# CHAPTER 5

# Priorities for Achieving a State of Good Repair

To achieve a state of good repair (SGR), infrastructure assets must be replaced as safety standards or obsolescence dictates. Once a state of good repair has been achieved, the most effective way to sustain the optimum performance of these assets is preventive maintenance. Deferring maintenance, even for a short time, accelerates the degradation of infrastructure assets. Proper attention to maintenance can greatly extend useful life and reduce costs overall. In addition, proper maintenance is critical for providing safe and reliable service.

The key components of a successful, ongoing preventive maintenance program include adequate personnel and the tools, equipment, and materials necessary to complete maintenance tasks within a reasonable time frame. It is imperative that these resources be made available in order for the MBTA to maintain efficient and safe operations that meet the needs of the riding public.

The following discussion surveys the categories of the MBTA's infrastructure assets, describing the status of each and highlighting the most important capital investments that will need to be made during the time frame of this PMT to bring the system into SGR. A more comprehensive list of SGR needs can be found in Appendix H. In addition to the currently identified SGR projects, it is anticipated that prior to 2030 many capital assets presently in serviceable condition will reach end-of-life and require replacement.

## REVENUE VEHICLES

Revenue vehicles are those vehicles that are used in the direct provision of services to the public. As such, they represent one of the most visible and important MBTA asset categories. The MBTA's revenue vehicles are currently as follows:

- 432 rapid transit vehicles serving the Red, Orange, and Blue Lines
- 207 light rail vehicles serving the Green Line
- 10 streetcars for the Mattapan High Speed Line
- 410 commuter rail passenger coaches
- 80 commuter rail locomotive units
- 968 motor bus coaches powered by compressed natural gas or low-sulfur diesel
- 20 compressed-natural-gas buses for the Silver Line
- 32 dual-mode buses for the Silver Line
- 28 electric trackless trolleys
- 426 RIDE vehicles
- 2 passenger marine vessels

The MBTA adheres to a general standard life cycle of 35 years for rapid transit and light rail vehicles, 25 years for commuter rail locomotives, 25 to 30 years for commuter rail coaches, and 15 years for buses. The condition of each vehicle fleet generally correlates with vehicle age; several of the older fleets are in need of major component replacements, overhauls, or, in some cases, total replacement. Without scheduled overhauls and planned retirements, the maintenance required to keep the existing fleets operating with acceptable service reliability would be excessively costly. Table 5-1 lists the MBTA's revenue vehicles by type and specific model and gives the remaining useful life of each.

It is anticipated that within the horizon of this PMT, the MBTA will need to replace the 74 No. 1 and 58 No. 2 Red Line cars. Beginning in 2013, the MBTA will start taking delivery of 146 new Orange Line cars to replace the current fleet of

*MBTA personnel conducting tests on an Orange Line vehichle*

120 No. 12 cars. Plans are currently underway to design the replacement Red and Orange Line cars in tandem. On the Blue Line, the MBTA is currently in the process of replacing the 70 No. 4 cars with 94 new No. 5 cars, which should still be in operation in 25 years. In addition, the MBTA has recently put 95 new No. 8 Green Line cars into service. As the existing fleet of 114 No. 7 Green Line cars is retired, additional new cars (No. 9) will need to be purchased.

The entire bus fleet will also turn over within the 25-year horizon of the PMT. The MBTA's current policy is that the average age of the buses in the fleet will not exceed 7.5 years. This average may be difficult to maintain as the current vehicles start to reach retirement age. Many of the buses in the existing fleet were purchased within a small window of time, so they will be due for replacement at approximately the same time.

