Chapter 4

Service Standards and Policies

Systemwide Service Standards [FTA C4702.1A, V. 2.a.]

To guard against discriminatory service design or operation, FTA guidance requires that the MBTA adopt quantitative systemwide service standards and systemwide service policies, which may not be based on a quantitative threshold.

Systemwide standards are required for vehicle load, vehicle headway, on-time performance, service availability, and the distribution of transit amenities. Standards for the first four categories are found in the MBTA's Service Delivery Policy. This policy, first adopted in 1996, was created to implement objective standards and consistent decision-making procedures for evaluating existing and proposed services. Since 1996, the Service Delivery Policy has been revised four times: in 2002, 2004, 2006, and 2008. These revisions were proposed during the development of the 2002, 2004, 2006, and 2008 Service Plans, and were discussed and commented on at the public meetings and hearings that were held for all three service plans. The proposed revisions were also posted on the MBTA's website, through which additional public comments were accepted. All revisions were ultimately approved by the MBTA Board of Directors before taking effect. Any future revisions to the service standards found in the Service Delivery Policy will also undergo a public-review process and MBTA Board approval.

Vehicle Load

The MBTA's vehicle load standard applies to the maximum number of passengers allowed on a service vehicle in order to ensure the safety and comfort of customers. The load standard is expressed as the ratio of passengers to the number of seats on the vehicle, and it varies by mode and by time of day. The following description of vehicle load standards is quoted directly from the *2010 Service Delivery Policy*.

> As indicated in the Frequency of Service Standard, the level of service provided by the MBTA is primarily a function of the demand for that service, as demonstrated through the number of customers utilizing the service at different times during the day. On weekends and during some weekday time periods,

most MBTA services operate with sufficient frequency to provide every passenger with a seat. However, at the heaviest weekday travel times or locations some passengers will need to stand.

During time periods when some passengers will be standing, the MBTA will provide sufficient service so that vehicles are not excessively crowded. The purpose of the Vehicle Load Standard is to define the levels of crowding that are acceptable by mode and time period. The time periods used by the MBTA for all modes, for both the Frequency of Service and Vehicle Load Standards, are defined earlier in this chapter (see Frequency of Service Standard).

Because heavy and light rail in the core area are heavily used throughout the day, some standees can be expected during all time periods. For the purposes of this policy, the core area, as it relates to the heavy rail and light rail Vehicle Load Standard, is defined as follows [Table 9 in the Service Delivery Policy is called Table 4-1 in this report.]:

TABLE 4-1 MBTA Core Area Boundaries : Light Rail & Heavy Rail Core Area
[Table 9 in the Service Delivery Policy]

Blue Line	Bowdoin to Maverick
Orange Line	Back Bay to North Station
Red Line	Kendall to South Station
Green Line	All underground stations as well as Lechmere and Science Park

By mode and time period, the acceptable levels of crowding are shown in the following table. The load standards in the table are expressed as a ratio of the number of passengers on the vehicle to the number of seats on the vehicle. To determine whether a service has an acceptable level of crowding, the vehicle loads are averaged over specified periods of time. Due to scheduling constraints and peaking characteristics, some individual trips may exceed the load levels expressed in the standards.

For most modes the load standards shown represent average maximum loads over any time period on weekdays and over the whole day on weekends. For bus, on weekdays the loads cannot exceed the standard when averaged over any 30-minute segment of an Early AM, AM Peak, Midday School or PM Peak period, or any 60-minute segment of a Midday Base, Evening, Late Evening or Night/Sunrise period. On weekend days, the loads cannot exceed the standard when averaged over any 60-minute segment of the whole service day.

TABLE 4-2 Vehicle Load Standards by Mode

[Table 10 in the Service Delivery Policy]

Mode	Time Period	Passengers / Seats**
Bus*	Early AM, AM Peak, Midday School & PM Peak	140%
	Midday Base, Evening, Late Evening, Night/Sunrise & Weekends	
	Surface routes	100%
	Tunnel portions of BRT routes	140%
Green Line	Early AM, AM Peak, Midday School & PM Peak	225%
	Midday Base, Evening, Late Evening, Night/Sunrise & Weekends	
	Core Area	140%
	Surface	100%
Red Line #1 & 2 Cars	Early AM, AM Peak, Midday School & PM Peak	270%
	Midday Base, Evening, Late Evening, Night/Sunrise & Weekends	
	Core Area	140%
	Outside Core Area	100%
Red Line #3 Cars	Early AM, AM Peak, Midday School & PM Peak	334%
	Midday Base, Evening, Late Evening, Night/Sunrise & Weekends	
	Core Area	174%
	Outside Core Area	100%
Orange Line	Early AM, AM Peak, Midday School & PM Peak	225%
	Midday Base, Evening, Late Evening, Night/Sunrise & Weekends	
	Core Area	140%
	Outside Core Area	100%

TABLE 4-2 Vehicle Load Standards by Mode (cont.)

[Table 10 in the Service Delivery Policy]

Mode	Time Period	Passengers/ Seats**
Blue Line	Early AM, AM Peak, Midday School & PM Peak	225%
	Midday Base, Evening, Late Evening, Night/Sunrise & Weekends	
	Core Area	140%
	Outside Core Area	100%
Commuter Rail	Early AM, AM Peak, Midday School & PM Peak	110%
	Midday Base, Evening, Late Evening, Night/Sunrise & Weekends	100%
Ferry	Inner Harbor – All time periods	125%
	Outer Harbor – All time periods	100%

**For the purposes of the Vehicle Load Standard, "bus" encompasses all rubber-tired vehicles, including diesel, CNG, trackless trolley, dual-mode, etc.*

***For Bus, Light Rail and Heavy Rail, the Vehicle Load Standard is based on the ratio of passengers to seated capacity at maximum load. For Commuter Rail and Ferry services, the load standard is based on the ratio of boarding passengers per vehicle to seated capacity.*

In addition to looking at loads within time periods, the MBTA will routinely evaluate loads at the beginning and end of the service day to determine whether changes in frequency and/or span of service are warranted. The Net Cost/Passenger Standard will be used as one means of flagging routes that may be candidates for such changes.

Vehicle Headway

Vehicle headway—or frequency of service—is an indication of the time interval between vehicles on a route that allows passengers to gauge how long they will have to wait for the next vehicle. Vehicle headway varies by mode and time of day, just as vehicle load does. The following description of frequency-of-service standards is quoted directly from the *2010 Service Delivery Policy*.

> To maintain accessibility to the transportation network within a reasonable waiting period, the MBTA has established minimum frequency of service levels for each mode, by time of day. On less heavily traveled services, these minimum levels dictate the frequency of ser-vice, regardless of customer demand.
>
> Table 4 [called Table 4-3 in this report] shows the weekday Time Period definitions used by the MBTA for all modes for both the Frequency of Service and Vehicle Load Standards. Because travel patterns on the weekend are different than on weekdays, specific time periods are not defined for Saturdays and Sundays. Table 5 [called Table 4-4 in this report] shows the Minimum Frequency of Service levels for each mode by time period.

