Canadian Institute of Transportation Engineers

Promoting Sustainable Transportation Through Site Design:

An ITE Proposed Recommended Practice

Institute of Transportation Engineers

IBI GROUP

Promoting Sustainable Transportation Through Site Design

A Proposed Recommended Practice of the
Institute of Transportation Engineers

The Institute of Transportation Engineers (ITE) is an international educational and scientific association of transportation and traffic engineers and other professionals who are responsible for meeting mobility and safety needs. ITE facilitates the application of technology and scientific principles to research, planning, functional design, implementation, operation, policy development and management for any mode of transportation by promoting professional development of members, supporting and encouraging education, stimulating research, developing public awareness, and exchanging professional information; and by maintaining a central point of reference and action.

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Publication No. RP-035
First Printing
500/CAA/Good/1204

Cover Illustration courtesy of Lynne Krisfalusi, L Krisfalusi Design Studio

ISBN No: 0-935403-88-4.
Printed in the United States of America

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Preface and Acknowledgements

This report is published as a proposed recommended practice of the Institute of Transportation Engineers. As such, it is to be considered in its proposed form, but is subject to change after receipt and consideration of suggestions received from those who have reviewed the report. Readers are encouraged to submit their written suggestions for improving this report to:

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Written suggestions should be received at the above address no later than March 31, 2005 to ensure consideration for incorporation into the final recommended practice report.

The report was developed by the Canadian Institute of Transportation Engineers (CITE-ITE District 7), with funding support from the Institute of Transportation Engineers and the Transport Canada Moving on Sustainable Transportation Program (MOST). A consultant team lead by IBI Group, in association with Noxon Associates and DPL Consulting, prepared the report under the direction of a Steering Committee appointed by CITE. Members of the committee were:

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Development of the report involved extensive consultation with ITE members and representatives of the urban planning, urban design, transportation planning/engineering, public transit, pedestrian, cyclist, transportation demand management and development communities. The primary sources of information used in preparing the report were:

- Existing documents published by municipalities, agencies and associations;
- Telephone interviews;
- Case studies and photos of desirable (and undesirable) site designs submitted by "Friends of the Committee" and other interested individuals and organizations; and
- An internet-based survey conducted with the assistance of ITE.

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The Steering Committee would like to acknowledge the contributions of the consultant team, lead by Brian J. Hollingworth (A) of IBI Group, and supported by Russell G. Brownlee (A) and Anjali Mishra of IBI Group, Geoff Noxon (A) of Noxon Associates, and Danelle Laidlaw of DPL Consulting. Their tireless efforts have produced a report that the entire project team is extremely proud of. The assistance received from the review panel, “friends of the committee,” and the many other individuals who have contributed to this project, is also greatly appreciated.

Standard ITE Metric Conversions

During the service life of this document, use of the metric system in the United States is expected to expand. The following common factors represent the appropriate magnitude of conversion. This is because the quantities given in U.S. Customary Units in the text, tables or figures, represent a precision level that in practice typically does not exceed two significant figures. In making conversions, it is important to not falsely imply a greater accuracy in the product than existed in the original dimension or quantity. However, certain applications such as surveying, structures, curve offset calculations, and so forth, may require great precision. Conversions for such purposes are given in parentheses.

Length
1 inch = 25 mm (millimeters-25.4)
1 inch = 2.5 cm (centimeters-2.54)
1 foot = 0.3 m (meters-0.3048)
1 yard = 0.91 m (0.914)
1 mile = 1.6 km (kilometers-1.61)

Volume
1 cubic inch = 16 cm3 (16.39)
1 cubic foot = 0.028 m3 (0.02831)
1 cubic yard = 0.77 m3 (0.7645)
1 quart = 0.95 L (liter-0.9463)
1 gallon = 3.8 L (3.785)

Speed
foot/sec. = 0.3 m/s (0.3048)
miles/hour = 1.6 km/h (1.609)

Area
1 square inch = 6.5 cm2 (6.452)
1 square foot = 0.09 m2 (0.0929)
1 square yard = 0.84 m2 (0.836)
1 acre = 0.4 ha (hectares-0.405)

For other units refer to the American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA, *Standard for Metric Practices E 380*.

1. Introduction

1.1 Purpose of the Report

This report recommends site design practices that can be applied through the land development process to promote the use of more sustainable modes of passenger transportation, such as walking, cycling and transit. Its primary purpose is to assist policy-makers and professionals involved in the preparation, review and approval of **non-residential** development proposals to identify and incorporate features that make sites more accessible to travel modes other than the single-occupant vehicle (SOV). The report also identifies a range of supporting policies and actions that agencies can implement to create an atmosphere conducive to promoting sustainable transportation through site design.

An underlying theme of this report is the integral relationship between land use and transportation. The report is based on the premise that effective site design can enhance the attractiveness, convenience and safety of walking, cycling and transit use, while not compromising the efficiency of travel by other modes. Conversely, if a site is not designed to provide access for sustainable transportation modes, users could be significantly discouraged from its use—a preventable situation given the level of information currently available.

1.2 Why Promote Sustainable Transportation Through Site Design?

During the past several decades, the global community has become increasingly concerned about the planet's ability to deal with the environmental consequences of human activities. The emergence of phenomena such as acid rain, smog and climate change present tangible evidence of these consequences.[1]

Transportation is one human activity that has a considerable impact on the environment. The development of infrastructure for a motor vehicle based transportation system, as is currently the case, requires vast amounts of land, intrudes into natural habitats and permanently alters the landscape. More significant from an environmental perspective is the consumption of large quantities of fossil fuels by the vehicles operating on the system. This consumption exhausts fuel resources and releases pollutants into the atmosphere.

From a passenger transportation perspective, the automobile is the primary mode of travel in many parts of the developed world. In countries like the United States and Canada, most individuals rely on a personal vehicle for the vast majority of work, shopping and social travel.

When compared to non-motorized passenger modes, such as walking and cycling, and motorized transit, automobile travel (especially in SOVs) is considerably more harmful to the environment. In one year alone, a typical automobile driven 17,000 km emits more than four

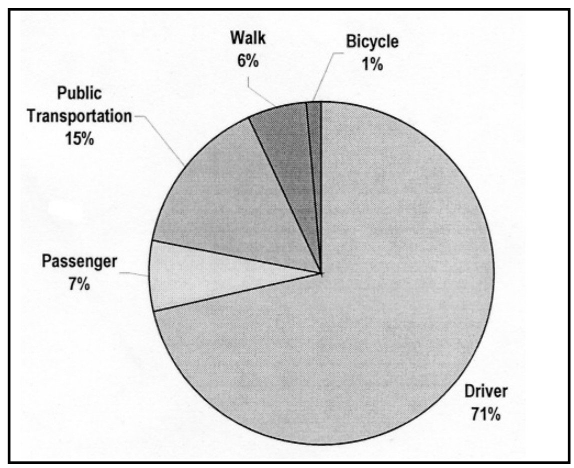

Figure 1–1. How Canadians travel to work.
Source: IBI Group[2]

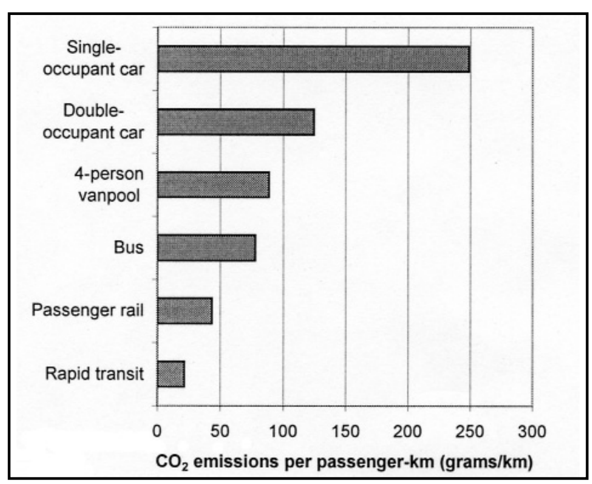

Figure 1–2. Greenhouse gas emissions from passenger transport modes.
Source: IBI Group[3]

1 Statistics Canada. Human *Activity and the Environment 2000*, Catalogue No. 11-509-XPE. Ottawa, ON, Canada: Statistics Canada, 2000.

2 Compiled from 2001 "Journey to Work" data, *Statistics Canada*.

3 Based on the data from *Making Transportation Sustainable, A Case Study of the Quebec City-Windsor Corridor*. Environment Canada, March 2002.

tonnes of greenhouse gases, necessitates as many as eight spaces for parking at home, work, stores and other locations, and contributes to nearly 3,000 motor vehicle related fatalities in Canada.[4]

With growing concern that society's continued dependence on the automobile for passenger travel is not environmentally sustainable in the long term, a new approach to transportation system development is beginning to evolve. **Sustainable transportation** is a concept that promotes a balance of the economic and social benefits of transportation with the need to protect the environment. A sustainable transportation system:

- "Allows individuals and societies to meet their access needs safely and in a manner consistent with human and ecosystem health, and with equity within and between generations;
- Is affordable, operates efficiently, offers choice of transport mode and supports a vibrant economy; and
- Limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles components and minimizes the use of land and the production of noise."[5]

Sustainable transportation modes are those modes that provide an alternative to the SOV and lessen reliance on automobiles for personal travel. Modes in this category include:

- Active transportation modes such as walking, cycling and in-line skating;
- All forms of public transportation and transit; and
- High-occupancy vehicles, including carpools and vanpools.

Figure 1-3. Examples of sustainable transportation modes.
Source: www.pedbikeimages.org / Dan Burden

The broader benefits of sustainable transportation mode use are well documented and include:

- *Environmental*: Reductions in motorized vehicle travel can reduce greenhouse gas emissions (and resulting climate change), air pollution, land consumption for roads and parking, noise and impacts on wildlife and vegetation;
- *Health*: Improved health may result from reductions in air pollution and motor vehicle collisions, and the promotion of more active and healthy living;
- *Quality of Life*: Reductions in vehicular traffic volumes can produce calmer and safer streets, improve walkability and lessen noise and congestion. These in turn increase opportunities for social interaction and improve the quality of life;
- *Accessibility*: Providing access to more modes allows all members of society to travel, regardless of their level of mobility or economic situation; and
- *Economic*: Alleviating the need for additional road capacity minimizes the requirement for expenditures on new infrastructure. There is also a reduction in healthcare costs related to injuries sustained in motor vehicle collisions and respiratory illness caused by air pollution. Less traffic congestion reduces delays to passenger travel and the shipment of goods, which reduces time costs and the burden on the economy and individual travelers.

Despite awareness of these benefits, moving away from today's auto-dominated transportation system presents a formidable challenge. The nature of existing infrastructure, prevailing societal values and preferences and the flexibility afforded by the personal vehicle tend to perpetuate a policy- and decision-making framework focused on the automobile.

Nowhere is this more evident than in the land development process. During the past five decades, the ease of mobility provided by the automobile has permitted the outward expansion or "suburbanization" of cities, a phenomenon often referred to as "urban sprawl." Sprawl is a spread-out, skipped-over development pattern, characterized by one- or two-story single-family residential

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[4] Distance driven per year is based on the *Canadian Vehicle Survey*, Transport Canada, 2000. Greenhouse gas emissions are based on an average fuel efficiency of 10 L/100 km and a GHG (CO2 Equivalents) factor of 2,500 gram/L. Number of parking spaces is a subjective estimate. Number of collisions is from the Canadian Council of Motor Transportation Administrators, *Canadian Motor Vehicle Traffic Collision Statistics*, 2001.

[5] Centre for Sustainable Transportation, 2003.

dwellings on lots ranging in size from one-third to one acre, accompanied by strip commercial centres and industrial parks, also two stories or less in height and with similar land takings (TRB, 1998).

"Sprawl occurs in response to increased affluence and growing dependence on the automobile as the preferred method of intra- and inter-metropolitan travel. Sprawl also occurs, in part, because local governments encourage this form of development via zoning and subdivision ordinances, which in turn reflects the desire of a large share of their citizenry."[6]

Many jurisdictions are responding to this situation through the introduction of land use planning policies, such as smart growth initiatives, aimed at encouraging denser, more compact, sequential development patterns. These high-level strategies provide a supportive framework for sustainable transportation, but tend to offer little guidance on the more micro-scale of site design. Decisions made at this micro-scale level of detail directly influence development, which in turn affects the ease and efficiency of sustainable transportation mode use.

1.3 Scope and Use of the Report

This report is intended to provide individuals involved in the land development process with information on how to better facilitate the use of modes other than the automobile through site design. The document focuses on design practices for **non-residential** land uses (such as office, retail, recreational, industrial and institutional), although many of the guidelines could be applied in the design of mixed-use and medium- to high-density residential sites.

The report is primarily oriented to the destination end of a trip rather than the origin because the research completed in preparing this report showed an absence of consolidated information and guidance on site design practices for non-residential types of land use. A relatively large base of information already exists on residential site design.

The objectives and recommended practices espoused in this report are consistent with and support the goals of emerging concepts such as smart growth, brownfields development and context sensitive street design. These initiatives, similar to the guidelines contained in this report, are focused on making urban areas more efficient, compact and people-oriented.

Several of the design elements described in the report, such as building placement and internal transportation network configuration, will only apply to new developments. Other elements, like guide signing, bicycle parking and racks and landscaping, will apply equally to redevelopment, retrofit and even existing sites.

The report does not attempt to provide definitive direction on every aspect of non-residential site design. Instead, the report highlights some of the more important design decisions influencing access to sustainable transportation modes and points individuals to known resources on the topic. Where such resources do not exist or conflict with the objective of promoting sustainable transportation, the report presents flexible or alternative practices that reflect the diversity of land uses and approaches to development.

To supplement design guidelines, the report provides a range of supporting land use and transportation policies and actions that agencies can implement to promote and facilitate the use of sustainable transportation modes. When implemented in a comprehensive and coordinated manner, these measures can create a public and private sector decision-making framework for land development and a provision of transportation services that is less oriented towards serving the automobile and more focused on accommodating the needs of pedestrians, cyclists and transit riders.

The recommended practices contained in this report have been intentionally written in an action-oriented manner, rather than in more passive terms such as "may" or "should consider." The report projects a strong, affirmative message to emphasize the importance of effective site design practices and supportive policies and actions for achieving a more sustainable transportation system. It is acknowledged that the recommended practices presented are not the only way of meeting this objective and applicability will be influenced by local conditions, requirements and constraints. Users will adapt implementation of the report to their own situations based on professional judgement. Public and private sector entities expected to use the report are shown in Table 1–1.

It is anticipated that public sector agencies will extend and incorporate applicable elements of the report into local policies, guidelines, ordinances and standards to facilitate implementation. In other instances, agencies may wish to use the information to update or supplement existing transportation plans, design standards and review processes and land use planning documents, such as official plans, zoning by-laws or ordinances and area development plans.

[6] Transportation Research Board. *The Cost of Sprawl—Revisited*, Transit Cooperative Research Program, Report 39. Washington, DC, 1998. p. 1.

Table 1–1. Expected Users of the Report

Public Sector	Private Sector
Elected officials and policy-makers	Developers
Municipal staff involved in land use planning, urban design, transportation engineering, municipal engineering and public works	Professional planners and engineers
Transit operators	Architects
Parking authorities and commissions	Landscape architects
School and parks boards and commissions	Roadway and site designers
Public Health Departments	Transportation engineering consultants
	Property managers

Where the recommendations of this report are inconsistent with or contrary to the existing regulations or plans of an agency, careful consideration should be given to the motivations, objectives and trade-offs reflected in the conflicting provisions of the documents. In these instances, the report can be used to assess how certain design decisions would place priority on specific travel modes and the long-term implications on available travel options, community integrity and capital and operating costs. **In no instance is the direction provided in the report intended to supercede local authority or regulation.**

1.4 Making it Happen

The land development process involves many parties, ranging from the developer advancing the site plan application to the municipality responsible for granting approval to proceed. At times, public and private sector participants can appear to be at odds, with municipal staff portrayed as the "enforcers of standards," and developers seen as avoiding such provisions in an effort to minimize costs.

This report adopts the alternative viewpoint that municipalities and developers share a common goal of achieving high quality development that is functional and attractive, and in turn provides a long-term return on investment. In many cases, the recommendations presented may be revenue neutral, or have a small initial cost. Additional costs, if there were any, would typically represent only a small fraction of total site development costs, and may in fact, result in lower overall life-cycle costs and other benefits. Such benefits include more leasable space (due to higher densities and coverage), better tenants (and higher rents), reduced parking costs (because fewer spaces are required) and improved company and agency image (through enhanced employee morale and recognition for environmental stewardship), not to mention the social and environmental benefits discussed above.

The inability to achieve a site design that facilitates access by sustainable transportation modes is often not the result of deliberate resistance by the development community, but rather a lack of available information on what can be done. In some cases, it may be as simple as providing the developer examples of what other landowners and municipalities have done in similar circumstances, which is one of the overarching objectives of this report. Often the images of good site design speak for themselves and breed good design in return.

The long-term benefits of improved site design cannot be understated. One can only point to cities that, in the 1960s, 1970s and 1980s, placed priority on building high capacity roadways and extensive parking areas within their downtowns, often to the detriment of established neighbourhoods and commercial districts. In hindsight, this strategy has had the effect of segregating communities, increasing noise, pollution and crime, reducing the "friendliness" of streets and driving away customers. These same cities are now looking at ways to revitalize their commercial areas and regain the street life that once existed.

The development of a more sustainable transportation system will clearly require efforts that transcend the recommended practices described in this report. Movement towards sustainable transportation will only result from action by all parties, and from the federal government to individual citizens and landowners. For this to occur, a common understanding of the benefits needs to be fostered, not only in environmental terms, but also from social and economic perspectives. If everyone is working towards the same goal, the synergistic effects will result in measurable progress.

1.5 Organization of the Report

The remaining chapters of the report are structured as follows:

Chapter 2 describes how to incorporate initiatives that facilitate the use of sustainable transportation modes into the site development process. It summarizes several factors that need to be considered when designing a site through this process.

Chapter 3 presents a range of site design guidelines that promote sustainable transportation. It outlines the structure of the guidelines, examines their applicability by stage in the site development process and by travel mode, and provides recommended practices, illustrative examples and related topics for each design element.

Chapter 4 lists several supporting policies and actions integral to the promotion of sustainable transportation, but not directly applicable to the design of a particular site.

Appendix A provides a list of resources and user groups that can provide further information on how to promote sustainable transportation through site design.

Appendix B provides a “prompt list” to guide developers and municipalities in the design and review of proposed site plans from a sustainable transportation perspective.

2. Incorporating Sustainable Transportation into Site Design

2.1 Overview of Site Development Process

Site development is an integrated and iterative process. It is typically not governed by any one jurisdiction, agency or department, or by a single set of guidelines. Nor does a developer carry out the process in the absence of professional guidance.

