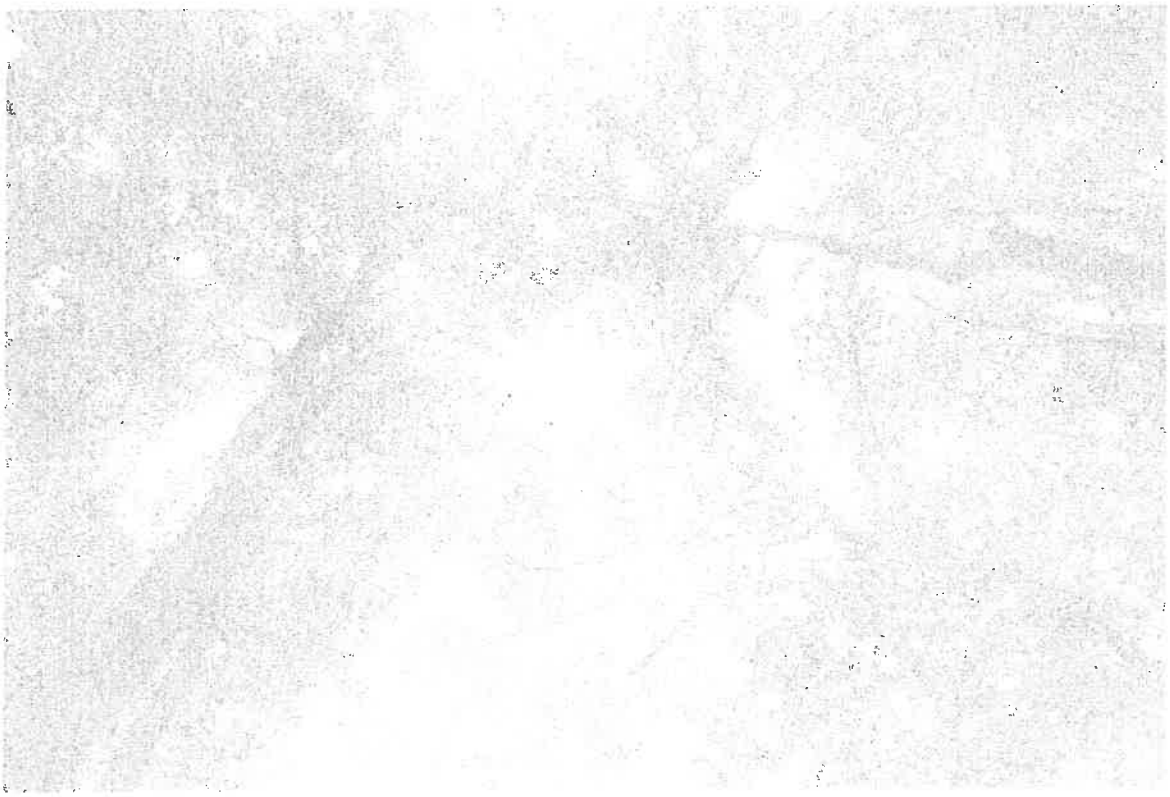
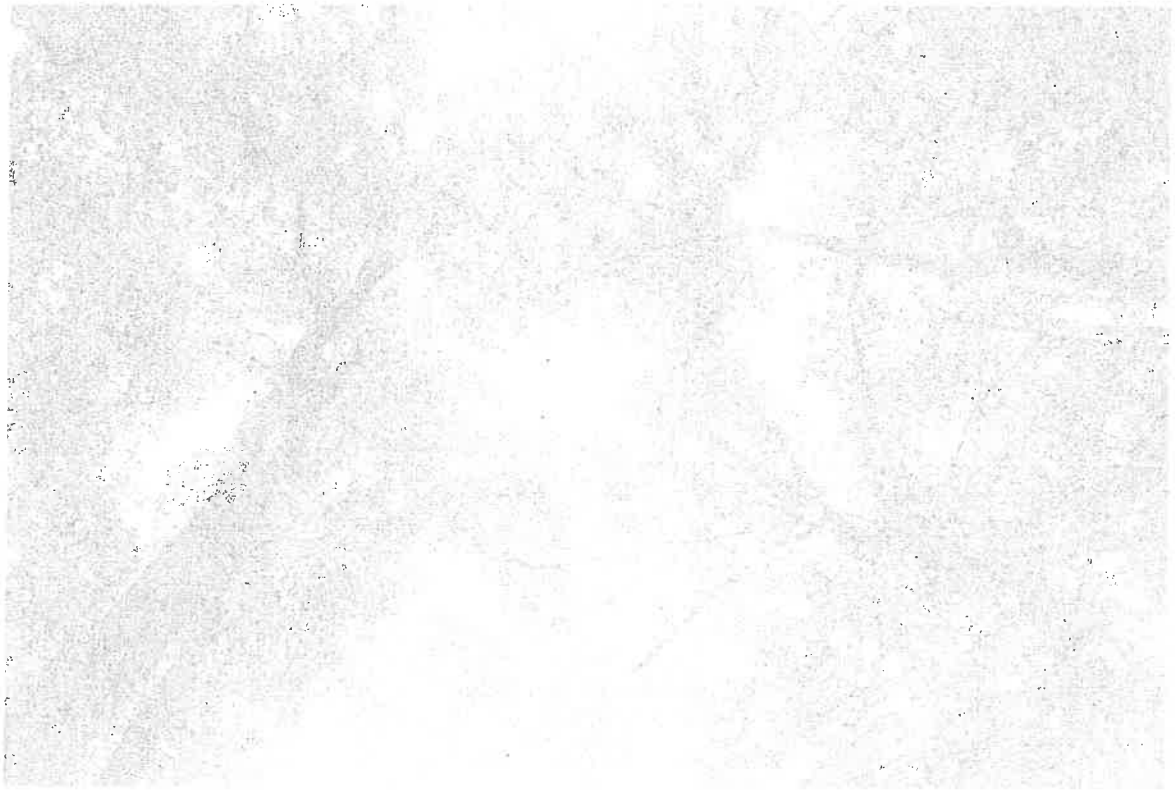
APPENDIX D-2