TABLE 4-3 MBTA Weekday Time Period Definitions
[Table 4 in the Service Delivery Policy]

Time Period	Definition
Early AM	6:00 AM – 6:59 AM
AM Peak	7:00 AM – 8:59 AM
Midday Base	9:00 AM – 1:29 PM
Midday School	1:30 PM – 3:59 PM
PM Peak	4:00 PM – 6:29 PM
Evening	6:30 PM – 9:59 PM
Late Evening	10:00 PM – 11:59 PM
Night/Sunrise	12:00 AM – 5:59 AM

TABLE 4-4 Minimum Frequency of Service Standards

[Table 5 in the Service Delivery Policy]

Mode		Weekday Time Periods	Minimum Frequency*
Bus**	Local/Community Rts.	AM & PM Peak	30-minute headway
		All Other Periods	60-minute headway (Mid-day policy objective of 30-minute headway in high density areas)
		Saturday & Sunday – all day	60-minute headway
	Express/Commuter Rts.	AM Peak	3 trips in the peak direction
		PM Peak	3 trips in the peak direction
	Key Routes	AM & PM Peak	10-minute headway
		Early AM & Midday Base/ School	15-minute headway
		Evening & Late Evening	20-minute headway
		Saturday – all day	20-minute headway
		Sunday – all day	20-minute headway
Light Rail/Heavy Rail		AM & PM Peak Periods	10-minute headway
		All Other Periods	15-minute headway
		Saturday & Sunday – all day	15-minute headway
Commuter Rail		AM & PM Peak Periods	3 trips in peak direction
		All Other Periods	180-minutes in each direction
		Saturday – all day	180-minutes in each direction
Ferry/Commuter Boat		AM & PM Peak Periods	30-minute headway in peak direction
		Off-Peak Periods	120-minute headway

**The Minimum Frequency of Service standards are primarily expressed as "Headways," which indicate the number of minutes scheduled between trips on a route.*

***For the purposes of the Frequency of Service standard, "Bus" encompasses all rubber-tired vehicles, including diesel, CNG, trackless trolley, dual-mode, etc. The definitions of types of bus routes are found in Chapter 2.*

> On heavily used services, the minimum frequency of service levels may not be sufficient to meet customer demand. When load levels indicate that additional service is warranted, as defined in the Vehicle Load Standard, the frequency of service will be increased to provide a sufficient number of vehicles to accommodate passenger demand.

On-Time Performance

In 2006, the bus schedule-adherence standard in the Service Delivery Policy was revamped to make it more useful for effectively diagnosing on-time performance problems. One major addition to the new bus standard was adherence to mid-route timepoints in anticipation of the rollout of CAD/AVL (computer-aided dispatch/automatic vehicle location) equipment, which allows the measurement of multiple timepoints and provides unlimited amounts of data that can be averaged over many days. By 2009, it became evident that the schedule-adherence standard needed to be revised again to take full advantage of the CAD/AVL data. At that time, the requirement that, for any given route, 75 percent of all *trips* must adhere to the arrival/departure standards for a route to be considered on time was changed so that 75 percent of all *timepoints* must adhere to the arrival/departure standards.

The schedule adherence standards for all modes, as they appear in the *2010 Service Delivery Policy*, are quoted below.

> Schedule Adherence Standards vary by mode and provide the tools for evaluating the on-time performance of the individual MBTA routes. The Schedule Adherence Standards also vary, based on frequency of service; because, passengers using high-frequency services are generally more interested in regular, even headways than in strict adherence to published timetables, whereas, on less frequent services passengers expect arrivals/departures to occur as published.
>
> Bus Schedule Adherence Standards: The Schedule Adherence Standards for bus routes are designed to ensure that routes operate as reliably as possible without early departures, chronic delays, or unpredictable wait and/or travel times.
>
> 1. Bus Timepoint Tests: To determine whether a bus is on-time at an individual timepoint, such as the beginning of a route, end of a route, or a scheduled point in between, the MBTA uses two different tests based on service frequency:
>
>   ◊ Scheduled Departure Service: A route is considered to provide scheduled departure service for any part of the day in which it operates less frequently than one trip every 10 minutes (headway ≥10 minutes). For scheduled departure services, customers generally time their arrival at bus stops to correspond with the specific scheduled departure times.

- Walk-Up Service: A route is considered to provide walk-up service for any part of the day in which it operates every 10 minutes or better (headway <10 minutes). For walk-up service, customers can arrive at a stop without looking at a schedule and expect only a brief wait.

A route might operate entirely with walk-up service, entirely with scheduled departure service, or with a combination of both throughout the day. Because any given route may have both types of service, each trip is considered individually to determine whether it represents schedules departure service or walk-up service, and each timepoint crossed on that trip is measured accordingly. Therefore, there are two separate timepoint tests:

- On Time Test for Scheduled Departure Timepoints: To be considered on time, a timepoint crossing of any trip with a leading headway scheduled for 10 minutes or more must meet the relevant condition out of the following:

  - Origin: The trip must leave its origin timepoint between 0 minutes before and 3 minutes after its scheduled departure time.

  - Mid-route timepoint: The trip must leave the route midpoint(s) between 0 minutes before and 7 minutes after its scheduled departure time.

  - Destination: The trip must arrive at its destination between 3 minutes before and 5 minutes after its scheduled arrival time.

- On Time Test for Timepoints on Walk-Up Trips:

  - Origin or mid-route timepoint: To be considered on time, any timepoint of a trip with a leading headway scheduled for less than 10 minutes must leave its origin timepoint or mid-route timepoint within 1.5 times the scheduled headway. For example, if "trip A" is scheduled to start at 7:30 AM and the route's next trip "trip B" is scheduled to start at 7:38 AM, trip B has an 8-minute scheduled headway. Therefore, trip B must start no more than 12 minutes after trip A actually starts to be considered on time.

  - Destination: The actual run time from the origin timepoint to the destination timepoint must be within 20% of the scheduled run time for the destination timepoint to be considered on time.

2. Bus Route Test: The second part of the Bus Schedule Adherence Standard determines whether or not a route is on time, based on the proportion of timepoints on the route that are on time over the entire service day. 75% of all timepoints on the route over the entire service day must pass their on-time tests.

TABLE 4-5 Summary of Bus Schedule Adherence Standard
[Table 6 in the Service Delivery Policy]

Timepoint Test	Origin Timepoint	Mid-Route Time Point(s)	Destination
Scheduled Departure Trips (Headways ≥ 10 minutes):	Start 0 minutes early to 3 minutes late	Depart 0 minutes early to 7 minutes late	Arrive 3 minutes early to 5 minutes late
Walk-up Trips (Headways <10 minutes):	Start within 1.5 times scheduled headway	Leave within 1.5 times scheduled headway	Running time within 20% of scheduled running time
Route Test	For any given bus route to be in compliance with the Schedule Adherence Standard, 75% of all timepoints must be on-time according to the above definitions over the service period measured.		