The development of a site, from concept to operation, presents many opportunities to promote sustainable transportation. At each stage of this process, there is a series of decision factors that influence the viability of sustainable transportation modes and guide resources and stakeholders typically consulted in reaching the decision.

Table 2–1 provides an overview of the four-stage site development process, highlighting how sustainable transportation is influenced at each point through the decisions made by various stakeholders. At the outset of the site development process, the developer will establish a concept that includes the site location, proposed uses (for example, office, retail, industrial), density and coverage, transportation connections and other defining factors, such as parking supply. Ultimate site users or tenant(s) may or may not be known at the **concept development** stage.

Key factors influencing the viability of sustainable transportation modes, such as land use mix and development form, are established at this early point. Guiding documents typically include official plans, transportation plans, secondary and area plans, zoning by-laws or ordinances and subdivision plans. Agencies can play an important role in helping to guide the developer towards choices that promote, or at least preserve, sustainable transportation mode options through application of supportive policies and practices, and any advice provided.

Once a concept has been developed, detailed **site planning** occurs. This is perhaps the most important stage of site development for ensuring efficient access by sustainable modes. Although zoning by-laws or ordinances and community-specific urban design guidelines may provide overall direction, planners, architects and engineers responsible for site design make many decisions that can affect the viability of sustainable travel modes. For example, internal transportation network configuration determines the ease of progression through the site for pedestrians, cyclists, carpoolers and possibly transit riders. Building placement, entrance locations and parking layout can make the site safer and more attractive to travelers considering whether to leave their automobiles at home.

Detailed **building design** typically occurs after the site planning stage. At this stage, consideration is given to design elements such as bicycle storage, parking space allocation, pedestrian walkway details and change facilities. The provision of such features can help make the difference between a person choosing to walk, cycle, rideshare, or take transit, instead of using their vehicle. For the most part, architects and other specialists make these decisions in conjunction with the developer. Agencies can influence this decision process through supportive policies and guidelines.

The site development process concludes with the opening of the building(s). Even at the **site operation** stage, decisions concerning facility maintenance, employee travel incentives and parking policies can impact the attractiveness of sustainable travel options.

Depending on the size and nature of the project, the site development process may require the involvement of several areas of practice, such as land use planning, urban design, transportation engineering, municipal engineering and building design. Within each of these broad areas, as illustrated on Figure 2–1, there are many design standards, policies and processes that apply to site design. In some cases, these directives are not supportive

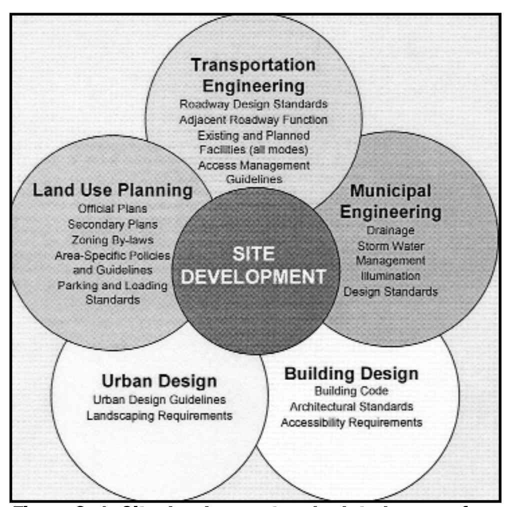


Figure 2–1. Site development and related areas of practice.
Source: IBI Group

Table 2–1: Site Development Process and Considerations for Sustainable Transportation Modes

Stage	Typical Decision Factors Influencing the Use of Sustainable Modes	Guiding Resources (where available)	Key Stakeholders
Concept Development	• Site location within community • Site location in relation to transportation infrastructure and services • Proximity to compatible land uses • Development densities and land uses (including mixed uses) • Requirements for new infrastructure • Parking supply	• Official plans • Secondary or area plans • Area-specific policies and guidelines • Zoning by-laws • Subdivision plans • Transportation plans • Mode-specific plans (transit, bicycle, pedestrian) • National and industry standards and guidelines	• Developer • Municipality/county (planning) • Consultants (architect, urban design, engineers) • Transit service provider • Public health departments • Surrounding neighbourhoods • Targeted users
Site Planning	• Building orientation and layout • Location and design of pedestrian and cycling facilities • Location of transit routes and stops • Parking placement and layout • Site access for vehicles	• Zoning by-laws • Urban design guidelines • Mode-specific design guidelines • Site-specific studies (traffic impacts, noise, wind, lighting, etc.) • Bicycle parking by-laws • National and industry standards and guidelines	• Developer • Municipality/county (planning, transportation, public works/engineering, landscape, transit) • Public health departments • Surrounding neighbourhoods • Targeted users
Building Design	• Design of pedestrian and cycling facilities • Interior/exterior building facilities, showers, lockers and changing facilities • Public/private space interface and access points • Lighting and security systems • Designation of parking spaces	• Architectural standards • Building codes • Urban design guidelines • Accessibility standards • National and industry standards and guidelines	• Developer • Municipality/county (planning, building, engineering) • Future tenants • Surrounding neighbourhoods • Targeted users
Site Operation	• Facilities maintenance • Traffic control and management • Employee programs • Parking policies	• Transportation demand management guidelines/programs/ associations • Occupational health and safety guidelines	• Owner, property manager, tenant, users (employees, patrons, students, etc.) • Surrounding neighbourhood groups, including business improvement associations • Targeted users

Source: IBI Group

of or may be in direct conflict with the objectives of promoting sustainable transportation through site design. Many, however, provide the flexibility to interpret the provisions in a more conducive manner.

2.2 Using Site Design to Overcome Barriers to Sustainable Transportation

When identifying means to encourage the use of transportation modes other than the automobile, one must consider the motivating factors in mode choice decisions. Most travel decisions come down to individual assessments of the relative time, cost and convenience of the competing modes, with comfort and mode availability factoring into the selection process.

Many travelers believe that automobiles provide the quickest and most convenient means of passenger transportation. The decision to not use alternatives to the auto is influenced by several factors:

- *Walking and Cycling*: A 1998 survey of Canadians revealed that the primary barrier to walking and cycling for commuters was distance (Figure 2–2).[7] However, the survey reported that 64 percent of respondents lived within a 30-minute (min.) walk of routine destinations and 84 percent lived within a 30-min. bike ride, suggesting that factors other than distance contribute to the lower use of these modes. A 1992 Federal Highway Administration (FHWA) and U.S. Department of Transportation (U.S. DOT) study found that concerns over traffic safety, lack of routes and weather were the main disincentives to cycling and walking, which is also deterred by loads to carry and the fear of crime.
- *Transit*: The Canadian Urban Transit Association reports that individuals choose not to take transit because of unfavourable travel times (25 percent of all dislikes mentioned), inconvenient schedules (22 percent), crowded vehicles (17 percent) and lack of availability or access (16 percent).[8]

Although less information exists on why people take certain modes than why they do not, it is clear that many individuals choose to walk, cycle or take transit due to personal preferences, not because they are captive to another mode. For example, people may choose to ride a bike for exercise or take transit so they can enjoy a book.

Proper site design can address most commonly cited barriers to walking, cycling and transit use:

- *Travel time and distance* can be reduced through compact and mixed-use development, proper site location and the provision of more direct routes;
- *Weather* can be mitigated through weather-protected walkways, enclosed transit shelters and waiting areas and on-site change facilities;
- *Convenience and comfort* can be improved through highly visible pedestrian and bicycle linkages, featuring on-site amenities like secure and accessible bicycle parking and aesthetically pleasing pathways; and
- *Safety and security* can be enhanced through supportive street design, dedicated cycling facilities,

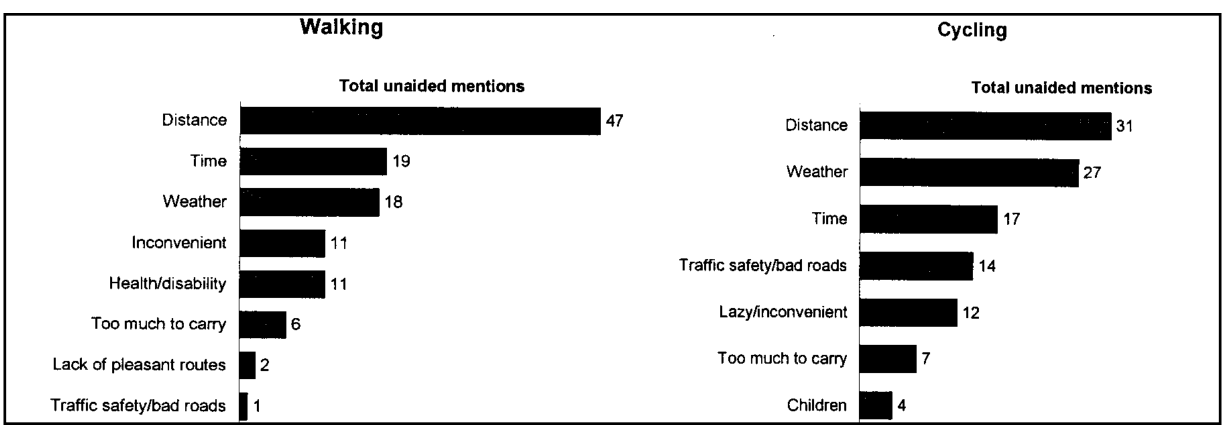


Figure 2–2: Main barriers to walking and cycling as a mode of transportation (%).
Source: 1998 National Survey on Active Transportation Summary Report, Environics International on behalf of Go for Green in Ottawa, 1998 www.goforgreen.ca/active_transportation/

[7] Environics International. 1998 *National Survey on Active Transportation Summary Report* on behalf of GO for Green, Ottawa. 1998.

[8] Canadian Urban Transit Association. Toronto, 2000.

proper lighting and landscaping. Section 2.3 further elaborates on this consideration.

The guidelines presented in Chapter 3 address many of these considerations, with the objective of overcoming impediments to the use of more sustainable transportation modes through supportive site design practices.

2.3 Safety and Security Principles

Safety (freedom from risk or danger) and security (perceived danger of being accosted, harassed, or robbed) considerations enter into many travel-related decisions beyond mode choice (where to live and work, where and when to cross a busy road). Although good site design cannot alleviate all concerns, poor site design can certainly discourage individuals from using sustainable travel modes. Some examples include:

- A parent may choose to drop off and pick up their child at school or at a mall, as opposed to letting them walk, bicycle, or take transit, due to traffic, personal safety, or security concerns at or near these developments. The result is four trips by automobile instead of two by a sustainable travel mode.
- An employee or visitor to an office or industrial site may choose to drive in the early morning or late evening so they can park close to a building entrance or in a secure garage.
- A cyclist may choose to avoid riding or walking if there is inadequate lighting or if bicycle parking is in a dim or secluded area.
- People may drive rather than walk or bike through areas where there is inadequate lighting or conspicuity due to fears of being accosted, especially at night.

In practice, measures to enhance safety and security for transit riders, cyclists and pedestrians may compete with other site design objectives, from minimizing costs to maximizing the efficiency of traffic movements. At the planning and design stages, a thorough review should be undertaken to ensure that competing objectives are properly balanced, *while ensuring that major safety or security deficiencies are not incorporated into a site design*. Changes to plans are less expensive and easier to implement than retrofits made after the site is developed. In most cases, a poorly designed site will not be retrofitted to correct safety deficiencies.

The following sections highlight the principles of on-site safety and security that should be incorporated into a site designed to facilitate the use of sustainable transportation modes. Many of these considerations are reflected in the guidelines presented in Chapter 3.

2.3.1 Road User Expectations

A critical element of road safety is consistency in meeting the expectations of all users. Through proper design of roads, parking areas and pedestrian and cycling routes, site designers can maximize each individual's readiness to successfully respond to situations and potential conflicts. Careful design will locate pedestrians and cyclists to eliminate the element of surprise (both for pedestrians/cyclists and motorists), a key factor in pedestrian and cyclist collisions with motor vehicles.

Roadway marking and signing standards provide a consistent base of information on which road users can make correct decisions. On-site road design and operations should therefore give due consideration to standard design and traffic control.

In addition to the proper design and operation of roadway and traffic/pedestrian controls, site design should situate key conflict points where all road users can:

- *Detect and recognize the hazard*: The time required for a road user to detect a possible hazard increases when the user is performing several competing tasks, where poor contrast exists, or when the hazard appears well off to the side. Good site design situates potential conflict points where they are both expected and easily detected, such as at intersections or marked mid-block crossings with good sight lines; and
- *Decide and take action to avoid the hazard*: Once a possible conflict has been recognized, the road user decides on an appropriate course of action, such as a change in speed or direction. Good site design ensures that sufficient time is provided for proper decision and action, and that decisions options are clear.

2.3.2 Conflict Points

While on-site conflicts between vehicles, cyclists and pedestrians cannot be avoided, potential risks that arise can be minimized. The more conflicts an individual has to negotiate as a pedestrian, cyclist, or transit rider, the more likely they will be to drive.

Proper site design aims to:

- Minimize the number of conflict areas and "multiple threat" locations through roadway design, parking layout, proper loading facility design, consolidating access/driveways and pedestrian concentration and channelization. Where pedes-

trian routes are not clear, confusion or walking in areas intended for motor vehicles may occur.
- Minimize exposure between road users by limiting the time they occupy the same space (through pedestrian refuges, reduced crossing distances, bicycle lanes, or paths);
- Provide adequate sight distances at internal roadway intersections, pedestrian crossings, parking aisle accesses and transit stop locations, in the vicinity of street-scaping features and in advance of signing. This enables road users to perceive and react to conflicts in a more timely manner. On larger sites with ring roads or internal arterial/collector type roadways, sight distances on horizontal and vertical curves will also be an important consideration. Sight distances should be consistent with the Transportation Association of Canada (TAC) *Geometric Design Guidelines for Canadian Roads*,[9] AASHTO's *A Policy on Geometric Design of Highways and Streets*, 5th Edition,[10] or similar standards.
- Reduce speeds by balancing the allocation of road space between travel lanes and adjacent pedestrian and cycling facilities;
- Locate primary road user conflict areas (intersections and pedestrian crossings) where traffic speeds are low, proper sightlines exist and driver attention is best focused (Figure 2–3);

Figure 2–3. Avoid designs where vehicle drivers exiting from driveways cannot see approaching pedestrians, as illustrated.
Source: IBI Group

- Highlight vehicle-pedestrian conflict points through signing, road markings, illumination and physical elements, such as raised crosswalks or curb extensions (Figure 2–4);
- Eliminate design elements that create unsafe situations such as "pinch points" that force cyclists to abruptly merge into traffic, or "trap areas" where misguided pedestrians are unable to leave the travel portion of the roadway due to buildings, transit shelters, or landscaping; and
- Consider the effects of darkness and illumination. Often times commuters travel in darkness for one or both legs of their journey, and as a result facilities should be designed to account for reduced visibility.

Figure 2–4. Safe pedestrian crossing should be an integral part of site design, not an afterthought.
Source: Richard James, RIchard James and Associates

2.3.3 On-Site Personal Security

The security felt by individuals on-site can be a primary factor in mode choice decision. Regardless of the travel or wait time, individuals will be reluctant to walk, cycle, or use transit if they feel at risk during their trip, especially when stopped or waiting. For example, a person may be discouraged from cycling if he/she is concerned about the risk of walking to a destination after parking a bicycle or feel insecure while locking or unlocking a bike, when his/her attention is diverted from scanning for hazards.

Proper site design can make users feel more comfortable, particularly after hours when there are fewer people on site, by:

- Minimizing walking distances between building entrances and primary pedestrian approaches, transit facilities and bicycle storage areas;
- Locating secluded portions of the site and loading areas away from primary pedestrian and cycling routes and transit stops;
- Designing pedestrian and cycling routes free of barriers and obstructions, such as traffic control measures, curbs and stairs;
- Locating and orienting buildings, site amenities and landscaping features to maximize pedestrian visibility from within buildings, at transit stops and on-site;

[9] Transportation Association of Canada, Ottawa, 1999.

[10] AASHTO. *A Policy on Geometric Design of Highways and Streets*, 5th Edition. Washington, DC: AASHTO, 2004.

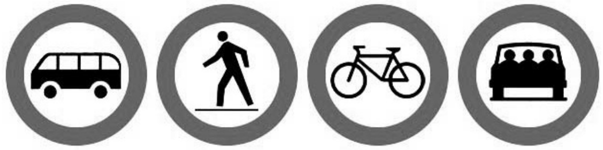
- Designing and situating bicycle parking to minimize the threat of theft and vandalism; and
- Illuminating primary pedestrian and cycling routes and transit stops during regular operating hours and all seasons of the year.

2.4 Operation and Maintenance Considerations

Several aspects of site operation and maintenance can influence the use of sustainable modes. Some of these factors are listed below for consideration during site design and are reflected in the guidelines presented in Chapter 3:

- Design site infrastructure to account for the presence and accumulation of snow in harsh winter climates. For example, a sidewalk located directly behind the curb would not provide space for snow storage and may become restricted as a result (Figure 2–5).
- Select design features and materials that facilitate safe travel, are aesthetically pleasing and minimize on-going maintenance, especially for site amenities. Although these items may cost more initially, overall life-cycle costs will often be less. Even if they are not, the attractiveness and functionality of the treatment can be preserved longer and with less on-going effort.

Figure 2–5. Snow and snow storage presents additional challenges in site design.
Source: York Region



3. Site Design Guidelines

3.1 Structure of the Guidelines

The site design guidelines are organized into four categories:

- *Site organization* elements (Section 3.3) determine the relative proximity and interconnectedness of buildings and key site features such as parking areas. This substantially influences the walkability of the site and its connectivity with and accessibility to adjacent transportation systems serving the property. Typical decisions made at this stage include building placement, parking lot size, location and form (at, above, or below grade) and building entrance locations.
- *Site layout* elements (Section 3.4) determine how individuals will arrive at and travel through a site. As a result, site layout has a significant impact on whether users of different modes can safely and comfortably co-exist. Major decisions at this stage include determining the internal transportation network configuration (where internal roads or driveways are required), parking layout and configuration (stalls and aisles, preferential parking, etc.) and the location of transit facilities, bicycle facilities and passenger pick-up and drop-off areas in relation to buildings and the internal and/or adjacent street network.
- *Site infrastructure* elements (Section 3.5) determine how physical features will be designed and built to facilitate access by sustainable transportation modes. This directly influences the "friendliness" of the site for walking, cycling and transit use. Site infrastructure is typically designed in greater detail once the general layout of buildings, parking, access and internal roads has been established. Decisions made at this stage include road and sidewalk widths, materials and treatments and signing provisions.
- *Site amenity* elements (Section 3.6) determine the functionality and attractiveness of the site from the perspective of the pedestrian, cyclist and transit rider. Site amenities are generally considered later in the process, but should still be assessed as part of the initial site design, rather than after a project is completed. Features such as protected waiting areas, accessible bicycle parking, change facilities and attractive and functional landscaping, can make the difference between a person choosing to walk, cycle, or ride transit and taking his/her vehicle. While some of these measures may involve extra upfront costs, long term financial benefits can be achieved through improved employee satisfaction, increased property value and reduced need for auto facilities.