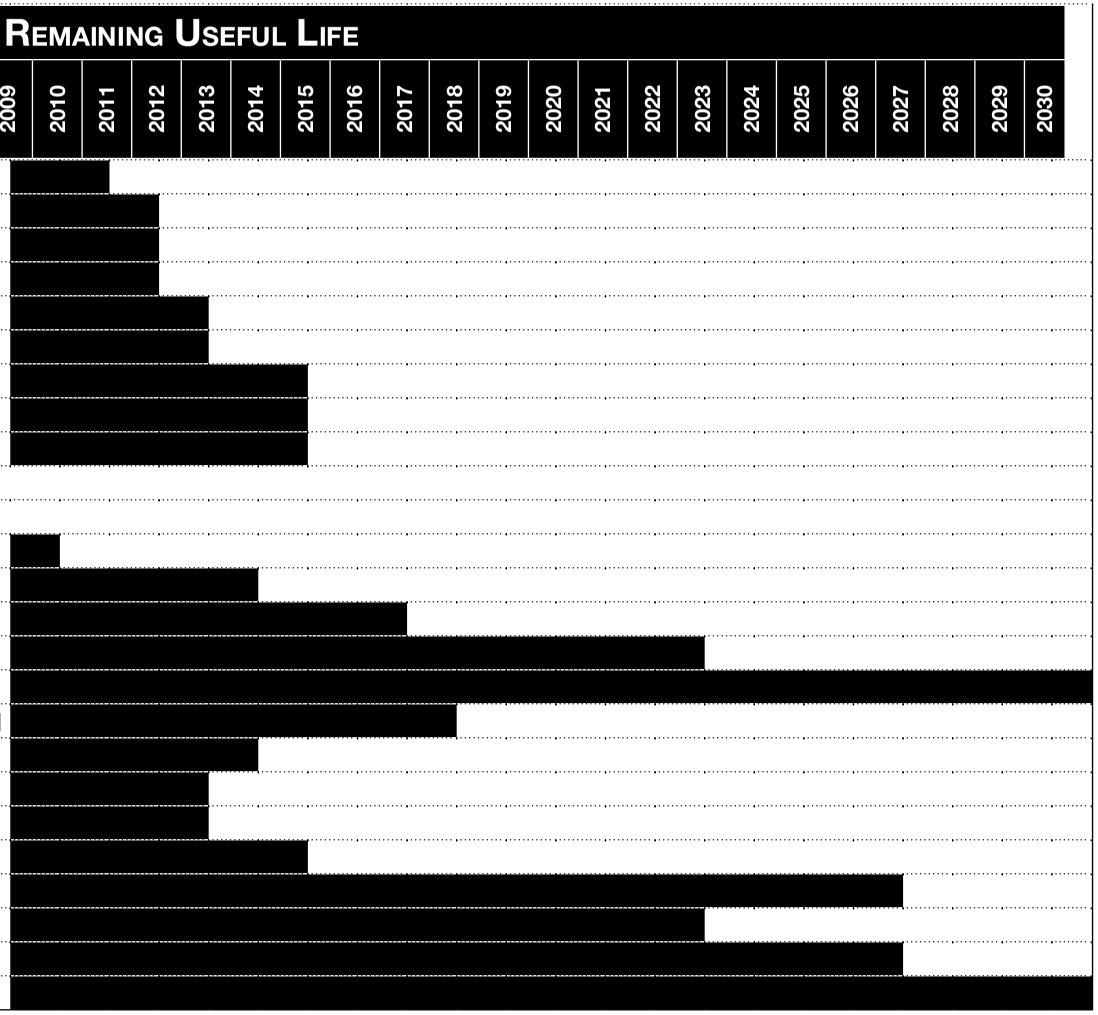
The MBTA is currently in the process of procuring 75 new bi-level commuter rail coaches, delivery of which should begin within the next five years. During the course of the next 25 years, all but the most recently purchased coaches will need to be replaced. In addition, the Authority is in the process of purchasing 28 new locomotives and will need to replace all other locomotives currently in service by 2030.

