



Smart Transportation Guidebook

EXECUTIVE SUMMARY

Planning and Designing Highways and Streets that Support Sustainable and Livable Communities

New Jersey
Department of Transportation

Pennsylvania
Department of Transportation

MARCH 2008

What Is Smart Transportation?

PennDOT and NJDOT cannot always solve congestion by building more, wider and faster state roadways. There will never be enough financial resources to supply the endless demand for capacity. Sprawling land uses are creating congestion faster than roadway capacity can be increased. The practice of Smart Transportation proposes to manage capacity by better integrating land use and transportation planning. The desire to go "through" a place must be balanced with the desire to go "to" a place. The Guidebook intends to help agencies, local governments, developers and others plan and design roadways that fit within the existing and planned context of the community through which they pass.

In conjunction with the New Jersey Department of Transportation (NJDOT) and the Pennsylvania Department of Transportation (PennDOT), the Delaware Valley Regional Planning Commission (DVRPC) has commissioned the preparation of the Smart Transportation Guidebook.

Smart Transportation can be summarized in six principles:

1. Tailor solutions to the context.

Roadways should respect the character of the community, and its current and planned land uses. The design of a roadway should change as it transitions from rural to suburban to urban areas. Changes in roadway widths, the presence or absence of parking lanes, and other factors provide clues to motorists on how fast to drive when they pass from one land use type to another. Vehicular speeds should fit local context in order to enhance safety.

The transportation context of the roadway is essential. The design of every roadway must respond to its unique circumstances, and its role within the larger roadway context. The environmental context must also be considered.

Finally, the financial context must be considered. In both states, transportation funding is far exceeded by transportation needs. By permitting a narrower roadway, a Smart Transportation approach can save money on some projects. In other cases, streetscaping needs and other components may increase costs. But in all cases, designing a road to fit its context is the smart thing to do.

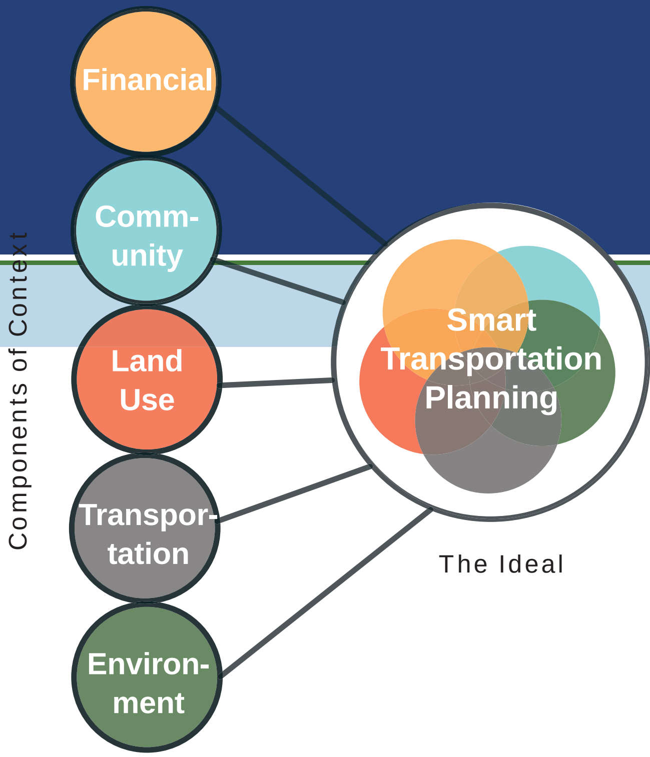
2. Tailor the approach.

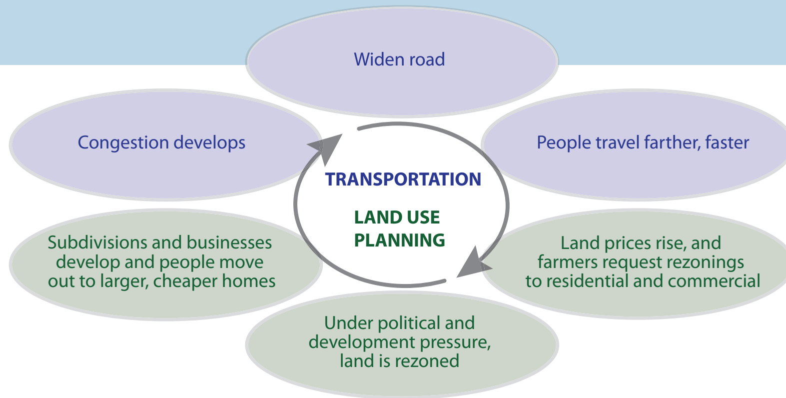
Projects vary in need, type, complexity and range of solutions. Therefore, the approach for each project should be tailored to that specific project.

3. Plan all projects in collaboration with the community.

All state transportation projects are planned through an on-going partnership with the local communities. Both parties have responsibilities.

NJDOT or PennDOT will review proposed transportation projects to ensure that they maintain vital regional or statewide mobility goals. If the design is not consistent with community plans, the DOT may recommend revising the roadway design, or explore alternative strategies to better accommodate regional trips.





The local government is responsible for sound land use planning. It should avoid planning large, single-use developments, disconnected from other developments that place many trips on state roadways. Rather, it should help create a well-connected transportation network that will better accommodate local trips, thus removing trips from the state highway.

In summary, the collaboration between state and community involves the integration of land use planning with transportation planning, and a focus on the overall transportation network rather than a single roadway.

4. Plan for alternative transportation modes.

The needs of pedestrians, bicyclists and transit users must be considered in all roadway projects. Sidewalk networks should be well connected with opportunities for regular, safe street crossings. On collector and arterial roadways, bike lanes or wide curb lanes can encourage people to bike rather than drive for short and middle distance trips. If a roadway is designed to discourage vehicular speeding, it can be comfortably used by pedestrians and bicyclists alike. Transit friendly design should support a high level of transit activity.

5. Use sound professional judgment.

All recommendations should be filtered through the best judgment of the project team after considering the specific circumstances of each project. The smart solution on some projects may be to seek design exceptions or waivers to allow for true context-based design.

6. Scale the solution to the size of the problem.

Find the best transportation solution that fits within the context, is affordable, is supported by the communities, and can be implemented in a reasonable time frame. Safety must be considered on all roadway projects.

Purpose of Guidebook

The book provides guidelines for improving the roadway system in accordance with Smart Transportation principles. It should be used in the planning and design of non-limited access roadways of all classifications, from principal arterial highways owned by the state government to local roadways. This is the Executive Summary of the Guidebook; the entire Guidebook should be referenced for complete guidelines and more information.

Project Sponsors and Use of the Guidebook

The Guidebook has potential application for a wide range of users in New Jersey and Pennsylvania:

- Metropolitan Planning Organizations (MPOs) and Rural Planning Organizations (RPOs) in the two states – serve as guidelines for integrated land use and transportation studies.
- NJDOT and PennDOT – serve as guidelines for applying the NJDOT and PennDOT design manuals in a context sensitive manner.
- Municipalities and Counties – serve as guidelines for land use and roadway development projects.
- Developers – provide tools to realize "smart growth" goals for developments.
- Residents of New Jersey and Pennsylvania – guide community development and better understand their role in the transportation project development process.

Smart Transportation Tools and Techniques

Project delays and escalating costs are discouraging to everyone involved. Planning and designing solutions that are not affordable and cannot be implemented do not solve problems. Projects that are built but do not meet the expectations of the community, the transportation agency or the general public are also frustrating. To address these problems, Smart Transportation "tools and techniques" are recommended by the Guidebook. Use of these tools will permit a better understanding of the problem, potential solutions, and budget early in the process.

Tool A: Understand the problem and the context before programming a solution for it.