Each design element is presented in a common format, featuring a discussion providing:

- A short, clear statement of the design element **objective**;
- The recommended **guidelines** for achieving the objective, with an elaboration on its rationale, benefits, applicability and cautions;
- Other **related topics** in this section; and
- A list of **related resources** the user can reference to obtain more insight into that particular design element.

3.2 Applicability of the Guidelines

3.2.1 By Stage in the Site Development Process

The report addresses all aspects of the site development process including concept development, site planning, building design and site operations, with an emphasis on site planning. Many of the guidelines will be applicable at a particular stage of the site development process. For example, broader guidelines (such as internal transportation network configuration) tend to be more relevant at earlier stages, while more detailed guidelines (site amenities) come into play when a project has evolved to a building-specific scale.

3.2.2 By Travel Mode

Table 3–1 describes applicability by travel mode (walking, cycling, transit and ridesharing). As the table notes, a certain guideline may be more relevant to a particular mode. For example, the provision of waiting facilities is more important to transit riders and carpoolers, whereas the availability of secured parking and change rooms would be more relevant to cyclists. In some cases, guidelines pertaining to different modes may conflict. Where this occurs, site designers should consider the relative merits and decide how to allocate priority between the competing objectives.

Table 3–1: Applicability of Guidelines by Travel Mode

Category of Design Elements	Design Element	Relevance to Travel Mode (● High ○ Moderate — Limited or negligible)			
		Transit	Walking	Cycling	Ridesharing
Site Organization	Building Placement	●	●	○	—
	Building Entrances	●	●	●	○
	Vehicle Parking Supply and Placement	—	—	○	●
Site Layout	Internal Transportation Network Configuration	●	●	●	●
	Passenger Pick-up and Drop-off Areas	●	○	—	●
	Pedestrian and Cyclist Routes	●	●	●	—
	Transit Facilities	●	○	○	—
	Vehicle Parking Layout	—	●	○	●
	Preferential Parking	—	●	—	●
	Bicycle Parking	—	○	●	—
	Loading Areas	—	○	○	—
	Site Grading	—	●	●	—
Site Infrastructure	Internal Roads	●	●	●	●
	Pedestrians Facilities	●	●	●	●
	Guide Signing	●	●	●	●
Site Amenity	Waiting Areas and Transit Shelters	●	●	○	●
	Bicycle Racks and Storage	○	—	●	—
	Showers, Change Rooms and Lockers	—	●	●	—
	Street Furniture and Landscaping	●	●	●	○

Source: IBI Group

It is important to note that all trips, with the exception of walking, are inherently multi-modal. Transit riders, cyclists and carpoolers must all walk at some point in their journey. Furthermore, rights-of-way (whether roads or pathways) are frequently shared by more than one mode.

3.2.3 Site Specific Considerations

Specific design guidelines will vary in their applicability to individual developments. For example, the guidelines will apply differently to a corner store and an office building, although the general principles would be consistent. The following site-specific considerations should be acknowledged when interpreting individual guidelines:

- *Size of Municipality*: The concepts presented in the guidelines apply equally to large, medium and small communities, but may apply in different ways. For example, larger communities with extensive transit systems and well-defined bicycle route networks may be more conducive and receptive to the introduction of site design features that enable access by sustainable transportation modes.
- *Existing Infrastructure*: For any number of reasons, infrastructure for sustainable transportation modes, such as a bicycle path system, may not currently exist in a given area. Notwithstanding, sites should still be designed to facilitate access by sustainable transportation modes in the event supporting networks are developed in the future, even if such measures are not initially constructed.
- *Availability of Transit Service*: Guidelines pertaining to transit may not be applicable in communities without service, although such design elements could enhance pedestrian and cycling environments.
- *Scale of Project*: The size and nature of the development will dictate the applicability of the guidelines. For example, a larger site may require multiple signalized access points and an internal road network, whereas a smaller one may only require a single driveway. It is important to recognize that the design of many smaller sites can collectively influence an area's overall attractiveness for sustainable modes and may spur the development of supportive infrastructure.
- *Size and Characteristics of Workforce*: The number and job function of employees determine both the amount of parking necessary (bicycle, carpool and automobile) as well as site traffic volumes. Site access and parking supply designs may therefore need to vary by size and type of workforce. Large employee populations will increase opportunities for transit and ridesharing, as the chances rise that many workers will share a similar residential location.
- *Customer Traffic*: The primary design distinctions related to customer traffic pertain to parking management. For example, conveniently located bicycle parking would be more attractive to retail shoppers than long term secured storage in the basement of the building.

3.3 Site Organization

Figure 3–1 illustrates how site organization design elements can be applied to a typical site to promote sustainable transportation.

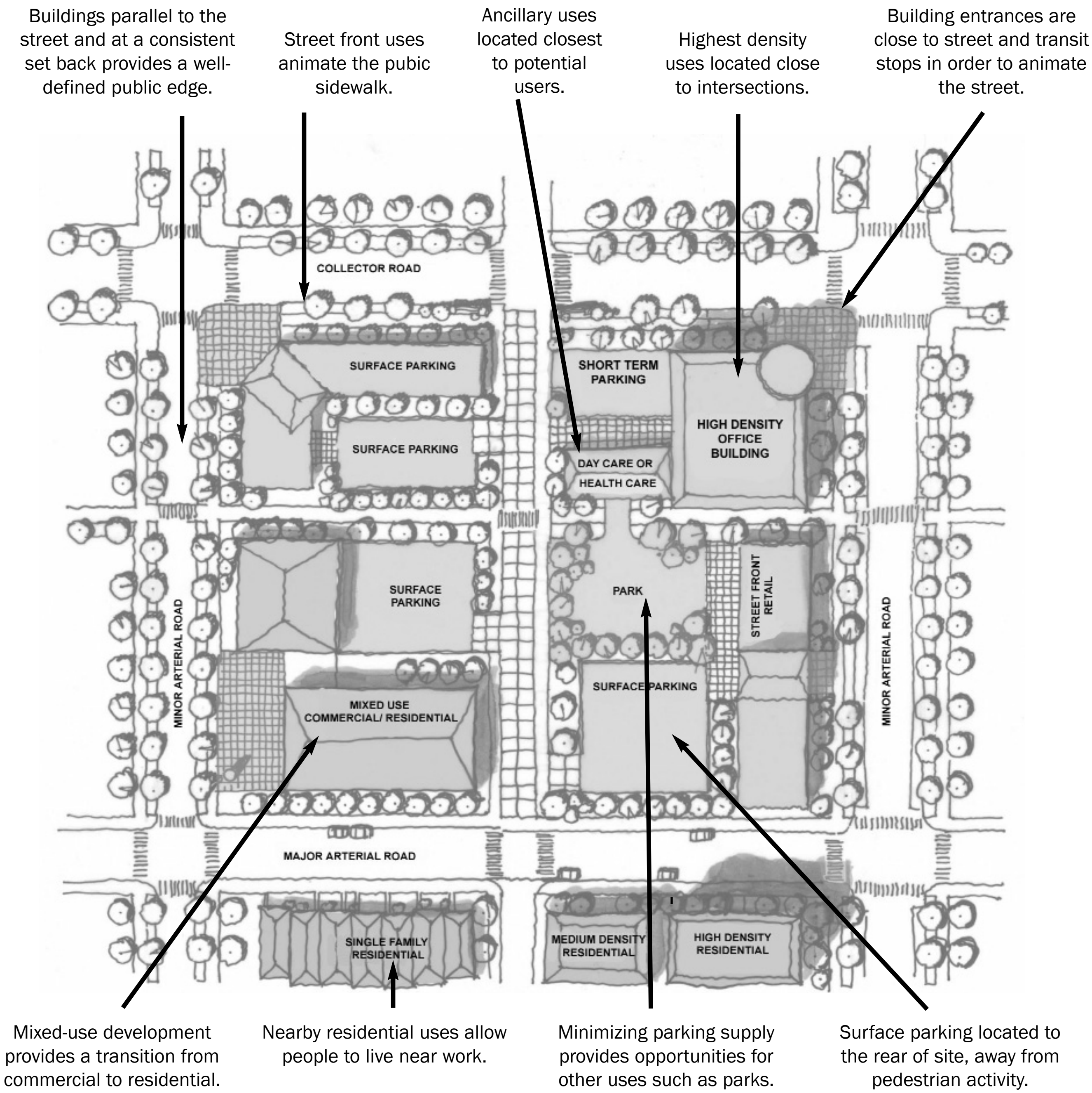


Figure 3–1: Application of site organization design elements on a typical site.
Source: IBI Group

3.3.1 Building Placement

OBJECTIVE ***To promote activity along street frontages and maximize pedestrian, cycling and transit connectivity to, from and within the site.***

GUIDELINES **Building Arrangement**

- Arrange buildings to occupy the least area possible. Compactness should be pursued in all densities of development to facilitate walking.
- Locate higher activity uses such as office towers, shopping centres, schools and entertainment facilities closest to transit stops.
- Arrange buildings such that complementary uses are close to each other to minimize walking distances and the need to lock and unlock bicycles for multiple stops. For example, locate a day-care or gym close to an office building.
- Layout sites to allow for increased density over time. For example, a multi-story building near a transit node can provide the same leasable area as a single-story large-footprint building, but allows for future intensification without redevelopment.
- Place public uses such as retail stores, services and restaurants at grade, parallel to the street to animate the street front, encourage pedestrian activity and improve personal security.
- Locate "nuisance" uses that generate noise or odors away from pedestrian areas and in such a way that heavy commercial vehicles are not directed along streets with high pedestrian or bicycle traffic.

Building Location

- Locate buildings close to the street to improve pedestrian access. This also improves personal security since there are more people to monitor street activities.
- Align buildings parallel to the street with a consistent setback from the property line to provide a continuous and well-defined edge of public activity. Setbacks should be rationalized with adjacent buildings. For taller buildings, upper stories can be set back further to allow for natural light and air circulation at the street level.

Figure 3–2. Entrances set back from the street present hazards for pedestrians and cyclists.
Source: Don Cook, City of Saskatoon

Figure 3–3. Entrances to this building area are easily accessible and visible from outside and inside.
Source: IBI Group

RELATED TOPICS Building Entrances (3.3.2), Vehicle Parking Supply and Placement (3.3.3), Internal Transportation Network Configuration (3.4.1), Vehicle Parking Layout (3.4.5)

RELATED RESOURCES

- *Urban Design Handbook*. City of Toronto. 1997.
- Ministry of Transportation and Ministry of Municipal Affairs and Housing. *Transit-Supportive Land-Use Planning Guidelines.* April 1992.

3.3.2 Building Entrances

OBJECTIVE

To minimize walking distances, provide positive guidance, improve aesthetics and increase the sense of security for pedestrians.

GUIDELINES

Number of Entrances and Facade Permeability

- Provide separate entrances on the ground floor where there are multiple and distinct tenants to minimize unnecessary walking and increase the liveliness of the street. Where several uses share an entrance, signing can help to guide patrons to the appropriate entrance.
- Include windows with transparent glass on all facades facing the street, whether they have entrances or not. The City of Spokane suggests that a minimum of 30 to 50 percent of commercial facades should be transparent, providing an interesting streetscape for pedestrians (City of Spokane, 2002).

Figure 3–4. This well-designed entrance provides direct access from the street while avoiding conflicts with the adjacent pick-up, drop-off and parking entrance.
Source: IBI Group

Entrance Location

- Locate the primary building entrance on major pedestrian walkways, as opposed to vehicle lanes or parking areas.
- Provide building entrances close to pick-up and drop-off areas and courier zones, but in locations that minimize conflicts between pedestrians and vehicles.

Figure 3–5. Long stretches of building with minimal access points should be avoided.
Photos: IBI Group

Entrance Design

- Define entrances using architectural and landscape treatments. Building entrances to non-residential areas should be distinguished from residential entrances to limit confusion.
- Design entrances to be vertically flush with the sidewalk to facilitate access for persons with physical impairments.
- Design entrances close to transit stops and pick-up and drop-off areas as supplemental transit waiting areas, provided passengers can anticipate arrivals.

RELATED TOPICS

Building Placement (3.3.1), Passenger Pick-Up and Drop-Off Areas (3.4.2), Pedestrian and Cyclist Routes (3.4.3), Facilities Waiting Areas and Transit Shelters (3.6.1)

RELATED RESOURCES

- City of Spokane. *Initial Design Standards and Guidelines for Centers and Corridors.* August 2002.
- City of Toronto. *Urban Design Handbook.* 1997.

3.3.3 Vehicle Parking Supply and Placement

OBJECTIVE

To minimize vehicle parking supply and locate parking areas in a manner that promotes safe and efficient pedestrian, bicycle and transit access.

GUIDELINES

Parking Supply

- Calculate parking requirements based on a realistic estimate of demand, instead of artificial market pressures for sale or leasing purposes. ITE's *Parking Generation* report (ITE, 2004) provides a starting point for estimating demand. Requirements will vary by development type and size, number of employees or patrons, travel options available to the site and local considerations, such as the presence of nearby public parking lots. Work with local planners to determine an appropriate parking supply.

Figure 3–6. Locating buildings behind parking means that pedestrians must walk through parking areas, which is both unsafe and requires extra effort.
Source: IBI Group

- Provide only enough parking to meet the recommended minimum standard outlined in local by-laws or ordinances. For example, most municipal parking standards for office development are in the order of 2.5–3.5 spaces per 100 sq. m of floor area, although more than 5.0 spaces per 100 sq. m in suburban areas is not uncommon. Oversupplying parking helps to promote auto use and is an inefficient use of both space and financial resources due to unused parking. It also helps to contribute to urban sprawl.
- Use conveniently available on-street parking to offset short-term on-site requirements.
- Pursue the use of shared parking facilities where practical and available. Sharing parking between an office building (busy during weekdays) and an entertainment use (busy on evenings and weekends) could help to reduce overall site requirements.
- Consider "land banking" techniques, whereby land is only converted to parking if necessary. This approach provides the added benefit of allowing future intensification of the site if parking demand does not materialize.

Parking Area Location and Type

- Locate parking at the rear of buildings or underground to improve pedestrian safety and increase visibility of the building from the sidewalk.
- Consider underground or structured parking as an option to large surface parking lots. Underground and structured parking minimizes land consumed aboveground for parking and provides opportunities to increase development densities. At the same time, less surface parking reduces walking and cycling distances and minimizes the number of conflict points between pedestrians and motor vehicles.
- Configure parking structures and adjacent buildings in a manner that places parking on the "inside" of the building mass. This will involve "wrapping" the building around the parking structure on at least three sides to provide an active frontage to the street.
- Provide smaller, more dispersed parking areas instead of one large parking area. These large parking areas tend to be more unattractive, increase the quantity of stormwater run-off and are difficult for cyclists and pedestrians to navigate safely and efficiently due to the travel distances and the greater potential for conflicts with vehicles.

RELATED TOPICS Vehicle Parking Layout (3.4.5), Preferential Parking (3.4.6), Bicycle Parking (3.4.7)

RELATED RESOURCES

- Institute of Transportation Engineers. *Parking Generation*, 3rd Edition. Washington, DC: ITE, 2004.
- Local parking by-laws or ordinances and standards.

3.4 Site Layout

Figure 3–7 illustrates how site layout design elements can be applied to a typical site to promote sustainable transportation.

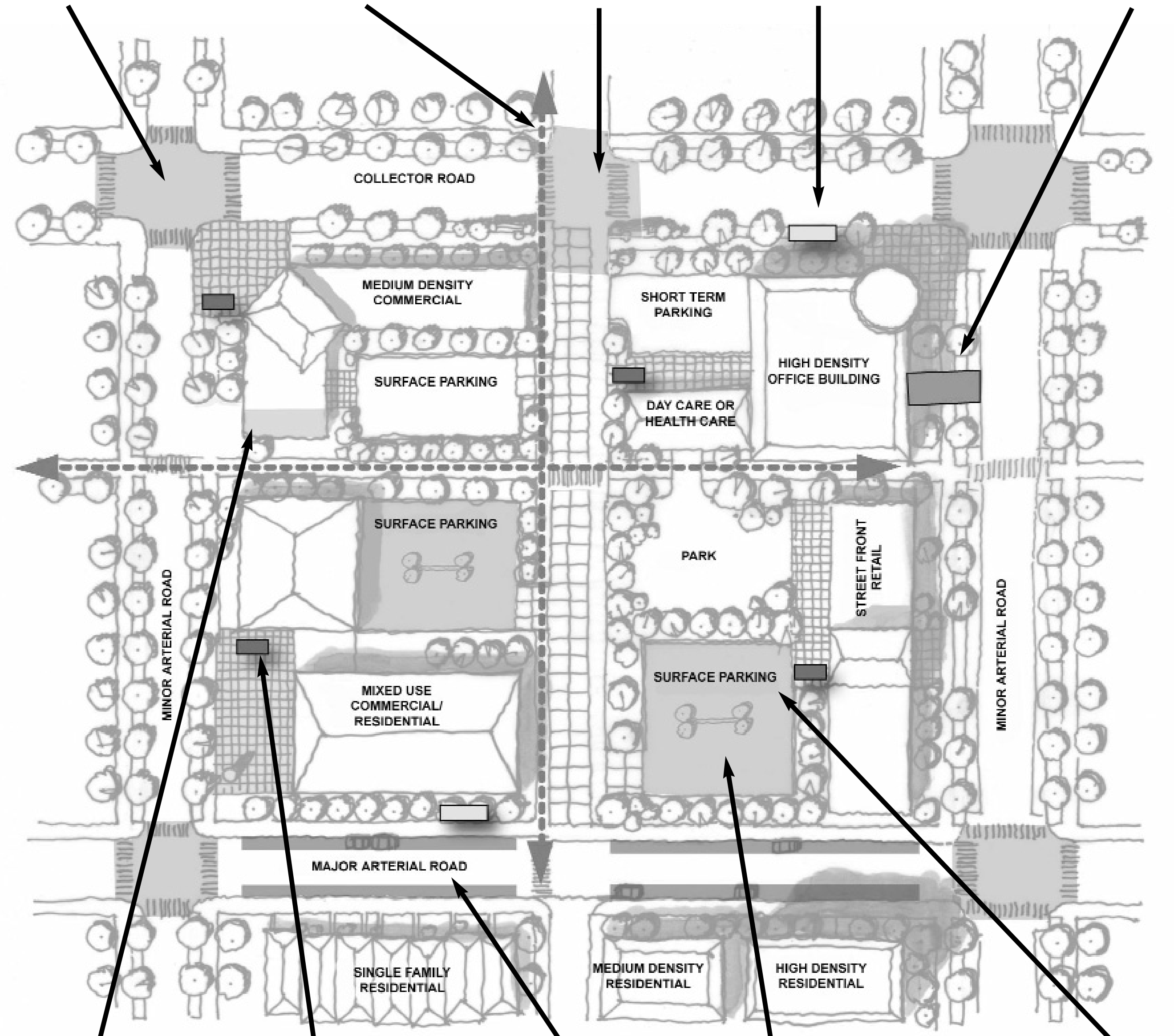


Figure 3–7. Application of site layout design elements on a typical site.
Source: IBI Group

3.4.1 Internal Transportation Network Configuration

OBJECTIVE

To provide a site circulation system that is conducive to safe and efficient pedestrian, cyclist and transit rider access and minimizes conflicts between users.