Entrance Sign Quarries and Companies

Central Stone Quarry
Bussen Quarry
Trautman Quarry
AAA Mailboxes
RB Advertising
D&J sandblasting
Flyer Striping
Re-Directions Inc

APPENDIX D-3



The Americans with Disabilities Act (ADA) of 1990 mandates the establishment of minimum walkway clearance widths and there are variety of organizations that offer sidewalk width recommendations. Updated and revised in 2004, the ADA and the Architectural Barriers Act (ADA–ABA) state that walking surfaces should have a clear width minimum of 36 inches.[8] This clear width minimum is the minimum width for passage and not a sidewalk width recommendation.[9] The clear width is the width of section of the walkway that is completely free of obstacles, vertical obstructions and protruding objects. The 36 inch width is the minimum width required to provide sufficient space for a person who uses mobility aids to travel within the restricted space.[10] However, restricting the pedestrian zone to 36 inches prevents passing and does not allow for two-way travel. The ADA–ABA guidelines state that where sidewalks are less than five feet in width, passing spaces sufficiently wide enough for wheelchair users to pass one another, or to turn around, shall be provided at intervals of 200 feet.[8] For more details visit ADA–ABA Accessibility Guidelines for Buildings and Facilities and the Accessible Rights-of-Way: A Design Guide.

The walkway width recommendations stated in several pedestrian facility guides exceed the 36-inch minimum needed for accessible travel as defined by the ADA–ABA Accessibility Guidelines for Buildings and Facilities.

- The Guide for the Planning Design and Operation of Pedestrian Facilities from the American Association of State Highway and Transportation Officials (AASHTO) recommends a minimum clear width for a sidewalk of four feet, and for sidewalks that are less than five feet in width passing space at least five feet in width should be provided at reasonable intervals.[11]
- The Design and Safety of Pedestrian Facilities from the Institute of Transportation Engineers (ITE) recommends different sidewalk width depending on the land uses and street type adjacent to the sidewalk. For residential areas, ITE recommends sidewalks widths ranging from four feet to five feet depending on housing density and for commercial areas a sidewalk width minimum of five feet. Sidewalks are required on a local street within two blocks of a school site that is on a walking route to school.[12]
- Designing Sidewalks and Trails for Access: Best Practices and Design Guide Part 2 from the FHWA recommends a minimum width of five feet of sidewalk that is free of obstacles.[13]

Pervious Concrete Pavement

Pervious concrete pavement is a unique and effective means to address important environmental issues and support green, sustainable growth. By capturing stormwater and allowing it to seep into the ground, porous concrete is instrumental in recharging groundwater, reducing stormwater runoff, and meeting U.S. Environmental Protection Agency (EPA) stormwater regulations. In fact, the use of pervious concrete is among the Best Management Practices (BMPs) recommended by the EPA-- and by other agencies and geotechnical engineers across the country-- for the management of stormwater runoff on a regional and local basis. This pavement technology creates more efficient land use by eliminating the need for retention ponds, swales, and other stormwater management devices. In doing so, pervious concrete has the ability to lower overall project costs on a first-cost basis.