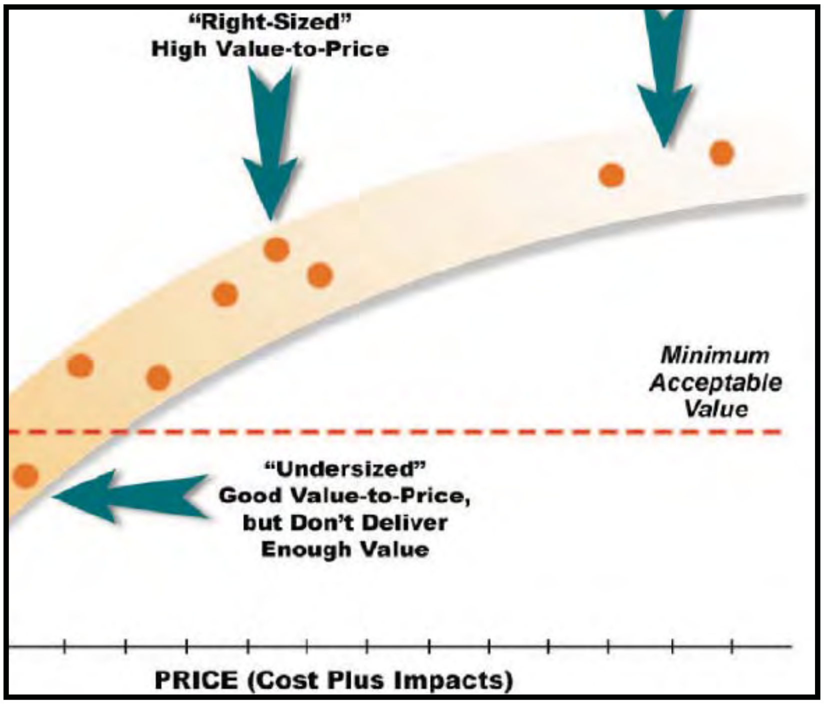
The purpose of the investment must be defined by project stakeholders from the beginning. Sufficient information must be gathered to understand the problem and its context, issues and opportunities, and potential solutions and estimated costs.

Tool B: Utilize a Multi-Disciplinary Team

A multi-disciplinary team contributes to a broader evaluation of data and measures of success, ensuring that the community's vision is well represented. Through local partnerships, network improvements and alternatives not located within the right-of-way can be implemented more easily.

Tool C: Develop a Project-Specific Communication Plan

A Communications Plan should be prepared for most projects, and should consider all substantive issues likely to arise in the development of alternatives. Many communication tools are available on projects; visualization tools are particularly effective in communicating complex ideas.



Value to Price Curve

Tool D: Establish the Full Spectrum of Project Needs and Objectives

Following are some common examples of project objectives:

1. Structural integrity. For many projects, the primary objective is to provide safe and structurally-sound roads and bridges.

2. Safety. Is safety increased through the raising of design speed (crash-worthiness) or through the reverse method of matching desired operating speeds with the context (context sensitive design)?

3. Traffic service. Do traffic service goals apply to service for all users all hours of the day?

4. Non-motorized user service. Formal level of service measures for pedestrian, bicycle and transit service can be considered.

5. Community character. Roadways should be compatible with community character. As a starting checklist, identify the land use context types as defined in the guidebook.

6. Economic development. The opening of a new roadway, or changing an existing major roadway, can have large implications for local economic development.

Tool E: Focus on Alternatives that are Affordable and Cost-Effective

The best alternative will often be one that achieves the greatest balance between costs and benefits. For example, if Alternative A meets 100% of the defined project needs and objectives, while Alternative B meets 80% of these same needs and objectives, but costs 50% of Alternative A, then Alternative B may be a better investment. If Alternative A meets 100% of the project needs and objectives but is not a regional or state priority and cannot be funded for the foreseeable future, then it is not a good choice for solving the problem.

Cost estimates should be prepared at the very beginning of a project, and updated as the project is refined. A concerted effort must be made to fit projects into the window of available funding.

Tool F: Define Wide-Ranging Measures of Success

Including measures of success that address community goals as well as traffic performance is critical to reaching a smart transportation solution. An evaluation measure calling for "attaining peak hour traffic level of Service C" would gauge success only by that measure, and the fact that the roadway may be located within a "Main Street" environment would not be considered. On this project, pedestrian mobility could also be measured, using such information as the number of safe pedestrian crossings. Because projects have wide-ranging needs and objectives, no single measure of success should be used to determine the preferred solution for a problem.

Tool G: Consider a Full Set of Alternatives

A critical element of Smart Transportation is a structured search through a wide range of alternatives at an early stage in the process. The first alternatives to be developed should be low-cost and low-impact. High-cost, high-impact alternatives should be developed only if the low build alternatives do not address enough of the needs and objectives.

Tool H: Compare and Test Alternatives

Measures of success for the various alternatives are "balanced" against one another to determine the best solution to meet project needs and objectives. The assessment process not only computes measures of success but also portrays the tradeoffs between measures, such as a reduced traffic level of service balanced against an increase in civic value associated with on-street parking.

Understanding Place

The land use context and roadway type together comprise the organizing framework for the selection of roadway design values. A context area is a land area that contains a unique combination of built and natural characteristics made up of different land uses, architectural types, urban form, building density, roadways, and topography and other natural features.

1. Rural

This context area consists of a few houses and structures dotting a farm or wooded landscape. The areas are predominantly natural wetlands, woodlands, meadow or cultivated land. Farming related markets, gas stations, diners, farm supplies, convenience grocers, etc. are often seen at the intersections of arterial or collector roads. Once the population of the settled area exceeds 250, it should be classified into the town/village context.

2. Suburban Neighborhood

Predominantly low-density residential communities, built throughout the region in the last four decades. House lots are typically arranged along a curvilinear internal system of streets with limited connections to regional road network or surrounding streets. Neighborhoods are primarily residential, but can include community facilities such as schools, churches, recreational facilities, and some stores and offices.

3. Suburban Corridor

Typically characterized by commercial strip development, sometimes interspersed with natural areas and occasional clusters of homes. Such areas consist primarily of big box stores, commercial strip centers, restaurants, auto dealerships, office parks, and gas stations.

4. Suburban Center

Often a mixed-use, cohesive collection of land uses that may include residential, office, retail, and restaurant uses where commercial uses serve surrounding neighborhoods. These areas are typically designed to be accessible by car, and may include large parking areas and garages.

5.Town/Village/Urban Neighborhood

Predominantly residential neighborhoods, sometimes mixed with retail, restaurants and offices. In urban places, residential buildings tend to be set close to the street with rowhouses fronting the sidewalk. Houses set back with a front garden or lawn are also common in the region.

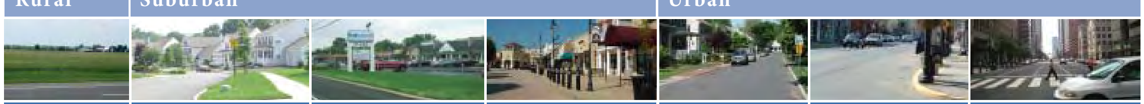
6. Town Center

A mixed use, high density area with buildings adjacent to the sidewalk, typically two to four stories tall with commercial operations on the ground floor and offices or residences above. Parallel parking usually occupies both sides of the street with parking lots behind the buildings. Important public buildings, such as the town hall or library, are provided special prominence.

7. Urban Core

Downtown areas consisting of blocks of higher density, mixed use buildings. Across the region, buildings vary in height from 1 to 60+ stories tall with most buildings dating from an era when elevators were new technology - so five to twelve stories were the standard.