GUIDELINES

Street Network

- Layout internal roads in a grid or curvilinear pattern to provide direct transit, cyclist and pedestrian connections through the site and to adjacent sites. The Ministry of Municipal Affairs and Housing et. al suggest that intersections between local roads and transit routes should be spaced 200 m to 250 m apart to maximize access to transit stops (MAH, 1992).
- Create intersections between surrounding roadways and internal roads, pathways and access points at locations that facilitate access to and orientation within the site.

Figure 3–8. Access points are well defined and non-auto facilities are clearly distinguished.
Source: Nortel Networks

- Avoid uninterrupted motor vehicle flow on internal roads adjacent to the frontage of a large building or series of buildings to discourage high vehicle speeds and to improve access points for pedestrians. This is particularly beneficial in active pedestrian zones and bicycle parking areas. ITE's *Transportation and Land Development* suggests that roadways adjacent to the building should have an uninterrupted length of no more than 120 m and preferably 100 m (ITE, 2002).
- Connect the internal transportation network to external bicycle routes passing the site. These connections will provide for a seamless interface between the external route and the internal road system, or a dedicated bicycle path if the site is large. Avoid discontinuing bikeways at intersections.
- Avoid one-way streets where possible to simplify circulation patterns, lower speeds and reduce cycling distances and the potential for wrong-way cycling.
- Avoid drive-through facilities. They create additional conflicts for pedestrians and cyclists, create unnecessarily on-site circulation, contribute to air pollution through the unnecessary idling of waiting vehicles and are often aesthetically unpleasing.

Number and Location of Driveways

- Minimize the number of site driveways. The number of conflict points between pedestrians, cyclists and motor vehicles traveling on adjacent streets and sidewalks tends to increase with the number of driveways. Mid-block access for cyclists and pedestrians need not be tied to vehicular access points. Local authorities generally have minimum standards for driveway spacing along major roads.
- Minimize the number of new signalized intersections required to serve a development by reducing the number of driveways and by locating driveways opposite to an existing entrance or road that is already signalized. Closely spaced signals reduce the capacity of arterial and collector streets and the resulting congestion creates unpleasant and unsafe conditions for pedestrians and cyclists and delays transit vehicles. The *Geometric Design Guide for Canadian Roads* suggests an absolute minimum spacing of 200 m between successive traffic control signals on arterial roads, although greater distances need to be maintained to provide traffic signal progression and ensure safe traffic operations (TAC, 1999).

- Require adjacent sites to share driveways. This can increase convenience for site users while minimizing impacts on road operation and increasing safety.

Conflict Areas

- Configure internal roads to minimize the number of potential conflict points with walking and cycling routes. Making walking routes circuitous will likely not achieve this objective because pedestrians typically take the shortest path. Conversely, cyclists are more amenable to reasonable diversions because of their faster travel speeds. Where pedestrian and cyclist crossings do occur, 90-degree junctions (rather than those skewed at a lesser angle) are preferred.

Figure 3–9. Fronting building entrances with internal circulation routes increases potential vehicle-pedestrian conflicts.
Source: Richard James, Richard James and Associates

- Lay out internal roadways to reduce excessive motor vehicle traffic across primary pedestrian routes.
- Provide advance signing and other visual cue areas to alert approaching motorists to high volume pedestrian and cycling areas and slowing or stopped vehicles. Use intersections and road narrowing to define pedestrian conflict areas.
- Design intersections to facilitate walking and cycling. Left- and right-turn auxiliary lanes at key pedestrian crossings and along preferred bicycle routes should be minimized in order to reduce roadway width, reduce vehicle speeds and provide continuity of bikeways. Right-turn lanes introduce conflicts between motor vehicles and cyclists, and should be avoided in areas of high pedestrian and cyclist activity.

RELATED TOPICS

Building Placement (3.3.1), Pedestrian and Cyclist Routes (3.4.3), Internal Roads (3.5.1), Pedestrian Facilities (3.5.2)

RELATED RESOURCES

- Ministry of Municipal Affairs and Housing and Ministry of Transportation. *Transit-Supportive Land-Use Planning Guidelines.* April 1992.
- Transportation Association of Canada. *Geometric Design Guide for Canadian Roads*. 1999.
- Transportation Research Board. *Access Management Manual*. Washington, DC: TRB, 2003.
- Stover, Vergil G. and Frank J. Koepke. *Transportation and Land Development*, 2nd Edition. Washington, DC: ITE, 2002.

3.4.2 Passenger Pick-Up and Drop-Off Areas

OBJECTIVE

To make buildings safer to enter and more accessible by minimizing conflicts between vehicles and pedestrians and minimizing walking distances.

GUIDELINES

Pick-Up and Drop-Off Area Location and Access

- Locate passenger pick-up and drop-off areas at side or rear entrances of buildings and away from the main entrance. The appropriate location, type and size of passenger pick-up and drop-off facilities will vary by size and type of development. Maximum walking distance to entrances should be no greater than 30 m.
- Ensure vehicle circulation routes to and from pick-up and drop-off areas do not pass in front of main entrances and where possible, do not cross major sidewalks or other pedestrian facilities.
- Mark and illuminate pedestrian routes to building entrances from the pick-up and drop-off area. Routes should be clearly defined and uninterrupted.

On-Street Pick-Up and Drop-Off Areas

- Locate on-street drop-off and pick-up areas downstream of the building entrance and out of transit stop areas. This ensures that drivers passing by an entrance have an unobstructed view of key pedestrian areas.

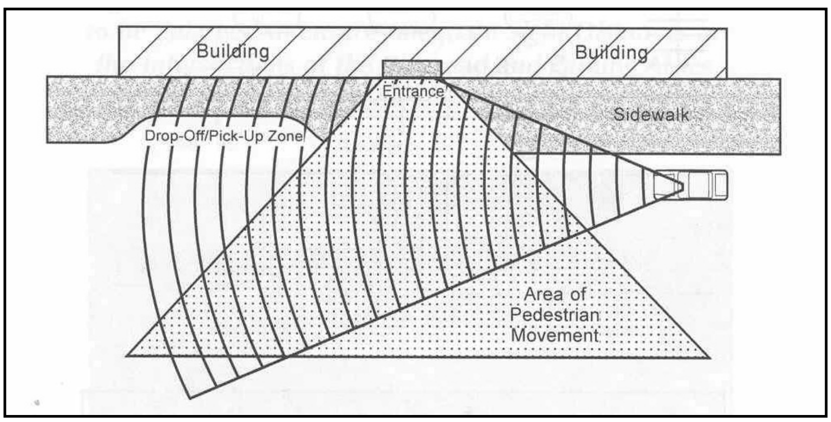


Figure 3–10. Schematic illustration of proper pick-up and drop-off area location. Drivers have an unobstructed view of key pedestrian routes.
Source: ITE . Transportation and Land Development. *2002. pg. 8–30.*

- Provide recessed pick-up and drop-off areas to improve visibility and prevent waiting cars from interrupting the flow of traffic. These areas should be designed to ensure demand does not exceed supply, and access and egress is safe and efficient.

RELATED TOPICS

Guide Signing (3.5.3), Waiting Areas and Transit Shelters (3.6.1)

RELATED RESOURCES

- Institute of Transportation Engineers. *Transportation and Land Development*, 2nd Edition. Washington, DC: ITE, 2002.

3.4.3 Pedestrian and Cyclist Routes

OBJECTIVE

To minimize travel distances, reduce or define conflict areas and provide safe and secure access for pedestrians and cyclists.

GUIDELINES

Route Location and Design

- Provide continuous, safe, convenient and clearly defined pedestrian and cycling systems that link building entrances along a direct path from adjacent streets. The internal pedestrian system should be separate from motor vehicle rights-of-way, but should connect to adjacent sidewalks and pathways beyond the site. The internal cycling routes do not need to be on a separate right-of-way, but should be demarcated with pavement markings and signing to identify the preferred paths to building entrances, particularly where several routes exist.
- Layout pedestrian and bicycle routes prior to or in conjunction with roadways in new developments. The routes should provide pedestrians, cyclists and transit riders with the most probable route to and from transit stops, site access points, bicycle parking areas and protected waiting areas.
- Layout on-site walking routes to serve natural desire lines as directly as possible, whether between nearby complementary uses or between a building entrance and the nearest bus stop. Supplement sidewalks along internal roads and driveways with pathways that minimize walking distances between buildings. If the route provided is significantly longer than the desired line or perceived to be unsafe, pedestrians may create their own path.
- Provide separation between walkways and driveways to minimize potential pedestrian-vehicle conflicts. On constrained sites or where the nearest safe pedestrian crossing is at the throat of the driveway (due to traffic signal location), optimal walking routes may coincide with driveway locations.
- Design walkways, illumination and covered walking areas to channel pedestrians along safe and convenient routes. Physical measures such as landscaping can be used to help guide pedestrians to safer intersection or mid-block crossing locations.
- Avoid directing pedestrian and cyclist routes through delivery or service areas or along the rear of buildings or long building faces or fences, etc. where safety and personal security may be an issue. Provide visible locations for users to report emergencies or call for help.
- Make pedestrian and cyclist routes to major destinations identifiable by their physical form. Provide signing to inform users of the amenities available.

Figure 3–11. Pedestrian walkways need not follow streets if a more direct route can be provided.
Source: IBI Group

Figure 3–12. Direct connections for bicycles from adjacent facilities provides convenient access.
Source: IBI Group

Crossings on Internal Roadways

- Design internal roadways so that they meet principal pedestrian routes at intersections. Motorists generally expect pedestrian movements to occur at intersections rather than mid-block locations.

- Mid-block pedestrian and cycling crossings may be considered to facilitate crossings of major streets where adjacent intersections are infrequent, pedestrian generators are located on opposite sides of a roadway, or the nearest intersection creates substantial out-of-direction travel (ITE 2002). The *Ontario Traffic Manual* (Book 12 Traffic Signals) does not recommend installing pedestrian crossovers within 200 m of other signal-protected pedestrian crossings (MTO, 1998).

RELATED TOPICS

Building Entrances (3.3.2), Vehicle Parking Layout (3.4.5), Bicycle Parking (3.4.7), Pedestrian Facilities (3.5.2), Guide Signing (3.5.3)

RELATED RESOURCES

- Institute of Transportation Engineers. *Transportation and Land Development*, 2nd Edition. Washington, DC: ITE, 2002.
- Institute of Transportation Engineers. *Design and Safety of Pedestrian Facilities, A Recommended Practice of the Institute of Transportation Engineers*. Washington, DC: 1998.
- Ministry of Transportation Ontario (MTO). *Ontario Traffic Manual*, Book 12 Traffic Signals. 1998.

3.4.4 Transit Facilities

OBJECTIVE

To balance the location and circulation needs of transit vehicles with the convenience and comfort of pedestrians and cyclists.

GUIDELINES

Transit Stop Location

- **Consult with transit service operators when locating on-site transit facilities**. This simple, yet often overlooked action, is key to promoting coordination and ensuring facilities are placed in the preferred location.
- Locate transit stops as close as possible to major destinations, such as main entrances, and link them directly with sidewalks or pathways. However, the stop should not be placed directly in front of the entrance, as this may impede other pedestrians accessing the building. The Ministry of Municipal Affairs and Housing of Ontario et al. (MAH, 1992) indicate that 400 m is generally the longest walk that most people will make to a transit stop. This figure may be lower in severe weather or where walking is perceived to be unpleasant or unsafe.
- Locate transit stops close to designated pedestrian crossing locations like signalized intersections. Where transit stops must be located mid-block and transit use is high, protected pedestrian crosswalks, refuges and curb extensions should be considered.
- Locate transit stops where they are visible and can be easily monitored by security staff, building occupants, passing travelers, or neighbours.

Figure 3–13. Transit stop located away from development with no direct access to building entrance is not recommended.
Source: IBI Group

Figure 3–14. Well-designed transit stop with real-time transit information and other amenities.
Source: IBI Group

- Locate transit stops and shelters no more than 6 m from the front door landing area to facilitate timely passenger loading.
- Integrate transit stop locations with on-site amenities such as cafes and retail services. Combining these features will enhance the pedestrian experience and contribute to a sense of security for users.
- Avoid locating stops in areas where transit vehicles could be significantly delayed. Bus bays are not generally recommended on busy streets, as buses may experience difficulty attempting to re-enter traffic.

Pedestrian Access to Transit Stations and Stops

- Provide illumination along primary pedestrian routes to transit stations and stops where evening ridership could occur.
- Place easily recognizable signing or other identifiers at transit stations and stop locations.

On-Site Bus Circulation

- Consider routing buses on-site when:
  - The site is a major transit transfer point;
  - The site is the terminus of a transit route; or
  - The site is large and generates a major share of the ridership on the route (for example, major sports facility, regional shopping mall, etc.).

  In general, it is undesirable to route buses on-site as it increases travel times for "through" passengers.

Figure 3–15. Regional malls are ideal locations for integrated transit terminals.
Source: Richard Tebinka, ND Lea

Transit Stations

- Promote joint development around and over transit stations where sites are located near transit nodes. This not only allows for more intensive use of the land, but also increases the number of potential transit riders. Furthermore, real estate rents on buildings owned by transit agencies may generate additional revenue.
- Provide direct underground or covered connections to transit stations on large sites close to rapid transit. Well-designed underground connections can minimize exposure to weather, providing further comfort for riders.
- Integrate bicycle stations into transit stations to encourage bicycle use. Bicycle stations provide storage, rental and sometimes repair services.

RELATED TOPICS

Building Entrances (3.3.2), Internal Transportation Network Configuration (3.4.1), Guide Signing (3.5.3), Waiting Areas and Transit Shelters (3.6.1), Bicycle Racks and Storage (3.6.2)

RELATED RESOURCES

- Ministry of Municipal Affairs and Housing and Ministry of Transportation of Ontario. *Transit-Supportive Land-use Planning Guidelines*. April 1992. www.mah.gov.on.ca/userfiles/HTML/nts_1_3173_1.html
- TRI-MET-Tri-County Metropolitan Transportation District of Oregon. *Planning and Design for Transit Handbook: Guidelines for Implementing Transit Supportive Development*. Portland: Tri-County Metropolitan Transportation District of Oregon, 1995.

3.4.5 Vehicle Parking Layout

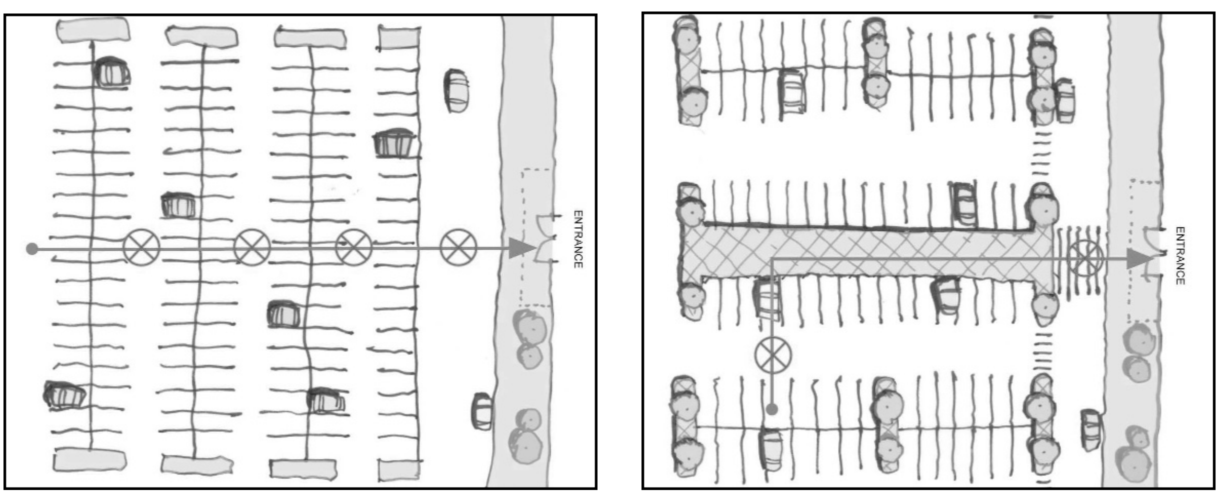
Objective ***To minimize the impact of parking areas on pedestrian and cyclist routes and on road user safety.***

Guidelines **Parking Area Access**

- Consolidate parking access points with those of adjacent sites. This helps to reduce the volume and conflicts of vehicle traffic entering and exiting the site from the road, and provides more direct and convenient connections for pedestrians and cyclists between sites.
- Link parking areas for adjacent sites through continuous, cross-property parking aisles. This allows individuals to travel between sites without having to access the adjacent road/path system, reducing trip distances and times. It also helps to reduce overall parking requirements by allowing sites to share parking.
- Provide sufficient throat length to allow drivers to clear the intersection with the external street before encountering on-site access intersections.
- Set parking gates or attendant booths back from adjacent roads (whether internal or external) to prevent queued vehicles from blocking through traffic, sidewalks, or pathways. Make provisions for cyclists that must pass through parking control devices to reach bicycle parking so they do not need to dismount. This can be accomplished through detection mechanisms (for example, infrared beam, contactless smart card) or a separate travel path around the control gate.

Parking Area Configuration

- Separate parking modules with plantings and/or walkways to provide pedestrian refuge, define the vehicle circulation system, prevent high-speed diagonal movements and improve aesthetics. Appropriate sightlines need to be maintained.
- ITE's *Transportation and Land Development* recommends that aisle lengths should not exceed 120 m without a break for circulation.
- Orient parking modules perpendicular to building entrances and access routes to minimize the number of traffic aisles that pedestrians must cross.



LESS DESIRABLE ⊗= Potential Conflict Point ***MORE DESIRABLE***

Figure 3–16. Parking modules should be oriented toward building entrances to reduce the number of conflict points.
Source: IBI Group

- Partition and orient parking areas to ensure that desired pedestrian crossing routes do not traverse parking facilities, drive through access, queues and exits.