In pervious concrete, carefully controlled amounts of water and cementitious materials are used to create a paste that forms a thick coating around aggregate particles. A pervious concrete mixture contains little or no sand, creating a substantial void content. Using sufficient paste to coat and bind the aggregate particles together creates a system of highly permeable, interconnected voids that drains quickly. Typically, between 15% and 25% voids are achieved in the hardened concrete, and flow rates for water through pervious concrete are typically around 480 in./hr (0.34 cm/s, which is 5 gal/ft²/ min or 200 L/m²/min), although they can be much higher. Both the low mortar content and high porosity also reduce strength compared to conventional concrete mixtures, but sufficient strength for many applications is readily achieved.

While pervious concrete can be used for a surprising number of applications, its primary use is in pavement. This site focuses on the pavement applications of the material, which also has been referred to as porous concrete, permeable concrete, no-fines concrete, gap-graded concrete, and enhanced-porosity concrete.

NRMCA PCA *Acknowledgements*

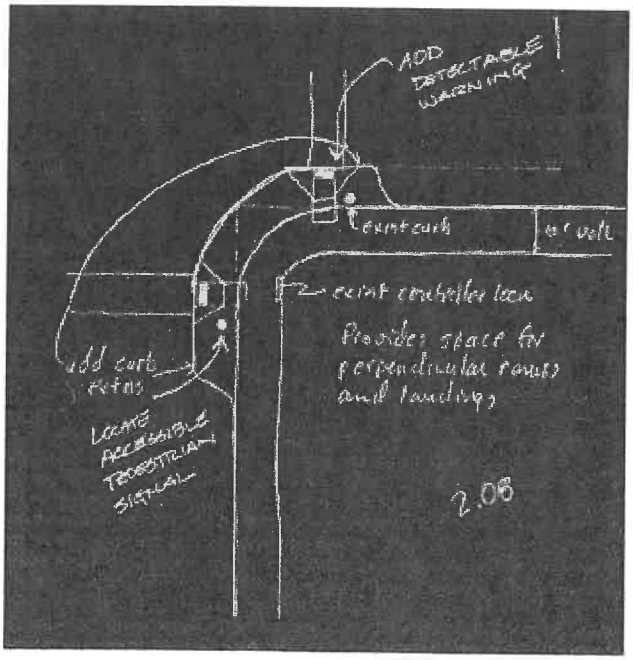
Pervious concrete minimizes storm water runoff. Pervious concrete pavement has a 15-25% void structure, allowing 3-8 gallons of water per minute to pass through each square foot. When it rains, pervious drains, putting water back in the ground where it belongs.

http://www.perviouspavement.org/

Side note the Beautification Issue Team has done extensive research on Pervious pavement
Susie Boone the Arnold Park Director has information on Rubble Surfaces for possible current use.

Special Report: Accessible Public Rights-of-Way Planning and Design for Alterations PDF version

August 2007



This report and its recommendations are the work of a subcommittee of the Public Rights-of-Way Access Advisory Committee (PROWAAC) and are intended to provide technical assistance only. The report is not a rule and has no legal effect; it has not been endorsed by the U.S. Access Board, the Department of Justice, or the Federal Highway Administration of the Department of Transportation.

Public Rights-of-Way Access Advisory Committee (PROWAAC)
Subcommittee on Technical Assistance
Jerry Markesino, PROWAAC Chair, Portland, OR
Janet Barlow, TAM Subcommittee Chair, Atlanta, GA

Document Produced by Otak, Inc.

Table of Contents

ABBREVIATIONS

AASHTO—American Association of State Highway and Transportation Officials

ADA—Americans with Disabilities Act

ADAAG—ADA Accessibility Guidelines

APS—Accessible Pedestrian Signal(s)

APWA—American Public Works Association

and alterations of pedestrian facilities in the public right-of-way. The DOT has already indicated its intent to adopt the PROWAG, when completed, into its 504 standard.

In the interim, jurisdictions must continue to design and construct new and altered pedestrian facilities that are accessible to and usable by people with disabilities. The 2005 draft PROWAG has been identified by DOT as the current best practice in accessible pedestrian design under the Federal Highway Administration's Federal-aid (504) regulation.

Resource: FHWA Memorandum of January 2006 at:
http://www.fhwa.dot.gov/environment/bikeped/prwaa.htm .