Industrial areas are not identified as a separate place, since industrial uses can show up in different contexts. However, roadways serving industrial areas have certain needs, which are further discussed in the Guidebook.



	Rural	Suburban			Urban		
Quantifiable Characteristics	Rural	Suburban Neighborhood	Suburban Corridor	Suburban Center	Town/Village Neighborhood	Town Center	Urban Core
Density Units	1 DU/20 ac	1 DU/ac - 8DU/ac	2 - 30 DU/ac	3 - 20 DU/ac	4 - 30 DU/ac	8 - 50 DU/ac	16 - 75 DU/ac
Building Coverage	NA	< 20%	20% - 35%	35% - 45%	35% - 50%	50% - 70%	70% - 100%
Lot Size/Area	20 acres	5,000 - 80,000 sf	20,000 - 200,000 sf	25,000 - 100,000 sf	2,000 - 12,000 sf	2,000 - 20,000 sf	25,000 - 100,000 sf
Lot Frontage	NA	50 to 200 ft	100 to 500 ft	100 to 300 ft	18 to 50 ft	25 to 200 ft	100 to 300 ft
Block Dimensions	NA	400 wide x varies	200 wide x varies	300 wide by varies	200 by 400 ft	200 by 400 ft	200 by 400 ft
Max. Height	1 to 3 stories	1.5 to 3 stories	retail -1 story; office 3-5 stories	2 to 5 stories	2 to 5 stories	1 to 3 stories	3 to 60 stories
Min./Max. Setback	Varies	20 to 80 feet	20 to 80 ft	20 to 80 ft	10 to 20 ft	0 to 20 ft	0 to 20 ft


Rural
Suburban Corridor
Suburban Center
Suburban Neighborhood
Town Center
Town / Village / Urban Neighborhood
Urban Core

Roadway Type and Function

The Guidebook proposes a new roadway typology in order to design roadways that better reflect their role in the community.

Every roadway owned by NJDOT or PennDOT, or by county governments in New Jersey, is assigned one of the following functional classifications consistent with the AASHTO Green Book: (1) Principal Arterial; (2) Minor Arterial; (3) Collector (major and minor); and (4) Local.

A limitation of the existing functional classification system is that an entire highway is sometimes placed into a certain class based on select characteristics – such as the overall highway length, or trip volumes relative to other roadways in the urban area – although its level of access and mobility are not consistent with other roadways in that class.

For example, many state highways are classified as principal arterials even if they are far more vital to community access than to regional mobility. This creates a dilemma for highway designers: the application of design standards for that class may encourage higher operating speeds than are appropriate for segments serving community access.

To address this issue, a roadway typology is proposed which better captures the role of the roadway within the community. It focuses more narrowly on the characteristics of access, mobility and speed. If a segment of an arterial roadway has a relatively low speed, is important to community access, and has a lower average trip length, it should not be designed like a high order arterial. It should be emphasized that this typology should be used as only a planning and design "overlay" for individual projects. Both states will keep the underlying traditional functional classification.

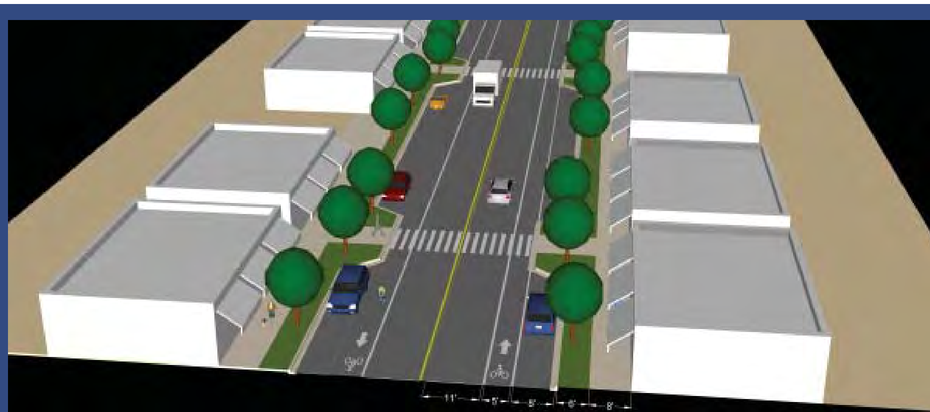
Although not a separate classification, the concept of the "Main Street" has an important place in Smart Transportation for its ability to encourage active town centers.

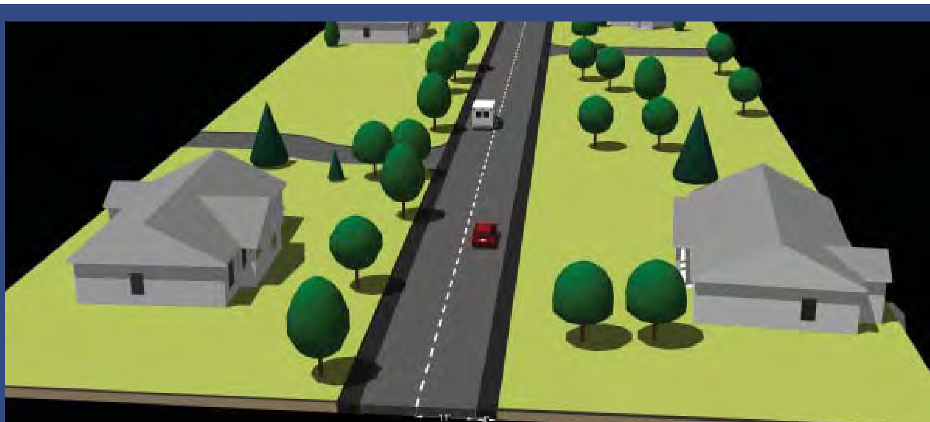
Regional Arterial (In Suburban Corridor Context)

- Desired operating speed: 30-55 mph
- Average trip length: 15-35 miles
- Volume: 10,000-40,000
- Intersection Spacing: 660-1,320 ft
- Roadways in this category would be considered "Principal Arterial" in traditional functional classification.

Community Arterial (In Town Center Context)

- Desired operating speed: 25-55 mph
- Average trip length: 7-25 miles
- Volume: 5,000-25,000
- Intersection Spacing: 300-1,320 ft
- Often classified as "Minor Arterial" in traditional classification but may include road segments classified as "Principal Arterial."





Community Collector (In Rural Context)

- Desired operating speed: 25-55 mph
- Average trip length: 5-10 miles
- Volume: 5,000-15,000
- Intersection Spacing: 300-660 ft
- Often similar in appearance to a community arterial.
- Typically considered a “Major Collector” in traditional functional classification

Neighborhood Collector (In Suburban Neighborhood Context)

- Desired operating speed: 20-30 mph
- Average trip length: < 7 miles
- Volume: < 6,000
- Intersection Spacing: 300-660 ft
- Similar in appearance to local roadways.
- Typically considered a “Minor Collector” in traditional functional classification.

Local Road (In Suburban Neighborhood Context)

- Desired operating speed: 20-25 mph
- Average trip length: < 5 miles
- Volume: < 3,000
- Intersection Spacing: 200-660 ft

(Re) Thinking Speed

Desired operating speed is one of the most important concepts in the Guidebook. The desired operating speed is the speed of traffic that, in the expert judgment of the highway designer and community planner, best reflects the function of the roadway within the surrounding land use context. Identification of this speed allows the designer to select an acceptable design speed and appropriate roadway and roadside features.

Desired operating speed is the speed at which we would like people to travel. Operationally, it is the desired speed of the 85th percentile vehicle. Desired operating speed is best explained by its relationship to three other concepts of speed: operating speed, posted speed, and design speed.