Surface Parking Treatments

- Provide wheel stops or increased sidewalk widths (preferred) to compensate for parked vehicle overhangs where perpendicular or angle parking is located adjacent to sidewalks. Overhanging vehicles can block wheelchairs and force pedestrians to walk on the parking lot or roadway surface.
- Use hard surface end islands rather than painted islands that motorists can drive across. Hard surfaced islands better delineate pedestrian paths and provides pedestrian refuge areas.

Figure 3–17. Vertical separation between parking spaces and pedestrian walkways promotes pedestrian safety and comfort.
Source: Jamie Krzeminski, HDR Engineering

Underground and Structured Parking

- Locate motor vehicle parking access points away from main pedestrian areas and ensure that vehicles have a clear view of pedestrians and cyclists when entering and exiting the facilities.
- Locate exhaust grates away from pedestrian areas and above the heads of pedestrians.

Figure 3–18. Structured parking can minimize visual and safety impacts on the pedestrian environment while increasing safety. Structured parking efficiently uses land and enables high-density development.
Source: IBI Group

On-Street Parking

- Designate on-street parallel parking adjacent to sidewalks to buffer pedestrians from passing vehicles. Parallel on-street parking can be provided along designated cycling routes if sufficient physical separation exists to prevent conflicts between cyclists and auto occupants entering or exiting vehicles. The Transportation Association of Canada recommends an absolute minimum of 4.0 m for a shared parking/bike lane (TAC, 1999). On-street parking should be restricted in the vicinity of transit stops to avoid conflicts with transit vehicles stopping for boardings and alightings. Care should be exercised in the use of on-street parking, as it can increase the number of vehicle-vehicle collisions.

RELATED TOPICS

Vehicle Parking Supply and Placement (3.3.3), Preferential Parking (3.4.6), Bicycle Parking (3.4.7), Pedestrian Facilities (3.5.2)

RELATED RESOURCES

- Institute of Transportation Engineers. *Guidelines for Parking Facility Location and Design*. Washington, DC: ITE, April 1994.
- Institute of Transportation Engineers. *Traffic Engineering Handbook*. Washington, DC: ITE, 1999.
- Institute of Transportation Engineers. *Transportation and Land Development*, 2nd Edition. Washington, DC: ITE, 2002.
- Urban Land Institute. *The Dimensions of Parking*, 4th Edition. Washington, DC: ULI, 2000.

3.4.6 Preferential Parking

OBJECTIVE

To provide facilities and incentives that encourage ridesharing and facilitate short-term parking.

GUIDELINES

Ridesharing

- Provide preferential parking for carpools and vanpools. Place this parking in the most convenient location within the lot, preferably next to accessible parking, with clear visibility and signing. Where carpool or vanpool parking cannot be provided in the immediate vicinity of building entrances, consider pick-up/drop-off facilities at building entrances.
- Provide on-site passenger pick-up and drop-off areas with adequate short-term vehicle storage to facilitate ridesharing among users located at different sites.
- Reduce or eliminate parking fees for carpools and vanpools.

Figure 3–19. Preferred high-occupancy parking should be well identified and located close to main entrances.
Source: IBI Group

Short-Term Parking

- Locate courier parking close to building entrances. The courier parking area should be designed so that vehicles do not interfere with pedestrian and cyclist access.
- Institute a priority parking strategy that places only essential short-term parking close to building entrances. A sample priority system could be (1) couriers and very short duration errands (15-min. maximum) and (2) patrons and shoppers. All other parking demands would be accommodated in lots further away or at nearby off-site locations. Monitoring and enforcement would be key to ensuring the long-term success of the strategy.

RELATED TOPICS

Passenger Pick-up and Drop-off Areas (3.4.2), Vehicle Parking Layout (3.4.5), Bicycle Parking (3.4.7)

RELATED RESOURCES

- Transport Canada. Commuter Options: *The Complete Guide for Canadian Employers*. Ottawa: Transport Canada, 2002. www.tc.gc.ca/programs/Environment/Commuter/downloadguide.htm
- Victoria Transport Policy Institute. *TDM Encyclopedia, Bicycle Parking*. 2002. www.vtpi.org/tdm/tdm85.htm

3.4.7 Bicycle Parking

OBJECTIVE

To provide sufficient bicycle parking in an area that is convenient and secure for cyclists and their equipment, and protects them from the elements.

GUIDELINES

Parking Supply

- Calculate the amount of bicycle parking based on the number of people in the building and not as a function of total motor vehicle parking stalls. Bicycle parking requirements vary by location, type of land use and user characteristics. If bicycle parking requirements are not specified in a local by-law or ordinance, the number of spaces should be at least 5-10 percent of the maximum number of visitors and employees forecast to be on site at any one time. Typical minimum parking supply standards are provided in Table 3–2.

Table 3–2. Typical Minimum Parking Supply Standards

Type of Establishment	Minimum Number of Bicycle Parking Spaces
Primary or secondary school	10 percent of the number of students, plus 3 percent of the number of employees.
College or university classrooms	6 percent of the number of students, plus 3 percent of the number of employees.
Commercial—retail or office	One space per 250-300 sq. m of commercial space.
Sport and recreation centre	10–20 percent of the "design capacity" of number of visitors and employees (depending on the type of sport).
Movie theatre or restaurant	5–10 percent of the number of seats plus employees.
Industrial	5–10 percent of the number of employees.
Multi-unit housing	1 space per 1–2 apartments.
Public transit stations	Varies, depending on usage.

Source: Adapted from Litman, T., Online TDM Encyclopedia, *Bike Parking and various other sources.*

- Do not establish a "cap" on bicycle parking requirements as bicycle parking will increase proportionally with size of development.

Location and Access for Long Duration Parking (Class I—Employee)

- Locate long-term bicycle parking indoors or in a weather-protected area. These areas should be easily accessible to cyclists.
- Place bicycle parking in underground or indoor parking areas. These areas should be:
  - Well-signed and well-lit, as cyclists will leave their bicycles for a longer period of time and may have greater concerns regarding possible theft;
  - Ideally located in a separate room with a secure locking system;
  - Accessible by clearly identified and textured bicycle access ramps to avoid collisions; and
  - Located as close as possible to elevators or the attendants' kiosk to provide added security.
- Provide hooks for hanging bicycles inside an office building as an alternative to centrally located bicycle racks. These hooks can be located within individual offices or adjacent to the reception area. Supplement "in-office" parking with bicycle racks for heavy snow/salt days or in case "in-office" parking is eliminated at some future time.

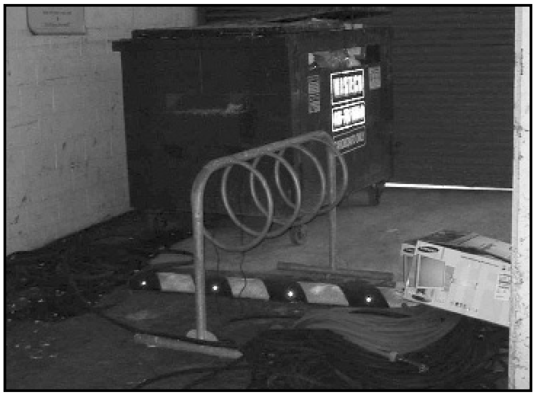


Figure 3–20. Bicycle parking located in undesirable areas will not be used.
Source: IBI Group

Figure 3–21. Building overhangs can provide weather protection for bicycle parking.
Source: Richard James, RIchard James and Associates

- Locate bicycle racks in weather-protected and highly visible areas where there is no underground parking and "in-office" bicycle parking is not feasible.
- Secure bicycle racks to the ground or wall and incorporate vandal-resistant features.

Location and Access for Short Duration Parking (Class II—Retail/Entertainment)

- Provide bicycle parking at each building entrance. The Association of Pedestrian and Bicycle Professionals (APBP) suggests that bicycle racks should be located no more than 35 m from the entrance and preferably within 15 m to allow for direct and convenient access to the building.
- Locate bicycle racks underneath building overhangs or canopies to protect cyclists and their equipment from the elements. Where an overhang is not available, provide a kiosk over the bicycle parking. Alternately, limited parking can usually be provided inside and adjacent to the building doors without obstructing the exit. This last solution provides greater security and comfort.
- Locate bicycle parking and accesses in well-lit and visible locations to maximize personal security and minimize the risk of theft.
- Provide signing to denote bicycle parking locations and guide cyclists from the street if signs are not directly visible.
- Secure bicycle racks to the ground and incorporate vandal-resistant features.

Related Topics

Building Entrances (3.3.2), Internal Transportation Network Configuration (3.4.1), Pedestrian and Cyclist Routes (3.4.3), Bicycle Racks and Storage (3.6.2), Showers, Change Rooms and Lockers (3.6.3)

Related Resources

- Association of Pedestrian and Bicycle Professionals. *Bicycle Parking Guidelines*. APBP, 2003. www.bicyclinginfo.org/pdf/bikepark.pdf
- Institute of Transportation Engineers. *Innovative Bicycle Treatments*. Washington, DC: ITE, 2002. www.ite.org
- Victoria Transport Policy Institute. *TDM Encyclopedia, Bicycle Parking*. 2003. www.vtpi.org/tdm/tdm85.htm
- National Centre for Bicycling and Walking. *Bicycle Facilities Reference Guide*. 2003. www.bikewalk.org/bicycling/bike_design_guide_intro.htm

3.4.8 Loading Areas

OBJECTIVE ***To minimize conflicts with pedestrians and cyclists and limit visual intrusiveness.***

GUIDELINES

Loading Area Location and Access

- Locate loading areas and service routes off the street, behind, or underneath buildings. Properly located loading areas minimize conflicts between service/delivery vehicles and site patrons, as well as other site traffic.
- Design loading areas to avoid the need for back-in or back-out movements.
- Avoid routing service driveways through parking areas or across primary on-site pedestrian, transit and cyclist routes.
- Design manoeuvring and staging areas so that loading activity does not interrupt or interfere with pedestrian or cyclist routes.

Figure 3–22. On larger sites in urban settings, loading areas can be located underground to minimize impacts on pedestrians and cyclists. Pedestrians and cyclists should be clearly visible from the loading ramp exit.
Source: IBI Group

On-Street Loading Areas

- Designate on-street loading areas, where warranted, in a manner that does not block transit vehicles or bicycles in adjacent lanes. If this is not possible, set times at which loading can occur outside of peak hours to minimize conflicts with pedestrian activity periods and the number of sidewalk disruptions.

Screening

- Screen loading areas from public view through building design, location, landscaping and fencing, while maintaining appropriate sightlines.
- Minimize the infiltration of exhaust fumes and noise into pedestrian areas or pathways. If necessary, use appropriate ventilation and/or noise attenuation features to mitigate impacts.

RELATED TOPICS Building Placement (3.3.1), Internal Transportation Network Configuration (3.4.1)

RELATED RESOURCES

- City zoning by-laws or ordinances.

3.4.9 Site Grading

OBJECTIVE

To minimize grade changes on-site and between sites that can constrain pedestrian routes, reduce accessibility, create adverse cycling conditions and impair security.

GUIDELINES

Terrain

- Minimize steep grades to facilitate a comfortable walking and cycling environment and reduce obstacles to travelers with mobility aids or strollers. The National Building Code of Canada stipulates that the limit for accessible grades is 8.3 percent or 1:12 (NRC-CNRC). The Americans with Disabilities Act (ADA, 2002) has similar requirements. The Canadian Institute of Planners' *Community Cycling Manual* suggests that a plateau (flat area between slopes) should be provided every 100 m along cyclist routes, including entrances to parking facilities, if grades exceed 5 percent (Canadian Institute of Planners, 1990).
- Avoid substantial berms or landscape features around or within a site that might create a physical barrier to pedestrian movements. Poor sightlines can impact personal security.
- Avoid site grading that requires stairways or retaining walls on the periphery or within the site. Poor site grading can compromise the accessibility of the site.

Figure 3–23. Avoid berms and landscaping that obstruct sight lines and/or create barriers for pedestrians.
Source: IBI Group

Figure 3–24. Steps leading to building entrances are discouraged as they present problems for people who have mobility impairments.
Source: IBI Group

Building Access

- Locate building entrances at or near street level to avoid the need for stairs and lengthy ramp configurations that reduce accessibility. The City of Toronto's *Urban Design Guidelines* require ground-floor entrances to be no more than 0.2 m above or below the public sidewalk (City of Toronto, 1997).

Stormwater Management

- Design roadways, sidewalks and pathways with appropriate slopes and drainage to avoid water ponding or slush build-up. Local design standards typically provide appropriate site grading parameters.

RELATED TOPICS

Building Entrances (3.3.2), Pedestrian Facilities (3.5.2), Street Furniture and Landscaping (3.6.4)

RELATED RESOURCES

- Transportation Association of Canada. *Geometric Design Guide for Canadian Roads*. 1999.
- NRC-CNRC. *National Building Code of Canada*. 1995.
- The Access Board. *ADA Accessibility Guidelines for Buildings and Facilities*. Washington, DC: ADAAG, 2002. www.access-board.gov/adaag/html/adaag.htm
- Canadian Institute of Planners. *Community Cycling Manual—A Planning and Design Guide.* 1990.

3.5 Site Infrastructure

Figure 3–25 illustrates how site infrastructure design elements can be applied to a typical site to promote sustainable transportation.

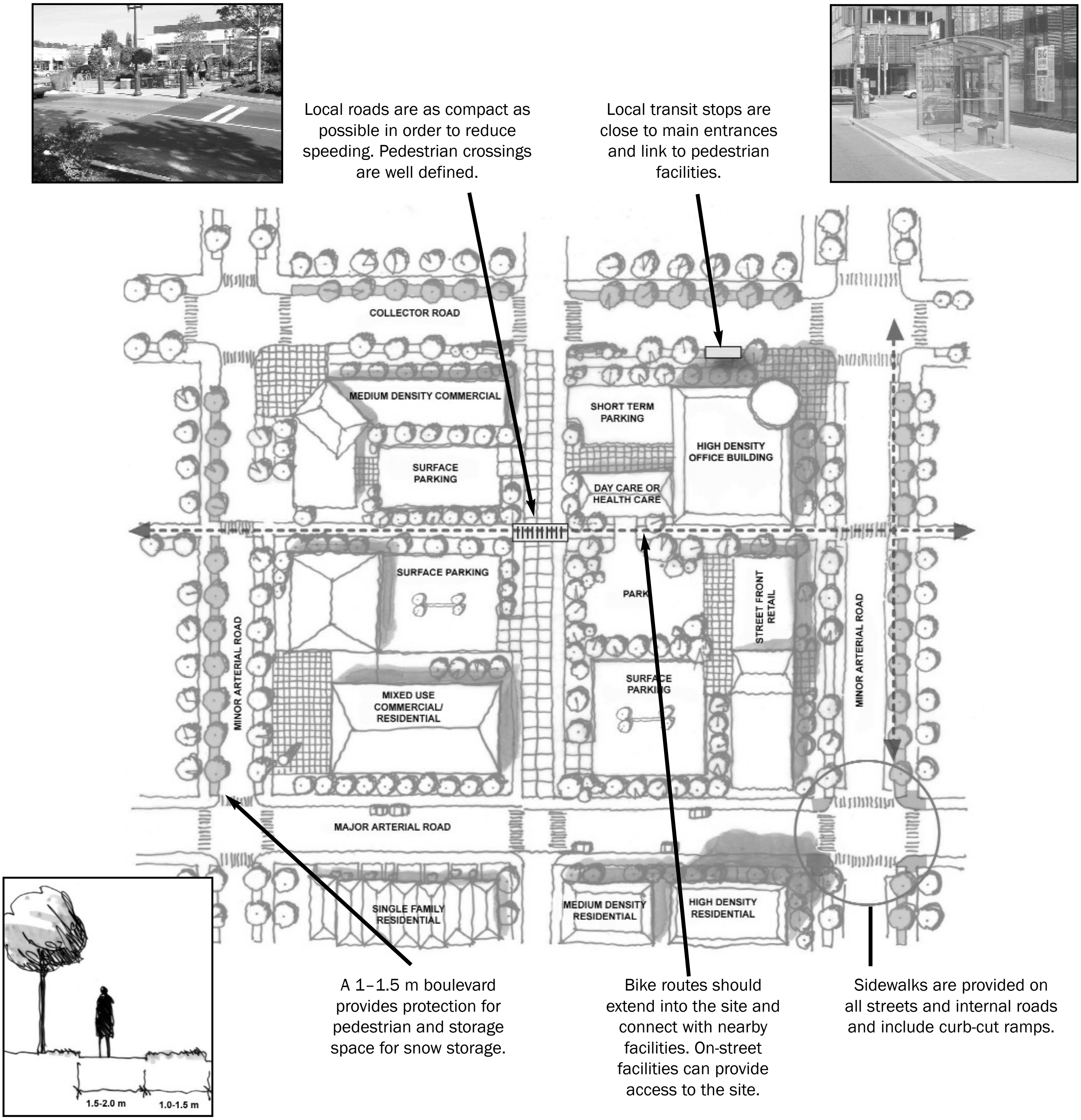


Figure 3–25. Application of site infrastructure design elements on a typical site.
Source: IBI Group; with the exception of the photo on the top left. Top left photo source: Jamie Krzeminski, HDR Engineering

3.5.1 Internal Roads

OBJECTIVE ***To provide safe, convenient connections for motor vehicles and bicycles between the on-site circulation system and adjacent transportation facilities while minimizing impacts on pedestrians.***

GUIDELINES **Roadway Cross-Section**

- Minimize lane widths where possible. Narrower lanes help to reduce motor vehicle speeds and the space dedicated to hard surfacing, but can pose difficulties for cyclists. The AASHTO *Guide for the Development of Bicycle Facilities* indicates that motor vehicles and bicycles can operate safely side-by-side in a curb lane that is 4.25- to 4.5-m wide (AASHTO, 1999). On roads with low traffic volumes, narrower lanes would be acceptable as cyclists could safely use the full extent of the travel lane. The Transportation Association of Canada's *Geometric Design Guide* indicates that the minimum lane width for a shared roadway (right lane) is 4.0 m for low volume roads (AADT 0-1000). (TAC, 1999)

Figure 3–26. Internal roads should be designed to encourage low speeds so that cyclists and motor vehicles can safely "share the road."
Source: Jamie Krzeminski, HDR Engineering

- Minimize the number of traffic lanes. Internal roadways are typically two lanes wide, but can be four lanes if traffic volumes warrant. Additional care should be exercised in the design on four-lane roads to promote lower vehicle operating speeds and safe crossing locations.

- Provide sidewalks along all roads, except where pedestrians would not be traveling adjacent to a roadway or where channeling pedestrians to one side is a desired safety objective (for example, on internal roadways that are used for commercial vehicle access only, or on the outside of ring roads on large sites). Typically, pedestrians should not be required to walk on a paved road surface other than at marked crossings.