Exceptions:

- Express routes that serve only two points do not have a midpoint.
- Express routes may arrive more than 3 minutes early at their final destinations.
- A schedule may note that certain trips will not leave until another vehicle arrives and allows passengers to transfer. (For instance, the last bus trip of the day might wait for passengers from the last train of the day.) When applying the standard, these trips are not included.
- The first trip of the day, which does not have a leading headway, is considered a scheduled departure trip.
- If a route does not have published departure times (such as Silver Line Washington Street, which does not need a published timetable because it runs so frequently all day) its trips shall be considered walk-up trips regardless of scheduled headway.

Light Rail & Heavy Rail Schedule Adherence Standards: As with frequent bus services, passengers on light rail and heavy rail do not rely on printed schedules, but expect trains to arrive at prescribed headways. Therefore, schedule adherence for light rail and heavy rail is measured similarly to the way in which frequent bus service is measured. The percent of individual trips that are on time is calculated, based on a measure of how well actual headways correlate to scheduled headways. In addition, the percent of trip times that correspond to scheduled trip times is measured.

Two different measures are used to evaluate headway performance. For surface light rail and heavy rail, Schedule Adherence is measure based on the percent of trips that operate within 1.5 scheduled headways. For example, a trip with a 4-minute headway would be considered late if the observed headway were greater than 6 minutes (1.5 x 4 minutes). Because the headways in the core area for light rail are less than two minutes, Schedule Adherence is measured by the percent of trips with headways less than 3 minutes. Table 7 [called Table 4-6 in this report] provides a summary of the Schedule Adherence standards for Light Rail and Heavy Rail services.

TABLE 4-6 Schedule Adherence Standards for Light Rail & Heavy Rail
[Table 7 in the Service Delivery Policy]

Mode	Headway Performance	Trip Time Performance
Light Rail – Surface	85% of all trips operated within 1.5 scheduled headways over the entire service day.	95% trips operated within 5 minutes of scheduled total trip time over the entire service day.
Light Rail – Subway	95% of all service operated with headways less than 3 minutes over the entire service day.	95% of all trips operated within 5 minutes of scheduled trip time over the entire service day.
Heavy Rail	95% of all trips within 1.5 headways over the entire service day.	95% of all trips operated within 5 minutes of scheduled trip time over the entire service day.

Commuter Rail & Ferry/Commuter Boat: The Schedule Adherence standards for Commuter Rail and Ferry/Commuter Boat measure the percent of trips that depart/arrive within 5 minutes of scheduled departure/arrival times. These standards reflect the long distances and wide station spacing of commuter rail, and the absence of intermediate stations on most boat services. Table 8 [called Table 4-7 in this report] shows the Schedule Adherence standards for Commuter Rail and Ferry/Commuter Boat services.

TABLE 4-7 Schedule Adherence Standards for Commuter Rail & Ferry/Commuter Boat
[Table 8 in the Service Delivery Policy]

Mode	Standard
Commuter Rail	95% of all trips departing and arriving at terminals within 5 minutes of scheduled departure and arrival times
Ferry/Commuter Boat	95% of all trips departing and arriving at ports within 5 minutes of scheduled departure and arrival times

Service Availability (Coverage)

The MBTA's coverage guidelines are only for the bus and rapid transit system service area (the urban fixed-route system), where customers are most likely to walk to transit. The guidelines are established to indicate the maximum distance that a passenger who lives in a densely populated area should need to walk to access some transit service (regardless of the mode). The following description of the coverage guidelines is quoted directly from the Service Delivery Policy.

> An important aspect of providing the region with adequate access to transit services is the geographic coverage of the system. Coverage is expressed as a guideline rather than a standard, because uniform geographic coverage cannot always be achieved due to constraints such as topographical and street network restrictions. In addition, coverage in some areas may not be possible due to the infeasibility of modifying existing routes without negatively affecting their performance.
>
> The Coverage guidelines are established specifically for the service area in which bus, light rail, and heavy rail operate, as riders most frequently begin their trips on these services by foot. Because commuter rail is usually accessed via the automobile, the coverage guidelines do not apply in areas where commuter rail is the only mode provided by the MBTA.

TABLE 4-8 Coverage Guidelines
[Table 2 in the Service Delivery Policy]

Service Days	Minimum Coverage
Weekdays & Saturday	Access to transit service will be provided within a ¼ mile walk to residents of areas served by bus, light rail and/or heavy rail with a population density of greater than 5,000 persons per sq/mile.
Sunday	On Sunday, this range increases to a 1/2 mile walk.

Distribution of Transit Amenities

The FTA Title VI circular requires that the MBTA adopt service standards for the distribution of various transit amenities, including bus shelters, benches, timetables, route maps, trash receptacles, intelligent transportation systems (ITS), elevators, escalators, and park-and-ride facilities. Each of these amenities is described below.

Bus Shelter Placement

There are essentially three categories of bus shelters in the MBTA system. The first category is MBTA-owned and -managed: shelters that are purchased, installed, and maintained by the MBTA. Historically, most shelters were of this variety. More recently, two other categories of shelters, both of which are privately owned, have been placed at MBTA bus stops. For stops located in the city of Boston, the City entered into a contractual agreement with JCDecaux (formerly Wall USA) to provide shelters that are manufactured, owned, and maintained by JCDecaux. These shelters display advertisements, and the cost of their upkeep is paid for through advertising revenues. Outside of Boston, the MBTA entered into an agreement with a different company, Cemusa, to provide shelters in other municipalities. The manufacture, placement, and maintenance of these shelters are also supported by advertising revenues. Although the MBTA does not set standards for privately owned shelters, it coordinates with both companies to ensure that the placement of their shelters does not disadvantage minority and low-income areas.

In 2005, the MBTA updated its standards for determining the eligibility of bus stops for shelter placements, regardless of the source. The following description of how decisions are made for bus shelter placement is quoted directly from the 2005 Bus Shelter Policy.

A. Purpose

The purpose of this policy is to provide guidance for the placement of MBTA bus shelters and to establish a procedure for evaluating shelter requests. In areas or locations where the MBTA, or its contractors, are the primary suppliers of shelters at bus stops, placements will be evaluated using two steps:

(1) Conformance with eligibility standards, and
(2) a site suitability test.

Central to any placement decision will be a commitment to meeting the requirements of Title VI of 1964 Civil Rights Act as defined in the FTA Circular C 4702.1. Title VI ensures that MBTA services are distributed in such a manner that minority communities receive benefits in the same proportion as the total service area. This policy in no way establishes a requirement for placement, since all placements will be dependent on available resources.

B. Background

The previous shelter policy was established in 1984, having been extracted from the 1977 Service Policy for Surface Public Transportation. This older policy considered three major factors when evaluating stops: number of boardings, frequency of service, and percentage of persons using the stop that were elderly or had disabilities.

The current policy continues to include these important measures; however, it more systematically quantifies each factor in determining eligibility.

C. Evaluation Procedure

MBTA Operations will be responsible for evaluating placement requests and ensuring compliance with Title VI.