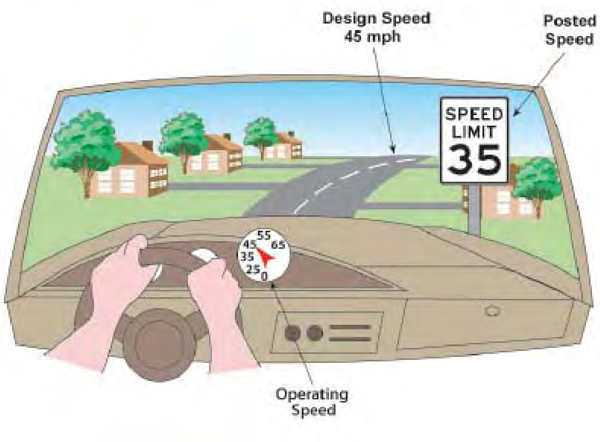
- Operating speed is the speed at which a typical vehicle operates.
- Posted speed is the legal speed limit. It is exceeded by a majority of drivers on most roadways, creating safety problems and making conditions uncomfortable for pedestrians and bicyclists.
- Design speed is the speed used to determine various geometric features of a roadway, including horizontal and vertical curves.

Historically, both states have required setting the design speed for roadways at least 5 mph higher than the posted speed. However, research has shown that motorists drive as fast as they believe the road can safely accommodate. Existing design speed practice may thus encourage operating speeds that are higher than the posted speed.

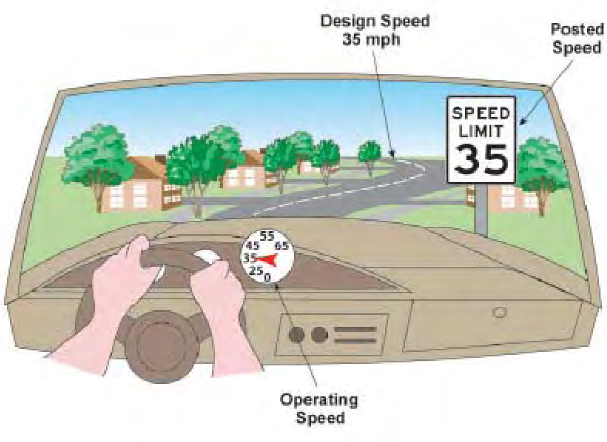
From the standpoint of highway safety, there should be a stronger relationship between the posted speed limit, design speed, and operating speed. Smart Transportation proposes that the desired operating speed for most roadway types be the same as the design speed and the posted speed. The exception is roadways posted at 45 mph or higher, for which the design speed should be set 5 mph above the posted speed and desired operating speed.

Under this policy, controlling design elements such as horizontal and vertical curves would be set equal to and therefore reinforce the desired operating speed. Roadway and roadside features not directly related to design speed (such as lane and shoulder width, parking lane, building setback or use of street trees) would likewise be designed to support the desired operating speed.

The highway designer should select the design elements that will most effectively reinforce the desired operating speed.

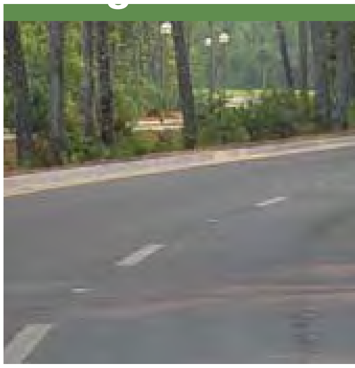


Conventional Design

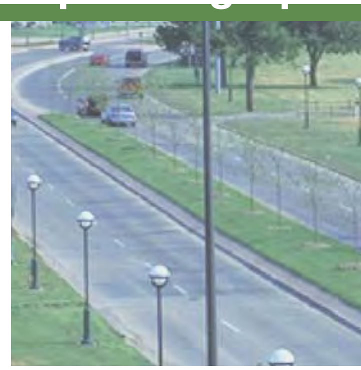


Using Desired Operating Speed

Design Features That Can Impact Operating Speeds:

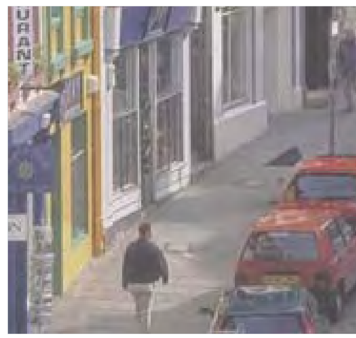


A tight curve radius has a greater impact on operating speed than any other element.



Roadways without medians have lower speeds than roadways with medians.

Street trees and shrubbery along roadways can reduce speeds, especially when sight distance is restricted. However, safe sight distance must be provided at all intersections.



On-street parking leads to lower speeds, due to side friction between moving and passing vehicles.

Narrower lane widths and roadway widths are associated with lower speeds.

Speeds tend to be lower on streets with curbs than streets without curbs.

A higher concentration of access points results in lower operating speeds. Limiting access points is recommended on higher speed roads, or areas with higher pedestrian levels.

Speeds are lower on roadways with higher pedestrian activity.

Higher signal density is associated with lower operating speeds.

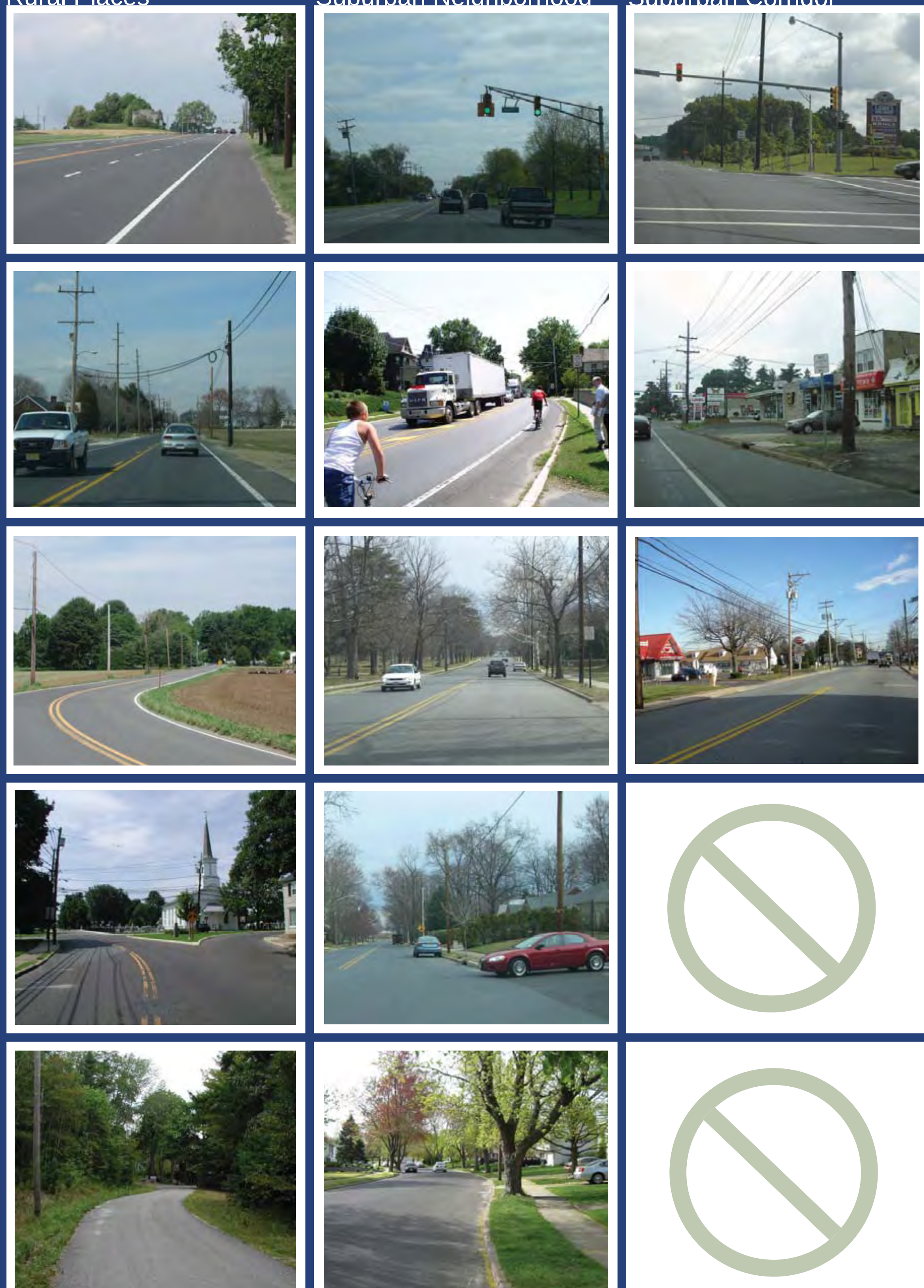
Traffic calming measures are very effective in lowering speeds. Roundabouts are one of the most popular measures on higher-order roadways.