- Include a boulevard or planting strip along internal roadways. A boulevard between the curb and sidewalk (typically at least 0.6 m, but ideally 2.0 m or more) makes walking more attractive by buffering pedestrians from vehicles (whether moving or parked) and road spray. A boulevard provides a place for landscaping, snow storage and street furniture. It also allows for the sidewalk cross-fall to remain at 2 percent required for drainage rather than to follow the grade of the driveway, which creates a less safe side slope for pedestrians. Driveway grade changes can occur outside the sidewalk limits.

Intersection and Driveway Configuration

- Minimize the area occupied by driveway intersections with adjacent streets to reduce pedestrian crossing distances and conflicts, control vehicle speeds and paths and maximize opportunities for green space, street furniture and landscaping. Intersections should be as compact as possible, while meeting safety and operational needs.

- Align intersecting roads at right angles and minimize turning radii at corners to reduce pedestrian crossing distances and turning vehicle speeds and help visually impaired pedestrians navigate the intersection. However, turning radii that are too small can cause the rear wheels of large vehicles to traverse the pedestrian waiting area.

- Provide sufficient queue storage in driveways to prevent vehicles from blocking on-site pedestrian crossings, intersections and parking aisles. Parking circulation patterns should be designed to avoid crossings of queuing areas.

- Design turning lanes to facilitate cyclists. How the cyclist will use the lane should be considered when determining the width (a cyclist would properly "take" a narrow lane, but "share" a sufficiently wide one). At T-intersections, curbside "jug handles" can be used to provide space for cyclists to slow down, turn their bicycle, face the driveway and wait for an adequate gap or green signal without having to dismount.

- Keep intersection sightlines clear to enable motorists to see approaching vehicles, cyclists and pedestrians. Bus shelters, landscaping, parked cars, signs and other items should not block the view of drivers, pedestrians, cyclists, or transit riders who may be at various heights. Many obstacles tend to be noticed only after construction, so efforts should be made to consider potential obstacles at the early stages of design.

Delineation of Crossings

- Mark and sign pedestrian and cyclist crossings of the road. This helps to direct pedestrians and cyclists to safe crossing locations and forewarn approaching drivers of their presence. Advance signs are especially important at bicycle path crossings given the potential speed of approaching cyclists. Signs, bollards, median refuges and varied pavement surfaces can also provide advance warning.

- Mark stop bars at intersections to guide motorists and cyclists to stop in locations that do not encroach into pedestrian crossing areas.

- Install intersection pedestrian signals (IPS) or other traffic control devices at warranted high volume pedestrian and cyclist crossings to provide safe right-of-way.

- Install STOP or YIELD signs facing pathway users in advance of the road edge, in a location that permits cyclists to observe oncoming traffic. Other forms of advance notice, such as warning signs, grade changes or turns, bollards or textured pavements, may encourage cyclists to reduce speed and prepare to stop. However, speed reduction measures should not force cyclists to dismount or lift their bikes, impede a trailer from passing through, destabilize a cyclist, or become a hazard.

- Observe national, state, provincial and local warrants, standards and guidelines when considering and installing traffic control devices. Applying these measures in a manner consistent with the abutting street system enhances safety because users are familiar with the meaning and intent of the device.

Drainage and Snow Considerations

- Locate and design walkways, bikeways, transit stops and other similar facilities such that they do not become snow storage areas after plowing. Sidewalks should be located at least 1 m behind the curb to provide boulevard space for snow storage.

- Design roadways with appropriate grades, cross-falls and drainage facilities to avoid build-up or ponding of water and slush in locations frequented by pedestrians and cyclists.

- Orient catchbasin grates diagonally or perpendicular to the direction of travel of cyclists or install bicycle-friendly grates. Catchbasins inset or recessed behind the curb can further enhance the safety and efficiency of on-road cycling.

Figure 3–27. Various options exist to ensure drainage facilities do not impact the safety of cyclists.
Source: JoAnn Woodhall

- Locate catchbasins and other drainage facilities away from walking paths so pedestrians can cross without getting their feet wet.

RELATED TOPICS

Vehicle Parking Supply and Placement (3.3.3), Internal Transport Network Layout (3.4.1), Pedestrian and Cyclist Routes (3.4.3), Vehicle Parking Layout (3.4.5), Bicycle Parking (3.4.7), Pedestrian Facilities (3.5.2)

RELATED RESOURCES

- American Association of State Highway and Transportation Officials. *Guide for the Development of Bicycle Facilities*, 3rd Edition. Washington, DC: AASHTO, 1999.
- Federal Highway Administration. *Manual on Uniform Traffic Control Devices*. Washington, DC: Department of Transportation, 2003.
- Institute of Transportation Engineers. *Transportation and Land Development*, 2nd Edition. Washington, DC: ITE, 2002.
- Institute of Transportation Engineers. *Neighborhood Street Design Guidelines:* An ITE Proposed Recommended Practice. Washington, DC: ITE, 2003.
- Transportation Association of Canada. *Manual on Uniform Traffic Control Devices*. 1998.
- Transportation Association of Canada. *Geometric Design Guidelines for Canadian Roads*. 1999.
- Transportation Association of Canada. *Bikeway Traffic Control Guidelines for Canada*. 1990.
- Transportation Research Board. *Access Management Manual*. Washington, DC: TRB, 2003.

3.5.2 Pedestrian Facilities

OBJECTIVE

To create a safe and attractive walking environment for all pedestrians, regardless of physical abilities.

GUIDELINES

Materials and Dimensions

- Provide a flat (2 percent maximum cross-slope), smooth and skid resistant surface, such as asphalt or concrete, on pedestrian facilities.
- Provide a clear width (travel path free of any obstructions) of at least 1.5 m (5 ft.) on sidewalks. The ADA Accessibility Guidelines indicate that the minimum clear width for passage of two wheelchairs is 1.525 m (ADA, 2002). In commercial and other activity areas, walkways should be at least 3-m wide to serve higher pedestrian volumes and facilitate public use of the area.
- Use curbs to define walking and cycling routes immediately next to a road. A minimum curb height of 0.15 m (6 in.) is recommended to sufficiently distinguish walkways from roadways and parking areas and provide basic protection from motor vehicles operating on adjacent streets. Along walkways immediately adjacent to perpendicular vehicle parking, a buffer of 0.9 m (3 ft.), in addition to sidewalk, is required to prevent vehicles from intruding into the pedestrian travel path. Next to a building wall or other fixed obstacle, a buffer of 0.6 m (2 ft.) is needed to provide pedestrians with a comfortable walking environment. Pavement markings, textures, landscaping, medians and other delineations can also highlight spaces reserved for pedestrians.

Figure 3–28. In this case, there is no separation between vehicular traffic and pedestrians at the building entrance.
Source: IBI Group

- Provide a minimum clear width of 3 to 3.6 m (10–12 ft.) on pathways shared by cyclists and pedestrians. A centreline may be required on the pathway to separate travel directions or modes (pedestrians from cyclists) if conflicts occur. Pathways used by cyclists need 0.6 m (2 ft.) lateral clearance from obstructions, including road curbs higher than 0.15 m (6 in).
- Provide a maximum rise-to-run ratio of 1:20 (5 percent) on walkways as recommended by the Access Board. A steeper slope or stairs would require ramps with handrails, bike wheel guide rails (on stairs) and/or level rest areas at frequent intervals for pedestrians with mobility impairments. Ramp slopes should not exceed 1:12 (8.3 percent).

Figure 3–29. Enhanced paving and landscape treatments ensure that pedestrian connections are clearly distinguished within this rear parking lot.
Source: IBI Group

- Avoid stairways where possible. Stairways are not universally accessible, require regular maintenance in harsh climates and must be accompanied by an alternative barrier-free route such as a ramp or elevator. If required, stairways should be equipped with handrails.
- Use colour and texture to warn pedestrians of dangers such as driveways, curbs, or grade changes. Tactile warnings at intersections, guide strips running parallel to the edge of a walkway and other wayfinding aides should be considered to assist individuals with visual impairments to navigate the site. Ensure that the design scheme adopted is consistent throughout the site and with local guidelines and requirements.

Pedestrian Crossings

- Provide frequent pedestrian crossing opportunities within sites and locate them at intersections wherever possible. Crossings should be perpendicular to the roadway in order to minimize walking distances.

- Mark pedestrian crossings at STOP signs, signalized intersections and intersection pedestrian signals (IPS), where these devices are warranted. Markings will vary by locale and intersection conditions, but should conform to national, provincial, state and local guidelines, such as the MUTCD and the Transportation Association of Canada's *Pedestrian Crossing Control Manual*. The standard marking of two white stripes may be "upgraded" to diagonal striping, perpendicular striping, or new emerging technology like light-emitting indicators, in high volume pedestrian areas, where conflicts exist, or where priority is placed on pedestrian crossing.

- Provide drivers with visual cues of upcoming pedestrian activity through landscaping, road design features, or advance signing. Design features, such as raised crosswallks and intersections assist pedestrians in crossing the road and help slow vehicle traffic, in addition to providing a visual cue to drivers.

- Provide sidewalk ramps at intersections and other crossing locations to allow pedestrians with mobility aids, shopping carts, or strollers to cross unencumbered. Where the crosswalk is not raised across the intersection, separate ramps should be provided for each pedestrian crossing. In confined rights-of-way, where it is not possible to expand the corner area, the entire corner may need to be depressed as a single ramp serving both crossings. Sidewalk ramps should have a flat travel path at least 1-m wide within the pedestrian crossing. Detectable warnings are required at the base of all curb ramps where they meet the street, as well as any other blended transitions to street crossings, to notify visually impaired pedestrians that they are entering a roadway.

Figure 3–30. Visual cues inform drivers of key pedestrian areas.
Source: Jamie Krzeminski, HDR Engineering

- Use medians on wider roads to separate traffic flow by direction and provide refuge for pedestrians who move slowly and need two traffic signal cycles to cross the road. Site driveways do not generally require medians unless they have more than two lanes.

- Consider accessible pedestrian signals (those emitting audible tones) to help visually impaired pedestrians align themselves in the correct crossing direction and notify them when they have the right-of-way.

- Lengthen pedestrian clearance intervals (usually based on a typical walking pace) at signalized intersections frequently used by children or seniors.

Treatment at Driveways

- Maintain the sidewalk at the same elevation across **low volume driveways** where exiting vehicles must stop. The sidewalk should generally be continuous across the driveway and the street and curb should not be connected. Raising the driveway to the level of the sidewalk slows traffic and alerts driver to the crossing.

- Interrupt the sidewalk at **high volume and/or signalized driveways** where exiting vehicles may be given right-of-way over crossing pedestrians. The sidewalk should be discontinuous in either grade (with appropriate ramps for accessibility) or surface material, if not both across the drive-

Figure 3–31a. Typical configuration for high volume driveways/signalized driveways.
Source: IBI Group

Figure 3–31b. Typical configuration for low volume driveways where the site driveway is raised to the level of the sidewalk and is continuous across driveway (preferred configuration for pedestrians).
Source: IBI Group

way and the street curb should continue into the driveway curb. A textured surface should be provided to warn the visually impaired of the upcoming crossing.

- Consider speed control measures, such as speed humps and raised crosswalks, where speeding vehicles pose a hazard to crossing pedestrians and better site layout cannot be achieved. The *Canadian Guide to Traffic Calming* (TAC/CITE, 1998) provides more information on these measures.

Safety and Security Considerations

- Maximize the safety and security of walkway and pathway users. The principles of crime prevention through environmental design can improve surveillance, control site access and minimize opportunity for crimes to occur. Proper lighting of walkways, pathways and surrounding areas is essential to maximize users' visibility and lines of sight.
- Place emergency call stations at frequent intervals in isolated areas to provide rapid access to help in case of accident or crime. These call stations should be visible from a distance and can be as simple as public telephones.

RELATED TOPICS

Building Placement (3.3.1), Building Entrances (3.3.2), Internal Transportation Network Configuration (3.4.1), Pedestrian and Cyclist Routes (3.4.3), Street Furniture and Landscaping (3.6.4)

RELATED RESOURCES

- Canadian Standards Association. *Barrier Free Design*. Toronto: CSA, 1995.
- Federal Highway Administration. *Manual on Uniform Traffic Control Devices*. Washington, DC: U.S. Department of Transportation, 2003.
- Institute of Transportation Engineers. *Alternative Treatments for At-Grade Pedestrian Crossings.* Washington, DC: ITE, 2001.
- Institute of Transportation Engineers. *Traffic Calming State of the Practice.* Washington, DC: ITE, 1999.
- NRC-CNRC. *National Building Code of Canada*, Section 3.8.
- Transportation Association of Canada. *Manual on Uniform Traffic Control Devices*. 1998.
- Transportation Association of Canada. *Pedestrian Crossing Control Manual*. 1998.
- TAC/CITE. *The Canadian Guide to Neighbourhood Traffic Calming*. 1998.
- The Access Board. *ADA Accessibility Guidelines for Buildings and Facilities*. Washington, DC: ADAAG, September 2002. www.access-board.gov/adaag/html/adaag.htm

3.5.3 Guide Signing

Objective ***To assist users navigate into and around sites in a safe and efficient manner.***

Guidelines **Site Navigation and Promotion**

- Assist visitors and users navigate the site by providing maps of:
  - Local attractions in pedestrian areas; and
  - Bicycle routes at central bicycle parking areas and major transit stops.

Maps can be displayed on boards in specified locations or handed out in paper form. The provision of area maps at key intersections, waiting areas and access points helps indicate and clearly define pedestrian and cycling routes. Maps also help to promote the use of more sustainable modes.

Figure 3–32. This colorful map allows pedestrians to locate area attractions and walkways.
Source: Nortel Networks

Site Identification

- Provide highly visible and easy to understand site identification signs along approaching roads. This gives motorists and cyclists additional time to properly position themselves to access the site. More specific site identification (street number, building name, major tenants) is still required to assure arrivees that they have found their destination.
- Provide pedestrian scale signing where street signs either cannot be seen or where additional guidance is needed. Such guidance should be oriented toward major pedestrian destinations and provided in advance of walkway intersections.
- Orient internal roads towards landmarks such as transit stations, clock towers, or public art displays. This complements signing and provides opportunities for users to confirm location and direction. The visibility of landmarks is particularly important when users are exiting buildings with several entrances or in areas with poor views of the surroundings. Landmarks can also help orient drivers and cyclists exiting structured parking facilities, or pedestrians exiting large and/or underground facilities.
- Provide signing for each mode, describing the preferred routes along the respective networks. Pedestrian signing should be closer to the decision point than bicycle or vehicle signing.

Figure 3–33. Signage should be use-specific so as not to discourage travel by sustainable modes.
Source: Innovative Bicycle Treatments, *ITE 2002*

Parking Area Identification

- Guide cyclists and drivers toward appropriate parking areas. Where separate parking facilities exist for different purposes (such as bicycles, visitors, physically impaired, short-term parkers, employees, carpools, couriers), distinct signing should be provided for each user at the point where access routes diverge. Reassuring site visitors that they are headed in the right direction helps to prevent U-turns, sudden braking and needless circulation, and allows motorists to focus on the driving task. For larger sites, pedestrians may also need on-site guidance.

Entrance Identification

- Use signs or other architectural treatments to identify primary and alternative entrances to large buildings. Users should be able to know where they are headed before they park their bicycle or car, or enter the site from the street or transit stop.

Transit Facility Identification

- Guide transit riders leaving a site to the nearest transit stop. A prominently posted site map or directional signing will provide the necessary information. The provision of on-site transit schedules and route maps are also helpful.

Figure 3–34. Signage should indicate reserved parking areas for travel by sustainable modes.
Source: Nortel Networks

Related Topics

Building Entrances (3.3.2), Pedestrian and Cyclist Routes (3.4.3), Transit Facilities (3.4.4), Pedestrian Facilities (3.5.2), Waiting Areas and Transit Shelters (3.6.1), Street Furniture and Landscaping (3.6.4)

Related Resources

- Chittenden County *Regional Planning Commission. Transit Oriented Design (TOD) for* Chittenden County. 2002.
- American Planning Association. *Context Sensitive Signage Design*. 2002. www.planning.org/signs/index.htm

3.6 Site Amenity

Figure 3–35 illustrates how site amenity design characteristics can be applied to a typical site to promote sustainable transportation.

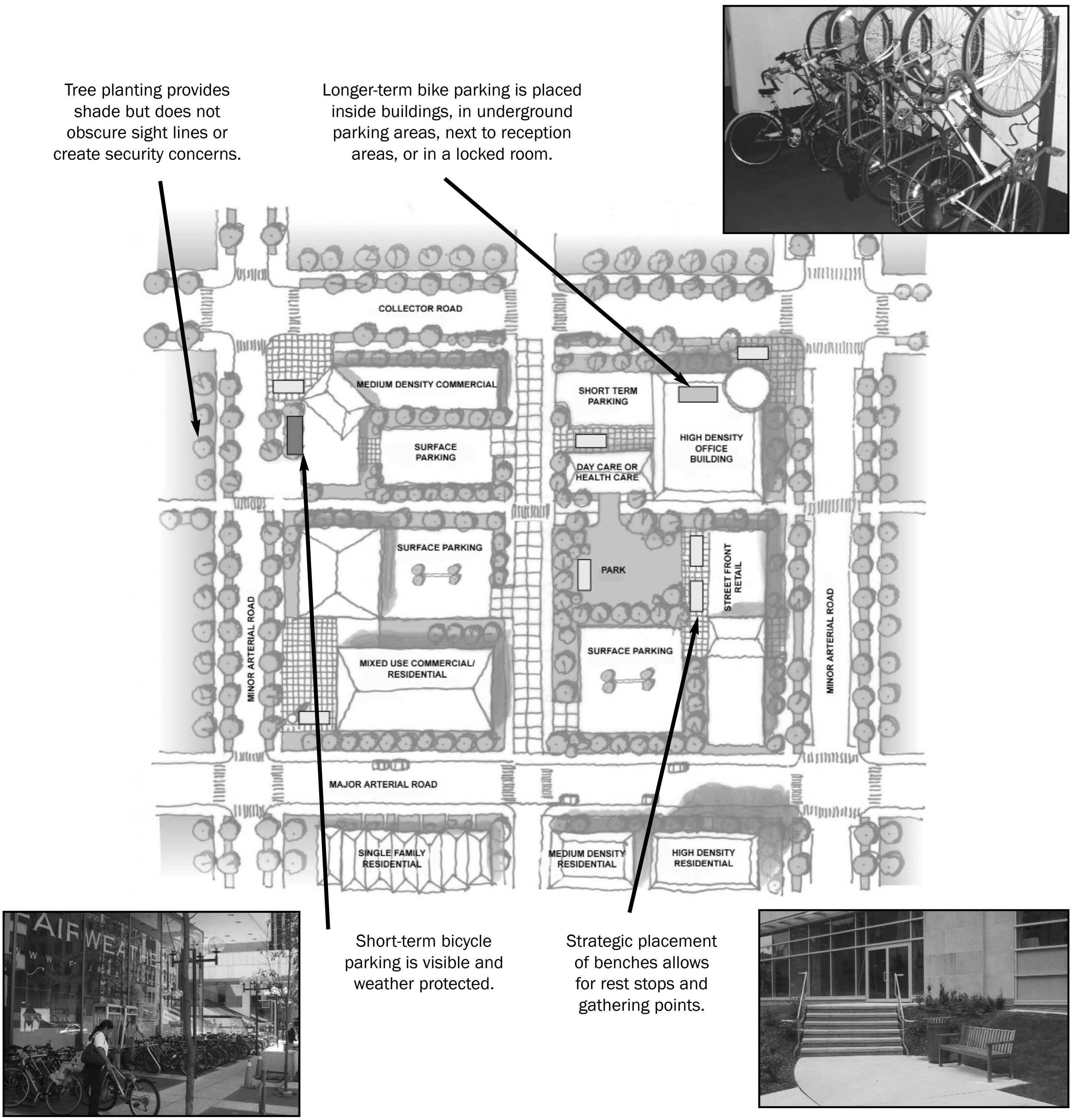


Figure 3–35. Application of site amenity design elements to a typical site.
Source: IBI Group

3.6.1 Waiting Areas and Transit Shelters

OBJECTIVE

To provide comfortable, safe, convenient, informative and inviting waiting areas that require limited maintenance and upkeep, and transit shelters where they are needed.