The first step in the evaluation process is a determination if the bus stop conforms with shelter eligibility standards. As in the previous shelter policy, the number of boardings at a bus stop is a major determinant for eligibility. As described in the table below, all bus stops that meet the required number of boardings will be eligible. However, a number of other criteria can also be considered. To standardize the process, the various types of criteria have been given values. The following table lists all criteria to be factored into an assessment of eligibility for each bus stop and the value associated with each criterion. A site must receive a total of 70 points to be considered eligible under this policy.

TABLE 4-9 Shelter Eligibility Criteria for MBTA Bus Stops

Eligibility Criteria	Points
60+ Average weekday daily boardings (ADB)	70
50-59 ADB	60
20-49 ADB	40
Less than 20 ADB	30
MBTA initiative to strengthen route identity	20
Seniors, disabled, medical, social service, or key municipal facility in close proximity to stop	15
Official community recommendation	10
Bus route transfer point	10
Infrequent service (minimum of 30-minute peak/ 60-minute off-peak headway)	10
Poor site conditions (weather exposure etc.)	5
Shelter promotes adjacent development/increased ridership	5
Passing Score: 70	

Any bus stop that has more than 60 boardings is eligible for a shelter, with an automatic score of 70 points. For bus stops with fewer boardings, a combination of the factors listed above will be considered in determining eligibility. Operations will keep records of all requests that document the assignment of scores. All bus stops that currently have shelters will be grandfathered into the program without need for additional analysis.

The second step in the evaluation process is the site suitability test. There are physical and practical requirements that must be met before a shelter can be placed. These include:

(1) Property ownership,
(2) abutter approval,
(3) compliance with the Americans with Disabilities Act requirements,
(4) adequate physical space and clearances,
(5) close proximity to an existing bus stop, and
(6) community approval

D. Reporting

The Operations Department will retain the necessary documents to ensure correct application of the policy. The Service Planning Department and CTPS will submit the required Title VI reports. Title VI ensures that MBTA services are distributed in such a manner that minority communities receive benefits in the same proportion as the total service area.

In terms of the shelter policy, once a bus stop is eligible for a shelter it will be included in all analyses for Title VI purposes, until such time that it is indicated otherwise. Consequently, all bus stops with 60 or more boardings will be included in Title VI reports, as well as any bus stops with less than 60 boardings that meet the 70-point eligibility requirement. Any bus stop that meets the eligibility standard, but is found not to meet the site suitability test, will be noted and not included in the analysis. Bus stops in the MBTA service area that have pre-existing shelters, but do not meet the policy requirements, will be noted and included in the total comparisons.

Benches

It is the MBTA's policy that all bus shelters have benches, whether the shelters are provided by the MBTA or through one of the two private companies (JCDecaux and Cemusa) that install shelters under contract to individual municipalities. Benches are also provided at all subway and light rail station platforms, with the exception of certain Green Line surface stops where the platform is too narrow to accommodate a bench.

Timetables and Route Maps

Historically, the MBTA did not post timetables (schedules) in bus shelters; however, the MBTA requires that Cemusa, which provides bus shelters to municipalities outside of Boston, post bus timetables in all of their shelters. In addition, timetables are provided at all bus stops located at terminals, and pole-mounted "tubes" and/or "cubes" with timetable information are located at most stops on Key Bus Routes. Transit maps are provided at all Cemusa and JCDecaux shelters.

Snow Clearance Policy

In response to numerous customer complaints this past winter concerning longstanding snow and ice barriers at bus stops, the MBTA amended its practice of relying on cities and towns for path-of-travel snow clearance at bus stops and curbs. In February 2011, at the direction the General Manager, the MBTA began dedicating considerable manpower resources to snow clearance between bus stops and shelters and curbs at the most heavily used of the more than 8,000 bus stops in the MBTA system. The MBTA is preparing a new standard operating procedure to prioritize clearing snow at bus stops with high ridership and on Key Routes to minimize access barriers to MBTA service during the winter months.

Neighborhood Maps in Rapid Transit Stations

The neighborhood map program involves the placement of two types of maps at rapid transit stations that have bus connections: (1) neighborhood maps, showing major landmarks, bus routes, the street network, the one-half-mile walking radius around the station, green space, pathways, and accessible station entrances; and (2) more detailed maps that show all bus routes that serve a particular station, along with service frequency information.

The objectives that the program hopes to accomplish at each station include: (1) providing route and schedule information for bus routes serving that station, (2) placing the transit station in the context of the surrounding neighborhood, and (3) highlighting the areas around the station that are within easy walking distance.

Where space allows, one or both maps are placed at stations with bus connections. The maps are also generally installed at new or renovated stations, regardless of whether or not a station has bus service. Due to space constraints, maps are not located at many surface Green Line stops.

Intelligent Information Systems (ITS): Automated Fare Collection (AFC) Fare Gates and Fare Vending Machines

The automated-fare-collection system was rolled out during 2006 and was fully implemented on the bus and subway systems at the beginning of 2007. The number and location of fare gates and fare vending machines to be placed at each rapid transit station were determined based on the number of customers entering the station, the number of station entrances, and the general configuration and available space at the station.

Retail sales outlets were initially placed so that they would be convenient to customers who use the Key Bus Routes, as they are the most heavily used routes in the system and operate in the urban core, where minority and low-income populations are most prevalent.

The AFC equipment relays monitoring data on device status to the AFC Central Computer System, which is located at 10 Park Plaza. These data are also available to AFC field technicians via workstations located in each of the booths in the subway system formerly used by toll collectors, and at each of the locations used by AFC farebox technicians to store fares collected on buses and the Green Line.

Each AFC device is monitored for cash and ticket levels so that Revenue Service personnel and management can schedule the necessary resources to maintain the ticket and coin levels in all devices.

The MBTA has established performance metrics that are based on the availability for use of the fare gates and fare vending machines.

- The minimum acceptable device availability threshold is 95 percent.
- The device availability goal is 98 percent.

Intelligent Transportation Systems (ITS): Variable Message Signs (VMS)

The MBTA currently has three different types of electronic message signs in use on the bus rapid transit (BRT), rapid transit, and commuter rail systems. These include: (1) signs that display public-service announcements, (2) signs that alert passengers that trains are approaching and arriving at the station, and (3) signs that count down the number of minutes until the next vehicle arrives at the station.

Bus Rapid Transit VMS

VMS that count down the minutes until the arrival of the next BRT vehicle are placed at 19 of the 23 stops on Silver Line Washington Street. There is one sign at each end of the two routes—one at Dudley Station, one at the Temple Place inbound terminus, and one at the South Station inbound terminus—and one sign at each of the 16 stops (8 per direction) on Washington Street. Eighteen of these VMS were installed as a part of the Washington Street reconstruction/Silver Line ITS project and were bound to the project in two key ways. First, as part of station construction, this project included the construction of kiosks along Washington Street that were used to house the signs. Second, Washington Street service had a dedicated fleet that wirelessly relays vehicle location data to a central computer, so that the arrival time can be displayed on the VMS. The sign at the South Station surface stop was installed as part of the Washington Street South Station Connector Project, and it runs off of the MBTA's general prediction feed.