## TABLE 5-1
## Revenue Vehicle Fleet: Remaining Useful Life

| Vehicle Type by Mode | Quantity | Date in Service | Asset | Remaining Useful Life |
|---|---|---|---|---|
| **Bus** | | | | |
| Bus | 5 | 1976 | 40' Trolley Bus 1976 | |
| Bus | 28 | 2003 | Neoplan Electric Trolley Buses | |
| Bus | 32 | 2004 | Dual Mode Vehicle 2005 | |
| Bus | 17 | 2002 | New Flyer 40' low-floor | |
| Bus | 44 | 2003 | 2003 Neoplan 60' Artic. Bus | |
| Bus | 124 | 2003 | NABI 40' Bus | |
| Bus | 175 | 2004 | NABI 40' Low-Floor CNG | |
| Bus | 148 | 1994 | 40' RTS Bus 1994 | |
| Bus | 60 | 1995 | 40' RTS Bus 1995 | |
| Bus | 84 | 2005 | ECD Neoplan I | |
| Bus | 109 | 2006 | ECD Neoplan II | |
| Bus | 155 | 2007 | ECD New Flyer I | |
| Bus | 155 | 2008 | ECD New Flyer II | |
| **Ferry** | 2 | 1996 | Diesel Catamarans | |
| **Rapid Transit** | | | | |
| Mattapan Line | 10 | 1945 | Presidential Conference Cars (PCCs) | |
| Green Line | 94 | 1986 | No. 7 Passenger Cars | |
| Green Line | 20 | 1997 | No. 7 Additional Passenger Cars | |
| Green Line | 85 | 2005 | No. 8 (Breda) Cars | |
| Green Line | 10 | 2007 | No. 8 (Breda) Additional Cars | |
| Blue Line | 50 | 1979 | No. 4 Passenger Cars I | |
| Blue Line | 20 | 1979 | No. 4 Passenger Cars II | |
| Blue Line | 94 | 2008-09 | Blue Line No. 5 Passenger Cars | |
| Orange Line | 120 | 1981 | No. 12 Passenger Cars | |
| Red Line | 74 | 1969 | No. 1 Passenger Cars | |
| Red Line | 58 | 1988 | No. 2 Passenger Cars | |
| Red Line | 86 | 1994 | No. 3 Passenger Cars | |

**TABLE 5-1 (cont.)**
**Revenue Vehicle Fleet: Remaining Useful Life**

| VEHICLE TYPE BY MODE | QUANTITY | DATE IN SERVICE | ASSET | REMAINING USEFUL LIFE |
|---|---|---|---|---|
| THE RIDE | 11 | 2003 | 2003 Dodge Vans | |
| THE RIDE | 11 | 2004 | 2003 Dodge Vans | |
| THE RIDE | 68 | 2004 | 2003 Dodge Paratransit Vans | |
| THE RIDE | 167 | 2004 | 2005 Ford Sedans | |
| THE RIDE | 3 | 2006 | 2006 Ford Sedans | |
| THE RIDE | 22 | 2006 | 2007 Ford Sedans | |
| THE RIDE | 3 | 2008 | 2008 Ford Sedans | |
| THE RIDE | 50 | 2007 | 2006 Ford Paratransit Vans | |
| THE RIDE | 84 | 2007 | 2007 Ford Paratransit Vans | |
| | | | | |
| **Commuter Rail** | | | | |
| Locomotives | 18 | 1979 | Locomotive - F40PH-2 | |
| Locomotives | 25 | 1987 | Locomotive - F40PH-2C | |
| Locomotives | 12 | 1991 | Locomotive - F40PHM-2C | |
| Locomotives | 25 | 1997 | Locomotive - GP40MC | |
| Locomotives | 28 | 2011 | Locomotive - New Diesel 2005 | |
| Coaches | 57 | 1979 | Passenger Coach – Pullman Standard [BTC] | |
| Coaches | 33 | 1987 | Passenger Coach - MBB [BTC] | |
| Coaches | 34 | 1987 | Passenger Coach - MBB [CTC] | |
| Coaches | 40 | 1987 | Passenger Coach - Bombardier-A | |
| Coaches | 106 | 1989 | Passenger Coach - Bombardier-B | |
| Coaches | 75 | 1990-91 | Passenger Coach - Kawasaki | |
| Coaches | 17 | 1998 | Passenger Coach - Kawasaki-option | |
| Coaches | 15 | 2002 | Passenger Coach - New Bi-level | |
| Coaches | 33 | 2005 | Passenger Coach - Kawasaki - 2005 | |



## NON-REVENUE VEHICLES

For use in responding to emergencies, performing maintenance work, keeping the system safe for passengers, and engaging in major construction work, the MBTA operates a large fleet of vehicles and work equipment not used to transport passengers. Non-revenue vehicles and equipment support the entire range of Authority operations, including maintenance service calls, safety-critical situations, field supervision, revenue collection, repair projects, and system upgrade efforts, all of which occur throughout the MBTA's service district.

