feet without a median left-turn lane (56 feet without on-street parking), and 79 feet with a median left-turn lane (67 feet without on-street parking). On streets without curbs, bicycle lanes can be reduced to 5 feet. Travelway widths vary when raised medians are provided (see Medians section).

“The people of cities understand the symbolic, ceremonial, social and political roles of streets, not just those of movement and access. Regularly, they protest widening. They object to high volumes of fast traffic on their streets. On the other hand, proposals to improve existing streets, to make them special, great places are common and are regularly approved by voters who tax themselves to achieve this end.”

Allan B. Jacobs

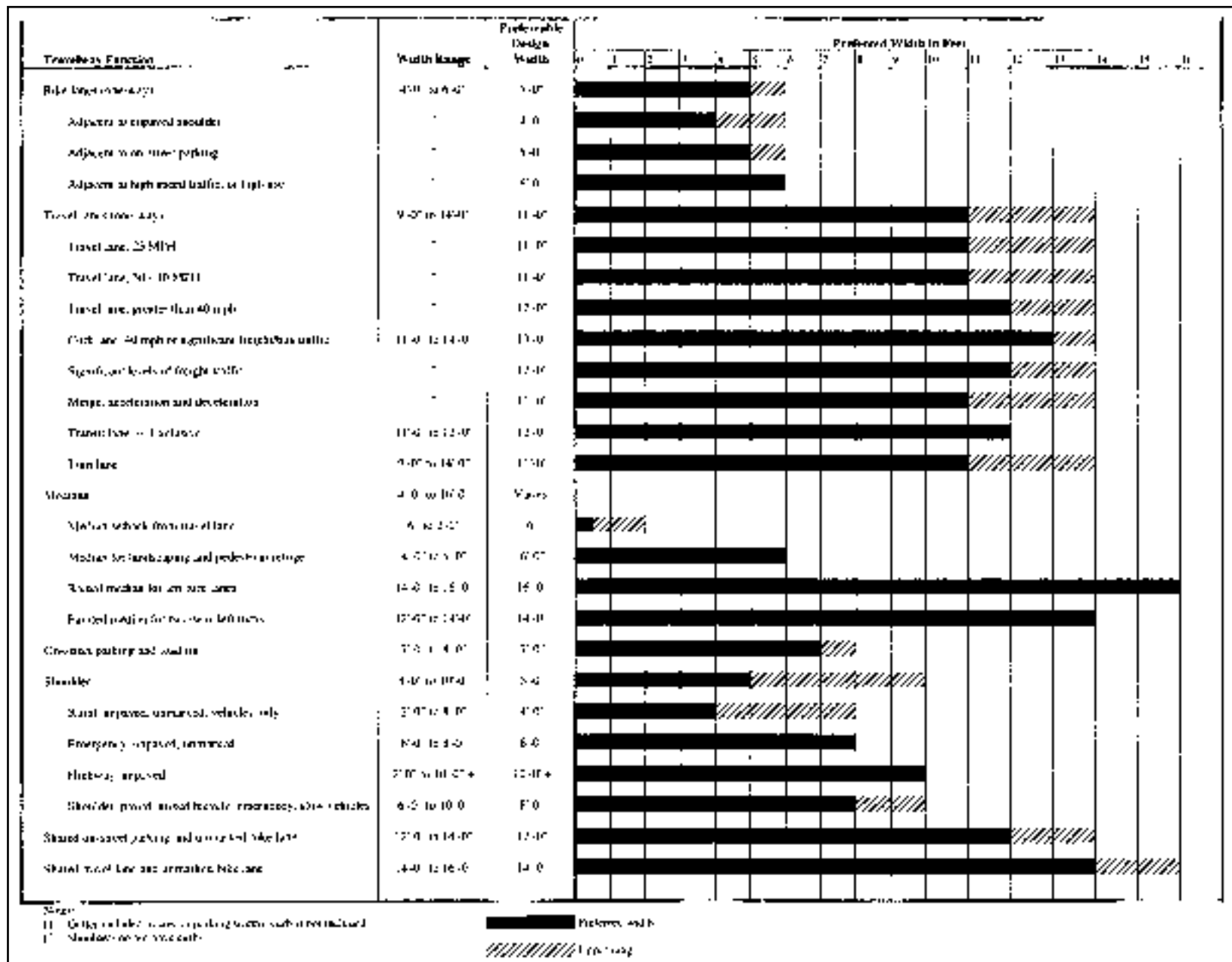


Table 1. Travelway functional widths.

3. Travel Lane Width

Travel lane width is a function of the use of the lane, the type of vehicles served and the vehicle speed. Travel lane width is also determined by the location of the travel lane within the travelway. Outside curb lanes require a wider width to accommodate turning trucks and buses, and reduce the effect of adjacent obstructions such as parked vehicles.

General considerations

- Consider use of designated transit lanes along regional street routes in dense, heavily travelled urban areas.

Design guidelines

- Regional street travel and turning lane widths vary from a minimum of 11 feet to 14 feet. The preferred width of travel and turning lanes is 11 feet.
- Provide a preferred and minimum 11-foot-wide outside curb lane where speeds are lower than 40 mph (12 feet, if all other desirable design elements can be accommodated). Provide a preferred 13-foot-wide (minimum 11 foot) outside curb lane where speeds are 40 mph or higher, or where truck and transit vehicle volumes are high.
- Provide 11 to 12-foot-wide inside travel lanes at any speed.
- The preferred turning lane width on regional streets is 11 feet.
- On streets without curbs, the width of the street needs to accommodate a minimum 5-foot-wide bicycle lane.

“People are broad-minded. They’ll accept the fact that a person can be an alcoholic, a dope fiend, a wife beater, and even a newspaperman, but if a man does not drive, there is something wrong with him.”

Art Buchwald

4. Medians

Medians provide access control and reduce or eliminate turning movement conflicts. Medians provide space for lighting; traffic control devices; and street tree and landscape planting, as well as provide width for turning lanes and storage. Medians provide pedestrian and bicyclist refuges at intersections and mid-block crossings. Medians can be either raised concrete or asphalt or painted on pavement such as continuous two-way left turn lanes.

The functions of raised and painted medians can be different. Painted medians generally channelize and remove turning traffic from through lanes. Sometimes painted medians are used to provide additional separation between directions of travel. Raised medians can serve the same purpose as painted medians, but also provide other functions such as access control, landscaping, and pedestrian and bicycle refuge.

General considerations

- Use medians as part of overall corridor access management strategy to reduce vehicular conflicts, increase capacity and prevent accidents.
- Use medians for access management in main street areas and on regional boulevards to improve capacity and distribute traffic to side streets and parking.
- Use medians in conjunction with major driveway consolidation.
- Use narrow medians (4 feet or less) to prevent cross-traffic and reduce mid-block accidents.
- Identify routes where median access control complements regional through-travel objectives.
- On streets with constrained right of way where it is desirable to provide a median for access management, pedestrian refuge, or aesthetic purposes, consider reducing the number of travel lanes in each direction.

Design guidelines

Application of medians

Regional streets can have different median conditions, depending on the intensity of adjacent land use, cross-street and site access needs, and available right of way:

Continuous two-way left-turn lane. Used within inner residential neighborhoods, outer residential neighborhoods and commercial corridors where driveways and intersections are frequent.

Raised landscaped median. Used to restrict turning movements, channelize and protect turning traffic, and reduce conflicts along commercial corridors, main streets and station communities. Raised medians provide pedestrian refuge and space to install traffic control devices and street lighting. Use raised medians where site access is provided from side streets or U-turns are permitted at frequent intervals. Narrow raised medians (4 to 10 feet wide) can be applied on street segments with infrequent driveways and intersections. On segments with frequent driveways and intersections, wider medians (14 to 16 feet wide) are preferred to accommodate alternating left turn bays.

No median. Used within inner and outer residential neighborhoods, commercial corridors and main streets where site access is less frequent and traffic volumes and speeds are lower.

- Use medians for installation of traffic control, lighting, landscaping, street trees and pedestrian refuges, speed change lanes, turning lanes and storage, to reduce headlight glare, to reserve right of way for future roadway expansion, to reduce or eliminate turning movement conflicts, and to prohibit hazardous turns from driveways and cross-streets.
- Medians should be used on major urban streets with four or more lanes.
- The minimum paved width between a median curb face and outside curb face or on-street parking lane is 16 feet (including bicycle lane), unless the median is offset from the travel lane, thereby requiring a minimum width of 16 feet plus the median offset.

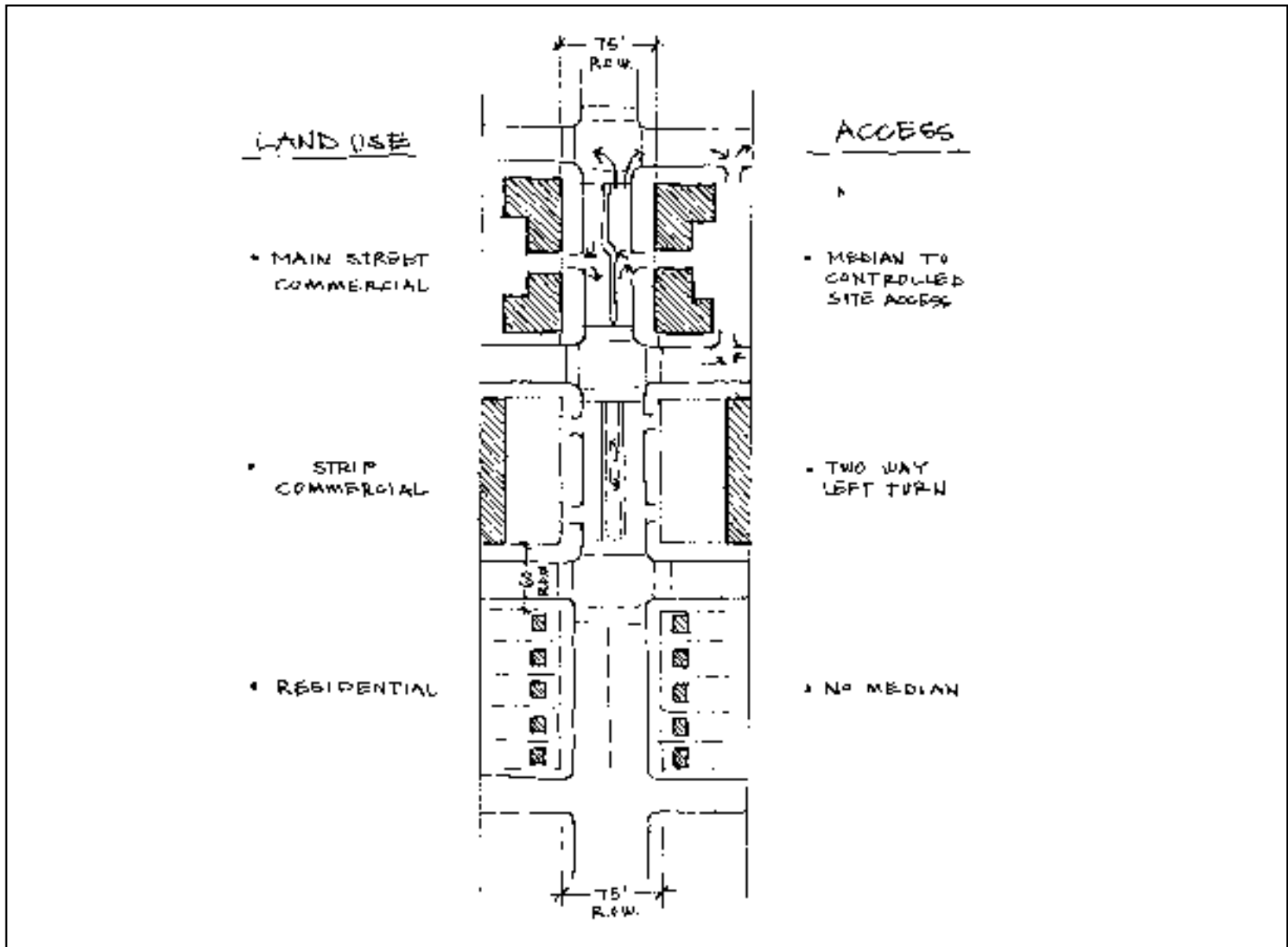


Figure 5. Regional streets can have different median conditions, depending on the intensity of adjacent land use, cross-street and access needs, and available right of way.

Median width

- Preferred raised median width is 10 feet to separate traffic, control access and to provide trees (4 feet minimum). Preferred raised median width for pedestrian refuge is 6 feet. Preferred raised median width for installation of traffic control devices is 14 feet (6 feet minimum). Preferred raised median width for provision of turning bay is 16 feet (14 feet minimum).
- Preferred and minimum median width for provision of a painted left turn bay is 12 feet. Preferred median width for provision of a continuous two-way left turn lane is 14 feet (12 feet minimum).
- Provide a maximum 2-foot-wide offset between median curb face and travel lane where right of way permits. No minimum offset required in constrained right of way conditions. On double median boulevard design types, an increased offset may be required between the median and travel lanes, between 2 and 6 feet.

Access control and turning movements

- Modify existing medians at intersections and mid-block crossings to comply with ADA requirements.
- Ensure U-turns can be negotiated at downstream intersections or median breaks when medians are used for access management.
- Design median breaks to accommodate appropriate design vehicles. Minimum median break width is 40 feet median nose to median nose for a break providing full turning movements.
- Prohibit left turns on regional streets where left-turn lanes are warranted, but cannot be provided.

Facility design

- Design medians for ease of pedestrian and bicyclist movement with at-grade cuts at all intersections and signal heads in refuges (see Intersection and Mid-Block Crossing sections).

“There’s more to life than increasing its speed.”

Gandhi

5. Mid-Block Crossings

Mid-block crosswalks provide alternative locations for pedestrians to cross regional streets in areas with infrequent intersection crossings or where the nearest intersection crossing creates substantial out-of-direction travel. When the spacing of intersection crossings are far apart or when the pedestrian destination is directly across the street, pedestrians “jaywalk,” exposing themselves to traffic where drivers do not expect them. Properly designed and visible mid-block crosswalks warn drivers of potential pedestrians.

Traffic engineers are very careful about installing mid-block crosswalks based on subjective criteria alone. This is because installation of crosswalks or other forms of pedestrian protection at locations that do not meet specific “warrants” can result in adverse affects including: (1) disruption of traffic flow and increased potential for rear-end collisions due to unexpected mid-block traffic stops, (2) proliferation of crosswalks to the detriment of training pedestrians to walk to more conventional intersection crossings, and (3) creation of a false sense of security in pedestrians, causing them to be less careful about when they cross and be less attentive to approaching traffic. Conversely, when specific warrants are met, installing mid-block crosswalks can: (1) help channel crossing pedestrians to the safest mid-block location, (2) provide visual cues to allow approaching motorists to anticipate pedestrian activity and unexpected stopped vehicles, and (3) provide pedestrians with reasonable opportunities to cross during heavy traffic periods, when there are few natural gaps in the approaching traffic streams.

General considerations

- Use the following guidelines to place mid-block crosswalks at appropriate locations. However, do not place them indiscriminately. The guidelines are not a substitute for proper engineering evaluation and analysis.
- A registered engineer from the appropriate street jurisdiction should always evaluate important factors before installing mid-block crossings including sight distance, vehicle speed, accident records, illumination, traffic volumes, type of pedestrian, nearby pedestrian trip generators, etc.

Design guidelines

Application of mid-block crosswalks

- Consider providing mid-block crossings when protected intersection crossings are spaced greater than 600 feet, or so that crosswalks are located no greater than 300 feet apart in high pedestrian volume locations, or based on the thresholds that follow.
- Generally, provide mid-block crossings on streets with speeds less than 45 mph when the minimum hourly pedestrian crossing volume (for peak four hours) exceeds 25 on streets with average daily traffic (ADT) identified in the references cited below. At locations where significant numbers of pedestrians are children, elderly or disabled, minimum crossing thresholds are 10 pedestrians per hour (peak four hours) on streets with average daily traffic identified in the references cited below. Use this guideline as long as the basic criteria governing sight distance, speeds, etc., are met. For details regarding this guideline, see references that follow:

References:

1. R.L. Knoblauch; Investigation of Exposure Based Pedestrian Accident Areas: Crosswalks, Sidewalks, Local Streets, and Major Arterials; Publication No. FHWA/RD 88/038, September 1988
 2. Synthesis of Safety Research Related to Traffic Control and Roadway Elements; Vol. 2; U.S. Department of Transportation, Federal Highway Administration; Publication No. FHWA-TS-82-233, December 1982
 3. Median Intersection Design; Report 375, National Cooperative Highway Research Program, Transportation Research Board
- Unsignalized mid-block crossings should not be provided on streets where traffic volumes do not create the minimum time gap in the traffic stream required for a pedestrian to walk to the other side or to a median refuge. At locations with inadequate gaps that also meet Manual of Uniform Traffic Control Devices signalization warrants, consider a signalized mid-block crossing.

- Consider a signalized mid-block crossing where pedestrians must wait more than 30 seconds for an appropriate gap in the traffic stream. When wait times exceed 30 seconds, pedestrians may become impatient and cross during inadequate gaps in traffic. Use this guideline in conjunction with signal warrant guidelines that follow.
- On streets with continuous two-way left-turn lanes, provide a raised median pedestrian refuge with a minimum length of 20 feet and a minimum width of 8 feet.
- Always conduct engineering studies to evaluate mid-block crossings on routes to school to determine if the location is the most appropriate and whether an adult crossing guard is warranted.
- Provide street lighting on both sides of mid-block crossings.
- Provide ADA-compliant wheelchair ramps at mid-block crossings with curbs and medians.
- Provide raised median pedestrian refuges at mid-block crossings where total crossing is greater than 60 feet. Provide an at-grade channel in median at a 45-degree angle toward advancing traffic to encourage pedestrians to look for oncoming traffic.
- Use ladder-style crosswalk markings to increase visibility.
- Supplement crossings with advance crosswalk warning signs for vehicle traffic.
- Provide curb extensions at mid-block crossings with illumination and signing to increase pedestrian and driver visibility.
- Provide a signalized mid-block pedestrian crossing and appropriate advance warnings when an engineering study shows it is warranted, particularly at established school crossings. Consult the Manual of Uniform Traffic Control Devices, which provides signalization warrants based on pedestrian crossing volumes within an 8-hour, 4-hour or peak-hour time period.

6. Bicycle Lanes

Regional streets provide the primary network for bicycle travel in the region, and require features that support bicycle traffic.

Bicycle lanes are the preferred bikeway design choice for the throughway (highway), boulevard, street and road classification concepts described in this document. A bicycle lane is a portion of the roadway designated for exclusive or preferential use by bicyclists. Some general design considerations and design guidelines follow. For more detail on bikeway design, refer to the *Oregon Bicycle and Pedestrian Plan* chapter titled Facility Design Standards (pages 65 through 168) and the *City of Portland Bicycle Master Plan* Appendix A, Bikeway Design and Engineering Guidelines (pages A1 through A44).

General considerations

- Bicycle lanes are the preferred bikeway design choice for the throughway (highway), boulevard, street and road classification concepts.
- Where bicycle lanes are not possible due to width constraints and parking needs, a wide outside lane is acceptable on streets with average daily traffic of 10,000 to 20,000. A wide outside lane should be wide enough to allow an average size motor vehicle to pass a bicyclist without crossing over the adjacent lane. Wide outside lanes are acceptable where any of the following conditions exist:
 - it is not possible to eliminate or reduce lane widths
 - topographical constraints exist
 - additional pavement would disrupt the natural environment or character of the natural environment
 - parking is essential to serve adjacent land uses or improve the character of the pedestrian environment.

Construction of a parallel bikeway within one-quarter mile is also an acceptable alternative where the above constraints exist, as long as the parallel bikeway provides an equally convenient route to local destinations. Parallel bikeway design options include bicycle lanes, bicycle boulevards and multi-use paths.

- On streets where the ADT is greater than 20,000 and bicycle lanes are not possible due to width constraints or parking needs, a parallel bikeway should be developed.
- Provide bicycle facilities without gaps to special destinations (schools, parks, commercial areas). Bicycle facilities on regional streets should serve same areas as autos.
- Provide an interconnected street system to encourage more bicycle trips.
- Provide uniformity in facility design, signs and pavement markings for bicyclist and motorist safety.
- Provide secure bicycle parking on development sites and at transit stations. Provide bicycle parking on sidewalks or on-street in lieu of auto parking where appropriate.
- Maintain and clean along bicycle lanes to ensure a smooth, obstruction free travelway. Ensure pavement is in good condition and eliminate height differences between gutter pan and asphalt. Regular street cleaning to remove debris from bicycle lane will improve bicyclist safety and encourage use of the facility.

Design guidelines

Application of bicycle lanes

- Always design bicycle lanes as one-way in same direction of travel as vehicles, and marked as such. Exception is one-way streets with opposite direction bicycle lane separated from travel lanes (contra-flow lane).

Existing design standards

- Refer to ODOT width standards for bike lane design. Preferred width on regional streets is 6 feet for new construction and 5 feet on retrofit projects. Minimum bicycle lane width on regional streets in urban areas is 4 feet.
- On rural or urban reserve roads, use ODOT standards at a minimum for paved shoulders used for bicycles. Preferred shoulder width is 6 feet or greater. Minimum widths are 4 feet on an open shoulder and 5 feet against a curb or guardrail.
- Provide consistent signing and pavement markings along entire length of bicycle lanes and routes per the 1995 Oregon Bicycle and Pedestrian Plan guidelines.

Bicycle lane width

- On regional streets with shared bicycle lane and on-street parking, the preferred and minimum combined width is 12 feet (7-foot-wide parking lane and a 5-foot-wide bicycle lane).

Facility design

- Design crossings of railroad tracks perpendicular to direction of bike travel. Use appropriate treatment to ensure smooth and safe crossings.
- For curbside bicycle lanes, always provide curb inlet grates where possible. If not possible, use proper inlets in bicycle lanes so bikes can cross safely.
- Provide secure parking at transit stations.

Relationship to other guidelines

- Avoid designing continuous right-turn lanes on regional streets.
- Avoid diagonal on-street parking where it conflicts with bicycle travel.

“You can do no great things – only small things with great love.”

Mother Teresa

7. Intersections

Intersections on regional streets are junctions with other regional streets, local streets or driveways and freeway interchanges. Intersections provide for change in travel direction and control the right of way for conflicting traffic movements. Multi-modal intersections are intended to operate with vehicles, pedestrians and bicycles moving in many directions – usually at the same time. Intersections have the unique characteristic of the repeated occurrence of conflicts between all modes. This characteristic is the basis for most intersection design standards, particularly for safety.

Major signalized intersections must allocate “time” to each vehicular movement as well as to pedestrians. Because of constraints on the amount of time allocated to each movement, intersections usually restrict capacity of streets and often require additional lanes or capacity to separate movements and accommodate traffic demand. Larger, high-volume intersections create long pedestrian crossings.

Intersection design is performed on a case-by-case basis depending on vehicle capacity, pedestrian, bicycle and large vehicle requirements as well as existing right of way constraints. Proper intersection design considers many factors including design elements and standards based on the design speed of the street and the expected mix of traffic. The following guidelines are not intended to address the multitude of factors in intersection design, but to emphasize the need to improve designs for pedestrian, bicycle and transit modes of travel. The intersection designer should consider the trade-off between increasing vehicular capacity and improving pedestrian and bicycle mobility and safety in cases where it is appropriate. Figures 6 and 7 illustrate example intersection designs on community boulevards.

General considerations

- Multi-modal intersection design needs to accommodate appropriate level of service, design speed and types of traffic.
- Avoid elimination of any travel modes in intersection design. Intersection widening for additional turn lanes to relieve con-

gestion is acceptable as long as it encourages pedestrian and bicycle movement.

- Raised medians should extend as far into the intersection as the curb return of the street. Medians can end prior to the crosswalk for a continuous pedestrian crossing, or extend through the crosswalk if a wheelchair ramp is provided through the median.
- The preferred location for pedestrian crossings is at intersections.
- Capacity improvements may increase pedestrian wait at crossing locations, and discourage pedestrian activity, bicycle use and on-street parking. Therefore consider parallel routes and other strategies before increasing the number of travel lanes beyond three in each direction.
- Support innovative intersection designs that reduce right of way needs.
- Consolidate multiple driveways into single intersections.
- Integrate access management polices into functional classifications and design standards.

Design guidelines

Pedestrian crossings

- Pedestrians can legally cross the street at any intersection whether a striped crosswalk exists or not. Since regional street design types are predominantly arterial classifications, the guidelines below emphasize crossings with striped crosswalks.
- Set pedestrian crossing times at signalized intersections for walking speeds appropriate for the type of pedestrian using the facility (children, elderly). Preferred timings for children and elderly are 3.5 feet per second, and 4.0 feet per second for others.

- Stripe crosswalks on all approaches of signalized intersection. If special circumstances make it unsafe to do so, attempt to mitigate the circumstance.
- Stripe crosswalks at all intersections near schools.
- Provide pedestrian pushbuttons and signal heads (Walk, Don't Walk) at all signalized intersections with pedestrian actuated signals. In high pedestrian volume locations, provide a walk phase every cycle.
- Provide pedestrian pushbuttons and signal heads on median refuges at signalized intersections.
- Consider special paving treatment (brick, alternative colors, cobblestone, etc.) for crosswalks to enhance the visibility of the crosswalk and to remind motorists that they are sharing the street with pedestrians.
- Provide ADA-compliant wheelchair ramps (two per corner) at all intersections.
- Avoid striping crosswalks at unsignalized intersections with inadequate sight distance. Either mitigate the inadequate sight distance or direct pedestrians to alternative crossing location. Minimum intersection sight distance is based on local, state or AASHTO guidelines
- Use local, state or AASHTO guidelines to determine decision and stopping sight distance triangles at uncontrolled and stop controlled intersections before striping a crosswalk.
- Generally, provide striped crosswalks at stop controlled intersections when the minimum hourly pedestrian crossing volume (for peak four hours) exceeds 25 on streets with average daily traffic identified in the references cited in the Mid-Block Crossing section. At locations where a significant number of pedestrians are children, elderly or disabled, minimum crossing thresholds are 10 pedestrians per hour on streets with average daily traffic (ADT) identified in the above cited references. Use

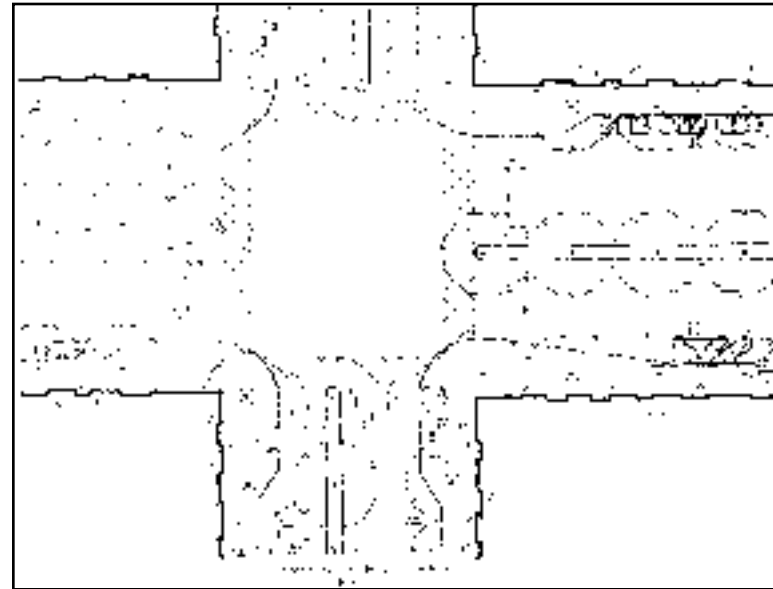


Figure 6. Typical intersection of a community boulevard and a regional street.