Roads in Context

RURAL TO URBAN

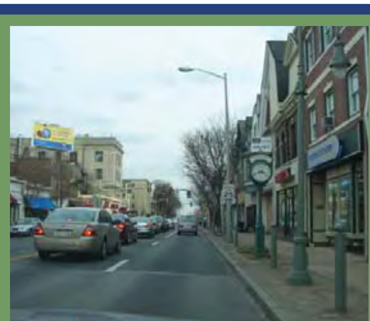
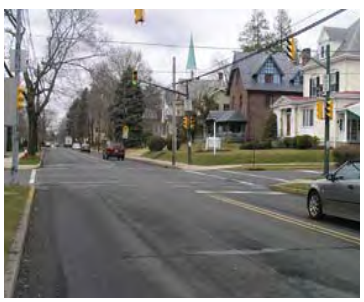
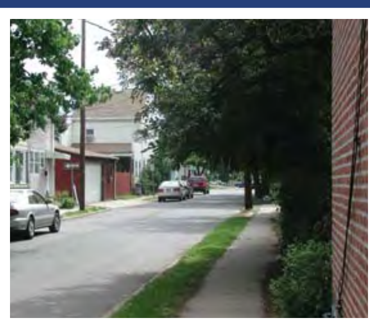
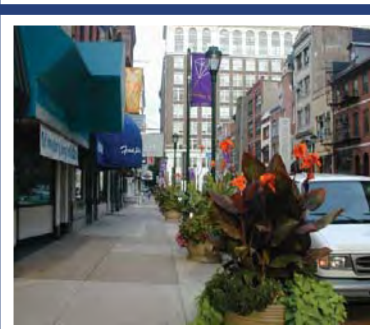
Rural Places | Suburban Neighborhood | Suburban Corridor

REGIONAL TO LOCAL



Once the context area and roadway type is established, the roadway should be designed using the range of design values proposed in the Guidebook matrix. The Guidebook should be consulted for the design values; on the right are examples of what different roadway types might look like within each context area.

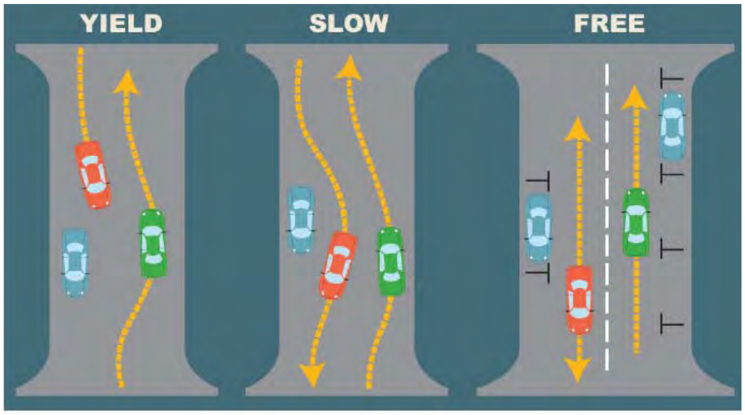
Town Center and Core City streets that also operate as local or regional Main Streets are indicated with a green outline.

	Suburban Center	Town / Village / Neighborhood	Town Center	Urban Core
Regional Arterial				
Community Arterial				
Community Collector				
Neighborhood Collector				
Local Road / Street				

Roadway Guidelines

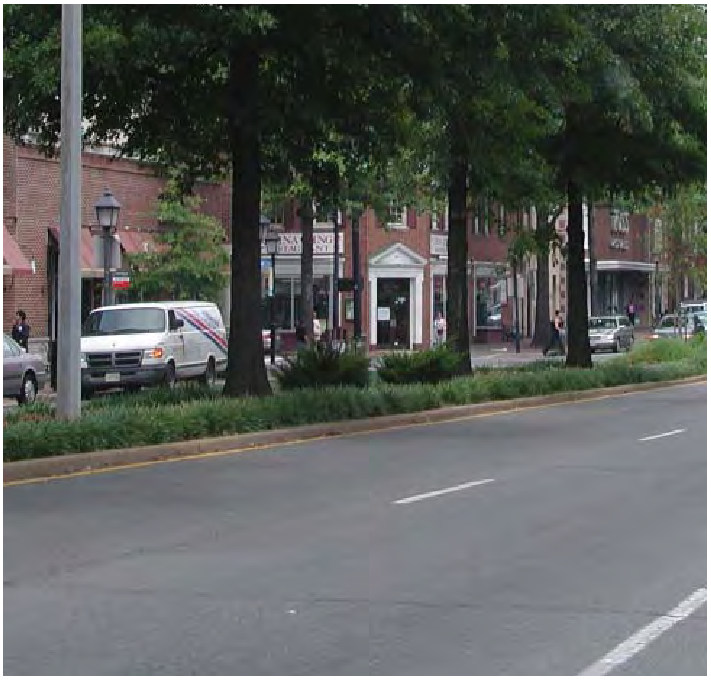
Travel Lanes

The optimal lane width depends on at least five factors:



Local Street Design, Travel Lanes: "Yield" and "Slow" conditions are traditional ways of calming traffic on local streets.

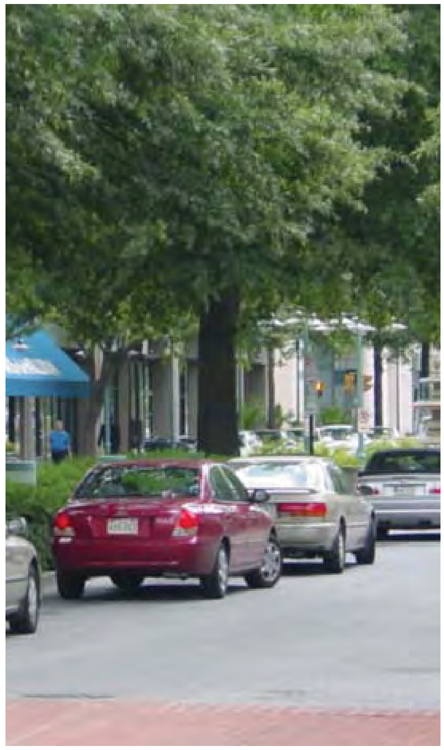
- **Roadway type.** Widths of 11 to 12 ft. should be used for regional arterials in rural and suburban areas, although widths may be reduced to 10 ft. in urban contexts. The fullest range of lane widths – 10 to 12 ft. – are regularly used for the community arterial, since this roadway type has the greatest need for flexibility. On collector roadways, lanes of 10 to 11 ft. are recommended for urban areas and suburban centers, although widths of up to 12 ft. are possible in suburban corridors. Widths of 9 to 11 ft. are recommended for local roads in urban and suburban centers.
- **Desired operating speeds.** Lane widths of at least 11 ft. are recommended when posted speeds are 35 mph or higher. Widths of 10 to 11 ft. are often used for roadways posted less than 35 mph, and are recommended for speed control purposes.
- **Context area.** Narrower lane widths are commonly used in urban areas, especially traditional commercial districts or neighborhoods.
- **Truck and bus volumes.** Lane widths of 12 ft. are recommended for arterials with posted speeds of 35 mph or higher and that have heavy truck volumes in excess of 5 percent, or bus service headways of more than twice per hour. Widths of 11 to 12 ft. are recommended for other roadways with significant heavy truck volumes, or in industrial districts.
- **Bicycle facility.** If bike lanes or paved shoulders of at least 4 ft. are provided, travel lanes can be striped as narrow as 10 ft. on community arterials and lower speed roadways. In the absence of bike lanes, an outside lane width up to 14 ft. should be considered where the roadway is part of a planned bike network.