The Authority owns a fleet of over 1,000 non-revenue vehicles. These vehicles are of many different types, including rail-mounted cars, rubber-tired cars, trucks, sedans, police cruisers, snow plows, track geometry cars, brush cutters, and spreaders. Included in the maintenance-of-way category are crane, bucket, cable, platform, and snow-fighting trucks.

In general, the useful life expectancy for non-revenue equipment is approximately 10 years, although this varies with the type of equipment. Given this 10-year replacement cycle, most assets in this category will be due for replacement either once or twice during the next 25 years.

## TRACK/RIGHT-OF-WAY

Achieving and maintaining a state of good repair for rapid transit and commuter rail track and right-of-way is critical to the on-time performance and safety of the system, as it reduces the need for speed restrictions and the possibility of accidents.

### Rapid Transit

The MBTA currently operates light and heavy rail transit over 185 miles of track, 125 of which are in revenue service on the Red, Orange, Blue, and Green Lines. Of the 185 miles of rapid transit track, 180 miles are 115 lb. rail, and 5 miles are 85 lb. rail. In general, track has a useful life of 25 years.

The rapid transit right-of-way generally consists of track, ballast, and concrete or timber ties; however, there are about 14 miles of direct-fixation track. The subway fleets operate over approximately 1 million feet of mainline-ballasted track and approximately 400,000 feet of yard-ballasted track. There are 383,000 wood ties in the track system and 60,000 concrete ties, of which 50,400 are monoblock ties and approximately 2,500 dual block ties. Special trackwork consists of 619 switches for turnouts and crossovers, both revenue and non-revenue. Each rapid transit line is divided into segments that are determined by their geographical location or track construction.

The MBTA has approximately 560 mainline turnouts (with equipment), which have useful lives ranging from 4 to 25 years. There are 675 total yard turnouts (with equipment), which have useful lives ranging from 8 to 25 years. In addition, there are 64 grade crossings along the Green Line and other crossings within MBTA yards that generally have a useful life of 12 to 15 years.

The several different types of track construction used on each line of the rapid transit system are listed in Table 5-2.

The MBTA has an ongoing track and tie replacement program. In addition, recent track efforts have focused on upgrading the Green Line tracks to ensure proper operation of the new low-floor cars. The Green Line tracks will require continuous inspection and maintenance to support this new fleet.

Other anticipated high-priority projects include replacement of the floating slab track on the Red Line between Harvard and Alewife Stations. This track has been in use since 1984 and is reaching the end of its useful life. The concrete dual-block ties on the southern portion of the Orange Line currently need monitoring and may require rehabilitation in the near term. On the Blue Line, sections that are currently bolted rail should be replaced with welded rail to maintain the system. In addition, the track yards need to be upgraded.

**TABLE 5-2**
**Rapid Transit Track**

| Line | Miles of Revenue Track | Types of Track Construction |
|---|---|---|
| **Red Line** | 45 | Timber tie track<br>Concrete dual-block tie track<br>Direct-fixation<br>Concrete floating slab track<br>The entire line is powered by third rail. |
| **Orange Line** | 22 | Timber tie track<br>Concrete dual-block tie track<br>Direct-fixation<br>Concrete floating slab track<br>The entire line is powered by third rail. |
| **Blue Line** | 12 | Primarily timber tie<br>Some sections are monoblock concrete tie track.<br>The line is powered by third rail and overhead catenary lines. |
| **Green Line** | 46 | Primarily wood tie and ballast units<br>Some monoblock concrete tie track<br>The running rail on the line consists of both “T” rail and girder guardrail.<br>The entire line is powered by overhead catenary. |

## Commuter Rail

Commuter rail right-of-way consists of rail, wooden ties, railroad crossties, grade crossings, and associated fencing. Most of the over 1,300 miles of rail (650 miles of track) in the commuter rail network consists of welded rail, although sections of older bolted rail remain along the Haverhill, Lowell, and Fitchburg Lines. Sections of straight rail can generally be expected to last approximately 40 years, while curve rail has a shorter life span.