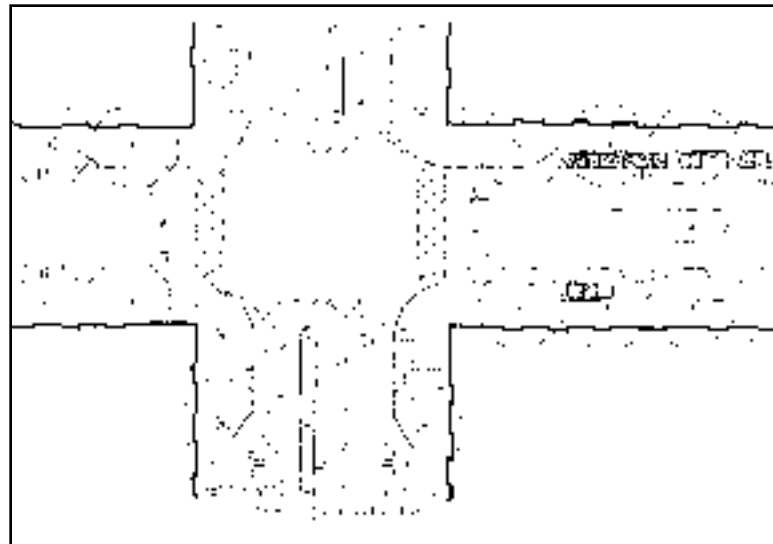


Figure 7. Typical intersection of a community boulevard and a community or regional street.

this guideline as long as the basic criteria governing sight distance, speeds, etc., are met. For details regarding this guideline, see references cited in Mid-Block Crossing section.

- If a raised median nose extends into the crosswalk, provide ADA-compliant channel through median.
- Reduce crossing width at intersections by either providing curb extensions into the street equal to the width of on-street parking (but not interfering with bicycle lane) or reduce curb return radius to the maximums stated under the curb return radius section. Exceptions include narrow streets with short crossings, intersections with exclusive right-turn lanes, or intersections with a high volume of right turning trucks or buses.
- Provide enough illumination to light all four corners of urban intersections with striped crosswalks.
- Avoid placement of crosswalks on the right hand side of unsignalized “tee” intersections (where pedestrians cross in front of left turns from major street) to minimize pedestrian conflicts with turning vehicles.

Bicycle lanes at intersections

- Extend bicycle lanes up to intersection stop bars or crosswalks. Where right of way is constrained, use appropriate markings and signs to end bicycle lane prior to intersection. Use of colored lanes or “skip” marking through intersection is recommended.
- At intersections with exclusive right-turn lanes, transition the bicycle lane to the left of the right-turn lane. If right of way is a constraint, use appropriate markings and signs to end bicycle lane prior to intersection.
- Avoid intersection designs with dual right-turn lanes, particularly with one of the lanes being a shared through-right lane. These create situations difficult for bicyclists to negotiate.

- Install bicycle loop detectors at intersections with loop detectors. Provide pavement markings identifying location of detector. Alternatively, provide pedestrian pushbuttons accessible from bicycle lane.
- Provide bicycle clearance intervals at signalized intersections to accommodate a 10 mph crossing.

Curb return design

- Curb return radii and the configuration of medians should be designed to ease pedestrian crossings, while also accommodating major bus and freight movement on primary freight routes.
- Provide the following designs for curb return radii:
 - high pedestrian traffic – provide curb extensions to reduce crossing width
 - typical urban intersection – 10-25 feet radius maximum
 - high truck and bus turns – 40 foot radius maximum or lower if the “effective” radius (accounting for bicycle lanes and parking) accommodates larger vehicles.
- Avoid design of channelized right-turn islands (pork chop design). Exceptions include existing locations with low pedestrian volumes and high volumes of large vehicles, such as in rural or industrial areas.

Design elements for designated “boulevard” intersections

Figure 8 illustrates desirable design elements for a typical “boulevard” intersection to improve mobility and safety for pedestrians and bicycles, and transit access.

- Place crosswalks prior to curb returns to reduce crossing widths.
- Add raised median (preferred width of 6 feet, minimum width of 4 feet) for pedestrian refuge at crosswalks on regional streets. Plant trees on medians. Transition median to the pre-

dominant median treatment on regional streets, a painted two-way left-turn lane.

- At intersections with exclusive right-turn lanes and far-side bus stops, avoid extending the right-turn lane through the intersection to create a bus pull-out. Instead, provide a normal curb return and create a bus turnout downstream from the intersection as shown in Figure 8.
- Provide pedestrian connections from the corner to adjacent land uses to minimize walking distances.

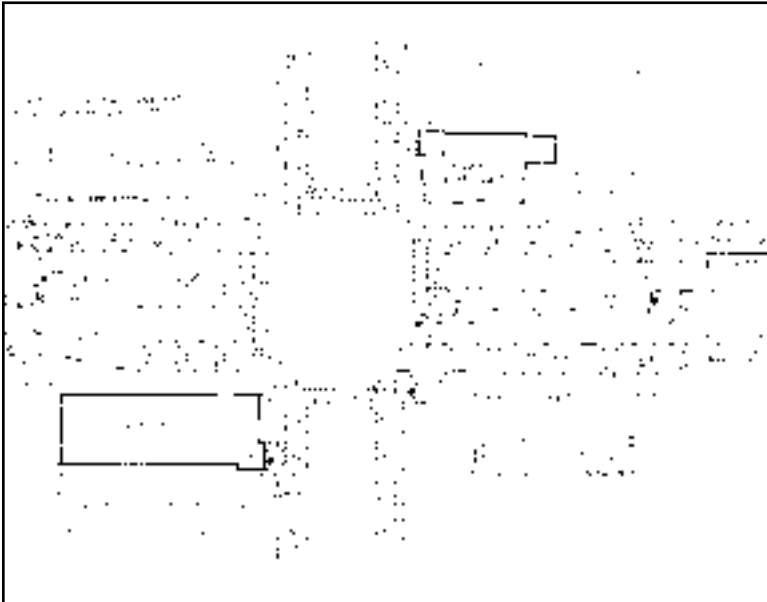


Figure 8. Typical features of a “boulevard” intersection as identified on Metro’s Regional Street Design map.

“Change is the law of life. And those who look only to the past or present are certain to miss the future.”

John F. Kennedy Jr.

8. Street Connectivity

Street patterns in most suburban communities are disconnected. They are designed primarily to isolate land uses and for easy auto movement within a hierarchy of streets from cul-de-sacs to major arterials. Collector streets and cul-de-sacs branch off of the major arterial network, with few, if any linkages in between. This pattern forces all trips, whether by car, foot or bicycle, onto the arterial street system without regard for their ultimate destination (see Figure 9). Consequently, few streets, other than the arterial, allow a pedestrian to walk to a nearby lunch spot or a transit station. Given this framework – the inaccessibility of the arterial network to pedestrians and the circuitous nature of the route – driving is automatically more convenient than walking. Thus, congestion and ever wider through streets are becoming the norm even in the newest developing communities.

In contrast, an interconnected internal street system that provides linkages to local shopping and recreation destinations, as well as between adjacent developments, allow local trips to stay off the arterial network. Streets that converge at nodes and transit stops provide pedestrians with the option for walking for some trips in a safe and comfortable environment. Those who choose to drive may exit to the arterial system or find a shorter and more direct route to a nearby destination on local streets. With an interconnected street system that provides multiple routes to local destinations, any single street will be less likely to be overburdened by excessive traffic. Thus, streets should be designed to keep through trips on arterial streets and provide local trips with alternative routes (see Figure 10).

General considerations

- Plan for local and regional travel routes. Throughways allow for efficient conveyance of long-distance travel, but act as barriers to pedestrians, so they should not pass through or separate core commercial areas from employment districts.

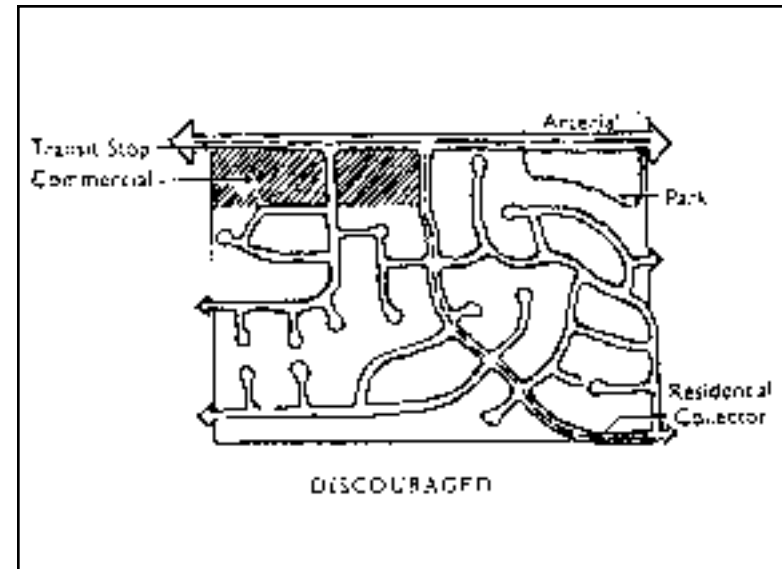


Figure 9. Conventional suburban street pattern.

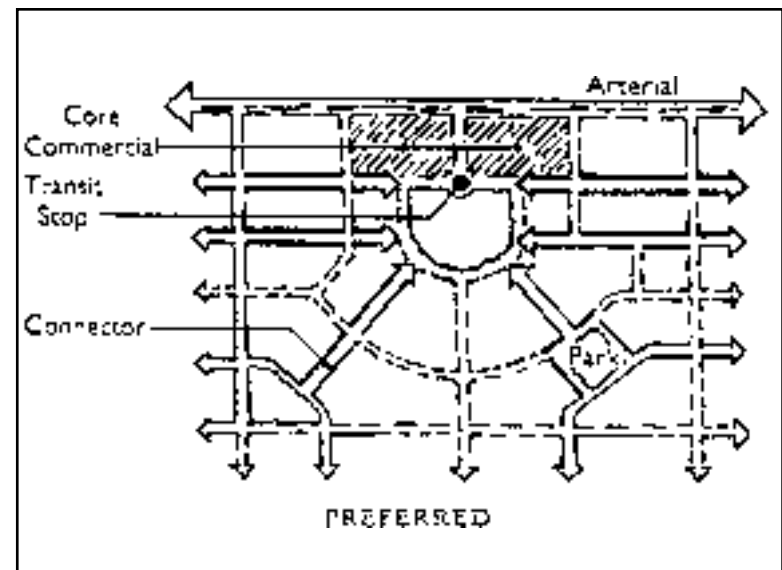


Figure 10. Preferred interconnected street pattern.

- Encourage the use of traffic calming devices to discourage speeding and through traffic cutting through local neighborhoods. Local street widths and corner curb radii should be as small as possible for pedestrian accessibility, while providing for legitimate safety and emergency vehicle considerations.
- Create a pedestrian scale block pattern to maximize the convenience for pedestrians.
- Decisions to increase connectivity in existing neighborhoods and communities should follow a comprehensive evaluation of the potential impacts (intrusion and economic), and a public outreach effort.

Design guidelines

- Provide direct routes to local destinations, such as activity center nodes, recreation facilities and shopping centers.
- Distribute travel within districts among several connector streets (minor arterials and collectors) that lead to the arterial system and more significant destinations.
- Connecting street intersections on regional streets (local, collector, and major driveways) generally should be spaced at about 12 to 14 per mile in more intensely developed areas with pedestrian activity. Signalized intersections should be spaced between 600 to 2,600 feet apart, depending on the intensity of the adjacent land use and access requirements. Full access unsignalized intersections and driveways should be spaced no more than 600 feet apart, and limited access intersections and driveways should be spaced about 300 to 400 feet apart. While this guideline presents specific dimensions, the spacing of intersections in new design or in retro-fitting existing streets is a complex issue with many design, operations, and environmental factors to consider. Comprehensive study of any proposed access concept is required.
- Consolidate major driveways of large development projects at ideal 1/8-to 1/4-mile intervals. Align driveways on opposite sides of street.

“Suburbia is where the developer bulldozes out the trees, then names the streets after them.”

Bill Vaughn

9. Pedestrian Realm

A functional, safe pedestrian realm is vital for successful multi-modal street design. The pedestrian realm extends from the vehicle travelway to the edge of right of way and can include land adjacent to the right of way. The pedestrian realm is composed of the sidewalk, on-street parking, street trees and buffer landscaping, streetscape and public transit elements. The pedestrian realm:

1. provides a continuous travel corridor for pedestrians, serving same destinations as automobiles
2. serves local land use by providing pedestrian access to commercial and residential buildings
3. serves transit by providing convenient pedestrian connections to transit and between land uses and transit facilities
4. provides open space and public outdoor activity space to the city and the region, supporting public social contact
5. provides a buffer for adjacent properties from the traffic and noise of the street

General design considerations and guidelines

- The pedestrian realm requires attention to pedestrian safety, as well as comfort and ease of access. Pedestrian safety and comfort are directly related to the width of the sidewalk and buffering from traffic.
- Provide physical and spatial definition to the street to reduce the impact and dominance of automobile traffic on the safety and comfort of pedestrians. Physical spatial definition of streets also provides a sense of place, enhancing the status of the street and adjacent property values. See discussions that follow on providing continuous rows of street trees (relatively closely spaced), providing buildings facing the street, building street frontages and edge treatments.

- Orient land uses to the street to increase and focus pedestrian activity to support ease of access to and use of public transit. Supporting an active pedestrian environment is vital to the functioning and identity of a regional street within commercial areas. (See public transit section on page 40.)

“Our national flower is the concrete cloverleaf.”

Lewis Mumford

10. Sidewalks

Sidewalks are the fundamental pedestrian element in street design. Sidewalks provide visual – as well as physical – access to adjacent land uses and transit facilities. Sidewalks are typically designed to minimum widths and can become crowded with public and private kiosks, benches, newspaper racks, trash cans, bus shelters, cafe tables and chairs.

Table 2 provides a summary of sidewalk functional widths. For each sidewalk function is a range of widths in feet. Figures 11 through 18 provide design examples for sidewalk widths ranging from 5 feet to 15 feet, including transit facilities. Each example indicates how the design of a sidewalk can be divided into separate functional clearances. Narrower sidewalks overlap functional clearances, and wider sidewalks provide adequate space for each function. For each case, a continuous, relatively straight line clearance of 5 feet is provided to meet ADA requirements for wheelchairs.

General considerations

- Establishing an active pedestrian environment is vital to the function of a regional street within commercial areas.
- Provide adequate width for all sidewalk uses, including loading and unloading of people from on-street parking, walking traffic, window shopping traffic, bicycle parking and use of street furniture. Think of the sidewalk as divided into separate functional clearances as shown in Table 2. Sidewalks wider than 10 feet accommodate more intensive pedestrian traffic and use of the sidewalk by local merchants and residents.
- Provide pedestrian-scaled lighting to provide a separation from street traffic and spatial definition that is human scale.
- Consider special paving treatments to separate the pedestrian realm from the travelway realm at intersection crossings.
- Provide continuous sidewalk improvements along major arterial streets. Close gaps between pedestrian connections.

- Provide pedestrian and sidewalk improvements on all new and redevelopment street projects.

Design guidelines

- Provide a minimum 5-foot clear zone along sidewalks conforming to the ADA minimum passing space for a wheelchair. ADA requires a wheelchair passing space every 200 feet on a walkway.
- The preferred width of a sidewalk is 12 to 15 feet in commercial areas with storefronts close to the street. The minimum width of a sidewalk in these areas is 8 feet wide.
- Sidewalk widths of greater than 12 feet provide space for pedestrian amenities, for local business activity to spill out onto the sidewalk and for leisurely walking pace without vehicle traffic dominating the pedestrian realm.
- Ensure sidewalks are continuous. Close gaps with standard design concrete sidewalks or provide temporary asphalt sidewalks during interim period.
- On rural or urban reserve roads, at a minimum use ODOT standards for paved shoulders used for pedestrians. Preferred width is 6 feet or greater. Minimum widths are 4 feet on an open shoulder and 5 feet against a curb or guardrail.
- Ensure minimum sidewalk width for pedestrian through traffic is not obstructed with street furniture, utility poles, traffic signs or trees.
- Avoid combining sidewalks and bikeways unless designed as a specific multi-use path separated from the street with a preferred 12-foot width (10-foot minimum). See bicycle lane section on page 21.

Sidewalk Function	Minimum Width Range	Sidewalk Width in Feet																			
		0	1	2	3	4	5	6	7	8	9	10									
Pedestrian path clearance from building wall	1'-6"	1	2																		
Open car door clearance from curb	1'-6" to 2'-0"	1	2																		
Pedestrian path clearance from street trees	1'-6"	1	2																		
Single pedestrian through traffic	1'-10" to 3'-0"	1	2	3																	
Bus traffic curbside clearance for street furniture	2'-0"	1	2																		
Street furniture zone	2'-0" to 3'-0"	1	2	3																	
Wheelchair movement clear width	2'-8" to 3'-0"	1	2	3																	
Window shopping zone width front storefront	3'-0"	1	2	3																	
Clear distance width between bus bench and curb	3'-0"	1	2	3																	
Planting strip width for trees	3'-0" to 4'-6"	1	2	3	4																
Clear distance between bus shelter and curb	3'-0" to 4'-6"	1	2	3	4																
Two-way pedestrian through traffic	3'-8" to 4'-0"	1	2	3	4																
Minimum ADA sidewalk (5'-0" wide required every 200')	4'-0"	1	2	3	4																
Practical ADA sidewalk (wheelchair turning circle)	5'-0"	1	2	3	4	5															
Bus zone with bench width	5'-0"	1	2	3	4	5															
Bus zone with bus shelter	7'-8"	1	2	3	4	5	6	7													
Minimum ADA bus drop off clear zone	8'-0"	1	2	3	4	5	6	7	8												

Table 2. Minimum sidewalk functional clearances.

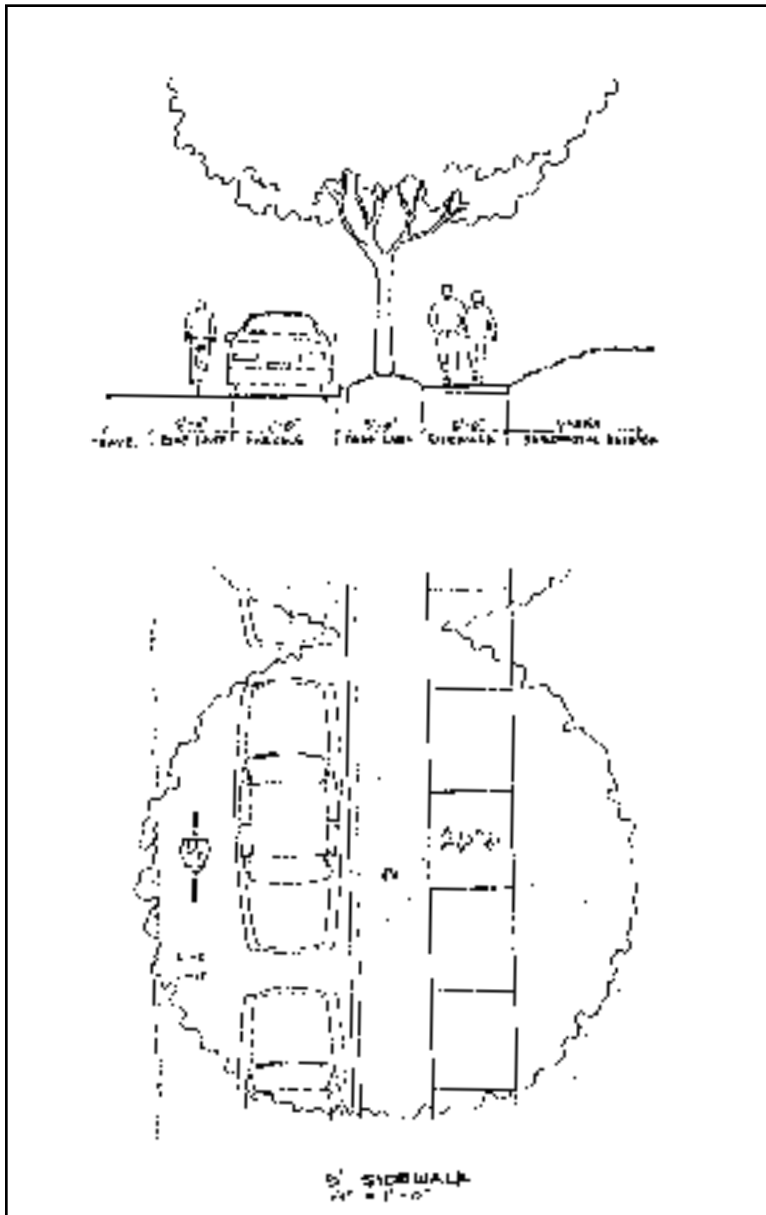


Figure 11. Five feet provide two-way pedestrian traffic and ADA minimum clearance. This applies to residential and non-commercial land uses.

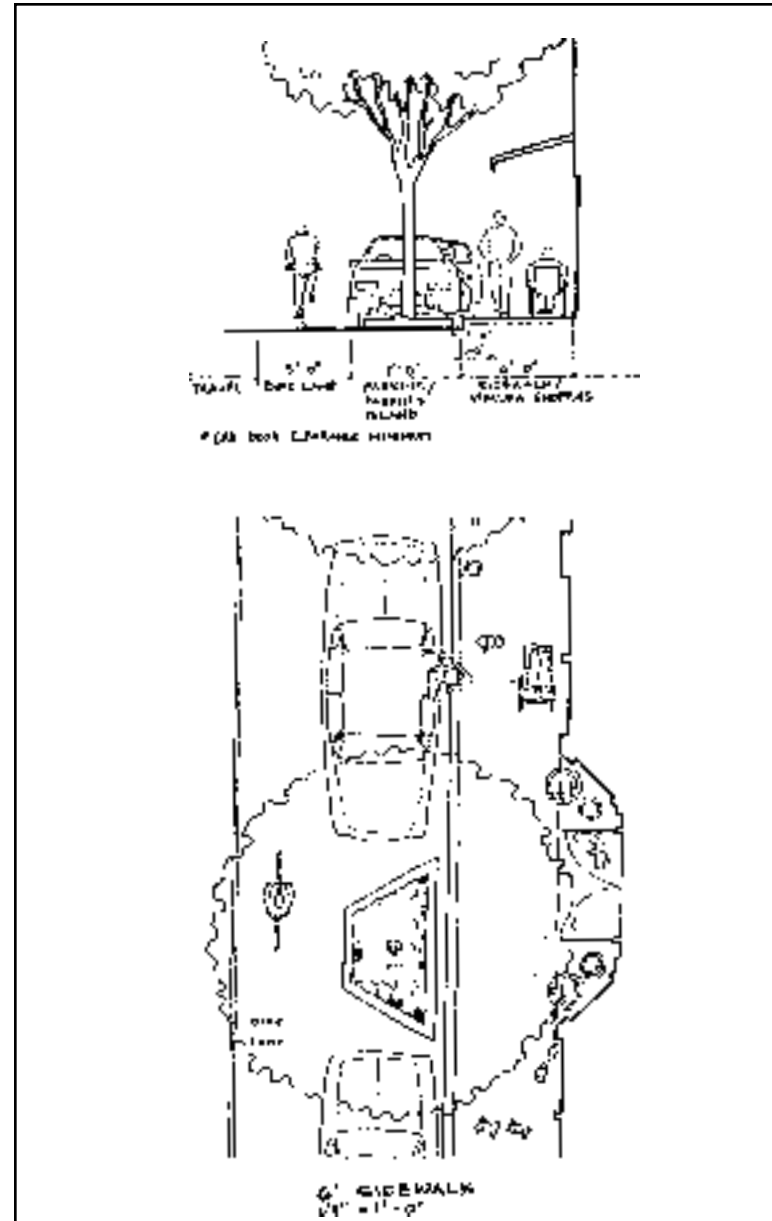


Figure 12. Six feet combine two-way pedestrian traffic, window shopping and streetscape elements. This applies to lower-intensity commercial areas.

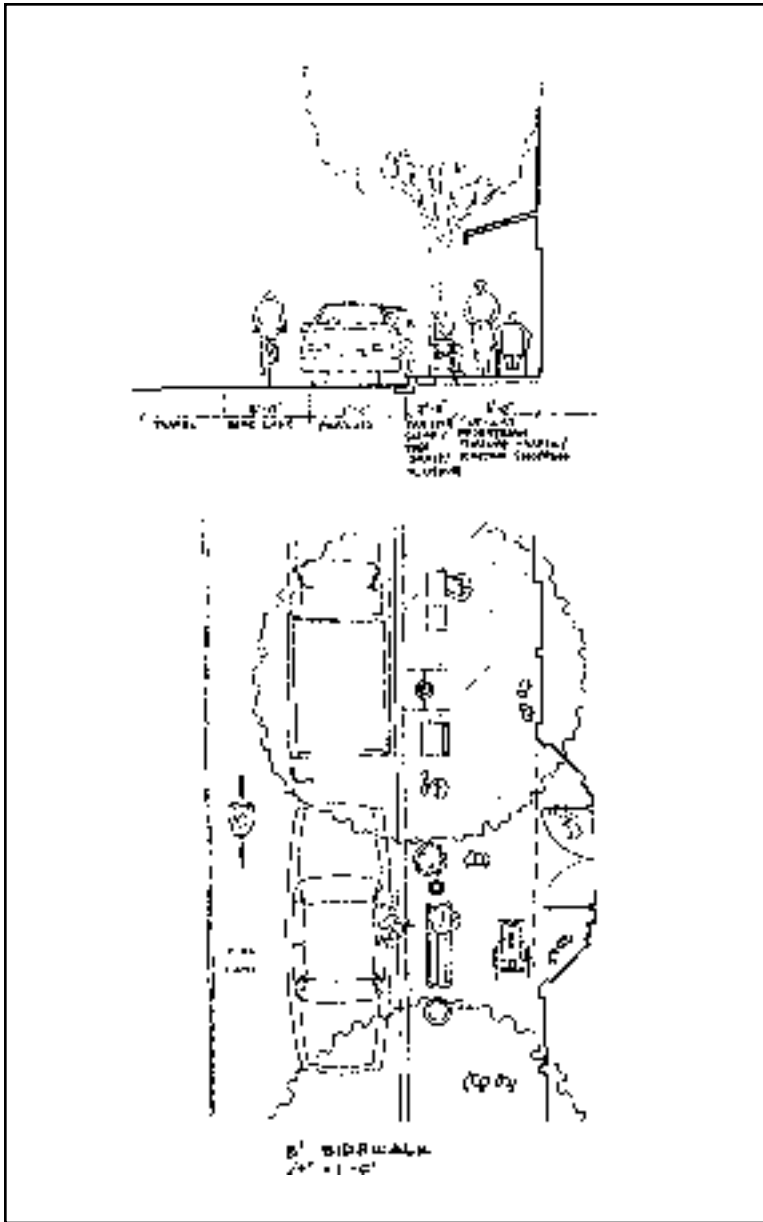


Figure 13. Eight feet combine two-way pedestrian traffic, window shopping and a 3-foot street furniture zone along the curb. The street furniture buffers pedestrians from traffic.

