

Chapter 3: Service Standards

The Service Standards provide a framework for measuring the performance of MBTA services and are used as a part of the Service Evaluation Process, which is discussed in Chapter 4. Through the Service Evaluation Process, data collected on MBTA services are compared against the Service Standards to determine whether or not individual existing services perform at acceptable levels and to evaluate the potential of possible service changes. The Service Standards are also used to compare the performance of existing services, service changes, and proposed new services to prioritize the allocation of resources within the system.

Because the overall levels of funding for service are determined through the annual budget process, the Service Evaluation Process using the Service Standards helps to ensure an effective allocation of budgeted funds. The Service Standards and Service Evaluation Process can also be used to identify service improvements that are not feasible within the existing budget and could be considered for future funding.

Each of the Service Standards is expressed as either a threshold that must be met, or a guideline that the Authority strives to meet. Following is a discussion of the MBTA Service Standards, in the context of the Service Objective to which each applies. These Standards address the fixed route modes operated by the MBTA (as described in Chapter 2).

Accessibility Service Standards

The Accessibility standards/guidelines define the minimum levels of service that will provide access to the transit system, in terms of geographic Coverage, the length of the service day (Span of Service) and the Frequency of Service. Each of these standards varies by mode.

- **Coverage Guidelines**

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 1: Coverage Guidelines

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 ½ mile walk.

- **Span of Service Standards**

Span of Service refers to the hours during which service is accessible. The MBTA has established Span of Service Standards that define the minimum period of time that any given service will operate. This provides customers with the confidence that particular types of services will be available throughout the day.

The Span of Service Standards, stated in Table 3 below, vary by mode and by day of the week, reflecting the predominant travel flows in the region. The standards require that the first trip in the morning in the peak direction of travel (typically toward Boston) must arrive at the route terminal at or before the beginning span of service time (e.g., 7:00 AM for local bus). At the end of service day, the last trip in the evening in the peak direction of travel (typically away from Boston) must depart from the route terminal at or after the ending span of service time (e.g., 6:00 PM for local bus).

Table 2: Span of Service Standards

Mode	Day	Minimum Span of Service
Bus* Local Routes	Weekday	7:00 AM – 6:30 PM
	Guideline for high density areas:	
	Saturday	8:00 AM – 6:30 PM
	Sunday	10:00 AM – 6:30 PM
Community Routes	Weekday	10:00 AM – 4:00 PM
Express/Commuter Routes	Weekday	7:00 – 6:30 PM (no service required 9:00 AM – 4:00 PM)
Key Bus Routes	Weekday	6:00 AM – midnight
	Saturday	6:00 AM – midnight
	Sunday	7:00 AM – midnight
Heavy Rail	Weekday	6:00 AM – midnight
	Saturday	6:00 AM – midnight
	Sunday	7:00 AM – midnight
Light Rail	Weekday	6:00 AM – midnight
	Saturday	6:00 AM – midnight
	Sunday	7:00 AM – midnight
Commuter Rail	Weekday	7:00 AM – 10:00 PM
	Saturday	8:00 AM – 6:30 PM
Ferry/Commuter Boat	Weekday	7:00 AM – 6:30 PM

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

The minimum Span of Service indicated in the table above may be extended at either end of the day, based on customer demand and in accordance with the other service standards stated in this policy.

- Frequency of Service Standards**

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 service, regardless of customer demand.

Table 4 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 shows the Minimum Frequency of Service levels for each mode by time period.

Table 3: MBTA Weekday Time Period Definitions

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: Minimum Frequency of Service Standards

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

Mode	Weekday Time Periods	Minimum Frequency*
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.

Reliability Service Standards

The on-time performance of service is affected by many variables, including traffic congestion, accidents, weather, road/track conditions, infrastructure maintenance work, vehicle failures, etc. The Schedule Adherence Standards provide ways of measuring how reliably services adhere to the published schedules. If a service does not pass the Schedule Adherence Standards, the MBTA will determine the reason why it does not perform reliably and will take action to correct the problems. In terms of service planning, this may mean adjusting running times, changing headways, etc.

- **Schedule Adherence**

Schedule Adherence Standards vary by mode and provide the tools for evaluating the on-time performance of the individual MBTA routes/services within each mode. 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 arrival/departures to occur as published.

Bus Schedule Adherence Standards: The environment in which buses operate makes it difficult to provide bus service with the same degree of precision that is possible for some other modes. Therefore, the Schedule Adherence Standards for bus routes are designed to ensure that routes operate as reliably as possible—given their uncertain environment—without early departures, chronic delays, or unpredictable wait and/or travel times.

The Bus Schedule Adherence Standards establish two separate thresholds to measure on-time performance. The first measures the on-time performance of each trip on the route. The second measures the on-time performance of the route itself, based on the percent of trips throughout the day that operate on time.

