7 BICYCLE AND PEDESTRIAN FACILITIES

The bicycle and pedestrian modes were added to the CMS program in response to feedback on the 2000 CMS report. A different approach is used for reporting on these modes from the approach used for the roadway, transit, park-and-ride, and HOV-lane facilities. Bicycle and pedestrian facilities are not evaluated for congestion; instead the focus here is on how the region's transportation infrastructure accommodates these modes. After all, bicycling and walking provide an alternative to motorized roadway travel, especially when they can be used in conjunction with transit, and thus they are instrumental in reducing motorized, single-occupancy-vehicle travel and improving air quality.

According to the 2000 census, over 87,000 residents of the Boston metropolitan area walked to work, constituting just under a six percent mode share for all commuters in this area. The mode share of walking as the primary means of traveling to work decreased between 1990 and 2000 for commuters residing in the Boston metropolitan area, while commuting by bicycle increased slightly according to census journey-to-work figures.[1] From 1990 to 2000, the number of Boston area residents who reported bicycling as their main means of traveling to work increased by over 1,000, to 9,100 bicycling commuters. This figure does not include those who used a bicycle for a portion of their commute trip, for example those who bicycled to a rail station where they transferred modes from bicycling to transit.

Based on the 2000 census figures, approximately 54 percent of the population within the Boston MPO region lives within walking distance of MBTA transit service.[2] This statistic reinforces the importance of promoting public transit use, particularly by providing a safe environment for pedestrians and bicyclists in the areas served by transit.

7.1 TRANSIT STATION ACCESS

Walking is the mode used for approximately half of all trips to MBTA rapid transit stations: it is the mode chosen for 56 percent of trips to the Red Line, 43 percent of trips to the Blue Line, 47 percent of trips to the Orange Line, 70 percent of trips to the Green Line D branch, and over 90 percent of trips to the other Green Line branches.[3] Therefore, providing and maintaining convenient, pleasant, and safe access to transit stations is important to enhance the experience of existing pedestrians as well as promote the use of public transit. Facilitating pedestrian access includes providing sidewalks, sufficient lighting, properly placed and designed wheelchair ramps, and pedestrian street crossings.

Crosswalks are the predominant form of increasing safety for pedestrians crossing a street. A clearly striped crosswalk provides guidance for pedestrians crossing the road and serves to alert drivers. A

[1] Journey-to-work figures are percentages based on a sample questionnaire. Only workers over 16 years of age are included; all primary and secondary school students, including those over 16 years of age, are excluded from the census survey. Furthermore, these are census data that are collected in early spring, when, according to counts in the Boston metropolitan area, bicycle volumes are about one-quarter of the peak-season volumes. The seasonal variations for pedestrian activity are not known; however, pedestrian volumes are assumed to be less variable than bicycle volumes. Another factor to consider is that the census questionnaire asks for the mode used for the longest portion of the work commute. Hence, a trip involving a two-mile bicycle trip to a rail station, a five-mile train ride, and a half-mile walk to the office would be classified by the census as a rail commute trip.

[2] Walking distance to transit is defined as the distance of ¾ mile or less from a rail station and ½ mile or less from a bus stop. This measure is used to identify the potential transit market area.

[3] Central Transportation Planning Staff, *MBTA Systemwide Passenger Survey: Rapid Transit/Light Rail 1994*, produced for the Massachusetts Bay Transportation Authority, July 1996.

marked crosswalk is not mandatory at all intersections, but according to standard industry practices, one should be installed where vehicular volumes and the number of pedestrians crossing are sufficient to warrant one.

Bicycling is a mode many riders use to access transit stations. Providing bicycle racks is one significant way to encourage riders to access the transit stations by bicycle, particularly if a shelter for the bicycles is provided. Adequate bicycle parking facilities may contribute to increased transit ridership, especially since conventional bicycles[4] are not allowed on MBTA trains during peak travel periods.[5]

The CMS staff performed an inventory of pedestrian crosswalks and bicycle rack availability and use at transit stations. The results of both of these inventories are presented next.