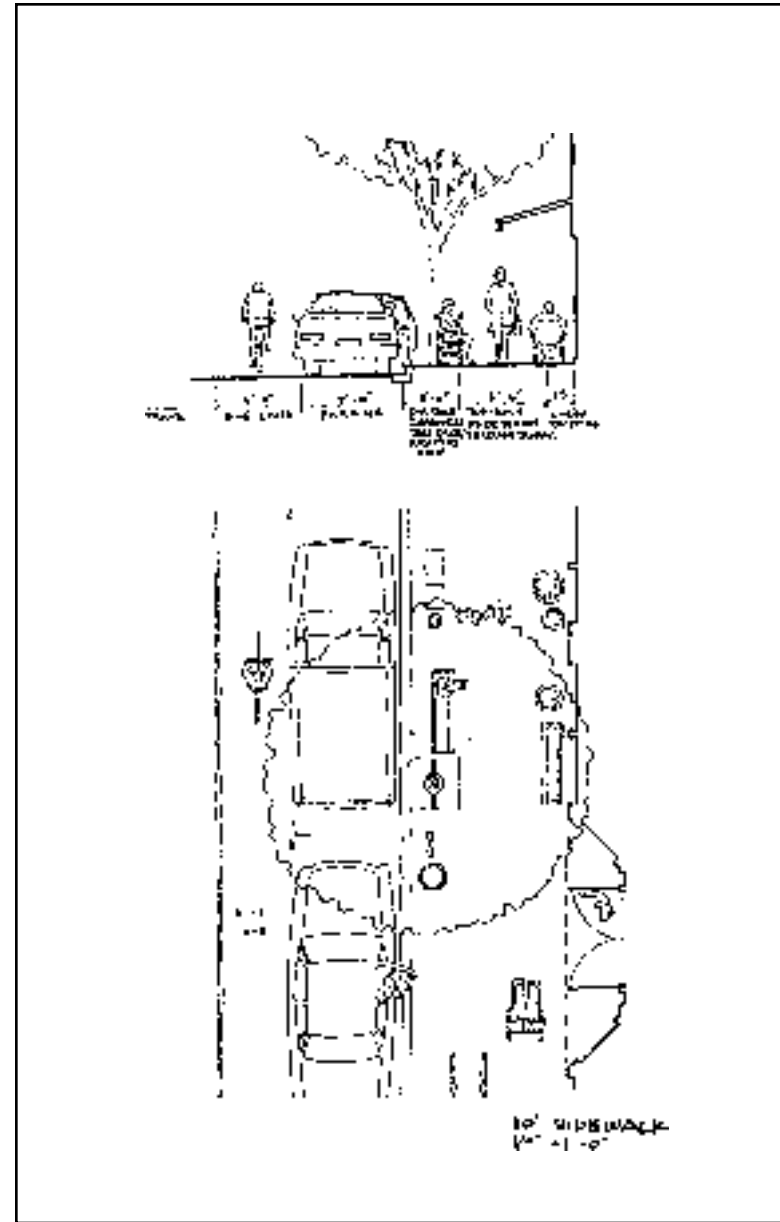


Figure 14. Ten feet provide an opportunity for street furniture to be located along the curb or along the storefronts.

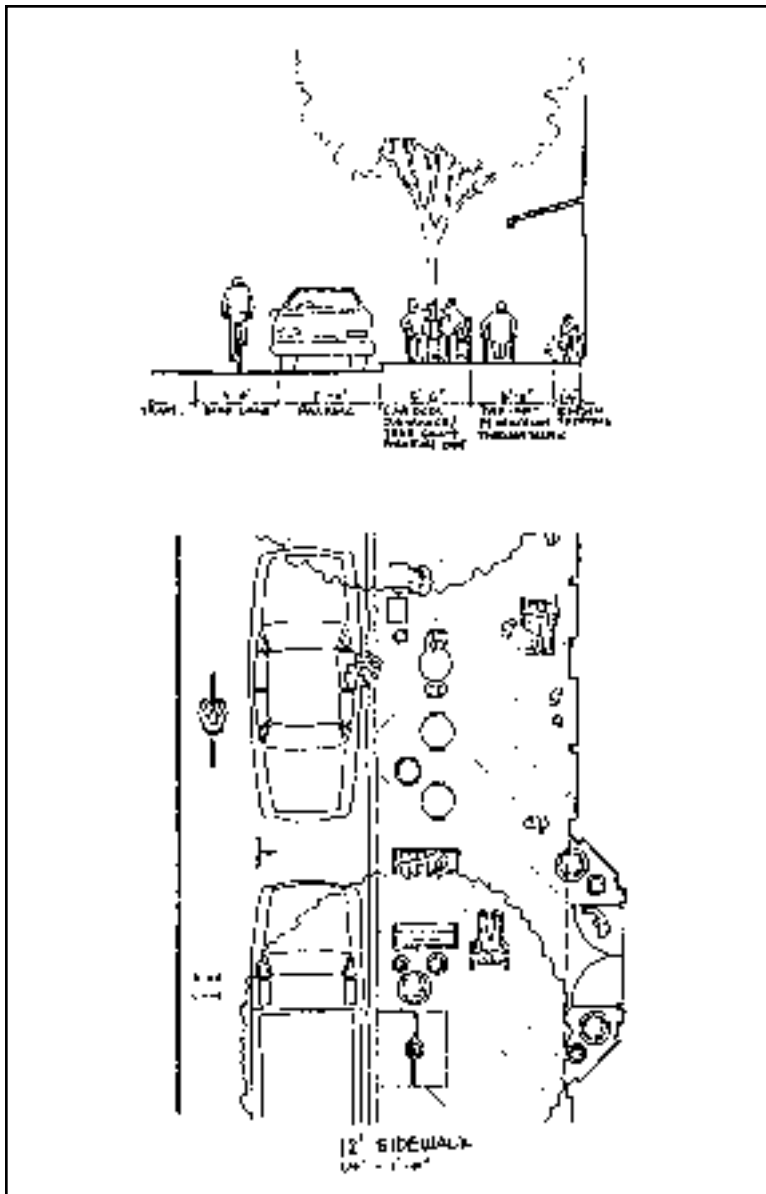


Figure 15. Twelve feet provide an opportunity to create an outdoor dining or cafe space on the sidewalk, with up to seven feet clear for seating.

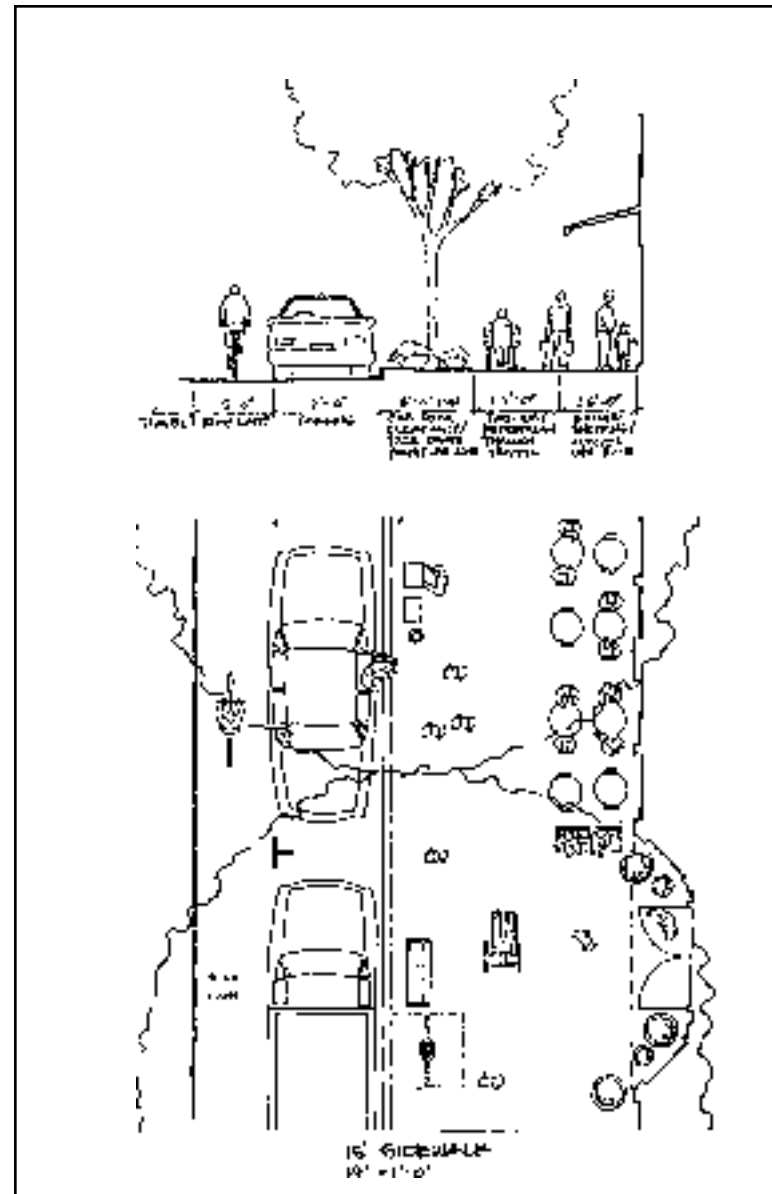


Figure 16. Fifteen feet provide an opportunity for a variety of outdoor use of the sidewalk for shopping or dining, with ample area for high levels of pedestrian activity.

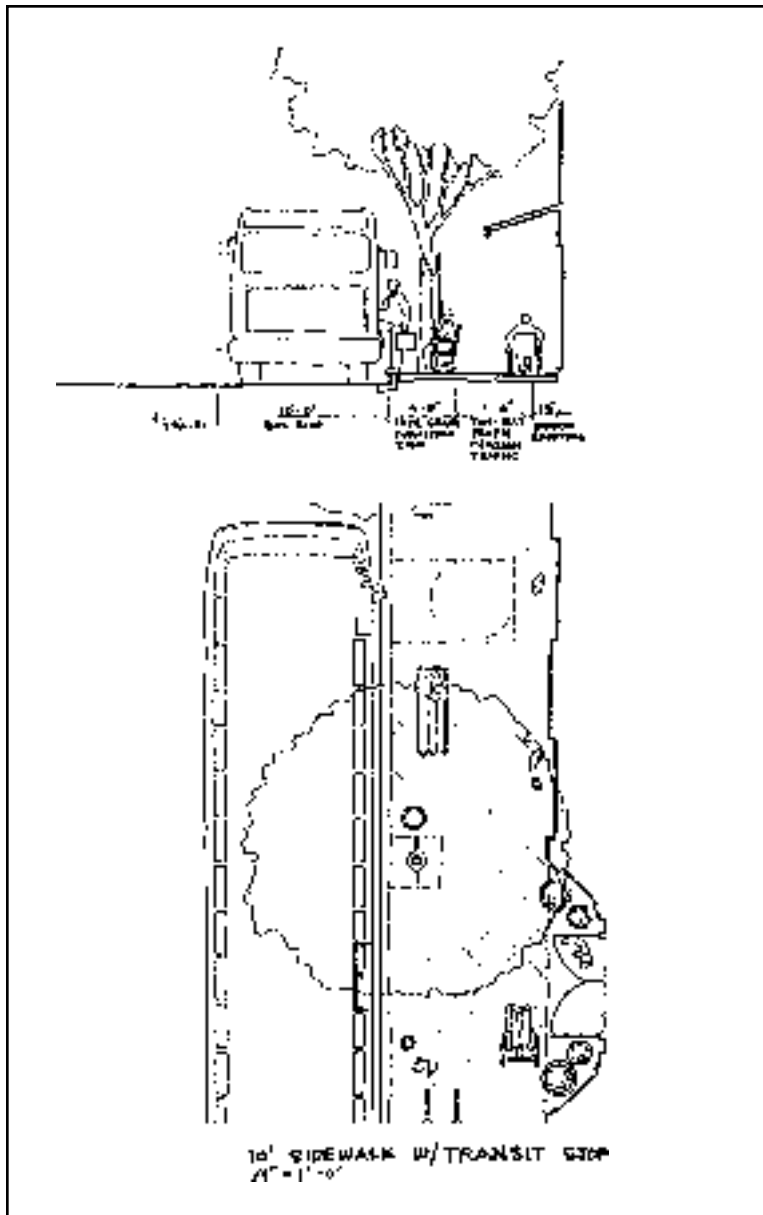


Figure 17. Ten feet with transit stop is tight to have a bus shelter, but sufficient for a bench.

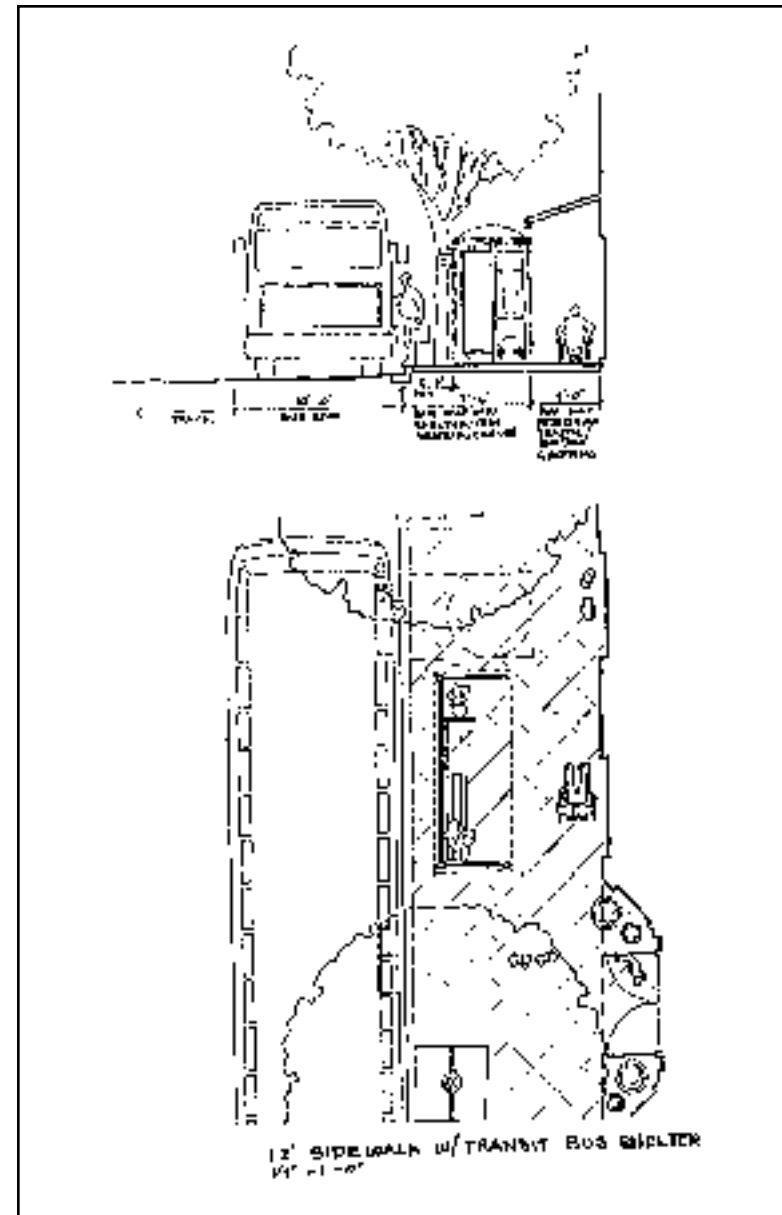


Figure 18. Twelve feet with transit stop is sufficient for a transit shelter.

11. Street Trees

Street trees are indispensable to the attractiveness, comfort and safety of street design. Street trees, along with the overall width of the street, are a primary element in providing a sense of safe separation from traffic. Without street trees, a wide regional street is dominated by vehicles and appears barren. Street trees increase the desirability of pedestrian activity, as well as enhance the status of the street and adjacent property values. Street trees serve several functions:

1. street trees separate and define the boundary between the pedestrian realm and the travelway, reducing the impacts of the volume and speed of traffic on pedestrians and the adjacent land use
2. street trees provide tranquillity to the street, slowing the pace and intensity of street activity, enhancing the well being of pedestrians and motorists
3. street trees provide shade in the summer and allow sunlight in the winter
4. street trees can reduce the automobile scale of wide regional streets to human scale
5. street trees provide identity to a street, orientation of the street within the system of streets within a city, and provide status and prestige to addresses along the street
6. street trees can reinforce the design and hierarchy of the regional street system
7. street trees remind of the natural regional identity of the Portland metropolitan area

General considerations

- Provide continuous and uniformly and closely spaced tree plantings to create a continuous canopy along the length of and across the width of the street. Tree spacing should connect to form a continuous canopy over the street. A minimum spacing as low as 12 feet is possible, depending on the tree species. London plane trees can be spaced from 15 to 25 feet.
- Plant street trees within the center median. Trees planted within the median reduce the perceived width of the street.
- Plant street trees in planting strips in areas with less intensive pedestrian and commercial activity, or tree wells with tree grates in areas with more intensive pedestrian and commercial activity.
- Street trees need regular maintenance.
- Street trees do not need to be one species. Tree species can alternate to provide variety.
- Deciduous trees are preferable. They provide summer shade and allow winter sun.
- Plant street trees in narrow sidewalk conditions, those with 8 feet or less, between on-street parking spaces in treewells adjacent to the curb in the street.
- Use treewells, with tree grates, for street tree plantings on sidewalks.
- Select tree species whose canopy does not encroach into pedestrian headroom or into tall curbside vehicles such as buses.

Design guidelines

- For trees planted in tree wells with tree grates, the minimum planter area is 3 feet by 3 feet.
- Space street trees as low as 12 feet depending on the species. Space larger species between 15 to 25 feet.
- Permit tree planters within on-street parking lanes. Provide a minimum of 1-2 feet between planter and curb to allow for drainage unless not permitted by local street cleaning policy.
- Either maintain a high tree canopy or end the row of trees in median prior to bay taper (if applicable) to maintain sight distance and permit space for traffic control devices on median nose. Extend planting of median trees to the intersection if median width permits and median not required for traffic control devices. Ensure good maintenance of trees to avoid reduction in sight distance.

“Given a limited budget, the most effective expenditure of funds to improve a street would probably be on trees. Moreover, for many people trees are the most important single characteristic of a good street.”

Allan B. Jacobs

12. On-Street Parking

On-street parking is permitted and provided on many of the best streets. Proportionately, parking is provided on more good streets than not. At today's car ownership levels on-street parking cannot by itself meet all of the demand created by adjacent land use.

Nevertheless, on-street parking:

1. supports local economic activity of merchants, by providing access to local uses, as well as visitor needs in residential areas
2. increases pedestrian safety by providing a buffer for pedestrians from automobile traffic
3. increases pedestrian activity, in general, on the street. Since people rarely find parking in front of their destination, they walk, providing more exposure to ground floor retail and increasing opportunities for social interactions
4. increases local economic activity by increasing the visibility of storefronts and signs to motorists parking on street
5. supports local land use by reducing development costs for small business by reducing needs for on-site parking
6. provides space for on-street loading, increasing the economic activity of the street and supporting commercial uses

On-street parking is included as a higher priority design element in all of the regional street design types. This priority reflects the document's emphasis on high intensity commercial areas. However, in lower intensity areas and along many corridor segments, on-street parking is not necessary to serve adjacent land use. The additional width may be used for other desirable design elements, such as increasing the landscaped pedestrian buffer strip or median width.

General considerations

- Provide on-street parking as a buffer between pedestrians and moving vehicles on streets and boulevards.
- Use on-street parking for local land-use access.
- Reduce development costs for small business by permitting parking to be provided on street.
- Provide on-street parking to increase the activity and vitality of the street.
- Provide on-street parking for passenger and freight loading and unloading zones.
- Use on-street parking to reserve right of way for ultimate street widening or turn lanes. However, it is desirable to avoid removing on-street parking to increase capacity in dense commercial areas such as town centers and main streets.
- Minimize on-street parking lane width to reduce the curb-to-curb width of a street.
- On-street parking decreases the capacity of the adjacent travel lanes between 3 percent and 30 percent depending on the number of lanes and the frequency of parking maneuvers. Balance through traffic and local access requirements when deciding on where to provide on-street parking.
- On-street parking should be primarily parallel parking on regional streets.
- Use metered parking to manage parking limits, supporting short-term parking while discouraging long-term parking.
- Provide the level of on-street parking for planned, rather than existing, land-use densities to avoid future retrofit.
- If more parking is needed, consider public or shared parking structures, or below grade structures under adjacent land uses.

Design guidelines

- The preferred on-street parking lane width for parallel parking is 7 feet. Where right of way exists, the maximum width is 8 feet.
- Avoid diagonal parking on streets with bicycle lanes or a high volume of bicyclists.
- Ensure that pedestrians waiting to cross the street are visible to motorists by prohibiting on-street parking adjacent to crosswalk or curb return if necessary, or extending curb to equal the width of the on-street parking lane.
- Prohibit on-street parking on regional streets with speeds of 45 mph or greater.
- Extend sidewalks or curb at transit stops equal to width of on-street parking lane to increase pedestrian accessibility to transit.

“For every problem, there is one solution which is simple, neat and wrong.”

H.L. Mencken

13. Public Transit

Regional streets provide the primary access and mobility routes for the region, and are the best locations for public transit investment, as well as support pedestrian access to transit. Design for transit service must support safe and efficient use of transit to create an attractive alternative to the single-occupant vehicle. Transit can contribute to improving the quality of life of the region by:

1. supporting more passengers per vehicle, making more efficient use of the existing road investments and capacity
2. reducing the number of vehicle trips, reducing congestion, travel time, vehicle miles traveled and improving air quality
3. supporting pedestrian activity around transit stops, contributing to the commercial vitality of the adjacent land use

See Tri-Met's extensive guidelines for bus and transit supportive facilities, such as the Planning and Design for Transit Handbook, dated January 1996.

General considerations

- Access to transit in lower density residential and commercial neighborhoods and corridors requires pedestrian connections from the land-use areas to transit stops.
- Transit stops in more densely developed areas require sufficient sidewalk width to provide bus shelters.
- Provide safe pedestrian crossings within light-rail transit station areas.
- Provide streetscape improvements to support pedestrian accessibility when improving light-rail transit station areas.
- Transit-oriented features should serve as amenities for surrounding land uses and activities.

- Leverage desired transit facilities from development when impacts warrant them.
- Pedestrian and local street crossings of light-rail transit corridors are important design elements of station community development.

Design guidelines

- Bus shelters should be oriented away from the street to protect transit riders from winter weather conditions. Exceptions depend on the prevailing wind direction.
- Provide bus stops on regional streets based on demand, or provide bus stops at regular intervals of 1/8-to 1/4-mile in areas of high intensity land uses. Typical bus stop spacing ranges from 400 to 1,000 feet in central business districts to 1,000 to 5,000 feet in areas of lower intensity land use.
- Minimum curbside bus stop width is 10 feet, or 11 feet if bus is turning right.
- Provide pedestrian crossings at all transit stops using striped crosswalks, pedestrian refuges and curb extensions, as appropriate.
- Implement bus pre-emption systems on high-capacity, frequent through and express bus routes.
- Use Tri-Met standards for length of bus stop, bus stop on a curb extension or bus turnout design.
- Ensure passenger waiting areas do not interfere with passage on sidewalk. Increase size of waiting area based on patron demand.
- Provide secure bicycle parking at transit stations.

- Preferred clearance between curb and street furniture at a bus stop is 6 feet (3 feet minimum). The preferred distance between the curb and a bus shelter is 4.5 feet (minimum 3 feet), unless shelter faces away from street in which case the distance may be less.
- The minimum ADA required bus drop-off clear zone is 8 feet. The minimum width of a passenger waiting area with a bench is 5 feet, or 7.5 feet with a bus shelter. See minimum sidewalk functional clearances, Table 2.

“Your profession is not what brings home your paycheck. Your profession is what you were put on earth to do. With such passion and such intensity that it becomes spiritual in calling.”

Thomas Edison

14. Streetscape Features

Streetscape features serve pedestrian and outdoor activities, as well as provide lighting and signs for motor vehicle drivers. Streetscape features are the elements that furnish the street environment and enhance community livability.

General design considerations and guidelines

- Provide pedestrian-scaled lighting to provide a separation from street traffic and spatial definition that is human scale. Pedestrian-scale street lights should be lower than conventional street lights and provide more illumination of the sidewalk. Pedestrian-scale street lights are lower and more closely spaced than conventional street lights. To provide identity to certain districts, consider special light standards such as antique replicas, etc. Provide lighting over crosswalks.
- Provide continuity of streetscape features along the length of a street identified as a specific district or area.
- Provide pedestrian kiosks, benches, newspaper racks, trash cans, bus shelters, cafe tables, hanging flower baskets and chairs to increase the number of opportunities for people to socialize and spend leisure time outdoors along public streets.
- Provide opportunities for “stationary” pedestrian activities. Stationary activities are either standing or sitting, where people choose to stay in a place to observe or participate in public outdoor activities. Seating can be either primary (chairs and benches, such as that found at a cafe or a transit stop) or secondary seating (low walls, steps, fountain edges, where people spontaneously collect).

“Hell, there are no rules here – we’re trying to accomplish something.”

Jane Jacobs

15. Landscaping and Planter Strips

Planter strips provide an opportunity for pedestrian buffering and a decorative streetscape element. Planter strips provide identity to an area, increase pedestrian safety and enhance the aesthetics of community livability.

Higher traffic speeds, particularly those more than 45 mph, affect pedestrian comfort and perceptions of safety when streets lack a sufficient buffer between sidewalks and adjacent travel lanes. Tree-lined planting strips in areas with narrow sidewalks and no on-street parking encourage walking and public transit use.

General design considerations and guidelines

- Use planter strips in less intense commercial areas where there is less need for wide sidewalks to accommodate high levels of pedestrian activity.
- Provide sufficient maintenance to ensure the quality of the planting areas.
- Preserve existing mature trees through flexible street designs.
- Encourage agreements with private developers and landowners to plant and maintain trees.
- Consider wider planting strips for less intense residential areas.
- Differentiate between regional and local streets using the design and planting of landscape strips and tree wells.
- Ensure proper sight distance and other safety elements in designing and landscaping planting strips.

