

4.6.15 Median Refuges

A refuge within a roadway median is a place in the middle of a road where trail users can wait safely before crossing the next lane(s) of traffic. It allows a cyclist or pedestrian to cross half of the road without waiting until both directions of traffic are clear. Refuges can consist of a curb cut in the existing median or a structure built specifically as a new crossing refuge. They are used where crossing of a busy roadway is required, there is an existing central median or room for an island, but where a mid-block signal light is undesirable.

For medians, the minimum width of the refuge should be 3.0 metres. This allows cyclists at least 0.5 meter clearance at either end of their bicycles. The refuge should allow cyclists or pedestrians from both directions to congregate. Too large a width is to be avoided as motorists could use it for turning. Standard crosswalk pavement markings should be used.

Where there is not an existing median, narrowing lanes and installing an island refuge is an option. This type of refuge must be physically defined with standard barrier curbs, not just painted on the road surface. The two halves of the island should extend 5.0 metres in either direction. The use of reflectorized bollards is recommended.

4.6.16 Access to Bridges and Tunnels

Often a narrow existing bridge or tunnel (e.g., railway trestle) is the only way to cross over or under an obstacle. There are two possible solutions to restricted access over or through these structures.

The first is to amalgamate pedestrian access to a sidewalk on only one side of the bridge or tunnel and widen the outside travel lanes using the resulting extra width for shared lanes for cyclists. In-line skaters may be accommodated on the sidewalk if there is adequate width.

The second is to encourage cyclists onto whatever sidewalks are present, where they would be required to dismount and walk their bicycles. It is not mandatory that cyclists use the sidewalk because in most cases cyclists have the right to use any roadway other than limited access highways.

Another option is to widen the right-of-way during future reconstruction or to add on extra travel width with a parallel structure in the case of a bridge.

In all cases the minimum recommended tunnel width for a multi-use path is 3.3 metres. Any necessary alignment or grade changes should be made on the access ramps. Tunnel should be well lit with special consideration made to security, maintenance and drainage. Abutments should be appropriately painted with hazard markings.

In general, cyclists and pedestrians prefer a tunnel to a bridge if it is shorter and faster to negotiate, however tunnels do not provide opportunities for scenic views out or surveillance views in.

4.6.17 Loop Activated Traffic Lights

Many traffic signals in urban areas are activated by detector loops embedded in the roadway. These traffic loops respond to the magnetic field induced by the metal in a motor vehicle. The sensitivity of these loops can be adjusted to detect a bicycle without sensing passing vehicles. This can be facilitated by using a quadruple loop, which minimizes sensitivity outside the loop while increasing it within. Detector loops are not usually installed across the entire lane and it is quite possible that a bicycle on the far right side of the road will not be detected. Pavement markings, either stencils or indicator dots, should be used on the right edge of the loop. This will allow cyclists to line up on the loop and activate the signal.

4.6.18 Delayed Green Traffic Lights

Cyclists and in-line skaters travel at slower speeds than motorized vehicles, and therefore, take longer to clear an intersection. Delaying the green light or providing a four-way red signal allows the intersection to clear before other traffic proceeds.