San Francisco uses plywood curb ramps with edge protection for temporary sidewalk detours. Here PROWAAC member Ken Stewart of CCLVI (with white cane) tests a model while Lukas Franck of The Seeing Eye looks on.

Following completion of Building a True Community, the Access Board asked PROWAAC to develop guidance and recommendations focused on achieving accessibility in alteration projects within the public right-of-way. This advisory, Special Report: Accessible Public Rights-of-Way—Planning and Designing for Alterations, compiles the recommendations of a subcommittee of PROWAAC that worked to develop and highlight model rights-of-way design alternatives, design processes for making alterations, design solutions to specific problems, and case studies demonstrating examples of accessible design practices from across the country.

Alterations

The focus of this report is on improvement projects in the public right-of-way that are classified as alterations under the ADA.

Alterations are discretionary changes, which the agency chooses to fund, to existing facilities within an already-developed right-of-way where the work affects, or could affect, the usability of that facility. ADA Title II implementing regulations require that each part of a facility altered by, on behalf of, or for the use of a public entity after January 26, 1992, be designed and constructed so that the altered parts are readily accessible to and usable by individuals with disabilities to the maximum extent feasible. While the following quote is from the ADA Title III regulation, it is a useful explanation of alteration and existing facilities.

> *b) Alteration. For the purposes of this part, an alteration is a change to a [...] facility that affects or could affect the usability of the building or facility or any part thereof.*
>
> *(1) Alterations include, but are not limited to, remodeling, renovation, rehabilitation, reconstruction, historic restoration, changes or rearrangement in structural parts or elements, and changes or rearrangement in the plan configuration of walls and full-height partitions. Normal maintenance, reroofing, painting or wallpapering, asbestos removal, or changes to mechanical and electrical systems are not alterations unless they affect the usability of the building or facility.*

This guidance has been drawn from expert practitioners across the U.S. and is focused entirely on improvement projects in the public right-of-way that can be considered alterations under the ADA. The design process for making accessibility improvements in alteration projects is not any different from the design process for traditional street modification projects. It involves the same use of standards, technical guidance, and product information that designers follow in every roadway design project. One key to success: recognition that ADA design standards are minima and maxima describing a range rather than design or engineering objectives. The running slope of a complying curb ramp may range between 0 and 1:12, but we suggest that designers set their calculations to fall within that range, not at its extreme, lest a construction or other anomaly affect compliance.

Case Study Examples

Throughout this Special Report are case study examples that illustrate alteration challenges and solutions applied to these challenges. Comments are provided to clarify the particular application and to provide the reader with background conditions to better understand the solution. Look for case study examples in a box similar to this one.

Case Study—Narrow Right-of-Way

- A midblock crossing and perpendicular curb ramp are aligned with an existing building entrance walkway. The walkway serves as the level landing for the curb ramp and the work was coordinated with the abutting property owner.
- Pedestrians can use the landing to bypass the descending ramp and its flares if they are continuing along the sidewalk.
- The midblock crossing has a pedestrian signal with a call button and an APS with a locator tone.
- Still needed: detectable warnings at the street edge.

Case Study—Narrow Right-of-Way

- The roadway travel lane was narrowed to add width to the pedestrian sidewalk and to accommodate the relocated parking meters.
- At the corner, a curb extension (bulb-out) into the parking lane provides the necessary space for a curb ramp and landing.
- The curb radius was omitted at this non-turning corner.
- Still needed: detectable warnings at the street edge.

Case Study—Downtown Redevelopment

- The project required other improvements that offered opportunities for increased access: re-striping, new

controllers and vehicle and pedestrian signals (existing equipment did not meet new MUTCD standards), and new curb ramps where bulb-outs were added.
- New accessible parking spaces were located near intersections to take advantage of the curb ramp serving the crossing.

The before photo (above) is a downtown streetscape in Pottstown, PA that was the subject of an improvement project to invigorate downtown retail, add bike lanes, and increase parking. The after photos (left) show the changes: new angled parking, bike lanes and more visible markings.

Case Study—Work Zone Accessibility

- The photograph shows a same-side temporary pedestrian route that bypasses construction on the sidewalk.
- Plywood surfacing is used where the route crosses grassy terrain; the joint is highlighted with contrasting paint. Still needed: a better bevel at the joint.
- The edge of the plywood walkway provides an adequate wayfinding cue on the opposite side (it provides good sound-on-cane information.) Chain link fencing is poor as a channelization enclosure, since it is not easy to follow with a cane and usually requires 'feet' that narrow the walkway.