GUIDELINES

Design Features

- Design waiting areas to meet the needs of all user groups, including those with impairments, parents with strollers, cyclists and the elderly.
- Use protective awnings and building overhangs to protect individuals from wind, snow and excessive heat or sunlight. Where appropriate, buildings located adjacent to waiting areas, such as transit stops, should include canopies. Shade trees can also be planted to provide additional climate protection. Careful landscaping and adjacent building design can improve wind patterns.
- Provide proper illumination and seating for passengers. Benches should be incorporated at transit stops where use is high, there is a high concentration of elderly users and persons with physical impairments or where transit services operate on long headways.
- Use a common visual theme and landscaping to make waiting areas easily identifiable. Waiting areas can be an important trademark of a site or transit system. Clearly identified, attractive and well-maintained areas project a positive image and can induce riders to visit the site or use the transit system. Provide maps and schedules where possible.

Figure 3–36. Landscaped waiting areas offer a pleasant place to sit.
Source: York Region

- Design waiting areas so that waiting passengers do not block the sidewalk. For sheltered areas, a 2-m pedestrian pathway on at least one side of the shelter, preferably in line with the existing sidewalk, is recommended. Sidewalks should be wide enough to accommodate the shelter, waiting area, street furniture, landscaping and pedestrian traffic, while leaving an area adjacent to buildings free for window-shopping.
- Integrate bicycle storage facilities into the design of waiting areas to enable multi-modal transport.

Figure 3–37. Bicycle parking may be integrated into waiting areas providing weather-protected parking.
Source: JoAnn Woodhall, Region of Waterloo

- Provide sufficient waiting areas and appropriately placed ramps at locations where bicycles are to be loaded onto transit vehicles.
- Provide direct and convenient connections from the sidewalk to the shelter/waiting area, from the shelter/waiting area to vehicle loading doors, and from unloading doors to the shelter/waiting area. Direct sidewalk connections should also be provided from adjacent sites to the shelter/waiting area or to the sidewalk that accesses the shelter/waiting area. Areas where pedestrians board and alight from a transit vehicle should be paved. A clear landing pad area is required for mobility aids.
- Provide adequate space for snow storage so that it will not interfere with the use of pedestrian facilities, transit stops, or normal pedestrian movements. Grade the surface of transit stops to

drain away from snow storage areas. This helps to avoid ice build-up, especially at bus loading areas.

- Provide sightlines between waiting passengers and drivers, as well as other pedestrians on the street, for informal surveillance and to improve visibility.

Guidelines for Installing Transit Shelters

- **Work with local transit agencies to determine the optimal placement and design for transit shelters.** The U.S. *ADA Accessibility Guidelines for Buildings and Facilities* also includes requirements for transit shelter location and design.
- Provide transit shelters at transit stops where passenger volumes are high, where passengers are required to wait for more than 5 min. and the local climate creates unfavorable conditions. The Tri-County Metropolitan Transportation District (Tri-Met) of Oregon's *Planning and Design for Transit Handbook* recommends that shelters be provided at stops with more than 50 passenger boardings per day (Tri-Met, 1995).
- Give priority to placing shelters at waiting areas that serve a high concentration of elderly customers and/or people with impairments.
- Locate transit shelters based on the type of road and right-of-way conditions, as shown below. Where wide boulevards exist, transit shelters should be located at the back of the sidewalk and open towards the street (Figure 3–38). Where sidewalks are narrower, it may be necessary to place transit shelters adjacent to travelled lanes (Figure 3–39). In this case, shelters should face away from the street to protect users from splashing water and salt spray.

Figure: 3–38. Bus shelter is located away from street protecting passengers from splashing and maintaining clearance for pedestrians on sidewalk.
Source: IBI Group

Figure 3–39. Bus shelter faces away from street to protect passengers from splashing; adequate clearances are maintained between the shelter and building for pedestrians.
Source: IBI Group

RELATED TOPICS

Building Entrances (3.3.2), Passenger Pick-up and Drop-off Areas (3.4.2), Transit Facilities (3.4.4), Pedestrian Facilities (3.5.2), Street Furniture and Landscaping (3.6.4)

RELATED RESOURCES

- Ministry of Transportation and Ministry of Municipal Affairs and Housing. *Transit-Supportive Land-use Planning Guidelines*. April 1992. www.mah.gov.on.ca/userfiles/HTML/nts_1_3173_1.html
- The Access Board. *ADA Accessibility Guidelines for Buildings and Facilities*. Washington, DC: ADAAG, September 2002. www.access-board.gov/adaag/html/adaag.htm
- Crime Prevention Through Environmental Design Association. www.cpted.net/default.html

3.6.2 Bicycle Racks and Storage

OBJECTIVE **_To provide safe, secure and protected bicycle areas for cyclists and their equipment._**

GUIDELINES **Storage Location**

- Place bicycle racks and storage facilities in easily accessible locations, close to main entrances, indoors within offices, or within a centrally located facility. Bicycle facilities should be located in visible, well-lit and secure areas, but not placed so as to impede pedestrian flow.

Figure 3–40. Acceptable bike storage.
Source: Wilf Koppert, City of Ottawa

Figure 3–41. Acceptable bike rack design for secured interior parking.
Source: IBI Group

- Provide hooks or lockers for equipment such as clothing, helmet, gloves and shoes in storage locations.

Bicycle Rack Configuration

- Provide bicycle racks that support the frame and at least one wheel to prevent tampering and damage to the bicycle while it is in the rack. The racks should allow for the use of a U-type lock in order to prevent theft. Bicycle rack design should comply with the Association for Pedestrian and Bicycle Professionals' *Bicycle Parking Guidelines* (APBP, 2003) or a similar standard.

Figure 3–42. Acceptable bike rack design.
Source: IBI Group

Figure 3–43. Unacceptable bike rack design (frame of bike cannot be secured).
Source: IBI Group

- Configure bicycle racks to allow for a large number of bicycles in a small space. Careful configuration can maximize available space, while providing easy access to bicycles. In a very confined space, it may be preferable to provide upright storage. Hanging hooks or rails and hooks offer maximum capacity, but are not recommended for areas where children or others may have difficulty lifting up bicycles. Where space permits and longer-term (for example, employee) parking is required, it may be preferable to provide bicycle lockers. The Association of Pedestrian and Bicycle Professionals' *Bicycle Parking Guidelines* (APBP, 2003) provides a good overview of different bicycle rack designs and their advantages and disadvantages.

- Place racks away from walls and other obstacles to provide sufficient clearance to access the rack from both sides.

RELATED TOPICS

Bicycle Parking (3.4.7), Showers, Change Rooms and Lockers (3.6.3)

RELATED RESOURCES

- Victoria Transport Policy Institute. *TDM Encyclopedia, Bicycle Parking*. 2003. www.vtpi.org/tdm/tdm85.htm
- Association of Pedestrian and Bicycle Professionals. *Bicycle Parking Guidelines*. 2003. www.bicyclinginfo.org/pdf/bikepark.pdf
- City of Calgary. *Bicycle Parking Handbook: A Developers Guide*. Calgary, 2003.
- Institute of Transportation Engineers. *Innovative Bicycle Treatments.* Washington, DC: 2002. www.ite.org

3.6.3 Showers, Change Rooms and Lockers

OBJECTIVE

To encourage employees to commute by active (non-motorized) transportation modes and participate in physical activity near their place of work.

GUIDELINES

Provision and Placement

- Provide shower and change facilities at locations where employees remain on site for extended periods of time. Generally speaking, these include office buildings, larger retail stores, malls, industrial sites, recreation facilities and educational institutions.
- Provide adequate space for employees to change and store equipment, such as in-line skates, bicycle helmets, or towels. Provide hooks or wardrobe rack and hangers and (where possible) dryers for employees to store wet clothing. Designating a changing/locker room eliminates the need for employees to have to store their wet or dirty clothes and equipment in their offices.

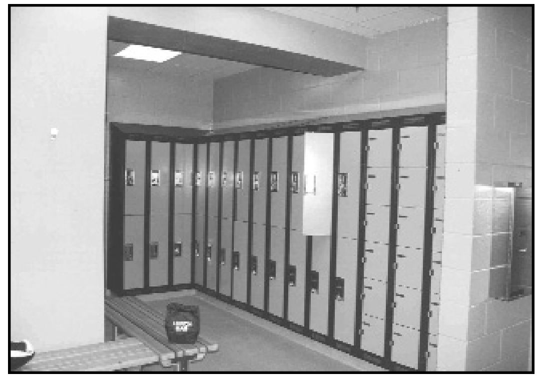


Figure 3–44. Changing areas and showers within an office building are useful for active commuters.
Source: Transport Canada

- Locate showers and lockers in the washrooms on each floor or in an accessible central location. If a fitness facility is provided in the building, the showers and lockers provided there should be made available for individuals using active transportation modes. A single shower in each washroom is typically sufficient if one is provided on each floor. Transport Canada suggests providing one shower per 100 employees.
- Provide one locker for each employee who commutes using an active transportation mode. Local travel behaviour data and/or comparative sites can be useful in estimating demand.
- Establish agreements with nearby fitness centres to provide shower and change facilities if they cannot be accommodated on-site.

Security

- Locate shower and change facilities inside the security perimeter of the building. Where no such security perimeter exists (within a park or recreation area), change and shower rooms should be monitored or visited by building security staff on a regular basis.

RELATED TOPICS

Bicycle Parking (3.4.7), Pedestrian Facilities (3.5.2)

RELATED RESOURCES

- Transport Canada. *Commuter Options: The Complete Guide for Canadian Employers.* Ottawa: Transport Canada, 2002. www.tc.gc.ca/commuter

3.6.4 Street Furniture and Landscaping

Objective

To provide appropriate and attractive interior and exterior amenities and streetscapes, while maintaining accessibility and proper sightlines for all modes.

Guidelines

Street Furniture

- Incorporate the following street furniture elements into the site design where practical and appropriate:
  - Benches;
  - Drinking fountains;
  - Washrooms and change facilities;
  - Waste receptacles;
  - Communications and security, including public telephones; and
  - Public art and other interesting diversions along the way.

Figure 3–45. Modest landscaping together with amenities such as street furniture serves to enhance the pedestrian experience.
Source: IBI Group

- Locate street furniture and other amenities close to transit stops and along key pedestrian and cycling routes. Ensure that street furniture and other amenities do not block or interfere with pedestrian and bicycle pathways and movements.

Landscaping

- Install landscaping, attractive paving and other hardscape features to enhance the attractiveness of walking routes and add interest to the trip.
- Ensure that landscaping does not create blind spots at entrances, exits, turns in pathways and crossings/intersections with motor vehicles.
- Avoid landscaping with dark or enclosed areas that can create security concerns.
- Incorporate a variety of flowering and non-flowering plant species at several elevations in planting strips, boulevards and hanging flowerpots. Choose plant material that creates a landscape that evolves with the seasons. Indigenous plants should be considered, as they are already adapted to the local weather patterns.
- Plant trees along streets and key pedestrian routes to provide shade and protection from winds, buffer street noise and reduce air pollution.
- Illuminate all routes at all times of the evening, night and early morning. Light fixtures should be of a human scale (4- to 5-m high) and should be shielded to prevent light dispersion of light outside intended areas.

Related Topics

Site Grading (3.4.9), Pedestrian Facilities (3.5.2), Guide Signing (3.5.3), Waiting Areas and Transit Shelters (3.6.1)

Related Resources

- Chittenden County Regional Planning Commission. *Transit Oriented Design (TOD) for Chittenden County*. 2002.
- Vermont Chapter of the American Society of Landscape Architects. *Sustainable Landscape Design.*
- Local urban design departments.

3.7 Application for Specific Types of Development

3.7.1 Large Format Retail

Large-format retail sites, often referred to as "big-box" developments, feature stores that specialize in bulk or discount goods, home improvement products, large movie theatres and other services with a regional market potential. These sites tend to cater to automobile users, but by doing so they inevitably present difficulties for users of more sustainable transportation modes.

The assumption that people will not walk, cycle, or take transit to large-format retail stores should not be a reason to abandon the principles of sustainable transportation. For example, customers could have their purchases delivered. In other cases, patrons could carry small size (not necessarily low value) purchases home with them by foot, on their bicycle, or when using transit. Those who arrive by car should be encouraged to walk from the parking area to various buildings reducing trip making on-site. Similarly, employees may wish to bicycle, take transit, or walk to work and should be afforded safe and attractive environments to do so. Finally, there is a need to appreciate that large-format retail sites are part of the urban landscape and should contribute to the area's overall attractiveness and the safety of all patrons, regardless of their mode of transportation.

The following measures should be considered to facilitate access to large-format retail sites by sustainable transportation modes:

- Locate the majority of parking to the rear of the site and provide at least one entrance close to the street to reduce walking distances and create a more attractive street frontage for pedestrians, cyclists and transit riders. Design the site to have at least one side front on and abut to a major street (See *Building Placement, Building Entrances and Vehicle Parking Supply and Layout*);
- Locate uses with the highest potential for pedestrian access (for example, clothing stores, restaurants) closer to the street than those with greater propensity for vehicle use, such as building supply stores (See *Building Placement*);
- Provide walkways and pedestrian refuge areas through parking lots and along the building frontage (See *Vehicle Parking Layout and Pedestrian Facilities*);
- Avoid parking layouts that require vehicles to circulate in front of store entrances (See *Vehicle Parking Layout*); and
- Provide bicycle parking near all main entrances for customers, and protected on-site parking and changing facilities for employees (See *Bicycle Parking, Bicycle Racks and Storage, and Showers, Change Rooms and Lockers*).

3.7.2 Schools

There is a growing trend toward students, even those living within reasonable walking or cycling distances, driving or being driven to school. This may be partly due to the fact that community designs have made it difficult for students to walk to school (houses back onto arterials, internal streets are discontinuous or circuitous), and that many parents and school administrators view walking and cycling as unsafe due to traffic volumes, speeds, or personal security concerns.

With this trend, safety concerns have arisen due to the high volume of cars at the site. Even if a site is designed to allow for high volumes of drop-offs, the high volume on the adjacent street presents safety and environmental issues. Site developers must work with school administrators and boards to develop a comprehensive approach to school transportation including a well-designed site for pedestrians, cyclists, buses and essential cars.

Recognizing the need to accommodate auto users while at the same time encouraging more sustainable behaviours for school trips, the following measures should be considered:

- Locate vehicle drop-off facilities (on street or off-street) away from main entrances and other high activity areas (such as playgrounds or playing fields). In all cases, school bus pick-up/drop-off facilities should be closest to building entrances. On-street parking restrictions may be required to manage parent pick-up and drop-off activity to avoid safety and congestion problems. In no case should a pick-up/drop-off area or its access drives compromise the directness and safety of pedestrian routes between the surrounding neighbourhood and the school entrances (*See Passenger Pick-Up and Drop-Off Areas*);
- Ensure that pedestrian crossings are clearly delineated and located in the most likely areas of demand, since students will typically cross where it is most convenient. Vertical (speed humps, raised crosswalks) and horizontal traffic calming measures (curb extensions) may help to improve pedestrian safety (See *Internal Transportation Network Configuration and Pedestrian and Cyclist Routes*);
- Provide school crossing guards at high pedestrian/vehicle volume crossing locations. In some cases, traffic control signals or intersection pedestrian signals may be warranted to protect cross-

ing children. Provision of any traffic control devices would be subject to local guidelines, including the *Manual on Uniform Traffic Control Devices* (See *Internal Transportation Network Configuration*);

- Provide/develop a plan showing safe routes for walking and cycling between homes in the area and school. "Safe routes to school" information should be provided to each parent, with the locations of crossing guards clearly identified;
- Locate bike racks in highly visible and weather-protected areas, such as an overhang outside a lobby or classroom. Provide a sufficient number of spaces to accommodate demand (See *Bicycle Racks and Storage*);
- Provide access to surrounding communities from all directions. For example, a small park or greenway between two houses could be used to provide access to surrounding streets (See *Internal Transportation Network Configuration and Pedestrian and Cyclist Routes*);
- Provide transit passes to students who are not bussed to school but come from farther distances; and
- Provide minimal on-site parking for students to discourage auto use. This may require a parking management strategy whereby students are only allowed to drive to school when walking, cycling, transit, or school bus options are not feasible or available (See *Vehicle Parking Supply and Placement*).

Figure 3–46. Ideas such as the "walking school bus" are possible when schools and communities are designed for pedestrians.
Source: GO for Green

4. Supporting Policies and Actions

4.1 Land Use Planning

The success of efforts to promote sustainable transportation through site design will be limited in the absence of more compact, mixed-use, transit-supportive land use patterns. This form of development:

- Brings complementary activities closer together and increases the potential for walking, cycling, ridesharing and transit use;
- Increases the number of potential transit passengers per kilometre, which leads to more cost-efficient transit services and, in turn, higher transit service levels; and
- Supports a broader range of services, especially entertainment and shopping, making streets more lively and attractive for walking and cycling.

This section describes four fundamental land use planning policies that municipalities should pursue to achieve a development pattern that better facilitates access by sustainable transportation modes. Many of these concepts are beyond the scope of site design and are best addressed through documents, such as official plans, zoning by-laws/ordinances and transportation plans.