1. **Bus Trip Tests:** To determine whether or not individual trips on a route are on time, the MBTA uses two different tests. These tests are based on the type of service, as determined by its frequency. For the purposes of the Bus Schedule Adherence Standards, the two types services are defined as follows:

- **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 more frequently than one bus every 10 minutes (headway < 10 minutes). For walk-up service, customers can arrive at a stop without looking at a schedule and expect only a brief wait. There are two important indicators of on-time performance for walk-up service. One is how evenly spaced the buses are, and the other is how closely the actual duration of the trip approximates the scheduled travel time.

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 measured individually to determine whether or not it is on time, according to the type of service that it provides. Therefore, there are two separate trip tests that are applied to the trips on any given route before the whole route can be tested for Schedule Adherence.

- **On Time Test for Scheduled Departure Trips:** To be considered on time, any trip with a leading headway scheduled for 10 minutes or more must meet all of the following conditions:
 - The trip must start between 0 minutes before and 3 minutes after its scheduled departure time.
 - The trip must leave the route midpoint(s) between 0 minutes before and 7 minutes after its scheduled departure time (midpoints are calculated only for routes on which the data is collected using CAD/AVL).
 - The trip must arrive at its destination between 3 minutes before and 5 minutes after its scheduled arrival time.
- **On Time Test for Walk-Up Trips:** To be considered on time, any trip with a leading headway scheduled for less than 10 minutes must meet all of the following conditions:
 - The trip must start within 25% of its scheduled headway (but not necessarily within 25% of its scheduled departure time). *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 6 to 10 minutes after trip A actually starts to be considered on time.

- The trip must leave the midpoint(s) within 50% of its scheduled headway (midpoints are calculated only for routes on which the data is collected using CAD/AVL). *Continuing the above example, if trip B is scheduled to leave a midpoint 8 minutes after trip A is scheduled to leave it, then trip B must leave the midpoint 4 to 12 minutes after trip A actually departs the midpoint to be considered on time.*
- The trip’s running time must be within 20% of its scheduled running time. *Continuing the above example, if trip B is scheduled to take 30 minutes from the beginning of the route to the end, the actual trip time must be 24 to 36 minutes 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 trips on the route that are on time over the entire service day (regardless of which types of trips they are).

- **On Time Test for a Bus Route:** For a Bus Route to be considered on time, 75% of all trips on the route (in both directions) over the entire service day must pass their trip on-time tests.

Table 5: Summary of Bus Schedule Adherence Standard

Trip Test	Beginning of Route	Mid-Route Time Point(s)*	End of Route
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 25% of scheduled headway	Leave within 50% of scheduled headway	Running time within 20% of scheduled running time
Route Test	For any given bus route to be in compliance with a the Schedule Adherence Standard, 75% of all trips on must adhere to the above measures over the entire service day.		

*For Schedule Adherence, mid-route time points will be used only for routes on which the on-time performance data has been collected using CAD/AVL equipment.

Exceptions:

- Express routes that serve only two points do not have a midpoint. Other routes must have at least one midpoint. The MBTA will add additional time points to certain routes based on their distance, running time and frequency.
- 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 to these trips the scheduled departure, midpoint and arrival times may be shifted forward by the amount of time the bus had to hold for connecting passengers.

- If a series of trips alternate 9- and 10-minute headways, they may all be considered walk-up trips.
- The first trip of the day, which does not have a leading headway, is considered a scheduled departure trip.

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 provides a summary of the Schedule Adherence standards for Light Rail and Heavy Rail services.

Table 6: Schedule Adherence Standards for Light Rail & Heavy Rail

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 shows the Schedule Adherence standards for Commuter Rail and Ferry/Commuter Boat services.

Table 7: Schedule Adherence Standards for Commuter Rail & Ferry/Commuter Boat

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

Safety & Comfort Service Standard

The public's perception of comfort and the reality of public safety are influenced by the number of passengers on the vehicle and whether or not a seat is available to each rider for all or most of the trip. The Vehicle Load Standards, which vary by mode and time of day, establish the average maximum number of passengers allowed per vehicle to provide a safe and comfortable ride.

- **Vehicle Load**

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, during 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 8: MBTA Core Area Boundaries

Light Rail & Heavy Rail Core Area	
Blue Line	Bowdoin to Aquarium
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.¹ 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 9: Vehicle Load Standards by Mode

Mode	Time Period	Passengers/ Seats ²
Bus*	Early AM, AM Peak, Midday School & PM Peak	140%
	Midday Base, Evening, Late Evening, Night/Sunrise & Weekends	
	Surface portions of routes	100%
	Tunnel portions of 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%
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%

¹ 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.