4.6.19 Bicycle Parking

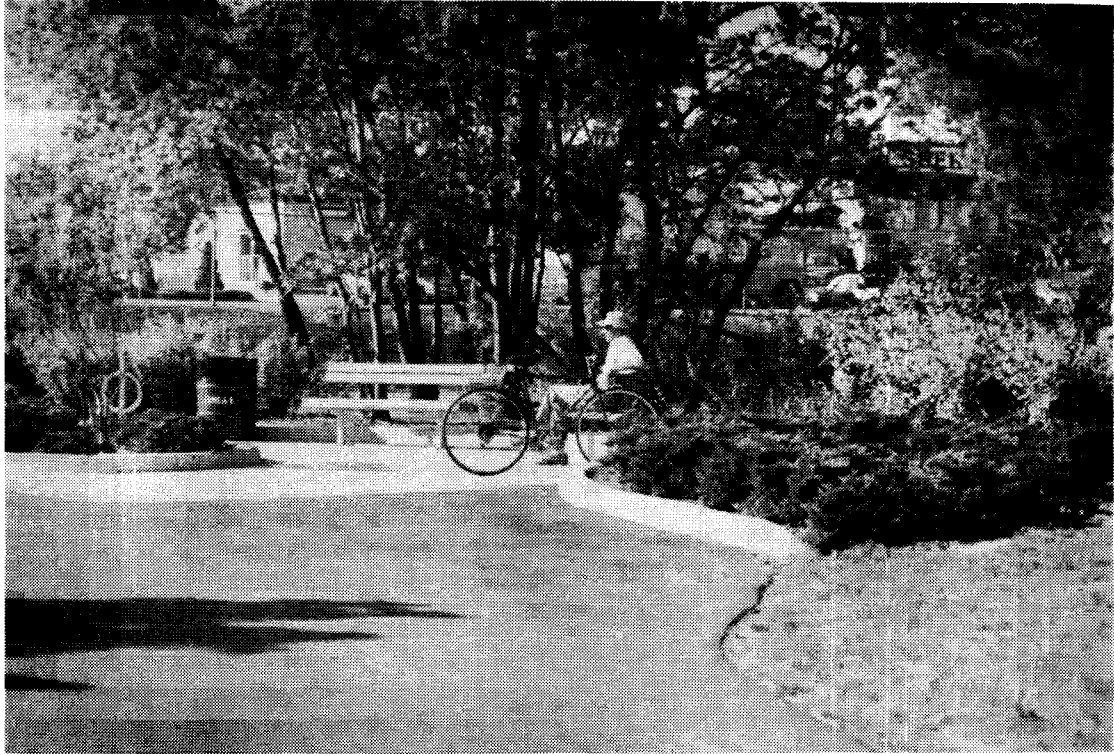
Adopt inexpensive, straightforward, yet highly identifiable bicycle parking devices such as the Toronto post and ring rack, which support the body of the bicycle as well as facilitating the locking of both wheels. They are compatible with a wide variety of bicycles and locking devices.



4.6.20 Rest Stops

Any long off-road pathway needs periodic rest stops. These should be at midway points, scenic lookouts, or near amenities such as parkettes, restaurants, beaches, picnic areas, etc. A rest stop should have, at a minimum, a bench and a bicycle parking rack. They should be located at a desirable interval of every 1.0 kilometres (20 minutes walking distance at 3.0 km/h) in urban areas. Rest areas with a drinking water fountain, washroom facilities and a pay telephone should be provided at all major parks and trailheads with parking lots having more than 20 car spaces.

Locate playgrounds, benches and water fountains well away from the general thoroughfare of the Waterfront Trail to prevent parked bicycles, etc. from causing congestion.



5.0 DESIGN GUIDELINES - BIBLIOGRAPHY

- Alberta Recreation and Parks. 1989. *Recreation Trails*. Edmonton.
- American Association of State Highway and Transportation Officials. 1991. (AASHTO) *Guide for the Development of Bicycle Facilities*. Washington.
- American Society of Civil Engineering, Human Powered Transportation Committee. 1992. *Bicycle Transportation Facilities Guidelines for Engineers - Draft*.
- Ann Arbor (Michigan), Department of Parks and Recreation. 1990. *Bicycle Master Plan*. Ann Arbor.
- Associated Planning Consultants. 1996. *Accessibility for disabled users of the Waterfront Trail: a checklist*. Toronto: Waterfront Regeneration Trust.
- Australia Ministry of Transport. 1989. *Planning and Design of Bicycle Facilities*. Victoria.
- Barton-Aschman Canada. 1977. *City of Toronto Bikeway Study Technical Advisory Committee Workpaper Number Two*. Toronto.
- Brampton (Ont.), Community Services Department. 1991. *Pedestrian and Cyclist Trails - Final Report*. Brampton.
- Brownell, V.R. 1993. *Waterfront natural areas: parts I and II*. Toronto: Waterfront Regeneration Trust.
- Calgary (Alberta), Transportation Department. 1984. *Calgary Cycle Plan*. Calgary.
- Canadian Institute of Planners (CIP). 1990. *Community Cycling Manual*. Ottawa.
- Canadian Roads and Transportation Association of Canada. 1983. *Guidelines for the Design of Bikeways*. Ottawa.

