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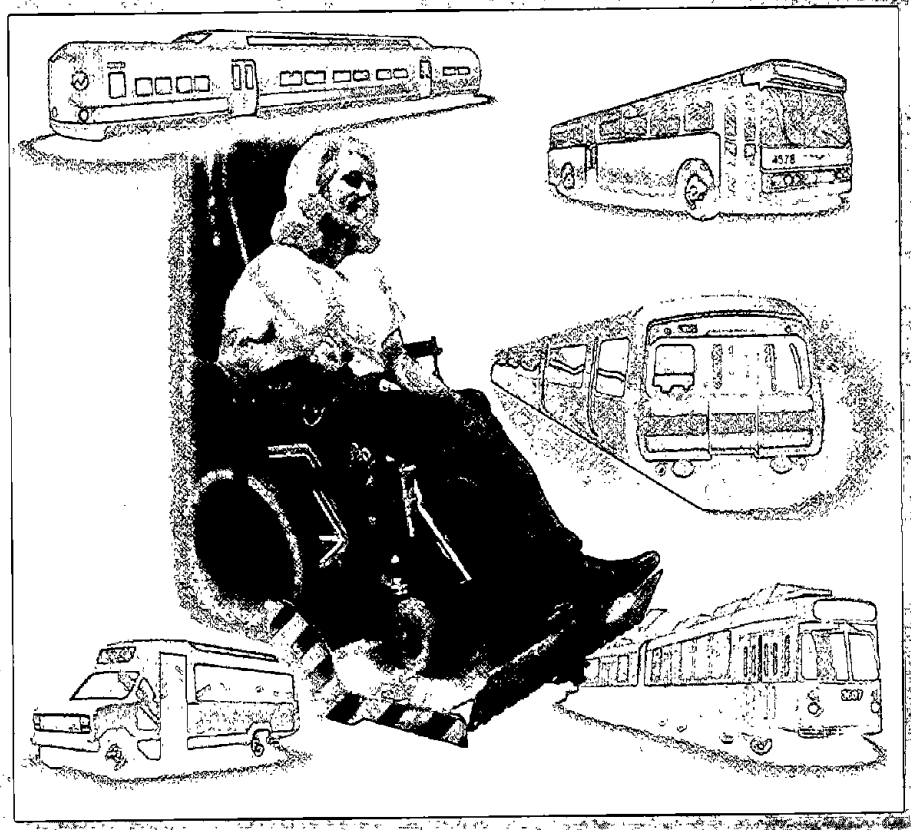
U.S. Department
of Transportation
**Federal Transit
Administration**

Assessment of ADA Research and Development Needs

Final Report
July 1997



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13. ABSTRACT (Maximum 200 words)

The Federal Transit Administration (FTA) has sponsored this project in order to assess the progress that transit systems have made in improving the accessibility of their services and facilities. Specific objectives included the identification of innovative solutions to technical and operational challenges in implementing the accessibility requirements of the Americans with Disabilities Act (ADA) regulations; and the identification of potential research and development areas for FTA support.

The assessment methodology was based on the collection and organization of data from the perspective of a disabled passenger as they make a complete trip—from learning about and preparing to use available transit service, to the point where passenger leaves the vehicle or station/terminal. A total of 32 transit systems agreed to participate (29 on-site assessments and 3 mail/telephone reviews), with at least one on-site visit in each of FTA's ten regions and all major transit modes covered.

The results include more than 70 innovative technologies and practices, organized by passenger activity, e.g., finding the correct vehicle, entering the vehicle, traveling on the vehicle, etc. It is concluded that the FTA has already initiated research and technical assistance projects on a number of the most difficult ADA implementation issues including bus stop annunciation, wayfinding by visually impaired persons, mobility aid securement and occupant restraint, and travel training. There are no major technical problems remaining related to ADA accessibility for fixed route transit that warrant an independent program of federal research and development.

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transit accessibility, transit assessment, ADA requirements, ADA equipment and technology, accessible paths, vehicle accessibility, facility accessibility, innovative solutions, transit systems, mobility improvements, wheelchair access, communications with visually impaired persons, communications with hearing impaired persons

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The ADA Assessment project was conducted by a Project Team assembled by TMS consisting of senior technical professionals, each with an extensive background in ADA accessibility and technology issues. The following individuals, along with the authors, participated in all aspects of the project including the development of the ADA Assessment review questions and procedures, and the performance of on-site assessment reviews at three or more transit systems:

- Annabelle Boyd – Boyd, Maier & Associates
- Judith Byman – JB Enterprises
- Vincent DeMarco – Trans-Tech
- Patricia Maier – Boyd, Maier & Associates
- Thomas J. McGean – Specialist-Innovative Transit

John Balog of the KETRON Division of the Bionetics Corporation conducted an independent review of the ADA Requirements and the Review Questions that were used by the Project Team when conducting the assessment review.

The success of the project was dependent upon the cooperation and good will of the management and staff at each of the 32 transit systems (presented in Section 2, Table 2-1) that agreed to participate in the ADA Assessment Review process. The authors appreciate the time and effort of the numerous individuals at each transit system who: arranged the on-site visits; provided technical data and information; patiently answered the review questions; and responded to requests for follow-up data and information.

Finally, the authors would like to thank Tamara L. DeGray for her contributions and effort in the preparation of this report.

METRIC/ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in) = 2.5 centimeters (cm)
1 foot (ft) = 30 centimeters (cm)
1 yard (yd) = 0.9 meter (m)
1 mile (mi) = 1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in^2) = 6.5 square centimeters (cm^2)
1 square foot (sq ft, ft^2) = 0.09 square meter (m^2)
1 square yard (sq yd, yd^2) = 0.8 square meter (m^2)
1 square mile (sq mi, mi^2) = 2.6 square kilometers (km^2)
1 acre = 0.4 hectare (ha) = 4,000 square meters (m^2)

MASS - WEIGHT (APPROXIMATE)

1 ounce (oz) = 28 grams (gm)
1 pound (lb) = .45 kilogram (kg)
1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp) = 5 milliliters (ml)
1 tablespoon (tbsp) = 15 milliliters (ml)
1 fluid ounce (fl oz) = 30 milliliters (ml)
1 cup (c) = 0.24 liter (l)
1 pint (pt) = 0.47 liter (l)
1 quart (qt) = 0.96 liter (l)
1 gallon (gal) = 3.8 liters (l)
1 cubic foot (cu ft, ft^3) = 0.03 cubic meter (m^3)
1 cubic yard (cu yd, yd^3) = 0.76 cubic meter (m^3)

TEMPERATURE (EXACT)

$°C=5/9(°F - 32)$

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm) = 0.04 inch (in)
1 centimeter (cm) = 0.4 inch (in)
1 meter (m) = 3.3 feet (ft)
1 meter (m) = 1.1 yards (yd)
1 kilometer (km) = 0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm^2) = 0.16 square inch (sq in, in^2)
1 square meter (m^2) = 1.2 square yards (sq yd, yd^2)
1 square kilometer (km^2) = 0.4 square mile (sq mi, mi^2)
10,000 square meters (m^2) = 1 hectare (ha) = 2.5 acres

MASS - WEIGHT (APPROXIMATE)

1 gram (gm) = 0.036 ounce (oz)
1 kilogram (kg) = 2.2 pounds (lb)
1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons

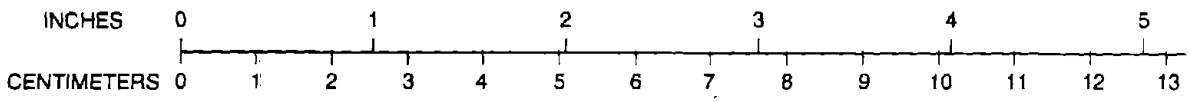
VOLUME (APPROXIMATE)

1 milliliter (ml) = 0.03 fluid ounce (fl oz)
1 liter (l) = 2.1 pints (pt)
1 liter (l) = 1.06 quarts (qt)
1 liter (l) = 0.26 gallon (gal)
1 cubic meter (m^3) = 36 cubic feet (cu ft, ft^3)
1 cubic meter (m^3) = 1.3 cubic yards (cu yd, yd^3)

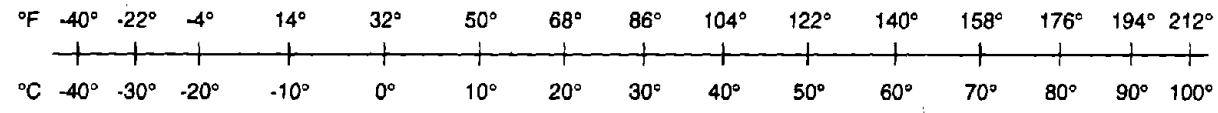
TEMPERATURE (EXACT)

$°F=9/5(°C) + 32$

QUICK INCH-CENTIMETER LENGTH CONVERSION



QUICK FAHRENHEIT-CELSIUS TEMPERATURE CONVERSION



For more exact and or other conversion factors, see NIST Miscellaneous Publication 286, Units of Weights and Measures. Price $2.50. SD Catalog No. C13 10286.

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Table of Contents

List of Figures

List of Tables

Executive Summary

The Americans with Disabilities Act (ADA), enacted in 1990 (Public Law 101-336), guarantees individuals with disabilities access to employment, public accommodations, transportation, public services, and telecommunications. U.S. Department of Transportation (DOT), through the Federal Transit Administration (FTA), has developed regulations that set forth the specific elements that comprise access to public transportation services. Much of the attention on the effect of ADA on public transportation has focused on the requirement of transit systems to provide complementary paratransit service for individuals who are unable to use the fixed route service. Many transit systems have been scrambling to establish their paratransit service, with a January 1997 deadline for full service. In contrast, the changes to accessibility in fixed route service are more gradual; they are taking place as old equipment is replaced and passenger facilities are being renovated. The accessibility changes are also spread over all parts of a transit system: operations, customer relations, procurement, vehicle maintenance, facility design and construction. The move toward greater accessibility is sometimes decentralized, without overall coordination—particularly in larger, multimodal transit systems.

E.1 PROJECT OBJECTIVES

The Volpe National Transportation Systems Center (Volpe Center) and Technology & Management Systems, Inc. (TMS) conducted this project to help the FTA to assess the progress that transit systems have made to overcome the technical and operational challenges in implementing ADA. The project had three primary objectives:

- Determine the progress of transit systems in increasing the accessibility of their services.
- Identify innovative solutions developed by transit systems to meet the requirements of ADA.
- Identify potential research and development areas for FTA to support to improve transit accessibility.

To meet these primary objectives, Team members sought answers to the following questions:

- What solutions were in place and working prior to ADA?

- Where are the sources for the solutions implemented since ADA?
- What determines the balance between the use of technology and labor in meeting the requirements?
- What are the costs to install (or purchase/build) and then maintain the solutions?
- Are improvements implemented on a systemwide basis?
- What problems have proved unexpectedly difficult to resolve?

E.2 METHODOLOGY

The underlying theme to the approach used by the Project Team to collect and organize the data was to "follow" a disabled passenger as that passenger rides a bus or train. This way of thinking about ADA helped the Project Team to focus on the practical, perhaps even mundane, details of using transit that a non-disabled rider may take for granted. The activities of a passenger were grouped as follows:

1. System Information/Trip Planning (learning about the available transit service and preparing to use it)
2. Finding the Correct Vehicle
3. Entering the Vehicle
4. Traveling on the Vehicle
5. Departing the Vehicle
6. Leaving the Station/Terminal

There are individual functions that comprise each of these six activities. For each function within each activity, the Project Team identified the pertinent requirements, as set forth in the ADA regulations. From this ADA Requirements List, the Project Team created a set of review questions. These review questions served as the primary data collection mechanism during the on-site visits and the telephone reviews.

E.3 SELECTION OF REVIEW SITES

TMS conducted site visits at 29 transit systems; mail or telephone reviews were conducted with an additional three transit systems. There was at least one site visit in each FTA region. The reviews encompassed all major modes: 25 fixed route bus operations; eight light rail operations; seven rapid rail operations; five commuter rail operations; plus one automated guideway and two paratransit systems.

In selecting the set of transit systems for ADA assessments, the Project Team sought a wide range of operating characteristics and environments. This diversity provided the opportunity to observe problems that are representative of problems faced by all transit systems, as well as observe innovations that may be transferrable to many other systems. For example, the fleet sizes of the fixed route bus operations ranged from under 100 (Bridgeport, Topeka) to over a thousand (Houston, New York, Philadelphia).

E.4 ASSESSMENT HIGHLIGHTS

Transit systems have made great progress in adapting their services, vehicles, and facilities to meet the requirements of ADA. Most encouraging is that many of the technologies and practices that transit systems are using are relatively low cost and simple to implement. A sampling of these technologies and practices are cited in the following paragraphs. The report contains full descriptions of over 70 innovative technologies and practices.

In the area of providing **system information** to passengers and developing handbooks to assist other transit systems to improve accessibility, here are three transit system practices:

- **Customized Trip Itinerary Cassette**, Bi-State Development Agency (St. Louis), to help visually-impaired passengers use fixed route service.

- **Information Kiosks and Brochures**, Seattle Metro, including a map of downtown Seattle that indicates accessible paths.

- **Bus Stop Handbook**, Valley Metro (Phoenix) providing ADA design guidelines for use by municipalities.

In the area of improving **vehicle and facility access**, some innovative transit system practices and technologies are:

- **Specifications for Wheelchair Maneuverability**, AC Transit (Oakland), designing bus interiors for easier use by wheelchair users.
- **Mud Flap for Wheelchair Lift**, Greater Bridgeport Transit District, a low cost device to improve rear-door lift reliability.
- **Accessible Supervisor Vehicles**, RIPTA (Rhode Island) and Valley Metro, allowing supervisors to transport passengers when there are lift problems on the bus.
- **Stokes Strap**, Valley Metro, for speeding and simplifying wheelchair securement.
- **Intermodal Transfers**, MARTA (Atlanta) allowing convenient and fully accessible transfer between rail and bus.

In the area of **communicating with passengers** at the station and on the vehicle, some innovative transit system practices and technologies are:

- **Train Announcements Using Male/Female Voices**, Metro-Dade Transit Agency (Miami), providing a clear way to distinguish the direction of an incoming train.
- **Passenger Intercoms**, MTA of Maryland and Chicago Transit Authority, allowing rail passengers to communicate directly with the train operator.
- **Improved Station ID Signage**, SEPTA (Philadelphia), providing more visible exterior signs for passenger in the trains.

E.5 OTHER FINDINGS

The FTA, through its own research and technical assistance and the projects it supports through Project ACTION, has focused attention on a number of the most prominent ADA implementation issues, including: bus stop annunciation; wayfinding by visually impaired persons; mobility aid securement and occupant restraint; and travel training.

The greatest impediments for fixed route transit operators to full implementation of the ADA are institutional issues: responsibility for facilities and surroundings divided among multiple public (and on occasion, private) entities; reluctance or resistance by transit staff to modify their practices to accommodate individuals with disabilities; and competing priorities for available financial resources.

There are no major technical problems remaining related to ADA accessibility for fixed route transit that warrant an independent program of federal research and development. There is, however, a real need in the transit industry for individuals involved in ADA implementation to have easy access to information about technology, specialized equipment, procedures/practices, and training programs. Most importantly, such information should reflect each transit system's experience in terms of cost, performance, reliability, and effectiveness. Easy access to timely and relevant information will require a substantial and continuing commitment to the acquisition of quality information and organization of important data into a user-friendly format.

E.6 RECOMMENDATIONS

Based upon the findings of this project, the following steps are recommended for FTA action.

1. **Require Grantees to Measure Project Cost and Effectiveness**

   In any of its future activities related to ADA accessibility improvements, whether contracted directly by the FTA or through other organizations such as Project ACTION or the Transit Cooperative Research Program (TCRP), the FTA should require the grantee to measure and report on the costs, effectiveness, performance, and reliability of technology improvements and practices in terms that are meaningful to the transit systems that are interested in implementing such new ideas. There are existing models for evaluation of FTA-sponsored projects, e.g., the "Advanced Public Transportation Systems: Evaluation Guidelines." These guidelines can be adapted for use in evaluating ADA technologies. The guidelines provide specific procedures for ensuring consistency of evaluation philosophy and techniques, and the development of measures to promote comparability and transferability of results.

2. **Establish "ADA Transit Technology Information Center"**

   The FTA should establish an "ADA Transit Technology Information Center" that would serve two roles: collect information on ongoing ADA practices and technologies; and respond to queries about specific ADA-related transit issues.

Currently, there is no single means of obtaining information on the location and status of FTA-sponsored programs that yield innovative ADA technologies/practices. The ADA Transit Technology Information Center would have the role of gathering this information, including contact names at the transit systems to gain the latest information on these developments.

The second role of the ADA Transit Technology Information Center would be to respond to transit systems that have questions about specific technologies or practices. Transit systems would be able to obtain specific and timely information and guidance on the availability, performance, reliability, effectiveness, and cost of ADA technology and equipment to perform some specified function. The ADA Transit Technology Information Center would draw this information from the actual operating experience of transit systems. The information would be continuously updated through a cooperative and mutually beneficial data collection agreement with the transit industry.

Section 1
Introduction

The Americans with Disabilities Act (ADA), enacted in 1990 (Public Law 101-336), guarantees individuals with disabilities access to employment, public accommodations, transportation, public services, and telecommunications. U.S. DOT, through the Federal Transit Administration (FTA), has developed regulations that set forth the specific elements that comprise access to public transportation services. (Appendix A lists the titles and section numbers of the applicable regulations.) Public transportation operators face many technical and operational challenges in complying with these regulations and making their services accessible. They must examine all of their activities, all of their vehicles, and all of their facilities—both as individual components and as an integrated system—to determine how to meet the needs of their disabled passengers.

Much of the attention on the effect of ADA on public transportation has focused on the requirement of transit systems to provide complementary paratransit service for individuals who are unable to use the fixed route service. This current emphasis on paratransit could be explained by two factors. First, the deadlines for complying with the paratransit regulations are closer (full compliance by January, 1997); second, paratransit is a new responsibility for many fixed route systems, often requiring establishment of new departments and hiring new staff. In contrast, the changes to accessibility in fixed route service are more gradual; they are taking place as old equipment is replaced and passenger facilities are being renovated. The accessibility changes are also spread over all parts of a transit system: operations, customer relations, procurement, vehicle maintenance, facility design and construction. The move toward greater accessibility is sometimes decentralized, without overall coordination—particularly in larger, multimodal transit systems.

1.1 PROJECT OBJECTIVES

The Volpe National Transportation Systems Center (VNTSC) and Technology & Management Systems, Inc. (TMS) conducted this project to help the FTA to assess the progress that transit systems have made to overcome the technical and operational challenges in implementing ADA. The project had three primary objectives:

- Determine the progress of transit systems in increasing the accessibility of their services.

- Identify innovative solutions developed by transit systems to meet the requirements of ADA.

- Identify potential research and development areas for FTA to support to improve transit accessibility.

To meet these primary objectives, Team members sought answers to the following questions:

- What solutions were in place and working prior to ADA?

- Where are the sources for the solutions implemented since ADA?

- What determines the balance between the use of technology and labor in meeting the requirements?

- What are the costs to install (or purchase/build) and then maintain the solutions?

- Are improvements implemented on a systemwide basis?

- What problems have proved unexpectedly difficult to resolve?

The primary means of data collection was a series of transit systems site visits (and selected telephone/mail surveys) in which Team members viewed operations and facilities and met with transit system staff.

1.2 ADA AND FIXED ROUTE SERVICE

Under the regulations' definition of full accessibility for fixed route service, a portion of the disabled population will continue to require paratransit. Nevertheless, transit systems have a great financial incentive to accommodate as many trips as possible on the fixed route, as opposed to paratransit. Based on statistics from the FTA's National Transit Database, the average operating cost per unlinked passenger trip on buses, light rail, and heavy rail is about two dollars; for complementary paratransit, the average operating cost per passenger trip is more than 10 dollars.

Many individuals with disabilities would prefer to use fixed route service if they could; compared to paratransit, fares are lower and service is more flexible. By making stations, stops, vehicles, and information more accessible, transit systems provide disabled individuals a greater opportunity to

use their preferred mode of travel. At the same time, enabling more disabled individuals to travel on fixed route frees up more capacity on paratransit for those who need the special service.

Furthermore, greater fixed route accessibility benefits everyone. Here are some examples of accessibility improvements that are helpful to a broader set of passengers:

- Automated traveler information systems that allow travelers to call at all times to obtain route and schedule information.
- Curb cuts, ramps, and elevators for parents pushing strollers.
- Larger, easier to read, and consistently designed signs that make it easier for passengers to find their way on their own.
- Stop announcements on buses that help riders who are unfamiliar with the route..
- Brighter lighting to make waiting passengers feel more secure while waiting at bus stops or on platforms.

All of these changes make it easier for all passengers to learn about service and plan their trips; to navigate their way through the system; or use the vehicles and facilities. Also, any features that make it easier to use fixed route service will encourage more people to ride the buses and trains, and ride them more often.

1.3 OTHER FTA EFFORTS TO ASSESS ADA COMPLIANCE

The FTA has funded (or is overseeing) three other recent initiatives to gather information on the progress of transit systems in achieving compliance with the ADA regulations.

In 1994, Project ACTION provided the American Public Transit Association (APTA) with a grant (through FTA funding) to survey its members on the obstacles to full implementation of the transportation requirements of the ADA. The purpose of this project was to guide Project ACTION in funding future studies and demonstration projects. TMS worked with APTA on this survey, providing 10 of the 15 questions used in the questionnaire distributed to the transit systems. APTA

produced a summary of its findings in 1995.[1] This summary report cited key concerns of transit operators, both for paratransit and fixed route service. The report did not include responses from individual transit systems.

Since 1992, transit systems that provide fixed route bus and rail service have been submitting ADA Complementary Paratransit Plans to the FTA on an annual basis. Part of these submissions have included data on the accessibility of the systems' fixed route buses. This information has allowed FTA to track the industrywide progress on that aspect of ADA compliance.

In 1996, the FTA has been conducting "ADA Key Station Reviews." These reviews are on-site inspections of rail operations (rapid, light, and commuter rail) to verify their compliance with the ADA requirements. For systems that were in operation prior to the regulations, station compliance applies to designated "key stations" and stations that opened since the regulations were issued. For newer systems, the regulations apply to all stations. The FTA inspections also cover the rail vehicles, and to a lesser extent, operational issues.

This study differs from the other FTA initiatives in several ways. First, the Project Team has looked beyond the fundamental issue of compliance/non-compliance to understand *how* a transit system got there and what obstacles remain that prevent further progress. Second, this project takes a *systems approach* to assessing compliance with the regulations—by looking at how operations, vehicles, facilities, employees, passengers, and environment all contribute (or clash) to achieve compliance. Third, this project has uncovered specific solutions developed by transit systems. These solutions are presented throughout this report, with the intent that they prove useful for other transit systems facing similar challenges.

1.4 REPORT ORGANIZATION

The remainder of this report is divided into the following sections:

- Section 2, **Methodology**, describes the Team members' activities to conduct the project.

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[1]American Public Transit Association (1995), "New Themes and Directions in the Project ACTION Dissemination and Funding Process: Recommendations From the Transit Industry Perspective."

- Section 3, **Findings: System Information/Trip Planning**, is the first of six sections that presents information collected from the transit system site visits and mail/telephone surveys on one of the functional activities related to using fixed route service; these activities are discussed at the beginning of Section 2. The findings of ADA solutions and obstacles are also cross-referenced by passenger disability, by transit mode, and by transit system.

Sections 4 through 8 follow similar formats in presenting information about each of the other travel activities.

- Section 4, **Findings: Finding the Correct Vehicle**.
- Section 5, **Findings: Entering the Vehicle**.
- Section 6, **Findings: Traveling on the Vehicle**.
- Section 7, **Findings: Departing the Vehicle.**
- Section 8, **Findings: Leaving the Station/Terminal**.
- Section 9, **Conclusions and Recommendations**, presents conclusions drawn from the project research and analysis. This section also poses several recommendations to the FTA for promoting further transit accessibility improvement and for encouraging the development of innovative solutions.

The report also includes the following appendices:

- **ADA Requirements List.** A list of activities that a user of bus or rail transit undertakes, and the associated ADA regulations.
- **Review Questions for Assessment of ADA Research and Development Needs.** The full set of questions used by Team members to interview transit system staff.
- **Review Questions for Site Visit: Interviewer Guide.** A set of comments and guidance materials used by Team members to accompany the Review Questions.
- **Glossary of Transit Accessibility Terms.** A selected set of specialized words and phrases used in the context of the ADA site visits.

- **Transit System Contacts.** A list of staff at the transit systems who can provide additional information about the ADA solutions presented in this report.

Section 2
Methodology

This section of the report describes the major activities of the Project Team to conduct this study. These activities include:

- Developing the approach for reviews.
- Selecting transit systems for review.
- Preparing for and conducting the reviews.
- Analyzing the collected data.

The remainder of this section discusses the tasks involved for each of this activities.

2.1 DEVELOP THE APPROACH FOR REVIEWS

The underlying theme to the approach used by the Project Team to collect and organize the data was to "follow" a disabled passenger as that passenger rides a bus or train. This way of thinking about ADA helped the Project Team to focus on the practical, perhaps even mundane, details of using transit that a non-disabled rider may take for granted. The activities of a passenger were grouped as follows:

- 1. System Information/Trip Planning (learning about the available transit service and preparing to use it).
- 2. Finding the Correct Vehicle.
- 3. Entering the Vehicle.
- 4. Traveling on the Vehicle.
- 5. Departing the Vehicle.

- 6. Leaving the Station/Terminal.

There are individual functions that comprise each of these six activities. For example, finding the correct vehicle includes some or all of the following functions (depending on the particular transit mode):

- Locating the stop, station, or terminal.
- Locating and accessing the fare system (for rail).
- Activating and passing through the fare gate.
- Moving to the proper boarding area/platform.
- Identifying the correct incoming vehicle.
- Identifying and moving to the vehicle doorway.

For each function within each activity, the Project Team identified the pertinent requirements, as set forth in the ADA regulations. The complete set of actions, the individual functions, and the associated ADA requirements are listed in Appendix A.

From this ADA Requirements List, the Project Team created a set of review questions. These review questions served as the primary data collection mechanism during the on-site visits and the telephone reviews. There are question sets that correspond to the six passenger activities. For three of the six activities (finding the correct vehicle; entering the vehicle; departing the vehicle), separate questions sets were developed for rail (low platform and high platform) and bus. For example, Question Set 2a., "Finding the Correct Bus," includes the following questions:

1. What special provisions have been made to assist passengers to locate the proper bus stop location (on the street or within a terminal area) and to identify the correct bus for boarding?
   - blind and visually impaired
   - individuals with cognitive disabilities
   - other persons with disabilities

2. Is there any use of tactile or audio paths to guide persons to the correct bus stop location?

3. Are bus stops identified by uniform features and large print/high contrast signage?

4. Is there any audio or visual sign announcement capability at any bus stops?

5. Are there any special provisions for audio or visual identification of each bus?

6. Is there a way for a blind or visually impaired person to identify the correct bus when different routes use the same stop? Is there a way for that individual to identify him/herself to the driver?

In addition to the question sets corresponding to the six activities, TMS developed an initial set of questions, "Overview of ADA Activities," that seek information on how a transit system makes policy and manages ADA issues. Small revisions were made to the wording and ordering of original version of the review questions after the Project Team conducted a set of pilot transit system reviews (discussed below). Appendix B provides a complete listing of the revised Review Questions.

Appendix C includes the "Interviewer Guide." This document is a companion to the Review Questions. The Guide provided the Team members with guidance and comments on the review questions and review process. Appendix D is a "Glossary of Transit Accessibility Terms," which explains technical phrases and terms used in the review questions. The glossary helped to provide Team members and transit staff with a consistent basis for presentation of questions and collection of data.

2.2 SELECT TRANSIT SYSTEMS FOR REVIEW

TMS conducted site visits at 29 transit systems; mail or telephone reviews were conducted with an additional three transit systems. There was at least one site visit in each FTA region. The reviews encompassed all major modes: 25 fixed route bus operations; eight light rail operations; seven rapid rail operations; five commuter rail operations; plus one automated guideway and two paratransit systems. Table 2-1 presents a list of the transit systems reviews. Figures 2-1 and 2-2 display maps of the review sites.

Table 2-1
Assessment of ADA Research & Development Needs
Transit System Reviews

City	State	Transit System	FTA Region	Modes	Review Month
Bridgeport	CT	GBTD	1	B	Nov 94
Providence	RI	RIPTA	1	B	Oct 94
Garden City	NY	LI Bus	2	B	June 95
Jamaica	NY	LIRR	2	C	June 95
New York	NY	NYCT	2	B R	June 95
New York	NY	MNCR	2	C	June 95
Baltimore	MD	MTA-MD	3	B L R	Nov 94
Charlottesville	VA	Jaunt	3	P	Nov 94
Philadelphia	PA	SEPTA	3	B C R	Mar 95
Atlanta	GA	MARTA	4	B R	Apr 95
Fort Lauderdale	FL	Tri-Rail	4	C	Feb 95
Miami	FL	MDTA	4	A B R	Feb 95
Pompano Beach	FL	Broward Co.	4	B	Feb 95
Chicago	IL	CTA	5	R	Mar 95
Chicago	IL	Metra	5	C	Mar 95
Madison	WI	Metro	5	B	June 95
Minneapolis	MN	MCTO	5	B	Nov 94
Bryan	TX	Brazos TS	6	B P	Jan 95 (T)
Houston	TX	Metro	6	B	Mar 95
Topeka	KS	Topeka MTA	7	B	Jan 95 (M)
Omaha	NE	MAT	7	B	Mar 95
St. Louis	MO	BSDA	7	B L	Mar 95

Table 2-1
Assessment of ADA Research & Development Needs
Transit System Reviews (Cont.)