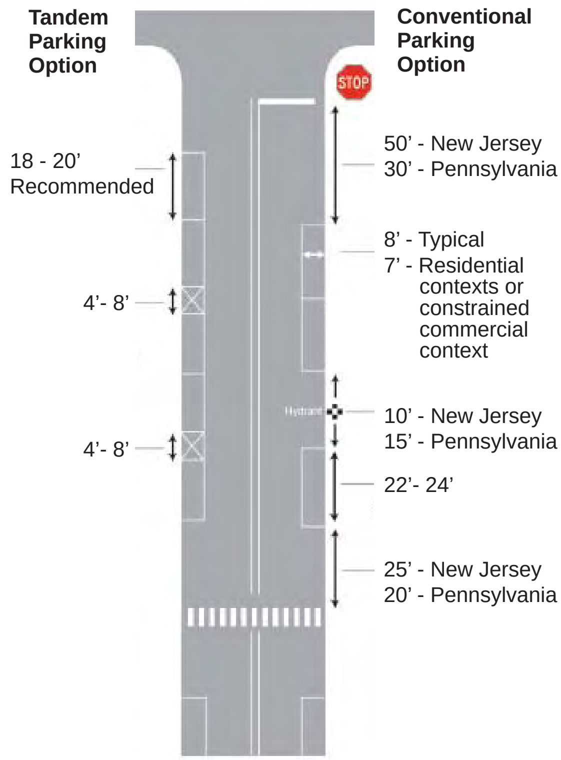


The use of 10 foot travel lanes is common on urban streets.

On-Street Parking

On-street parking is an important part of the urban fabric. Business owners prefer this parking type, and it benefits pedestrians by buffering them from passing traffic. It provides a clue to motorists entering urban areas that they should slow down. On-street parking should be considered in all contexts except the rural and suburban corridor context areas, and on all roadway types. Parallel parking lanes are typically 8 ft. in width (except when wide parking lanes are used in conjunction with bike lane treatments). Widths can be reduced to 7 ft. on commercial streets with low traffic volumes, and residential streets. The width of angled parking stalls ranges from 17 ft. 8 in. to 19 ft. 3 in.





Shoulders

The shoulder accommodates stopped vehicles, emergency use, and bicyclists. The need for a shoulder depends on the context areas. A shoulder is more critical on limited access roadways and rural highways with an appreciable volume of traffic. Shoulders are also desirable on higher order, higher speed roadways in suburban contexts. On these roads, shoulders will help avoid crashes, and allow motorists to stop if they have mechanical difficulties. These needs are less acute in urban and suburban center contexts, where on-street parking lanes can provide room for motorists to stop. Stopped vehicles here rarely pose a hazard for passing cars. In these contexts, shoulders rank lower in priority than parking or bike lanes. Most lower order, lower speed roadways do not need shoulders.

Shoulders of 8 to 10 ft. in width are recommended for higher speed roadways. Widths of 4 to 6 or 8 ft. are recommended for medium speed roadways. Narrow shoulder widths accommodate bicyclists and still allow vehicles to pull largely out of the traveled way, while controlling overall roadway width.

However, shoulders can perform a useful role in retrofitting existing urban and suburban center roadways with wide travel lanes, minimal demand for on-street parking, and where bike lanes are not practicable. In these situations, a shoulder of 4 to 6 ft. in width narrows the travel lane for motorists, and provides a safe area for bicyclists.

This urban street was retrofitted with a shoulder to enhance bike travel.

Roadway Guidelines, Cont.

Bicycle Facilities

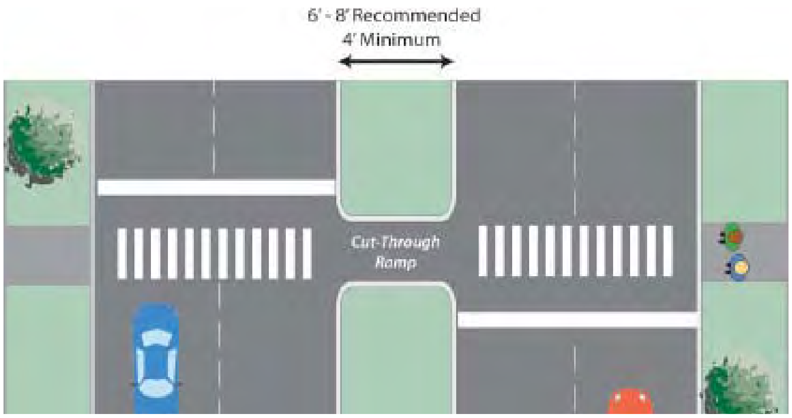
All roadway improvement projects on arterial and collector roadways should consider the best means of accommodating bicyclists, in order to encourage more trips by bicycle. The two most common types of bike facilities are the bike lane and shared roadway:

Shared roadway –roadways in which bicyclists share a wide curb lane with motorists, or ride on the shoulder. A shared travel lane should be 14 ft. wide on most roads.

Bike lane – A striped lane and markings on the roadway designate an area for preferential or exclusive use by bicyclists. A width of 5 ft. is preferred, although widths can increase to 6 ft. on roadways with higher speeds and truck volumes, and decrease to 4 ft. on suburban roads without curbs, or constrained urban roads.

The bike lane is the recommended bike facility for the general population. Many bicyclists prefer bike lanes to wide curb lanes, and ride further from the edge of the roadway than in a wide curb lane, reducing the risk of being hit by an opening car door. Fewer bicyclists ride on sidewalks along streets with bike lanes, which also improves safety. However, experienced bicyclists often prefer wide curb lanes, since they provide greater flexibility in maneuvering. Wide curb lanes are often more free of debris, but a regular sweeping program should be employed for bike lanes in any case.

Guidance on the appropriate facility should be provided by a bike network plan prepared for the community.



Medians

Medians can be grouped into three categories:

- Non-traversable – Examples of non-traversable medians include raised (with curbing), Jersey barriers, flush grass or guiderails.
- Traversable – painted medians that do not discourage vehicles from entering or crossing.
- Continuous Two-Way Left Turn Lane (TWLTL) – striped to permit left turns in either direction.

The non-traversable median is the preferred type because it is associated with the lowest crash rate. Within this category, the raised median best fulfills context sensitive principles, since it provides safer pedestrian crossings on higher order roadways. Raised medians for pedestrian crossings should be 6 to 8 ft. To house left turn lanes, raised medians should be 12 to 18 ft. wide. Raised medians can also be planted for an aesthetic enhancement.