7.1.1 Pedestrian Crossings

In August 2002, data were collected on the status of crosswalks near MBTA rapid transit stations. Most of the locations appeared to have sufficient crosswalks. There were some stations without any marked street crossings. These stations include Capen Street, Valley Road, Butler Street, and Cedar Grove on the Mattapan High Speed Line, and Shawmut on the Red Line. The surface Green Line stops at Summit Avenue and Warren Street on the B branch and St. Paul Street on the C branch also lacked adequate pedestrian crossings; these locations, which are considered transit *stops*, not stations, typically fall under the jurisdiction of local government, not the MBTA.

7.1.2 Bicycle Parking Availability and Utilization

An inventory of bicycle racks at MBTA commuter rail stations was conducted in August 1999, while information pertaining to bicycle racks at rapid transit stations was collected in August 2002. Table 7.1 is a list of commuter rail stations that do not have bicycle racks. At eight of these stations, Gloucester, Beverly, Swampscott, Melrose Highlands, Canton Junction, Dedham Corporate Center, Endicott, and Natick, bicycles were observed chained to fences or railings at or near the station. This finding could imply latent demand for bicycle racks at these stations. The bicycle racks currently provided at commuter rail stations are in fair or good condition.

Tables 7.2 and 7.3 list, respectively, the rapid transit and light rail stations that do not provide bicycle racks. Some of the transit stations without bicycle parking are located in the urban core; others are light rail surface stops that are located in the median strip of a major arterial roadway, where space is limited or nonexistent for bicycle parking. The bicycle racks currently provided at rapid transit stations are in fair or good condition.

The MBTA rapid transit stations with the most bicycle parking include: Alewife (174 spaces), Davis (165 spaces), Malden Center (66 spaces), Quincy Adams (64 spaces), and Kendall (58 spaces). Stations with 75 percent or more of its bicycle parking utilized include: Davis, Porter, Harvard, Central, Kendall, Wollaston, Oak Grove, Malden Center, Sullivan, and Maverick.

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[4] *Conventional bicycles* means non-folding bicycles. Throughout this chapter, the term *bicycles* will be used to refer to non-folding bicycles.

[5] Bicycles are allowed on the Blue, Red, and Orange lines at all times except for weekday rush hours from 7:00 AM and 10:00 AM, and 4:00 to 7:00 PM; bicycles are permitted all day on weekends. Prior to November 2004, restrictions for weekday use permitted bicycles on these lines only from 10:00 AM to 2:00 PM and after 7:30 PM. On commuter rail trains, bicycles are permitted anytime, except during weekday rush hour periods, and all day on weekends; rush-hour restrictions apply to inbound trains in the morning and outbound trains in the evening (the times are indicated on commuter rail schedules). Folding bicycles are allowed on the subway and commuter rail trains anytime. For more details on the rules pertaining to transporting bicycles on MBTA vehicles, please visit *www.mbta.com/traveling_t/usingthet_bikes.asp.*

Table 7.1. Commuter Rail Stations without Bicycle Racks

Station	Line	Station	Line
Gloucester	Newburyport/Rockport	Littleton/I-495	Fitchburg/South Acton
Prides Crossing	Newburyport/Rockport	Kendall Green	Fitchburg/South Acton
North Beverly	Newburyport/Rockport	Waverly	Fitchburg/South Acton
Beverly	Newburyport/Rockport	Natick	Framingham/Worcester
Swampscott	Newburyport/Rockport	Wellesley Hills	Framingham/Worcester
Riverworks	Newburyport/Rockport	Auburndale	Framingham/Worcester
Chelsea	Newburyport/Rockport	West Netwon	Framingham/Worcester
Haverhill*	Haverhill	Newtonville	Framingham/Worcester
Lawrence*	Haverhill	Roslindale Village	Needham
North Wilmington	Haverhill	Highland	Needham
Melrose Highlands	Haverhill	Windsor Gardens	Franklin
Melrose/Cedar Park	Haverhill	Norwood Depot	Franklin
Wyoming Hill	Haverhill	Islington	Franklin
Wilmington	Lowell	Dedham Corporate Ctr.	Franklin
Wedgemere	Lowell	Endicott	Franklin
West Medford	Lowell	Canton Junction	Attleboro/Stoughton
North Leominster*	Fitchburg/South Acton	Route 128	Attleboro/Stoughton
Shirley*	Fitchburg/South Acton		
Ayer*	Fitchburg/South Acton		