City	State	Transit System	FTA Region	Modes	Review Month
Albuquerque	NM	Sun Tran	8	B	Jan 95 (T)
Denver	CO	RTD	8	B L	Mar 95
Phoenix	AZ	RPTA	8	B	Apr 95
Oakland	CA	BART	9	R	Feb 95
Oakland	CA	AC Transit	9	B	Feb 95
Sacramento	CA	SRTD	9	B L	Mar 95
San Diego	CA	MTDB	9	B L	Apr 95
San Francisco	CA	Muni	9	B L	Feb 95
Portland	OR	Tri-Met	10	B L	Feb 95
Seattle	WA	Metro	10	B L	Feb 95

KEY:

Modes:

B	Bus
C	Commuter Rail
L	Light Rail
P	Paratransit
R	Rapid Rail
A	Automated Guideway

For Review Month:

(T)	Telephone Review
(M)	Mail Review

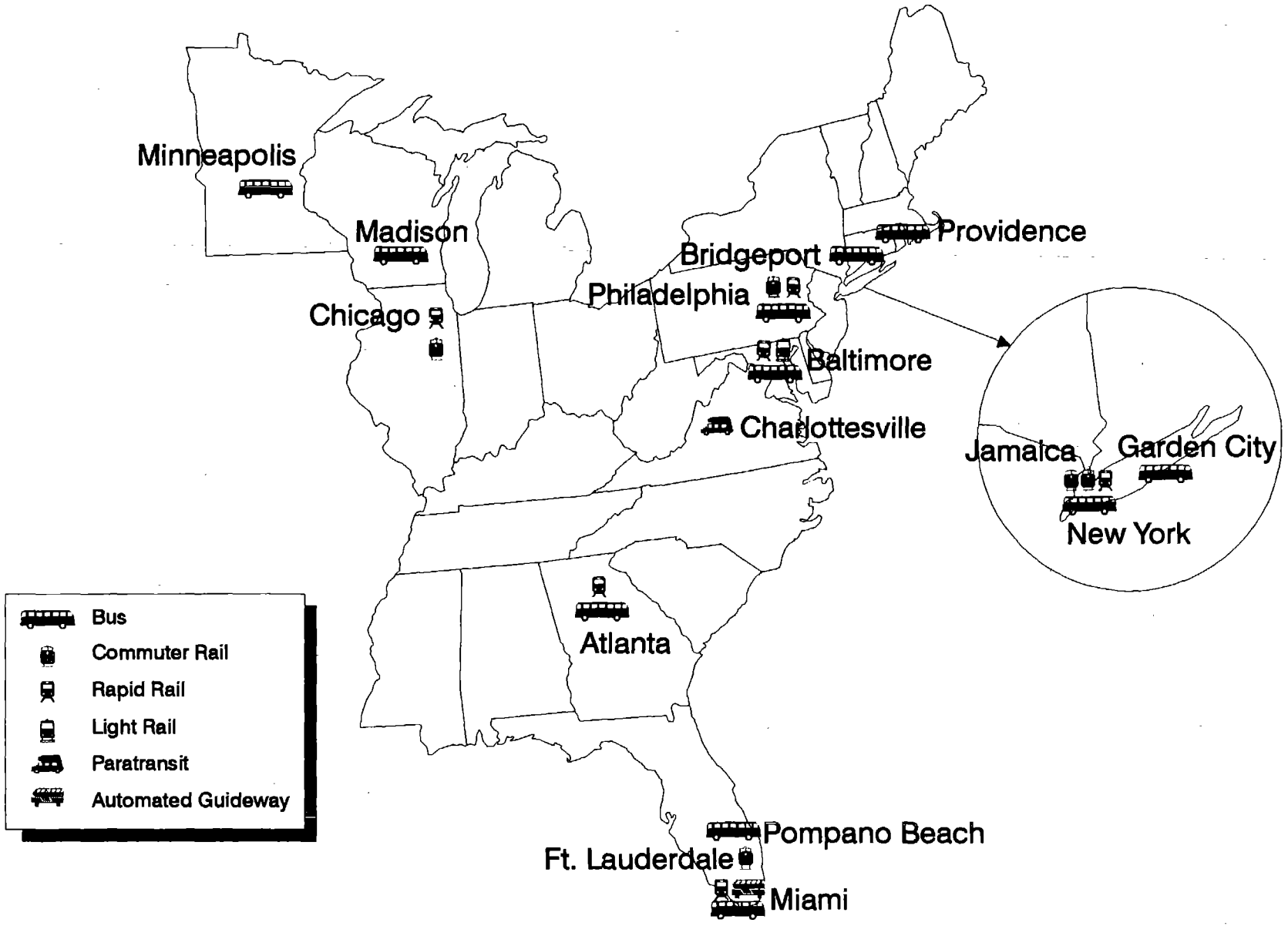


Figure 2-1
Locations of ADA Assessment Reviews–FTA Regions 1 to 5

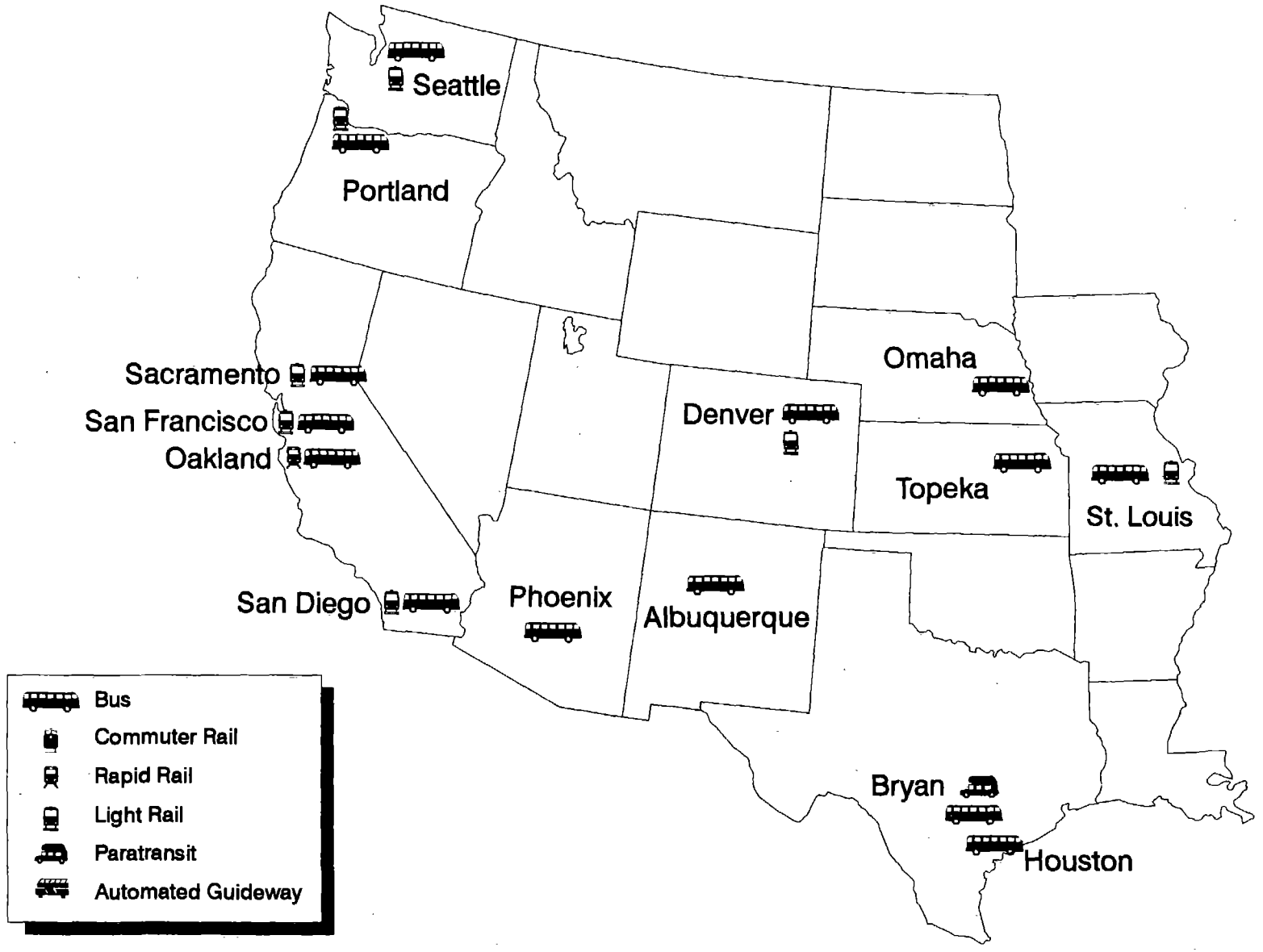


Figure 2-2
Locations of ADA Assessment Reviews–FTA Regions 6 to 10

In selecting the set of transit systems for ADA assessments, the Project Team sought a wide range of operating characteristics and environments. This diversity provided the opportunity to observe problems that are representative of problems faced by all transit systems, as well as observe innovations that may be transferrable to many other systems. For example, the fleet sizes of the fixed route bus operations ranged from under 100 (Bridgeport, Topeka) to over a thousand (Houston, New York, Philadelphia).

The age of the operations, their vehicles, and their facilities also varied greatly. This affected the nature of the problems faced by the transit systems. A number of the rail systems have passenger facilities built in the 19th century and have not had a major renovation for decades. The effort that they must undertake to bring their system in compliance with the ADA regulations is considerable. In contrast, two of the light rail systems visited (Denver, St. Louis) began operations in 1994, so they were developed with the ADA regulations in mind.

The range of operating environments certainly affects the type of obstacles that a transit system must overcome in complying with the ADA regulations. The set of transit systems included in this assessment cover a spectrum of operating environments. "Environment" refers to three separate issues:

- **Climate**. The temperature range (hot and cold), humidity, type and amount of precipitation, and even wind variations all play a role in a transit system's concerns. For example, Portland, Phoenix, and Philadelphia have wide differences in temperature, humidity, and precipitation. Their respective needs for maintaining vehicles and facilities and for protecting passengers affect how they meet the ADA regulations.

- **Geography**. The physical terrain of the area in which a transit system provides service, as well as the spatial pattern of trip origins and destinations affect the type of problems that a system must overcome to meet the regulations. For example, Seattle has particular concerns about safe deployment of wheelchair lifts, in part because of the many hills that its bus routes travel.

- **Jurisdictional Authority**. A transit system must usually rely on other entities to ensure that its service, taken as a whole, complies with the ADA. In most cases, a bus system depends on the city or county to install curb cuts and accessible paths for its bus stops. Many rail systems are tenants (to private companies or other public agencies) in their stations, especially the large multimodal terminals. In a few instances, the transit system has control over its right-of-ways and its passenger waiting areas. But often an obstacle to a transit system's meeting the ADA regulations is that it does not have the legal authority to do so.

To ensure that the study results were representative of all parts of the country, the Project Team contacted at least three transit systems in each of the ten FTA regions to request their participation in the study. The goal was to have at least two systems per region participating, with at least one system taking part in an **on-site** review.

2.3 PREPARE FOR AND CONDUCT THE REVIEWS

Once a transit system agreed to participate in the study, the Project Team worked with the staff to coordinate the details of the site visit, e.g., visit dates, other participating staff, locations to visit while on site. The Project Team also prepared the package of questions that the Team members would be asking during the visit, and sent these question to the transit system in advance of the visit. In addition, the Project Team requested that the transit system send any readily available information about its ADA activities (e.g., planning studies, passenger schedules and flyers, statistics, station plans) to help the Team prepare for the site visit.

2.3.1 Conducting the Reviews

TMS conducted five on-site reviews during the pilot phase of this project during late 1994. All of these on-site reviews were conducted at transit systems that were in close proximity to the home office of the Team member who conducted the review. In addition, TMS conducted three pilot mail/telephone reviews in January 1995. Based on the experience with these reviews, TMS refined the procedures for the remainder of the reviews.

Each on-site review followed the same general pattern. First, the TMS Team member(s) provided an introduction and overview of the project, and explained the goals for the particular site visit. Staff from the transit system had the opportunity to ask questions and then to discuss the key ADA issues for their system. At this opening session, TMS also asked the Overview of ADA Activities (Question Set A) and System Information/ Trip Planning (Question Set 1) questions.

Second, the TMS Team met with transit system staff for each mode to pose the review questions applicable to that mode. The responses to the review questions helped to determine the stops for the "ADA tour." For assessments that encompassed several modes, TMS had separate review question sessions with staff from each mode.

Third, the TMS Team member(s) went on an ADA tour with transit system staff for each mode. This allowed TMS to see firsthand the vehicles, stations, and other facilities where the transit system had

made improvements in accessibility, or where obstacles to accessibility still remained. TMS Team members have documented their observations with photographs and videos.

Site visits at transit systems that covered one mode lasted one full day. For assessments that encompassed two or more modes, the total time on site was generally one day per mode (e.g., two days for MARTA, three days for SEPTA).

2.4 ANALYZE COLLECTED DATA

TMS Team members reviewed the information collected from all of the assessments conducted. The primary data sources are the responses to the review questions, photographs, and videos. In addition, transit systems have provided a wide range of sample material that demonstrates their ADA activities, including:

- Schedules, maps, and brochures distributed to the general public.
- ADA paratransit plans and key station plans.
- Accessible format material, e.g., Braille and audio tape schedules.
- Videos for staff training, public outreach, and internal use.
- Studies, reports, memos and data collected for internal use.
- Vehicle bid specifications.
- Employee manuals.
- Architectural plans and other facility design documents.

As needed, Team members called staff at transit systems to follow up on site visit observations: to verify data, to request documents not available during the site visit, to check on the progress of a transit system's ongoing project.

Section 3
Findings:
System Information/Trip Planning

This section of the report presents information collected from the transit system site visits and mail/telephone surveys on System Information and Trip Planning: the initial functional activity related to using fixed route service. The first part of this section discusses the issues involved, for all passengers and for disabled passengers in particular. The second part of this section cites the most useful technologies and practices observed by the Team members during the site visits.

3.1 SYSTEM INFORMATION AND TRIP PLANNING ISSUES

When a traveler wants to use public transportation, the first step in the process is to gain information about the available service. For a single trip, the traveler needs the answers to the following questions:

- Is there service close to the origin and destination? Where exactly do I go to board the vehicle?
- Does the service operate during the time and day of the trip?
- What type of vehicle(s) provides this service?
- How much does it cost? How do I pay?
- Will the trip involve a transfer to another vehicle (or mode)?
- Where do I get off the vehicle?
- Can I use public transportation to make my return trip?

Some of the conventional methods that transit systems use to convey this information include the following:

- Printed schedules, maps, and brochures.
- Customized trip planners.
- Customer service telephone lines.
- Staffed information booths at public places.

To meet the requirements of ADA, transit systems must be able to provide all of this information to travelers with disabilities. The applicable regulations for a transit system are cited in Section 1 of Appendix A–ADA Requirements List, "System Information/Trip Planning." These regulations in CFR Chapter 49 include:

- §37.173 Training Requirements.
- §37.167(f) Other Service Requirements.

To meet the needs of individuals with mobility impairments, a transit system's responsibility is to provide information to these individuals that lets them know about the accessibility features of the system, e.g., accessible paths, lifts and ramps, special locations for boarding vehicles. On the other hand, for individuals with visual or hearing disabilities, the transit system's special mission is to provide information about all aspects of its service *in a format that is usable to the traveler*. This is the idea of "accessible formats."

3.2 SYSTEM INFORMATION AND TRIP PLANNING HIGHLIGHTS

The Project Team gathered information and materials from all of the transit systems regarding their efforts to provide information about their services to their disabled passengers. One technology that all of the transit systems in this study make use of is TTYs. These devices allow individuals with hearing impairments to communicate over the telephone. The interviews with transit systems found that the use of TTYs ranges from "several times per week" to "rarely." Since TTYs are a well-established and common technology at transit systems, this report will focus on other technologies and practices found at the transit systems. These selected technologies and programs appear to be

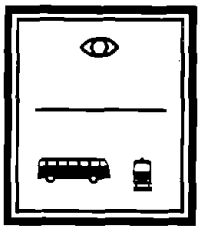
the most promising in terms of transferability and widespread acceptance by the transit industry; at the same time, these technologies and programs are in use at only a few (perhaps only one) transit systems.

There is a short description of each ADA solution or obstacle. Next to the description are graphical icons. These icons indicate: whether the solution or obstacle concerns a mobility, visual, hearing and/or cognitive disability; and mode of transit involved (at the transit system where it was observed; some solutions could be applied to other modes at other systems). In addition, to help readers to locate solutions and obstacles, this section includes tables that has them cross-referenced by passenger disability (Table 3-1), by transit mode (Table 3-2), and by transit system (Table 3-3).

KEY FOR ICONS

Disabilities		Transit Modes	
?	Cognitively Impaired		Automated Guideway
	Hearing Impaired		Bus
	Mobility Impaired		Commuter Rail
	Visually Impaired		Light Rail
			Rapid Rail

3.2.1 *Mailing List for Accessible Schedule and Service Information*



The **Bi-State Development Agency** (BSDA) operates bus, light rail, and paratransit service in St. Louis and surrounding counties in Missouri and Illinois. Since late 1993, BSDA's Customer Services Department has maintained a mailing list of individuals who need schedule and other service information in accessible formats. Any information that is available to the general public is also provided in accessible formats: schedules for individual routes, as well as brochures on other aspects of BSDA service.

Service information is mailed to individuals on the list each quarter, coinciding with schedule changes. The time required to update and maintain the list is fairly small: about 30 hours of staff time per quarter, according to BSDA's Customer Service Director. BSDA publicizes the mailing list through its newsletter, at its ADA committee meetings, and at presentations by its Customer Service Director. As of fall, 1995, the mailing list had over 60 names.

Table 3-1
System Information/Trip Planning Highlights Grouped by Passenger Disability

Disability Group	Idea	Transit System	Mode	Page
	Accessible On-Site System Information	MARTA		3-9
	Key Station Video	Metra		3-10
	Customized Trip Itinerary Cassette	BSDA		3-8
	Mailing List for Accessible Information	BSDA		3-3
	Real-time A/V System on Platform	TCRA		3-10
	Accessible On-Site System Information	MARTA		3-9
	Key Station Fact Sheet	Metra		3-10
	Key Station Video	Metra		3-10
	Accessible On-Site System Information	MARTA		3-9
	Automated Traveler Information System	SEPTA		3-8
	Customized Trip Itinerary Cassette	BSDA		3-8
	In-house Braille Printing	MTA-MD		3-7
	Mailing List for Accessible Information	BSDA		3-3
	Raised-Line Braille Subway Map	NYCT		3-7
	Real-time A/V System on Platform	TCRA		3-10
	Schedules in Electronic Format	Valley Metro		3-9

Table 3-2
System Information/Trip Planning Highlights Grouped by Transit Mode

Mode	Idea	Transit System	Disability Group	Page
Bus	Accessible On-Site System Information	MARTA	Cane, Wheelchair, Eye	3-9
Bus	Automated Traveler Information System	SEPTA	Eye	3-8
Bus	Customized Trip Itinerary Cassette	BSDA	Cane, Eye	3-8
Bus	In-house Braille Printing	MTA-MD	Eye	3-7
Bus	Mailing List for Accessible Information	BSDA	Cane, Eye	3-3
Bus	Schedules in Electronic Format	Valley Metro	Eye	3-9
Heavy Rail	Automated Traveler Information System	SEPTA	Eye	3-8
Heavy Rail	Key Station Fact Sheet	Metra	Wheelchair	3-10
Heavy Rail	Key Station Video	Metra	Cane, Wheelchair	3-10
Heavy Rail	Real-time A/V System on Platform	TCRA	Cane, Eye	3-10
Light Rail	Automated Traveler Information System	SEPTA	Eye	3-8
Light Rail	Customized Trip Itinerary Cassette	BSDA	Cane, Eye	3-8
Light Rail	In-house Braille Printing	MTA-MD	Eye	3-7
Light Rail	Mailing List for Accessible Information	BSDA	Cane, Eye	3-3
Commuter Rail	Accessible On-Site System Information	MARTA	Cane, Wheelchair, Eye	3-9
Commuter Rail	Automated Traveler Information System	SEPTA	Eye	3-8
Commuter Rail	In-house Braille Printing	MTA-MD	Eye	3-7
Commuter Rail	Raised-Line Braille Subway Map	NYCT	Eye	3-7

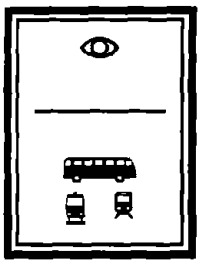
Table 3-3
System Information/Trip Planning Highlights Grouped by Transit System

Transit System	Idea	Disability Group	Mode	Page
BSDA	Customized Trip Itinerary Cassette			3-8
BSDA	Mailing List for Accessible Information			3-3
MARTA	Accessible On-Site System Information			3-9
Metra	Key Station Video			3-10
Metra	Key Station Fact Sheet			3-10
MTA-MD	In-house Braille Printing			3-7
NYCT	Raised-Line Braille Subway Map			3-7
SEPTA	Automated Traveler Information System			3-8
TCRA	Real-time A/V System on Platform			3-10
Valley Metro	Schedules in Electronic Format			3-9

BSDA produces all accessible format material in response to specific passenger requests. The agency takes different approaches for large print, Braille, and cassette formats:

- **Large print** material is easily produced in-house. Information in this format contains the identical words, tables, and graphics as the standard print material.
- **Braille** material is produced by an outside contractor. On the Braille versions, BSDA abbreviates the information presented on the schedules and the brochures.
- **Audio cassettes** (refer to subsequent description of "Customized Trip Itinerary Cassettes.")

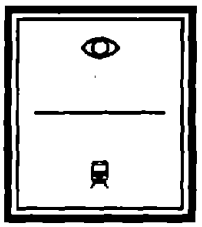
3.2.2 In-house Braille Printing System



The **Mass Transit Administration of Maryland** (MTA-MD) has found it costly to use an outside vendor to produce Braille information (e.g., brochures, schedules) requested by their blind patrons. As a result, the MTA has set up a system that allows them to produce their own Braille material. This system consists of a personal computer, a Braille printer, and software that converts standard word processing files for use by the printer.

The software, "Duxbury Braille Translator for WordPerfect," translates WordPerfect text files into Grade 2 Braille. The translated file is directed to the Braille printer;MTA-MD uses a "Braille Blazer" (sold by Blazie Engineering). This printer produces pages of Braille, just as a conventional computer printer produces pages of printed text. With this system, the MTA-MD can keep information on hand electronically, and convert and print in Braille the specific items as patrons request them. The complete system cost the MTA-MD less than $2,500.

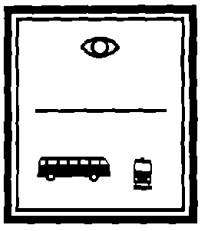
3.2.3 Raised-Line, Braille Subway Maps



New York City Transit has teamed up with the Baruch College Computer Center for Visually Impaired People to produce a series of raised-line Braille maps, with large-print backup, depicting major portions of the New York City subway system. Strip maps of six subway lines, an overview map of the Bronx, and the 66th Street Lincoln Center Station map were available as of summer, 1995. NYC Transit is planning to produce a complete set of line maps, large

overview maps, and maps of four key stations over a two-year period. They also offer free three-hour training session on map use at Baruch College.

3.2.4 Customized Trip Itinerary Cassettes

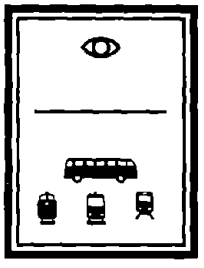


BSDA found that creating audio cassettes of entire bus route schedules was impractical, as well as difficult to use for the intended audience. As an alternative, audio cassettes are custom produced for each passenger request. Instead of reciting all the written information on a bus schedule and describing the path of the particular bus route, BSDA prepares an audio description of a itinerary requested by a passenger. For example. a cassette might have instructions such as:

- Walk to the southeast corner of 20th and Market.
- Get on the number 11 bus.
- Get off at 8th and Market.
- Walk two blocks north to 8th and Pine to the Metro entrance, etc.

This technique is much less labor intensive for BSDA staff, as well as more responsive to the needs of visually disabled passengers.

3.2.5 Automated Traveler Information System

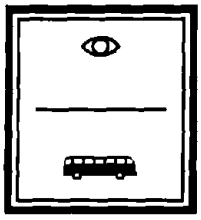


The **Southeastern Pennsylvania Transportation Authority (SEPTA)** operates buses, trackless trolleys, rapid and light rail, and commuter rail in Philadelphia and four surrounding Pennsylvania counties. In mid-1995, SEPTA introduced an automated telephone information service, SEPTA Transit Advisory Response (STAR). STAR allows customers to get service information everyday, 24 hours a day. A caller accesses information through a series of menus; options are chosen by pressing buttons on the phone.

The user can get travel information for all modes and can plan trips for a specified origin-destination: either for the present, or for a future day and time. STAR constructs a trip itinerary that may include transfers (intra- or intermodal). The primary criterion for constructing the itinerary is to minimize travel time. The caller may choose to have a trip constructed that meets some other objective, e.g., minimize fares, minimize transfers, all accessible route.

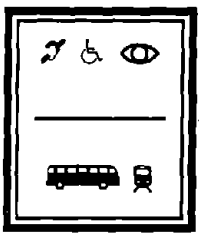
Teleride Sage was the vendor of this system. The cost to SEPTA for installation (hardware and software) was $300,000. This does not include maintenance of the system, which consists primarily of keeping the information up to date. SEPTA anticipates that it will require three full-time staff to maintain STAR; however, these staff will also be involved with the maintenance of another SEPTA customer information system (that will provide real-time vehicle location information) that is not yet in operation.

3.2.6 Schedules in Electronic Format



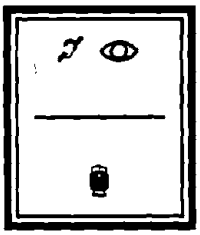
Valley Metro is the fixed route bus operator in Phoenix, AZ and surrounding communities. In addition to the standard large-print materials, Valley Metro also offers bus schedules on disk. Persons with visual impairments using computers equipped with Braille printers or with audible text readers find schedule information in this format useful.

3.2.7 Accessible On-Site System Information



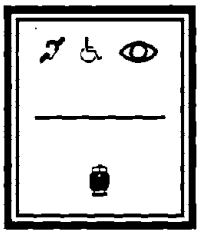
The **Metropolitan Atlanta Rapid Transit Authority** (MARTA) operates bus and rapid rail service. MARTA makes available information specifically designed for disabled riders. However, the system also has made efforts to make general information accessible to persons with disabilities. For example, information kiosks located throughout its rail system are wheelchair accessible. Also, information signs have high-contrast visual content as well as an accompanying audio message. Both of these information sources are used by the general riding public as well as those passengers with disabilities.

3.2.8 Real-time A/V System on Platform



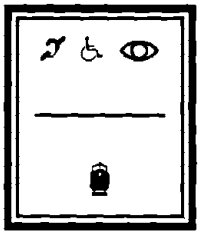
The **Tri-County Commuter Rail Authority** (TCRA), which operates in Broward, Dade, and Palm Beach Counties, FL, has installed LED message boards and public address systems at all of its stations. The announcements for this combined audio and visual display system is controlled from a central location, the operations dispatch office. As well as providing general information and announcements (e.g., safety reminders, ticket sale locations), the system provides actual train schedule information, and emergency announcements.

3.2.9 Key Station Video



Metraoperates commuter rail service in the Chicago metropolitan region. Metra has produced a 15-minute video which features the changes made to Metra rail cars and key stations to make them accessible to the disabled. It highlights the unique features of both the diesel and electric train lines and describes accessible parking, improved signage, reading a train schedule, ticket options, accessing the platform, boarding the accessible rail car, and other features. The video is available free of charge to organizations that work on behalf of the disabled.

3.2.10 Key Station Fact Sheet



Metra has created "Fact Sheets" for each of its key commuter rail stations. These sheets provide the station address, hours of operation, amenities, station layout, accessible parking information, available ramps and/or elevators, suggested accessible routes to the platform, connecting service information, ticket purchasing information, and important phone numbers. These fact sheets are distributed to the general public as well as to disability groups and are available in large print.