“It has become appallingly obvious that our technology has exceeded our humanity.”

Albert Einstein

16. Adjacent Land Use

The site planning and building design of the adjacent land use can significantly contribute to supporting walking and transit as a competitive choice over the automobile. The design guidelines for adjacent land use focus on supporting and encouraging pedestrian activity, including providing pedestrian linkages to transit and among different land uses. The site and building design of adjacent land use is an opportunity to redirect private investments to support multi-modal transportation and increase transit ridership. Refer to guideline section 18. Building Street Frontages for how to coordinate adjacent land use and regional street design.

The adjacent land uses are composed of those land uses that can orient buildings to the street, street frontage types for those uses, land-use edge treatments for those uses that are not oriented to the street.

General design considerations and guidelines

- Provide appropriate building densities and land uses within walking distance of transit stops to facilitate public transit to become a viable alternative to the automobile.
- Provide mixed-use development to encourage and support walking trips amongst uses and to transit.
- Support the physical definition of streets and public spaces as places of shared use by appropriate urban architecture and landscape design.
- Create safe and secure environments through the design of streets and buildings, but not at the expense of accessibility and openness.
- Balance the need to accommodate automobiles and respect pedestrians and public space through the appropriate design of streets. Streets are the public spaces of the region.

- Create comfortable and interesting pedestrian environments to support public outdoor activity. Properly configured, street design should encourage walking and enable neighbors to know each other, protect their communities and evolve socially.

17. Buildings Facing the Street

Orienting the front entrance of buildings to the street is fundamental to increasing regional and local access and mobility by transit, walking and bicycling. It facilitates pedestrian access and supports pedestrian activity on the street.

General design considerations and guidelines

- Buildings should face the street within central city, regional center, town center, station communities and main street areas.
- Use land-use controls, such as floor area ratio, building setbacks, build-to lines, building orientation, open-space requirements and lot coverage to ensure buildings face the street.
- Control scale of buildings to provide spatial definition of streets, as shown in Figure 19.
- Provide horizontal spatial definition to streets with buildings oriented to the street.
- Provide vertical spatial definition to streets with buildings oriented to the street as shown in Figure 19. Ratios less than 5:1 of building height to right of way provide a visually defined street environment. Ratios of 1:2 to 1:3 are ideal.
- Street trees can be used to reduce the perceived scale of the street width. With tall buildings located on a narrow right of way, building setbacks with recess line can preserve daylight access to the street and provide street spatial definition.

“Sometimes you gotta create what you want to be part of.”

Geri Weitzman

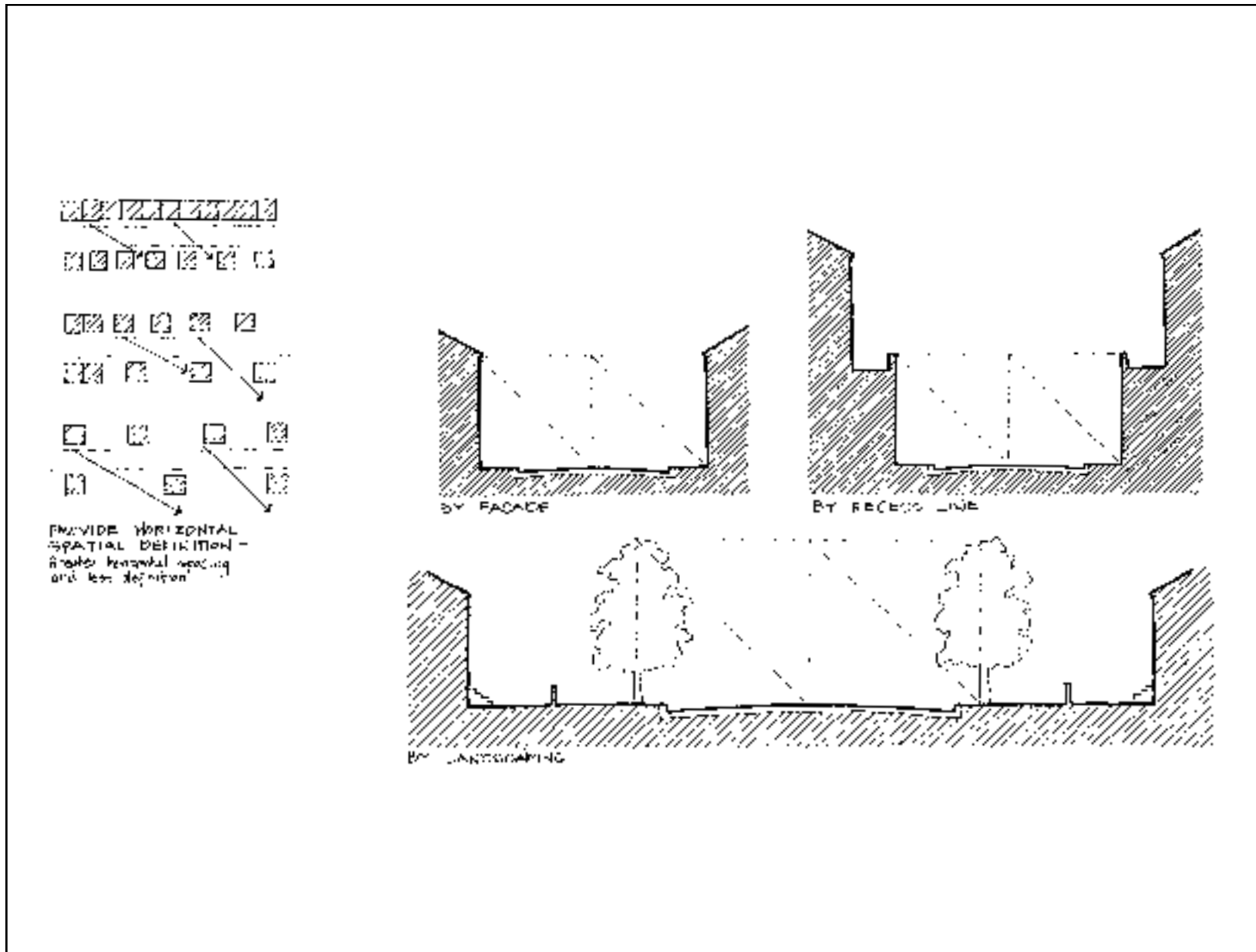


Figure 19. Provide horizontal spatial definition to streets with front of buildings oriented to the street. Provide vertical spatial definition with uniform building heights, street trees or building recesses.

18. Building Street Frontages

This section identifies eight building frontage types as design prototypes for how individual buildings can support pedestrian activity and access to regional streets. The frontage types are distinguished from each other by the type and intensity of commercial, mixed-use or residential land use, and the type and intensity of pedestrian activity. They are organized from most intense commercial uses to least intense residential uses, as shown in Table 3, and Figures 20 to 23. The physical improvements and relationship to the right of way, as well as pedestrian and outdoor social activity that can be supported, is discussed for each type.

Where buildings are located relative to the property line is a key element to support pedestrian activity in regional street design. The travelway, pedestrian and adjacent land-use realms are shown in relationship to the street right of way and the location of the building frontage in each figure. Buildings can be located within, along or set back from the right of way, depending on the width of the street and the desired type and intensity of pedestrian activity. Planners, designers and engineers can use these frontage types to consider how to best design the pedestrian, travelway and street realms for given right of way and traffic volume conditions.

General design considerations and guidelines

- For wide streets with ground-floor commercial activity, consider an arcade with building above projecting above the right of way, to reduce the width of the street.
- For narrow streets with ground-floor commercial activity, consider a recessed arcade, where the building's frontage is along the right of way. This provides spatial definition to the street, yet permits a greater travelway width by extending the pedestrian realm onto private property.
- For significant traffic volumes on narrow streets with residential or mixed uses, consider a forecourt or raised terrace, where buildings have a shallow setback (5 to 15 feet) from the right of

way. This gives privacy and spatial separation from the street, while supporting pedestrian access to the street.

- The appropriate relationship of building frontage type and regional street multi-modal design requires public and private decision makers to balance the needs of adjacent land-use development while encouraging pedestrian access and multi-modal mobility.

Building Frontage Type	2040 Concept Land-Use Component	
	Commercial and Mixed-Use Central City Regional Center Town Center Station Community Main Street	Residential Inner Neighborhood Outer Neighborhood
Arcade with building above	X	
Storefront	X	
Recessed arcade	X	
Steep	X	X
Forecourt	X	X
Raised terrace	X	X
Porch and fence		X
Common lawn		X

Table 3. Building frontage type by 2040 Growth Concept land-use components.

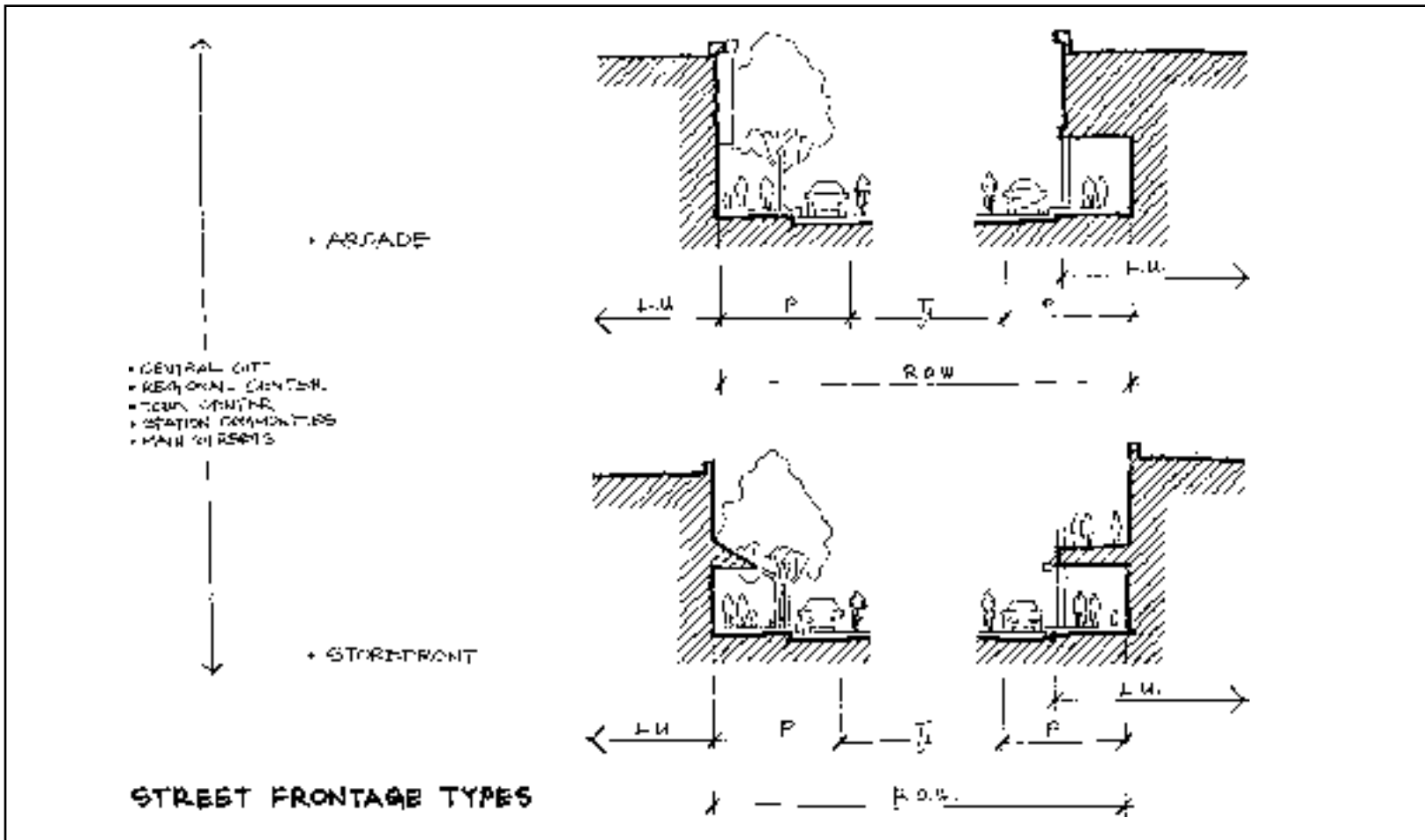


Figure 20.

Arcade with building above – This applies to mixed-use residential or commercial buildings with ground-floor retail. The arcade projects above the right of way, with occupiable floor area above. The treatment creates a sheltered outdoor place for public use and provides a continuous covered pedestrian way. Projecting bay windows provide opportunities for people to view the activity on the street in privacy, where they can only be publicly seen if standing at the window. This treatment provides spatial definition and activity to the street, and increases visibility of the storefronts to pedestrians and motorists.

Storefront – This applies to mixed-use residential or commercial buildings. The building is aligned directly on the property line with the building entrance at grade, with ground-floor retail and no ground-floor residential use. Projecting awnings or second story balcony provides a continuous covered arcade. This treatment provides spatial definition and activity to the street, and increases visibility of the storefronts to pedestrians and motorists.

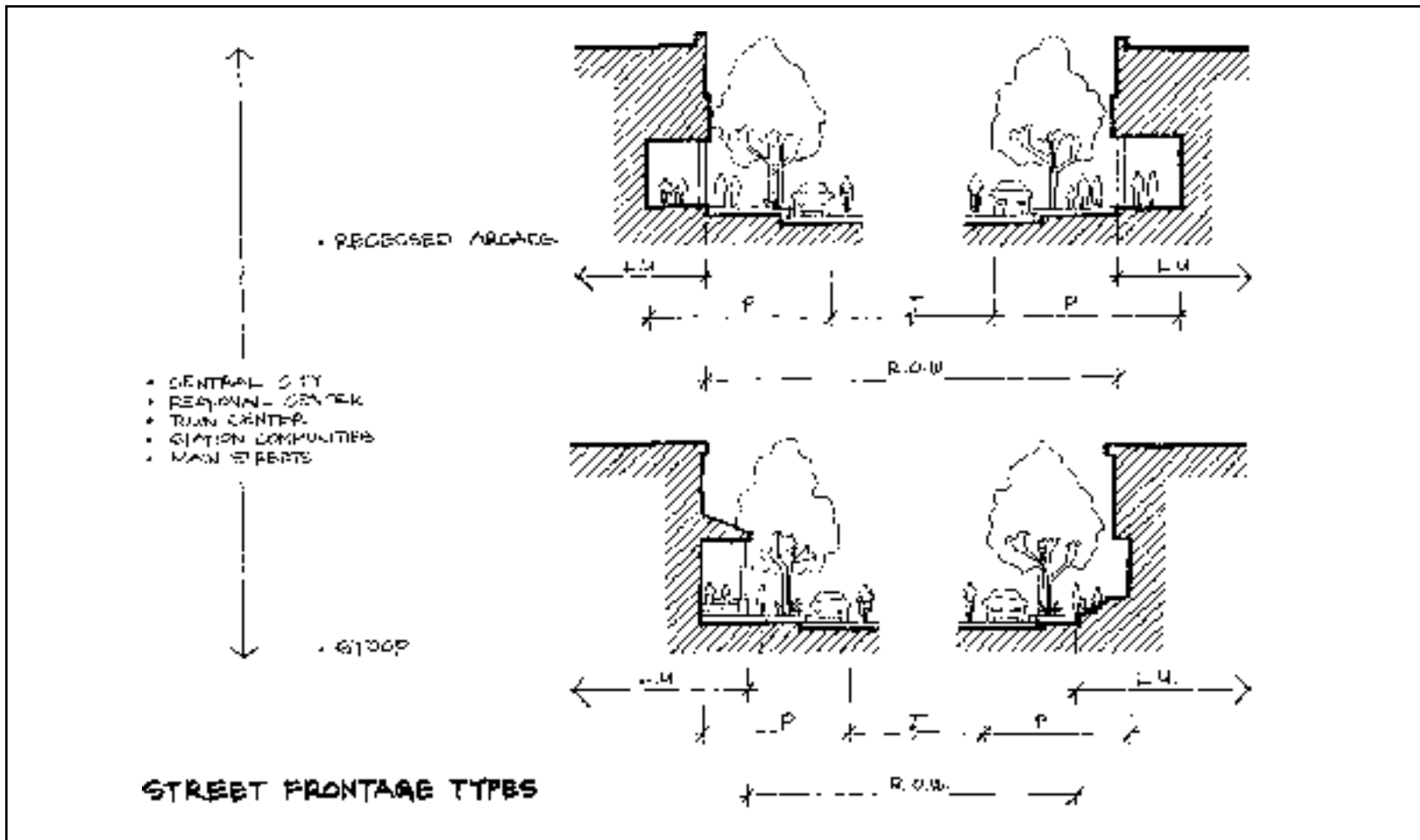


Figure 21.

Recessed arcade – This applies to mixed-use residential or commercial buildings. Buildings are aligned directly on the property line with the building entrance at grade setback from property line creating a deep pedestrian sidewalk. This treatment provides direct activity to the street and increases public outdoor space for private uses to spill out on the sidewalk.

Stoop – This applies to residential or commercial areas, where buildings are aligned directly on the property line. Building entrances and the first floor are slightly raised above street level. The front door is a semi-private, semi-public area that provides a vantage point to view and make social contact with the activity on the street. This treatment provides spatial definition to the street and some privacy for first-floor windows and living or working areas.

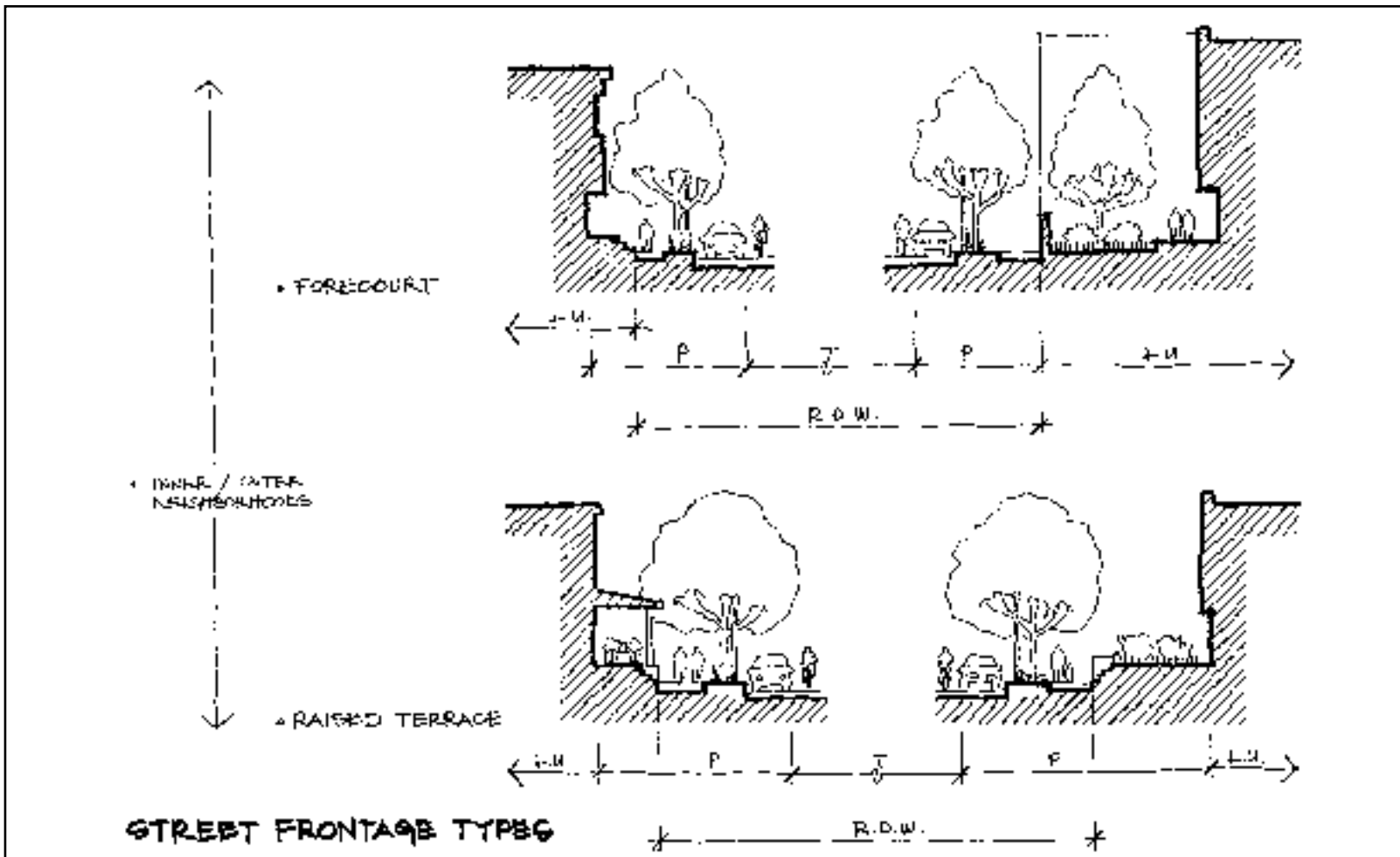


Figure 22.

Forecourt – This applies to residential or commercial areas where buildings are aligned directly on the property line. A recessed courtyard faces the street with a low wall separating the court from the street. This treatment provides a courtyard that is limited to private use, but is publicly visible. People using the courtyard can see and be seen from the street, allowing a more controlled form of social contact, based on how people use the courtyard space. Street trees maybe planted within the courtyard to increase privacy for upper level uses.

Raised terrace – This applies to residential or commercial areas where buildings are set back from the property line with a raised garden or terrace facing the street. This treatment provides a balance between public and private social activity. Ground-floor living or working areas are raised from street level, providing privacy from public view from the street. Covered terraces provide outdoor space for cafes and restaurants where people can view and be seen from the street. It allows people to have a public social presence while maintaining control over their outdoor space.

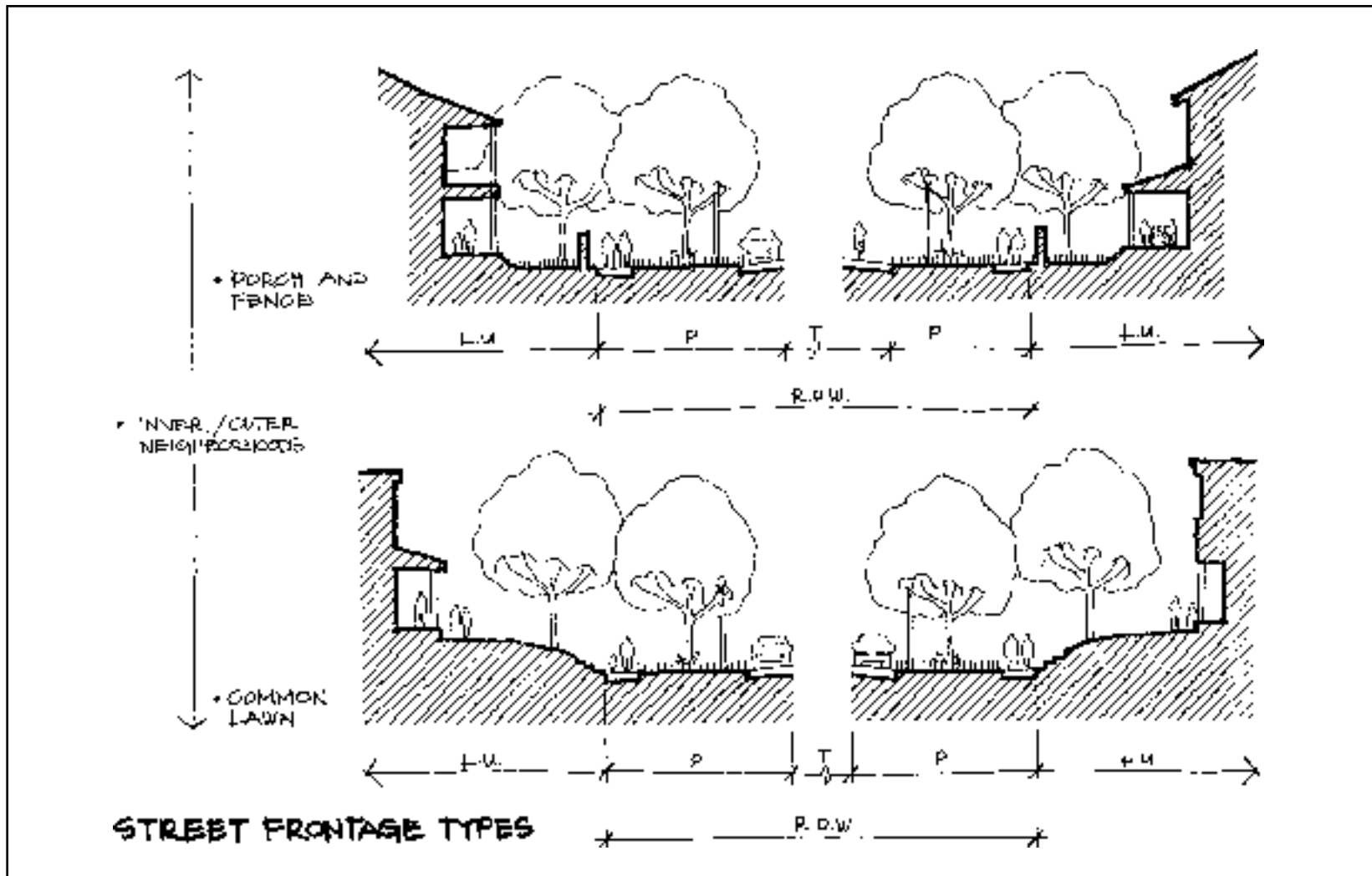


Figure 23.

Porch and fence – This applies to residences with a projecting front porch setback from the property line with a fence marking the boundary between the public street and private property. The front yard setback and fence provide a semi-private space for residents to view the life on the street. This treatment facilitates a sense of neighborhood ownership of the street and encouraging neighborly social contact among the people using and living on the street.

Common lawn – This applies to residences set back from the street with a broad landscaped front yard. This treatment provides a high degree of privacy for the residences. People using the street feel less inclined to initiate spontaneous social contact with residents.

19. Land-Use Edge Treatments, Buffers and Soundwalls

Land-use edge treatments, the land adjacent to and visible from the public right of way, are an opportunity to enhance the identity and status of a regional street. Land-use edge treatments are for those land uses that do not orient the primary face or front entrance of buildings to the street, such as commercial corridors and outer residential neighborhoods.

Land-use edge treatments provide a buffer for pedestrians from surface parking lots and site circulation and loading.

Buffers, fences and soundwalls are the elements that separate the public right of way and private property. Buffers, fences and soundwall treatments are appropriate for industrial and commercial corridors, and employment centers. The design of these elements can enhance the identity of the area and provide visual continuity to the regional street network. Figures 24A through 24D illustrate various edge treatments for land-use intensities ranging from least to most intense and for employment centers.