** Outside Boston Region MPO area.*
Inventory performed by MBTA, August 1999.

Table 7.2. Rapid Transit Stations without Bicycle Racks

Station	Line	Station	Line
Charles/MGH*	Red Line	Haymarket	Orange/Green Line
Park Street	Red/Green Line	Chinatown	Orange Line
Downtown Crossing	Red/Orange Line	N.E. Medical Center	Orange Line
Broadway	Red Line	Airport	Blue Line
Andrew	Red Line	Aquarium	Blue Line
Savin Hill	Red Line	State Street	Orange/Blue Line
Fields Corner	Red Line	Government Center	Blue/Green Line
Shawmut	Red Line	Bowdoin	Blue Line
Newton Highlands	D Green Line		

Inventory performed by CTPS, August 2002.

** Bicycle parking will be available at Charles/MGH when reconstruction of the station is complete.*

Table 7.3. Light Rail Transit Stations without Bicycle Racks

Station	Line	Station	Line
All B Line stops	Green Line	Lechmere to Copley	Green Line
All E Line stops	Green Line	Hynes/ICA	Green Line
All C Line stops, except St. Mary's, Coolidge Corner, Washington Sq., Cleveland Circle	Green Line	All Mattapan High Speed Line stops, except Mattapan and Milton	Red Line, Mattapan High Speed Line branch

Inventory performed by CTPS, August 2002.

7.2 BICYCLING NETWORK

As the number of bicycle paths in the Boston region increases—they now include the Minuteman Commuter Bikeway, the Pierre Lallement Bike Path (Southwest Corridor Linear Park), the Dr. Paul Dudley White Bicycle Path along the Charles River, and a handful of other paved, off-street facilities—a bicycle path network is emerging in the Boston region. Bikeways allow users to be separated from motor vehicle traffic, thus creating a comfortable alternative to bicycling on roadways; these facilities may also encourage additional travelers to bicycle, rather than drive. (Further description of the off-street network is provided in Section 7.2.2.)

However, most bicycle travel in the region entails travel on existing roadways. The following section describes an evaluation of the CMS roadway network for its suitability for bicycle travel. Integrating the information about on-street and off-street bicycle travel helps to provide a thorough description of the barriers to and opportunities for bicycle travel in the region.

7.2.1 On-Street Network: The Suitability for Bicycling of the CMS Roadway Network

An assessment of the relative safety and comfort of bicycle users on all CMS-monitored roadways was made using a few relevant roadway characteristics and travel speeds. The method is based on various bicycle travel research studies.[6] These studies were conducted to identify different characteristics of a roadway that are important in determining the comfort and safety of bicycle users. According to this research, the most influential factors are:

- Paved shoulder width
- Minimum travel lane width (in the absence of paved shoulders)
- Vehicular travel speed
- Traffic mix/percent of heavy vehicles
- Grade/terrain (level or rolling)
- Traffic volume
- Pavement features, such as manholes, drains, grates
- Pavement condition/smoothness
- Street lighting
- On-street parking turnover
- Sight distance

[6] This research was conducted using the following sources*: AASHTO 2001 Policy on Geometric Design of Highways and Streets*; FHWA Publication #FHWA-RD-92-073 1994, *Selecting Roadway Design Treatments to Accommodate Bicycles*; and notes provided by Northwestern University Traffic Institute's *Bicycle Planning and Facilities Workshop,* July 16-18, 1997.

The Federal Highway Administration (FHWA) published a report on the Bicycle Compatibility Index.[7] This study developed a method for evaluating level of service for on-street bicycling. However, due to the magnitude of the CMS roadway network, collecting data on all recommended characteristics for all the roadways is infeasible. Therefore, an assessment of the bicycling environment on the CMS roadway network was made using readily obtained data from the MassGIS roadway inventory database and from CMS roadway monitoring. This approach limited the categories of data to roadway shoulder width, terrain, truck route designation, and average peak-period speed of traffic.[8]

The greater the difference in speed that exists between bicyclists and motor vehicles, the less safe a bicyclist is likely to feel (and the less safe a cyclist is likely to be). FHWA's research suggests that in order for a bicyclist to feel safe riding on a roadway with travel speeds over 40 mph, a wider shoulder or wider travel lane is required, as compared to a roadway with speeds less than 40 mph.