Section 4
Findings: Finding the Correct Vehicle

This section of the report presents information collected from the transit system site visits and mail/telephone surveys on Finding the Correct Vehicle: the second functional activity related to using fixed route service. The first part of this section discusses the issues involved, for all passengers and for disabled passengers in particular. The second part of this section cites the most useful technologies and practices observed by the Team members during the site visits.

4.1 FINDING THE CORRECT VEHICLE: ISSUES

A traveler that sets out to make a trip on public transportation must identify and reach the proper location to wait for the vehicle. This location may be as simple as a sign at a street corner; or more complex, such as an underground station; or may be a multi-story, multimodal, multi-use building. Some of the tasks that a traveler may have to undertake to find the correct vehicle include:

- Arriving at the proper stop/station.
- Moving to and through the faregate.
- Moving to the proper area within the station.
- Identifying the correct vehicle (when the stop/station is served by multiple routes/lines).
- Moving to the vehicle doorway.

The applicable regulations for a transit system are cited in Section 2 of Appendix A–ADA Requirements List, "Finding the Correct Vehicle." These regulations provide specifications for service (49 CFR Part 37), facilities (Appendix A to 49 CFR Part 37), and vehicles (49 CFR Part 38).

A wide range of issues are involved in ensuring that a disabled traveler can find the correct vehicle. For example:

- Who is responsible for creating the accessible route: the state, local jurisdiction, transit system, private property owner, and/or some other entity?

- How does the transit system coordinate with other entities to ensure an accessible route when no single entity has overall responsibility?

- What are the various technologies available to communicate to individuals with visual or hearing disabilities?

- What are the operating procedures that can achieve the same results as technological solutions?

- What are low cost and/or low maintenance improvements to facilities that benefit the general riding public as well as disabled travelers?

For bus operations, the major obstacle to overcome related to passengers finding the correct bus is conveying information to visually impaired passengers about the proper boarding location and the identification of the proper bus to board.

The problems associated with rail systems were mostly found in traversing the station, particularly in those cases where it is a transfer station between two rail lines. The problem of providing information to visually impaired persons becomes very difficult in rapid transit stations particularly on the older and more complex systems such as New York, Philadelphia, and Chicago. These systems pose two major difficulties. First, most of their facilities were built long before accessibility was a consideration. It is too late to design in consistent station layouts; it is necessary to use retrofit solutions that are costly and unique to each facility. Second, the complexity and size of these systems necessitates providing a great deal of information. It is a challenge even for sighted people to navigate the facilities.

Communications with visually impaired persons was one of the most difficult problems that was encountered during the site visits. A frequent question raised by transit systems was, "In the absence of complete uniformity in station layout and design, how can blind persons who have not been trained to use a particular station find the correct place for information signs that will guide them to the proper platform?" Most systems, such as the **New York City Transit**, continue to struggle with the design and deployment of signs that will meet the needs of all persons that must travel along the accessible route.

4.2 FINDING THE CORRECT VEHICLE: HIGHLIGHTS

The technologies and programs highlighted in the following paragraphs appear to be the most promising in terms of transferability and widespread acceptance by the transit industry. While some of the technologies and programs presented here are in use at several transit systems, others are in use at only a few (perhaps only one) transit operations.

The format for presenting the information in this section is similar to the format used in Section 3. There is a short description of each ADA solution and obstacle. Next to the description are graphical icons. These icons indicate: whether the solution or obstacle concerns a mobility, visual, hearing and/or cognitive disability; and mode of transit involved (at the transit system where it was observed; some solutions could be applied to other modes at other systems).

The solutions applicable to bus operations are presented first. These are followed by solutions applicable to the more complex situations faced by disabled persons in trying to find the correct light rail, rapid rail, or commuter rail vehicle.

In addition, to help readers to locate solutions and obstacles, this section includes tables that has them cross-referenced by passenger disability (Table 4-1), by transit mode (Table 4-2), and by transit system (Table 4-3).

KEY FOR ICONS

Disabilities		Transit Modes	
?	Cognitively Impaired		Automated Guideway
	Hearing Impaired		Bus
	Mobility Impaired		Commuter Rail
	Visually Impaired		Light Rail
			Rapid Rail

Table 4-1
Finding the Correct Vehicle Highlights Grouped by Passenger Disability

Disability Group	Idea	Transit System	Mode	Page
?	Talking Signs	BART Muni		4-14
?	TVM with Tactile and Audio	BART		4-16
?	Marked Door Opening Location	MDTA		4-20
?	Marked Waiting Area	MTDB		4-20
Deaf	Color-Coded Video Displays	LIRR		4-16
Deaf	On-Platform A/V System	CTA		4-19
Deaf	Police Trained in Sign Language	MARTA		4-16
Mobility	Accessible Automated Fare Collection System	CTA		4-17
Mobility	Bus Stop Accessible Path Construction	Houston Metro		4-10
Mobility	Bus Stop Handbook	Valley Metro		4-11
Mobility	Camera Surveillance of Platform	MARTA		4-19
Mobility	Marked Door Opening Location	MDTA		4-20
Mobility	Marked Waiting Area	MTDB		4-20
Mobility	Privatization of Bus Stop Shelters	MTDB MARTA BCT		4-12
Mobility	Tactile Bus Stop Plates	MTDB		4-10
Visual	Audio Signals to Doorways	Muni		4-22
Visual	Between Car Barriers	BART CTA		4-21

Disability Group	Idea	Transit System	Mode	Page
	Bus Identifier Kits	Tri-Met Valley Metro Madison Metro		4-12
	Camera Surveillance of Platform	MARTA		4-19
	Color-Coded Video Displays	LIRR		4-16
	Directional Tactile Path	BART	 	4-18
	Distinctive and Consistent Bus Stop Signs	Seattle Metro		4-10
	Male/Female Train Announcements	MDTA		4-20
	Marked Door Opening Location	MDTA	 	4-20
	Marked Waiting Area	MTDB		4-20
	On-Platform A/V System	CTA		4-19
	Police Trained in Sign Language	MARTA		4-16
	Raynes Rail	NYCT		4-18
	Snow and Ice Removal from Detectable Warnings	MTA-MD		4-20
	Staff Escort to Track	MNCR		4-19
	Tactile Bus Stop Plates	MTDB		4-10
	Talking Directory Display System	NYCT LIRR		4-16
	Talking Signs	BART Muni		4-14
	TVM with Tactile and Audio	BART		4-16

Table 4-2
Finding the Correct Vehicle Highlights Grouped by Transit Mode

Mode	Idea	Transit System	Disability Group	Page
	Marked Door Opening Location	MDTA	? ♿ 👁	4-20
	Bus Stop Accessible Path Construction	Houston Metro	♿	4-10
	Bus Stop Handbook	Valley Metro	♿	4-11
	Bus Identifier Kits	Tri-Met Valley Metro Madison Metro	👁	4-12
	Directional Tactile Path	BART	👁	4-18
	Distinctive and Consistent Bus Stop Signs	Seattle Metro	👁	4-10
	Privatization of Bus Stop Shelters	MTDB MARTA BCT	♿	4-12
	Tactile Bus Stop Plates	MTDB	♿ 👁	4-10
	Color-Coded Video Displays	LIRR	👂 👁	4-16
	Staff Escort to Track	MNCR	👁	4-19
	Talking Directory Display System	NYCT LIRR	👁	4-16
	Audio Signals to Doorways	Muni	👁	4-22
	Marked Waiting Area	MTDB	? ♿ 👁	4-20
	Talking Signs	BART Muni	? 👁	4-14

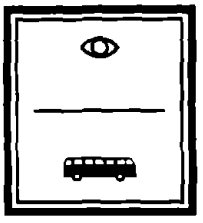
Mode	Idea	Transit System	Disability Group	Page
🚆	Accessible Automated Fare Collection System	CTA	♿	4-17
🚆	Between Car Barriers	BART CTA	👁	4-21
🚆	Camera Surveillance of Platform	MARTA	♿ 👁	4-19
🚆	Directional Tactile Path	BART	👁	4-18
🚆	Male/Female Train Announcements	MDTA	👁	4-20
🚆	Marked Door Opening Location	MDTA	? ♿ 👁	4-20
🚆	On-Platform Platform A/V System	CTA	🦻 👁	4-19
🚆	Police Trained in Sign Language	MARTA	🦻 👁	4-16
🚆	Raynes Rail	NYCT	👁	4-18
🚆	Snow and Ice Removal from Detectable Warnings	MTA-MD	👁	4-20
🚆	Talking Directory Display System	NYCT LIRR	👁	4-16
🚆	Talking Signs	BART Muni	? 👁	4-14
🚆	TVM with Tactile and Audio	BART	? 👁	4-16

Table 4-3
Finding the Correct Vehicle Highlights Grouped by Transit System

Transit System	Idea	Disability Group	Mode	Page
BART	TVM with Tactile and Audio	?		4-16
BART	Talking Signs	?		4-14
BART	Directional Tactile Path			4-18
BART	Between Car Barriers			4-21
BCT	Privatization of Bus Stop Shelters			4-12
CTA	Between Car Barriers			4-21
CTA	Accessible Automated Fare Collection System			4-17
CTA	On-Platform Platform A/V System			4-19
Houston Metro	Bus Stop Accessible Path Construction			4-10
LIRR	Color-Coded Video Displays			4-16
LIRR	Talking Directory Display System			4-16
Madison Metro	Bus Identifier Kits			4-12
MARTA	Privatization of Bus Stop Shelters			4-12
MARTA	Camera Surveillance of Platform			4-19
MARTA	Police Trained in Sign Language			4-16
MDTA	Male/Female Train Announcements			4-20
MDTA	Marked Door Opening Location	?		4-20
MNCR	Staff Escort to Track			4-19

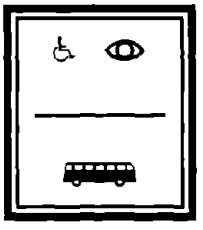
Transit System	Idea	Disability Group	Mode	Page
MTA-MD	Snow and Ice Removal from Detectable Warnings			4-20
MTDB	Privatization of Bus Stop Shelters			4-12
MTDB	Tactile Bus Stop Plates			4-10
MTDB	Marked Waiting Area	?		4-20
Muni	Talking Signs	?		4-14
Muni	Audio Signals to Doorways			4-22
NYCT	Raynes Rail			4-18
NYCT	Talking Directory Display System			4-16
Seattle Metro	Distinctive and Consistent Bus Stop Signs			4-10
Tri-Met	Bus Identifier Kits			4-12
Valley Metro	Bus Identifier Kits			4-12
Valley Metro	Bus Stop Handbook			4-11

4.2.1 Distinctive and Consistent Bus Stop Signs



The simplest approach to dealing with the proper location for boarding at a street stop is to use a consistent location, whenever possible, and identify the bus stop sign in some unique way. **Seattle Metro** has adopted the use of a two inch square bus stop pole as a unique means to identify each bus stop in the service area. This is a simple approach which allows the disabled passenger to positively distinguish the bus stop from traffic sign poles.

4.2.2 Tactile Bus Stop Plates

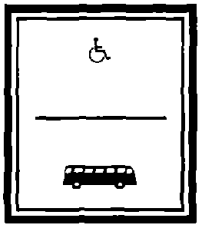


San Diego Transit (a subsidiary of **MTDB**) has equipped selected bus stop signs with tactile plates that indicate the bus route(s) served by the stop. These tactile plates have raised triangles. San Diego Transit signs were traditionally triangle-shaped, so residents still associate the shape with the bus system. Also, San Diego Transit has placed stickers displaying the universal symbol of accessibility on bus stop sign poles at eye level to indicate that a route is accessible. Currently, nearly all routes are accessible, but in the past, the stickers were very helpful in signifying that the buses serving the route(s) were lift-equipped.

Most systems have adopted or are adopting uniform signage for each bus stop with large print letters and numerals to provide key information on bus routes servicing the stop. In some cases, the transit system has also provided the route information in braille and raised letters at the bus stop.

4.2.3 Bus Stop and Accessible Path Construction

One of the most difficult ADA implementation issues that many transit systems face is working with municipalities on the development of accessible bus stops. Problems involving jurisdiction, ownership, and funding create difficult institutional barriers.



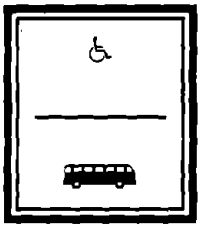
In order to create bus pads, stops, and shelters that are useful for disabled patrons, **Houston METRO** has been forced to take the lead in the construction of sidewalks, connectors, curb cuts, ramps, and other mobility improvements traditionally considered to be the responsibility of the city of Houston. The METRO Accessibility Task Force devised a long-range plan to make bus pads, stops, and shelters around the city comply with the ADA. Bus stop pad, stop

accessories, and shelter improvements constitute the most expensive part of METRO's ADA compliance effort. This includes 11,000 bus stops and 1,200 bus shelters that serve 121 bus routes.

When the process of upgrading the stops began, some of the pads built by METRO did not connect to any accessible sidewalks, forcing wheelchair users to travel in the street. For example, bus pads were built, in some cases, near apartment complexes that had no accessible walkways that would allow residents to reach the stop. So, if mobility impaired passengers were left off at the pad, they had no way to reach the apartment.

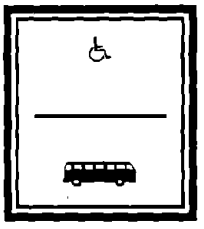
This problem largely has been resolved through coordinated efforts with the city of Houston. METRO has been working with the city to have sidewalks built, where necessary, to connect the pads to existing walkways. In some cases, METRO has built these walkways from its own funds. Construction efforts are now planned in conjunction with the city. Some minor problems still exist because the city chooses to follow the minimum requirements dictated by ADA. Houston METRO, for example, installs ramps with a 1:15 slope (because patrons prefer a shallower slope) while the city installs ramps with a 1:12 slope (the steepest allowed by ADA).

4.2.4 Bus Stop Handbook



In the area served by **Valley Metro**, the city of Phoenix is responsible for building sidewalks and curb cuts at bus stops that fall within the municipality. The other cities that Valley Metro serves (Scottsdale, Paradise Valley, Peoria, Glendale, and Sun City) have responsibility for building accessible bus stops within their jurisdictions. To encourage cooperation from local governments, Valley Metro issued a **"Bus Stop Handbook"** to provide guidance to planners, designers, developers, and agency officials. This document explicitly states ADA requirements as well as Valley Metro recommended guidelines for bus stop design. To prepare the **"Bus Stop Handbook,"** Valley Metro conducted a field inspection of bus stops to identify areas for improvement. The field inspection revealed eight major problems with bus stop accessibility including lack of comfortable passenger waiting area, impaired bus stop sign visibility, improper bus stop sign location, and lack of ramps and accessible connections to surrounding sidewalks and buildings.

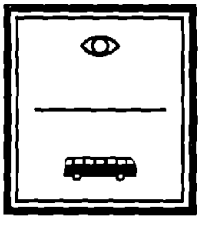
4.2.5 Privatization of Bus Stop Shelters



San Diego Transit (**MTDB**) has turned over the maintenance of many of the system's bus stop shelters to a private firm (Gannett Advertising). Under the current arrangement, this firm receives advertising revenue in exchange for performing this function. In exchange, the firm is required to perform trash removal as well as stop improvements to achieve compliance with ADA (curb cuts, removal of landscaping, etc.).

Other transit systems with similar arrangements include **MARTA** and **Broward County Transit** (Ft. Lauderdale, FL). All of them believe that the contracted firms have a strong incentive to maintain the bus shelters at a high level.

4.2.6 Bus Identifier Kits



ADA regulations require new buses to have external speakers to enable drivers to make announcements to waiting passengers. This is one way for passengers to identify their desired bus. Observations from the project site visits, however, indicate that few bus operations are making use of this capability. In part, this may be attributable to the fact that no bus fleet is fully equipped with external speakers, so managers have not yet instituted policies on their use.

Other bus systems have opted for providing its visually impaired passengers a "bus identifier kit" as a means for letting the driver know of their desired bus. The kit may be a small sign, a mitt, or a set of flashcards that a passenger holds up for the driver to see. The kit displays the specified route ID and any additional special required information. The kit's component characters have Braille or raised letters to enable the user to "read" them. Figure 4-1 illustrates the bus identifier kit provided by **Tri-Met** in Portland, OR.

Bus identifier kits of several varieties have been tried at several systems, including **Valley Metro** and **Madison Metro** (Madison, WI), with mixed acceptance. Many passengers feel that using the kits singles them out at bus stops in an embarrassing way. A few passengers feel especially vulnerable to criminal activity when using the kits.

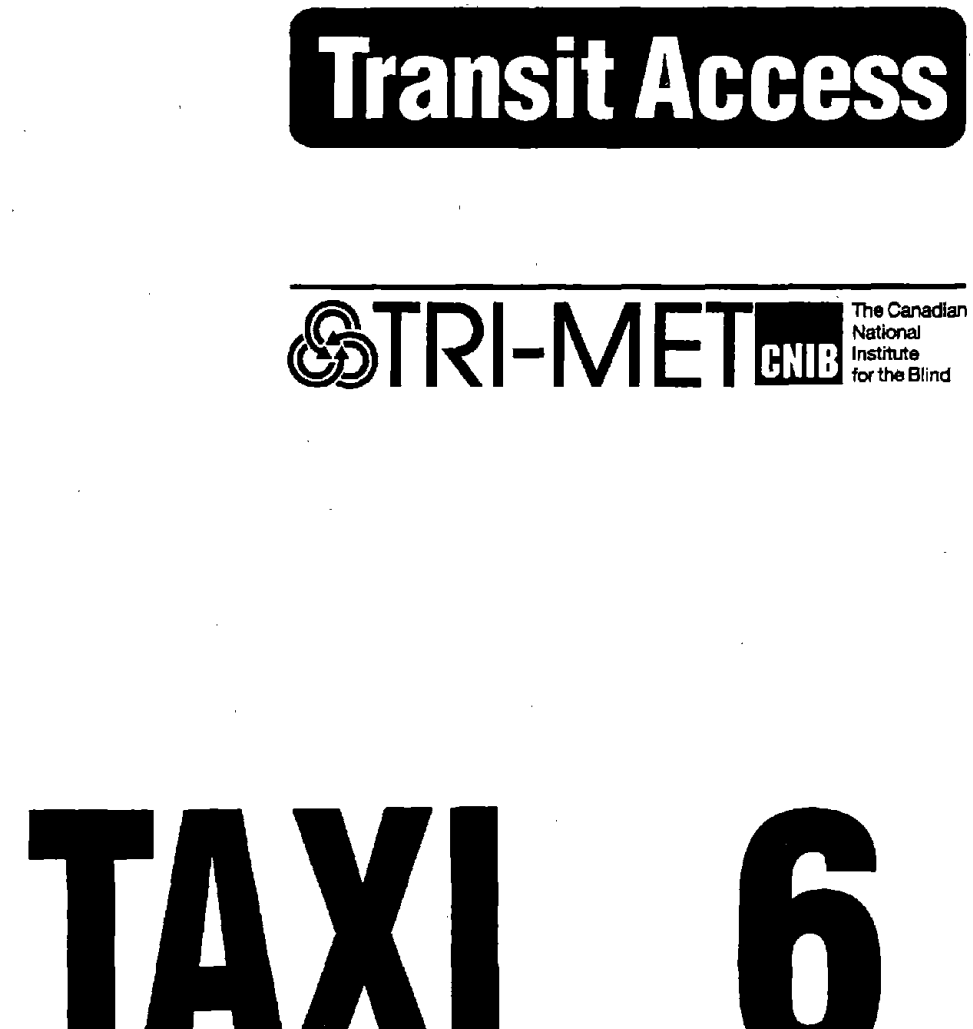
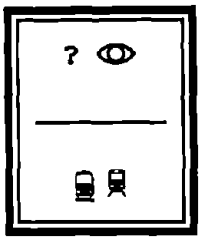


Figure 4-1
Bus Route Identifier Kit Provided to Visually Impaired Persons

Courtesy of Tri-Met in Portland, OR

4.2.7 Talking Signs



Talking Signs® are an information system for blind and other visually impaired and "print disabled" persons consisting of an infrared transmitter located at a specific point in a transit station (or other facility) such as a stairway, elevator, or phone, and a small handheld receiver used by the blind person. The transmitter provides a repeating message which can be either a label message, such as "faregate," or a directional message, such as "main boarding area further down this platform." The intensity and clarity of the message increases as the person points the receiver directly at the transmitter and gets closer to it, in effect receiving feedback as they approach the transmitter.

The remote infrared signage technology used in the Talking Signs® has been developed by the Smith-Kettlewell Eye Research Institute of San Francisco.[1] Due to this proximity, **Muni** and **BART** have been involved in the testing and demonstration of this concept including a major installation (93 transmitters) at three underground levels of the Powell Street Station in downtown San Francisco. The system has been well received by the persons testing it and there are plans to expand the concept to other underground stations used by both Muni and BART. Figure 4-2 illustrates the concept of talking signs to locate key points in facility and some details of the transmitter and receiver.

There is relatively little information available about the performance characteristics, maintainability and reliability, of the units when subjected to the transit environment for an extended period of time. This type of information will become available as different transit systems experiment with their application. Due to their nature, Talking Signs® can potentially be used in a wide variety of settings in the transit environment, such as for providing information about the location of bus stops or shelters and route information at the shelter.

One of the potential impediments to widespread implementation of the system is the cost of the handheld receivers, which has been estimated by Smith-Kettlewell at approximately $250/unit. Any decision to purchase the units on behalf of the potential users will require careful consideration on the part of the transit system or any other participating or sponsoring agency.

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[1]For further information: "Remote Signage for the Blind and Print Handicapped" (3rd Edition), Smith-Kettlewall Eye Research Institute (1994).

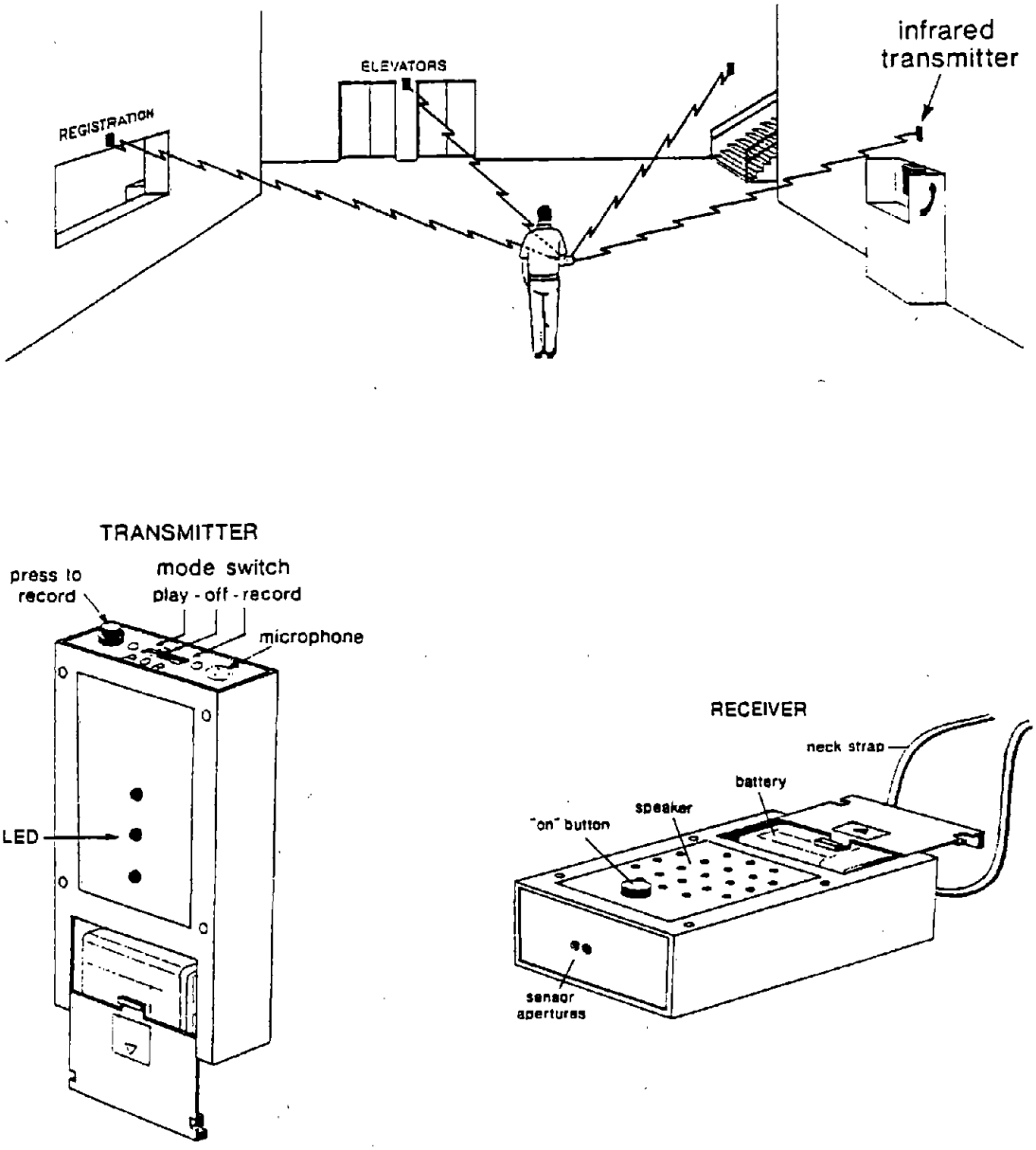
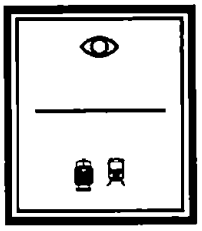


Figure 4-2
Illustration of Talking Signs® in a Facility and Transmitter/Receiver Details

Source: Smith-Kettlewell Eye Research Institute

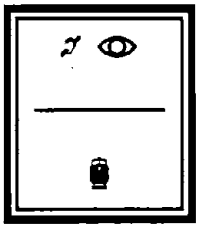
4.2.8 Talking Directory Display System (TDDS)



The TDDS is an information kiosk for transit stations which is in the development stage under a grant from Project ACTION. A demonstration unit is under development by the Baruch College Computer Center for Visually Impaired People for placement at Penn Station in New York City, a major inter-modal transfer station, used by **NYCT** and **LIRR**. The TDDS kiosk is activated by stepping on a mat when entering the phone booth-like structure. The computer within the kiosk has a touch screen and audio capability which allows the user to select specific locations and receive accurate information on how to proceed to the designated location.

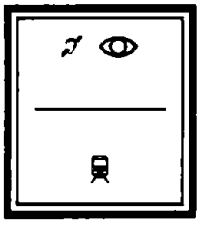
Since this unit is in the early demonstration stage, it is difficult to make a projection regarding its performance, effectiveness, and cost.

4.2.9 Color-Coded Video Displays



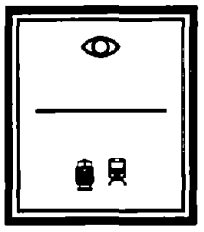
To provide assistance to patrons in particularly busy facilities (Jamaica, Penn Station) the **Long Island Rail Road (LIRR)** has mounted video monitors in some stations that display train departure information. Each line of text on the monitor includes the train line, time of departure, and track number. The monitors are similar in concept to monitors used in airports. However, LIRR monitors display information in larger print (with only 8 to 10 lines of text per screen). Also, all text is in white on a color background to match the associated color of the train line (the same color as the signs and schedules for the line).

4.2.10 Police Trained in Sign Language



In addition to sensitivity training, 12 of **MARTA's** transit police officers have received training in signing for the deaf. These officers wear a special pin on their regular uniform to indicate to passengers with hearing impairments that they are able to sign.

4.2.11 Ticket Vending Machine with Tactile and Audio

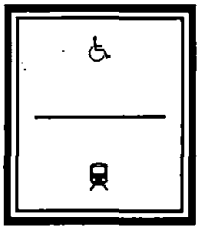


Transit systems using ticket vending machines (TVMs) typically provide instructions in Braille and raised lettering. This is acceptable if the fare structure is simple and there is no interaction required between the passenger and the machine, i.e., a simple sequence of steps will produce the desired ticket. Many systems, such as the **Long Island Rail Road**, are using machines that are very difficult for visually-impaired patrons to use because they operate like bank ATM machines with a series of instructions that appear on a monitor. These instructions must be completed by typing station ID numbers and other relevant information about the fare (peak, off-peak, disabled fare, etc.). Since these machines do not offer an audio message to accompany the visual instructions, visually-impaired patrons are forced to purchase tickets at the counter (not always staffed) or through the mail.

BART is currently using a TVM that has both tactile and audio information for the passenger. These TVMs also have the capacity to handle bank cards; therefore, they had to make special provisions for entering PIN codes by providing a Braille overlay for the keypad. Because these machines have recently entered service, the experience base is quite limited.

One of the interesting technical problems with an accessible TVM in a system with faregates (ticket readers) is that most systems, such as BART, offer a substantial discount on fares for disabled persons. Since there is no simple way for the TVM to verify that a passenger is disabled, the machines have to be programmed for providing full fare tickets. In the absence of some fraud-proof control technique, the transit system can only provide the discounted tickets through the more conventional sales outlets, thereby negating the usefulness of the accessible features of the TVM.