General design considerations and guidelines

- Provide a minimum 5-foot landscape buffer along property line for commercial corridors with buildings set back from the street and parking lots abutting the street.
- Plan breaks in soundwalls and fences to allow bicycle and pedestrian access. Spacing of breaks should be consistent with connectivity spacing guideline of 12 to 14 per mile (see section 8. Street Connectivity). Combine breaks with emergency access where appropriate.
- Discourage fencing that isolates communities and neighborhoods.

- Require minimum number of street and access connections per mile consistent with connectivity spacing guideline of 12 to 14 per mile.
- Require a landscape strip on private property. If a fence is proposed on private property, place landscaping between the fence and the public right of way to screen parking and loading areas from view.

“Become a possibilitarian. No matter how dark things seem to be or actually are, raise your sights and see possibilities – always see them, for they’re always there.”

Norman Vincent Peale

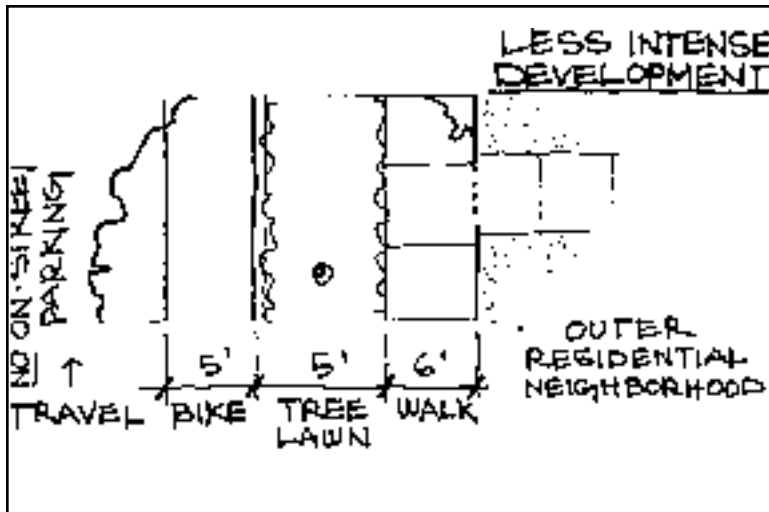


Figure 24A. Less intense development, a wide landscaped buffer provides separation for the pedestrian from traffic, and a large planting area for street trees.

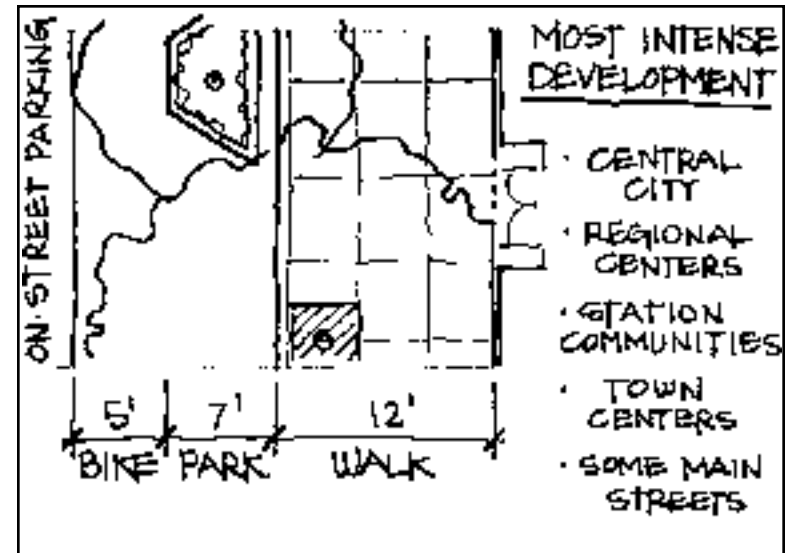


Figure 24C. Most intense development, buildings are located adjacent to the right of way with recessed entries.

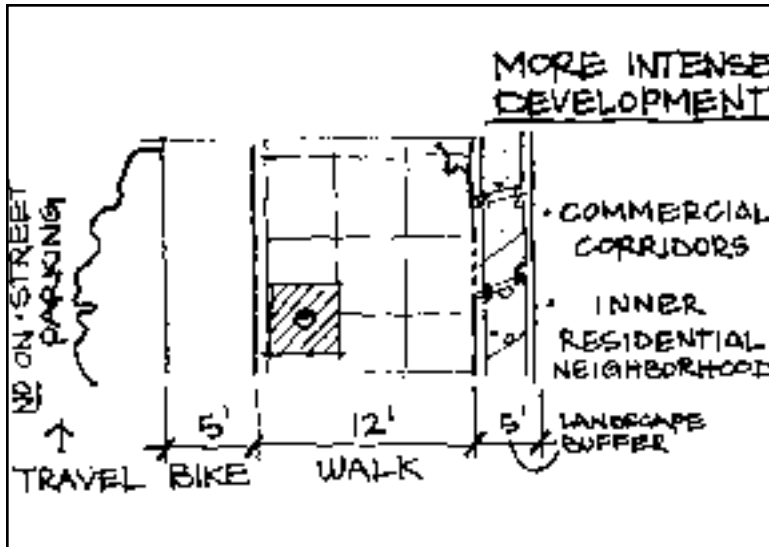


Figure 24B. More intense development, a landscape buffer provides separation from commercial corridor traffic.

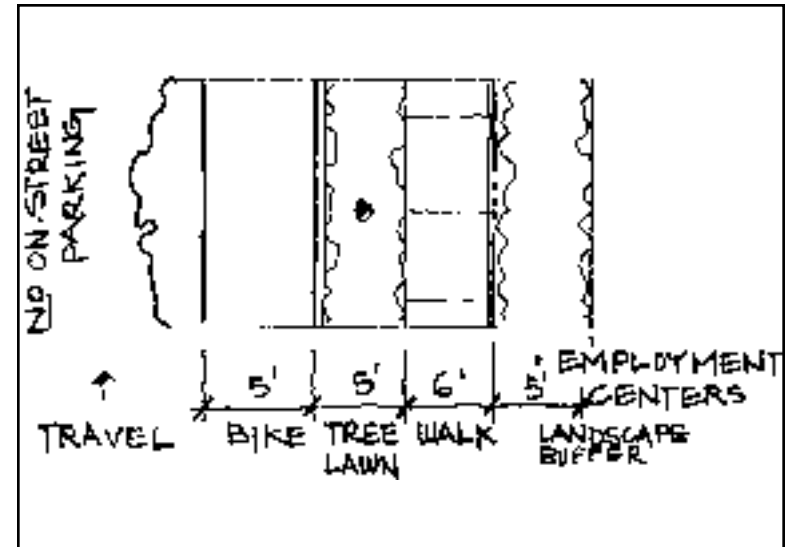


Figure 24D. Employment centers, a landscaped buffer screens the employment parking or service areas from public view, enhancing the identity of the street.

20. Transitions

For regional street design, “transitions” refer to changes in land use, right of way width or regional street type. Transitions are typically neglected aspects of urban form, and result in unattractive leftover planting areas. Transitions are opportunities to create gateways to signify the change from one land-use area to another.

General design considerations and guidelines

- Provide identity and continuity of street.
- Locate transitions at change in land use or at intersections.
- Provide identity and continuity of street by providing landscape plantings as illustrated in the transition designs for land-use edges for the predominant regional street types.

Figure 25 illustrates two types of transition:

From street to boulevard

Use the parking curb extension as a landscaped transition from the wider travel way of the regional street or commercial corridor to the narrower travel way of the boulevard. A sign or other monument can be used to identify the change from one land-use area to another.

From boulevard to street

Use the parking curb extension as a landscaped transition from the narrower travel way of the commercial or residential boulevard to the wider travel way of the commercial street or corridor. A sign or other monument can be used to identify the change from one land-use area to another.

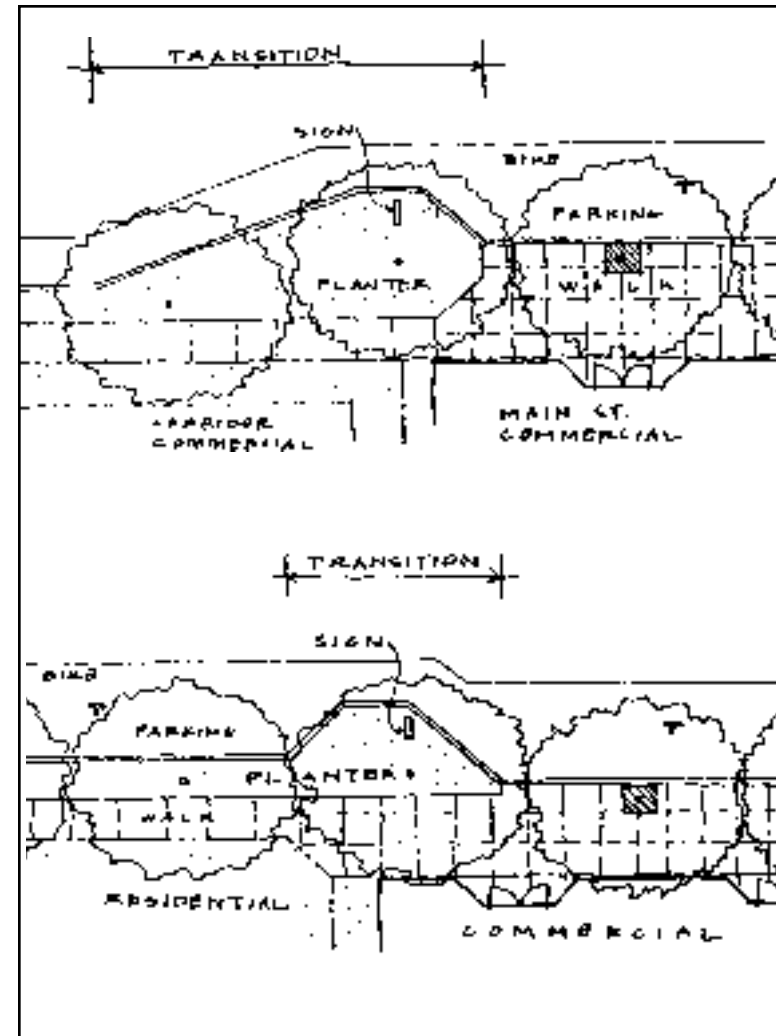


Figure 25. From street to boulevard – Use the parking landscape bulb as a landscape transition from the wider travel way of the street to the narrower travel way of the boulevard.

From boulevard to street – Use the parking landscape bulb as a landscape transition from the narrower travel way of the boulevard to the wider travel way of the street.

21. Stormwater Opportunities

Impervious surfaces are hard surfaces that don't allow water to soak into the ground, and increase the amount of stormwater running off into the stormwater drainage system. The majority of total impervious surfaces is from roads, sidewalks, parking lots and driveways. Stormwater runoff from these impervious surfaces reduces the amount of groundwater and increases the capacity requirements of the stormwater drainage system. Higher impervious surface coverage has been linked to dramatic changes in the shape of streams, water quality, water temperature and the health of the wildlife that live in the natural waterways.

Most local governments require stormwater drainage and treatment systems and other development practices to reduce the impact of impervious surfaces, but could do more to address the source of the problem through impervious surface reduction techniques.

General design considerations and design guidelines

- Look for opportunities to reduce impervious surfaces in the development review and street design process.
- Earthen open channels and swales can be used on smaller streets and roads, as long as runoff velocities are low enough to prevent erosion.
- Earthen open channels and swales can be effective in filtering stormwater pollutants through grass and soil.
- A wider right of way is required for open channels or swales.
- Increase the width of the planting strip adjacent to the travelway between 6 to 8 feet for storage of plowed snow, where required.
- Grade sidewalks so that stormwater runs off into adjacent unpaved areas such as planting strips or landscaped private property.
- In landscape design, select grass species that produce a uniform cover of fine-hardy vegetation that can withstand prevailing moisture conditions. Provide routine mowing to keep grass in active growth phase and to maintain dense cover.
- For enclosed stormwater drainage systems, consider in-line treatment strategies including special structures to trap sediment (catch basins, sump pits, oil/grit separators). Regularly remove trapped sediment and pollutants to avoid resuspending them in subsequent storms.
- Consider reducing commercial, industrial and multi-family use parking requirements to reduce impervious surface coverage. Consider reducing building footprints (and roof surface area) by constructing taller buildings. Use on-street parking to provide some of the required parking supply.
- Encourage the use of shared parking to reduce the size and number of parking lots.
- Consider use of porous pavement (pavers) for appropriate areas such as under bicycle parking, overflow parking areas, emergency access roads and other low-use areas.
- Consider use of alternative pervious surfaces such as gravel and bark in appropriate low-use areas.
- Encourage underground, under-building or above-ground parking structures for appropriately sized development projects.
- Encourage shared driveways between adjacent development projects.
- Follow guidelines for erosion control techniques during construction of regional streets and adjacent development projects.

IV. Predominant Regional Design Types

The predominant regional design types fall under the following categories:

Throughways emphasize motor vehicle travel and connect major activity centers.

Boulevards serve major centers of urban activity and emphasize public transportation, bicycle and pedestrian travel balancing the many travel demands on intensely developed areas. These types of streets represent 80 percent of the regional transportation system.

Streets serve transit corridors, main streets and neighborhoods with designs that integrate all modes of travel and provide accessible and convenient pedestrian, bicycle and public transportation travel.

Roads are vehicle-oriented, with designs that integrate all modes but primarily serve motor vehicles.

The predominant types differ based on purpose and design emphasis required to support the 2040 Growth Concept land-use components. The following describes the purpose, function and land-use relationships for each predominant regional street type.

Throughways

These facilities connect major activity centers within the metropolitan region, including the central city, regional centers, industrial areas and intermodal facilities. Throughways provide inter-city, inter-regional and inter-state connections.

Throughways are divided into freeways where all intersections are grade separated, and highways, which have a mix of grade separated and at grade intersections. Throughways are designed to provide high-speed travel for longer vehicle trips and primary freight routes through the region to serve all 2040 Growth Concept land-use components.

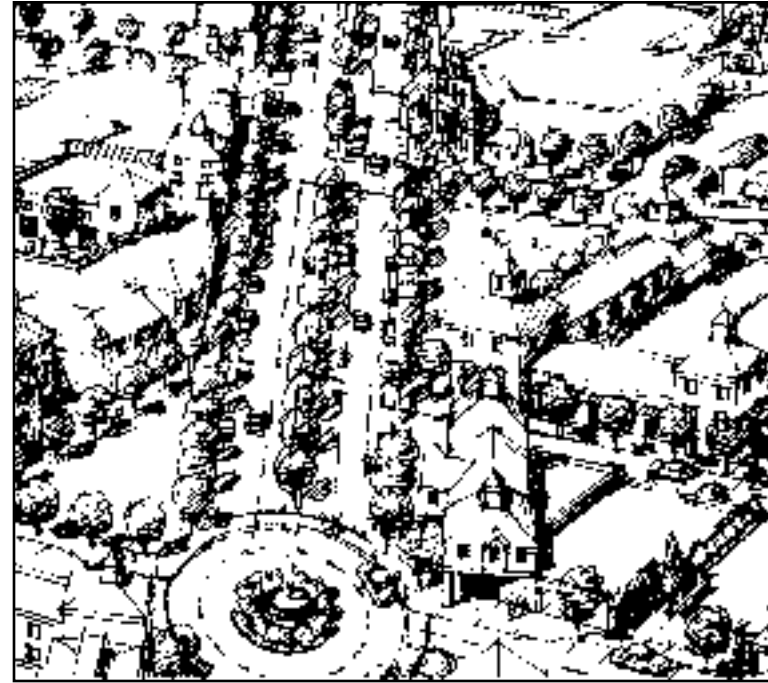


Figure 26. The regional transportation system is comprised of throughways, boulevards, streets and roads.

Freeways

Freeways consist of four to six vehicle travel lanes, with additional travel lanes in some cases. Design speeds and posted speed limits for these facilities are high. Freeways are completely divided, prohibiting access and turning movements except at grade-separated interchanges. There is no pedestrian and bicycle access to freeways, and buildings are not oriented to these facilities. Pedestrian access occurs at over passes or under passes, while bicycle facilities are typically on parallel routes. Freeways traverse all land-use areas.

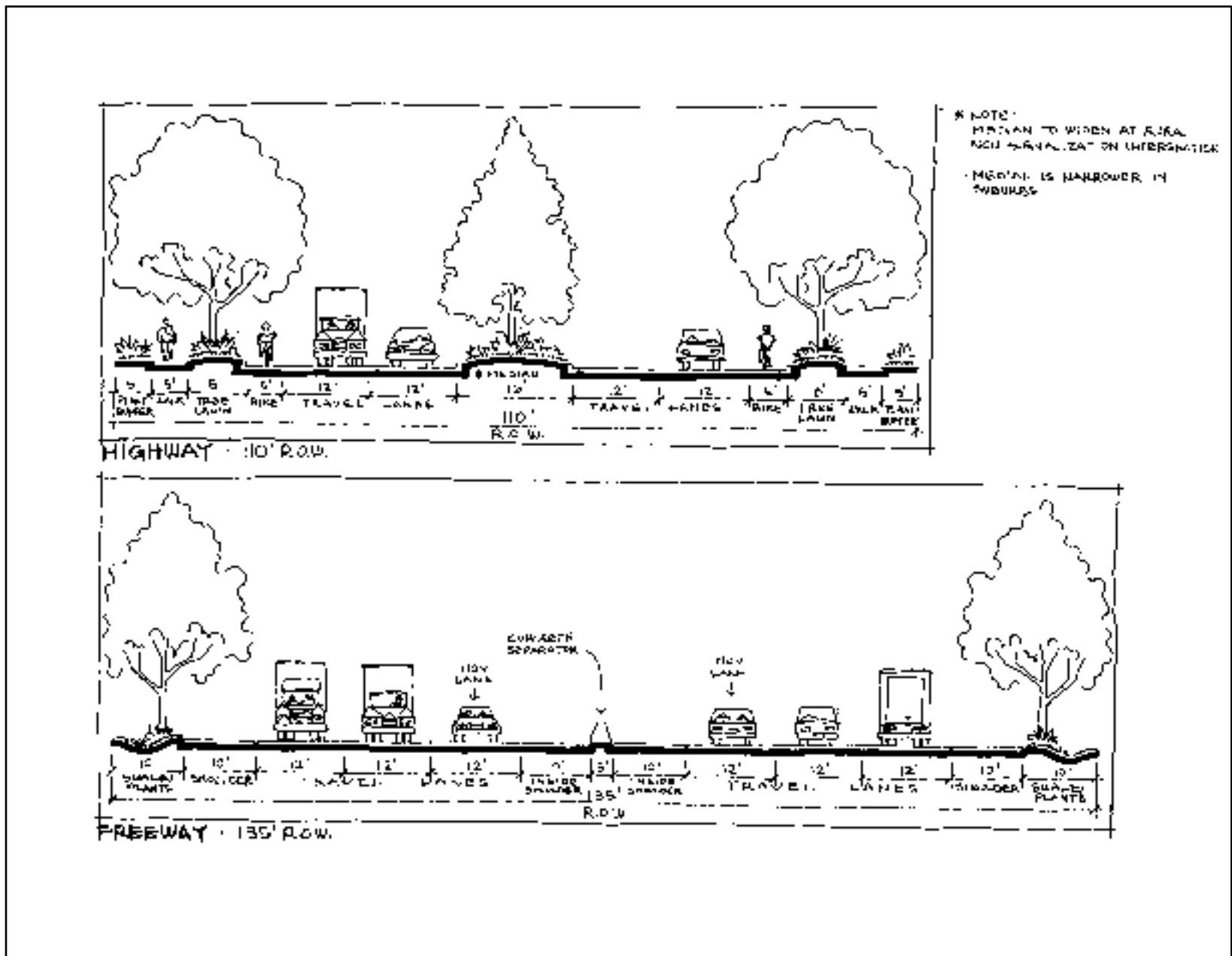


Figure 27. Typical throughway design types: highway and freeway. These facilities are vehicle-dominated.

Highways

Highways consist of four to six vehicle travel lanes, with additional travel lanes in some cases. Design speeds and posted speed limits for these facilities are high. Highways are usually divided with a median, but have left-turn lanes where at-grade intersections exist. Highways have few street connections that occur both at-grade or grade-separated. Land-use access is restricted, with few buildings facing highways. On-street parking is usually prohibited along highways. Highway designs include striped bicycle lanes and pedestrian sidewalks with landscape buffering. Improved pedestrian crossings are located at overpasses or at-grade intersections. Highways traverse all land-use areas.

Boulevards

Boulevards serve the multi-modal travel needs of the region's most intensely developed activity centers, including the central city area of Portland, regional centers, station communities, town centers and some main streets. Boulevards are the continuation of regional street network within more intensely developed activity centers. Boulevards are designed with special amenities that promote pedestrian, bicycle, and public transportation travel in the districts they serve.

Boulevards are classified as regional and community scale designs. Regional boulevards serve a function similar to the major arterial classification designated by most state and local agencies. Community boulevards serve a function similar to the minor arterial classification.

Regional boulevards

Regional boulevards consist of four or more vehicle travel lanes, balanced multi-modal function, and a broad right of way. Features highly desirable on regional boulevards include on-street parking, bicycle lanes, narrower travel lanes than throughways, more intensive land use oriented to the street, wide sidewalks, and may include a landscaped median. The right of way ranges from 85 to 120 feet or greater.

Regional boulevards are located within the most intensely developed activity centers with development oriented to the street. These are primarily central city, regional centers, station communities, town centers and some main streets. Figure 28 illustrates the typical cross-section of a Regional Boulevard.

Other regional boulevard types

The double median or "Parisian Boulevard" type has a central roadway for through traffic separated on either side from local traffic and pedestrian ways by tree-lined medians. This type of street has a minimum right of way width of 100 feet, a functional minimum width of 110 feet, and an ideal width of 120 feet or greater. Figure 29 illustrates the typical cross-section of a double median boulevard.

Community boulevards

Community boulevards consist of four or fewer vehicle travel lanes, balanced multi-modal function, narrower right of way than a regional boulevard, landscaped medians, on-street parking, narrower travel lanes than throughways, more intensive land use oriented to the street, and wide sidewalks. The right of way ranges from 63 to 98 feet or greater.

Community boulevards are located within the most intensely developed activity centers with development oriented to the street. These are primarily central city and regional centers, town centers, station communities and some main streets. Figure 30 illustrates the typical cross-section of a community boulevard.

Other community boulevard types

Community boulevards are also located within main street districts.

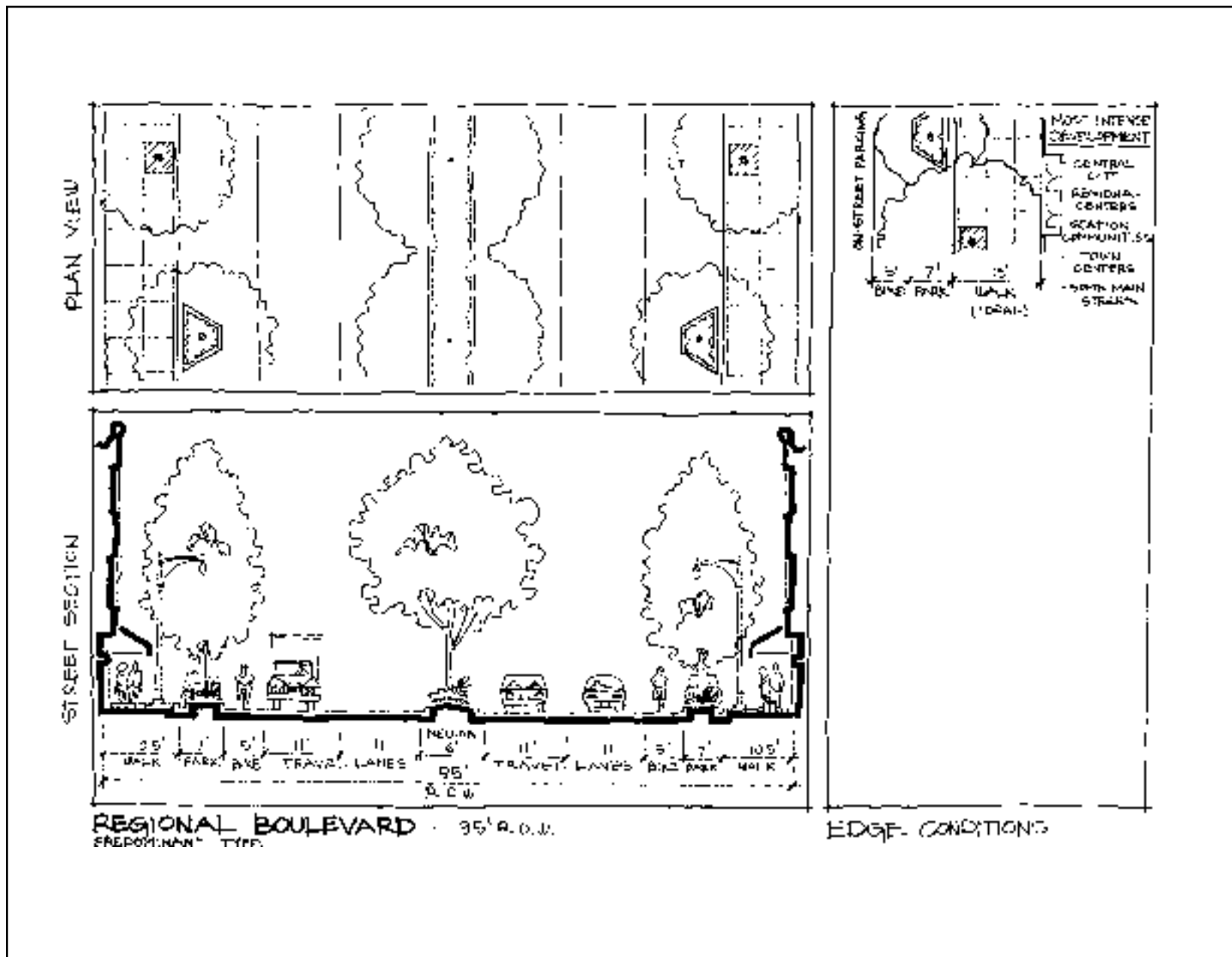


Figure 28. Typical regional boulevard design type. These facilities emphasize bicycle, pedestrian and transit travel modes.