CHAPTER 2: ALTERATIONS
by Jerry Markesino, PE, Otak, Inc.; Michele Ohmes, APWA

Alteration projects in the public right-of-way present particular challenges because of the limits of width and grade already

of the items is identified for reconstruction, it is likely that other facilities will be involved. This is simply the nature of this type of work.

This new parallel curb ramp on a large-radius suburban corner curves down to the street and is otherwise usable, but the pedbutton isn't. Installed on a signal pole, it is out of horizontal reach range for this pedestrian. A better installation can be seen across the street, where a stub pole has been installed in a more usable location.

Depending on the scope of the project, these existing facilities need to be considered in the project design. In some cases, desirable changes can be included with a small expansion in project scope and designed and built with little impact on the primary project. In other cases, removal of barriers to program access or correction of inaccessible adjacent construction should remain outside the scope of work.

Existing facilities can become physical constraints that impose a limit on the extent of any right-of-way improvement. When a new streetcar trackway is being planned, the preferred alignment may lie directly over a shallow steel water main. If the trackway is built over the water main, the electric powered train will discharge power to the ground and cause corrosion to the water pipe. After a few years of operation, the electrical discharge will destroy the water main. A decision must be made to either realign the trackway or rebuild the water main and protect it from being destroyed by the electrical discharge. In this case, the water main has become a physical constraint that imposes limitations on the streetcar project, perhaps requiring an expansion in the project scope of work.

In another example, an additional travel lane is proposed in the project scope and existing street trees occupy the space needed for the travel lane. The trees are a physical constraint. However, the scope of the project requires a new travel lane. It is likely that the trees will need to be removed. In this case, the tree removal and new tree planting elsewhere becomes part of the scope of the project. Ensuring that pedestrian facilities are accessible is just as important as meeting roadway design and operational guidelines. Where existing physical constraints are encountered, the project design should deal with them and deal with them in ways that are commensurate with the overall undertaking. For example, sight distance obstructions that affect intersection safety are routinely removed in an intersection modification project. Likewise, physical constraints that affect sidewalk usability should also be handled as a routine design practice.

Ooops! Where's the wheelchair accessible route? Much better coordination is needed at this urban bus shelter location. Even though the sidewalk width is generous, tree boxes crowd the shelter on either side and a fixed trash can on one side and the bus stop sign on the other complete the job—it looks good but isn't usable because there's no pedestrian access route or pad of sufficient size to deploy a bus lift. The bicycle chained to the sign is the last straw! Best fix: move the trash can and bus stop sign.

When existing physical conditions affect the feasibility of achieving full conformance with accessibility criteria in an alteration, the design engineer should determine, on an element-by-element basis, what degree of usability can reasonably be achieved within the scope of the planned project.

The challenge of dealing with project physical constraints in alteration projects has been recognized by the authors of accessibility standards for years. In 1992, in the development of proposed regulations, the Access Board identified a number of possible physical constraints that might bear on the feasibility of certain accessibility features, including:

- the existence of an underground structure, such as a utility vault, manhole, or sewer inlet at a street crossing that may preclude the installation of a new public sidewalk curb ramp in full compliance with provisions for new construction;

- the geometric design of existing roadways, bridges, or tunnels constrained by structural elements that, even when altered, may not accommodate a public sidewalk with adequate width for wheelchair users;
- differences in finished grade at curbside and elevations at existing building entrances at the back-of-sidewalk that may preclude compliance with cross slope provisions across the entire public sidewalk width;
- existing fixed equipment, such as fire hydrants or street lighting standards, located on a public sidewalk and connected to below-grade water, power, signal, and similar distribution systems that may prevent full compliance with public sidewalk curb ramp provisions if the equipment cannot be relocated in the course of the work;
- existing narrow public si dewalks or rights-of-way that might preclude the maintenance of a continuous passage free of gratings required for new subway construction; or
- the existence of an established landscaping feature, such as a large tree or grouping of trees that may preclude the provision of a parallel access aisle at a newly-established on-street parking space. Furthermore, a pre-existing commercial use of the public sidewalk, as for a sidewalk café, may also constitute a physical constraint if no other location for an accessible parking space is feasible within the scope of the alterations project.

Public agencies and designers need to be creative and flexible in developing solutions that promote accessible travel. Adjusting the geometrics in an existing system takes a greater degree of creativity, thought, and engineering know-how than when starting from scratch on a new project.

An understanding of accessibility criteria and rationale, skills enhanced from engineering study, and design experience with accessible facilities will enable practitioners to develop and deploy a toolbox of approaches appropriate to a wide range of project conditions. Designers should consider the entire right-of-way that is available as they work to balance facilities between vehicle, bicycle, and pedestrian use.