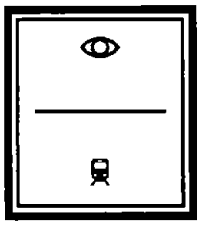
4.2.12 Accessible Automated Fare Collection System



The **CTA** (Chicago) is planning a new accessible automatic fare card system. It will be similar to the fare card system used by the Washington Metro. It will make use of magnetic stored value cards, which will have a special code to enable a wheelchair user to actuate the disabled fare gate. An approximately $50 million contract for this new system has been awarded to Cubic. Installation at the Ravenswood Station on the Brown Line and the 79th Street Station on the Red Line began in spring, 1995.

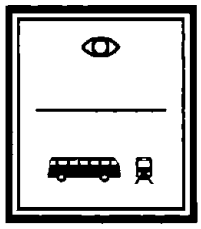
Following successful demonstration at these two stations, the contractor will receive the "go ahead" to proceed with the full $50 million contract. This will convert all stations in the CTA system to automatic fare collection.

4.2.13 Raynes Rail



The Raynes Rail is a Braille and audio handrail system designed to allow blind and visually impaired persons to guide themselves independently throughout unknown buildings and new surroundings. The rail provides a continuous wayfinding system with Braille on its inner face and audio information at strategic locations. The Raynes Rail has been patented by Coco Raynes Associates. The initial application of the rail have been in hospital settings such as the Massachusetts Eye and Ear Infirmary where it was installed on one floor, with plans for expansion to the complete facility. **New York City Transit** is currently considering installation of the Raynes Rail at two subway stations that are undergoing modernization in the near future.

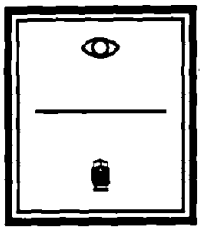
4.2.14 Directional Tactile Path



A low-tech solution to wayfinding in a transit station or terminal environment is to provide a tactile (accessible pathway) path which leads the visually impaired person directly from the station entrance through the faregate to the proper platform location. One application of a tactile path can be found at **BART's** recently opened (December 1995) transit station at North Concord/Martinez. The station design includes a narrow tactile strip (coarse cut concrete) on the pathway which leads the traveler from the bus transfer center portion of the station past the accessible fare collection gate and all the way to the platform edge.

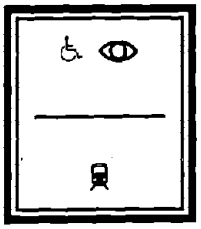
The tactile walkway concept can be readily adapted for new station construction. Its transferability to an existing station environment may be much more difficult, due to the need to retrofit the materials into the existing pathway. The pathway would have to include some cues for alerting the passenger to signs which could provide location information for such items as phones and restrooms. This may provide a way to incorporate some of the other wayfinding technology, such as Talking Signs®.

4.2.15 Staff Escort to Track



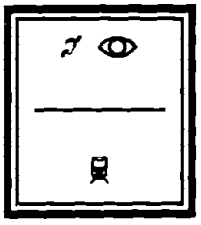
Even with Braille signage throughout Grand Central Terminal, nearly all passengers of the **Metro-North Commuter Railroad** (New York) who are visually impaired go directly to the information desk as they enter the building and request that a system employee escort them to their track. Metro-North offers this service due to the complexity of this facility—which is otherwise extremely difficult to use for persons with visual impairments.

4.2.16 Camera Surveillance of Platforms



Personnel in **MARTA's** rail control room watch the station platforms continuously using closed circuit television. If a disabled patron appears to need assistance, these personnel can communicate with the patron via the public address system. The patron can be directed to an assistance phone for further information.

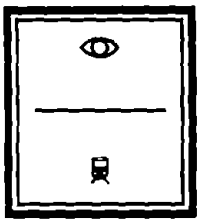
4.2.17 On-Platform A/V System



The **Chicago Transit Authority** is developing a software-based, remotely controlled audio/visual information system using colored LED signs. Two different systems are presently being developed and tested in the Merchandise Mart Station. One system is a Windows-based system with software developed by AT&T controlling signs by EDI. The other system uses software by Ameritech and Scala with signs by Silent Radio. Both systems can send preprogrammed audio and visual messages to individual signs in any station linked to the system. Messages can be either routine announcements of train arrivals or special emergency messages. The latter can be accompanied with a flashing strobe light, if desired. Testing presently underway includes determining visibility under various lighting conditions, susceptibility to vibration, and susceptibility to winter weather conditions.

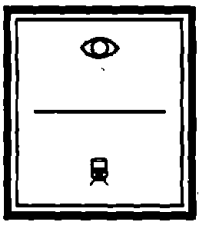
CTA will go out for bid for the entire communications package. It will cover 26 Green Line Stations which are all being rebuilt, plus the 50 key stations on the CTA system. The sign content will be remotely controlled from CTA central control.

4.2.18 Train Announcements Using Male/Female Voices



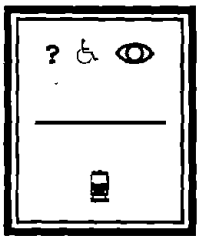
The Metrorail system of the **Metro-Dade Transit Agency** (Miami, FL) has a number of stations with center platforms, i.e., a single passenger platform with the two tracks on either side. MDTA has a subtle yet clear way to let waiting passengers know the direction of the incoming train: MDTA uses a male voice to announce the southbound trains that are arriving at the station, and uses a female voice to announce the northbound trains.

4.2.19 Snow and Ice Removal from Detectable Warnings



MTA-MD (Baltimore) has a major program to install detectable warning tile in the platforms of its rapid rail stations. The MTA-MD has found it necessary to heat the platform edge of all outdoor stations to remove snow and ice from the detectable warning material. The use of salt is unacceptable because of the corrosive combination of salt and water in the vicinity of high voltage electricity. Chipping of ice and snow damages the warning tile. To solve this problem, MTA-MD has installed electric wires cast in the platform slab under a seven-foot width from each edge of the platform (a total of 14 feet for a center platform). When activated, these wires serve to melt the snow and ice.

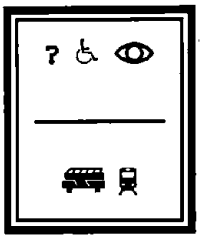
4.2.20 Marked Waiting Area



All stations of the San Diego Trolley (a subsidiary of **MTDB**) are accessible to wheelchair users. The blue international symbol of accessibility is located on each station platform. A disabled passenger who requires the lift must wait by this symbol. As a train pulls into the station, the train operator will line up the front door of the first car directly with the disabled rider. This waiting area can also be used by those with visual or mental impairments who may need to be lined up with the door for boarding.

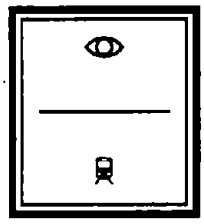
This policy has been quite successful in ensuring that train operators see disabled clients. Also, by having the wheelchair user in the right location, boarding time is decreased. Generally, it takes 60 to 90 seconds to perform a wheelchair boarding. Visually-impaired clients also appreciate the waiting areas for their convenience and consistency.

4.2.21 Marked Door Opening Locations



The **Metro-Dade Transit Agency** operates a rapid rail and an automated guideway system. For both modes, the trains are programmed to stop at a specific location along each station's platform. Along each platform edge, MDTA has installed the required two-foot width of detectable warning material. At two locations along each platform edge, MDTA has installed two additional feet of detectable warning material (total width of four feet). These two locations line up with two door opening positions of the trains. This helps visually impaired passengers to locate the train doors easily. The "double-wide" detectable warning areas also lets mobility impaired passengers be close to the doorway. For passengers with cognitive impairments, the detectable warning areas provide them with a cue that can be used in learning to travel on the rail systems.

4.2.22 Between Car Barriers



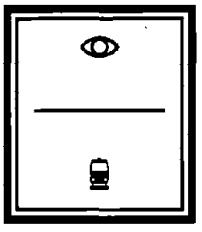
ADA regulations call for the provision of devices to prevent individuals from stepping off platforms between rapid rail cars, except when platform screens are provided. The requirement is also applicable to light rail, commuter rail, and automated guideway transit vehicles whenever the boarding situation involves a high level platform. The regulations apply to new, used, or remanufactured vehicles that were purchased or leased after August 25, 1990. Existing vehicles and those that are retrofitted to comply with the "one car per train rule" are not required to have the barriers.

This requirement has been difficult to comply with for newer rapid rail and light rail systems, which tend to have automated processes for coupling and uncoupling cars. The coupling and uncoupling of the barrier devices would also have to be automated. The preferred approach for automatic coupling operations appears to be a "bellows" type closure which is presently used on **BART** rapid rail cars. If the bellows are placed out as far as possible to the side of the car, it helps to minimize any gap between the platform and the surface of the bellows.

Simple devices such as chains or pantograph gates are typically used when the coupling/uncoupling of rail cars is performed manually. The **Chicago Transit Authority** uses springs as between car barriers. This is an inexpensive solution which is useful when the cars have to operate on tight radius

curves, such as encountered at the CTA and many other systems. A total of six springs connect each carset, three on each side.

4.2.23 Audio Signals to Doorways



Muni has been investigating alternatives to the physical couplings between cars as part of their plans to purchase new light rail vehicles. One concept has involved the use of highly directional audio signals placed near the doors on the cars to act as a positive audio guide for individuals with vision impairments. In a further refinement of this concept, Muni is also considering the application of Talking Signs® (infrared transmission of voice messages) at the doorways on their new light rail vehicles. This has the advantage of being able to provide audio signals that indicate the exact location of the door, as well as information about the route and ultimate destination of each car. In Muni operations, two cars with different routes and destinations are sometimes coupled together for a part of the route; therefore a visually impaired rider needs to receive the information to know which car to board at the beginning of the trip.

Section 5
Findings: Entering the Vehicle

This section of the report presents information collected from the transit system site visits and mail/telephone surveys on Entering the Vehicle: the third functional activity related to using fixed route service. The first part of this section discusses the issues involved, for all passengers and for disabled passengers in particular. The second part of this section cites the most useful technologies and practices observed by the Team members during the site visits.

5.1 ENTERING THE VEHICLE: ISSUES

To enter a vehicle, a passenger must move from the waiting area through the vehicle doorway. This waiting area may be a curb sidewalk, shelter (enclosed or not), or platform. The potential barriers facing a boarding passenger include:

- Steps inside the vehicle.
- Vertical gap from the waiting area to the vehicle.
- Horizontal gap from the waiting area to the vehicle.

Once inside the vehicle, the passenger must safely move to a seat, securement position, or standing area. In addition, on most fixed route buses and some light and rapid rail trains, the passenger pays the fare immediately upon entering the vehicle.

The applicable regulations for a transit system are cited in Section 3 of Appendix A— Requirements List, "Entering the Vehicle." These regulations provide specifications for service (49 CFR Part 37), facilities (Appendix A to 49 CFR Part 37), and vehicles (49 CFR Part 38).

Based on the collective observations of the Project Team, the solutions to overcoming these barriers are known and available, often in many forms. For example, nearly all new rail systems (light, rapid, and commuter) and renovated stations of older rail systems are designed so that the station platform and the floor of the rail car are at the same height ("level boarding"), thereby eliminating the need for a ramp or lift for a passenger with a mobility impairment. The barriers for entering a vehicle

exist in large part because the design of the interface between vehicles and stations did not account for their use by passengers with mobility impairments— and not because the "technology" was unavailable.

The technologies and programs highlighted in the following paragraphs appear to be the most promising in terms of transferability and widespread acceptance by the transit industry. While some of the technologies and programs presented here are in use at several transit systems others, in are use at only a few (perhaps only one) transit operations.

The format for presenting the information in this section is similar to the format used in the previous two sections. There is a short description of each ADA solution and obstacle. Next to the description are graphical icons. These icons indicate: whether the solution or obstacle concerns a mobility, visual, hearing and/or cognitive disability; and mode of transit involved (at the transit system where it was observed; some solutions could be applied to other modes at other systems).

The solutions applicable to bus operations are presented first. These are followed by solutions applicable to entering a light rail, rapid rail, or commuter rail vehicle. The last part of this section discusses some special boarding situations.

In addition, to help readers to locate solutions and obstacles, this section includes tables that has them cross-referenced by passenger disability (Table 5-1), by transit mode (Table 5-2), and by transit system (Table 5-3).

KEY FOR ICONS

Disabilities	
?	Cognitively Impaired
	Hearing Impaired
	Mobility Impaired
	Visually Impaired

Transit Modes	
	Automated Guideway
	Bus
	Commuter Rail
	Light Rail
	Rapid Rail

Table 5-1
Entering the Vehicle Highlights Grouped by Passenger Disability

Disability Group	Idea	Transit System	Mode	Page
?	Service Animals	Muni		5-14
?	Service Animals	NYCT		5-14
♿	Accessible Supervisor Vehicles	Valley Metro RIPTA		5-8
♿	Bridgeplate for Commuter Rail	Metra		5-11
♿	Bridgeplate for Rapid Rail	CTA		5-10
♿	Fare Card Reader for Rear Door	SEPTA Valley Metro		5-9
♿	Lift-Equipped Light Rail	MTDB		5-13
♿	Low Floor Light Rail	Tri-Met		5-13
♿	Mud Flap for Wheelchair Lift	GBTD		5-7
♿	On-Board Lift for Commuter Rail	Metra		5-12
♿	Oversize Wheelchairs	Seattle Metro		5-15
♿	Specifications for Wheelchair Maneuverability	AC Transit		5-9
♿	Standees on Lifts	BSDA Denver RTD		5-15
♿	Threshold Extensions	MARTA		5-11
♿	Use of Low Floor Buses	MARTA		5-8
♿	Wayside Lift for Light Rail	Tri-Met		5-13
♿	Wheelchair Lift Maintenance	MTA-MD Madison Metro		5-6
👁	Service Animals	Muni		5-14
👁	Service Animals	NYCT		5-14

Table 5-2
Entering the Vehicle Highlights Grouped by Transit Mode

Mode	Idea	Transit System	Disability Group	Page
Bus	Accessible Supervisor Vehicles	Valley Metro RIPTA	♿	5-8
Bus	Fare Card Reader for Rear Door	SEPTA Valley Metro	♿	5-9
Bus	Mud Flap for Wheelchair Lift	GBTD	♿	5-7
Bus	Oversize Wheelchairs	Seattle Metro	♿	5-15
Bus	Service Animals	Muni	? 👁	5-14
Bus	Service Animals	NYCT	? 👁	5-14
Bus	Specifications for Wheelchair Maneuverability	AC Transit	♿	5-9
Bus	Standees on Lifts	BSDA Denver RTD	♿	5-15
Bus	Use of Low Floor Buses	MARTA	♿	5-8
Bus	Wheelchair Lift Maintenance	MTA-MD Madison Metro	♿	5-6
Commuter Rail	Bridgeplate for Commuter Rail	Metra	♿	5-11
Commuter Rail	On-Board Lift for Commuter Rail	Metra	♿	5-12
Light Rail	Lift-Equipped Light Rail	MTDB	♿	5-13
Light Rail	Low Floor Light Rail	Tri-Met	♿	5-13
Light Rail	Service Animals	Muni	? 👁	5-14
Light Rail	Wayside Lift for Light Rail	Tri-Met	♿	5-13
Rapid Rail	Bridgeplate for Rapid Rail	CTA	♿	5-10
Rapid Rail	Service Animals	NYCT	? 👁	5-14
Rapid Rail	Threshold Extensions	MARTA	♿	5-11

Table 5-3
Entering the Vehicle Highlights Grouped by Transit System

Transit System	Idea	Disability Group	Mode	Page
AC Transit	Specifications for Wheelchair Maneuverability	♿	🚌	5-9
BSDA	Standees on Lifts	♿	🚌	5-15
CTA	Bridgeplate for Rapid Rail	♿	🚇	5-10
Denver RTD	Standees on Lifts	♿	🚌	5-15
GBTD	Mud Flap for Wheelchair Lift	♿	🚌	5-7
Madison Metro	Wheelchair Lift Maintenance	♿	🚌	5-6
MARTA	Threshold Extensions	♿	🚇	5-11
MARTA	Use of Low Floor Buses	♿	🚌	5-8
Metra	Bridgeplate for Commuter Rail	♿	🚂	5-11
Metra	On-Board Lift for Commuter Rail	♿	🚂	5-12
MTA-MD	Wheelchair Lift Maintenance	♿	🚌	5-6
MTDB	Lift-Equipped Light Rail	♿	🚊	5-13
Muni	Service Animals	? 👁	🚌 🚊	5-14
NYCT	Service Animals	? 👁	🚌 🚇	5-14
RIPTA	Accessible Supervisor Vehicles	♿	🚌	5-8
Seattle Metro	Oversize Wheelchairs	♿	🚌	5-15
SEPTA	Fare Card Reader for Rear Door	♿	🚌	5-9
Tri-Met	Low Floor Light Rail	♿	🚊	5-13
Tri-Met	Wayside Lift for Light Rail	♿	🚊	5-13
Valley Metro	Accessible Supervisor Vehicles	♿	🚌	5-8
Valley Metro	Fare Card Reader for Rear Door	♿	🚌	5-9

5.2 ENTERING THE BUS: HIGHLIGHTS

The most frequently cited problems associated with entering the bus have been complaints about the maintenance required to keep wheelchair lifts in reliable operating condition. The experiences of transit systems varied widely. One transit system stated that lift maintenance was the most difficult ADA problem that it still faced; other transit systems were handling lift repair and maintenance as a routine matter and did not consider it a significant problem.

5.2.1 *Wheelchair Lift Maintenance*

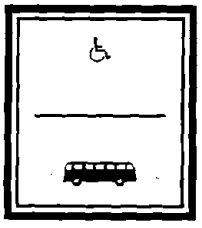
Most of the problems with wheelchair lift maintenance appear to be based on the following factors:

- Those systems that have more than one manufacturer's lift in their fleet have more difficulty due to the need to deal with different maintenance requirements, training, and parts for each lift.

- Lifts that operate on the principle of unfolding the bus steps into the lift platform (as compared to a solid platform that stores under the bus floor) appear to have created more maintenance and reliability problems for the systems that are using them.

- Transit systems that have to operate under severe winter conditions generally experience more difficulty with lift maintenance due to the corrosive effects of road salt and dirt particles that are splashed or sprayed onto various sensitive parts of the lifts.

Some of the solutions that transit systems have evolved to deal with the problems of lift maintenance and reliability come from ideas and innovations developed by the maintenance personnel as in the following examples.



The **MTA of Maryland** has implemented a number of design modifications to their "Lift-U" lifts to reduce maintenance. One design change suggested by an employee of the maintenance department replaces polyurethane wheels on the lift platform with aluminum wheels. The polyurethane wheels would wear out in approximately three months, primarily from scraping against the curb. The new aluminum wheels wear less rapidly; in addition, they emit noise which alerts the driver he has struck the curb. The MTA was paying $82 for the polyurethane wheels; the new aluminum wheels are made in local prisons for $5 to $7 each.

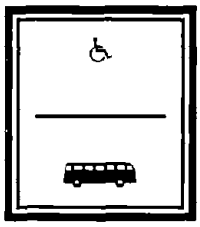
The MTA has realized an annual savings of over $38,000 from this design change. Other design changes include replacing the steel lift platform on older "Lift-U" models with stainless steel to prevent rapid deterioration from salt used on roads during winter months. MTA has also installed protective covers and has used "Permatex Xtend" rust treatment to reduce corrosion problems with lifts.

Madison Metro has been operating life-equipped buses since 1992. Metro's vehicle maintenance staff have developed a program for the upkeep of the wheelchair lifts. This program includes three major elements:

- Daily cycling of the lifts by drivers.
- Monthly (at least) preventative maintenance, including cleaning out the tracks.
- Lubricating the lifts: Teflon lubricant during the winter months, graphite lubricant during the summer months.

The lift manufacturer (Lift-U) states that lubrication of the lifts is neither necessary nor recommended. However, Madison Metro has found that this program has significantly improved the reliability of lift operation.

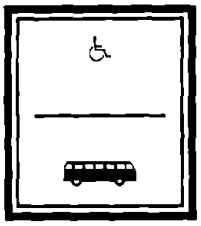
5.2.2 *Mud Flap for Wheelchair Lift*



The **Greater Bridgeport Transit District** (Bridgeport, CT) has designed a low cost device to improve the reliability of its rear door wheelchair lifts. By 1996, GBTD's entire fleet of 52 buses is scheduled to be lift-equipped. All of these lifts are step lifts located at the rear door. The GBTD mechanics found that dirt accumulated on the lift components, as well as on the underside of the steps. In the fall, leaves accumulated on the components and the underside; in the winter, snow, slush, ice, sand, and salt accumulated on the components and the underside. This was causing lifts to get stuck or otherwise not work properly.

The mechanics determined that the rear wheel—located immediately behind the rear doorway— was throwing this material forward onto the lift. To block the material from hitting the lift, GBTD installed a metal flap to the underside of its buses, between the rear wheel and the rear doorway. This flap has significantly helped to improve lift reliability, according to GBTD's assistant director of maintenance. The cost for this flap (material and installation) is about $55 per bus.

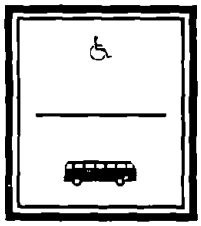
5.2.3 Accessible Supervisor Vehicles



Valley Metro was the first system in the country to supply low floor vans to road supervisors. In case of a malfunctioning lift on a bus, supervisors are able to pick up mobility impaired passengers, when waiting for the next bus is not feasible, taking into account the hazards of waiting outside for a long period in the extreme heat.

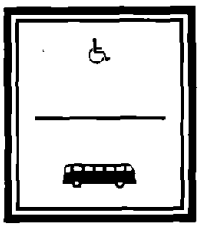
The **Rhode Island Public Transit Authority**'s supervisor vans are lift-equipped. RIPTA's primary concern was not the weather, but continuing frustration (passengers and staff) over the unreliable performance of the lifts on its fixed route buses. Both Valley Metro and RIPTA carry the passenger from the originating bus stop to the final destination. Both systems would rather not have to make use of their supervisor vans as backups for lift-equipped buses, but both have found this, on occasion, to be a practical alternative to dispatching a replacement bus.

5.2.4 Use of Low Floor Buses



Many transit systems are considering the use of low floor full size transit buses as a means of providing simpler and faster entry, particularly for mobility impaired passengers. **MARTA** currently has 51 forty-foot, low-floor buses in fixed route service. These buses use a unique ramp design for passenger boarding/alighting. Plans are underway for the procurement of 70 additional vehicles. These buses will comprise a significant percentage of MARTA's 560 bus peak requirement. The buses have been well-received by the ridership, and the ramp design is mechanically simpler (and consequently far more robust) than that of a lift. Especially practical is the override capability on the ramp mechanism which allows the bus operator to manually unfold the ramp in the case of malfunction.

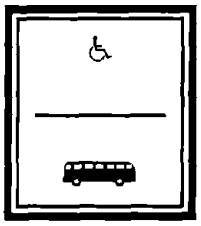
5.2.5 Fare Card Reader for Rear Door



In transit systems with rear-door wheelchair lifts, collecting the fare from a passenger who uses the lift can become problematic. Many systems prohibit the bus operator from handling the passenger's fare or bus pass. Consequently, the lift user must head to the front of the bus to deposit the fare or swipe the pass (very unlikely); hand the fare or pass to the operator (violating system rules); or not pay at all. At systems where the bus operator is allowed to handle a passenger's pass, the operator may occasionally forget to register (or return) the pass in the haste of securing the passenger and mobility aid.

SEPTA and **Valley Metro**, two bus systems that use rear-door lifts, mentioned the possibility of installing a pass reader at the rear door. Staff at both systems believe that a card reader at the rear door would be relatively inexpensive, and most likely save time and increase fare revenue. However, neither SEPTA nor Valley Metro has definite plans to develop a specification for a rear door card reader.

5.2.6 Specifications for Wheelchair Manueverability



The movement and positioning of wheelchair and mobility aid users within the vehicle is made much easier when special provisions are made to provide wider clearances in the aisle ways. One transit system that has taken a proactive approach to this problem is **AC Transit** (Oakland, CA). The AC Transit Board has made an official policy that the lift platform on all of their new bus procurement must be thirty-two inches (32") wide, which exceeds the ADA minimum requirement by two inches. This is a clear width specification based on the dimensions inside any passenger handrails mounted on the lift platform. AC Transit, working with its Accessibility Advisory Committee, has created a mock-up of the front area on its buses to determine the requirements for maneuvering of wheelchairs and scooters. Their bus specifications, derived from the mock-up testing, requires that the path (aisle) width should be a minimum of 42 inches to allow for easy travel. In the securement area where 180 degree turns are expected, space should be clear in a full 68-inch diameter circle. A vertical clearance of 18 inches above the floor surface should be provided on the outside of turning areas for wheelchair foot rest clearance.

5.3 ENTERING THE RAIL CAR: HIGHLIGHTS

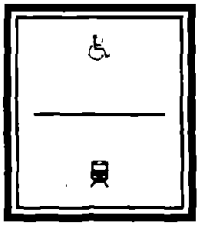
All rapid rail stations are designed for level boarding. Nevertheless, the major problem reported by the rapid rail systems deals with the vertical and horizontal gaps between the car and the boarding platform. The allowable maximum gaps, according to ADA regulations, depend on the following combinations of platform and rail vehicle:

	Vertical	Horizontal
New vehicle, new platform	5/8"	3"
New vehicle, key station platform	1½"	3"
Retrofitted vehicle, new platform	2"	4"
Retrofitted vehicle, key station platform	2"	4"

For example, for the combination of a new rail car (post-ADA purchase) and a new platform (post-ADA construction), the height difference between the platform and the car doorway cannot exceed 5/8-inch; the horizontal gap between the platform and the doorway cannot exceed three inches. These dimensions apply to rapid rail, light rail, commuter rail, and automated guideways.

Older light rail systems and some of the older commuter rail systems have low platform boarding, i.e., they require the passenger to climb steps to move from the platform to the rail car. To enable a passenger with a mobility impairment to board from a low platform, there must be some "level change" mechanism available: either a mini-high platform, a ramp, or a lift.

5.3.1 *Bridgeplate for Rapid Rail*

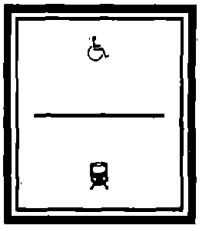


The most straightforward solution to the gap problem on the older rapid rail systems is to use a bridgeplate approach. Operationally, this is very difficult because of the time it takes to remove the bridgeplate from its storage location on the car (or on the platform), deploy it to assist the passenger on or off the car, and then place it back in storage. If the system is running with short headways, typical of rush hour conditions, there is a high likelihood of schedule delays if there are any problems in the handling of the bridgeplate or if there are several people requiring the use of the bridgeplate.

Of the older transit systems visited, only the **Chicago Transit Authority** had established a system of bridgeplates that were stored on the platform. One of their concerns regarding this bridgeplate

system was the trend at CTA and throughout the industry towards one-person operation of the train. If there is no conductor on the train, it means that there would have to be someone at each accessible station in a position to assist the disabled person by deploying the bridgeplate. It is very difficult to see how such a system can be handled effectively in the absence of some mechanism for alerting a station agent in advance of the individual boarding or alighting from the system.

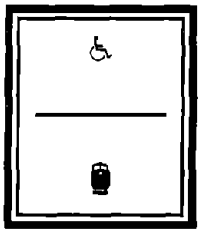
5.3.2 Threshold Extensions



At **MARTA**, all existing stations are being modified to accommodate passengers with mobility impairments. At some stations, the horizontal gap between the platform and rapid rail car exceeds three inches. To resolve this problem, MARTA has welded a 1½-inch extension to each rail car door opening. The average cost per rail car to perform this retrofit was $1,000 (six doorways per rail car). The vertical gap has not been an issue.

In addition, MARTA has suggested that passengers using wheelchairs enter the vehicle backward to avoid problems with the horizontal gap (the larger rear wheels entering first). However, most passengers do not find this necessary; as well, this practice tends to slow pedestrian traffic at the doorways.

5.3.3 Bridgeplate for Commuter Rail

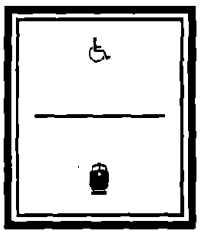


Metra has employed a contractor to rehabilitate 140 railcars on the Electric Division to be accessible under ADA regulations. All stations on the electrified line provide level-platform boarding. However, the gaps at these stations vary widely: as much as 12 inches horizontal; and minus six inches to plus four inches vertical. Consequently, wheelchair access at most stations requires a bridgeplate.

Metra has designed a short, hinged steel bridgeplate that is permanently mounted near the door in a locked case enclosed in a false vestibule wall. The bridgeplate is manually operated and deployed by the train conductor. It is mounted on the side adjacent to the door and is hinged to unfold in front of the door and then hinged again to swing out over the gap opening. One of Metra's engineers designed the bridgeplate with his disabled son in mind and had his son test the bridgeplate design. A prototype was later tested by representatives from the disabled community. Metra officials report that the bridgeplate has received widespread acceptance.