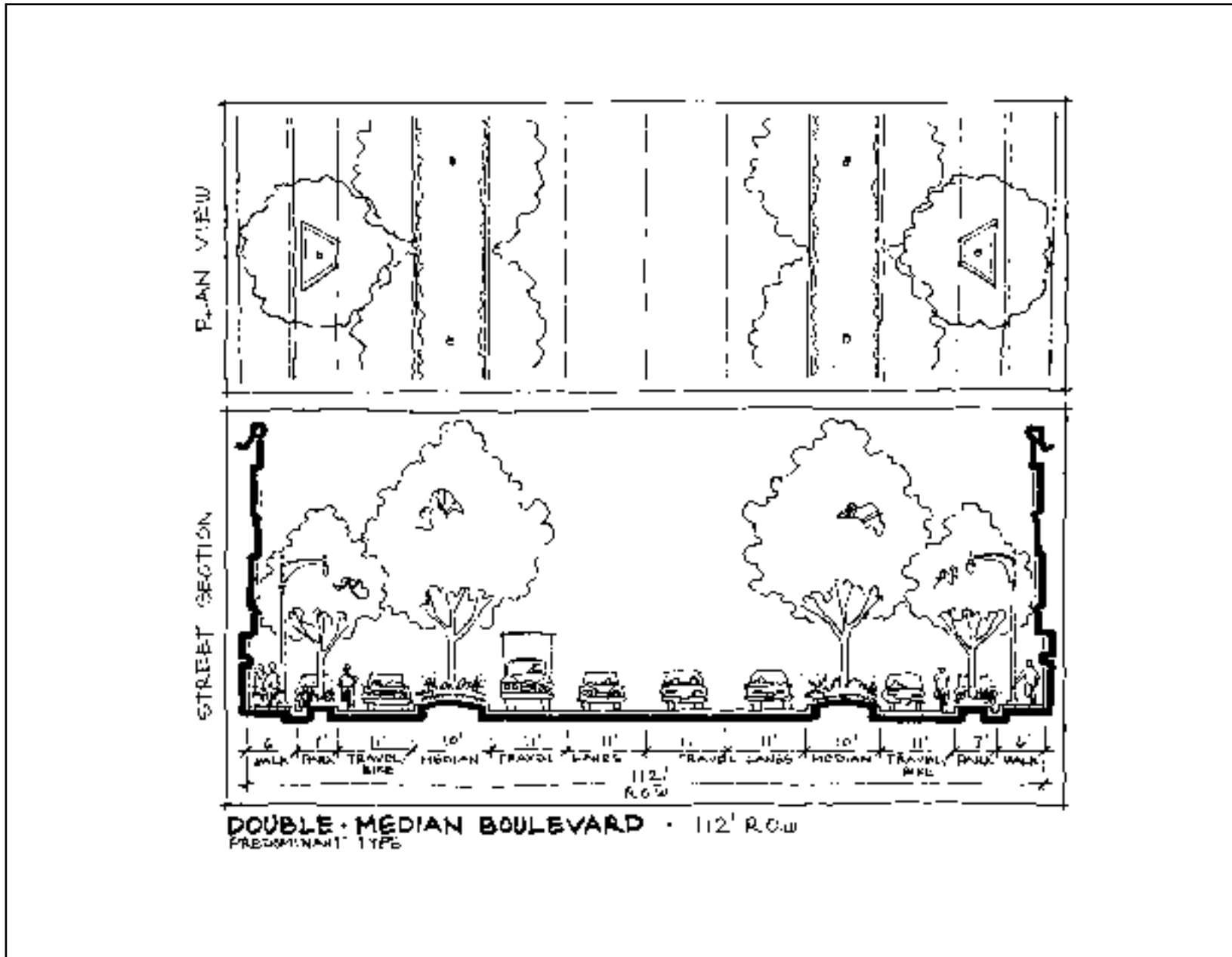


Figure 29. Alternative form of regional boulevard design type – the double median boulevard.

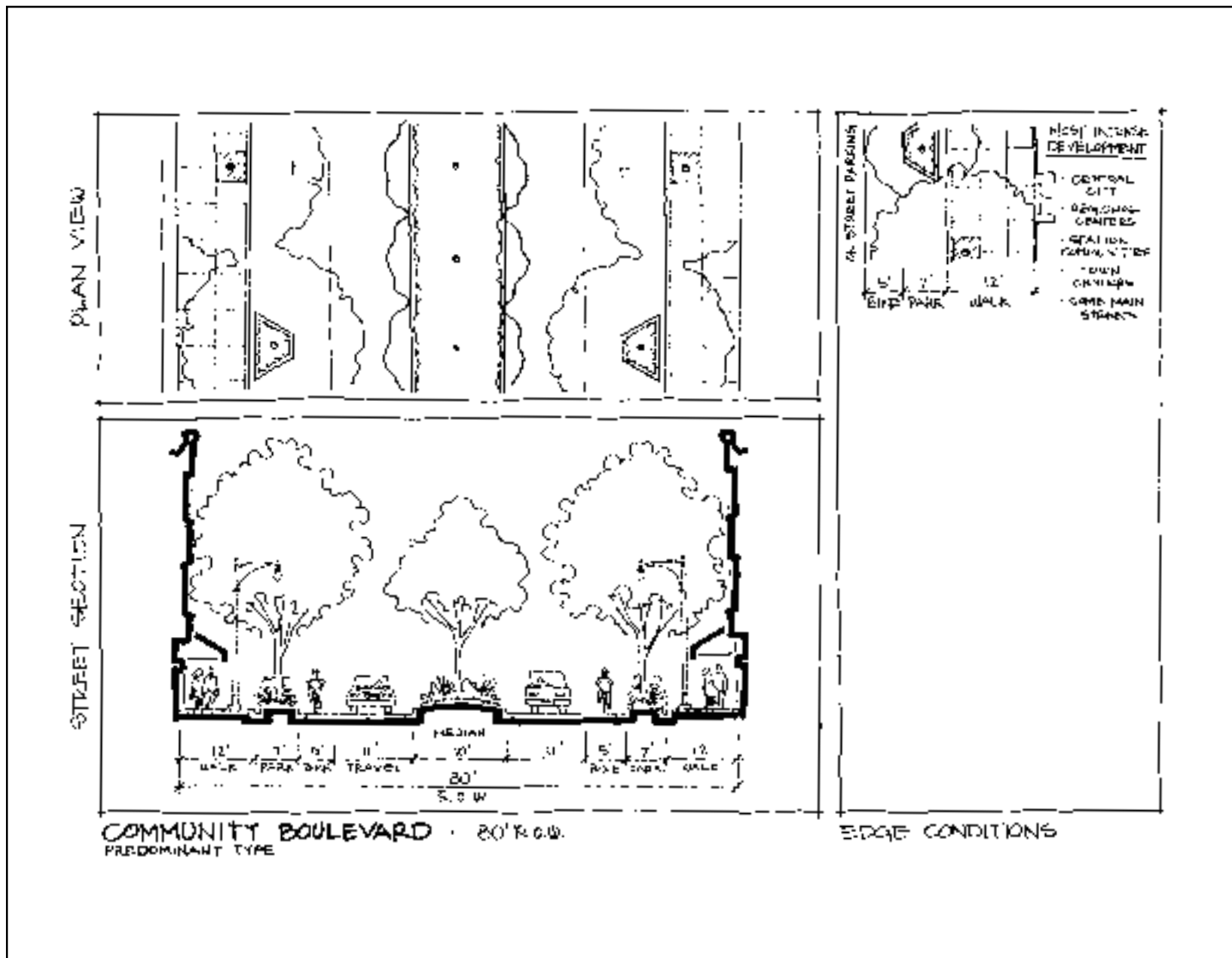


Figure 30. Typical community boulevard design type. These facilities emphasize bicycle, pedestrian and transit travel modes.

Streets

Streets serve the multi-modal travel needs of corridors, inner and outer residential neighborhoods and some main streets. Streets typically are more vehicle-oriented and less pedestrian-oriented than boulevards, providing a multi-modal function with an emphasis on vehicle mobility. Streets are classified as regional and community designs. Regional streets serve a function similar to the major arterial classification designated by most state and local agencies. Community streets serve a function similar to the minor arterial classification.

Regional streets

Regional streets consist of four or more vehicle travel lanes, balanced multi-modal function, broad right of way, limited on-street parking, wider travel lanes than boulevards, corridor land uses set back from the street, sidewalks with pedestrian buffering from street, and a raised landscaped median or, usually, a continuous two-way left-turn lane. The right of way ranges from 80 to 100 feet or greater.

Regional streets are located within low-density inner and outer residential neighborhoods to more densely developed commercial corridors and employment centers where development is set back from the street. Regional streets can be within main street districts where buildings are oriented toward the street at major intersections and transit stops. Figure 31 illustrates the typical cross-section of a regional street.

Other regional street types

At urban growth boundary additions and urban reserve areas, right of way for rural roads should be sufficient for future conversion to regional street design and capacity.

Community streets

Community streets consist of two to four travel lanes, balanced multi-modal function, narrower right of way than regional streets, on-street parking, narrower or fewer travel lanes than regional streets, and residential neighborhood and corridor land uses set back from the street. Community streets provide a higher level of local access and street connectivity than regional streets. Community streets have the greatest flexibility in cross sectional elements. The right of way ranges from 60 to 80 feet or greater.

Community streets can have three different median conditions, depending on the intensity of adjacent land use and site access needs:

Continuous two-way left-turn lane. Used within inner residential neighborhoods, outer residential neighborhoods and commercial corridors where driveways are frequent and the curb to curb width is greater than 74 feet.

Narrow landscaped media. Used to restrict turning movements and reduce conflicts along commercial corridors, main streets and station communities. Used where site access is provided from side streets or U-turns are permitted at frequent intervals, and the curb to curb width is greater than 50 feet.

No median. Used within inner and outer residential neighborhoods, commercial corridors and main streets where site access is less frequent and can be provided without a median or left-turn lanes and without significantly impacting capacity.

Community streets are located within low-density inner and outer residential neighborhoods to more densely developed commercial corridors and main streets where buildings are oriented toward the street at major intersections and transit stops. Figure 32 illustrates the typical cross-section of a community street.

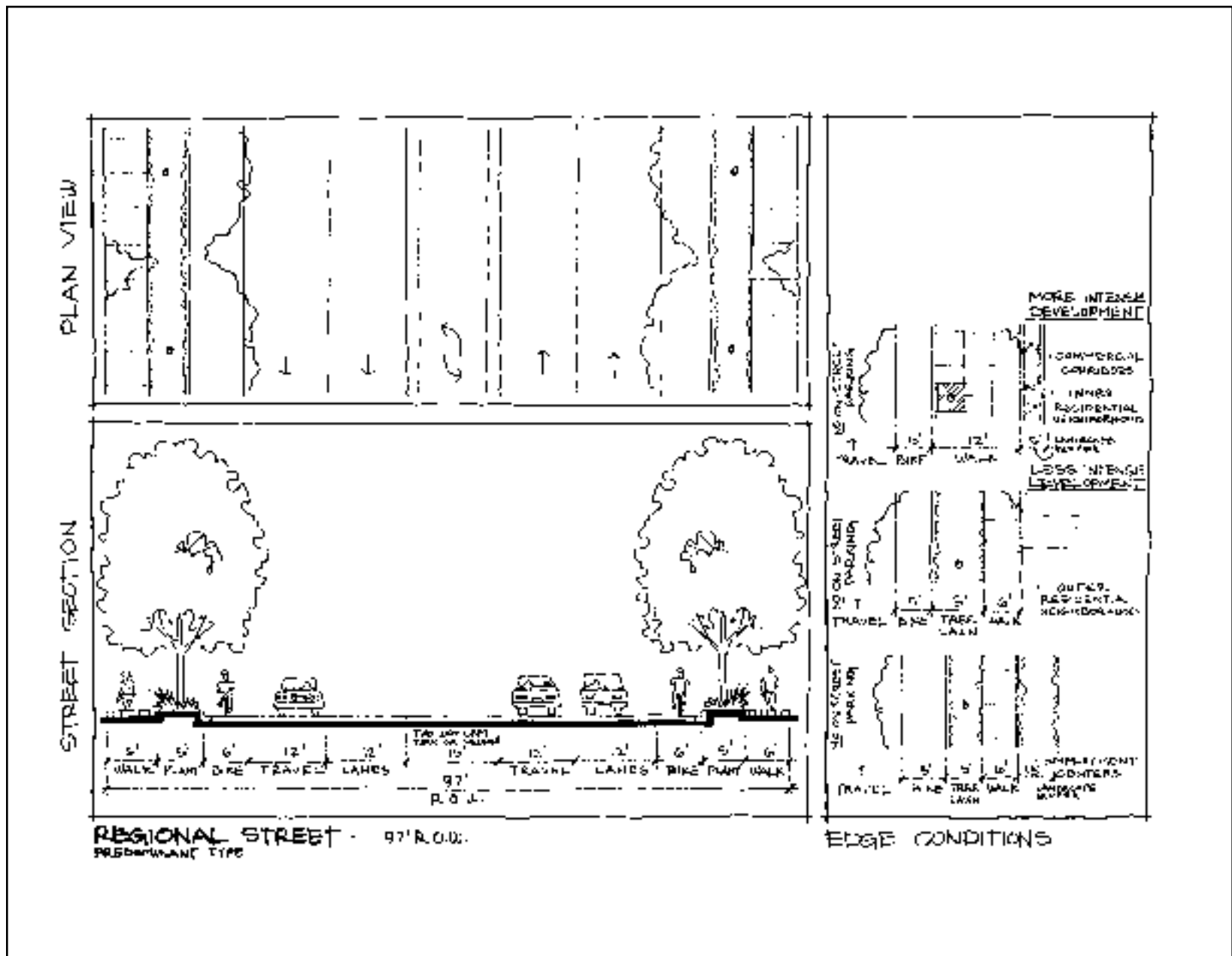


Figure 31. Typical regional street design type. These facilities provide a balance of all modes of travel.

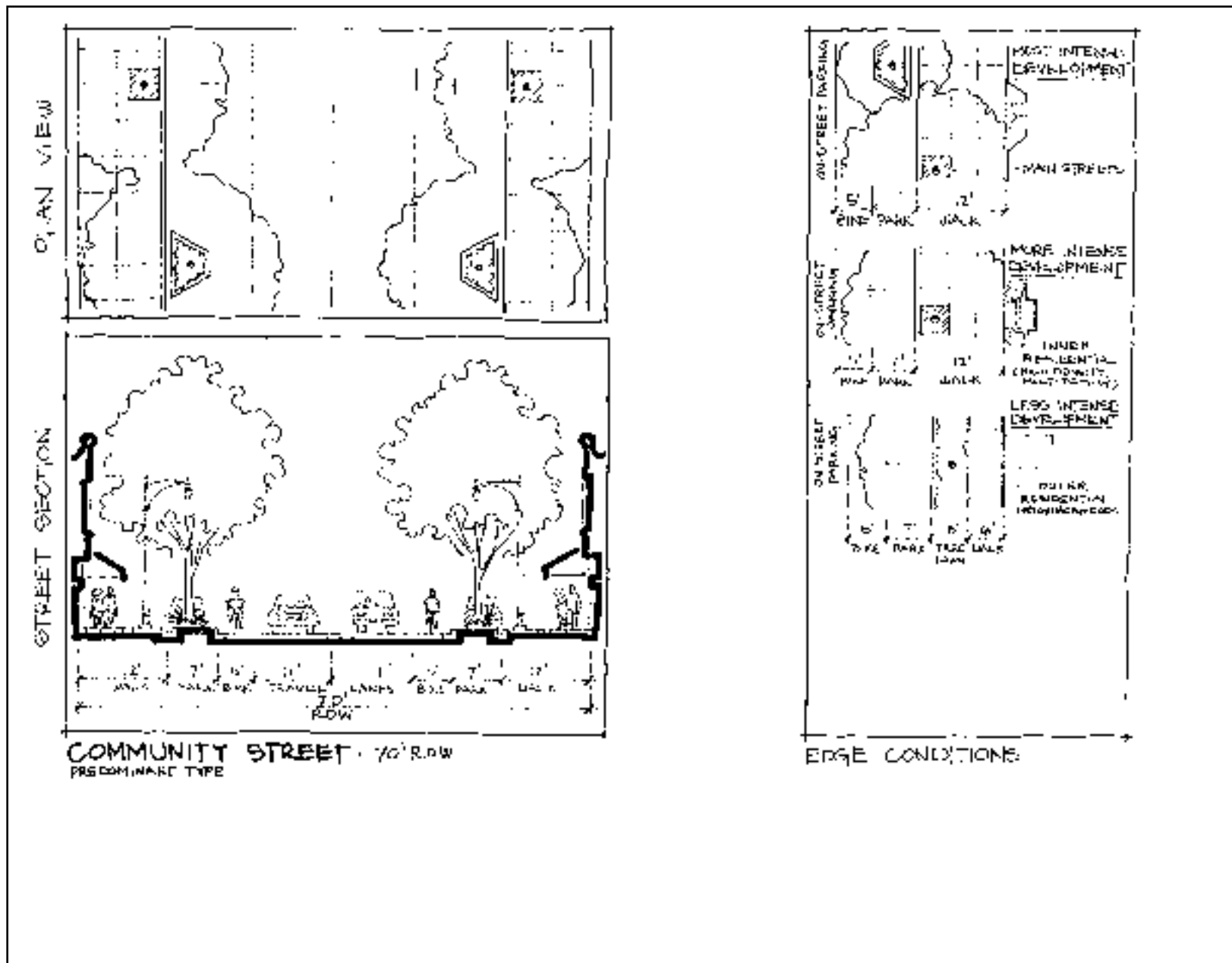


Figure 32. Typical community street design type. These facilities provide a balance of all modes of travel.

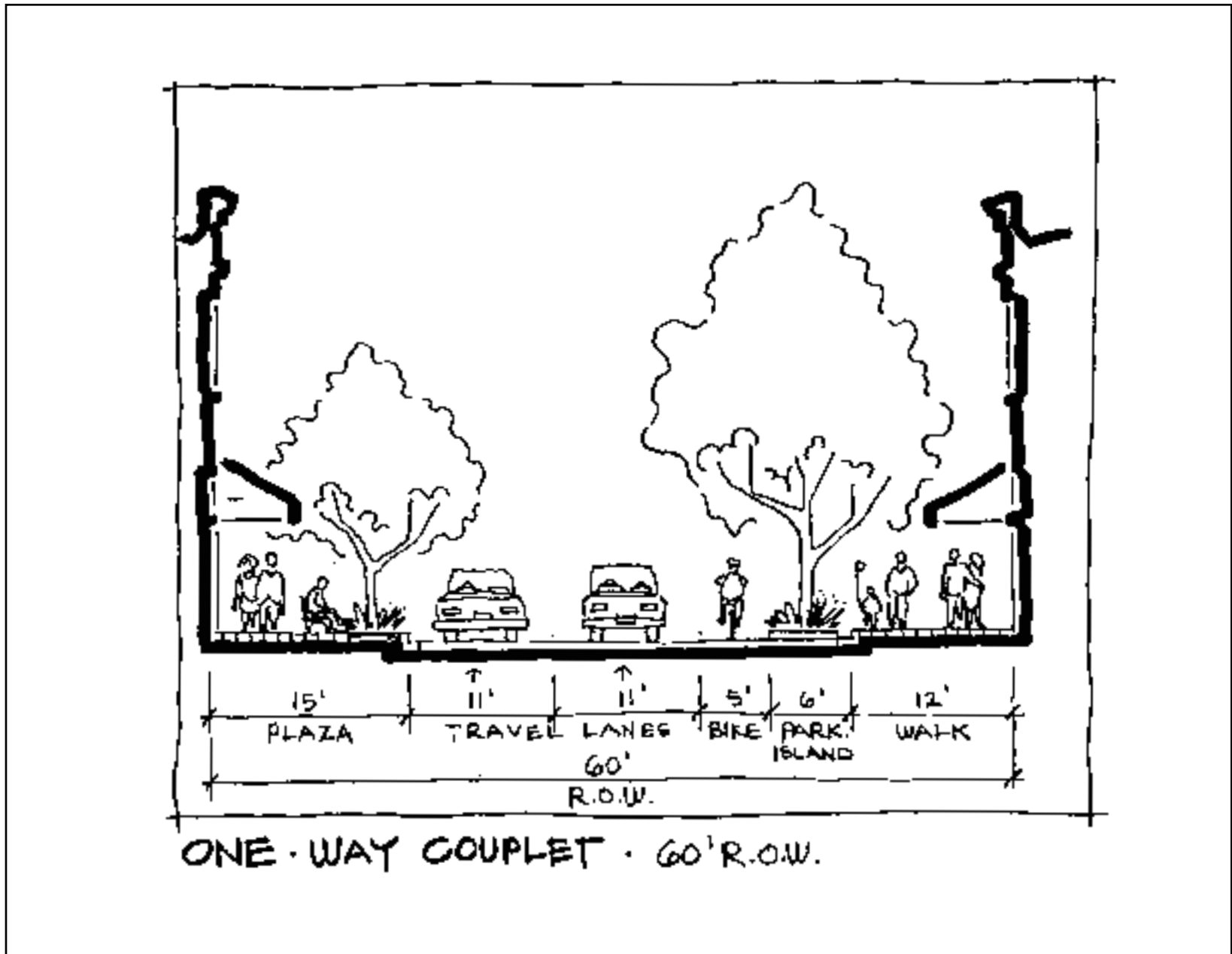


Figure 33. Another form of community street, the one-way couplet.

Other community street types

Community streets can also be located within main street districts.

Main street districts

Regional boulevards, community boulevards and some community streets are located within main street districts. The only difference is that a narrower two-lane street does not require a median.

One-way couplets

Boulevards or streets consisting of paired one-way streets, spaced no greater than one block apart. Used to increase capacity of intensely developed commercial areas. Figure 33 illustrates the typical cross section of one direction of a one-way couplet.

Roads

Roads serve low-density industrial and employment areas as well as rural areas located outside the urban growth boundary. Roads have minimal pedestrian and public transportation facilities. Roads are classified as urban and rural.

Urban roads

Urban roads carry significant vehicle traffic while providing for some transit, bicycle and pedestrian travel. Urban roads serve industrial areas, intermodal facilities and employment centers where buildings are seldom oriented to the street. Urban roads accommodate moderate to high vehicle speeds and usually include four vehicle travel lanes. Additional lanes are appropriate in some situations. There are some street connections and few driveways. Urban roads rarely include on-street parking. A center median serves to reduce conflicts and restrict turning movements except at intersections.

Urban roads serve as primary freight routes and often include specific design treatments to improve freight mobility. Urban roads are designed for through service transit, with limited or no amenities at transit stops. Sidewalks are included, although pedestrian buffering is optional. Pedestrian crossings are included at intersec-

tions. Urban roads have striped bicycle lanes. Urban roads serve industrial areas, employment centers, and corridors. They also serve new urban areas (urban growth boundary additions) where plans for urban use and infrastructure are not complete. Figure 34 illustrates the typical cross section of an urban road.

Rural roads

Rural roads carry rural traffic while accommodating limited transit, bicycle and pedestrian travel. These facilities allow moderate to high vehicle speeds and usually consist of two to four travel lanes, with additional lanes appropriate in some situations. Rural roads have some street connections and few driveways. On-street parking occurs on an unimproved shoulder, and is usually discouraged. These facilities include center turn lanes where appropriate.

Rural roads serve as important freight routes and often provide important farm to market connections. Designs to improve freight mobility are important for these roads. Rural roads rarely serve transit, but may include limited amenities at rural transit stops where transit service does exist. Bicycle and pedestrians share a common paved or unpaved shoulder, and improved pedestrian crossings occur only in unique situations (such as at rural schools or commercial districts).

Rural roads serve urban reserves, rural reserves and green corridors where development is widely scattered and usually located away from the road. Figure 35 illustrates the typical cross section of a rural road.

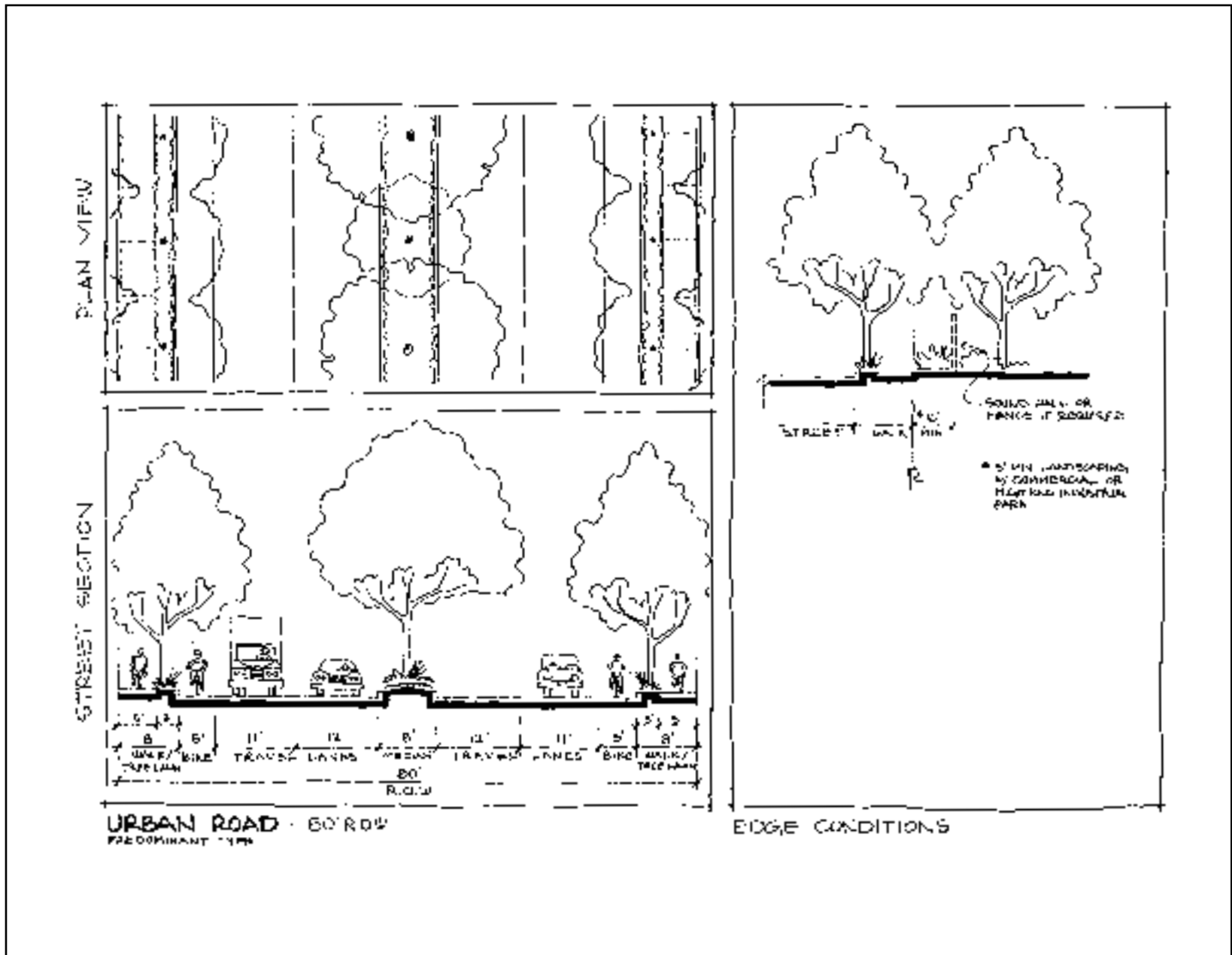


Figure 34. Typical urban road design type. These facilities serve all modes of travel, but emphasize vehicular travel.