The MBTA initiated the "T-Tracker Trial" pilot project in 2009. This project included the installation of additional VMS signs to provide countdown information for buses. One VMS sign was installed in Bellingham Square in East Boston for all routes serving that location in the outbound direction, and two LCD displays were installed in the Ruggles and Back Bay Stations to provide countdown information for buses serving these stations.

Rapid Transit VMS

The MBTA has installed VMS at rapid transit stations throughout the system. Through the 2006 agreement between the MBTA and the Boston Center for Independent Living (BCIL), signs are located at each set of fare gates and on inbound and outbound platforms. The exact locations and quantities of signs were determined through field observations of existing conditions and needs at each station.

Two types of VMS are in use: those that display next-train information, and those that display only public-service announcements. All Red, Orange, and Blue Line stations are being equipped with electronic message signs that display "next train approaching" and "next train arriving" messages. The information displayed on these signs is triggered through the train's signal system. Because the Green Line has a different type of signal system than the other rapid transit lines, next-train signs cannot be used at this time on that line. However, VMS that display public-service information have been installed at stations in the Green Line central subway and on the Green Line's D Branch. Due to the lack of power and communications connections to stations on the B, C, and E Branches of the Green Line, no VMS can be used at those stations in the near term.

Commuter Rail VMS

In the early 1990s, "Passenger Information Centers" (blue boxes approximately 2 by 3 feet in size) that displayed a one-line message were installed at stations on the Framingham/Worcester Line. There was only one message center at each station located on or near the inbound platform. These signs were primitive at best and were essentially large pagers.

In 1997, in conjunction with the opening of the Old Colony's Middleborough/Lakeville Line and Kingston/Plymouth Line, "PENTA" LED (light-emitting diode) message boards were installed at all stations on those lines. Although these signs used the current technology of that period, they had limited display capability—only one message at a time could be shown, with no more than 99 characters per message. PENTA signs were also installed at the new stations on the Framingham/Worcester Line west of Framingham, and on the Newburyport/Rockport Line at the new stations in Ipswich, Rowley, and Newburyport.

A project to install new passenger information signs at all commuter rail stations (with the exception of Silver Hill, Plimptonville, and Foxboro) was initiated in 2000. All of the "blue box" passenger information centers were replaced with these newer signs; at least one sign was added on each inbound platform, and, at stations with mini-high platforms, an additional sign was added. The PENTA signs were not replaced, however. The new signs can display multiple messages and have a capacity of up to 1,600 characters. All signs are installed on the inbound platforms in order to serve the greatest number of customers, as they travel inbound during the morning peak period.

The MBTA has implemented a Passenger Train Information System (PTIS), also known as the "Next Train" system, on commuter rail at all stations except those that offer live information (South Station, North Station, and Back Bay Station). The PTIS uses state-of-the-art global-positioning-system (GPS) technology on the trains moving along the line to generate automated messages regarding the arrival of

the next train on the LED signs located on the station platforms. If service is disrupted, the location information is supplemented by a "Console Operator" who monitors the movement of the trains to manually send ad hoc messages as required to the signs. The system also generates automatic station announcements on board the train.

Elevators and Escalators

Elevators and escalators provide vital access to the system, particularly for persons with disabilities. In 2006, the MBTA formalized a partnership with the Boston Center for Independent Living (BCIL) through a consent agreement that sets operational protocols and standards, as well as a proactive agenda for making the transit system more accessible. The MBTA uses the Americans with Disabilities Act (ADA), 49 CFR, Section 37.161 *Maintenance of accessible feature: General*, as its operability standard:

> (a) Public and private entities providing transportation services shall maintain in operative condition those features of facilities and vehicles that are required to make the vehicles and facilities readily accessible to and usable by individuals with disabilities. These features include, but are not limited to, lifts and other means of access to vehicles, securement devices, elevators, signage and systems to facilitate communications with persons with impaired vision or hearing.
>
> (b) Accessibility features shall be repaired promptly if they are damaged or out of order. When an accessibility feature is out of order, the entity shall take reasonable steps to accommodate individuals with disabilities who would otherwise use the feature.
>
> (c) This section does not prohibit isolated or temporary interruptions in service or access due to maintenance or repairs[2].

The MBTA contracts for the complete maintenance, service testing, and inspection of all transit system and facility elevators and escalators. The MBTA's contract imposes penalties if the contractor fails to comply with the ADA requirements. The MBTA has implemented a proactive maintenance program to keep equipment safe and operational. Maintenance specifications are defined to cover all equipment components. The MBTA's Maintenance Control Center (MCC) tracks all elevator and escalator service requests, which are transmitted to the MCC via MBTA personnel and field inspectors. The MCC transmits the service-request information to the elevator/escalator maintenance contractor via a computer terminal, and the contractor then dispatches maintenance personnel to perform repairs. The causes of equipment failures vary, as well as the length of time required to repair them. The MBTA elevators have been reliable 99 percent of the time for the past three years.

[2] *Title 49, U. S. Code of Federal Regulations, § 37.161.*

The MBTA is working toward the goal of making the system a model for accessibility within the U.S. transit industry. More than $271 million is allocated in the Authority's current Capital Investment Program (almost 6 percent of the capital budget) for accessibility enhancements, including redundant elevator installation, completion of the Key Station Plan, elevator/escalator maintenance, and wayfinding improvements. In addition, the MBTA has adopted an organization-wide commitment and desire to comply not only with the letter but also the spirit of the Americans with Disabilities Act, with the complete understanding that all people with disabilities must have every opportunity to be fully participating members of the community and that fundamental to this opportunity is the right and ability to use public transportation in an equitable, effective, and dignified manner. The following 12 stations have been made accessible or have undergone renovations that have improved accessibility since 2008:

- Ashmont
- Mattapan
- Capen Street
- Central Avenue
- Milton
- Butler
- Cedar Grove
- Copley
- Arlington
- Kenmore
- Maverick
- State Street

Seven of these stations are located in minority areas.

Distribution of Station Parking

While the supply of parking is only one element of transit access, it is particularly important in the commuter rail system, where 53 percent of users drive to stations and park to access service. Through the Program for Mass Transportation, the MBTA applied evaluation criteria prioritizing capital improvement parking programs. The evaluation standards are:

- Customer access – Quality of auto access to the station parking lot from major arterial roadways
- Land and air rights – MBTA ownership of (or access to) land and/or air rights for expansion of the parking facility
- Projected demand – Magnitude of expected future demand for parking at the station
- Potential utilization – Ability of potential parking expansion to meet the needs of projected demands

- Cost per parking space – Expected cost per parking space, in either a surface lot or garage
- Environmental status – Barriers to parking expansion resulting from existing environmental issues
- Ease of construction – Barriers to parking expansion resulting from issues such as space constraints, land acquisition issues, and challenging terrain

Systemwide Service Policies [FTA C4702.1A, V. 3.a.]

The circular requires systemwide service policies for vehicle assignment and for transit security. Policies differ from standards in that policies are not necessarily based on a quantitative threshold.