In addition to providing bridgeplates, the narrow passage from the vestibule has been widened. Inside the car, Metra is replacing four seats with flip seats which can be retracted to make room for a wheelchair. All of these accessible cars have the uniform accessibility sign prominently displayed near both the outside door and the inner door in the vestibule. The cars are also equipped with an amber light and a buzzer to warn passengers when the doors are about to close.

5.3.4 On-Board Lift for Commuter Rail

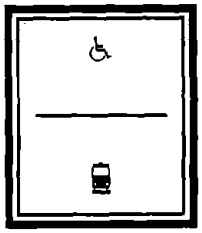


Metra operates 682 bi-level gallery coaches in push-pull locomotive service. All are low platform boarding. Floor level is 44 inches above top of rail and access is by means of steps in the car vestibule. Metra has ordered 173 new fully accessible bi-level cars under a $379 million contract with American Rail Corporation. Each of these cars is equipped with a Ricon on-board wheelchair lift. When all 173 cars are received, this will permit Metra to make one car of each four-car train accessible.

The Ricon lifts, which are stowed in the steps when not in use, can be automatically deployed and stowed under the control of the train conductor. In addition, in the event of failure, it is possible to manually operate the lifts from a control box outside the car. The Ricon lift is interlocked with the train propulsion control to prevent the train from moving while the lift is deployed. Inside the vestibule, two steel rods are put in place by the conductor to prevent the wheelchair from rolling into the opposite side stairwell.

These cars, along with a similar version to be supplied to Cal Train, will be the first lift-equipped commuter rail cars in the United States. Due to manufacturing problems and a change in the manufacturer (Morrison Knudsen spun off their transit business into the American Passenger Rail Car Company) there have been significant delays—all of which means that these innovative lift-equipped commuter rail cars will not be in service until late 1997 or early 1998.

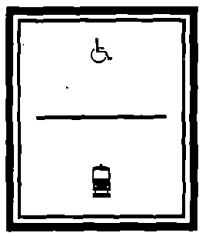
5.3.5 Wayside Lift for Light Rail



Tri-Met has used wayside (on platform) lifts for its light rail operations for a number of years. The cycle time for one deployment of a wayside lift is usually 60 to 120 seconds. They have worked fairly reliably, and their frequency of use is increasing considerably: Tri-Met had 9,900 light rail lift boardings in 1989, increasing to 22,900 lift boardings in 1995. Part of the popularity in lift use arises from the system's proactive program for standees on lifts, for both rail and bus.

In fact, the popularity of lift use has prompted Tri-Met to introduce the use of low floor light rail cars (discussed later in this section).

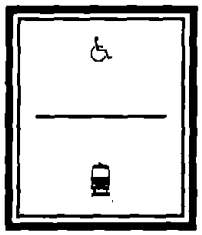
5.3.6 Lift-Equipped Light Rail



Of the light rail systems included in this study, only San Diego Trolley (subsidiary of **MTDB**) uses lifts mounted in the vehicles. Each rail car can accommodate at least two wheelchairs; the 52 cars placed into service since 1994 can accommodate up to four wheelchairs. Trains (from one to four cars) are configured so that there is always a lift at the front door of the first car, adjacent to the operator's cab.

San Diego Trolley has used Ricon lifts since 1985, and is very pleased with their performance. The failure rate of the lifts is only 0.8 percent—which may be attributable in part to the favorable weather conditions in the service area.

5.3.7 Low Floor Light Rail



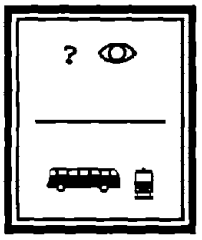
Tri-Met plans to be the first light rail system in this country to use low floor vehicles. Service is expected by the end of 1996. These vehicles will be equipped with a ramp that can be deployed by either the vehicle operator or by a passenger (from either the inside or outside). The new vehicles will be configured to work with Tri-Met's new light rail line, but they will also be used on the existing line. For proper operation of the ramp at an existing station, the station's platform will have to raised by two inches.

One of the reasons for selecting low floor light rail vehicles is to eliminate the time involved in deploying a lift for passengers who use wheelchairs, as well as to quicken the boarding and alighting process for all passengers. With the time to deploy a lift generally ranging from 60 to 120 seconds, the boarding and/or alighting of two or more lift users can potentially affect the schedule of vehicles. As noted in the description of Tri-Met's current wayside lifts, the system's lift boardings have increased significantly from 1989 to 1995.

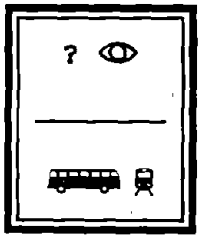
5.4 SPECIAL SITUATIONS

Transit system staff at most systems had concerns about the following three issues.

5.4.1 *Service Animals*



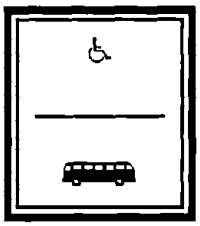
The use of service animals by disabled persons on transit vehicles has proven to be somewhat contentious. In many cases, it is very difficult to verify that a service animal has been trained since there are few service animal training schools that provide professional certification. Since ADA does not require that service animals have certification, most of the transit systems have adopted a fairly flexible policy. For example, **Muni** advises its vehicle operators that *guide dogs* for the blind can be identified by their harness, *signal dogs* can be identified by an orange collar and leash, and *service dogs* can be identified by their blue and yellow backpack; but it also advises the operators that those identifying markings are not mandatory. Muni also does not require that the working dog be in the photo on the Regional Transit Connection Discount Card (ID card issued by the Bay Area's transit systems).



New York City Transit has adopted a policy that requires anyone traveling on the subway or bus system with a service animal must show proper identification upon request. The accepted forms of identification include a picture ID card issued by a Service Animal Training School; Service Animal ID issued by the Delta Society; or a Service Animal License issued by the city or other municipality. For those persons who do not have any of these identification cards, NYC Transit has its own procedure for obtaining a NYC Transit Service Animal Identification Card. This approach provides a good solution for the

problem of dealing with certification and providing a method for ensuring that all disabled persons traveling with service animals will have some form of identification.

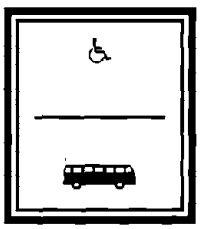
5.4.2 Oversize Wheelchairs



The boarding of oversize wheelchairs, particularly 3-wheel and 4-wheel scooters, has been a problem at some transit systems. If the wheelchair or mobility device cannot fit onto the standard ADA lift platform, which is 30 inches wide and 48 inches long, then the transit system is not obliged to board that particular passenger. **Seattle Metro** is one of several transit systems that is particularly concerned with oversize wheelchairs. More often the non-traditional wheelchair may be able to squeeze onto the lift platform, but for front-door lifts the passenger has a great deal of difficulty in maneuvering past the farebox.

In some rare instances, transit systems are confronted with a passenger in a motorized wheelchair whose combined weight exceeds the maximum limit of 600 pounds specified in the ADA regulations. Most wheelchair lifts can handle more than 600 pounds based on their design, but the transit system may be concerned about problems of handling the wheelchair passenger in an emergency situation or if there is a lift malfunction. This is one instance where the availability of a low floor bus with a boarding ramp would be very useful in avoiding problems with lift capacity.

5.4.3 Standees on Lifts



The response of most systems with regard to standees on lifts is that it has not been a problem as long as the lift conforms to the regulatory requirements of ADA—particularly the requirement to have handrails on the lift platform. The **Bi-State Development Agency** operates buses (pre-ADA) whose lifts do not have handrails. BSDA does not allow standees on these lifts. There are also systems such as **Denver RTD**, where they are concerned about standees on lifts from an operational safety perspective and try to discourage such a practice—although they certainly do not prohibit standees.

Another concern of transit operators with regard to standees on lifts is the clearance between the top of the lift platform and the top of the entry door. Taller people stepping from the lift platform into the vehicle could easily strike their heads on the top door frame if they are not paying attention. Any potential safety problem in this regard can be averted through proper training of the vehicle operator to remain alert to this type of situation. It is interesting to note that in one of the rare exceptions to

its ADA regulations, the FTA has allowed transit providers who operate buses having a particular lift model (the EEC Model 141 Lift, which is no longer manufactured) to deny its use to standees (49 CFR 37.165(g)). Among the reasons cited for this exception was the "arcing" of the lift as it operated; this created an unusually low head clearance.

Section 6
Findings: Traveling on the Vehicle

This section of the report presents information collected from the transit system site visits and mail/telephone surveys on Traveling on the Vehicle: the fourth functional activity related to using fixed route service. The first part of this section discusses the issues involved, for all passengers and for disabled passengers in particular. The next part of this section cites the highlights observed by the Team members during the site visits for bus operations. Following that are highlights for rail operations.

6.1 TRAVELING ON THE VEHICLE: ISSUES

Once on the vehicle, a passenger's next "task" may be to wait until the vehicle reaches the desired station or stop. Yet there are other potential on-board activities that non-disabled passengers may take for granted or do not have to perform. These include:

- Maneuvering to the seat or standing area.
- Using the securement system (for a passenger who uses a wheelchair).
- Transferring from a wheelchair to a seat.
- Accommodating the movement of other entering/exiting passengers.
- Listening and responding to operator announcements.

The associated regulations for most of these activities are specifications for accessible vehicles (49 CFR Part 38); regulations for employee training and general requirements for wheelchair securements are included in 49 CFR Part 37. The applicable regulations for a transit system are cited in Section 4 of Appendix A–Requirements List, "Traveling on Vehicle."

The most publicized issue for these set of activities is the ongoing search for a satisfactory wheelchair securement system on buses. A second high profile issue in the transit industry is the availability and use of internal communication systems. This section discusses devices that allow

communication between an individual passenger and a vehicle operator; Section 7 of this report covers the topic of stop and station announcements.

The format for presenting the information in this section is similar to the format used in the previous sections. There is a short description of each ADA solution and obstacle. Next to the description are graphical icons. These icons indicate: whether the solution or obstacle concerns a mobility, visual, hearing and/or cognitive disability; and mode of transit involved (at the transit system where it was observed; some solutions could be applied to other modes at other systems).

The solutions applicable to bus operations are presented first. These are followed by solutions applicable to traveling on a light rail, rapid rail, or commuter rail vehicle.

In addition, to help readers to locate solutions and obstacles, this section includes tables that are cross-referenced by passenger disability (Table 6-1), by transit mode (Table 6-2), and by transit system (Table 6-3).

KEY FOR ICONS

Disabilities		Transit Modes	
?	Cognitively Impaired		Automated Guideway
	Hearing Impaired		Bus
	Mobility Impaired		Commuter Rail
	Visually Impaired		Light Rail
			Rapid Rail

6.2 TRAVELING ON THE BUS: HIGHLIGHTS

The securement of wheelchairs on buses and vans is one of the most difficult problems that faces the transit systems included in this study. The problem stems from the fact that transit systems have to contend with a very wide range of traditional and non-traditional wheelchairs, since the term as defined in the ADA means:

Table 6-1
Traveling on the Vehicle Highlights Grouped by Passenger Disability

Disability Group	Idea	Transit System	Mode	Page
♿	Expanded Securement Area	Madison Metro	🚌	6-10
♿	In-House Securement System	MCTO	🚌	6- 8
♿	Passenger Intercom	CTA	🚆	6-11
♿	Passenger Intercom	MTA-MD	🚊	6-11
♿	Standardization of Securement System	Seattle Metro	🚌	6-8
♿	Stokes Strap	Valley Metro	🚌	6-10
♿	Use of Priority Seating Positions	MDTA	🚆	6-11
👁	Accessible Car ID Numbers	CTA	🚆	6-12
👁	Passenger Intercom	CTA	🚆	6-11
👁	Passenger Intercom	MTA-MD	🚊	6-11

Table 6-2
Traveling on the Vehicle Highlights Grouped by Transit Mode

Mode	Idea	Transit System	Disability Group	Page
	Expanded Securement Area	Madison Metro	♿	6-10
	In-House Securement System	MCTO	♿	6-8
	Standardization of Securement System	Seattle Metro	♿	6-8
	Stokes Strap	Valley Metro	♿	6-10
	Passenger Intercom	MTA-MD	♿ 👁	6-11
	Accessible Car ID Numbers	CTA	👁	6-12
	Passenger Intercom	CTA	♿ 👁	6-11
	Use of Priority Seating Positions	MDTA	♿	6-11

Table 6-3
Traveling on the Vehicle Highlights Grouped by Transit System

Transit System	Idea	Disability Group	Mode	Page
CTA	Accessible Car ID Numbers			6-12
CTA	Passenger Intercom			6-11
Madison Metro	Expanded Securement Area			6-10
MCTO	In-House Securement System			6-8
MDTA	Use of Priority Seating Positions			6-11
MTA-MD	Passenger Intercom			6-11
Seattle Metro	Standardization of Securement System			6-8
Valley Metro	Stokes Strap			6-10

"a mobility aid belonging to any class of three or four wheeled devices, usable indoors, designed for and used by individuals with mobility impairments, whether operated manually or powered. A "common wheelchair" is such a device which does not exceed 30 inches in width and 48 inches in length measured two inches above the ground, and does not weigh more than 600 pounds when occupied." (49 CFR 37.3)

Considering this very broad definition and the fact that a transit system may not deny transportation to a wheelchair or its user on the basis that the wheelchair cannot be properly secured, a difficult situation is created where transit systems must learn to cope with virtually every "common wheelchair." A transit system can require the wheelchair to be secured, but it can only recommend that the passenger use the independent passenger (lap and shoulder belt) restraints which must be available.

The situation is further compounded by the availability of a large variety of securement devices involving different fastening arrangements, such as individual adjustable belts which are placed on the frame of the wheelchair and fastened to the floor structure of the vehicle by means of a track or anchor points, or the use of permanently placed retractable belts. Other transit systems rely mainly on a claw or clamp device that fastens onto one rear wheel. This type of system must be supplemented with one or more belts in order to provide the stability of securement required by the ADA.

Many transit systems operate buses that are equipped with different securement systems because they were purchased at different times from different vehicle manufacturers, or even the same vehicle manufacturer who may have switched to a different securement system supplier. Therefore, the vehicle operator may be faced with handling two or more different securement systems depending upon the vehicle/operator assignment process. It is easy to understand why many systems have faced difficulties when confronted with such an inconsistent mix of wheelchair designs and securement system designs.

The transit systems that have the least problems with securement systems are those that make sure all of their vehicles (to the maximum extent possible) are equipped with the same securement design. In particular, wheelchair restraint systems using three retractable belts have been favored because they avoid problems associated with:

- individual belts that are stored in a separate compartment on the vehicle and are often found to be missing or stolen; and

- attachment of the fourth retractable belt to the wheelchair, which typically involves the vehicle operator having to work in very close proximity to the passenger—which is uncomfortable for both parties—or the operator having to work in a nearly inaccessible location.

The FTA has recognized the difficulties associated with securement systems and has sponsored a number of research projects (through Project ACTION) to develop new systems that are based on the principle of a universal securement. This type of securement concept would allow any wheelchair to be manufactured or retrofitted with a docking device that would slide into and attach to a permanently mounted structure that is securely fastened to the vehicle structure. In operation, the wheelchair user can simply back up and be mechanically guided into a firm securement without any assistance from the driver. A number of prototype units and some commercial versions of the universal securement devices have been constructed and tested in transit operation—but not at any of the sites visited. These units are undergoing a complete evaluation (Lane Transit District in Eugene, Oregon), with no reported results available yet.

Earlier data on universal securement prototypes indicate that the major technical problems appear to be in working out a methodology for attaching the docking devices to a wide variety of wheelchair configurations (including 3 and 4-wheel scooters) and for dealing with the temporary attachment of devices to wheelchairs that have no permanently fitted devices. Without a complete changeover to the new universal designs, transit systems are faced with the need to provide a backup system of belts, leading to increased securement system costs and complexity.

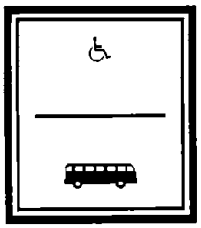
A 1995 report issued by the FTA entitled "Tri-Wheeled Scooters Transported on Buses and Vans: Assessment of Securement and Restraint Issues" offers a reasoned long-term approach to dealing with the very complex problems of securement systems. Among the recommendations are:

- Support for the concept of a "transportable mobility aid" standard and test protocol developed under the auspices of the American National Standards Institute and the Rehabilitation Engineering Society of North America (ANSI/RESNA).

- A testing, clearinghouse, technical assistance, and technology/information transfer program for mobility aid securement and occupant restraint (MASOR) systems.

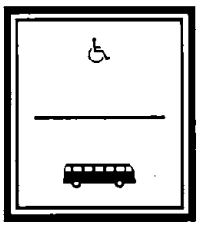
The report concludes that the universal design approach will only work if the vehicle, securement, mobility aid, and occupant restraint manufacturers each have cooperative responsibilities with each other to ensure compatibility of these subsystems. A number of the transit systems visited share this perspective. They also believe, however, that it will take a long time to obtain this type of design cooperation.

6.2.1 Standardization of Securement System



As noted earlier, the systems which appear to have the least problem with securement systems are those that have taken a proactive approach to dealing with the technical complexities associated with securement. For example, **Seattle Metro** is moving toward standardization of their securement systems (three retractable belts) and is also very actively involved with their local ADA Committee and individual wheelchair users to identify the best places for attachment of wheelchair restraints on all of the mobility devices used. They are in the process of providing identifying decals in those locations so that each driver knows immediately where securement belts are to be placed.

6.2.2 In-House Securement System



The **MCTO** has developed a wheelchair securement system for use in its fixed route buses. This securement system consists of four retractable belts. Three of these belts are used to hold the frame of the wheelchair. The fourth belt acts as a lap belt for the passenger. The MCTO is using this securement system in all of its new buses. Figure 6-1 illustrates the securement system used by MCTO.

The state of Minnesota passed legislation in 1980 that included standards for wheelchair placement and wheelchair securements. Since then, bus systems could use only securements that were certified by the state. The MCTO's predecessor (MTC) developed its own securement system in response to the state mandate, as well as to enable the handling of various size mobility devices. The new buses have two wheelchair positions, one on each side of the bus. The current version of the securement system can accommodate most electric wheelchairs.

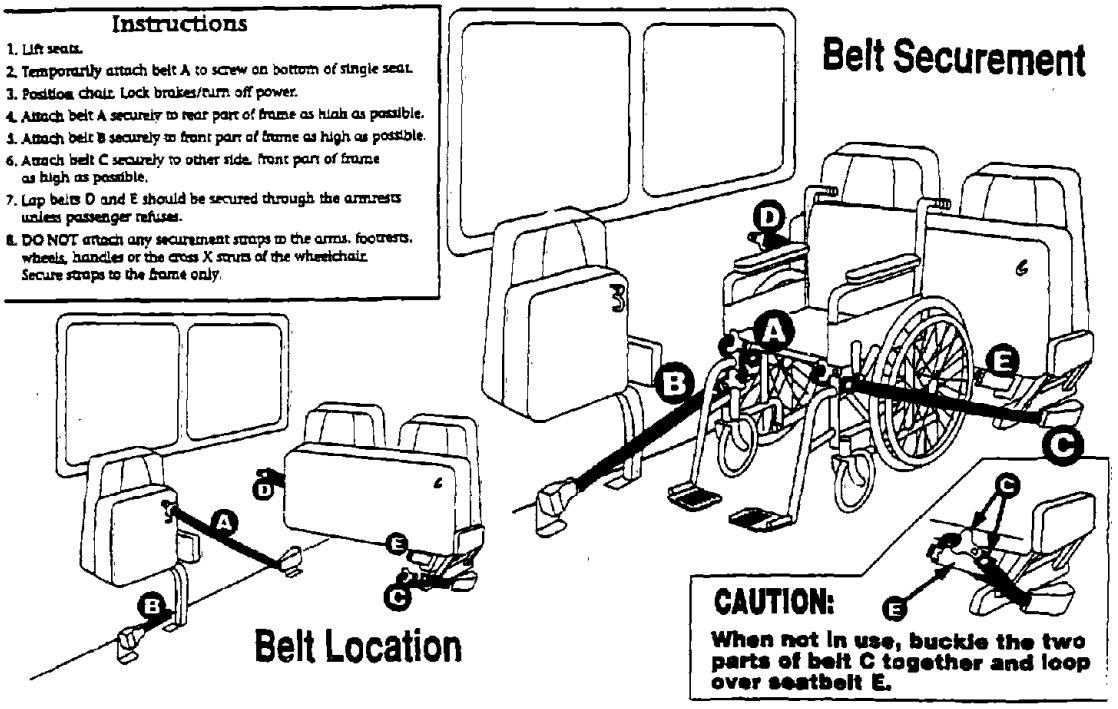
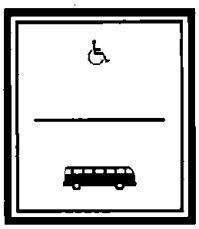


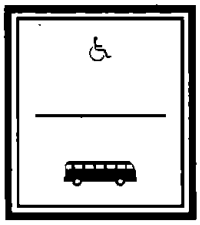
Figure 6-1
MCTO (Minneapolis) Wheelchair Securement System

6.2.3 Expanded Securement Area



Madison Metro has specified that the wheelchair securement areas in Metro's fixed route buses should be longer than the required 48 inches (49 CFR 38.23 (d)(2)). In Metro buses, the securement area is approximately 60 inches long. Depending on the configuration of the seats (forward or side-facing), this may lead to the loss of non-disabled seating. The benefit, however, is more maneuvering area for a wheelchair user and more room available to the bus operator when attaching or detaching the securement device.

6.2.4 Stokes Strap



Valley Metro offers its patrons who use a mobility aid the option of using a "Stokes Strap" to assist the bus operator in securing the mobility aid. The device consists of a yellow nylon strap that is fastened to the wheelchair/scooter frame or bumper before the passenger boards the bus; typically, the passenger will attach the strap, and leave it there permanently. When the operators perform the wheelchair/scooter securement procedure, they can attach the S-hook straps to the Stokes Strap. The system makes the securement process quicker and more stable.

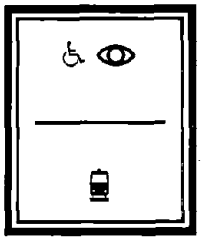
The strap is available to patrons free of charge. The cost to the system is approximately $1.25 per strap. The straps come in three different sizes. With the strap, patrons receive written instructions for installation that suggest the best fastening locations for different types of mobility aids.

6.3 TRAVELING ON THE RAIL VEHICLE: HIGHLIGHTS

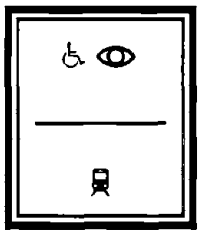
For some rail operations included in this assessment, dissatisfaction with securement systems is an issue just as it is for bus operations. However, it is a less prominent issue because many rail systems (rapid, light, and commuter) are not equipped with securement systems in their cars. Of those that do, some are simply claws or clamps that fasten onto a rear wheel, with no belts.

One of the highlights presented here for traveling on rail vehicles deals with the positioning of wheelchairs in rail cars, though it has what might be considered an unexpected outcome. The other two highlights for traveling on rail vehicles deal with improvements in communications.

6.3.1 Passenger Intercom

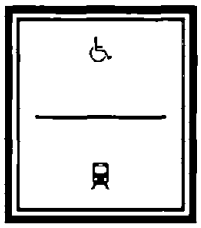


The **Mass Transit Administration of Maryland** is using several devices to improve communications on its light rail vehicles. All of the light rail cars have intercoms that passengers can use to speak to the operator. A switch to actuate the intercom is located on the underside of the jumpseat that is flipped up to create the wheelchair seating area: within easy reach of a wheelchair passenger. There is also a stop request button near the wheelchair position, also in the reach range of most wheelchair passengers.



The 256 Morris-Knudsen Series 3200 rail cars (put into service since 1991) of the **Chicago Transit Authority** are all equipped with a two-way communication system located near the doorway of each car, next to a large blue sign. The intercom allows any passenger to communicate with the train operator. The intercom is turned on by pushing a button to talk. The CTA is rehabilitating over 500 Budd Series 2600 rail cars (manufactured between 1981 and 1987) and will be equipping these cars with passenger intercoms also.

6.3.2 Use of Priority Seating Positions



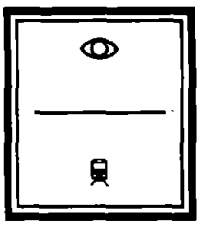
In rail cars that are designed to accommodate passengers who use wheelchairs, there are priority seating positions for these passengers. Usually, these positions are in the form of benches or individual seats that flip up to create the room for the wheelchair. In other rail car designs, there are open areas adjacent to the aisle with sufficient space for a wheelchair user to comfortably maneuver in and out from.

At the **Metro-Dade Transit Agency**, the priority seating positions for wheelchair users are open areas adjacent to the aisles. These areas do not have securement systems. MDTA staff have found that passengers who use wheelchairs rarely make use of these priority positions. They are anxious about missing their stop, especially when the train is crowded. As a result, most wheelchair passengers prefer to stay closer to a doorway, to assure themselves of being able to alight from the train at their stop.

Based on this everyday practice of their system's passengers, MDTA travel trainers now instruct wheelchair passengers who are new to Metrorail not to use the priority seating positions. Instead,

MDTA advises them to position themselves in the aisle near a doorway and to lock the brakes of their wheelchair.

6.3.3 Accessible Car ID Numbers



To help visually impaired passengers, the **CTA** places a sign located at the upper right of the door entryways of every rail car. The signs provide the car number in both raised numbers and Braille, as well as in print. This identification can help a visually impaired passenger when registering a complaint or suggestion. CTA's entire rail fleet has these signs.

Section 7
Findings: Departing the Vehicle

This section of the report presents information collected from the transit system site visits and mail/telephone surveys on Departing the Vehicle: the fifth functional activity related to using fixed route service. The first part of this section discusses the issues involved, for all passengers and for disabled passengers in particular. The next part of this section cites the highlights observed by the Team members during the site visits for bus operations. Following that are highlights for rail operations.

7.1 DEPARTING THE VEHICLE: ISSUES

Many of the activities related to departing a transit vehicle parallel those of entering a vehicle. At low platform rail stations and for most buses, the departing passenger must descend several steps to exit the vehicle. In addition, a rail passenger may encounter a vertical and/or horizontal gap between the threshold of the rail car and the station platform. The type of solutions to overcome these physical barriers for entering the vehicle (e.g., lifts, bridgeplates) are used again for departing the vehicle. Please refer to Section 5 of this report for a discussion of the "Entering the Vehicle."

The additional activity involved with departing the vehicle is identifying the proper stop to leave the vehicle. This problem is not restricted to those with visual, hearing, or mental disabilities. Any passenger who is unfamiliar with the transit system or the particular route can be assisted by signs and announcements that provide stop information on board the vehicle. The announcement of stops is one issue that transit systems—particularly bus operations—have been struggling with.

The applicable regulations for a transit system are cited in Section 5 of Appendix A–ADA Requirements List, "Departing the Vehicle." These regulations provide specifications for service (49 CFR Part 37), facilities (Appendix A to 49 CFR Part 37), and vehicles (49 CFR Part 38).

The format for presenting the information in this section is similar to the format used in the previous sections. There is a short description of each ADA solution and obstacle. Next to the description are graphical icons. These icons indicate: whether the solution or obstacle concerns a mobility, visual, hearing and/or cognitive disability; and mode of transit involved (at the transit system where it was observed; some solutions could be applied to other modes at other systems).

The solutions applicable to bus operations are presented first. These are followed by solutions applicable to entering a light rail, rapid rail, or commuter rail vehicle.

In addition, to help readers to locate solutions and obstacles, this section includes tables that has them cross-referenced by passenger disability (Table 7-1), by transit mode (Table 7-2), and by transit system (Table 7-3).

KEY FOR ICONS

Disabilities		Transit Modes	
?	Cognitively Impaired		Automated Guideway
	Hearing Impaired		Bus
	Mobility Impaired		Commuter Rail
	Visually Impaired		Light Rail
			Rapid Rail

7.2 DEPARTING THE BUS: HIGHLIGHTS

The ADA requires stop announcements at transfer points, major intersections, and destinations on fixed route bus systems. Stop announcements are also to be made at sufficient intervals to maintain orientation, and upon passenger request. The results of the ADA Assessment has shown that in many cases, the vehicle operator is reluctant or unwilling to announce the required stops. There are a variety of reasons cited for this difficulty in making stop announcements, including:

- Problems with the microphones or the public address system on the bus.
- Vehicle operator difficulty with public speaking and/or pronouncement of messages.
- Vehicle operator preoccupation with driving duties and other responsibilities.
- Lack of knowledge about intersections and stops on route.

Some of these problems can be readily addressed, such as the problems with PA systems, but other problems involving speaking skills and familiarity with street names and geography are more difficult to contend with. Solutions can emphasize employee training and motivation or state-of-the-art technology.