Using the available data, the relative comfort and safety that a bicyclist might experience on these roadways was predicted. The ratings of bicycling suitability of a route are poor, medium, or best. Table 7.4 shows a matrix of the characteristics that make up each rating.

The majority of roads that were evaluated for bicycling suitability (the CMS arterial roadway network) are predicted to be poor for bicycling. Overall, only about 250 of the 1,800 CMS arterial roadway network miles (directional) are rated "medium" or "best" for bicycling suitability. In other words, about 14 percent of the CMS arterial roadway network has a favorable suitability rating. However, this evaluation is for only about 8 percent of the entire roadway network in the MPO region, since the CMS network primarily consists of arterial roadways of functional class 4 and higher. Even though these major arterials are the most heavily used roads in our region, local and collector roadways—which typically have lower volumes, slower travel speeds, and little, if any, truck traffic—were not evaluated for bicycle suitability. The majority of these roads likely would receive a better bicycle suitability rating.

Table 7.5 lists roadway segments that received a medium or best rating for bicycling suitability.[9] Figure 7.1 graphically depicts the bicycling suitability results for the CMS roadways.

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[7] David L. Harkey et al., *Development of the Bicycle Compatibility Index:A Level of Service Concept*, produced by the University of North Carolina–Chapel Hill for the Federal Highway Administration, publication FHWA-RD-98-072, December 1998.

[8] Because data on truck traffic volumes are not available for the CMS roadways, the truck route designation in the roadway inventory file was relied on as an indication of potential truck traffic. A route's having a truck route designation indicates that trucks are directed (and thus, more likely) to use the designated route; thus, higher truck volumes are expected.

According to the roadway inventory file, there are two truck route designations, described as follows:

– Designated truck route under federal authority.

– Designated truck route ONLY under state authority.

Federal truck routes did not factor into the bicycle suitability analysis of CMS arterial roadways, as these routes are generally limited-access roads, such as the interstate highways. According to the roadway inventory file, some of the CMS network has a state truck route designation.

[9] Assessing the comfort and safety of a roadway for bicycle users is difficult due to the many subjective factors involved. Riders may not always agree with the technical assessment presented in this CMS report.

Table 7.4. Roadway Characteristics Associated with Bicycling Suitability Classifications

Bicycling Suitability Classification	Truck Route Classification	Terrain	Shoulder Width	Average AM and PM Peak Period Speeds
Best	Non–Truck Route	Level/Rolling	≥4 feet	Less than 40 mph
Medium	Non–Truck Route	Level/Rolling	No shoulder	Less than 40 mph
Medium	Non–Truck Route	Level/Rolling	1 to <4 feet	Less than 40 mph
Medium	Truck Route	Level/Rolling	≥4 feet	Less than 40 mph
Poor	Non–Truck Route	Level/Rolling	No shoulder	Greater than 40 mph
Poor	Non–Truck Route	Mountainous	Any shoulder	Greater than 40 mph
Poor	Truck Route	Level	<4 feet	Greater than 40 mph
Poor	Truck Route	Rolling	Any shoulder	Greater than 40 mph
Poor	Truck Route	Mountainous	Any shoulder	Greater than 40 mph

7.2.2 Off-Street Network

The major facilities in the existing network of off-street bicycle/multi-use paths/trails in the MPO region are the Minuteman Commuter Bikeway, the Dr. Paul Dudley White Bike Path, and the Pierre Lallement Bike Path (in the Southwest Corridor Linear Park). These facilities provide the opportunity to bicyclists (and other users) to travel greater distances without having to share the right-of-way with motorized vehicles. Other significant off-street, paved trails in the region include the Charles River Greenway, Mystic River Bicycle Path, Marblehead Rail Trail, Battle Road Trail, Neponset River Trail, Muddy River Path, Jamaica Pond Path, Red Line Linear Park bike path, Somerville Community Path, and East Boston Greenway. Most of these pathways were built on abandoned railroad rights-of-way or along natural corridors such as rivers. (The Minuteman Commuter Bikeway is an example of the former, and the Dr. Paul Dudley White Bike Path is an example of the latter.) Some trails connect to transit stations.