Vehicle Assignment

Vehicle assignment refers to the process by which vehicles are placed in garages and assigned to routes throughout the system. The policies used for vehicle assignment vary by mode and are governed by various operational characteristics and constraints.

Bus Vehicle Assignment

The MBTA's bus fleet consists of 28 electric trackless trolleys; 360 compressed-natural-gas (CNG) vehicles; 32 dual-mode vehicles; 503 emission-control-diesel (ECD) vehicles; 25 hybrid vehicles; and 127 older diesel buses. The MBTA has acquired over 500 clean-fuel vehicles to provide new service on Silver Line Washington Street bus rapid transit (BRT) routes and to replace the oldest diesel vehicles in the fleet. In accordance with the September 1, 2000, Administrative Consent Order, Number ACO-BO-00-7001, issued by the Commonwealth of Massachusetts, the Department of Environmental Protection (DEP), under the Executive Office of Environmental Affairs (now the Executive Office of Energy and Environmental Affairs), the MBTA will, "Insofar as possible, operate lowest emission buses in the fleet in transit dependent, urban areas with highest usage and ridership as the buses enter the MBTA bus fleet." Table 4-10 provides additional information on the vehicles in the bus fleet.

TABLE 4-10 Bus Fleet Roster									
Propulsion	Active Vehicles	Year Built	Air Cond.	Accessible	Over-haul	Length	Width	Seats	Planning Capacity
Straight Electric	28	2003-04	Y	Ramp	None	40’	102”	31	43
Diesel Series 60 500 HP (dual-mode)	24	2004-05	Y	Ramp	None	60’	102”	47	65
	8	2005	Y	Ramp	None	60’	102”	38	65
CNG Cummins C8.3	175	2004	Y	Ramp	None	40’	102”	39	54
	124	2003	Y	Ramp	None	40’	102”	39	54
CNG Series 60 400HP	44	2003	Y	Ramp	None	60’	102”	57	79
CNG Series 50G	15	2001	Y	Ramp	None	40’	102”	39	54
	2	1999	Y	Ramp	None	40’	102”	39	54
Diesel Caterpillar C9	193	2004-05	Y	Ramp	None	40’	102”	38	53
Diesel Series 50	127	1994-95	Y	Lift	2004-05	40’	102”	40	56
Diesel Cummins ISL	155	2006-07	Y	Ramp	None	40’	102”	39	54
Diesel Cummins ISL	155	2008	Y	Ramp	None	40’	102”	39	54
Hybrid	25	2010	Y	Ramp	None	60’	102”	57	79

The MBTA’s policy is to maintain an average age of the bus fleet of eight years or less. In general, each bus is assigned to one of nine MBTA bus storage and maintenance facilities and operates only on routes served by the garage to which it is assigned. Daily, within each garage, individual vehicles are not assigned to specific routes, but circulate among routes based on a number of operating constraints and equipment criteria. The following section summarizes the guidelines used by inspectors when assigning vehicles in the current bus fleet to routes.

28 Trackless Trolleys

The trackless trolley fleet currently consists of 28 new vehicles. These vehicles are limited to use on three routes—in Belmont, Cambridge, and Watertown—where overhead catenary lines provide electric power. The vintage 1976 Flyer vehicles will be retired, except for 5 vehicles that are maintained for contingencies.

360 Compressed-Natural-Gas (CNG) Buses

This fleet is composed of 316 40-foot nonarticulated vehicles and 44 60-foot articulated vehicles. Service is currently provided on Route 39 and Silver Line Washington Street with the 60-foot vehicles, all of which are housed at the Southampton facility; 17 of the 44 60-foot vehicles are dedicated to the Silver Line. Most of the 316 40-foot buses are housed at the Arborway and Cabot garages; they provide service on many routes in the urban core. With the exception of the vehicles at Southampton, which currently serve only three routes, inspectors assign these buses daily, on a random basis, within each garage.

630 Diesel Buses

The diesel buses are assigned to the suburban garages, as well as to the Albany Street and Charlestown garages. Of the 503 new ECDs in the fleet, 310 are New Flyer vehicles and 193 are Neoplan vehicles. These ECDs have been divided among the following facilities: Charlestown (138), Lynn (69), Quincy (64), Fellsway (76), Albany (116), and Cabot (39) garages. The 127 1994/1995 Nova vehicles remain at the Charlestown (82), Lynn (25), and Quincy (20) garages.

32 Diesel-Electric (Dual-Mode) Buses

All of the new 60-foot, articulated dual-mode vehicles are designed for operation on the Waterfront portion of the new Silver Line BRT service between South Station, various locations in South Boston, and Logan Airport.

25 Hybrid Buses

The new 60-foot, articulated hybrid vehicles operate on Routes 28, which operates between Mattapan Station and Ruggles Station via Dudley Station; Silver Line 4 (SL4), which operates between Dudley Station and South Station; and Silver Line 5 (SL5), which operates between Dudley Station and Downtown Crossing.

Light Rail and Heavy Rail Vehicle Assignment

The MBTA operates light rail vehicles on the Ashmont-Mattapan extension of the Red Line—the Mattapan High-Speed Line—and on all four branches of the Green Line: B–Boston College, C–Cleveland Circle, D–Riverside, and E–Heath Street.

Type 7 Green Line vehicles can be operated on any Green Line branch. However, all of the Type 8 cars are currently assigned to the B, C, and E Branches. Type 8 cars will be introduced on the D Branch pending a review of track conditions on the branch by the Department of Public Utilities.

The Mattapan High-Speed Line has weight, curve, and power limitations that prevent the use of current Green Line light rail vehicles. Instead, PCC (President's Conference Committee) cars are used for that line. All of the PCCs have recently undergone extensive rehabilitation, including the replacement of major structural components. These cars were equipped in 2008, for the first time, with air conditioners. Table 4-11 lists the vehicles in the light rail fleet.

TABLE 4-11 Light Rail Fleet Roster

Line	Type / Class of Vehicle	Fleet Size	Year Built	Builder	Length	Width	Seats	Planning Capacity
Mattapan High-Speed Line	"Wartime" PCC	10	1945-46	Pullman Standard (USA)	46'	100"	40	84
Green Line	Type 7 (1)	94	1986-88	Kinki-Sharyo (Japan)	74'	104"	46	104
	Type 7 (2)	20	1997	Kinki-Sharyo (Japan)	74'	104"	46	104
	Type 8	95	1998-2007	Breda (Italy)	74'	104"	44	99

Heavy rail vehicles are operated on the three subway lines: the Red Line, Orange Line, and Blue Line. The specific operating environments of these lines prevents one line's cars from operating on another line; therefore, each line has its own dedicated fleet.

Because there are no branches on the Orange Line or the Blue Line, and there is only one type of Orange Line car and one type of Blue Line car, no distribution guidelines are necessary for either of these lines. The Blue Line introduced a new replacement fleet in 2009. The Red Line has two branches, and operates using three types of cars. There are no set distribution policies for the assignment of Types 1, 2, and 3 cars to the two Red Line branches (Ashmont and Braintree). All three types are put into service on both branches as available. Table 4-12 lists the vehicles that are currently in the heavy rail fleet.