Resources:
AASHTO: "A Policy on Geometric Design of Highways and Streets", 2004;
"Guide for the Planning, Design, and Operation of Pedestrian Facilities", 2004: bookstore at **https://bookstore.transportation.org/**;
FHWA: "Manual on Uniform Traffic Control Devices", 2003 **http://mutcd.fhwa.dot.gov**

Plenty of street width is available for an imaginative solution to curb ramp installation at this small town intersection. Open culverts extend several feet from the curb at cross streets and are bridged with concrete ramps, open below for drainage, and handrails for edge protection. Beginning at the top of the curb almost 15 inches above road grade, these flying ramps both protect the culvert and provide access to the crosswalk. Edge protection is needed, however, and detectable warnings at the street edge.

Desirable objectives in the public right-of-way include curb ramps that are flatter than a 1:12 slope; adjacent landings that are near-level; signal call buttons within easy reach ranges of a person who uses a wheelchair; equipment installations that accommodate the techniques of low-vision and white cane travel; and crossing information that is usable by all pedestrians. Armed with an understanding of the rationale behind accessibility provisions and guidance available in industry documents, the street design professional will be well-prepared for the planning and engineering of alteration projects that include usable pedestrian facilities.

Analyzing Accessibility Alternatives

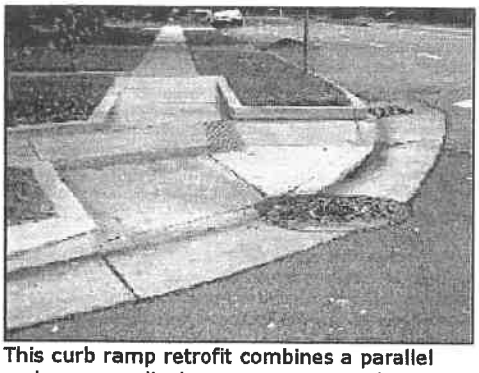
When physical constraints limit the application of new construction criteria, several potential approaches may be analyzed before selecting the solution that will optimize accessibility. Here is a simple two-step process for making decisions on selecting accessibility alternatives.

[In general, 'accessible' is used in this document to mean elements or facilities that comply with

applicable standards—this is the definition in ADAAG—and 'usable' to characterize elements or facilities that are not addressed in the standard, which represent equivalent facilitation, or that fall short of full compliance with scoping or technical provisions for new construction. Note that the ADA implementing regulations require new facilities to be both 'accessible to' and 'usable by' people with disabilities.]

First: Consider the use of work-around alternatives that do not affect usability by pedestrians who have disabilities. For example, where there is a problem placing a curb ramp in a preferred location, consider:

- using an alternate form of curb ramp (parallel, combination, or perpendicular);
- identifying an alternate location for the ramp;
- widening the crosswalk to include the curb ramp;
- borrowing space from the parking lane or the roadway;
- adjusting the horizontal and/or vertical roadway geometries;
- extending a curb ramp through the gutter-pan area;
- raising the roadway surface at the gutter;
- lowering the curb height;
- raising the crosswalk;
- adding a curb extension to 'grab' needed (and often more level) space for pedestrian facilities at corners;
- shielding the sides of a ramp with signs, sidewalk furnishings, and setbacks to eliminate the need for space-intensive flared sides; or
- ramping a sidewalk down to an intermediate level landing.



This curb ramp retrofit combines a parallel and a perpendicular ramp to stay within running slope limits. Curbed edges provide useful non-visual wayfinding cues. California State provisions (this is in Sacramento) require the corduroy markings at the intermediate landing, but research shows that the truncated domes required at the toe of the ramp (ADAAG 4.7) would provide a significantly more detectable indicator of the upcoming street crossing.

Second: If an alternative does not meet project constraints, favor approaches that have lesser usability implications. For example:

- modify curb ramp flare space requirements (the flare is not part of the required pedestrian access route [PAR]) or use returned curbs;
- construct a single curb ramp that can do the work of two;
- shave millimeters from a landing or decimals from the running or cross slope of a ramp;
- use a short length of blended or warped sidewalk that can be replaced during a future improvement to connect to existing undisturbed facilities; or
- blend non-conforming pavements in segments that provide as much planarity as possible for the wheelbase of a mobility device (~760 mm x 1220 mm).