Table 7-1
Departing the Vehicle Highlights Grouped by Passenger Disability

Disability Group	Idea	Transit System	Mode	Page
?	AVL-Based Stop Announcements	MTA-MD Houston Metro RIPTA		7-7
?	Commuter Rail Announcements	MNCR		7-10
?	Driver Stop Announcements and Training	SunTran Tri-Met		7-6
?	Improved Station ID Signage	SEPTA TCRA		7-10
?	Lapel Microphones	SEPTA		7-7
?	Mileage-Based Stop Announcements	LI Bus		7-9
?	Written Messages Between Passenger and Driver	MAT		7-7
	Announcements for the Hearing Impaired	Tri-Met		7-9
	AVL-Based Stop Announcements	MTA-MD Houston Metro RIPTA		7-7
	Commuter Rail Announcements	MNCR		7-10
	Improved Station ID Signage	SEPTA TCRA		7-10
	Mileage-Based Stop Announcements	LI Bus		7-9
	Written Messages Between Passenger and Driver	MAT		7-7
	AVL-Based Stop Announcements	MTA-MD Houston Metro RIPTA		7-7
	Driver Stop Announcements and Training	SunTran Tri-Met		7-6
	Lapel Microphones	SEPTA		7-7
	Mileage-Based Stop Announcements	LI Bus		7-9
	Written Messages Between Passenger and Driver	MAT		7-7

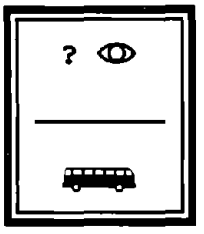
Table 7-2
Departing the Vehicle Highlights Grouped by Transit Mode

Mode	Idea	Transit System	Disability Group	Page
	Announcements for the Hearing Impaired	Tri-Met		7-9
	AVL-Based Stop Announcements	MTA-MD Houston Metro RIPTA	?	7-7
	Driver Stop Announcements and Training	SunTran Tri-Met	?	7-6
	Lapel Microphones	SEPTA	?	7-7
	Mileage-Based Stop Announcements	LI Bus	?	7-9
	Written Messages Between Passenger and Driver	MAT	?	7-7
	Commuter Rail Announcements	MNCR	?	7-10
	Improved Station ID Signage	TCRA	?	7-10
	Improved Station ID Signage	SEPTA	?	7-10

Table 7-3
Departing the Vehicle Highlights Grouped by Transit System

Transit System	Idea	Disability Group	Mode	Page
Houston Metro	AVL-Based Stop Announcements	?		7-7
LI Bus	Mileage-Based Stop Announcements	?		7-9
MAT	Written Messages Between Passenger and Driver	?		7-7
MNCR	Commuter Rail Announcements	?		7-10
MTA-MD	AVL-Based Stop Announcements	?		7-7
RIPTA	AVL-Based Stop Announcements	?		7-7
SEPTA	Improved Station ID Signage	?		7-10
SEPTA	Lapel Microphones	?		7-7
SunTran	Driver Stop Announcements and Training	?		7-6
TCRA	Improved Station ID Signage	?		7-10
Tri-Met	Announcements for the Hearing Impaired			7-9
Tri-Met	Driver Stop Announcements and Training	?		7-6

7.2.1 Driver Stop Announcements and Training

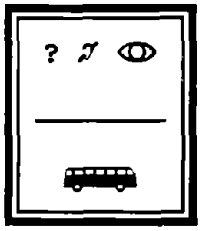


Of the transit systems included in this assessment, **SunTran** (Albuquerque, NM) unequivocally reported that its drivers were very good at providing stop announcements. When queried further on this point, the ADA Compliance Officer explained that the drivers took great pride in doing a good job and that this performance was part of the local culture. She also noted that this good driver performance was accomplished in a union environment with no driver incentive/commendation program and with no pre-ADA history of making stop announcements.

In addition to SunTran, there are many other systems that reported they were satisfied with their current approach of driver announcements. Even though they could not be precisely sure of the percentage of compliance, they were convinced that their current driver training programs were resulting in a gradual improvement in compliance. Most importantly, they believed that a cooperative and positive attitude between the drivers and the visually and hearing impaired persons using the bus would ensure that stop announcements would be made at the times that they were most needed.

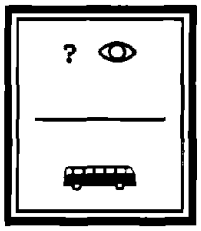
One of the transit systems that has a very positive and proactive approach to ADA-related driver training is **Tri-Met**. Its program is called "Welcome to our World" (WOW) and was developed in-house by a member of Tri-Met's Accessibility Program. She has an excellent understanding of ADA issues based on her own experience and disability. The WOW program is a full day of training, including a number of interactive exercises developed to experience disabilities and provide communication strategies. Tri-Met believes that providing this type of training program to all transit system personnel in general, and particularly to the newer drivers, helps to induce ever greater compliance in the stop announcement program. However, as with any endeavor involving human behavior, it is necessary to reinforce the training message whenever and wherever possible.

7.2.2 Written Messages Between Passenger and Driver



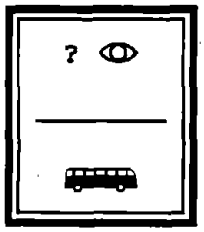
Metro Area Transit (Omaha, NE) has an active fleet of 150 buses. A majority of them were manufactured prior to ADA and do not have any internal communication equipment, audio or visual. To help drivers and passengers communicate, particularly those passengers with hearing impairments, drivers are required to carry a pencil and pad with them. In addition, the MAT staff says it is accepted practice for a passenger with a visual or cognitive disability to hand a note to the driver that names the desired bus stop.

7.2.3 Lapel Microphones



To encourage the drivers' announcement of bus stops, **SEPTA** was planning to provide microphones that clip onto a driver's shirt. SEPTA management saw two benefits to this fairly inexpensive and easy to implement technology. First, the microphones would overcome the obstacle of the many SEPTA buses that did not have public address systems. Second, drivers were not happy with the goose-neck microphones that other buses were equipped with. They claimed that these microphones were inconveniently positioned and even a potential safety hazard. Replacing the goose-neck microphones with the lapel microphones eliminated these driver concerns.

7.2.4 AVL-Based Stop Announcements



A technological solution to the announcement of bus stops involves the use of some form of automated vehicle location (AVL) system, coupled to an on-board digital audio and video display system. AVL is a proven technology, whether through a Global Positioning Systems (GPS) or a signpost transmitter system, and is used by the transit industry for monitoring vehicle operations. However, a number of real world complexities make the application of GPS to stop announcements much more difficult than simply knowing the vehicle location. Among these complexities are GPS location problems that can arise through the reflection or diffraction of transmission signals; or because of unplanned vehicle detours.

Some of these problems can be resolved by using a preprogrammed route/bus stop audio and sign messaging system such as that produced by Digital Recorders (Raleigh, NC) in their "Talking Bus" system. This is most appropriate to a system where there are a relatively small number of routes or where there is a very structured route assignment by vehicle, where one does not have to be concerned that a vehicle could be "pulled out" at random to be placed on one of dozens or more routes. The Talking Bus type of technology appears to be making some progress in number of installations. There are still some concerns about the cost of the technology, which is on the order of approximately $5,000 per bus.

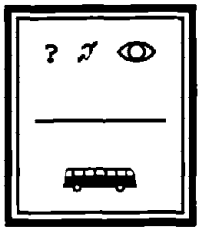
Automated Next Stop Demonstration. The FTA, through Project ACTION, has sponsored a test of a fully automated on-board next stop and route identification system using GPS technology at the Rochester-Genesee (NY) Regional Transportation Authority (R-GRTA). The system utilized was developed by Luminator Company (Plano, TX). For this demonstration, the bus annunciation system is actually triggered by an odometer sensor where at predetermined distances, appropriate bus stop announcements are made. The GPS data is used to calibrate the odometer sensor at specified locations, where the GPS coordinates have been precisely determined by earlier surveys. A door-opening sensor performs the function of a trigger to recalibrate the odometer, which is typically performed by the vehicle operator at the beginning of a route; or in the event of a route deviation, at the first GPS calibration point after the bus comes back on the route.

The R-GRTA evaluation found that a dependable automated system is an excellent way of making public transit easier to use for patrons with visual and auditory impairments, and it is more consistent than manual announcements. The evaluation also found that the automated system was not trouble-free in that it required an excessive amount of driver intervention to keep the system on track.The evaluation also pointed out that the R-GRTA system had no upgrade capability to make the improvements that the management wanted, and recommended that other transit systems make sure that any bus stop annunciation system that they are considering should allow for upgrades for at least a two-year period, since the technology is changing and progressing rapidly.

Transit System Experience with Automated Announcements. The results of the ADA Assessment visits tended to confirm the R-GRTA experience. Most systems were looking forward to the possibility of having an automated stop announcement available— especially if it were reliable, easy to use and relatively low cost. For most systems, this would relieve them of the difficult administrative problem of monitoring driver performances and responding to consumer complaints. At the same time, they recognized that the technology was evolving and there were many potential technical problems that they could be facing if they moved forward too quickly. Several of the systems in this assessment were conducting or planning to conduct limited pilot tests of automated stop announcement systems, including **RIPTA, Houston Metro,** and the **MTA of Maryland**. There were no definitive evaluation results available at the time of the site visits. However, telephone

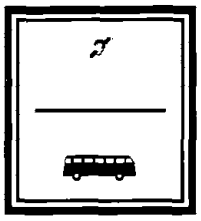
conversations subsequent to the site visits indicated that these systems were pleased with the results of the pilot tests and were moving forward with further deployment of the automated stop announcement system.

7.2.5 *Mileage-Based Stop Announcements*



Long Island Bus personnel are working with federal, state, and private sector organizations to develop an automated visual/audio next stop public announcement system for both inside and outside of the bus. In contrast to automatic vehicle locator public annunciator technology, this system will use route mileage and door openings to trigger a pre-recorded tape. One such system that is being considered by LI Bus is manufactured by Clever Devices (Glenwood, NY).

7.2.6 *Announcements for the Hearing Impaired*



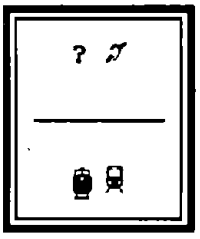
Visual signs for stop announcements for the hearing impaired, beyond the simple lighted "Stop Requested" sign, are not practical in the absence of some form of automated stop announcement system. **Tri-Met** was concerned that the access needs of hearing impaired passengers were not getting sufficient attention. Therefore, they applied for and received a Project ACTION grant, in conjunction with the Oregon Deaf Resources Center (ODRC) to develop a standardized picture language for communicating various situations that can occur during fixed route travel. Tri-Met is now developing a set of pictograms, particularly those that are difficult to verbally communicate to people. The project will also include a training video to educate transit drivers about deaf culture that is to be created by people who are deaf.

7.3 DEPARTING THE RAIL VEHICLE: HIGHLIGHTS

Stop announcements for rail service—whether rapid rail, light rail, or commuter rail—have not been the problem that they have been for bus service. Rail cars have been equipped with audio announcement systems well before the ADA. It has been the general practice of rail operators to announce every stop. Furthermore, rapid rail systems are being equipped with in-vehicle automated station announcement systems, both audio and visual, linked to the train control operations. The

issues highlighted in the following paragraphs focus on communicating with rail passengers who have hearing impairments.

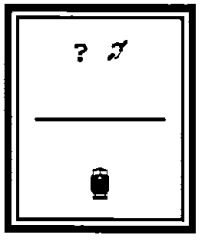
7.3.1 Improved Station ID Signage



In the absence of on-board visual displays, passengers with hearing impairments need other cues to help them to identify the proper station for alighting. The most common cues are the signs along the track and platform that identify the station. **SEPTA** has undertaken an extensive program on its commuter rail and rapid rail systems to improve the signs that identify the station to passengers inside the trains. Seated passengers and standing passengers have different fields of view when looking out a window. SEPTA is placing station ID signs at two different heights so that both seated and standing passengers can read the signs. SEPTA is also placing more station ID signs (both high and low level) along the tracks: one sign every 50 feet for commuter rail; more frequently for rapid rail.

The **Tri-County Commuter Rail Authority** is also working on the issue of placement of station ID signs. The added twist to TCRA's situation is its use of bi-level rail cars. TCRA (along with other commuter rail systems that use bi-level cars) must ensure that the station ID signs can be read by passengers on both the upper and lower levels, whether they are standing or seated.

7.3.2 Commuter Rail Announcements



Few, if any, commuter rail cars are equipped with visual announcement boards. This poses a problem for providing information to hearing impaired passengers. **Metro-North Commuter Railroad** makes regular use of its on-board public address system to provide special information. For example, some doors on a train may not open at certain stops (if the train is longer than the platform), and the conductor will announce which rail cars are available for alighting. These announcements present a problem for persons with hearing impairments or cognitive disabilities who may need this information. Unless these passengers specifically request help, conductors may not be aware of their disabilities, and these passengers may miss their stops.

Section 8
Findings: Leaving the Station/Terminal

This section of the report presents information collected from the transit system site visits and mail/telephone surveys on Leaving the Station/Terminal: the sixth and final functional activity related to using fixed route service. The first part of this section discusses the issues involved, for all passengers and for disabled passengers in particular. The next part of this section cites the highlights observed by the Team members during the site visits.

8.1 LEAVING THE STATION/TERMINAL: ISSUES

One of the most difficult tasks that passengers may face, whether disabled or not, is finding their way through a complex transportation center. Many interfaces between the transit operations and the local surroundings are straightforward, e.g., stepping out of a bus onto a sidewalk, passing through a turnstile and then an exit door to the outside. On the other hand, leaving a transit terminal can involve movement between different levels to reach other lines or modes, or locating the proper passageways that connect different sections of the complex.

The most difficult technical problem for the transit system occurs with trying to provide guidance to visually impaired passengers. The dilemma of transit systems is, even if the right information in a usable format is made available — even beyond what the regulations may require — how do they alert a visually impaired passenger of its availability and location? Further complications arise when the transit system cannot provide all the desired accessibility features because another entity (local municipality, private landlord, or other transit system) controls part or all of the station.

The applicable regulations for a transit system are cited in Section 6 of Appendix A—ADA Requirements List, "Leaving the Station/Terminal." These regulations provide specifications for accessible transit facilities. (Appendix A to 49 CFR part 37).

Section 3 of the report, "Findings: System Information/Trip Planning," discusses some of the solutions for providing information to passengers about the station/terminal and surroundings. Section 4 of the report, "Findings: Finding the Correct Vehicle," discusses some of the solutions for wayfinding, e.g., Talking Signs®, Talking Directory Display System, Raynes Rail. This section

presents solutions (and obstacles) that focus on the movement of a passenger to another transit link, or beyond the transit setting.

The format for presenting the information in this section is similar to the format used in the previous sections. There is a short description of each ADA solution and obstacle. Next to the description are graphical icons. These icons indicate: whether the solution or obstacle concerns a mobility, visual, hearing and/or cognitive disability; and mode of transit involved (at the transit system where it was observed; some solutions could be applied to other modes at other systems).

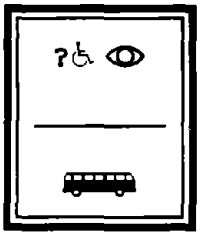
In addition, to help readers to locate solutions and obstacles, this section includes tables that has them cross-referenced by passenger disability (Table 8-1), by transit mode (Table 8-2), and by transit system (Table 8-3).

KEY FOR ICONS

Disabilities		Transit Modes	
?	Cognitively Impaired		Automated Guideway
	Hearing Impaired		Bus
	Mobility Impaired		Commuter Rail
	Visually Impaired		Light Rail
			Rapid Rail

8.2 LEAVING THE STATION/TERMINAL: HIGHLIGHTS

8.2.1 Information Kiosks and Brochures



Information to guide individuals that have mobility impairments to accessible routes is an important part of providing accessibility improvements. **Seattle Metro** provides an excellent example of a unified approach to providing accessibility information. Metro operates in a downtown transit tunnel which has five accessible stations. The locations of all tunnel station entrances are identified by a tall three-sided sign (kiosk) displaying the tunnel symbol, station name, and arrow pointing toward the entrance. One flat side of the sign is parallel to the curb, and the corner where the other two sides meet points toward the entrance.

Table 8-1
Leaving the Station/Terminal Highlights Grouped by Passenger Disability

Disability Group	Idea	Transit System	Mode	Page
?	Accessible Route Information	MDTA		8-6
?	Directional Tiles and Markings	LI Bus		8-8
?	Information Kiosks and Brochures	Seattle Metro		8-2
?	Intermodal Transfers	MARTA		8-8
♿	Accessible Route Information	MDTA		8-6
♿	"High-Block" Hazards	MTA-MD		8-8
♿	Information Kiosks and Brochures	Seattle Metro		8-2
♿	Intermodal Transfers	MARTA		8-8
👁	Accessible Route Information	MDTA		8-6
👁	Directional Tiles and Markings	LI Bus		8-8
👁	Information Kiosks and Brochures	Seattle Metro		8-2

Table 8-2
Leaving the Station/Terminal Highlights Grouped by Transit Mode

Mode	Idea	Transit System	Disability Group	Page
	Accessible Route Information	MDTA	? ♿ 👁	8-6
	Accessible Route Information	MDTA	? ♿ 👁	8-6
	Directional Tiles and Markings	LI Bus	? 👁	8-8
	Information Kiosks and Brochures	Seattle Metro	? ♿ 👁	8-2
	Intermodal Transfers	MARTA	? ♿	8-8
	"High-Block" Hazards	MTA-MD	♿	8-8
	Accessible Route Information	MDTA	? ♿ 👁	8-6
	Intermodal Transfers	MARTA	? ♿	8-8

Table 8-3
Leaving the Station/Terminal Highlights Grouped by Transit System

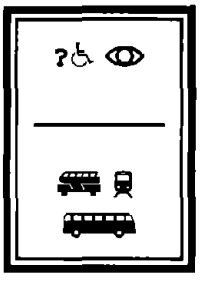
Transit System	Idea	Disability Group	Mode	Page
LI Bus	Directional Tiles and Markings	?		8-8
MARTA	Intermodal Transfers	?		8-8
MDTA	Accessible Route Information	?		8-6
MTA-MD	"High-Block" Hazards			8-8
Seattle Metro	Information Kiosks and Brochures	?		8-2

Kiosks at accessible tunnel entrances display the blue international accessibility symbols. Entrance signs are lighted for easy identification and each entrance has a granite marker on the sidewalk. The color and texture contrast of the stone helps visually impaired customers find the entrances. At the tunnel bus loading bays, there are information panels with raised letters to identify location and bay identification along with customer information telephones.

Seattle Metro distributes a large amount of information on accessible routes. One of them is a guide for travel routes in downtown Seattle, "Accessible Downtown Seattle: A Guide to Travel Routes for Wheelchair Users and Those with Other Disabilities."

Figure 8-1 presents a portion of the map of downtown Seattle included in this guide. The map displays key accessibility features, such as curb cuts, travel routes with no steps (suitable for wheelchair users), and elevators to its bus stations.

8.2.2 Accessible Route Information



The **Metro-Dade Transit Agency** has a computerized Customer Information System (CIS) used by its customer service agents to provide information over the telephone to MDTA users. In addition to looking up general information about routes, schedules, and fares, the customer service agents can use the CIS to create a customized trip itinerary for a caller, plotting out a trip for a particular origin-destination pair. The caller can place certain criteria on the trip, such as:

- shortest travel time
- least expensive (lowest total fare)
- 100 percent accessible

The CIS database includes information about accessible routes leading from Metrorail and Metromover (the automated guideway) stations and from selected bus stops. Having this information when planning a trip is important for passengers with mobility impairments, as well as for passengers with visual or cognitive disabilities.

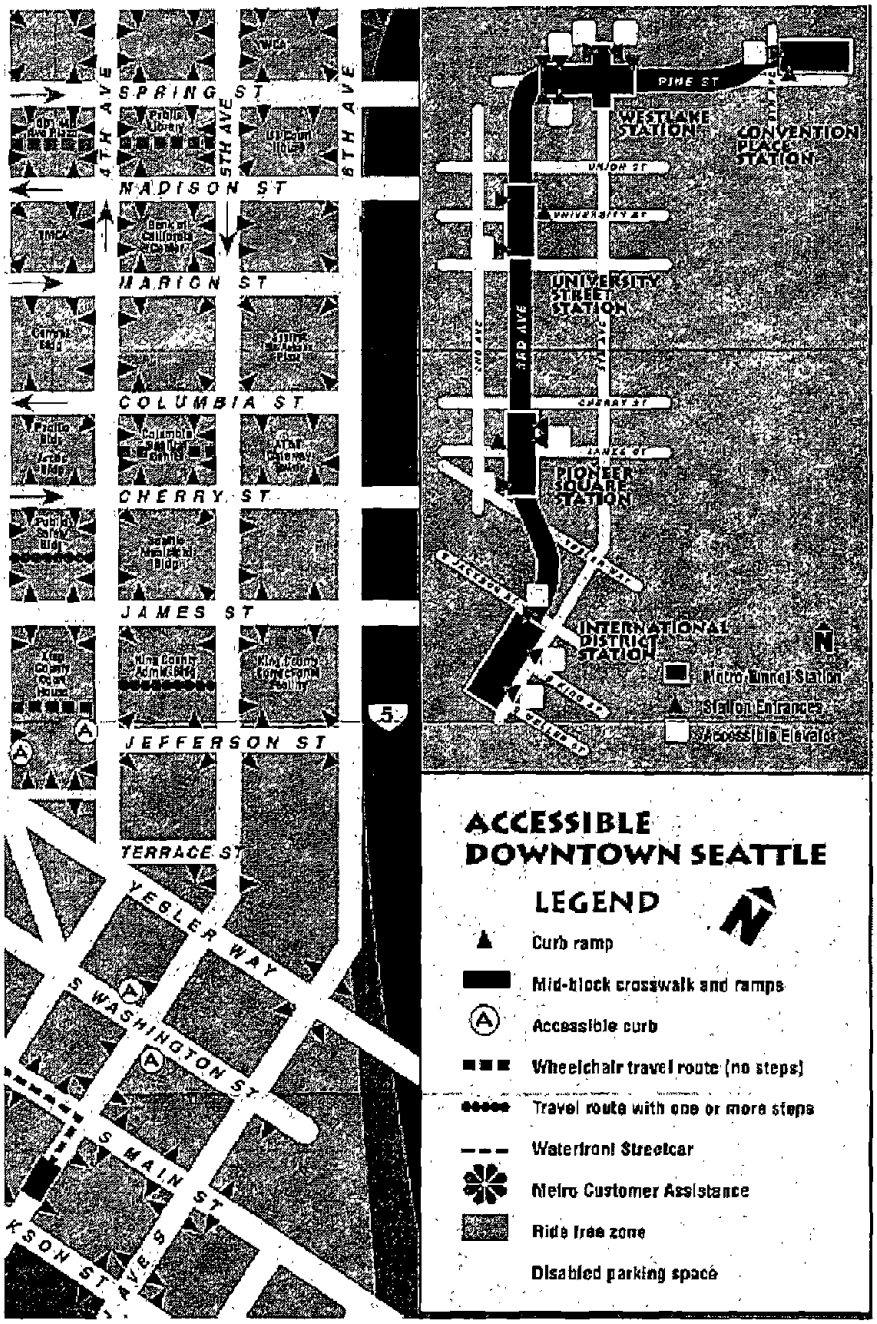
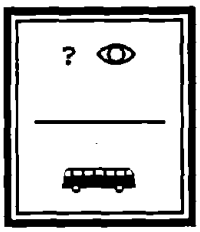


Figure 8-1
Excerpt from "Accessible Downtown Seattle"

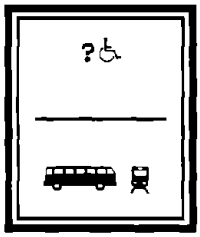
8.2.3 Directional Tiles and Markings



Buildings that are open to the public (e.g., hospitals, museums, shopping malls) often have colored lines on the floor or the walls to help guide visitors to various locations within the building. An extension of this idea is the use of directional tiles that can be felt by the hand or foot that persons with visual impairments can use to navigate their way through a complex facility.

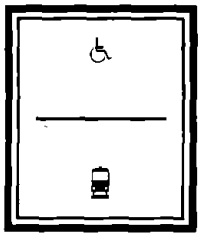
The hub of **MTA-Long Island Bus** service is the Hempstead Transit Center. More than half of its 45 bus routes runs through this Transit Center. The Transit Center is also a transfer point for private bus carriers and the Long Island Rail Road. The Hempstead Transit Center has been renovated to become fully accessible, with features such as automatic opening doors, lowered ticket counters, large print/high contrast signage, and a public announcement system. The Transit Center also features concrete pathway markings and directional signs that lead visually-impaired passengers to key areas of the center and out of the center. LI Bus has also installed similar signage at several of the shopping malls served by its routes.

8.2.4 Intermodal Transfers



Seventeen of **MARTA's** rail stations serve as transfer points to MARTA bus routes. Since there is no charge for a transfer, most of these stations have been designed such that a passenger departing from a train and entering a bus (or the reverse) stays entirely within the revenue area. This makes transferring much more convenient for all passengers. For disabled passengers, there is no need to pass through a gate or turnstile to transfer modes. For MARTA, the accessible path between modes remains completely under its control.

8.2.5 "High-Block" Hazards



MTA-MD staff is concerned with the platform-vehicle interface and the use of mini-platforms— called "high-blocks" in Baltimore—on its light rail system. The high-block is a small, high level platform, wheelchair accessible by a ramp, that is used to board the front door of the first car of a light rail train. The train operator manually drops a bridge plate over the stairwell and train/platform gap to permit level boarding from the high-block.

At some intersections, a railing separates the light rail platform from the street to prevent passengers from crossing anywhere except the intersection. However, this physical configuration causes alighting ambulatory passengers to climb the stairs to the high-block and exit using the ramp in order to reach the intersection. This requires all ambulatory passengers to cross the high-block. Boarding ambulatory passengers must follow a reverse path across the high-block. This heavy traffic is disconcerting to the wheelchair user. Beyond that, the stairs represent an unprotected hazard to the wheelchair user, who must worry about being pushed down the stairs by the pressure of traffic. The MTA-MD has been unable to obtain permission from the city to install a midblock pedestrian crossing so ambulatory passengers do not have to use the high-block.

Section 9
Conclusions and Recommendations

The results of the ADA Assessment presented in Sections 3 through 8 provide a broad perspective of the state-of-the-art in ADA accessibility issues. The information presented will provide a reference source on ideas, innovations, and technologies for transit systems seeking guidance on specific ADA requirements or functions. This section presents the conclusions that have been reached based on the experiences gained from the entire ADA Assessment process. These conclusions lead to two recommendations to the Federal Transit Administration (FTA) as a means of promoting further accessibility improvements and encouraging the development of innovative solutions.

9.1 CONCLUSIONS

The following conclusions are drawn from a detailed review and analysis of the information collected during the ADA Assessment visits and reviews with 32 transit systems across the country. These conclusions address two of the project's objectives: determine the progress of transit systems in increasing the accessibility of their services; and identify innovative solutions.

1. Transit systems have made great progress in adapting their services, vehicles, and facilities to meet the requirements of ADA. As documented in this report, transit systems have identified and put into use innovative techniques for increasing accessibility for their disabled passengers. Most encouraging is that many of the technologies and practices that transit systems are using are relatively low cost and simple to implement. A sampling of these technologies and practices are cited in the next three paragraphs.

2. In the area of providing **system information** to passengers and developing handbooks to assist other transit systems to improve accessibility, three transit system practices are:

   - **Customized Trip Itinerary Cassette**, Bi-State Development Agency (see Section 3), to help visually-impaired passengers use fixed route service.

- **Information Kiosks and Brochures**, Seattle Metro (Section 8), including a map of downtown Seattle that indicates accessible paths.

- **Bus Stop Handbook**, Valley Metro (Section 4), providing ADA design guidelines for use by municipalities.

3. In the area of improving **vehicle and facility access**, some innovative transit system practices and technologies are:

   - **Specifications for Wheelchair Maneuverability**, AC Transit (Section 5), designing bus interiors for easier use by wheelchair users.

   - **Mud Flap for Wheelchair Lift**, Greater Bridgeport Transit District (Section 5), a low cost device to improve rear-door lift reliability.

   - **Accessible Supervisor Vehicles**, RIPTA and Valley Metro (Section 6), allowing supervisors to transport passengers when there are lift problems on the bus.

   - **Stokes Strap**, Valley Metro (Section 6), for speeding and simplifying wheelchair securement.

   - **Intermodal Transfers**, MARTA (Section 8), allowing convenient and fully accessible transfer between rail and bus.

4. In the area of **communicating with passengers** at the station and on the vehicle, some innovative transit system practices and technologies are:

   - **Train Announcements Using Male/Female Voices**, Metro-Dade Transit Agency (Section 4), providing a clear way to distinguish the direction of an incoming train.

   - **Passenger Intercoms**, MTA of Maryland and Chicago Transit Authority (Section 6), allowing rail passengers to communicate directly with the train operator.

   - **Improved Station ID Signage**, SEPTA (Section 7), providing more visible exterior signs for passenger in the trains.