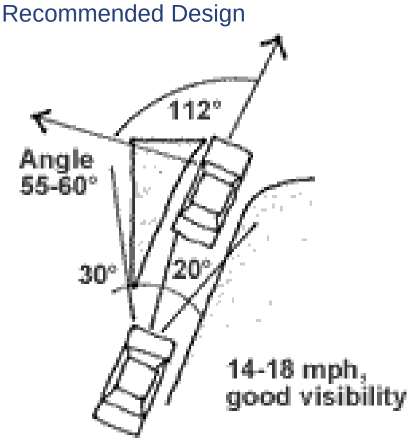
TWLTL's can be used on roadways with daily traffic volumes up to 24,000 and a high number of left turns, and if business owners strongly object to a raised median.

Intersections

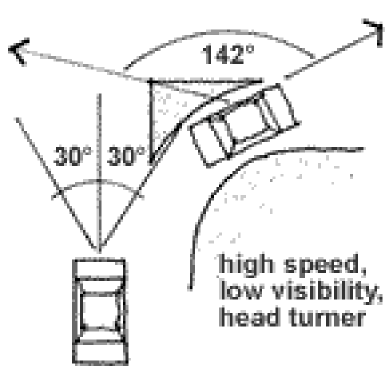
Safe, convenient pedestrian crossings should be provided at all intersections. To reduce the length of pedestrian crossings, a curb radius of 10 to 15 ft. should be used in urban core and town center contexts with intense pedestrian activity. Larger curb radii of 25 to 30 ft. will accommodate most turns on collector roadways. Radii of 35 to 50 ft. can be used to accommodate trucks on arterial roadways.

Traffic islands can improve traffic safety, and pedestrian safety by providing a refuge at a wide intersection. However, high-speed channelized right turn lanes should not be used in urban contexts, since they create conflicts with pedestrians.

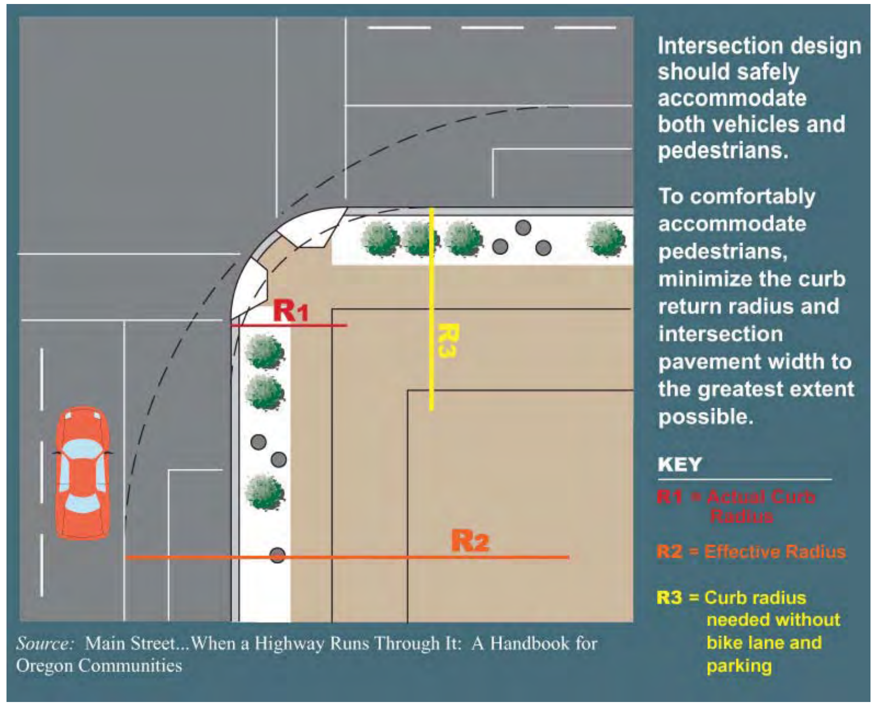
Recommended Design



Current AASHTO Standard



The effective curb radius of an intersection is increased by the presence of bike and parking lanes.



Source: Main Street...When a Highway Runs Through It: A Handbook for Oregon Communities

Roadside Guidelines

Pedestrian Facilities

Walkability is a critical aspect of the context-sensitive street. Sidewalk location and width, and pedestrian crossing design deserve special attention. Sidewalks should be built on both sides of the road in commercial and industrial areas; in residential areas on higher order roads, and local roads with 1 or more housing unit per acre. Clear sidewalk widths of 6 to 14 ft. are recommended for major roadways in town center and urban core contexts, and clear widths of 5 to 8 ft. in most other context areas.

The presence of buffers, consisting of grass in suburban areas, and street furniture in urban areas, improves pedestrian comfort. The widest buffers, of 6 to 8 ft., are recommended on suburban corridors. Buffers of 4 to 5 ft. are common in urban areas, with buffers of at least 5 ft. being desirable to host most tree species.

Providing safe midblock crossings presents a challenge on many roadways. Especially on higher order roadways with high volumes, the installation of midblock crosswalks should always be accompanied by special signs, signals and/or markings.

Missing sidewalk links are one of the biggest impediments to pedestrian mobility, particularly in suburban areas in the two states. Pedestrians in these areas must regularly walk in the street.

The 13' clear sidewalk width on this downtown street permits groups of people to comfortable walk side by side.

Public Transportation

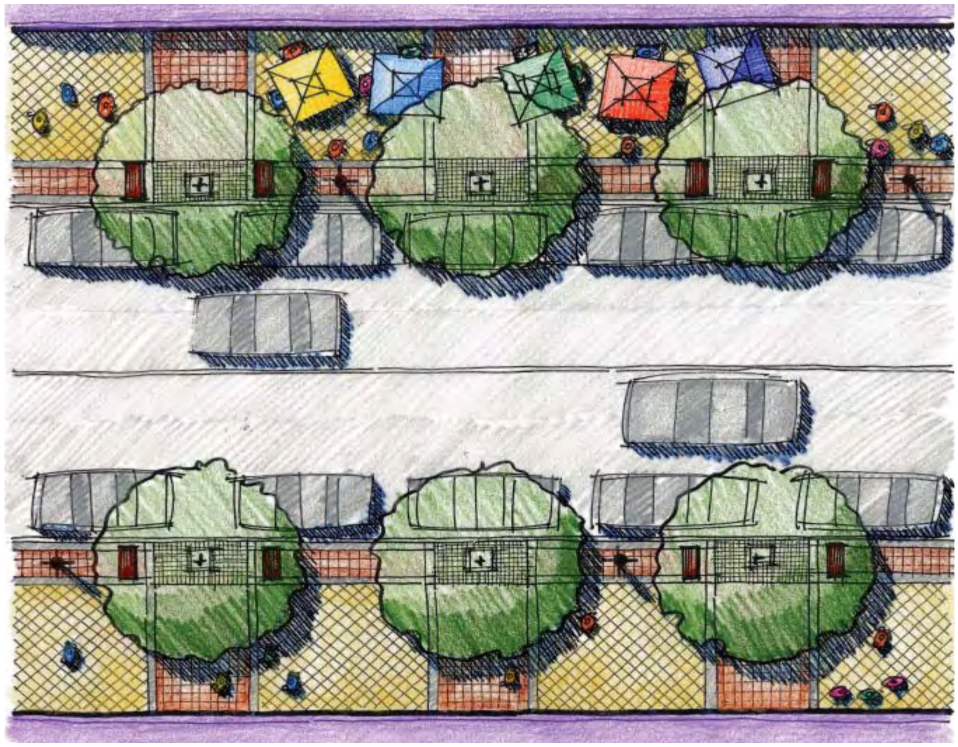
Greater use of transit is a key Smart Transportation strategy. Bus stops should be provided at the spacing indicated in the chart on the right.

Bus stops should provide a level, all-weather surface, with immediate access to a sidewalk.