Note that manipulating scoping requirements (one ramp where two will not work, a lesser number of accessible on-street parking spaces where construction is constrained) may also provide needed flexibility in conditions of infeasibility. Equivalent facilitation, obtaining the prescribed ends in another way, is also permitted. For example:

- use of an existing corner curb ramp to serve as an added accessible parking space where sidewalk space is limited;
- use of a leading-pedestrian interval (LPI) or all-red signal to provide crossing opportunities where other timings are not feasible;

Driveway crossings with excessive cross slope

2b. Question: What if the curb ramp can be placed over the vault, but an access cover would have to be located on the curb ramp to do so?

Answer: An access cover on the curb ramp is not prohibited if it conforms to the surface requirements (stable, firm, slip resistant; no changes in level that exceed ADA standards, etc.) for the pedestrian route.

3. Question: One corner of an intersection is being altered by curb and gutter reconstruction to add a curb extension for traffic calming. Paired curb ramps will be installed as part of this project. The other three corners of the intersection are not being altered. Must curb ramps be provided (or improved) at the unaltered corners as part of this work?

Answer: No, although it may be more cost-effective to do so, since most corners should be fitted with curb ramps eventually. Curb ramps within the limits of the project at the altered corner are a required part of this work. Discussion: Existing corners without curb ramps are subject to section 504 and ADA Title II program access requirements; broadening the current project's scope of work to include them now may make good economic sense (unless future construction at other corners is already scheduled).

In this downtown improvement project in Auburn, AL, splitting the sidewalk allowed two objectives to be served: the upper level provides stepless access to shops and the lower level maintains access to the street. Landscaping, benches, and decorative wrought iron railings separate the two levels, which are connected by a ramp at midblock and blended to a common level at corners. The reconstruction borrowed street space to provide the sidewalk width needed for this imaginative solution in a daunting hilly streetscape.

Sidewalks

4. Question: A project will be undertaken to connect a series of sidewalk segments near a school in support of a Federally-funded Safe-Routes-to-School (SR2S) program. Must the existing segments of sidewalk be modified if they do not meet width or cross slope provisions?

Answer: This is an alteration to an existing pedestrian circulation system and compliant features must be installed to the extent that it is feasible to do so within the scope of the project. Discussion: Since this is an area-wide project intended to provide student circulation routes between homes and school, and not just to link two separated segments of an existing walkway together, the project should be planned to include improvements to existing sidewalk segments that can feasibly be corrected within the scope of a sidewalk improvement project. Students with disabilities cannot be excluded from SR2S programs, which by their nature encourage walking and bicycling, and such programs carry their own program access responsibilities.

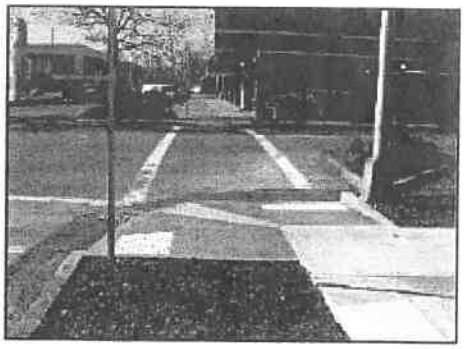
5. Question: A new sidewalk is being built along an existing road that contains many driveway access points. Must those driveways be modified if their cross slope exceeds 2%?

Answer: Yes, to the maximum extent feasible within the scope of the project. A new sidewalk, even when constructed as an alteration, must be designed to conform to accessibility standards to the extent that it is feasible to do so. Design guidance from the Access Board includes several driveway apron retrofit schemes (see Case Studies for details).

6. Question: A city is resurfacing a sidewalk along Main Street. The distance between the edge of the right-of-way and the existing roadway does not provide sufficient room for a four-foot-wide pedestrian access route. Does the municipality have to acquire more right-of-way from private property owners or narrow the roadway to provide a more conforming walkway?

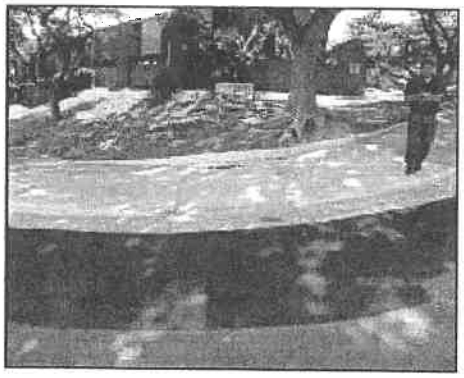
Answer: No, accessibility guidelines do not require the municipality to obtain right-of-way or to narrow roadways in the limited scope of work of a sidewalk resurfacing project. However, if a municipality

Case Study—Returned Curb Aids Wayfinding



- This photograph shows a new downtown traffic calming project in Vancouver, WA
- Returned curbs against the landscaped setback provide good orientation cues to crossing pedestrians
- Flares have been minimized in order to make preferred incline/directional ramps possible at this small curb radius

Case Study—Steep Terrain at Corner



- This new combination (parallel and perpendicular) ramp is installed in an existing sidewalk network as a consequence of resurfacing alterations. It is located at the apex of the corner to insure that pedestrians do not enter the crossing in an active traffic lane.
- Roadway surface and gutter have been raised and blended to meet the new parallel ramp, making this a good example of a combination ramp.
- Where true level landings cannot be provided in alterations, it is particularly important to limit sidewalk cross slope to 2%.