Approximately 1.5 million timber cross ties and switch timbers support the commuter rail system. Railroad crossties usually have a life span of 25 to 30 years. Grade crossings are the most prominent fixtures of the commuter rail system. The system has 257 grade crossings, which have a life expectancy of 12 years.

The MBTA has an ongoing rail replacement program for the commuter rail system to maintain SGR. In addition to the rail itself, approximately 48,000 crossties, 5,000 switch timbers, and 21 grade crossings are replaced each year through this program.

## SIGNALS

Train control is an integral part of rail operations, as it is vital to the safety and reliability of the system. Signals are necessary for collision avoidance, route integrity, speed control and enforcement, broken rail protection, and all other safety aspects of rail operations.

### Rapid Transit

The rapid transit system uses several types of signal system architecture on the four rapid transit lines. The Red and Orange Lines use an Automatic Train Control (ATC) system. This type of signal system consists of both wayside equipment and a car-borne package that receives commands from the wayside circuitry. The Blue and Green Lines utilize an Absolute Block Signal (ABS) system. In this case, the signal equipment is housed in wayside cases and Central Instrument Houses but does not communicate with an on-board package. Each track circuit is governed by a signal that will, depending on the position of the train, restrict the movement of the following train. On the Blue Line, train stops provide an additional safety feature to ensure that a train comes to a stop when a signal is red. Much of the Green Line operates in the same way, except that there are no train stops at the signals: the operator has sole responsibility for adhering to the signals. Train signals are not used on the parts of the Green Line that operate in vehicular traffic.

The signal system also includes supervisory controls. These are located in the rapid transit Operations Control Center (OCC) and allow control of field devices, i.e., switches, signals, heaters, etc., from a centralized location. The supervisory control system facilitates more consistent and timely revenue service and reduces the number of required field personnel.

**TABLE 5-3**
**Rapid Transit Signal System Components**

| Component | Red Line | Orange Line | Blue Line | Green Line | Total |
|---|---|---|---|---|---|
| Signals | 210 | 199 | 154 | 497 | 1,060 |
| Switches | 135 | 107 | 86 | 91 | 419 |
| Switch heaters | 68 | 101 | 43 | 40 | 252 |
| Track circuits | 355 | 245 | 181 | 497 | 1,278 |
| Third-rail heaters | 1,632 | 457 | 12 | | 2,101 |
| Train stops | 2 | 17 | 145 | | 164 |
| Train stop heaters | 2 | 34 | | | 36 |
| Trip stops | | | 145 | | 145 |
| Trip stop heaters | | | 290 | | 290 |
| Train approach lights | 12 | 48 | 74 | | 134 |
| Instrument houses | 16 | 12 | 4 | | 32 |

Many of the components of the rapid transit signal systems are listed in the table below, which gives their distribution among the lines.

The signal system on the Orange Line has recently been upgraded; however, signal work on the other rapid transit lines remains a high priority. On the Red Line, the failure rate of the signal equipment has increased over the years in several areas due to outdated equipment or inadequate maintenance. The signals in the Green Line central tunnel, which date from the 1920s and are the oldest of their kind in regular use in the U.S., must be replaced. The Blue Line ABS signal system, although relatively new, is not considered state of the art and does not allow for as much flexibility in scheduling as newer signal technologies. Consideration should be given to upgrading the system to allow for implementation of shorter headways.

### Commuter Rail

The Authority's commuter rail signal system consists of over 480 miles of signalized track, 190 miles of aerial pole line, 80 interlockings, 10 train control machines, over 1,000 signal heads, 476 electric switches, and 200 grade crossings with automatic protection equipment. There are 35 bungalows and 52 bungalow/houses in the commuter rail signal system. They all have a useful life of 25 years. The two systemwide signal units are the wayside system and the OCC signal equipment. Both systems have a 25-year useful life.