Context Recommended Spacing	
Urban Core, Town Center	450 ft.
Town / Village Neighborhood, Suburban Center	750 ft.
Suburban Corridor, Neighborhood	1000 ft.

Landscape Design

More than a valued aesthetic enhancement, landscape elements help integrate a roadway into the surrounding environment. Street trees provide scale, visual interest, texture and shade to roadways. Landscape features buffer pedestrians from passing vehicular traffic, making them feel more comfortable. They also provide an important storm water management function by reducing runoff, and improving water quality by filtering runoff before it enters the collection system or nearby streams.



Street Furniture

Street furniture refers collectively to sidewalk amenities that accommodate pedestrians, transit users and bicyclists, such as benches or trash receptacles. They should be placed where they can accommodate the greatest number of people, and where activity nodes are most desired.

Road System Issues

Skillful network design is integral to Smart Transportation. A well-connected roadway network operates more efficiently than a network with limited connections, and reduces the need for significant widening of major roads. This section discusses network design and other system issues.

Network Design

There are two types of roadway networks - traditional grid and contemporary branching network. Traditional grids disperse traffic rather than concentrating it at a handful of intersections. They offer more direct routes and hence generate fewer vehicle miles of travel (VMT) than do contemporary networks. They encourage walking and biking with their direct routing and their options for travel.

Contemporary networks do have some advantages, such as the ability to lessen traffic on local residential streets. With their curves and dead ends, contemporary networks can go around or stop short of valuable natural areas.

Because they are more pedestrian and bicycle friendly, traditional grids are recommended in context sensitive design. Also, by offering many different routes to a destination, they better meet the needs of local motorists. Contemporary networks force motorists to incorporate higher order roads into most trips, increasing congestion on these roads.

Following are principles for well-connected networks:

- Arterial roadways should be continuous and networked in generally rectilinear form with spacing of ½ to 1 mile in suburban contexts and ¼ to ½ mile in urban contexts. Closer spacing may be needed depending on activity levels and through movements.
- Collectors may be spaced at 1/8 mile intervals, if needed.
- All neighborhoods in the community should be connected to the larger street system at least every ¼ mile.
- Where streets cannot be connected, provide bike and pedestrian connections at cul-de-sac heads or midblock locations as a second-best solution to accessibility needs. Recommended maximum spacing is 330 ft.
- Communities can improve network connectivity, such as by requiring at least a 1.4 to 1 ratio of street segments to street ends, or capping the length of blocks at 300 to 600 ft.

Traditional network

Contemporary network

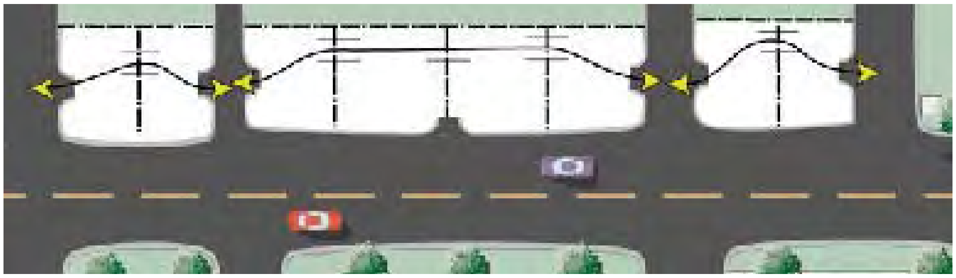
Access Management

Access management improves mobility and safety by controlling the location, frequency and design of driveways and intersections.

Following are access management techniques recommended by ITE:

- Minimize property access directly onto arterials through design of a connected network of closely spaced collectors and local streets.
- Minimize curb cuts in urban areas to reduce conflicts between vehicles, pedestrians and bicyclists.
- Facilitate cross-access drives between two or more lots to reduce the number of driveways. This is highly recommended for commercial corridors.

Municipalities in both states can encourage developers to link access and parking areas through offering incentives, such as a reduction in the required number of parking spaces. This in turn will help to reduce the number of driveways on major roadways.



Traffic Calming

Physical design, complementary road striping, and other traffic calming strategies are key to slowing motorists to speeds that are appropriate to their contexts, thereby reducing the number and severity of collisions, and increasing the safety and comfort of pedestrians and bicyclists.

Generally, the toolbox of available traffic calming measures gets smaller as you move up the functional hierarchy. Both vertical and horizontal deflection measures (speed tables, raised intersections and traffic circles) have been successfully applied to collector roadways. Signal retiming, on-street parking, and roundabouts have been implemented on arterial roadways. The road diet - or removing or narrowing travel lanes - is one of the most common traffic calming practices for higher-order roadways.

Operations and Maintenance

Local maintenance capabilities are important to consider with designs that incorporate landscaping. A community that supports a maintenance-heavy design, such as a planted median, will generally need to provide the maintenance itself, since NJDOT and PennDOT may not be able to do so. Community and neighborhood associations may be enlisted to provide maintenance on such features. Alternatively, the cost of maintenance may lead a community to support alternative measures, such as installation of a hardscape median, or low-maintenance plants such as natural grasses.

To abet pedestrian and bike mobility, maintenance operations should include regular snow removal on all sidewalks, around bus stops, curb ramps, and on bike facilities.

Maintenance Implementation

1. Enlist Early Community Involvement
2. Establish Commitment from the Appropriate Party to Maintain Facilities
3. Preserve the Project's Design Intent
4. Develop Operation and Maintenance Procedures Acknowledging Any Unique Needs
5. Use Context Sensitive Design to Reduce Maintenance Impacts
6. Consider Local Maintenance Capabilities

Emergency Vehicles

Narrower lane widths, physical medians, smaller curb-return radii and traffic calming measures all have potential to increase the response time for emergency service vehicles. It is possible to build support for context sensitive solutions if emergency services understand that the improvements may result in slowing traffic through a busy area, resulting in fewer and less severe crashes. Frequently, however, a project team will need to work with emergency services to demonstrate that any impact on response times will be minimal, or to modify the roadway design.

Implementation

The Smart Transportation Guidebook has potential application for a wide range of users: state government, local government, MPOs, and private developers. The Guidebook can also be used in many different ways. It can be used as a technical resource, consulted on an as-needed basis at various points during the course of a roadway development project. It can also be used to help steer a roadway project, from identification of the transportation problem through preliminary design.

For a complete project, the different parts of the Guidebook work together:

Tools and Techniques. These should be used to gain a better understanding of the transportation problem, potential solutions, and budget early in the project development process. The discussion of different performance measures emphasizes that successful projects can address a wide variety of transportation issues.

Description of Context Areas. The existing and planned context areas should be identified at the beginning of projects, using the typical characteristics defined in the Guidebook.

Matrix of Design Values. Rather than simply relying on conventional functional classification, the project team must define the existing and desired role of the roadway, to serve both the community and regional mobility. The concept of desired operating speed ensures that whatever roadway type is selected, its design is consistent with its intended role. Once the context area and roadway type are selected, the recommended design values can be selected.

Roadway and Roadside Guidelines. These sections should be consulted for guidance on the selection of design values when assembling roadway and roadside features alike.

System Issues. Guidance is provided on strategies such as access management and traffic calming in order to create a roadway system that better meets the needs of all users.

Use of the Guidebook is not meant to result in a cookie-cutter template, in which the same Main Street or commercial corridor design appears in every town. Both states prize the diversity of their communities.

At a minimum, however, application of the Guidebook should result in the creation of roadways that: reflect community and state consensus; complement and strengthen the host community; and, comprise a transportation system which most effectively meets the needs of all modes: vehicular, walking, biking, and transit.

BEFORE

AFTER

BEFORE

AFTER

Acknowledgments

Smart Transportation Guidebook Review Committee

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Federal Highway Administration – Pennsylvania

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