Mode	Time Period	Passengers/ Seats ²
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.

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.

Because there are a number of different types of vehicles in the MBTA’s fleets at any given time, and because the fleets change over time, the actual seating capacity and maximum number of passengers allowed by the load standards for each type of vehicle are included in an addendum to this policy. This addendum will be regularly updated as the fleets change.

Cost-Effectiveness Service Standard

The operation of MBTA service must be conducted within the resource levels budgeted for each mode. It is therefore important to have a measure that can compare the economic productivity of any given route in relation to other routes or to the system average for that mode. As a part of the 1996 *Service Delivery Policy*, the MBTA developed the Net Cost Per Passenger standard to measure the cost-effectiveness of bus routes. This Cost-Effectiveness Standard was developed only for bus at that time, because bus services were considered most appropriate for this type of comparative analysis. Unlike rail services, bus route alignments and services can be easily adjusted to accommodate changes in ridership patterns and demands. The MBTA will consider development of similar service productivity standards for other modes that would allow comparative evaluations within each mode and would support the efficient use of budgeted operating resources.

- **Bus Net Cost per Passenger Standard**

Net cost per passenger is calculated by subtracting the average revenue from the cost of operating a route and dividing by the number of passengers. This ratio reflects the benefits of a given service (measured in customers) against the public cost of operating the service.

During the regular service planning process, all bus routes and their respective net cost per passenger are compared against the bus system average. Routes that have net cost per passenger more than three times the system average are considered deficient and are subject to review for modifications that could improve the performance. Exceptions to the net cost per passenger standard

can be made, on a case-by-case basis, due to extenuating circumstances such as geographic isolation

Table 10: Bus Cost-Effectiveness Service Standard

Net Cost/Passenger:	$\frac{\text{Operating Costs} - \text{Service Revenue}}{\text{Boarding Customers}}$
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Deficient Route:	≥3 times the system average
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Key Bus Route Addendum

Key Bus Routes are similar to local routes, but have policy standards for a longer Span of Service and a higher Frequency of Service. The Key Bus Route Network was designed to complement the MBTA's light and heavy rail system and to ensure that all high-demand corridors have access to frequent transit service seven days a week.

The MBTA's *Service Delivery Policy* establishes Key Bus Route Service Standards, which make the Span of Service and the peak period Frequency of Service on Key Bus Routes equivalent to light and heavy rail. This guarantee of high-frequency service provides assurance to riders that they will not have to wait long for the next bus, even if they do not know the published schedule. To encourage this kind of "walk up" use of Key Bus Routes, they will be included with the light and heavy rail system on MBTA's "spider" maps as they are updated. Key Bus Routes will also be designated on the MBTA's system map, schedule cards and other marketing materials.

Initially, 15 routes were selected for the Key Bus Route system, based on their demonstrated heavy demand for service on all days of the week. The original Key Bus Routes were also chosen to provide high frequency service to areas of the region's urban core not served by light or heavy rail. The Silver Line, Boston's first Bus Rapid Transit (BRT) route, heads the list of Key Bus Routes. In addition, one corridor that is served at a high frequency by two bus routes was assigned Key Bus Route status.

The original 15 Key Bus Routes include:

- **Silver Line** Dudley Station – Downtown Crossing via Washington Street
- **Route 1** Dudley – Harvard via Mass. Ave.
- **Route 15** St. Peter's Square – Ruggles via Dudley
- **Route 22** Ashmont – Ruggles via Grove Hall
- **Route 23** Ashmont – Ruggles via Codman Square
- **Route 28** Mattapan – Ruggles
- **Route 32** Wolcott Square – Forest Hills
- **Route 39** Forest Hills – Back Bay
- **Route 57** Watertown – Kenmore via Oak Square
- **Route 66** Harvard – Dudley via Allston
- **Route 71** Watertown Square – Harvard via Mount Auburn St.
- **Route 73** Waverley – Harvard via Mount Auburn
- **Route 77** Arlington Heights – Harvard via Mass. Ave.
- **Route 111** Woodlawn – Haymarket Station
- **Routes 116 & 117** Broadway @ Park Avenue – Maverick Station (combined trunk portion of routes)

Going forward, additional Key Bus Routes may be designated based on consideration of a number of characteristics. Not all of these characteristics must be present in a given route to make it eligible for Key Bus Route status. Each route will be considered in the context of the MBTA's transit system as a whole and within available operating resources.

The characteristics that may trigger consideration of a route for Key Bus Route status include:

- high ridership demand;
- connectivity within the system;
- geographic coverage;
- accommodation of major new development; and
- operation as BRT (all BRT route segments that operate in dedicated rights-of-way will automatically be designated as Key Bus Routes).