Annual replacement of underground signal cable, aerial signal cable, electric switch machines, and electric grade crossing mechanisms is required to ensure the safety and reliability of the signal system within an acceptable life-cycle cost. Signal maintenance is performed under the commuter rail management contract and is primarily funded by the operating budget.

## COMMUNICATIONS

The MBTA communications system comprises a two-way radio system, telecommunications, security systems, closed circuit television systems, remote monitoring and control systems, fire alarm systems, electronic signs, public address systems, the MBTA website, and the customer-care center. These are connected via a Wide Area Network (WAN) of interconnected fiber optic cables and leased circuits to transmit voice, data, and video communications between electronic devices throughout the Authority's service district.

*MBTA Bus Operations Center*

Many of these systems communicate through the OCCs. The rapid transit OCC is one of the most automated transit control centers in the world. It consists of proven state-of-the-art computer-based technology that permits real-time monitoring and supervisory control of the signal and communication systems for all four transit lines. The bus OCC provides real-time route performance monitoring and dispatch through the use of CAD/AVL (computer-aided dispatch/automated vehicle locator) equipment. The commuter rail OCC provides real-time monitoring and supervisory control of the signal and communications systems for the commuter rail network.

The MBTA uses the Supervisory Control and Data Acquisition System (SCADA II) to remotely monitor and control miscellaneous equipment owned and operated by the Authority at various locations, including fire alarms, water pumps, emergency ventilation fans, emergency generators, and secured doors.

The Authority has made great strides over the past several years in upgrading its communications systems so as to monitor and operate its services more efficiently and to communicate with the public more effectively. Over the next 25 years, the MBTA will need to complete the efforts that it has started and track trends in rapidly changing technologies to keep its communications systems up-to-date.

## POWER

Using power supplied by an outside utility, the MBTA transforms and distributes electricity over its own system to power a network that consists of 10 power substations, 67 unit substations, 48 traction power substations, 3 switching stations, 800 miles of cable, 1,200 circuit breakers, 1,000 switch boxes, 3,325 manholes, 54 passenger station low-voltage switchgears, 2 emergency backup generators, and 2 supervisory control systems to monitor and control all of the power facilities.

For the rapid transit and trackless trolley services, the MBTA distributes electricity to power various systems, including: signals; communications; station lighting, escalators, and elevators; maintenance and layover facilities; tunnel lighting and ventilation fans; fire alarms; and fare collection. In addition, the MBTA distributes electricity to the overhead catenary system that powers the Green Line, part of the Blue Line, the Silver Line Waterfront, and the trackless trolleys. The third-rail system that powers the Red Line, Orange Line, and part of the Blue Line also receives electricity through the MBTA's power network. In addition, the MBTA distributes the power to light five ferry facilities.

The commuter rail electrical system provides lighting and power for signal systems, communication systems, bridges, buildings, stations, parking lots, maintenance facilities, layover facilities, and grade crossings. This system also provides redundant power at critical facilities and, via cables, power to operate mechanisms on the Beverly Drawbridge. Again, the MBTA itself distributes the electricity carried by this system.

The major components of the power system have a useful life of between 15 and 30 years, meaning that most will need to be replaced during the period of this PMT in order for the system to be maintained in SGR. The most critical needs include replacing the cables throughout the power system.

## MAINTENANCE FACILITIES

Maintenance facilities are where the MBTA conducts regularly scheduled maintenance and emergency repairs on its vehicle fleets. Basic structures at each of these facilities include roofs, electrical systems, and major maintenance equipment such as lifts and hoists.

The Authority operates three heavy rail maintenance facilities: Cabot (Red Line), Wellington (Orange Line), and Orient Heights (Blue Line). The four light rail maintenance facilities are located at Riverside, Reservoir, and Lake Street (for the Green Line) and at Mattapan Yard (for the Mattapan High Speed Line).