5. The FTA, through its own research and technical assistance and the projects it supports through Project ACTION, has focused attention on a number of the most prominent ADA implementation issues, including:

   - Bus stop annunciation.
   - Wayfinding by visually impaired persons.
   - Mobility aid securement and occupant restraint.
   - Travel training.

6. The greatest impediments for fixed route transit operators to full implementation of the ADA are institutional issues: responsibility for facilities and surroundings divided among multiple public (and on occasion, private) entities; reluctance or resistance by transit staff to modify their practices to accommodate individuals with disabilities; and competing priorities for available financial resources.

   In relation to the limited financial resources, older rail systems face the particular challenge of modernizing vehicles and facilities that have been in place long before the ADA requirements.

The third objective of this project was to identify potential research and development areas for FTA to support. The findings of this assessment lead the Project Team to conclude that there are no major technical problems remaining related to ADA accessibility for fixed route transit that warrant an independent program of federal research and development.

There is, however, a real need in the transit industry for individuals involved in ADA implementation to have easy access to information about technology, specialized equipment, procedures/practices, and training programs. Most importantly, such information should reflect each transit system's experience in terms of cost, performance, reliability, and effectiveness. Easy access to timely and relevant information will require a substantial and continuing commitment to the acquisition of quality information and organization of important data into a user-friendly format. This topic is addressed further in the following recommendations.

9.2 RECOMMENDATIONS

Based upon the above conclusions, the following steps are recommended for FTA action.

1. **Require Grantees to Measure Project Cost and Effectiveness**

   In any of its future activities related to ADA accessibility improvements, whether contracted directly by the FTA or through other organizations such as Project ACTION or the Transit Cooperative Research Program (TCRP), the FTA should require the grantee to measure and report on the costs, effectiveness, performance, and reliability of technology improvements and practices in terms that are meaningful to the transit systems that are interested in implementing such new ideas. There are existing models for evaluation of FTA-sponsored projects, e.g., the "Advanced Public Transportation Systems: Evaluation Guidelines." These guidelines can be adapted for use in evaluating ADA technologies. The guidelines provide specific procedures for ensuring consistency of evaluation philosophy and techniques, and the development of measures to promote comparability and transferability of results.

2. **Establish "ADA Transit Technology Information Center"**

   The FTA should establish an "ADA Transit Technology Information Center" that would serve two roles: collect information on ongoing ADA practices and technologies; and respond to queries about specific ADA-related transit issues.

   The FTA sponsors a variety of vehicle purchases, facility construction and modernization, and communication systems improvements/upgrades that contain new and innovative ADA technologies and design practices. Currently, there is no single means of obtaining information on the location and status of these technologies/ practices. The ADA Transit Technology Information Center would have the role of gathering this information, including contact names at the transit systems to gain the latest information on these developments. As appropriate, the FTA would conduct some on-site data collection to have firsthand information available in a timely manner for particular technologies that are evolving rapidly and have a broad interest within the transit industry.

   The second role of the ADA Transit Technology Information Center would be to respond to transit systems that have questions about specific technologies or practices. Transit

systems would be able to obtain specific and timely information and guidance on the availability, performance, reliability, effectiveness, and cost of ADA technology and equipment to perform some specified function. The ADA Transit Technology Information Center would draw this information from the actual operating experience of transit systems. The information would be continuously updated through a cooperative and mutually beneficial data collection agreement with the transit industry. Initially, the scope of the information requests could be limited to the specific areas that have been identified in this assessment as being of widespread concern in the transit industry. As the ADA Transit Technology Information Center collects more information, the scope of its roles can be broadened.

Appendix A

ADA Requirements List

ADA Requirements List

1. System Information/Trip Planning

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Learn Routes, Schedules, and Fare Information	§37.173 Training Requirements* — operations personnel must be trained in communications and assistance techniques §37.167(f) Other Service Requirements — adequate information to be provided in accessible formats	Text Telephone (TTY) Large Print/High Contrast Information Tactile Maps Audio Aids Video Text/Audio Text Information Sensor Orientation and Mobility Training (Travel Training)
Planning a Trip	§37.167(f) Other Service Requirements — adequate information to be provided in accessible formats	Text Telephone (TTY) Automated Traveler Information Service (ATIS)
Trip Request (Paratransit)	§37.131 Service Criteria for Complementary Paratransit	Text Telephone (TTY)

*The specific language of this requirement is so broad that it essentially applies to all of the functional requirements and will not be repeated. §37.173 states that "Each public or private entity which operates a fixed route or demand response system shall ensure that personnel are trained to proficiency, as appropriate to their duties, so that they operate vehicles safely and properly assist and treat individuals with disabilities who use the service in a respectful and courteous way, with appropriate attention to the difference among individuals with disabilities."

2. Finding the Correct Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Locate the Stop/Station/Terminal	§37.167(e), (f) Other Service Requirements — ensure personnel make use of accessibility features and communications via accessible formats and technology §A10.2.1(3) Bus Route Identification Signs — proper character sizes and proportion and color contrast §A10.3.1(3), (4), (5), (6) Fixed Facilities and Stations — accessible route to boarding areas; proper signs for routes, stations, destinations §A10.3.2(5) Key Stations — accessible route to boarding areas	Uniform Features Large Print/High Contrast Signage Tactile or Audio Paths Travel Training

Continued

2. Finding the Correct Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Locate and Access Fare System (Rail)	§37.167(e), (f) Other Service Requirements — ensure personnel make use of accessibility features and communications via accessible formats and technology §A4.3 Accessible Route — for wheelchair use (see Facility Guidelines for checklist) §A10.3.1(18) Ticketing Area Requirements §10.3.2(3) — accessible ticketing area along accessible path in key stations	Tactile/Braille Vending Machines Audio Instructions Large Print, Non-Glare, High Contrast Instructional Signage Standard Signage and Symbols Travel Training
Activate and Pass Through Fare Gate	§A10.3.1(7) Fare Collection Device Specifications — (see Facility Guidelines for checklist)	"Smart" Cards and Prepaid Passes Audio/Visual Signals Illumination Levels Travel Training

Continued

2. Finding the Correct Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Move to Proper Boarding Area/Platform (Rail)	§37.167(e) (f) Other Service Requirements — ensure personnel make use of accessibility features and communications via accessible formats and technology §A10.3.1(13), (16), (17) — requirements for crossing tracks, use of escalators and elevators for level changes §A10.3.1(8) — detectable warnings at platform edges §A10.3.1(10) — same boarding location for disabled and non-disabled passengers	Auditory Pathways Electronic or Tactile Circulation Aids Detectable Warnings Along Platform Edge Track Crossing Gap Reduction Visual Displays of Announcements Standard Signage and Symbols Color Coding Travel Training
Boarding Area (Bus)	§A10.2(1), (2) Bus Stops and Terminals — requirements for bus stop pad dimensions and bus shelter dimensions §A10.2.2(1) Bus Stop Siting — new stops required to have room for ramp/lift deployment	Accessible Path Accessible Bus Shelter Lighting Signage and Symbols

Continued

2. Finding the Correct Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Identify Correct Incoming Vehicle	§37.167(c) — where different routes use the same stop, the requirement to provide a means for visually disabled persons (and others) to identify the correct vehicle (or be identified to the vehicle operator) §38.39 Destination and Route Signs — illumination and character size requirements §10.3.1(11) — requires uniform illumination levels near signage and along circulation routes §38.61 Public Information System for Rapid Rail Vehicles — external speaker provisions §A10.3.1(14) — requires visual alternative to PA system in stations for persons with hearing impairments §A10.3.1(15) — requirements for design and locations of clocks in stations	Front, Side, and Rear Signs Displayed for Sufficient Time (Bus) "Talking" Bus Stop External PA Announcements (Rail) Visual Signs for Next Bus/Next Train Arrival Audio/Visual Vehicle Identification System Color Coding

Continued

2. Finding the Correct Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Identify and Move to Vehicle Doorway	§38.63 Between Car Barriers — requirements for devices to prevent individuals from stepping off platforms between rapid rail cars, except when platform screens are provided §38.85, §38.109, and §38.173(b) Between Car Barriers — for high platform, level boarding light rail, commuter rail, and automated guideway transit vehicles §38.53(b) and §38.73(b) Signage — requires International Symbol of Accessibility on accessible rapid rail cars and accessible light rail cars	Audio Cue Fixed Stopping Point Between Car Barriers, Including Pantograph Gates, Chains, Motion Detectors, etc.

3. Entering the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Move Across Gap and Through Doorway (Rail)	§38.53 Doorways — covers clear width, signage, auditory and visual signals, and platform vehicle gap for rapid rail vehicles §38.73 Doorways — similar requirements for light rail vehicles §38.83 Mobility Aid Accessibility — provisions for level-change mechanism or boarding device, e.g., lift, ramp, or bridge plate for light rail vehicles §38.93 Doorways — similar requirements for commuter rail cars §38.95 Mobility Aid Accessibility — provisions for level-change mechanism or boarding device, e.g., lift, ramp, or bridge plate for new commuter rail vehicles §A10.3.2(4) — maximum vertical and horizontal gaps between the platform and vehicle for light rail, rapid rail, and commuter rail cars in key stations	Mechanisms to Minimize Horizontal and Vertical Gaps Between Platform and Rail Cars Auditory Door Opening and Closing Signal Visual Door Opening and Closing Signal Level Change Mechanisms (Lift or Ramp) for Light Rail If Required Use of Platform or Vehicle Mounted Ramps or Bridge Plates Handrails and Stanchions for Boarding (Light Rail)

Continued

3. Entering the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Ascend Stairs/Use Lift/ Use Ramp (Bus)	§37.165 Lift and Securement Use — all common wheelchairs and their users to be transported §37.163 Keeping Vehicle Lifts in Operative Condition — requirements on lift maintenance, reporting of inoperative lifts, and use of vehicles with inoperative lifts §A10.2.1 New Construction — provides detailed dimensions (96" x 60") and requirements for new bus stop pads §38.23(a) General — requires provision for lift or ramp on all buses and vans §38.23(b) Vehicle Lift — covers design load, controls, emergency operation, power or equipment failure, platform barriers, platform surface, platform gaps, platform entrance ramp, platform deflection, platform movement, boarding direction, use by standees, and handrails	Vehicle Lifts Modifications to pre-ADA Lifts Low Floor Vehicles/Ramps Bus Stop Pads and Maneuvering Space Slip Resistant Surfaces Color Contrast at Step Edges, etc. Lighting Systems

Continued

3. Entering the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Ascend Stairs/Use Lift/ Use Ramp (Bus) (continued)	§38.23(c) Vehicle Ramp — covers design load, ramp surface, ramp threshold, ramp barriers, slope, attachment, storage, and handrails §38.25 Doors, Steps, and Thresholds — slip resistant surfaces; contrasting colors for step edges, thresholds and the boarding edge of ramps or lift platforms; and minimum door height clearances. §38.31 Lighting — for stopwell, doorway, and adjacent ground area	

Continued

3. Entering the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Ascend Stairs/Use Lift/ Use Ramp (Rail)	§37.165 Lift and Securement Use — provision for all common wheelchairs and their users to be transported §38.71 and §38.91 General — provides for use of wayside or car-borne lifts, mini-high platforms, or other boarding devices for light rail and commuter rail vehicles §38.79 and §38.99 Floors, Stops, and Thresholds — slip resistance and color contrasting edges on light rail and commuter rail vehicles §38.81 and §38.101 Lighting — provides illumination requirements for entry on light and commuter rail vehicles §38.83 and §38.95 Mobility Aid Accessibility — provides detailed requirements for lifts and ramps or bridge plates used on light rail and commuter rail vehicles	Vehicle Lifts Wayside Lifts Mini-platforms Ramps and Bridge Plates Slip Resistant Surfaces Color Contrast Lighting Systems

Continued

3. Entering the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Special Situations Encountered Entering Vehicle	§37.165(d), (e), and (f) — entity may not deny access because "wheelchair" cannot be secured, may recommend (not require) that passenger transfer to seat and personnel shall assist with use of securement systems, ramps, and lifts upon request §37.165(g) — entity shall permit non-wheelchair passengers including standees to use all lifts (except EEC Model 141) or ramp to enter vehicle (ADA Rule amendment effective December 30, 1993) §37.167(d), (h), and (i) — entity shall permit service animals (e.g., seeing eye and hearing ear animals) to accompany individuals, shall permit individuals with respirator or portable oxygen supply consistent with DOT hazmat rules, and shall ensure adequate time to complete boarding or disembarking from vehicle	Conventional Wheelchair Securement Technology Securement of Three-Wheeled Scooters and Other Unusual "Common Wheelchairs" Handrail Retrofits on Lifts Space Provisions for Service Animals Rail Vehicle Door Closing Time
Pay Fare (Bus)	§38.33 Fare Box — placement to avoid obstruction to wheelchair and mobility aid users	Use of Smart Cards and Passes " Talking" Fare Box Standard Visual/Audio Signals

Continued

3. Entering the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Identify Vacant Seat or Wheelchair Securement Location	§37.167(j) Other Service Requirements — entity to "ask" persons to move from priority seats and wheelchair securement locations (ADA Rule amendment effective December 30, 1 993) §38.27 Priority Seating Signage — buses §38.55 Priority Seating Signage — rapid rail vehicles §38.75 Priority Seating Signage — light rail vehicles §38.105 Priority Seating Signage — commuter rail vehicles	Training Signage "Practicable" approaches for light rail, rapid rail, and commuter rail systems

Continued

3. Entering the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Move to Seat or Securement Location	§38.29 Interior Circulation, Handrails, and Stanchions — provisions for space (including minimum interior height) and assists to reach seat or securement location in buses §38.57 Interior Circulation, Handrails, and Stanchions — provisions for clear route (at least 32 inches wide) to two spaces for wheelchairs, and assists for maneuvering in rapid rail vehicles §38.77 Interior Circulation, Handrails, and Stanchions — provisions for assists on stop-equipped vehicles, clear route (at least 32 inches wide) to two wheelchair spaces, and assists for maneuvering in light rail vehicles §38.79(a) and §38.99(a) — floor surface slip resistance for light rail and commuter rail vehicles §38.97 Interior Circulation, Handrails, and Stanchions — provides for maneuvering and assists in commuter rail vehicles	Sufficient Room for Mobility Aid Maneuvering Space for Service Animals Slip Resistant Surfaces

Continued

3. Entering the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Move to Seat or Securement Location (continued)	§38.59 Floor Surfaces — slip resistance requirements for rapid rail vehicles §38.53(a)(2) Doorway Clear Width Between Cars — minimum width for doorways in multi-car rapid rail vehicles (generally for emergency evacuations) §38.73(a)(2) Doorway Clear Width Between Cars — similar requirement for light rail vehicles §38.93(a)(2) Doorway Clear Width Between Cars — similar requirement for commuter rail vehicles	

4. Traveling on Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Accommodate to Motion of Vehicle	§38.29, §38.57, §38.77, and §38.97 — provides for handrails and stanchions within buses, rapid rail, light rail, and commuter rail vehicles	Special Handrail and Stanchion Arrangements Within Vehicles
Securement Within Vehicle	§37.165 (b), (c), and (f) — provides general requirements for securement of wheelchairs on vehicles §38.23(d) — provides detailed requirements for securement devices including design load, location and size, mobility aids accommodated, orientation, movement limits, stowage, and seat belt and shoulder harnesses (buses and vans)	Universal Securement Device Securement of Three-Wheeled Scooters and Other Non-Traditional Wheelchairs
Accommodate Entrance and Egress Movements of Others	§38.23(a), (d), §38.57, §38.77, and §38.97 — defines minimum clear space for at least two wheelchair or mobility aid seating locations (except one for bus vehicles that are 22 feet in length, or less)	Sufficient Room for Mobility Aids and Service Animals Uniformly Located Priority Seating

Continued

4. Traveling on Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Comprehend Special Announcements	§38.35 Public Information — requires buses (over 22 feet long) to be equipped with driver PA or recorded announcements to provide passenger information within vehicle §38.61, §38.87, and §38.103 Public Information System — general requirement for interior PA system in each rapid rail, light rail, and commuter rail vehicle, and allowance for alternative systems or devices providing equivalent access. Exception for rapid rail vehicles when station announcement systems provided.	General Safety/Emergency Information in Accessible Formats Standard Symbols and Directions Large Print/High Contrast Information PA Systems Assistive Listening Devices Visual Displays Emergency Strobe Light System
Respond to Special Announcements	§37.173 Training Requirements — interpreted to mean that personnel must be able to properly assist individuals in the event of special situations, i.e., emergencies	Emergency Evacuation Procedures Special Evacuation Equipment Orientation and Mobility Training Maintenance of Clear Pathways

5. Departing the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Identify Desired Stop/Station/Terminal	§37.167(b) — on fixed route systems, requires stop announcements at transfer points, major intersections, and destinations, sufficient intervals to maintain orientation and upon request §A10.3.1(5), (11) — station signs to be clearly visible from within the vehicle, illumination levels in signage areas to be uniform and minimum glare §38.35 Public Information System — requires PA system (buses) §38.61, §38.87, and §38.103 — PA systems for rapid rail, light rail, and commuter rail vehicles	PA Systems AVL Input into PA System Visual Displays PA Compatibility with Assistive Listening Systems Audio/Visual Next Stop Announcements Training
Notify Driver of Desire to Stop (Bus)	§38.37 Stop Request — requires controls adjacent to securement location for requesting stops with auditory and visual confirmation, and mandates placement and effort required to activate	Audio/Visual Stop Request Confirmation System

Continued

5. Departing the Vehicle

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Move to Doorway	Same ADA requirements as: Move to Seat or Securement Location	Auditory/Visual Indication of Correct Door
Move Through Doorway and Across Gap (Rail)	See: Move Across Gap and Through Doorway	
Descend Stairs/Use Lift/ Use Ramp (Bus)	See: Ascend Stairs/Use Lift/Use Ramp (Bus)	
Descend Stairs/Use Lift/ Use Ramp (Rail)	See: Ascend Stairs/Use Lift/Use Ramp (Rail)	

6. Leaving the Station/Terminal

FUNCTION	ADA REQUIREMENT	SPECIAL EQUIPMENT/TECHNIQUES
Determine Desired Exit Direction	§A10.2.1(3) — requirements for route signage at bus stops and terminals §A10.3.1(6), (14) — requirements for signage and provision of visual information where PA systems are used in rail stations	Large Print/Non-Glare High Contrast Signage Electronic or Tactile Circulation Aids Auditory Pathways Training
Activate and Pass Through Fare Central Gate (Rail)	§A10.3.1(7) — requirements for fare collection devices including dimensions, controls, and provisions for entry and exit	Prepaid Passes Smart Cards Audio/Visual Signals Illumination Levels
Exit Station/Terminal	§A10.2 Bus Stops and Terminals, and §10.3 Fixed Facilities and Stations — provide for accessible route, signage, illumination, etc. (See Facility Guidelines for Checklist)	Large Print/Non-Glare High Contrast Signage Electronic or Tactile Circulation Aids Auditory Pathways Training

Appendix B

Review Questions for Assessment of ADA Research and Development Needs

Assessment of ADA Research and Development Needs
Review Questions
A. Overview of ADA Activities

1. Who oversees planning and implementation for ADA compliance, e.g.,

   - general manager
   - assistant general manager
   - ADA compliance officer
   - head of special services

2. Is there a standing committee within the transit system for ADA issues? If so, who are the committee members?

3. What are the major responsibilities of the ADA leader/committee, e.g.,

   - develop policies
   - review specifications and procedures
   - collect data
   - resolve complaints
   - coordinate ADA activities within the transit system
   - assess implementation of ADA within the transit system

4. How is coordination among the various departments (e.g., operations, facilities, maintenance, purchasing, customer relations) occurring in implementing ADA?

5. Where does the system get its information on ADA compliance? Which types of documents are the most helpful?

   - checklists
   - technical assistance manuals
   - documents prepared internally/by contractors
   - discussions with others in transit industry

6. What outside groups work with the transit system staff on ADA issues, e.g.,

   - transit board committee/subcommittee
   - citizens' advisory committee
   - city (or other government) office on disabilities
   - private disability groups

7. Prior to ADA, what were the major influences in accessibility policy, e.g.,

   - state or local laws
   - federal 504 regulations
   - transit board policy
   - other

8. With which outside groups does the transit system work to ensure compliance with ADA?

   - contractors
   - landlords
   - municipalities

9. How was the Key Station Plan developed? (Applies only to transit systems with pre-ADA rail operations.)

   - criteria for selection of stations
   - timetable
   - context for renovating other "non-key" stations

10. Describe the training that transit system staff receive to make them aware of and to carry out their responsibilities under ADA.

11. What has been the major technical or operational obstacle(s) in implementing ADA that the transit system has overcome?

12. What remains as major technical or operational obstacle(s) in implementing ADA for the transit system?

Assessment of ADA Research and Development Needs
Review Questions
1. System Information/Trip Planning

1. What special provisions have been made to allow persons with disabilities to learn about using your transit system, i.e., stations, routes, schedules, and fare information? (For paratransit systems user information includes service area, days/times of operations, trip requests and confirmations, schedule changes and cancellations, no-shows, etc.)

   - blind and visually impaired
   - hearing impaired
   - cognitively impaired

   What type of information is available by mail?

2. If you provide automated traveler information services via telephone, is it accessible to persons who are hearing impaired?

3. Have there been any problems with the selection, use, or maintenance of teletypewriters (TTYs)* in the system? How often are they used?

4. Is system information available in large print/high contrast format?

5. Is system information available in a tactile format, e.g., tactile maps, etc.?

**The Access Board, responding to a national survey of deaf individuals, has complied with the deaf community's preference for the term teletypewriter (TTY) rather than text telephone (TT) or telecommunications devices for the deaf (TDD).*

6. Is system information available in an audio format, e.g., auditory maps, etc.?

7. Are all stops/routes for passengers in wheelchairs identified on maps? How often are maps updated to reflect system improvements/modifications? Are updated maps automatically mailed to certain individuals?

8. Are there any computer-based video text/audio text services available to provide current travel information?

9. Is there an orientation and mobility training program in place to train disabled individuals with disabilities in the use of the system?

10. How can persons with disabilities obtain fare media (tokens, tickets, passes)?

    - at stations
    - accessible buildings/stores
    - through the mail

Assessment of ADA Research and Development Needs
Review Questions
2a. Finding the Correct Bus

1. What special provisions have been made to assist passengers to locate the proper bus stop location (on the street or within a terminal area) and to identify the correct bus for boarding?

   - blind and visually impaired
   - individuals with cognitive disabilities
   - other persons with disabilities

2. Is there any use of tactile or audio paths to guide persons to the correct bus stop location?

3. Are bus stops identified by uniform features and large print/high contrast signage?

4. Is there any audio or visual sign announcement capability at any bus stops?

5. Are there any special provisions for audio or visual identification of each bus?

6. Is there a way for a blind or visually impaired person to identify the correct bus when different routes use the same stop? Is there a way for that individual to identify him/herself to the driver?

Assessment of ADA Research and Development Needs
Review Questions
2b. Finding the Correct Rail Vehicle

1. What special provisions have been made to assist passengers to locate and move to the proper station platform or location and to identify the correct rail vehicle?

   - blind and visually impaired
   - hearing impaired
   - cognitively impaired
   - physically impaired

2. Have there been any problems in establishing "accessible routes" that meet ADA requirements defined on Appendix A to Part 37 (ADAAG 4.3)?

3. Are accessible routes identified by uniform features and large print/high contrast signage?

4. What special provisions have been made to assist persons with disabilities, particularly blind and visually impaired persons, to use the fare collection system, including automated ticket or fare card vending machines, fare verification, and insertion into fare collection receptacle?

5. Have there been any problems in complying with ADA requirements for Fare Collection Device Specifications (ADAAG 10.3.1(7)), including clear opening widths, controls, operating forces, etc.

6. Is there any use of tactile aids or audio paths to guide persons to the correct station platform location?

7. Are there any special provisions for visual information on next train arrival or any form of vehicle identification system?

8. Have there been any problems associated with installation and use of external PA speakers on rapid rail cars or with alternative station announcement systems providing information on arriving trains?

9. Have there been any problems encountered with the issue of crossing tracks (including gap compliance) or other crossing of hazardous areas for disabled passengers as they move to the proper boarding platform?

10. Have there been any problems with the installation and use of detectable warnings at the edge of any platform where there is a drop-off not protected by platform screens or guard rails?

11. What special features are in use to identify a specific door opening location to be used by persons with disabilities (for one car per train applications)?

Assessment of ADA Research and Development Needs
Review Questions
3a. Entering a Bus

1. Have there been any problems or user complaints associated with ADA compliance regarding the installation, maintenance, or use of the lift (or ramp, if a low floor bus is used)?

2. Have there been any problems associated with the use of pre-ADA lifts or in any modifications to the lifts to bring them into ADA compliance? (Not required to retrofit pre-ADA lifts.)

3. Have there been any problems associated with the use of existing bus stops or newly constructed bus stop pads when entering the vehicle using the lift (or ramp)?

4. In the event of a malfunctioning lift, are there procedures/signage in place for a bus operator to communicate to a disabled passenger that the bus cannot pick him up? Are there procedures for the operator to inform the disabled passenger of the number/schedule of the next bus that will be able to pick him up?

5. Have there been any problems with meeting ADA requirements with regard to slip resistant surfaces, contrasting colors at step edges, minimum door height clearances, lighting, and handrails / stanchions to assist in boarding?

6. For paratransit vehicles or low floor buses, have there been any problems with wheelchairs or other mobility aids when using the ramp? Can persons with manual wheelchairs maneuver up and down the ramp by themselves?

7. Have there been any problems associated with the boarding of non-standard wheelchairs (three-wheeled or four-wheeled scooters) or other mobility aids?

8. Have there been any complaints regarding the time allowed for boarding of wheelchair or other mobility aid users?

9. Have there been any boarding problems with service animals or persons using portable oxygen devices?

10. Have there been any problems with standees on either ADA or pre-ADA lifts?

11. What provisions have been made to place the farebox to avoid obstruction to wheelchair and mobility aid users?

12. What provisions have been made to make the fare collection process accessible to persons with visual, hearing, and cognitive impairments?

13. Have there been any problems with priority seating arrangements or with requests for persons to move from priority seats or wheelchair securement locations?

Assessment of ADA Research and Development Needs
Review Questions
3b. Entering a High Platform Rail Vehicle

1. What special provisions have been made to assist passengers in entering a high platform rail (rapid, light, and commuter) vehicle in accordance with ADA requirements?

   - ◆ blind and visually impaired
   - ◆ physically impaired

2. Have there been any problems associated with installation and use of auditory and visual door opening and closing signals or in the provision of a minimum clear opening width of 32 inches at the doorway?

3. Have there been any problems with the installation of ADA-required between car barriers for rapid rail vehicles or for high platform, light rail and commuter rail vehicles? (New or post-ADA remanufactured cars.)

4. Have any special provisions been made to meet the ADA requirements for the horizontal and vertical gap between the station platform and a rapid rail car?

5. For light rail and commuter rail vehicles, have any special provisions been made to comply with ADA requirements on horizontal and vertical gaps for station platforms or mini-platforms?

6. If the gap requirements for rail vehicles have not been met, what provisions have been made for use of bridge plates or ramps?

7. Have there been any problems with the use of bridge plates or ramps?

8. Have there been any problems associated with wheelchair users or other mobility aid users entering the vehicle?

9. Have there been any problems associated with the boarding of non-standard wheelchairs (three-wheeled or four-wheeled scooters) or other mobility aids?

10. Have there been any complaints regarding the time allowed for boarding of wheelchair or other mobility aid users?

11. Have there been any problems with service animals or persons using portable oxygen devices?

12. Have there been any problems with priority seating arrangements or with requests for persons to move from priority seats or wheelchair locations?

Assessment of ADA Research and Development Needs
Review Questions
3c. Entering a Low Platform Rail Vehicle

1. Have there been any problems or user complaints associated with ADA compliance regarding the installation, maintenance, or use of a wayside or car-borne lift ?

2. Have there been any problems associated with the use of pre-ADA lifts or in any modifications to the lifts to bring them into ADA compliance? (Not required to retrofit pre-ADA lifts.)

3. Have there been any problems associated with installation and use of auditory and visual door opening and closing signals or in the provision of a minimum clear opening width of 32 inches at the doorway?

4. Have there been any problems with meeting ADA requirements with regard to slip resistant surfaces, contrasting colors at step edges, minimum door height clearances, lighting, and handrails/stanchions to assist in boarding?

5. Have there been any problems associated with the boarding of non-standard wheelchairs (three-wheeled or four-wheeled scooters) or other mobility aids?

6. Have there been any complaints regarding the time allowed for boarding of wheelchair or other mobility aid users?

7. Have there been any problems with service animals or persons using portable oxygen devices?

8. Have there been any problems with standees on either ADA or pre-ADA lifts?

9. What provisions have been made to place the farebox to avoid obstruction to wheelchair and mobility aid users?

10. What provisions have been made to make the fare collection process accessible to persons with visual, hearing, and cognitive impairments?

11. Have there been any problems with priority seating arrangements or with requests for persons to move from priority seats or wheelchair securement locations?