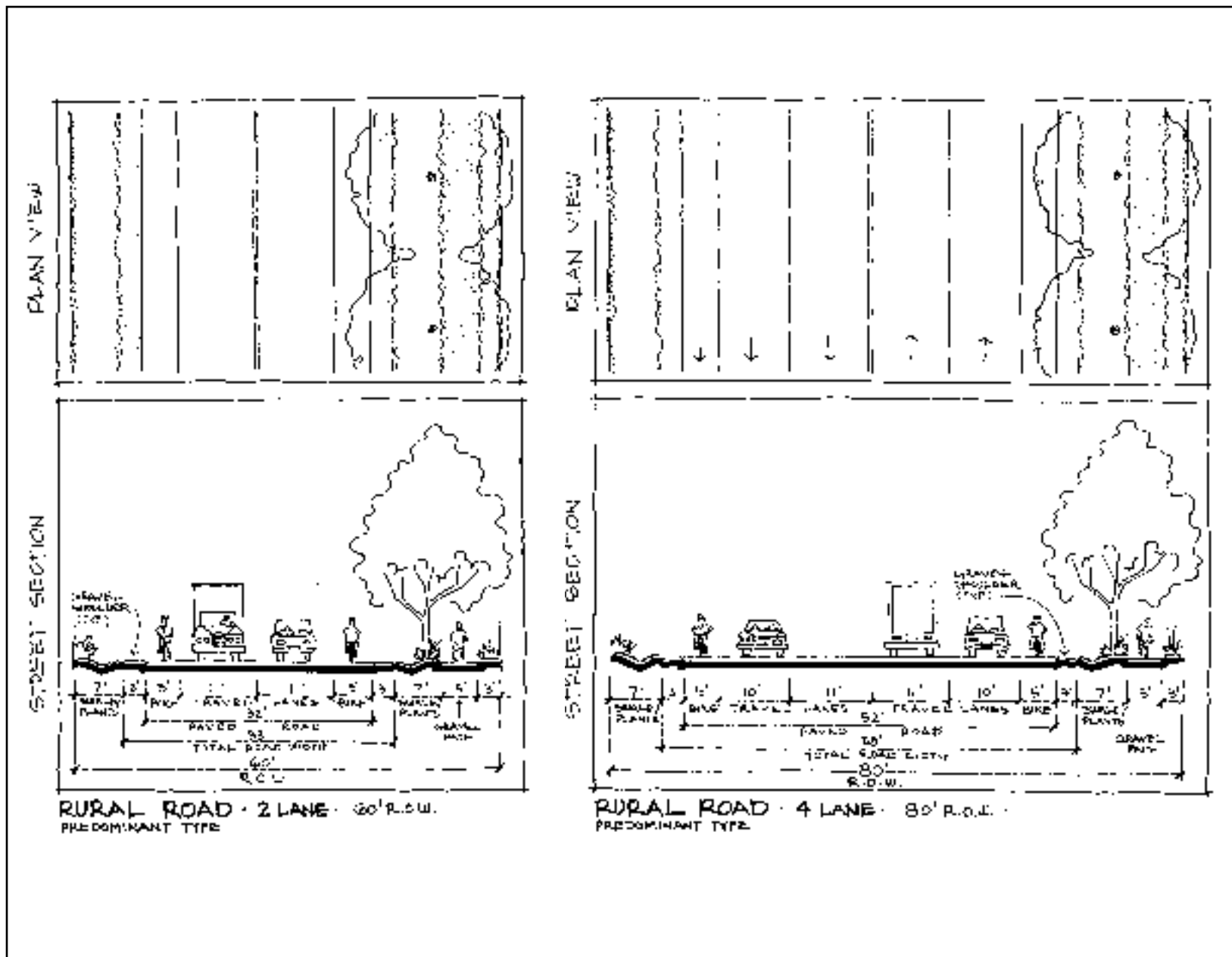


Figure 35. Typical two- and four-lane rural road design types. These facilities are designed for high speeds and are important freight routes.

V. Constrained Right of Way Studies

A fundamental conflict with street design is providing a balance between the desired design elements and the minimal requirements within a constrained right of way. This issue is most significant for regional boulevards, regional streets, community boulevards, community streets and within main street districts. This section of the handbook presents reduced right of way cross sections classified by several right of way widths: ideal, predominant, functional minimum and absolute minimum. This section identifies the priorities for each street type when it is necessary to select among the design elements to provide within a limited right of way.

The ideal and predominant street cross sections define the street types by providing all of the desirable design elements and preferred widths. The functional minimum is the minimum width that can accommodate most of the desirable design elements, without users perceiving the street as too narrow. The absolute minimum is the width in which most of the design elements can be provided without changing the type of street. In absolute minimum width cases, the sidewalk width is reduced to accommodate other elements resulting in narrow pedestrian access.

“Boulevards have much to teach. They are first and foremost public, and their design purpose, beyond that of the movement of vehicles and goods, is for people.”

Allan B. Jacobs

Below the absolute minimum, a decision needs to be made as to which design elements to eliminate. To facilitate the selection, the design elements for each street type are divided into high and low priorities. Within this division, the elements are ranked in order of priority. Lower priority elements can be eliminated without changing the type of street. When higher priority elements are eliminat-



Figure 36. Providing a balance of travel modes within limited rights of way is a significant issue in the region.

ed, the street type changes to the types identified. When a design element is eliminated, the resulting excess right of way is reallocated to the remaining design elements.

A discussion of how to design the transitions between wider and narrower rights of way is discussed under the Elements of Design under “Transitions.”

Regional Boulevards

Regional boulevards are major arterial streets. They are distinguished from the other regional design types by providing a minimum of four travel lanes, a narrow central landscaped median, wide sidewalks, bicycle lanes and on-street parking.

Widths

- Ideal width – 110 feet. This width provides a generous dimension for a regional boulevard, easily accommodating all the desirable design elements. Wide sidewalks can be accommodated, as well as a 12 to 16-foot-wide median. A 12-foot median can accommodate a narrow left-turn lane (10 feet) and a 2-foot-wide extended median nose at intersections. A 16-foot median can accommodate a wider left turn lane and a 4 to 5-foot-wide extended median nose that can serve as a pedestrian refuge. Width for varying median widths is taken from the sidewalks.
- Predominant width – 95 feet. At this width, all design elements can be accommodated: four travel lanes, bicycle lanes, on-street parking, 10.5-foot sidewalks and a 6-foot minimum landscaped median. The narrow median serves to restrict turn movements and as a pedestrian refuge, but cannot accommodate a left-turn lane at intersections.
- Functional minimum width – 90 feet. At this width, the 8.5-foot sidewalk is the minimum functional width for an intensively developed area with buildings oriented to the street. A 5-foot median is a narrow dimension that restricts turning movements, provides a minimal pedestrian refuge, and allows planting of smaller trees or shrubs and ground cover.
- Absolute minimum width – 85 feet. Reducing the median width to the minimum 4 feet required for restricting turn movements and the planting of ground cover, and reducing the sidewalk width to 6.5 feet results in the absolute minimum width which still defines a regional boulevard.

Figure 37 illustrates the various widths of regional boulevards. Figure 38 illustrates various widths of double median regional boulevards.

Wider medians on regional boulevards

On boulevard design types with closely spaced intersections and driveways, a consistent median width along the boulevard is required to provide alternating left turn bays. Narrow medians (less than 14 feet) cannot provide the width required to provide turning bays and the appropriate transitions to move vehicles laterally across lanes. Figure 38 illustrates regional boulevard cross sections with wider medians to be used when intersections are spaced at about 600 feet or less. Provide narrow medians on Regional Boulevard segments with longer distances between intersections.

Trade-offs

Right of ways less than 85 feet require elimination of either travel lanes or on-street parking. This is a trade-off between vehicular capacity and providing parking to support adjacent land-use. On-street parking, located on one side of the street, can be eliminated, to reduce the width to 79 feet. Eliminating all on-street parking reduces the width to 73 feet. If bicycles can travel on a separate parallel route, the width can be reduced from functional minimum of 90 feet to 80 feet, without changing any other elements. At less than 85 feet and with fewer than four travel lanes the section becomes a community boulevard.

Regional boulevard priorities

Higher priorities

- Pedestrian sidewalks with transit access
- Bicycle lanes
- Number of travel lanes

Lower priorities

- Width of travel lanes
- On-street parking
- Median for landscaping

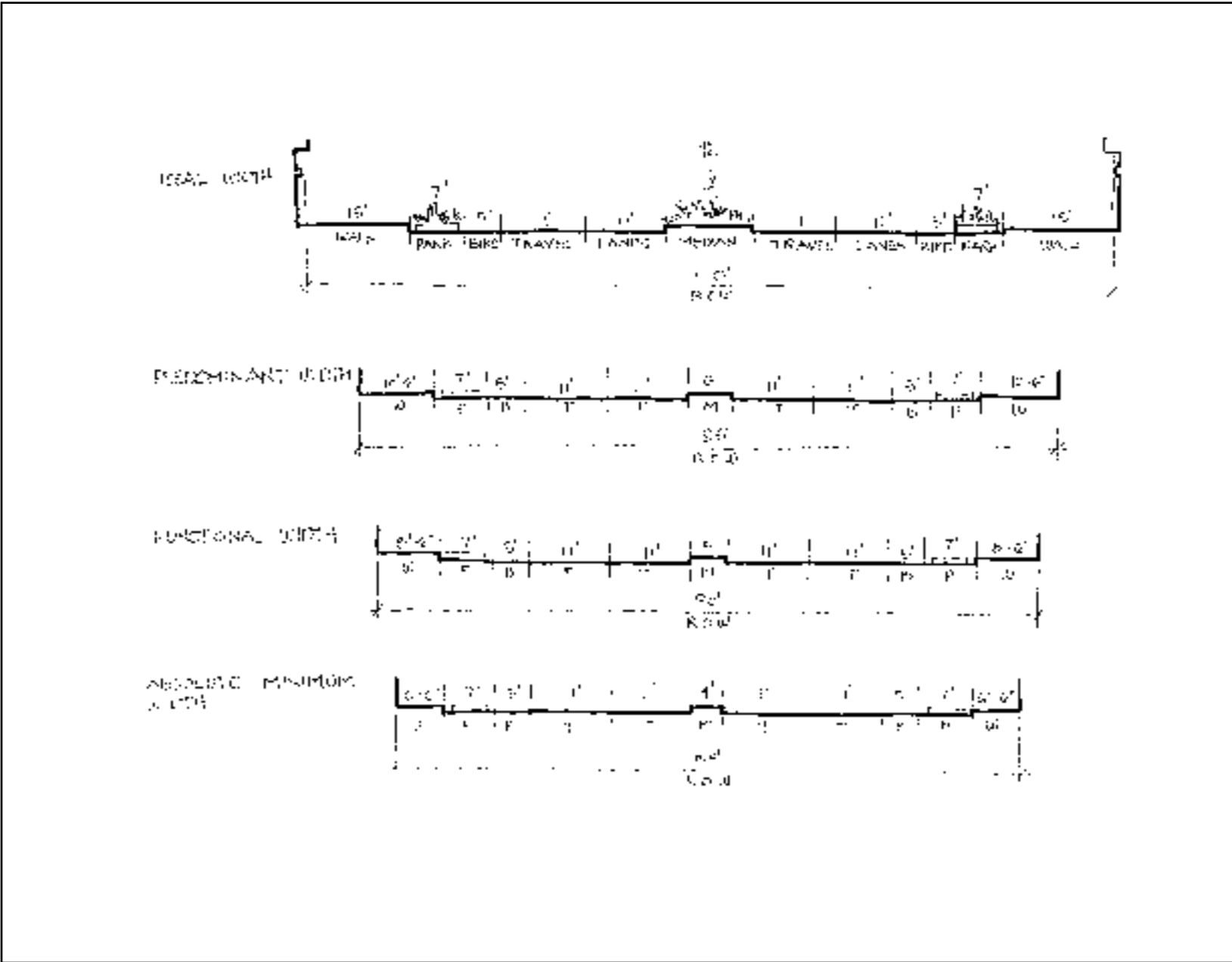


Figure 37. Typical regional boulevard cross sections within various rights of way.

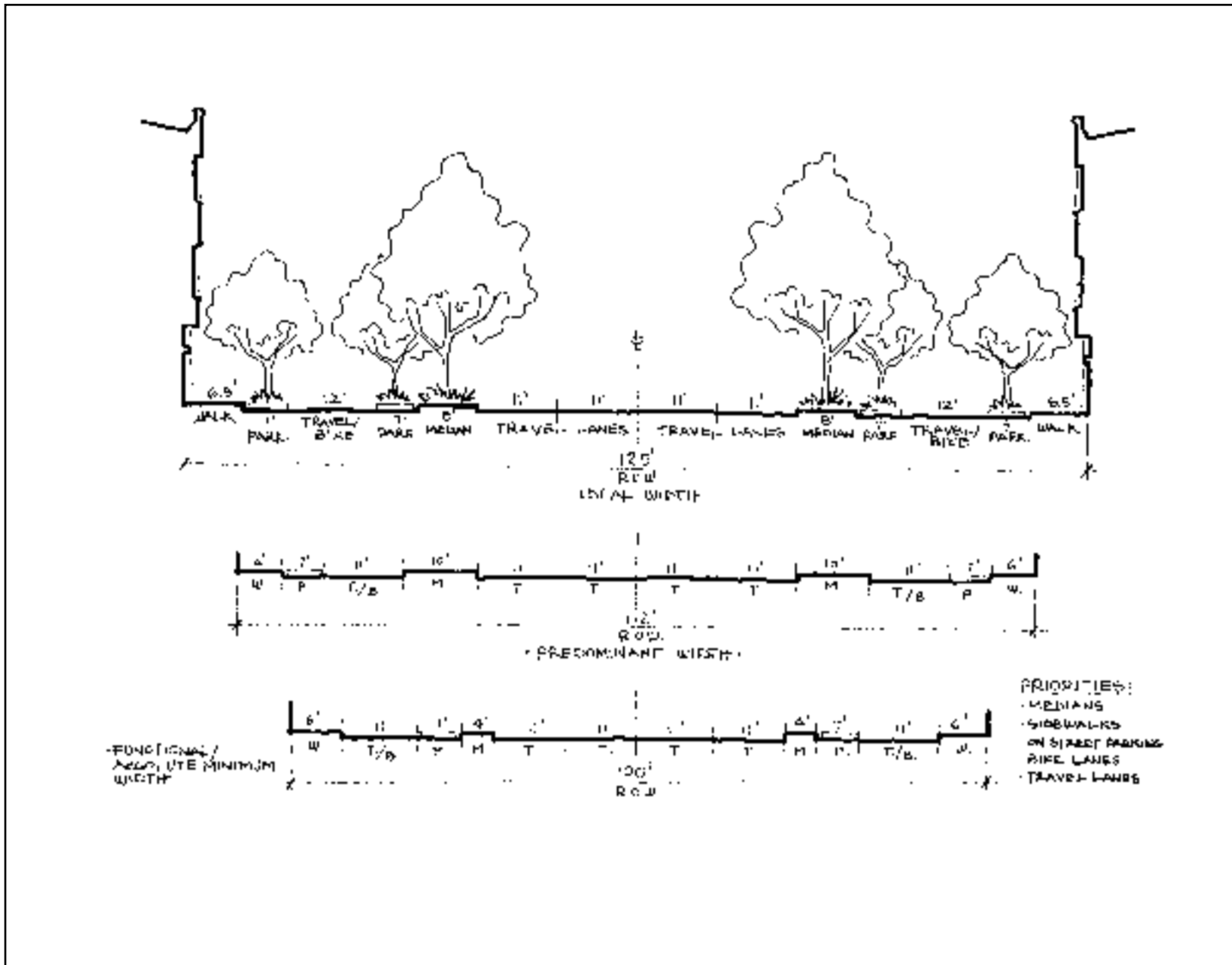


Figure 38. Typical double median boulevard cross sections within various rights of way.

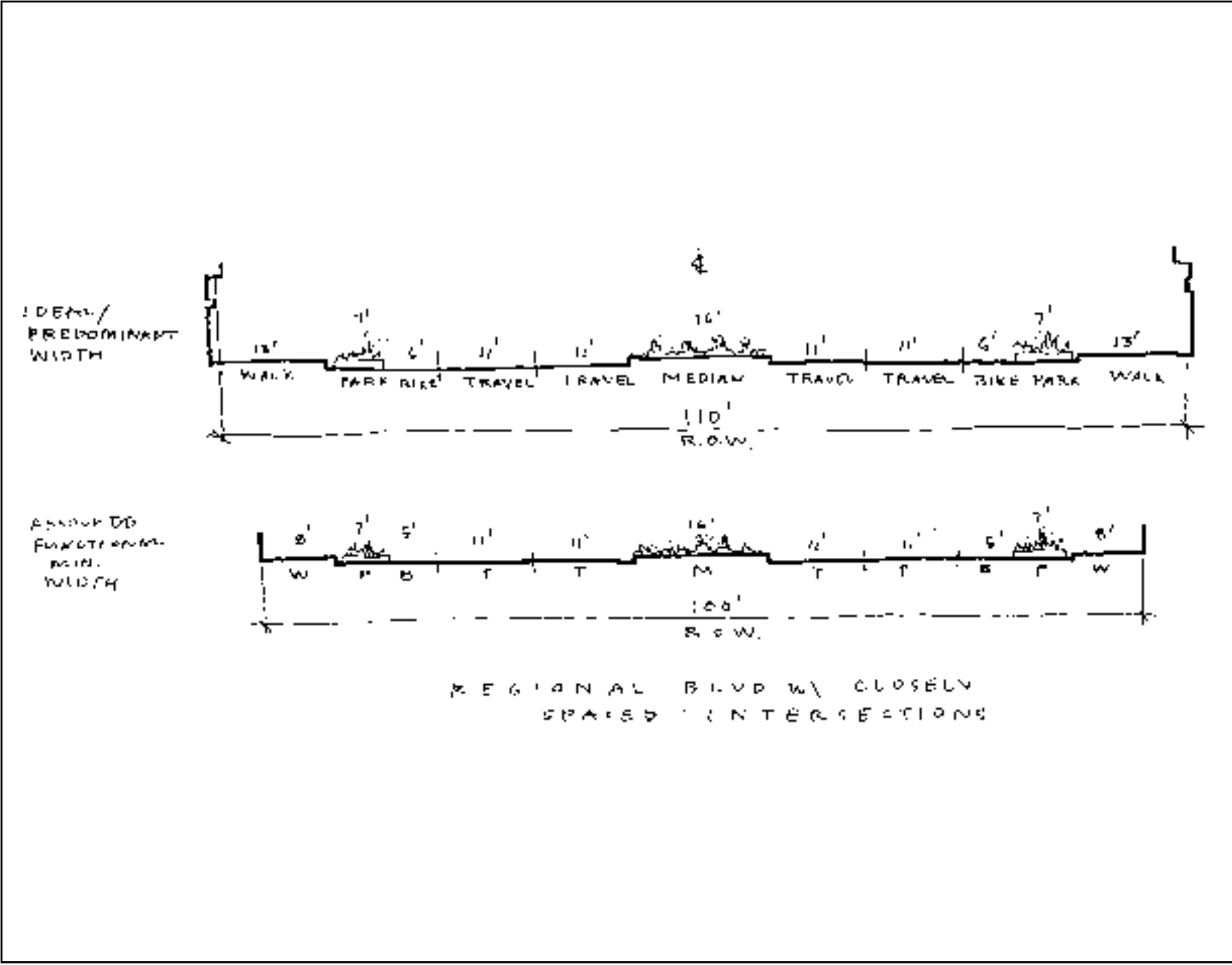


Figure 39. Typical regional boulevard cross sections with wider raised medians.

Community Boulevards

Community boulevards are minor arterial streets. They are distinguished from the other regional street types with a narrower right of way than a regional boulevard, a narrow landscaped median, two travel lanes, bicycle lanes, on-street parking and wide sidewalks.

Widths

- Ideal/predominant width – 80 feet. At this width all of the desirable design elements can be accommodated; two travel lanes, bicycle lanes, on-street parking, 12-foot-wide sidewalks and a 10-foot-wide landscaped median. Widening or flaring is required at intersections to provide a wider median and channeled left-turn lane or, alternatively, terminating the median prior to beginning the left-turn lane.
- Functional minimum width – 70 feet. At this width, sidewalks are reduced to 10 feet. The 4-foot-wide median is the absolute minimum for tree planting, and would preferably be 6 feet wide.
- Absolute minimum width – 63 feet. At this width, all design elements are accommodated with sidewalks reduced to 6.5 feet, the absolute minimum width.

Figure 40 illustrates the various widths of community boulevards.

Wider medians on community boulevards

On community boulevard design types with closely spaced intersections and driveways, a consistent median width along the boulevard is required to provide alternating left turn bays. Narrow medians (less than 14 feet) cannot provide the width required to provide turning bays and the appropriate transitions to move vehicles laterally across lanes. Figure 41 illustrates a community boulevard cross section with wider medians to be used when intersections are spaced at about 600 feet or less. Provide narrow medians on community boulevard segments with longer distances between intersections.

Trade-offs

When reducing the number of travel lanes to two and providing a median, the combined width of the travel lane and bicycle lane must provide a minimum of 16 feet to permit a vehicle to pass a breakdown or double parked vehicle.

Community boulevards wider than 85 feet can provide four travel lanes, which results in a street difficult to distinguish between a community boulevard and a regional boulevard. Therefore community boulevards generally are less than 85 feet and have two travel lanes.

At less than 63 feet the median is eliminated and a community boulevard becomes a community street.

Community boulevard priorities

Higher priorities

- Pedestrian sidewalks with transit access
- Bicycle lanes
- On-street parking
- Median for landscaping

Lower priorities

- Number of travel lanes
- Width of travel lanes

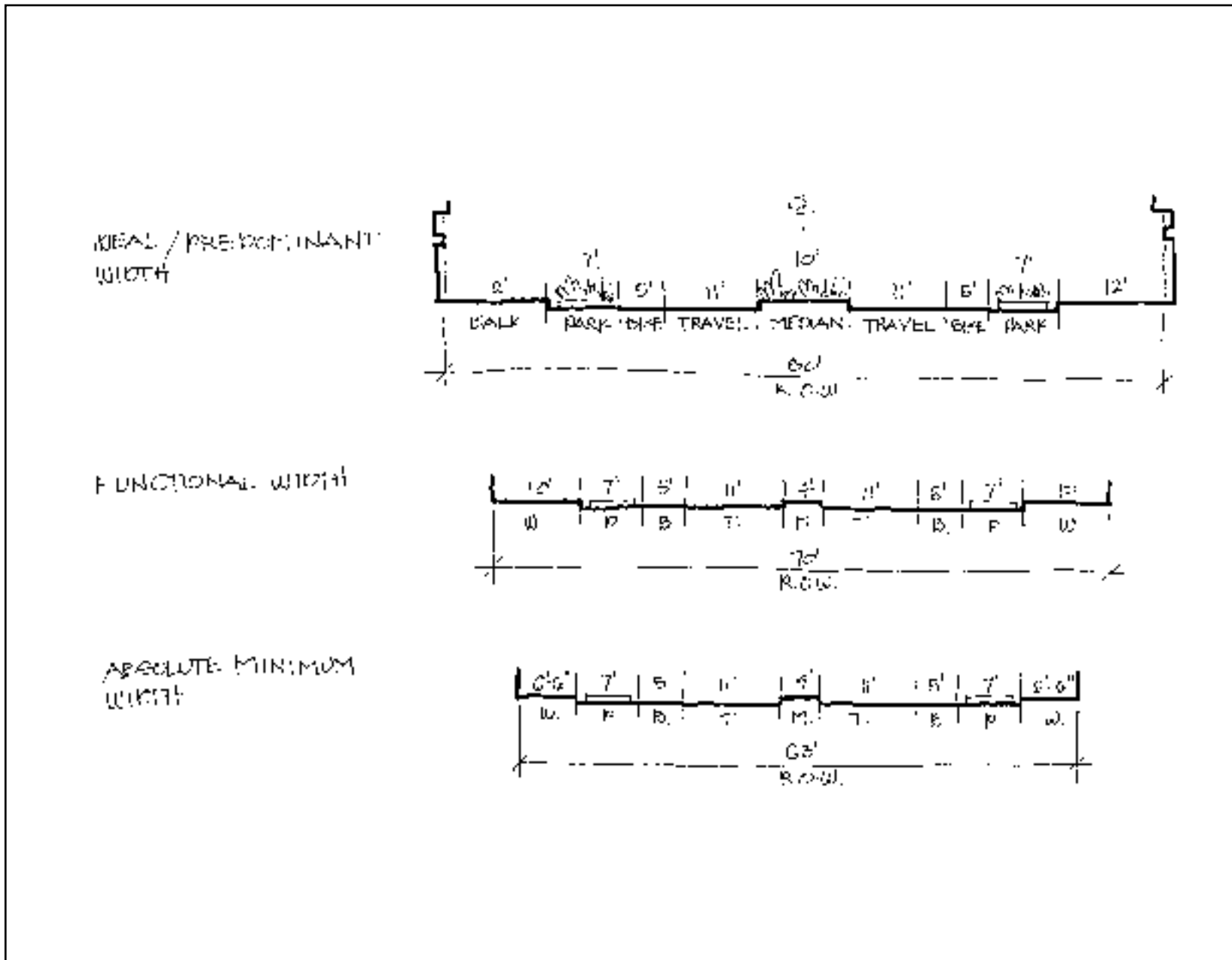


Figure 40. Typical community boulevard cross sections within various rights of way.