The nine maintenance facilities for the bus and trackless trolley system are listed in Table 5-4. The MBTA also operates the Everett Central Repair Facility at which it completes heavy maintenance for the entire bus fleet as well as equipment overhauls for light and heavy rail equipment.

**TABLE 5-4**
**Bus Maintenance Facilities**

| Facility | Year Built | Vehicle Capacity |
|---|---|---|
| Fellsway | 1925 | 61 |
| Quincy | 1930 | 88 |
| Lynn | 1936 | 104 |
| Albany | 1941 | 130 |
| Cabot | 1975 | 190 |
| North Cambridge (trackless trolley) | 1978 | 32 |
| Charlestown | 1979 | 242 |
| Arborway | 2004 | 118 |
| Southampton | 2004 | 76 |

For commuter rail, the MBTA operates a maintenance facility at the Boston Engine Terminal, a service and inspection facility at Widett Circle, a storage and light inspection facility at Readville, and outlying layover facilities.

The MBTA's maintenance facilities also include 17 smaller ones, some of which are in structures or buildings used by the Authority for various tasks and purposes.

As can be seen in Table 5-4, one of the bus garages (Fellsway) is over 80 years old, and two (Quincy and Lynn) are over 70. MBTA plans anticipate closure of Fellsway and construction of a replacement North Side facility that could ease system capacity constraints at Lynn and Charlestown. Quincy Garage also needs to be rehabilitated, as do Charlestown and Cabot. In addition, current needs include the design and construction of a new bus facility at the Arborway and the retrofit of existing bus facilities to service compressed-natural-gas (CNG) vehicles.

A number of challenges are inherent in keeping facilities up-to-date. As new fleets are purchased, they bring with them ever-changing technologies that require different types of maintenance to keep the vehicles on the road. The purchase of CNG vehicles provides a pertinent illustration. To maintain this fleet, it was necessary to build a new maintenance facility and retrofit existing ones. In addition to the equipment housed in the maintenance facilities, the buildings themselves need ongoing attention, including roof replacements, plumbing upgrades, general repairs to offices and other employee areas, etc.

## STATIONS

Stations are composed of the basic structure, including roofs and platforms, etc., as well as the equipment inside of the buildings, such as lights, elevators, and escalators. The MBTA system has over 250 stations. This includes 124 rapid transit and light rail stations, six of which serve more than one line (North Station, Haymarket, State Street, Government Center, Park Street, and Downtown Crossing). Subway stations typically have a useful life of 50 years. The MBTA also has 134 commuter rail stations including North Station, out of which the five North Side commuter rail lines operate, and South Station, out of which the eight South Side commuter rail lines operate. The Silver Line Washington Street bus rapid transit (BRT) line has 17 stations, and the MBTA owns 160 stops that are distributed throughout the bus system. Several rapid transit stations—Harvard Square, Ruggles, Ashmont, Haymarket, and Forest Hills—are also major bus terminals. Dudley is the only major station facility that serves bus and BRT, but not rapid transit.

Extensive station renovation work is currently being completed on the Red and Blue Lines. Red Line stations in Dorchester and the Red Line component of South Station are undergoing complete reconstruction. Eight Blue Line stations are being modernized to accommodate six-car trains and to make them fully accessible through the installation of new elevators and entrances. Over the past several years, the MBTA has implemented a program to improve elevator and escalator operability, in order to make stations more accessible to all customers. As a result of the rigorous inspections, maintenance, and repairs undertaken under this program, elevator and escalator operability and reliability have improved dramatically. The MBTA will continue

*Escalator in Red Line station*

to prioritize elevator and escalator state of good repair for the future.

Although most of the station structures will outlast the horizon of this PMT, many station components will need to be replaced or repaired during the next 25 years. For example, roof replacements are anticipated at Roxbury Crossing, Jackson Square, Mass. Avenue, and Forest Hills Stations. In addition, ventilation, platform, pavement, and drainage repairs will be necessary at stations throughout the system. The work needed to bring other stations into SGR, e.g., Boylston Station, will be undertaken in the context of the accessibility program, which is discussed in Chapter 6.