- Dinsmore, D. 1994. *Waterfront Trail user study: a survey of trail-based recreation along the Lake Ontario Greenway*. Toronto: Waterfront Regeneration Trust.
- Ecologists Limited. 1990. *Alternative Use of Abandoned Railway Rights-of-Way*. Waterloo.
- EDA Collaborative Inc. 1993. *Trail Planning and Design Guidelines*. Toronto: Metropolitan Toronto and Region Conservation Authority.
- Edmonton (Alberta) Transportation Planning Branch. 1992. *Bicycle Transportation Plan*. Edmonton.
- Energy Probe. 1989. *Why Ontarians Walk, Why Ontarians Don't Walk More*. Toronto.
- enTRA Consultants Inc. 1994. *Waterfront Trail demand analysis project: final report*. Toronto: Waterfront Regeneration Trust.
- Eugene (Oregon), Eugene Bicycle Committee. 1981. *Bicycles in Cities - The Eugene Experience*. Eugene.
- Ford Hollands-Hurst Landscape Architects Inc. 1989. *City of Waterloo Community Trails*. Oakville.
- Forester, John. 1983. *Bicycle Transportation*. Cambridge: MIT Press.
- _____. 1986. *Effective Cycling*. Cambridge: MIT Press.
- Grove, Noel. June, 1990. "Paths to the Future", *National Geographic*.
- Hilton Foster Ltd 1988. *Community Trail Design Standards Manual*. Waterloo.
- Hough Stansbury Woodland Naylor Dance Limited. 1994. *Ecological restoration opportunities for the Lake Ontario Greenway*. Toronto: Waterfront Regeneration Trust.
- Hough Woodland Naylor Dance Limited. 1995. *Restoring natural habitats: a manual for habitat restoration in the Greater Toronto Bioregion*. Toronto: Waterfront Regeneration Trust.

- Hough Woodland Naylor Dance Limited. 1995. *Restoring natural habitats: a manual for habitat restoration in the Greater Toronto Bioregion*. Toronto: Waterfront Regeneration Trust.
- Institute of Transportation Engineers. 1984. *Guidelines for Urban Major Street Design: A Recommended Practice*.
- Kelly, Carol and Ken Snell. 1987. *The Source Book - Architectural Guidelines for Barrier Free Design*. Toronto.
- The Landplan Collaborative Ltd. 1995. *Lake Ontario waterfront experiences*. Toronto: Waterfront Regeneration Trust.
- Lavallée, Janine. Fall 1991. "Commuting in Canadian Cities", *Canadian Cyclist*. Montréal.
- Lord Cultural Resources Planning and Management Inc. 1995. *The Lake Ontario Waterfront Trail interpretation plan*. Toronto: Waterfront Regeneration Trust.
- Lowe, Marcia. July, 1988. *Pedalling into the Future*. Washington: Worldwatch Institute.
- Mars/Kyriakides. 1986. *Riders, Reasons and Recreation*. Toronto: Ryerson School of Urban and Regional Planning.
- Marshall, Macklin, Monaghan. 1991. *Bicycle and Pedestrian Route Study for Mississauga Parks and Recreation - Final Report and Technical Appendix*.
- _____. 1992. *Route Selection Study for On-Street Bicycle Lanes*, Toronto: City of Toronto Planning and Development Department.
- McCarthy Tétrault. 1995. *The Waterfront Trail: liability and risk management issues*. Toronto: Waterfront Regeneration Trust.
- Metro By Cycle. 1993. *Two Wheeling Into the Future: A Snapshot of Cycling in Metro Toronto*. North York.
- Metropolitan Toronto (Ont.). 1992. Parks and Property Department, *Pedestrian/Bicycle Pathway User Counts 1991-1992*. Toronto.

- Montréal (Québec). 1988. *Un projet de politique vélo pour Montréal*. Montréal.
- National Capital Commission. 1986. *Recreational Pathways*. Ottawa.
- National Capital Commission/Planexel Ltée. 1992. *Feasibility Study of an Integrated Network of Recreation Pathways for the National Capital Region*. Ottawa.
- Northwestern University, Traffic Institute. 1993. *Program for Instruction for the Bicycle Planning and Facility Workshop*, March 30-April 1. Evanston, Illinois.
- Ontario. *Ontario Building Code*. 1989. Toronto: Government of Ontario.
- Ontario Ministry of Transportation. 1992. *Bicycle Policy Review and Update*. Thornhill, Marshall, Macklin, Monaghan Ltd.
- _____. 1991. *Cycling Skills*.
- _____. 1991. *Inventory for Municipal Roads*.
- _____. 1985. *Manual of Uniform Traffic Control Devices*, Fourth Edition.
- _____. 1996. *Ontario Bikeways Planning and Design Guidelines*, First Edition.
- Ottawa Cycling Advisory Group. 1992. *Commuter Cycling in Ottawa-Carleton, A Survey*. Montréal.
- Portland (Oregon), Office of Transportation. 1987. *Outer Central Corridor Bicycle Route Study*. Portland.
- Québec. 1989. *Signalisation des voies cyclables*. Province de Québec.
- Reid, Ron, Bobolink Enterprises. 1991. *The Waterfront Trail: First steps from concept to reality*. Toronto: Special Advisor to the Premier, Waterfront Development.
- _____. 1992. *The Waterfront Trail - Northumberland County*.