TABLE 4-12 Heavy Rail Fleet Roster								
Line	Type/ Class of Vehicle	Fleet Size	Year Built	Builder	Length	Width	Seats	Planning Capacity
Blue Line	No. 5 East Boston	94	2007/2008	Siemens	48' 10"	111"	42	95
Orange Line	No. 12 Main Line	120	1979-81	Hawker-Siddeley (Canada)	65' 4"	111"	58	131
Red Line	No. 1 Red Line	74	1969-70	Pullman Standard (USA)	69' 9 3/4"	120"	63	167
	No. 2 Red Line	58	1987-89	UTDC (Canada)	69' 9 3/4"	120"	62	167
	No. 3 Red Line	86	1993-94	Bom-bardier (USA)	69' 9 3/4"	120"	52	167

Planning and design are underway for the next generation of vehicles for the Red and Orange Lines, as well as for accommodation of expanded Green Line service associated with the Commonwealth's commitment to extend the Green Line to Somerville and Medford by December 2014.

Commuter Rail Vehicle Assignment

Vehicle assignments are developed based on specific standards of commuter rail service. These standards include providing a minimum number of seats for each scheduled trip, providing one functioning toilet car in each trainset, maintaining the correct train length to accommodate infrastructure constraints, and providing modified vehicles, when necessary, for a specific operating environment. The MBTA strives to assign its vehicles as equitably as possible within the equipment and operational constraints of the system.

Railroad Operations operates a 377-route-mile regional rail system in the Boston metropolitan area composed of 13 lines that serve 125 stations. The existing system consists of two separate rail networks: a five-route northern system, which operates north and east from North Station to terminals at Rockport, Newburyport, Haverhill, Lowell, and Fitchburg; and an eight-route southern system, which operates south and west from South Station to terminals at Worcester, Needham, Franklin, Attleboro, Providence, Stoughton, Readville, Middleborough, Kingston, and Plymouth. Trains operate in a push-pull mode, with the locomotive leading (pull mode) when departing Boston and the control car leading when arriving in Boston.

The commuter rail coach fleet is composed of four types of coaches and two types of locomotives, which are assigned to the 13 commuter rail routes. Both coaches and locomotives have a service life of 25 years. Table 4-13 lists the vehicles in the current fleet.

Train consists are assembled based on minimum seating capacity to meet the morning and evening peak-period requirements. Presently the MBTA commuter rail contract operator is contractually required to have 122 coaches in 22 North Side trains and 213 coaches in 33 South Side trains. Most train consists generally are not dedicated to a specific line, but are cycled throughout the system (either North or South). Every train consist must have a control coach. The following vehicle characteristics must also be considered when assigning vehicles:

- **Kawasaki Coaches (bilevel) –** There is no specific policy restricting the use of these vehicles in the commuter rail system. Currently they are used exclusively in the South Side commuter rail system, since it carries approximately 65 percent of the total boardings of the system. The bilevel coaches offer substantially more seating than the single-level coaches. This allows Railroad Operations to maintain consist seating capacity while minimizing the impacts of platform and layover facility constraints. The MBTA intends to purchase only bilevel coaches in future procurements in order to accommodate increasing ridership demands and to allow for greater flexibility when scheduling vehicle assignments.

- **Messerschmitt-Bolkow-Blohm (MBB) Coaches –** Every train consist has at least one MBB coach equipped with toilet facilities. MBB blind-trailer coaches have also been modified to guarantee priority seating for eight wheelchair spaces on all trains on the Worcester Line in accordance with agreements made at the time of the commuter rail extension to Worcester. There are only 14 trains that are cycled on the Worcester Line daily; however, 33 coaches were modified to provide for greater vehicle assignment flexibility.

- **Old Colony Lines –** The coaches used for service on the Old Colony lines (Middleborough/Lakeville, Kingston/Plymouth, and Greenbush) are equipped with power doors, as all of the stations on these lines have high platforms. This enables a crew member to control the operation of the doors in the consist from any coach via the door control panel. Portions of the Kawasaki, Pullman, and MBB coach fleets have had the power doors activated to meet this requirement.

- **Advanced Civil Speed Enforcement System (ACSES) –** All control coaches and locomotives operating on the Providence Line must be equipped with a functioning ACSES system. ACSES is a Federal Railroad Administration (FRA)–mandated requirement. All locomotives except the GP40 series have ACSES installed and functioning. The GP40 locomotives have ACSES installed but have not yet been qualified to use it. The Bombardier control coaches do not yet have ACSES installed, and therefore are limited to North Side service. There are more locomotives and control coaches equipped with ACSES than are required to meet the daily Attleboro scheduled trips. This provides for greater flexibility in vehicle assignments.

All coaches in the commuter rail fleet are equipped with similar amenities, the exception being the MBB coaches, which are equipped with toilets; therefore, the primary variation among coaches is age. For the purpose of periodic monitoring, an assessment of compliance for vehicle assignment is completed each year based on the average age of a trainset for a specified time period.

TABLE 4-13 Commuter Rail Fleet Roster

Manufacturer	Fleet Size	Date	Classification*	Rebuilt	Seats
Pullman	57	1978–79	BTC-1C	1995–96	114
MBB	33	1987–88	BTC-3	– –	94
MBB	34	1987–88	CTC-3	– –	96
Bombardier A	40	1987	BTC-1A	– –	127
Bombardier B	54	1989–90	BTC-1B	– –	122
Bombardier C	52	1989– 90	CTC-1B	– –	122
Kawasaki	50	1990–91	BTC-4	– –	185
Kawasaki	25	1990–91	CTC-4	– –	175
Kawasaki	17	1997	BTC-4	– –	182
Kawasaki	15	2001–02	BTC-4	– –	182
Kawasaki	33	2005–07	BTC-4C	– –	180

**BTC = Blind Trailer Coach; CTC = Control Trailer Coach*

Modernization of the commuter rail fleet is currently underway through the procurement of 28 locomotives and 75 bilevel coaches that will be delivered in 2012/2013.

Transit Security

This section summarizes the security measures for which the MBTA has developed and implemented policies to protect employees and the public against any intentional act or threat of violence or personal harm, either from criminal activities or terrorist acts.

Placement of Callboxes at Stations

The locations for placement of callboxes at MBTA stations are selected as part of the Crime Prevention Through Environmental Design (CPTED) program, which is governed by the following MBTA guidelines:

> "Crime Prevention Through Environmental Design (CPTED) is the proper design and effective use of the built environment which may lead to a reduction in the fear and incidence of crime, and an improvement of the quality of life."
> – National Crime Prevention Institute

CPTED theories contend that law enforcement officers, architects, transit and city planners, landscape and interior designers, and resident volunteers can create a climate of safety in a community, right from the start. CPTED's goal is to prevent crime through designing a physical environment that positively influences human behavior—people who use the area regularly perceive it as safe, and would-be criminals see the area as a highly risky place to commit crime.

CPTED studies ways to design physical spaces to reduce undesired behavior and crime. It can be used when developing new areas, reviewing plans, or revising existing space. CPTED is helpful with large projects such as multi-unit housing, transit systems, parks, business centers, and shopping centers, as well as single-family homes and offices.