Also of importance in maintaining the aesthetics of stations and promoting ease of customer use is the continuous replacement of outdated signage. This station update process, which is currently underway through initiatives such as the wayfinding program, will be continued throughout the period of this PMT.

## FACILITIES

MBTA "facilities" encompass a wide variety of structures, including administrative buildings, operators' lobbies, ferry terminals, vent buildings, storage buildings, noise walls, tunnels, culverts, retaining walls, parking garages, parking lots, escalators and elevators, ventilation structures, and the fencing necessary to prevent trespassers from gaining access to tracks carrying fast-moving trains. MBTA-owned administrative buildings include 45 High Street, 500 Arborway, Charlestown (Buildings 2 and 3), the Cobble Hill commuter rail operations facility, the Quality Control Facility on Freeport Street, and the MBTA Police Headquarters on Southampton Street, plus various others located throughout the rapid transit and commuter rail systems.

Commuter rail facilities include all structures or facilities at the 12 outlying layover points. Located at or near the end of commuter rail lines, layover areas are where trains are stored and serviced overnight. Repair equipment and facilities are located here to service and clean the

***MBTA BUS-WASHING FACILITY***

trains, prevent cold weather damage, perform maintenance, and eliminate idling. The MBTA also owns several commuter rail maintenance facilities, including Readville Mechanical, Readville maintenance of way (MOW), Abington MOW, Wilmington MOW, and Roland Street MOW. In addition, the Authority owns commuter rail equipment storage facilities at Lowell, Attleboro, Franklin, Rockport, and Wilmington.

The MBTA has recently made much progress bringing station elevators and escalators into SGR and maintaining them at a high level of reliability for customers with limited mobility. Going forward, emergency repairs are needed for many facility structures and components throughout the system. For example, MBTA parking garages are in serious need of work, and repairs are needed to stop leaks in many of the Authority's rapid transit tunnels. In addition, significant improvements are needed to the bathrooms and other facilities that are provided for the use of the front line employees who operate and repair the buses and trains.

## BRIDGES

The MBTA owns and maintains 470 bridges systemwide, including 290 commuter rail, 57 rapid transit, 82 highway bridges that pass over MBTA

tracks, and 41 pedestrian bridges that also cross over MBTA tracks. The Authority also owns and maintains 610 culverts on various commuter rail lines. Railroad and transit bridges typically have a useful life of 70 years, while highway and pedestrian bridges have a useful life of 50 years. Many of the bridges owned and/or maintained by the MBTA are reaching or have attained their life expectancies. While many of these bridges are in good structural condition, others are anticipated to need repairs.

The MBTA has an ongoing inspection program that is used to rate the condition of each bridge. The Authority prioritizes bridge replacement/reconstruction needs based on these ratings as well as a variety of factors including age, safety implications, service impacts, and the potential to disrupt service. Throughout the system, there are several highway bridges that are anticipated for future repair or replacement because of their age and condition.

Major rehabilitation projects are currently underway or are funded for the Merrimack River bridge on the Haverhill Line, the Concord Main Street bridge on the Fitchburg Line, the drawbridge over the Charles River that is used by all North Side commuter rail lines, the Fairmount Line bridges, the Beverly/Salem drawbridge, and Green Line bridges.

A number of MBTA railroad bridges will be a priority for future replacement and rehabilitation to improve the long-term structural integrity of the bridges, including West Street (Needham Junction), Washington Street (Somerville), the Gloucester drawbridge, and the Shawsheen River bridges. In addition, several rapid transit bridges have been identified as future candidates for rehabilitation, including the Savin Hill Underpass.

## TECHNOLOGY

The MBTA has recently invested in many new technologies to improve the reliability, comfort, and convenience of its services. These include variable-message signs, automated stop announcements, automated-fare-collection equipment, and computer-aided dispatch/automatic vehicle locators (CAD/AVL). Although this equipment is state of the art now, the MBTA will need to track technology trends closely and react rapidly to keep this equipment up-to-date and in SGR. It is anticipated that the MBTA will replace much of its current technology during the next 25 years.


*Variable-message sign in MBTA station*