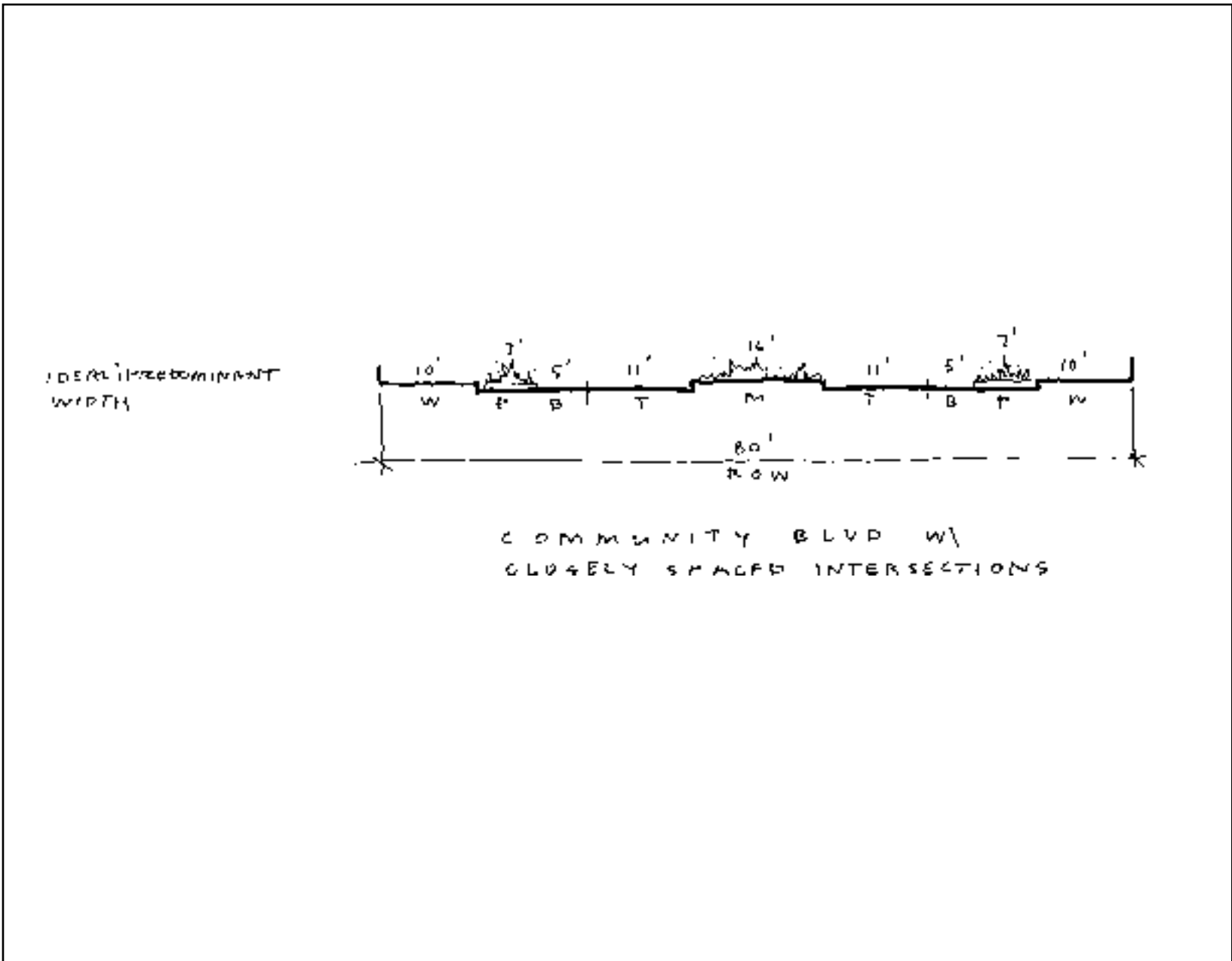


Figure 41. Typical community boulevard cross-section with wider raised median.

Regional Streets

Regional streets are major arterial streets. They are distinguished from other regional design types by requiring at least four travel lanes, bicycle lanes, sidewalks for transit access, pedestrian landscape buffers and no on-street parking.

Widths

- Ideal/predominant width – 97 feet. At this width, all design elements can be accommodated: four 12-foot travel lanes, 6-foot bicycle lanes, 6-foot sidewalks and 5-foot landscaped pedestrian buffers. The 15-foot-wide median can accommodate a two-way left-turn lane or a raised median with 11-foot left-turn lane and 4-foot-wide extended median nose. The design elements of this type of street at the ideal width are primarily vehicle-oriented, and provide the highest capacity facility of the street and boulevard classifications.
- Functional minimum width – 90 feet. At this width, two travel lanes are reduced to 11 feet, the bicycle lanes are reduced to 5 feet, and the two-way left-turn lane median reduces to 14 feet. This width of street continues to provide a high-capacity facility.
- Absolute minimum width – 84 feet. If the bicycle and outside travel lanes share a 15-foot width, the right of way of a regional street can be reduced to 88 feet. If the inside travel lanes are reduced to 11 feet, the width can be further reduced to 86 feet. With narrower 4-foot pedestrian landscape buffers, the width can be further reduced to 84 feet, the absolute minimum width that defines a regional street. The median two-way left-turn lane remains at 14 feet, the absolute minimum width used in this handbook.

Figure 42 illustrates the widths of regional streets.

Trade-offs

At greater than 97 feet, wider landscaped pedestrian buffers can be provided. At 119 feet, an additional travel lane can be added in each direction, creating a six lane cross-section. At less than 84 feet, bicycle lanes are eliminated (assuming bicycles can travel on a parallel route), which allows the width to be reduced to 74 feet. At 74 feet, four travel lanes and a median two-way left turn lane can be accommodated.

At less than 74 feet, a regional street would have fewer than four travel lanes, and the section becomes a community street.

Regional street priorities

Higher priorities

- Number of travel lanes
- Pedestrian sidewalks with transit access and buffer strip
- Medians
- Bicycle lanes
- Width of travel lanes

Lower priorities

- On-street parking

“The car has become a secular sanctuary for the individual, his shrine to himself, his mobile Walden Pond.”

Edward McDonagh

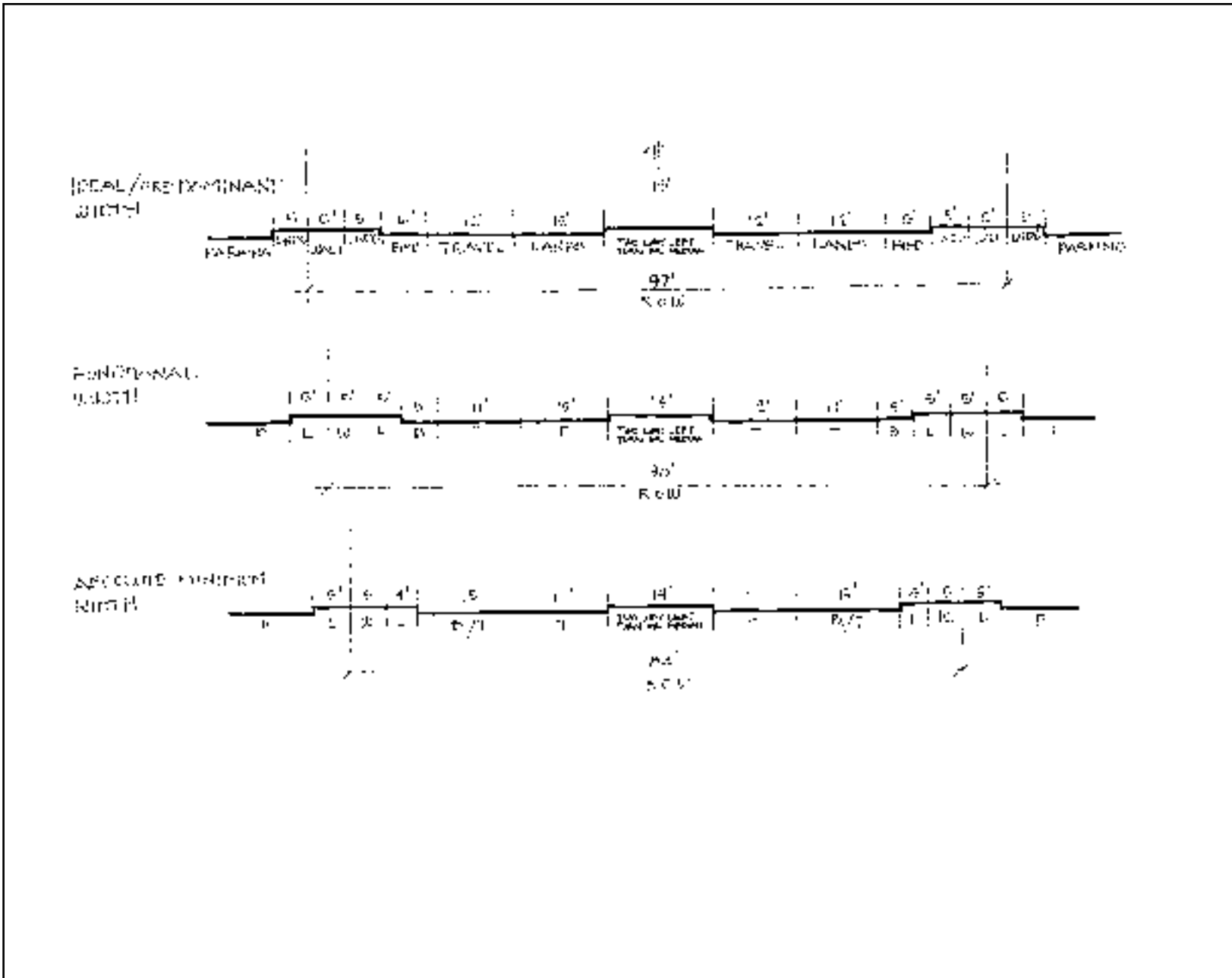


Figure 42. Typical regional street cross sections within various rights of way.

Community Streets

Community streets are minor arterial streets. They are distinguished from the other regional street types by a narrower right of way than the regional boulevards, community boulevards, and regional streets. Community streets have two travel lanes, bicycle lanes, sidewalks and on-street parking. Community streets may or may not have a median. The predominant community street type does not have a median. However, a narrow landscaped median or a two-way left-turn lane may be accommodated within wider rights of way.

Widths

- Ideal width – 76 feet. At this width two 11-foot travel lanes, 5-foot bicycle lanes, on-street parking and wide 15-foot sidewalks can be accommodated. Turning movements are performed from within the travel lanes, or from left-turn lanes at widened intersections.
- Predominant width – 70 feet. At this width all of the design elements can be accommodated with 12-foot sidewalks.
- Functional minimum width – 66 feet. At this width, 10-foot wide sidewalks are the functional minimum width.
- Absolute minimum width – 58 feet. At 58 feet sidewalks are reduced to 6 feet, and street trees need to be planted within the on-street parking lane.

Figure 43 illustrates the widths of a community street.

Trade-offs

Community streets have the greatest flexibility in what can be accommodated within an available right of way. The key to this flexibility is the use of medians. Community streets can have three different median types depending on the access requirements, intensity of adjacent land use and width of available right of way:

Continuous two-way left-turn lane. Used within inner residential neighborhoods, outer residential neighborhoods and commercial corridors where driveways are frequent. With an 80-foot width, a 14-foot-wide two-way left-turn lane can be accommodated with two travel lanes, bicycle lanes, on-street parking and 10-foot sidewalks. At 75 feet, a two-way left-turn lane can be accommodated with two travel lanes, bicycle lanes, on-street parking and narrow 7.5-foot sidewalks. At less than 72 feet, a two-way left-turn lane cannot be accommodated without eliminating other design elements such as on-street parking or bicycle lanes.

Narrow landscaped median. Used to restrict turning movements and reduce conflicts along commercial corridors, main streets and station communities. Used where site access is provided from side streets or U-turns are permitted at frequent intervals, and the right of way is greater than 63 feet.

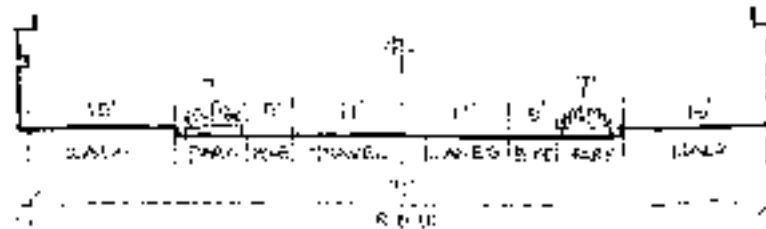
No median. Used within inner and outer residential neighborhoods, commercial corridors and main streets where site access is less frequent and can be provided without a median or left turn lanes and without significantly impacting capacity.

At less than 58 feet wide, a design element needs to be eliminated, such as on-street parking or bicycle lanes. Eliminating one side of on-street parking results in the width reduced to 55 feet, allowing an increase in sidewalk width from 6 feet to 8 feet. Eliminating bicycle lanes results in a width reduction to 52 feet, also allowing an increase in sidewalk width from 6 feet to 8 feet. A community street less than 52 feet is possible, but the street and the sidewalks may be crowded depending on the intensity of adjacent land use.

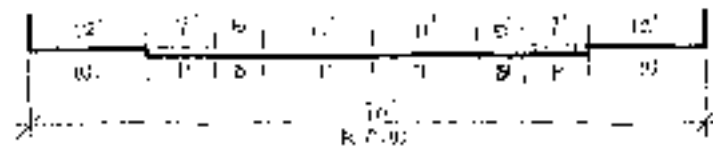
Four-lane community streets

Four travel lanes can be accommodated with a 75-foot right of way if on-street parking is eliminated. A 12 to 14-foot-wide median, four travel lanes and bicycle lanes can be accommodated within the widest right of way of 80 feet, but on-street parking must be eliminated and sidewalks must be narrowed to a minimum 5 feet.

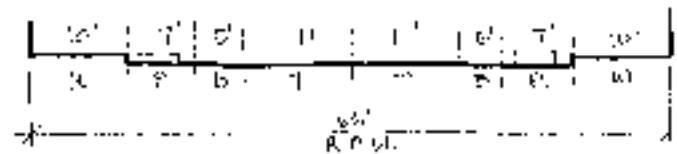
USUAL WIDTH



PREDOMINANT WIDTH



FUNCTIONAL WIDTH



ABSOLUTE MINIMUM WIDTH

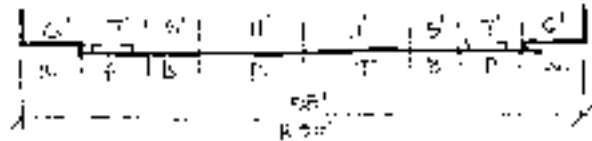


Figure 43. Typical community street cross sections within various rights of way.

Community street priorities

Higher priorities

- Pedestrian sidewalks with transit access
- Bicycle lanes
- On-street parking

Lower priorities

- Median for landscaping
- Number of travel lanes
- Width of travel lanes

Special Consideration for Main Street Districts

Main street districts occur along both major and minor arterial streets. Traditionally, main street district land uses are along the most significant street at the center of a town. Depending on the adjacent land use, available right of way and use of a landscaped median, main streets can be either community boulevards or community streets. Main streets have four travel lanes or less, bicycle lanes, sidewalks, on-street parking and in many cases, a landscaped median.

Widths

- Greater than 70 feet (see community boulevards). Seventy feet is the minimum functional width for a community boulevard, which accommodates two travel lanes, bicycle lanes, on-street parking, 12-foot sidewalks and a 10-foot landscaped median.
- Less than 70 feet (see community streets). Seventy feet is the predominant width for a community street, which accommodates two 11-foot travel lanes, bicycle lanes, on-street parking and 12-foot sidewalks.

Trade-offs

The major trade-off depends on the available right of way and the desirability of a landscape median. In wider rights-of-way (70 feet or greater) a median channels traffic and provides more area for landscaping and planting of trees in the median enhancing the identity and status of the street. See community boulevards for a discussion on streets with a landscaped median for rights of way greater than 63 feet.

In narrower rights of way (less than 70 feet) eliminating the median allows for greater sidewalk width. With narrower rights of way, two lane streets with mature street trees can be attractive and functional streets. See community streets for trade-offs at less than 70 feet.

Main street district priorities

Higher priorities

- Wide sidewalks including buffer areas with tree wells and transit access
- Bicycle lanes
- On-street parking
- Median for landscaping

Lower priorities

- Number of travel lanes
- Width of travel lanes

VI. Implementing the Guidelines

What Design Issues are Not Addressed in this Handbook?

This handbook provides a series of guidelines intended to complement Metro regional street design policies. Adopted design standards and engineering judgment are the primary tools of street designers. Street design requires the application of many engineering principles to achieve a design that is safe for pedestrians, bicyclists and for the speed and types of vehicles using the street (e.g., existing development, topography). Street designers also must address the multitude of factors and unique circumstances of each location. The guidelines in this handbook do not replace these factors and well-established engineering principles. The following is a list of issues that relate to regional street design policies, but are not addressed in this handbook:

- associated standards including horizontal and vertical alignment, sight distance, super-elevation and grades
- location of utilities
- access management, and comprehensive guidelines for street connectivity
- maintenance versus modernization projects.

How do the Guidelines Differ from Existing Design Standards?

The guidelines in this handbook are flexible and encompass most of the existing design standards in the Portland metropolitan area. Application of the design elements and guidelines in this handbook depend on the unique characteristics of the design project, the available right of way, and the type and intensity of the adjacent land use.

Table 4 compares the dimensions of the guideline's key design elements with existing design standards from the Oregon Department of Transportation, and Washington and Clackamas counties. This table provides, at a glance, the primary differences between key design element dimensions.



Figure 44. Implementing the design guidelines will encourage alternative modes of travel.

Design Element	Metro Design Guidelines				Hillsboro		Washington County		Clackamas County	
	Regional Boulevard (Major Arterial)	Regional Streets (Major Arterial)	Community Boulevard (Minor Arterial)	Community Street (Minor Arterial)	Major Arterial	Minor Arterial	Major Arterial	Minor Arterial	Major Arterial	Minor Arterial
Right-of-way (feet)	80-120 (a)	85-120 (a)	60-58 (a)	60-40 (a)	Varies	Varies	55-122	60-98	60-110	60-60
Right-of-way (ADT)	20,000-50,000	20,000-50,000	7,500-25,000	7,500-25,000	30,000-50,000	10,000-20,000	20,000	20,000-30,000	N/A	20,000
Curb to curb width (feet)	35-40	30-39	30-40	25-30	Varies	Varies	25-30	30-35	30-35	30-35
Number of lanes	1-6	4-6	2-4 (b)	2-1 (b)	2-5	2-6	1-6	2-5	1-5	2-4
Travel lane width (feet)	11-12	11-12	11-12	11	11-12	11-12	12-14	12-14	12-14	12-14
Travel lane width (feet)	11-12	11-12	11-12	11	11-12	11-12	11-14	11-14	12-14	12-14
Travel lane center line width (feet)	12-14	14-15	N/A	12-14	14-15	14-16	12-14	12-14	14	14
Turning lane width (feet)	11-12	11-12	11-12	11-12	12	12	12-14	12-14	12	12
On-street parking allowed	YES	NO	YES	YES	NO	YES	NO	NO	NO	NO
Parking lane width (feet)	7-8	NO	7-8	7-8	8-10	8-10	N/A	N/A	N/A	N/A
Design speed (mph)	35-40	30-35	35-45	25-30	40-60	40-60	45	45	40	45
Sidewalk width (feet)	5-15 (c)	N/A	5-12 (c)	5-12 (c)	6	6	5	5	5	5
Shoulder width (feet)	5-6 (d)	5-6 (d)	5-8 (d)	4-8 (d)	6	6	6	5	5	5
Median curb width (feet)	5-10	25-10	15-20	15-20	25-100	5-10	25-50	25-50	45-50	25-50
Off-street parking	In parking lots	6-5	In parking lots	In parking lots	Varies	Varies	Varies	Varies	4	4
Based median on-street parking allowed	YES	N/A (e)	YES	YES	YES	YES	YES	YES	YES	YES
Based median on-street parking	4-10	4-10	4-10	4-4	6-6	4-10	10	10	12	12

A check mark in this column indicates existing standards which do not encompass the ranges in the Metro guidelines.
(a) Dimension in parentheses "a" denotes the predominant right-of-way for the street class category.
(b) Community streets and boulevards are generally limited to two travel lanes to accommodate all of the desirable design elements. Four travel lanes are possible if lower priority design elements are eliminated.
(c) Absolute minimum sidewalk width is 5 feet.
(d) Minimum boulevard and thorough street parking is 5 feet. Without on-street parking, boulevard minimum width is 6 feet.
(e) Median median and pedestrian bridges are allowed on Regional Streets, but not required in Metro guidelines. However, pedestrian bridges should be provided on streets with continuous travel lanes.
N/A = Not Applicable

Table 4. Comparison of Metro design guidelines and current design standards.

The table focuses on the primary design elements of regional and community boulevards and streets, the equivalent of major and minor arterial street classifications in the existing standards.

Check marks “√” identify those existing design standards which are not fully encompassed in the range of dimensions in the guidelines. For example, the existing standard for travel lane width in Clackamas County is 12 to 14 feet, a range not fully encompassed within the guidelines’ range of 11 to 12 feet. However, in many cases the upper range of the guidelines equals the lower range of existing standards.

*“Coming together is the beginning.
Keeping together is progress.
Working together is success.”*

Henry Ford

What are the Cost Implications of Implementing the Guidelines?

This document presents the characteristics, design elements and benefits of multi-modal streets consistent with the policies set forth in the Regional Transportation Plan. Local agencies required to implement these policies must address their cost implications. This section presents example cost estimates under two scenarios: (1) a comparison of costs to modernize an existing street to meet current standards (of a representative county in the region) versus implementation of the guidelines in this document and (2) a comparison of the costs to construct an entirely new street based on current design standards versus the Metro guidelines.

Street modernization or construction costs vary dramatically due to the unique characteristics, design and constraints of each roadway project. The examples presented here are representative of such unique situations, but cannot reflect the countless variations of costs that are possible. The basic assumptions used to derive the cost estimates are described in this section. Detailed unit costs, line items, and drawings are available from Metro.

Example modernization cost comparison

The following modernization example is based on an actual street segment located in a representative county, Multnomah County. The segment is a 1,890-foot portion of Division Street from 127th to 133rd Avenue. This segment was selected to represent a typical street that currently requires a moderate level of improvements to meet current standards.

Upgrading Division Street to meet current Multnomah County standards for a major arterial does not require an extensive effort. The two major improvements are wheelchair ramps and curbs at intersections and construction of sidewalks where they do not currently exist. The requirements to upgrade Division Street to a regional street as described in this document are significantly more extensive. The cost estimate is based on the following major design elements and assumptions:

- sidewalk widths of 8 feet with street trees and grates on both sides of the street
- bicycle lanes on both sides of the street (5 feet wide)
- on-street parking lane 7 feet wide on one side of the street only (to accommodate the design elements within the existing 90-foot right of way)
- a continuous two-way left-turn lane 13 feet in wide
- four 11-foot-wide travel lanes
- curb extensions as necessary to identify the street centerline and lane configurations, and at intersections to meet wheelchair ramp standards
- curb extensions at intersections to reduce crossing distance
- curb extensions at mid-block locations to delineate on street parking, provide for street trees within parking lanes, and increase buffer between vehicles and pedestrians
- all existing sidewalks were assumed to be replaced because irrigation and tree wells impacted too much of the existing sidewalk area
- irrigation and landscape maintenance costs
- signal modifications to accommodate changes in existing lane alignments (relocation of signal heads and new poles and bases).

“A billion here, a billion there, sooner or later it adds up to real money.”

Everett Dirksen

Following is a comparison of Division Street modernization costs by major categories.

	Multnomah County Stds.	MetroRegional Street
1. Preparation/miscellaneous	\$9,571	\$82,830
2. Signalized intersections	\$0	\$34,220
3. Unsignalized intersections	\$39,590	\$42,065
4. Street improvements	\$19,354	\$283,545
5. Storm drainage system	\$52,150	\$191,950
6. Landscape/maintenance	\$0	\$318,430
7. Signals and signs	\$0	\$166,601
8. Miscellaneous utilities	\$0	\$4,000
Total	\$120,665	\$1,123,641

The comparison shows the cost of upgrading an existing arterial to Metro regional street guidelines can be nearly 10 times as high as the cost to improve the street to current standards. The difference in the level of improvement and reconstruction is significant in this example.

Example new street construction cost estimates

The following example compares the costs of constructing a new street to current Washington County arterial design standards to those for constructing a Metro regional boulevard. This comparison is based on a representative 98-foot right of way along a 1,380-foot (1/4 mile) segment. Cross-sectional elements of the Washington County design standard street include:

- four 12-foot-wide travel lanes
- 14-foot-wide center turn lane (no raised median)
- 6-foot-wide bicycle lanes on each side (no parking)
- 5 1/2-foot-wide sidewalks on each side
- 6 1/2-foot-wide landscape strips on each side (no trees).

Cross-sectional elements of the regional boulevard street design include:

- four 11-foot-wide travel lanes
- 13-foot-wide raised median with landscaping and trees
- 7-foot-wide on-street parking lanes with street trees within extended curbs on each side
- 5-foot-wide bicycle lanes on each side
- 8 1/2-foot-wide sidewalks with trees and grates on each side.

Cross-section and plan view drawings of each example are available from Metro. Following is a comparison of the street construction costs by major categories.

	Washington County Stds.	Metro Regional Boulevard
1. Preparation/miscellaneous	\$90,540	\$67,540
2. Signalized intersections	\$90,207	\$67,964
3. Unsignalized intersections	\$45,898	\$55,495
4. Restricted intersections	\$99,572	\$114,622
5. Street construction	\$354,702	\$359,155
6. Storm drainage system	\$133,300	\$158,890
7. Landscape/maintenance	\$6,306	\$239,415
8. Signals and signs	\$175,490	\$177,704
Total	\$996,015	\$1,240,785

The comparison shows that the cost of constructing a street designed to regional boulevard guidelines is comparable to that for an arterial designed to Washington County standards. The Washington County design cost example is about 20 percent lower than the regional boulevard example, or roughly equivalent to landscaping cost differences between designs.

While the cost comparisons represent only two possible variations of modernization and new construction scenarios, they indicate two important findings. The first is that the cost of modernizing an existing street to Metro guidelines can be significantly higher than simply improving the street to existing standards.

How Will the Guidelines be Implemented?

This handbook is a starting point for implementing the street design concepts of the Regional Transportation Plan. This handbook clarifies the street design goals of the 2040 Growth Concept and provides a number of tools and ideas to design multi modal streets and improve the livability of the region. Implementation of the street design concepts through use of the guidelines is the essential next step. Metro, working closely with local and state agencies, can develop a process through which the street design concepts can become a reality. The process will evolve over time as opportunities for street modernization occur. The following suggestions may be used to initiate the process.

- Metro should consider developing a database of the streets in the Regional Transportation Plan designated as one of the street design types. The database should identify those streets that already meet the definition of the street design type, or contain many of the desired design elements. Identify the percentage of streets within the region that meet the guidelines and inform the controlling agency of the street's status.
- Metro should consider monitoring street modernization projects and continually update the data base. Have agencies inform Metro of new street construction or modernization projects on the regional system.
- Metro should consider reviewing new or modernization street designs to check if they meet the guidelines. If the designs do not fully encompass the guidelines, Metro can discuss with the agency how the design could be improved to meet the guidelines, acknowledging the unique case-by case constraints of any street design project.
- For street design projects funded through Metro, develop a checklist of priority design elements and identify if designs encompass the guidelines, again acknowledging unique constraints of the individual projects.

- It is important to recognize constraints in specific street design projects and that all of the desired design elements may not be accommodated. In these cases, Metro can work with the agencies to identify priority design elements.
- Metro should develop a method of determining when a street design project encompasses the guidelines. This method should be flexible, but as objective as possible. The method may categorize streets into one of several categories: (1) designs that clearly encompass the guidelines, (2) designs that attempt to encompass the guidelines but do not for clearly stated reasons and (3) designs that do not encompass the guidelines despite the efforts of Metro and the agency.

The guidelines and the implementation process are dynamic and may change or be refined over time and through experience. The guidelines and implementation process should be monitored for effectiveness and successful applications throughout the region.

“The best way to predict the future is to invent it.”

Alan Kay

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