- _____. 1997. *The Waterfront Trail and Wildlife Habitat Protection*. Toronto: Waterfront Regeneration Trust.
- Roads and Transportation Association of Canada (RTAC). 1986. *Manual of Geometric Design Standards for Canadian Roads*, Metric Addition.
- Scottsdale (Arizona). Planning and Economic Development. 1988. *Scottsdale Bicycle Task Force*, Scottsdale.
- Seattle (Washington). Engineering Department. 1985. *Seattle Comprehensive Bicycling Policy*. Seattle.
- Solomon, D.Y. 1992. *The Bicycle as a Mode of Transportation in Metropolitan Toronto*. Municipality of Metropolitan Toronto.
- Florida Department of Transportation. *Bicycle Facilities Planning and Design Manual*.
- Thom/Clayton/Omar. 1990. *Winnipeg's Bicycle Accident Experience*. Conference presentation for the Institute of Transportation Engineers.
- Toronto (Ont.) Commissioner of Public Works and the Environment. 1990. *Bay Street Urban Clearway (Initial Report)*.
- _____. 1991. Commissioner of Public Works and the Environment. *Bay Street Urban Clearway: Six Month Preliminary Evaluation Report*.
- _____. 1991. *Bike to the Future*. Toronto.
- Toronto City Cycling Committee. *Cyclometer*. Toronto, various issues.
- U.S. Bicycle Federation of America Inc. 1986. *Selecting and Designating Bicycle Routes, A Handbook* Washington.
- _____. 1988. *Pro Bike 88 Proceedings Fifth International Conference*. Tuscon.
- Vancouver (B C.), Engineering Department. 1992. *Bicycle Network Study*. Vancouver.

- Vélo Mondial Conference Proceedings. 1992. *The Bicycle: Global Perspectives*. Montréal.
- Vélo Québec. 1990. *Guide technique d'aménagement des voies cyclables*.
- Victor S. Ford Landscape Architect Ltd. 1985. *Swift Current Bicycle Pedestrian Pathway*. Regina.
- _____. 1982. *Wascana Centre Authority Bikeway Study*. Regina.
- Victor Ford and Associates Inc. 1991. *Bicycle Use Development Study for the City of Windsor*. Oakville.
- _____. 1992. *Hamilton-Wentworth Regional Bicycle Network Study*. Toronto.
- _____. 1991. *Implementation Plan for a Network of Community Trails and Routes for the City of Waterloo*. Oakville.
- _____. 1995. *Guidelines for establishing pathway crossings at railways: interim draft*. Mississauga: City of Mississauga.
- Waterfront Regeneration Trust. 1996. *The Waterfront Trail Guidebook*. Toronto: Waterfront Regeneration Trust.
- _____. 1995. *Lake Ontario Greenway strategy*. Toronto: Waterfront Regeneration Trust.
- _____. 1995. *Lake Ontario Greenway strategy: next steps*. Toronto: Waterfront Regeneration Trust.
- _____. Natural Heritage Workgroup. 1996. *A natural heritage strategy for the Lake Ontario Greenway*. Toronto: Waterfront Regeneration Trust.
- _____. Tourism, Recreation and Economic Opportunities Workgroup. 1995. *Tourism, recreation and economic opportunities for the Lake Ontario Greenway*. Toronto: Waterfront Regeneration Trust.

_____. Shoreline Management Workgroup. 1996. *Shore management opportunities for the Lake Ontario Greenway*. Toronto: Waterfront Regeneration Trust.

Windsor (Ont.) Department of Public Works. 1976. *Bikeway Report*. Windsor.

Winnipeg (Manitoba) Streets and Transportation Department. 1993. *Winnipeg Bicycle Facilities Study - Final Report*. Winnipeg: Marr Consulting and Communications.