4.1.1 Establish Urban Boundaries

Most major cities face development pressures at their fringes. This interface between a community's rural and urban areas is often attractive for development because land costs are not as high and developers can avoid the typical challenges presented by urban infill development, most notably neighbourhood objection to proposals.

Urban boundary expansion results in a city that is spread out, disconnected and difficult to serve by transportation modes other than personal vehicles. The consequences of this phenomenon, commonly referred to as "urban sprawl," are well documented (for example, Blais, 1995, Burchell et al., 2000) and include increased infrastructure costs, lost agricultural production capacity and increased pollution due to a higher reliance on private motor vehicles.

Municipalities can help to avoid "urban sprawl" and promote more compact land development patterns by:

- Designating ultimate and interim urban boundaries in official plans to allow for a phasing of growth over a long period of time, while encouraging more compact urban form in the shorter term;
- Requiring land development to occur sequentially as transportation and other infrastructure services are extended incrementally from existing built-up limits;
- Discouraging scattered or "leap-frog" development in isolated areas outside urban boundaries that cannot be effectively served by transit and other forms of sustainable transportation;
- Promoting greater compactness and mixed-use development in areas already served by transit to reduce the need for new land consumption; and

Figure 3–47. The structure and density of land-uses has a major impact on the attractiveness and convenience of more sustainable transportation modes.
Source: IBI Group

Figure 3–48. The structure and density of land-uses has a major impact on the attractiveness and convenience of more sustainable transportation modes.
Source: City of Vancouver

- Developing a long-range transportation plan that supports a more compact urban structure, and does not "induce" sprawl through new highway construction in outlying areas.

4.1.2 Promote Compact Urban Form and Density

Creating compact urban form that utilizes land efficiently helps to minimize the need for costly infrastructure expansion and service extensions. This form of development makes better use of existing facilities and services and poses less impact on the environment. Travel by modes other than the automobile is also easier when land uses are contiguous.

By intensifying and increasing mixed-use development, supportive land use plans can make alternatives to the automobile, especially transit, more attractive and viable. Concentrating employment uses, especially office and service jobs, in locations supported by high quality transit service and good bicycle and pedestrian facilities help to promote the use of sustainable transportation modes. Placing higher density developments near transit stops and cycling and walking routes creates common destinations.

Municipalities can help to achieve a denser, more compact, mixed-use urban form by:

- Encouraging clustering of compatible and complementary land uses such as office, retail and residential to facilitate live-work relationships and maximize the use of existing infrastructure (for example, residential and office uses tend to have different traffic peaks);
- Requiring development densities that support a level of transit service that is sustainable, viable and competitive with automobile travel times. According to the Canadian Transit Association (CUTA, 1993), "for each kilometre of route being considered in a residential area, at least 2,100 people should live in the catchment area of a proposed new route (within a 450 m walk of the route). For each kilometre of new route in an industrial area, at least 750 people should work in the catchment area of a proposed new route." These figures equate to a minimum development density of approximately 25 people per hectare for residential development and 8 employees per hectare for industrial development;
- Incorporating provisions into local zoning by-laws or ordinances to permit reduced lot sizes, increased building heights and increased floor space indexes;
- Reducing or eliminating parking requirements (or maximum parking ratios) for development near neighbourhood centres and rapid transit stations;
- Introducing maximum building setbacks into zoning by-laws or ordinances so parking is located behind buildings rather than between the buildings and streets;
- Reducing the amount of space required for traffic lanes and parking, making more land available for productive development and/or other right-of-way uses;
- Encouraging infill, redevelopment and intensification of underutilized properties, including brownfield sites;
- Encouraging development of upper floors of ground level commercial uses for business and residential purposes;
- Discouraging auto-oriented developments, such as drive-through restaurants and large-format retail with expansive parking areas, along key transit corridors and in areas designated for higher density uses;
- Providing levels of transit service that allow people to conveniently live, work, shop and recreate in an area without having to rely on an automobile for travel needs; and
- Educating citizens and community members on the benefits of active living in compact urban form to off-set negative perceptions associated with "high-density development."

4.1.3 Develop Transit Nodes and Corridors

The most effective urban structure from a transit perspective is one of nodes and corridors (Blais, 1995). This form of development also facilitates walking, cycling and ridesharing because destinations are more centralized and connected.

Municipalities can help to promote more transit-supportive development in nodes and corridors by:

- Designing for transit initially, as part of the land use and development planning process, as opposed to "fitting it in" later as the area matures;
- Coordinating growth in nodes and corridors with evolving transit network, as opposed to focusing growth toward highway corridors;
- Encouraging a mix of land uses along transit corridors to create more balanced ridership levels, day-long transit use and a safer pedestrian environment;
- Locating higher density development close to transit nodes and corridors and at other locations where transit is readily available;

- Encouraging a mix of land uses at transit nodes to let people live and shop near their job; and
- Locating major trip generators (for example, office towers, shopping centres, schools and entertainment facilities) closest to transit nodes and corridors.

4.1.4 Layout Arterial and Collector Roads in a Grid Pattern

The layout of arterial and collector roads in a community can affect accessibility to transit and the attractiveness of walking and cycling as modes of transportation. A connected, permeable street network is key to ensuring that transit services can efficiently reach potential riders, and that cyclists and pedestrians can move easily and in an uninterrupted manner within and between neighbourhoods.

Municipalities can help to create a more conducive street network by:

- Requiring closely spaced grid patterns of arterial and collector roads on subdivision plans. This ensures developing areas are accessible for pedestrians and cyclists, and can be more easily serviced by transit. Ontario's *Transit Supportive Land-use Planning Guidelines* (Ministry of Municipal Affairs and Housing, 1992) suggests a spacing of no more than one kilometre between arterials and collectors to ensure that the majority of land is within 400 m of a bus stop;
- Maintaining the continuity of arterial and collector roads across and between neighbourhoods, providing direct routes for buses, cyclists and pedestrians;
- Designing local street patterns to provide direct access from buildings to transit stops and major arterial and collector roads. If direct access is not possible because of existing buildings or geographic constraints, provide pedestrian and bicycle connections through or between sites to minimize distances; and
- Promoting effective access management practices. Development practices that support sustainable transportation modes also support access management. For example, limiting the number of driveway connections reduces conflicts for pedestrians and cyclists accessing the site and creates more attractive and accessible street frontages. Similarly, bringing buildings closer to the street lengthens driveway throat distances and corner clearances.

4.2 Transportation System

Efforts to promote sustainable transportation through site design will also be curtailed in the absence of infrastructure, services and programs that enable and encourage walking, cycling, ridesharing and transit use.

This section describes four transportation system policies that agencies should pursue to achieve a network that better facilitates the use of sustainable transportation modes. Many of these concepts are beyond the scope of site design and are best addressed through local programs and documents such as official plans, transportation plans and design guidelines/standards. Information on certain initiatives can be found in Transport Canada's *Commuter Options: The Complete Guide for Canadian Employers* (www.tc.gc.ca/programs/Environment/Commuter/downloadguide.htm).

4.2.1 Encourage Walking

- Establish standards for pedestrian facilities within road rights-of-way, including design criteria;
- Develop guidelines and implementation programs to facilitate traffic calming initiatives, where appropriate;
- Establish urban design, streetscaping and greening guidelines that enhance the pedestrian realm;
- Consider the needs of all pedestrians, including children, adults, the elderly and individuals with sensory or mobility impairments, in decisions;
- Promote "International Walk to School Day" and similar initiatives; and
- Implement design and maintenance practices for sidewalks, trails and walkways that facilitate safe and efficient pedestrian activity.

4.2.2 Promote Cycling

- Include requirements for bicycle parking in zoning by-laws or ordinances;
- Develop or designate safe cycling routes in major travel corridors, supported by community-wide cycling route maps;
- Work with employers to improve facilities for cyclists and promote cycling through activities such as users groups;
- Install racks on buses and allow bicycles on trains and buses;
- Promote "Bike Week" and similar initiatives;
- Implement design and maintenance practices for bikeways and trails that facilitate safe and efficient cycling; and
- Provide publicly accessible bicycle parking racks, lockers and change facilities at major destinations and transfer locations such as transit stations and park-n-ride facilities.

4.2.3 Improve Transit

- Develop local street patterns and pedestrian facilities to provide convenient access to transit stops and stations;
- Develop consistent transit service standards and associated facilities (stops, shelters, walkways, etc.) to ensure that new developments are provided with adequate and reliable service from the outset;
- Promote safe transit use through education and awareness programs;
- Advocate for subsidized transit fares to make the cost to use transit more competitive with the automobile; and
- Provide transit passenger information systems, featuring real-time schedule information, trip planning services and advanced payment systems.

4.2.4 Facilitate Ridesharing

- Develop community-wide transportation demand management (TDM) strategies, including measures to support ridesharing;
- Ensure new development accommodates the TDM strategies (for example, transit access as convenient as parking, vanpool parking adjacent to building entrances);
- Establish and support transportation management associations (TMAs) to help employers implement TDM programs (such as guaranteed ride home, ride-matching);
- Work with employers to introduce employee rideshare programs and financial incentives to use modes other than the automobile; and
- Introduce high-occupancy vehicle (HOV) lanes in key transportation corridors.

4.3 Monitoring and Evaluation

It is important to track and conduct on-going assessments of how successful a community is in promoting sustainable transportation through site design. A clear understanding of changing conditions and progress towards goals enables a municipality to make more informed implementation decisions and timelier refinements to policies and site design practices.

This report does not set objectives for the uptake and use of sustainable transportation modes. Rather, it recommends that individual municipalities establish their own short- and long-term goals and plan a means of evaluation to assess their progress towards these targets. Goals of this nature are often stated in official plans or transportation plans.

It takes time to substantially increase the level of walking, cycling, or transit use in a community, particularly where infrastructure and services for sustainable transportation are limited or non-existent. Applying the recommended practices outlined in this report can accelerate the evolution towards more supportive development patterns, while helping to prevent the need for costly site retrofits in the future to accommodate higher levels of sustainable travel mode use.

The application of these or any other site design guideline should be monitored on a site-by-site basis to assess the effectiveness of the implemented measures in promoting sustainable transportation. Community- and subarea-wide monitoring should also be conducted to assess achievement of overarching modal-use objectives. Monitoring would ideally measure the impact of site design features on observed behaviour (modal shares) and user attitudes as to what works and what does not. The municipality should review the evaluation findings to determine the need for refinements to its local policies and guidelines.

Appendix A. References and Additional Resources

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Associations and Working Groups

A number of associations and working groups produce or distribute information related to sustainable transportation modes and site design.

Association for Commuter Transportation (ACT) of Canada—meets the needs of Transportation Demand Management Professionals in Canada (www.actcanada.com)

Association of Pedestrian and Bicycle Professionals (APBP)—promotes excellence in the emerging professional discipline of pedestrian and bicycle transportation (www.apbp.org)

British Columbia Cycling Coalition—registered non-profit society that represents the interests of cyclists provincially (www.bccc.ca)

Canadian Urban Transit Association—acts on behalf of the public transit industry in Canada and is a centre for transit-related research in Canada (www.cutaactu.on.ca)

Centre for Sustainable Transportation—provides leadership in achieving sustainable transportation in Canada (www.cstctd.org)

Congress for the New Urbanism—A United States-based non-profit organization that works with architects, developers, planners and others involved in the creation of cities and towns, teaching them how to implement the principles of the New Urbanism (www.cnu.org)

Federal Highway Administration (FHWA)—an department of the Department of Transportation in the United States, FHWA supports programs and research related to pedestrian and bicycle safety (www.fhwa.dot.gov)

Go for Green, the Active Living and Environment Program—national organization whose mission is to encourage outdoor physical activity that protects, enhances, or restores the environment (www.goforgreen.ca)

Institute of Transportation Engineers (ITE)—international individual member educational and scientific association dedicated to providing resources and information to traffic engineers, transportation planners and other professionals (www.ite.org)

National Centre for Bicycling and Walking—provides information to make cities more bicycle friendly and walkable (www.bikewalk.org)

Project for Public Spaces—non-profit organization dedicated to creating and sustaining public places that build communities (www.pps.org/about_pps.htm)

Pedestrian and Bicycle Information Centre (PBIC)—clearinghouse for information about health and safety, engineering, advocacy, education, enforcement and access and mobility (www.pedbikeinfo.org, www.walkinginfo.org and www.bicyclinginfo.org)

Transportation Association of Canada (TAC)—national association promoting the provision of safe, efficient, effective and environmentally and financially sustainable transportation services in support of Canada's social and economic goals (www.tac-atc.ca)

Smart Growth Network—organization working to encourage development that serves the economy, community and environment (www.smartgrowth.org)

Victoria Transport Policy Institute (VTPI)—research group providing information on innovative strategies for more efficient and equitable transportation (www.vtpi.org)

Appendix B. Site Design Prompt List

The following list is a convenient reminder for site designers and reviewers of the key site design considerations for promoting sustainable transportation. It is not a substitute for the guidelines themselves, to which users should refer for more specific information.

ISSUE/FACTOR		COMMENTS
Land-Use Planning and Urban Form Considerations (4.1)		
Development is compact and orients major uses to transit streets; densities are sufficient to support transit.	☐	
Proposed use adds to mix of land-uses in area and does not result in large tracts of similar uses	☐	
Project is located within designated urban boundary	☐	
Proposed land-use and density is compatible with planned uses, particularly if located in a designated node or corridor.	☐	
Adjacent street network provides for connectivity of transit, cycling and pedestrian routes.	☐	
Safety and Security Considerations (all sections)		
Overall site design attempts to minimize conflict points between vehicles, pedestrians and cyclists.	☐	
Sight distances have been considered in overall site design and conform to local standards.	☐	
Consideration has been given to personal security for pedestrians, cyclists and transit riders and carpool patrons.	☐	
Land-use and Site Planning (3.3 and 4.1)		
Highest density land-uses are located closest to activity nodes such as transit stops and intersections.	☐	
Proposed use provides or adds to mix of land-uses in surrounding area.	☐	
Proposed use is compatible with adjacent land-uses and with long term land-use plans for area.	☐	
Building Placement (3.3.1)		

ISSUE/FACTOR		COMMENTS
Buildings are located close to the street yet set back far enough to allow for pedestrian activities along street frontage.	❑	
Where appropriate, retail, restaurants and other pedestrian oriented uses animate the street frontage.	❑	
Building Entrances (3.3.2)		
Building entrances are located close to the street, with direct pedestrian access.	❑	
Vehicle paths do not cross major building entrance points.	❑	
Vehicle Parking Supply and Placement (3.3.3)		
Parking supply does not exceed the <u>minimum</u> standard, on-street parking is factored in to parking supply.	❑	
Internal Transportation Network Configuration (3.4.1)		
Roads and paths match up with surrounding networks and ensure direct connections through out the site for cyclists and pedestrians.	❑	
Block lengths are limited and mid-block crosswalks are provided where appropriate.	❑	
Traffic-calming principles are applied, where appropriate (proper site design should avoid the need to apply extensive traffic calming).	❑	
Appropriate measures have been taken to ensure easy progress of transit vehicles through the site, if desired by transit operator.	❑	
Passenger Pick-up and Drop-off Areas (3.4.2)		
Passenger pick-up and drop-off areas are located to the side or rear of buildings, downstream from the entrance, but no more than 30m away from it.	❑	
Pedestrian and Cyclist Routes (3.4.3)		
Safe, continuous and clearly defined routes for pedestrians and cyclists are provided along desire lines.	❑	
Weather protection and amenities such as trees are provided.	❑	

ISSUE/FACTOR		COMMENTS
Intersections are designed to provide safe pedestrian crossing.	❑	
Transit Facilities (3.4.4)		
Walking distances to stops do not exceed 400 meters, and pathways to stops are safe and direct.	❑	
On-site or adjacent transit stops are located close to the main entrances of activity generators.	❑	
Stops and waiting areas are properly illuminated, visible from a distance, and have warranted amenities such as shelters and benches.	❑	
Vehicle Parking Layout (3.4.5)		
Off-street parking is located away from the street, preferably behind buildings or underground.	❑	
Vehicle access is separate from pedestrian access, and access and egress controls are designed so vehicles do not block pedestrian ways.	❑	
Parking lots are kept small and designed to prevent speeding	❑	
Pedestrians have protected walkways through the lots.	❑	
Preferential Parking (3.4.6)		
Preferential parking is provided for sustainable modes in the most convenient area of the lot.	❑	
Bicycle Parking (3.4.7)		
Safe and sheltered bicycle parking is provided at each entrance for short term users.	❑	
Weather protected bicycle parking for longer term users is provided in a secure area. Storage for gear is provided.	❑	
Loading Areas (3.4.8)		
Loading areas are located off the street, and are screened from public view.	❑	

ISSUE/FACTOR		COMMENTS
Loading area access is designed so that pedestrian, cyclist, and transit routes are never severed.	❑	
Site Grading (3.4.9)		
Terrain along pathways is kept reasonably level, and ramps are also provided wherever stairs are necessary.	❑	
Slopes along pathways are designed to avoid the ponding of slush and water.	❑	
Internal Roads (3.5.1)		
Appropriate traffic signals and compact geometry of intersections control speeds and allow for safe passage of cyclists. Roads are designed to cross at right angles. Sight lines are respected.	❑	
Lanes are designed to accommodate motor vehicles and cyclists, and remind respective users of the other networks on the site.	❑	
Facilities for cyclists and sustainable modes are provided and continued across the site.	❑	
Pedestrian Facilities (3.5.2)		
Sidewalks are provided along all roads, and follow pedestrian desire lines on-site.	❑	
Properly signed crossings are provided wherever a path or sidewalk crosses a road.	❑	
Physical treatment of the pathway warn pedestrians of upcoming crossings. Accessible signals and special road detailing allow the safe progression of the visually impaired.	❑	
Pathways are clearly defined, delineated, and are of a sufficient unobstructed width. Appropriate amenities such and lighting and weather protection are provided and safety along the path is addressed.	❑	
Guide Signing (3.5.3)		
Appropriate signage and physical features allow users of all networks to determine their location, identify their destination and progress towards it.	❑	
Waiting Areas and Transit Shelters (3.6.1)		

ISSUE/FACTOR		COMMENTS
Shelters and rest areas are provided at transit stops and locations where there is a high number of users, the elderly or the disabled.	❑	
Shelters and rest areas are identifiable, accessible, placed appropriately, and are comfortable.	❑	
Bicycle Racks and Storage (3.6.2)		
Racks are situated to accommodate users and encourage use.	❑	
Showers, Change Rooms and Lockers (3.6.3)		
Where appropriate, facilities are provided or made accessible to facilitate active transportation, and storage of related equipment.	❑	
Street Furniture and Landscaping (3.6.4)		
Amenities are provided to create a comfortable and appealing environment, pre-empting litter and responding to user needs.	❑	
Landscaping does not compromise user security.	❑	