The Four Strategies of CPTED

1. **Natural Surveillance –** A design concept directed primarily at keeping intruders easily observable. This can be promoted by features that maximize visibility of people, parking areas, and building entrances: doors and windows that look out onto streets and parking areas; pedestrian-friendly sidewalks and streets; front porches; adequate nighttime lighting.

2. **Territorial Reinforcement –** Physical design can create or extend a sphere of influence. Users then develop a sense of territorial control while potential offenders, perceiving this control, are discouraged. This can be promoted by features that define property lines and distinguish private spaces from public spaces using landscape plantings, pavement designs, gateway treatments, and "CPTED" fences.

3. **Natural Access Control –** A design concept directed primarily at decreasing crime opportunity by denying access to crime targets and creating in offenders a perception of risk. This can be gained by designing streets, sidewalks, building entrances, and neighborhood gateways to clearly indicate public routes and to discourage access to private areas by using structural elements.

4. **Target Hardening –** Accomplished by features that prohibit entry or access, such as window locks, dead bolts for doors, interior door hinges.

An example of CPTED:

Loitering is not a very common occurrence in Boston, but when it is reported in or around the Massachusetts Bay Transportation Authority's major transportation centers, the MBTA and the MBTA Transit Police address the issue quickly. The MBTA Transit Police Department provides security and law enforcement for the entire MBTA system and works closely with the MBTA in using CPTED methods. An example of this can be seen in making physical changes to bus stops and benches to deter loitering. By adding seat dividers, each individual seated at a bus stop bench has a clearly defined area that temporarily belongs to them, while at the same time the seat dividers deter individuals from taking over an entire bench by sprawling their body across as if to use the bench as a bed. Most implementations of CPTED occur solely within the "built environment" to dissuade offenders from loitering. These tactics have been proven to dissuade those who loiter in and around transportation centers.

Transit Facility Safety and Security Review

The concept of Crime Prevention Through Environmental Design (CPTED) has evolved as a means to reduce the opportunities for crimes to occur. This is accomplished by employing physical design features that discourage crime, while at the same time encouraging legitimate use of the environment. CPTED design considerations, which have been employed in recent years by transit agencies in the design of safer public facilities, such as transit stations and bus stops, can be used to secure and harden elements of an agency's infrastructure from hazards and threats. Major elements of the CPTED concept are defensible space, territoriality, surveillance, lighting, landscaping, and physical security planning. These facilities include transit stops, transit stations, and vehicle storage yards.

- **Access Management**
  Controlling who (or what) may access restricted areas and assets in the system plays an important role in protecting transit infrastructure from all of the major threats identified in this section. A core principle of access management is that valuable assets are protected behind multiple "layers" of secure spaces, with security measures becoming more stringent for deeper layers. Access control may focus on discerning between employees and visitors, on maintaining locks, on screening for weapons, or on

barring unauthorized vehicle entry to a transit property. Access management techniques may include procedures and policies, physical barriers, identification and credentialing technology, security personnel, communications systems, surveillance, and intrusion-detection systems.

- **Surveillance**
  Surveillance can include closed-circuit televisions, security personnel, or vigilant bus operators/drivers or station clerks, who are often the first line in security defense. The presence of agency staff can deter an attack. The presence of surveillance equipment acts as a deterrent not only because an area is being watched remotely, but also because activities are recorded and intruders are aware of the possibility of detection and capture. Surveillance is also useful in warding off attacks upon remote, unmanned infrastructure, such as communications towers and power substations. Transit agencies should consider what combination of equipment and personnel are needed to achieve optimal security coverage. Placement should be based on the volume of human and vehicular traffic, the layout of the watched or guarded asset, as well as the location of any blind spots resulting from overlapping or peripheral areas.

- **Facility Inspection**
  Safety and security reviews should also include inspection of all facilities with special attention directed to:

  - Hazardous materials (storage, security and record-keeping)
  - Fuel storage and servicing
  - Personnel safety equipment (e.g., automatic defibrillators, eyewash stations, first aid and blood borne pathogen kits)
  - Fire prevention (e.g., fire extinguishers, alarms, sprinklers)
  - Maintenance infrastructure (e.g., pits, lifts, electrical feeds, no-walk areas, parts storage)
  - Lighting
  - Entrances, exits, intrusion detection, CCTV
  - Communication equipment
  - Sensitive information on employees and customers
  - High-risk facilities and activities near transit facilities and operations
  - Emergency supply cabinet or shed (food, water, medical, generator)
  - Perimeter fencing, physical barriers, barricades
  - Utility mains/shutoffs
  - Traffic calming

Placement of Surveillance Cameras on Buses

In 2006, the MBTA began placing cameras on some buses for surveillance and crime-prevention purposes. All buses that have been purchased since then are equipped with cameras, and all buses in future procurements will have cameras.

Security Inspection Program

In response to the terrorist attacks of September 11, 2001, in the United States, and subsequent terrorist attacks in other countries, the MBTA Transit Police developed a station inspection program through which searches of passengers' handbags, briefcases, and other carry-on items can be implemented. The Transit Police are currently scheduling random inspections throughout the system. The purpose of this program is to deter passengers from carrying explosives or other weapons onto MBTA vehicles. The full text of the policy, which is spelled out in General Order No. 2009-19, Chapter 152, of the MBTA Transit Police department manual, can be found in Appendix C of this report. Some of the provisions dictated by this policy include the requirement that supervisors record the race and gender of passengers who are inspected to assure that there is no actual or perceived bias-based profiling. In addition, the Police Department must translate information regarding inspections into multiple languages, and will use the Department's contracted "Language Line" interpreter service when inspecting a non-English-speaking passenger.

MBTA Transit Police Standards of Conduct

The MBTA Transit Police department is committed to upholding and protecting the constitutional and civil rights of all people. To this end, the MBTA Transit Police maintains the following policy concerning identification and prevention of bias-based profiling:

> "Except in 'suspect specific incidents', MBTA Transit Police Officers are prohibited from considering the race, gender, sexual orientation, religion, economic status, cultural group, lifestyle (e.g., clothing, personal appearance, etc.), or national or ethnic origin of members of the public in deciding to detain a person or stop a motor vehicle and in deciding upon the scope or substance of any law enforcement action."[3]

The full text of the policy, which is spelled out in General Order No. 2008-60, Chapter 122, of the MBTA Transit Police department manual, can be found in Appendix D of this report.

[3] *MBTA Transit Police Department Manual, Chapter 122.*

MBTA Transit Police Investigation Services

The MBTA Transit Police Department has a Criminal Investigations Unit (CIU). The major objective of this unit is the successful investigation and prosecution of crimes occurring on MBTA property. The Commander of the CIU serves as the Department's Civil Rights Specialist and oversees all investigations and monitors all court cases involving civil rights violations. The procedures for cases involving possible civil rights violations are described in General Order No. 2010-39, Chapter 271, of the MBTA Transit Police department manual, and can be found in Appendix E of this report.