Other trails are either in the planning stages or are under construction. Many of these trails will be several miles long and will enhance the existing system considerably.

Appendix B contains maps that show existing paved, off-street bicycle paths/trails; signed, on-street paths/routes; and abandoned railroad rights-of-way.

Table 7.5. CMS Roadway Segments with Bicycling Suitability of Medium or Best

Route	Description of Segment	Northbound or Eastbound Miles	Southbound or Westbound Miles
Route 2A	Route 4/225 to Waltham Street, Lexington	1.2	1.2
Route 3A	Sohier Street to Scituate TL, Cohasset	1.6	1.6
Route 16	Route 126, Holliston, to Dover Road, Wellesley (conditions for the evening peak period only)	10.3	10.3
Route 20	Wayland/Sudbury TL to Highland Street, Weston	4.1	4.1
Route 27	East Street, Walpole, to Route 109, Medfield	5.0	5.0
Route 27	Medfield/Sherborn TL to Rockland Street, Natick	4.3	4.5
Route 27	Route 135 to Route 9 on-ramps, Natick	1.5	1.4
Route 27	Route 62, Maynard, to High Street, Acton	1.8	1.9
Route 27	Newtown Road, Acton, to Carlisle TL	2.8	2.9
Route 27	Central Street to Route 138, Stoughton	1.5	1.6
Route 28	Brook Road to Reedsdale Road, Milton	1.0	1.1
Route 28	Fulton Street, Medford, to South Street, Stoneham	2.9	3.0
Route 30	Northborough Road to Route 85, Southborough	1.4	1.3
Route 30	Centre Street, Newton, to Boston TL	1.1	1.1
Route 37	Quincy Street, Holbrook, to Brockton TL	1.2	1.2
Route 53	Pembroke TL to Summer Street, Duxbury	2.6	2.6
Route 62	Route 85, Hudson, to Route 117, Maynard	5.4	5.3
Route 62	Monument Street, Concord, to Route 4/225, Bedford	4.2	4.2
Route 62	Route 114, Middleton, to Woburn Street, Wilmington	8.9	8.8
Route 85	Milford TL to Chestnut Street, Hopkinton	1.2	1.2
Route 85	Route 30, Southborough, to Framingham Road, Marlborough	1.1	1.1
Route 109	North Street, Medfield, to Burgess Avenue, Westwood	3.8	3.8
Route 117	Hudson Road, Stow, to Lexington Street, Weston	14.7	14.6
Route 123	Route 53, Hanover, to Route 3A, Scituate	5.8	5.9
Route 126	Elm Street to Center Street, Bellingham	2.2	2.2
Route 126	Route 140 to Hartford Avenue, Bellingham	1.9	1.9
Route 126	Bellingham/Medway TL to Route 16, Holliston	3.3	3.3
Route 126	Wayland TL to Concord TL, Lincoln	2.6	2.6
Route 129	Wilmington TL to Highland Street, Reading	1.8	1.8
Route 138	Route 27 to Morton Street, Stoughton	1.3	1.5
Route 139	Abington TL to Route 123, Rockland	1.2	1.2
Route 139	Center/Silver Street to Route 53, Hanover	1.3	1.3
Route 139	Duck Hill Lane, Marshfield, to Route 14, Duxbury	2.5	2.5
Route 140	North Street, Foxborough, to Wrentham TL	1.5	1.5
Furnace Brook Pkwy.	Adams Street to Route 3A/Southern Artery, Quincy	1.4	1.4

TL = town line

FIGURE 7.1

BICYCLING SUITABILITY CLASSIFICATION OF CMS ARTERIAL ROADWAYS

Best

Medium

Poor

Classification is based on truck route designations, terrain, shoulder width, and average peak-period travel speeds.

BOSTON MPO

Congestion Management System

CTPS