Assessment of ADA Research and Development Needs
Review Questions
4. Traveling on the Vehicle

1. Have there been any problems in meeting ADA requirements with regard to special handrail and stanchion arrangements for maneuvering within the vehicle?

2. What types of wheelchair and mobility aid securement devices are in use and what problems, if any, have been encountered in their installation and use?

3. In the case of buses or vans, have there been any problems in meeting ADA requirements for securement devices including design load, location and size, mobility aids accommodated, orientation, movement limits, stowage, and seat belts and shoulder harnesses? How long does it take to secure the mobility aid?

4. Have there been any complaints from other passengers regarding movement around mobility aids, service animals, or other problems in entering and leaving the vehicle?

5. What provisions have been made to provide passenger information (PA or alternative systems) within the vehicle for visually impaired, hearing impaired, and cognitively impaired persons?

6. What provisions have been made to alert and instruct disabled persons in the event of an emergency, including vehicle evacuation?

7. Do you have procedures for evacuating passengers with mobility impairments? With other disabilities?

Assessment of ADA Research and Development Needs
Review Questions
5a. Departing the Bus

1. What special provisions have been made to comply with ADA requirements for the driver to announce stops (or some alternative stop announcement system, e.g., GPS/AVL input into PA) at transfer points, major intersections, and major destinations?

2. What special provisions have been made to provide stop announcement information for hearing impaired persons?

3. Have there been any problems in meeting ADA requirements with regard to a stop request including auditory/visual information, placement, and activation effort?

4. Have there been any problems or user complaints associated with departing the bus, including the time allowed for alighting of wheelchair or other mobility aid users, and problems associated with maneuvering at the bus stop or at a newly constructed bus stop pad?

5. Has the transit system reviewed its bus stop locations to verify that they are accessible to passengers with mobility or other disabilities?

Assessment of ADA Research and Development Needs
Review Questions
5b. Departing the Rail Vehicle

1. What special provisions have been made to provide next-stop audio/visual information within the vehicle in accordance with ADA requirements?

2. Have there been any problems or user complaints about clear visibility of station signs from within the vehicle?

3. Have there been any problems or user complaints about leaving the vehicle, including auditory/visual indication of the correct door to use (for one car per train applications), sufficient time allowed for moving out of vehicle, audio/visual indication of door closing, or door closing speed and force?

Assessment of ADA Research and Development Needs
Review Questions
6. Leaving the Station/Terminal

1. What special provisions have been made to assist persons with disabilities to identify the correct "accessible route" after they get off the vehicle?

2. Have there been any problems or user complaints with ADA requirements for route signage at bus terminals or signage and provision of visual information at PA-equipped rail stations?

3. Have there been any problems or user complaints with exiting provisions through fare collection gates, including activation and control, if required?

Appendix C

Review Questions for Site Visit: Interviewer Guide

Review Questions for Site Visit: Interviewer Guide

This **Interviewer Guide** provides you with guidance and comments when using the Review Questions during a transit system site visit. The complete set of Review Questions consists of the following question sets:

A. Overview of ADA Activities
1. System Information/Trip Planning
2a. Finding the Correct Bus
2b. Finding the Correct Rail Vehicle
3a. Entering a Bus
3b. Entering a High Platform Rail Vehicle
3c. Entering a Low Platform Rail Vehicle
4. Traveling on the Vehicle
5a. Departing the Bus
5b. Departing the Rail Vehicle
6. Leaving the Station/Terminal

This Guide has a page of notes for each question set. The notes include:

- when to use the particular question set
- general comments about using the question set
- specific notes for individual questions
  - background on the question
  - the type of information we are seeking
  - examples of possible responses
  - follow up questions
  - cautions about potentially sensitive issues

As you discuss or observe an ADA solution, gather as much specific information as possible that will help us to evaluate the transferability of the solution:

- manufacturer, model number, drawings and/or other specifications
- cost data: unit cost, start-up cost, operating (ongoing) cost; cost of alternatives (not selected)
- data showing the change in performance : pre-solution and post-solution
- other technical changes resulting from solution
- other effects of solution, intended or unintended
- satisfaction (management, drivers, mechanics, passengers)

During your interviews, you should hand out copies of the questions to the transit staff. This helps them to follow the flow of your questioning. However, this Guide is for **internal use only.**

Customizing the Review Questions

The following table indicates the appropriate question sets to use during a transit system site visit. From the complete set of Review Questions, you can put together a customized package of question sets for each transit system.

You will use Question Sets A. and 1. during the initial visit at every transit system. Your use of the other question sets will depend on the service modes that a transit system operates.

Mode	A	1	2a	2b	3a	3b	3c	4	5a	5b	6
Initial Meeting/Overview	✓	✓									
Fixed Route Bus			✓		✓			✓	✓		*
Light Rail				✓		✓	✓	✓		✓	✓
Heavy rail				✓		✓		✓		✓	✓
Commuter Rail				✓		✓	✓	✓		✓	✓
Paratransit					✓			✓	✓		

** Maybe*

For example, you would use the following question sets at a site visit to Denver RTD, which operates fixed route bus, light rail, and paratransit:

- Initial Meeting: A., 1.
- Fixed Route Bus: 2a., 3a., 4., 5a., 6. (if there are bus stations/ transfer centers)
- Light Rail: 2b., 3b., 3c., 4., 5b., 6.
- Paratransit: 3a., 4., 5a.

A. Overview of ADA Activities

Use this set of questions during the initial meeting with the transit system. The answers gathered from them provide a context for the more detailed and technical questions in the other sets.

1. Whoever is responsible for ADA should be at this presentation.

2. If it exists, we are looking for the **in-house** committee that handles ADA. Often, each department within the transit system has a representative in such a committee. "Who are the committee members?" means whom do the members represent.

3. Check all that apply, and add other responsibilities. Note any distinguishing details.

4. For example, is there an "ADA review" of vehicle specifications? Are accessibility components uniform throughout the system, or do they vary from facility to facility (or stop to stop, facility to facility)?

5. Check all that apply. Note any additional sources of information. Get names of specific documents, publications, companies.

6. This is the **external** group (contrast with Q. 2).

7. This question may lead to a discussion of the transit system's history of disabled services, as well as provide a context for the progress to date.

8.
Contractors:	if operations (or any component) is performed by a private contractor.
Landlords:	if the transit system uses facilities that it does not own.
Municipalities:	most often an issue for bus stops or other right-of-way issues (does not apply if the municipality is the operator).

9. **Applies only to systems with pre-ADA rail service.**

   49 CFR Part 37, section 37.47 (light and rapid rail); section 37.51 (commuter rail): transit systems had to develop a Key Station Plan (by July, 1992) that designated existing stations for accessibility. The regulations *suggested* criteria for key station designation, but left the decision to each locality. Unless given an extension by FTA, the deadline was July, 1993.

10. We want to learn about the transit system's training programs for all personnel, including (but not limited to): drivers; customer service agents; vehicle maintenance staff; supervisors and managers. 49 CFR Part 37.173, "Training Requirements," specifically requires such training.

11.-12. You may want to skip these questions if these issues have already been discussed during the previous free form discussion/presentation. Also, it is likely that any topics raised here will be covered in subsequent review questions.

1. System Information/Trip Planning

Use this set of questions during the initial meeting with the transit system. The ADA compliance officer or the customer services manager may be the people most likely to provide this information.

Most of the questions should be straightforward. The transit system may have a standard brochure that describes some of their resources and capabilities on these topics. Draw out **positive** information, i.e., what *do* they have or what are they developing?

Also, for each resource and service offered for system information/trip planning, ask:

> How much it has been used or how many have been distributed, e.g., number of phone calls to the TTY per month, number of braille bus schedules requested.
>
> Who produces the material: in-house staff or private contractor or other government agency or another organization.

Notes on specific questions:

1. This is a general question intended to elicit information about specific equipment or procedures that have been put in place to communicate with the different disability groups. The answers here are likely to overlap with some of the answers to subsequent questions.

2.,4.-8. In general, we do not anticipate that many systems will have implemented some of the advanced concepts (e.g., tactile maps, auditory maps, etc.). The questions are intended to find out if they have given any thought or worked on various means of communicating with disabled individuals. The interviewer should be sensitive to the constraints on smaller systems based on their response to Question 1. and try to avoid asking a series of questions that will inevitably result in a negative response.

3. This question refers more to a TTY at the transit system's office to communicate with customers — although they may also talk about TTYs that they have installed at stations and terminals.

9. If the transit system has a mobility training program, do they use their own staff or a contractor (who)? If not, does another local group conduct training, e.g., independent living center, office on disabled? How many passengers have been trained?

10. Are these the same locations for the general public?

Note to the Interviewer: *If the system is paratransit only, do not use questions that pertain to fixed route operations (Questions 2, 7, 8).*

2a. Finding the Correct Bus

Use this set of questions during the discussion with the fixed-route bus representative.

Drawings, photos, videos, technical specifications to accompany the answers would be helpful.

1. This is a general question looking for any information on bus stop ID technology or techniques; the answer may overlap with answers in subsequent questions.

2. This generally applies to a location with several stops close together. This is more likely inside a station or at a transfer center. Examples: tactile directional material on the floor; braille signs; internal PA system.

3. Find out if the transit system is responsible for its bus stop signs; in some cases, the municipality may purchase and maintain the signs.
   Also: do they have any braille signs?

4. Examples: PA system or LED monitor **at the stop** — as opposed to on the bus.

5. Visual ID may include larger route signs in front and on side of bus. Audio ID may include use of the bus's external PA (either by the driver or via a pre-recorded message) to identify its route.

6. This is relevant for stops that are used by more than one bus route. Example of this capability: buses with an external PA system. For the rider, cards that identify their desired route.

2b. Finding the Correct Rail Vehicle

Use this set of questions during the discussions with the light rail, rapid rail, and commuter rail representative.

Drawings, photos, videos, technical specifications to accompany the answers would be helpful.

1. This is a general question on rail platform and vehicle ID. The answers here may overlap with answers to subsequent questions.

2. A wide range of issues apply here, including: signage (Q. 3), entrances, width of path, slopes, ramps, elevators, and coinciding with route used by non-disabled passengers. Get a sense of the problems overcome and the problems still existing.

4. Many detailed issues here also. Get information on any special provisions.

5. Applies to rail systems that use turnstiles.

   Are there automated turnstiles that meet the ADA specifications, or do disabled passengers go through the manual fare gate?

6. Examples: tactile directional material on the floor; braille signs; internal PA system.

7.-8. These questions refer to announcements made at the platform /station. Examples: PA system; monitors along platform.

9. Applies to low platform rail service.

   If there are any track crossing areas, how does the transit system handle them?

10. What type(s) of detectable warning used? One type for all stations? One type for inside, one type for outside? Varies by station? "Non-key" as well as key stations?

11. Applies when one entrance (or a limited number) on the train is wheelchair accessible.

3a. Entering a Bus

Use this set of questions during the discussions with the fixed-route bus and paratransit representative.

If the transit staff cites specific accessibility features of the vehicles, request a copy of the latest procurement package that included the ADA-related specifications.

1.-2. Find out the variety of lifts (or ramps in case of low floor buses) in the fleet (manufacturer, model year). What are the differences in performance, ease of use, reliability, maintenance? Does the transit system keep statistics on lift boardings?

3. Is the transit system responsible for the maintenance of bus stops — including cleaning, snow removal, illegal parking? Is the transit system responsible for the bus shelters? If not, what are the arrangements with the municipality?

   Are there new specifications for bus shelters since ADA?

4. What is transit system's policies:
   Putting a bus in service with a malfunctioning lift?
   Dispatching a replacement bus to pick up a wheelchair passenger?

5. Applies to ambulatory passengers using the steps to board and depart.

6. Omit this question if no vehicles have ramps.

7. Examples of potential problems:
   Passenger plus wheelchair exceeding weight limit for lift.
   Wheelchair "footprint" exceeds lift platform dimensions.
   Problem with maneuvering of four-wheeled scooter when entering bus.

   These problems are more likely with pre-ADA lifts. But it would be noteworthy to hear that they are also occurring with ADA lifts.

8. What is the average time to use the lift, then secure a passenger? To unhook, then use the lift for a departing passenger? (Strictly speaking, this is a topic for "departing the bus" — but it seems natural to talk about both securing and unhooking at one time.) Are these times measured or anecdotal?

9. You may talk here about problems relating to service animals and oxygen devices that may occur at any point of the trip. Does the transit system have a policy on carrying oxygen devices?
   Answer may range from "no problems" to some strange stories.

10. What is the transit system's policy for standees on lifts? Do buses have boarding chairs available?

11. Applies to front-door lifts/ramps. Also, how does a passenger that uses a rear-door lift/ramp pay the fare?

12. Examples: specially coded fare passes for disabled; talking farebox.

13. What are the policies for requesting passengers to move from priority seating or wheelchair positions?

3b. Entering a High Platform Rail Vehicle

Use this set of questions during the discussions with the light rail (if applicable), commuter rail (if applicable), and rapid rail representative.

1. This is a general question looking for information on any special design features, equipment, or operating procedures that have been used to assist disabled passengers. Answers may overlap with subsequent questions/answers.

2. Are audio or visual indicators in place on pre-ADA cars? ADA cars? Any problems with doorway opening widths on pre-ADA cars?

3. Between car barriers: to prevent passengers to step from the platform to the space between rail cars, and fall onto the track. Based on pilot reviews, this is a big concern for operators of high platform rail service.

4. Intended to find out if the system is making special efforts to maintain gaps within ADA specifications, e.g., checking wheel wear, suspension system adjustments, gap closers, etc.

5. Same as Q. 4. for high platform light rail and/or commuter rail. A transit system may use a different solution for each mode.

6.-7. Intended to elicit information on problems such as alignment and slope, storage when not in use, stolen or damaged bridgeplates, etc.

8. Any other mobility problems not covered in the previous questions.

9. Specific followup question dealing with boarding of non-standard wheelchairs.

10. If there are time problems, what are the causes? What is the average time to board? Is this time measured or anecdotal?

11. You may talk here about problems relating to service animals and oxygen devices that may occur at any point of the trip. Does the transit system have a policy on carrying oxygen devices?
Answer may range from "no problems" to some strange stories.

12. Does the transit system have a policy for requesting ambulatory passengers to move from wheelchair positions or priority seats?

3c. Entering a Low Platform Rail Vehicle

Use this set of questions during the discussions with the light rail (if applicable) and commuter rail (if applicable) representative.

1.-2. Wayside or carborne lifts are used at low platform stations if they do not have a mini-high platform. Find out the variety of lifts in use (manufacturer, model year). What are the differences in performance, ease of use, reliability, maintenance?

3. Are audio or visual indicators in place on pre-ADA cars? ADA cars? Any problems with doorway opening widths on pre-ADA cars?

4. Applies to ambulatory passengers using the steps to board and depart.

5. Specific question for boarding of non-standard wheelchairs.

6. If there are time problems, what are the causes? What is the average time to board? Is this time measured or anecdotal?

7. You may talk here about problems relating to service animals and oxygen devices that may occur at any point of the trip. Does the transit system have a policy on carrying oxygen devices?
Answer may range from "no problems" to some strange stories.

8. What is the transit system's policy for standees on lifts? Do vehicles have boarding chairs available?

9. Applies to front-door lifts/ramps in rail operations where the passenger pays when entering the vehicle. Also, how does a passenger that uses a rear-door lift/ramp pay the fare?

10. Examples: specially coded fare passes for disabled; talking farebox.

11. Does the transit system have a policy for requesting ambulatory passengers to move from wheelchair positions or priority seats?

4. Traveling on the Vehicle

Use this set of questions during the discussions with representatives of any transit mode.

1. Was there an "ADA review" for the handrail and stanchion specifications?

2.-3. You may have covered this topic for **buses** in Question Set 3a., Q. 7. and Q. 8. in an overall discussion of securement systems.

Note that ADA requires securement systems only for buses and vans, not rail vehicles.

If used on **rail** vehicles, you may have covered the topic in Question Set 3b., Q. 8., Q. 9., and Q.10; or Question Set 3c., Q.5. and Q. 6.

If not previously covered: get information on securement specifications.
What is the configuration within each vehicle (bus or rail car)?
If they have any vendor brochures, get a copy.

If not yet discussed, ask how long it takes to secure the passenger (or just the securement aid: is there a policy distinguishing the passenger and mobility aid?)

If this is a particularly positive or troublesome issue, be sure to include it on the ADA tour.

4. You may have covered this topic in Question Set 3a., 3b., or 3c.

Not a commonly cited problem, but it is interesting to see where it occurs and what the proposed solutions are.

5. This topic is included again in Question Sets 5a. and 5b.

6. Transit systems may be sensitive about this topic. If they are willing to discuss, fine. Otherwise, do not press them; note that they did not have information on this topic.

7. Transit systems may be sensitive about this topic as well. However, it is more likely that they have procedures for evacuating passengers with disabilities.

5a. Departing the Bus

Use this set of questions during the discussions with the fixed-route bus and paratransit representative. Questions 1 to 3 are only applicable to fixed-route bus.

1. If there is no automated system in place, has there been resistance from drivers in announcing stops? If so, what do they attribute this to (e.g., insufficient training, lack of enforcement, "bad attitudes")? Has this been an issue with passengers?

2. You may have covered this topic in Question Set 4, Q. 5, "Traveling on the Vehicle"

   Examples: LED boards.

3. Do the devices for stop request include both audio and visual indicators?

4. You may have covered the issue of time to use the securement system in Question Set 3a. ("Entering a Bus"), Q. 8, or Question Set 4 ("Traveling on the Vehicle"), Q. 2 and 3.

   What is the average time to unhook a passenger securement, then use the lift for a departing passenger? Is this time measured or anecdotal?

5. Does the transit system designate some stops as unsafe for use of a lift (or ramp), but safe for ambulatory passengers? If so, does the transit system have an explicit policy, or is it left to the judgment of each driver?

   If the transit system has a survey of its bus stops, get a copy.

5b. Departing the Rail Vehicle

Use this set of questions during the discussions with the light rail, rapid rail, and commuter rail representative.

1. You may have covered these topics in Question Set 4, "Traveling on the Vehicle."

   Examples: LED boards for hearing impaired passengers; internal PA for vision impaired passengers.

2. The viewing angles out the window are different for a passenger in a seat, a passenger in a wheelchair, and a standing passenger. Station signs should be placed at different heights and depths (relative to the rail vehicle) in order to be visible from all viewing angles.

3. Do all doors on the platform side open automatically, or does a passenger have to signal to open a particular door? What are the audio/ visual indicators of a door closing (if any)?

6. Leaving the Station/Terminal

Use this set of questions during the discussions with the light rail, rapid rail, and commuter rail representative.

If a transit system with buses only (no rail service) has transfer centers or terminal buildings, Q. 1 and Q. 2 may be applicable.

1. Examples: international disability symbol with arrows indicating accessible route; tactile directional material on the floor; braille signs; internal PA system. All key rail stations and, in general, all bus terminals must have at least one "accessible route."" How far from the platform (or bus departing location) is the transit system responsible for creating the accessible route?

2. Is all route information available in both audio and visual form?

3. Applies to rail systems that use turnstiles.

   Are there automated turnstiles that meet the ADA specifications, or do disabled passengers go through the manual fare gate?

Appendix D

Glossary of Accessible Transit Terms

Glossary of Accessible Transit Terms

Here are an assortment of technical phrases and terms used in the work plan and site review questions.

Accessible Route: "a continuous unobstructed path connecting all accessible elements and spaces of a building or facility. Interior accessible routes may include corridors, floors, ramps, elevators, lifts, and clear floor space. Exterior accessible routes may include parking access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps, and lifts." (from ADAAG, Section 3.5).

Examples of identifying the accessible route: international disability symbol with arrows indicating accessible route; tactile directional material on the floor; braille signs; internal PA system. All key rail stations, all newly constructed stations, and, in general, all bus terminals must have at least one accessible route.

Auditory Maps: Tape recorded information that guides a listener as s/he travels. They can provide directions that guide the listener from point to point (e.g., audio tours used by art museums) or that provide information for an entire area.

At present, transit systems have made little use of auditory maps.

Auditory Paths: electronically activated speakers that are positioned throughout a facility. Information broadcast on each speaker leads an individual to successive locations in the facility. There are several ways for an individual to activate the speakers: with a portable control that the individual carries; with a device that the speaker detects as the individual approaches; or with a master control at the facility entrance that activates each speaker as the individual enters a certain space.

While auditory paths have been used in test environments, they are not in use at any transit system.

Automated Traveler Information Services: a pre-recorded information system that allows a passenger to obtain route, origin-destination, schedule, and fare information — either general or for specific routes /lines. The information is usually offered over the telephone, allowing 24-hour access.

Between Car Barriers: Devices attached between adjoining rail cars to prevent passengers from stepping from the platform to the space between rail cars and falling onto the track. The most common between car barriers in current use are metal chains.

Clear Opening Width: the unobstructed horizontal space of a fully open entrance. This term is used in specifications for doorways (of vehicles, facilities, rooms, elevators) and other entrances between public spaces.

Key Station Plan: According to 49 CFR Part 37, section 37.47 (light and rapid rail) and section 37.51 (commuter rail) transit systems had to develop a Key Station Plan (in July, 1992) that designated certain existing stations for accessibility. The regulations *suggested* criteria for key station designation (e.g., high ridership, transfer points, proximity to health/government facilities), but left the decision to each locality. Unless a transit system received an extension from FTA (on a station-by-station basis), the deadline for compliance was July, 1993.

Operator Training: As related to ADA, there are several areas of training. They may be part of one program, or provided separately, by separate instructors. For example, courses may include:

- **Vehicle operations**: includes operating the lift/ramp and kneeling step (for buses)
- **Passenger assistance techniques**: includes maneuvering wheelchairs, using the vehicle securement system, providing assistance to ambulatory passengers as well
- **Sensitivity training**: understanding and responding to special needs of elderly and disabled passengers

Large Print, High Contrast: "Large print" for printed material usually refers to type size of 14 to 22 points ("point" = 1/72-inch). For signs, the size of the print depends on the intended distance that the sign is to be read. The print should be large enough so that a reader can see and understand the sign with enough time to make a decision based on the information.

"High contrast" means dark characters on a light background, or light characters on a dark background. For signs, light characters on dark background are generally more readable by individuals with low vision.

Orientation and Mobility Training: Customized training for disabled individuals (usually visual and/or cognitive) to enable them to travel on fixed route service. Also called **travel training**. Topics include:

- getting to the stop/station
- identifying the proper vehicle
- paying the fare
- riding the vehicle
- identifying the departure stop/station
- getting to the destination

This training can be for a particular origin-destination pair (e.g., home to work, home to school) or for general use of fixed route service.

Portable Oxygen Tanks: Tanks used by individuals with certain respiratory ailments that they take with them as they travel. These tanks are usually carried by the user.

Rail Car Platforms and Lifts: Rail system boarding locations are either **high platform** or **low platform**. High level platforms have no steps between them and the rail cars. Low level platforms are generally at least two steps lower than the floor of the rail car; some level changing device is necessary for a passenger using a wheelchair to board and alight from the car.

There are three common level changing devices for low level platforms. **Carborne lifts** are lifts built into the rail car (similar to lifts on buses). **Wayside lifts** are lifts set up on the station platform; the vehicle must be stopped to align the door opening with the lift. A **mini-high platform** is a short high level platform (usually 10 to 15 feet) that is the same height as the floor of the vehicle; there is a ramp that connects the mini-high to the rest of the platform.

Tactile Paths: Textured steps or blocks built into the floor that direct visually impaired individuals to various elements in a facility. Not to be confused with **detectable warnings**, which lead individuals *away* from hazardous areas. Tactile paths are used occasionally in Europe and Japan. The practical problem is the lack of standards for texture, size, and color (for low vision individuals).

Tactile Maps: maps that use raised markings (in place of visual symbols) to present information. They are intended for individuals with vision impairments. For a transit system, the maps may convey information about a station, a route, or portions of the system. The raised markings are generally points, lines, or various shapes, representing stops/stations, routes/lines, and other key landmarks, respectively. Tactile maps usually also have written and printed information as well, for passengers with low vision.

Tactile maps are not in common use; they are rarely distributed to the general public. They are occasionally found at stations, terminals, or shelters.

Vertical and Horizontal Gaps: "Vertical gap" refers to the difference in height between the surfaces of a platform and the doorway of a rail car. "Horizontal gap" refers to the width of the open space between the platform and the rail car doorway. The allowable maximum gaps to be considered accessible depend on the combination of platform and vehicle:

	Vertical	Horizontal
New vehicle, new platform	5/8"	3"
New vehicle, key station platform	1½"	3"
Retrofitted vehicle, new platform	2"	4"
Retrofitted vehicle, key station platform	2"	4"

If these gap standards are not met for a given platform/vehicle combination, then the station can be made accessible through: a **ramp** that extends from the vehicle doorway; or a **bridgeplate** that can extend from the platform.

These standards apply to light rail, rapid rail, commuter rail, and intercity rail. Different standards apply to automated guideway systems.

Video Text/Audio Text: Transit information that is available through a computer link. The user may be able to obtain real-time route and schedule information.

Viewing Angles out the window are different for a passenger in a seat, a passenger in a wheelchair, and a standing passenger. Station signs should be placed at different heights and depths (relative to the rail vehicle) in order to be visible from all viewing angles.

Appendix E

Transit System Contacts

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Transit System Contacts

REGION 1

Bridgeport, CT Greater Bridgeport Transit District	Kimberlee Kelly Morton Director, Paratransit Service (203) 366-7070
Providence, RI Rhode Island Public Transit Authority	Mark Therrien Principal Planner (401) 784-9552

REGION 2

Garden City, NY Long Island Bus	Claire E. Spielberg Director, Planning & Administration (516) 542-0100 x315
Jamaica, NY Long Island Rail Road	Robert Beck Staff Engineer - Projects (718) 558-3763 x3576
New York, NY New York City Transit	Augustine Angba Director of ADA (212) 632-7317
New York, NY Metro-North Commuter Railroad	Christoper K. Bennett Deputy Director - Facilities (212) 340-2243

REGION 3

Baltimore, MD Mass Transit Administration of Maryland	Lisa Darnall Customer Service Manager (410) 333-3328
Charlottesville, VA Jaunt	Mark Gregor Executive Director (804) 296-3184
Philadelphia, PA Southeastern Pennsylvania Transportation Authority	Cynthia Lister Managing Administrator (215) 580-3424

REGION 4

Atlanta, GA Metropolitan Atlanta Rapid Transit Authority	Jim Brown Director, Service Monitoring & Scheduling (404) 848-5341
Fort Lauderdale, FL Tri-County Commuter Rail Authority	David Daniels Planning Department (305) 728-8512
Miami, FL Metro-Dade Transit Agency	David Fialkoff Chief, Service Plan & Scheduling (305) 637-3740
Pompano Beach, FL Broward County Division of Mass Transit	Sylvia Smith Planning Manager (305) 357-8369

REGION 5

Chicago, IL Chicago Transit Authority	Lynn Everett ADA Compliance Officer (312) 664-7200 x4176
Chicago, IL Metra	Michael Bonham Assistant Manager of Planning (312) 322-8022
Madison, WI Madison Metro Transit System	Paul J. Larrousse General Manager (608) 266-4904
Minneapolis, MN Metropolitan Council Transit Operations	Tom Vida Asst. Director, Transportation (612) 349-7571

REGION 6

Bryan, TX Brazos Transit System	Gayle Todd Assoc. Administrator for Planning (409) 779-7443
Houston, TX Metropolitan Transit Authority of Harris Co.	Mary Ann Dendor Supervisor, Public Relations (713) 739-4984

REGION 7

Topeka, KS Topeka Metropolitan Tranist Authority	Craig Cole General Manager (913) 233-2011
Omaha, NE Metro Area Transit	Linda Stone Marketing Director (402) 341-7560
St. Louis, MO Bi-State Development Agency	Janis Shetley Director of Paratransit (314) 982-1505

REGION 8

Albuquerque, NM Sun Tran of Albuquerque	Dawn Matson Economic Analyst, Planning Dept. (505) 764-6129
Denver, CO Regional Transit District	Vicki Gonzalez Paratransit Coordinator (303) 299-2991
Phoenix, AZ City of Phoenix Public Transit Department	Sheila Barberini Senior Transit Planner (602) 261-8392

REGION 9

Oakland, CA Bay Area Rapid Transit District	Harley O. Goldstrom Supervisor, Access Planning (510) 464-6194
Oakland, CA AC Transit	Francis-Joseph Masson Accessible Services Coordinator (510) 891-4853
Sacramento, CA Sacramento Regional Transit District	Douglass Cross ADA Compliance Administrator (916) 321-3871
San Diego, CA San Diego Metro Transit Development Board	Tim Price Senior Planner (619) 557-4562
San Francisco, CA Municipal Railway	Annette M. Williams Manager, Accessible Services Program (415) 923-6142

REGION 10

Portland, OR Tri-Met	Patricia Nielsen Tri-Met Accessibility Program (503) 238-4904
Seattle, WA King County Department of Metropolitan Services	Bob Carroll Transit Planner (206) 689-3104

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