Note: DWS needed.

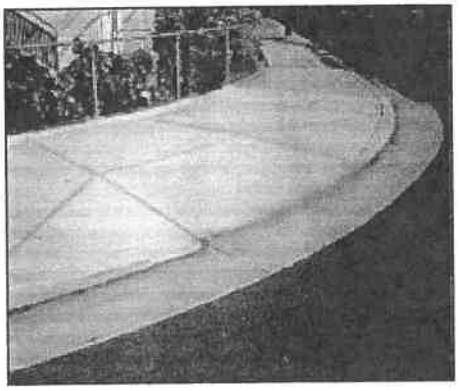
Case Study—Adding Pedestrian Signals

- Stub poles are used at these new curb ramps to properly locate the pedbutton near the departure curb.
- For maximum signal discrimination, each crossing direction should have a separately-mounted device; MUTCD standards require a 10-foot minimum between APS.
- While not specified in ADA or 504 Standards, greater accessibility for those with low vision would be provided if the new signal posts were darker and contrasted with the light sidewalk paving.

Case Study—Combination Curb Ramp

- Existing surface drainage patterns along this corner suggested the likelihood of flooding at the central landing of a parallel ramp so a new combination curb ramp design was specified.
- This is a good approach in limited right-of-way. The

short perpendicular curb ramp raises the central landing a few inches above the gutter flow line so it is not flooded.
- The design allows for a level bypass space at the top of the flared side ramp while accommodating the limited width of the existing sidewalk.
- Still needed: detectable warnings at toe.



Case Study—Midblock Crossing Criteria

- This APS provides audible and vibrotactile notice of the crossing phase at a midblock crossing where there is no parallel traffic surge to provide a cue. Its locator tone also identifies it as an actuated crossing.
- The pedbutton is installed as close to the departure curb as feasible and is operable from the level landing.
- The pedbutton and tactile arrow are oriented parallel to the crosswalk.

CHAPTER 3: DESIGN PROCESS
by Andrew Davis, PE, City of Akron, OH; Jerry Markesino, PE, Otak, Inc.; Jim McDonnell, PE, AASHTO; Bob Sexton, PE, HR Gray (Columbus, OH); Bill Hecker, AIA (Birmingham, AL), Ken Stewart, Council on Citizens with Low Vision, International

The design process for making accessibility improvements in alteration projects is not any different from the design process for traditional street modification projects. Incorporating accessible pedestrian elements in the public right-of-way requires the same reference to standards, technical

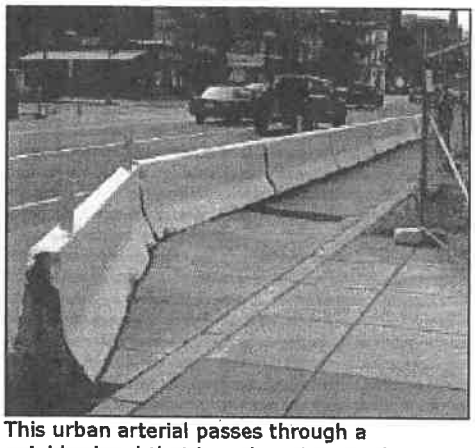
guidance, and product information that designers follow in every roadway design project. The design and placement of curb ramps into an existing developed streetscape is governed by many of the same considerations as roadway design: controlling horizontal and vertical geometries, surface conditions, and access to intersections, all at the scale of the pedestrian rather than the vehicle.

In an alteration, a balance needs to be struck between pedestrian and vehicle users vying for travel space (and time) within a limited right-of-way already constrained by existing development. A good understanding of the rationale behind accessibility standards will help the designer integrate usability for pedestrians who have disabilities into agency decision making.

Resource: FHWA's 'Designing Sidewalks and Trails for Access, Part 2' at:
http://www.fhwa.dot.gov/environment/sidewalk2/index.htm

Gathering Information

A planned alteration project may arise from a long-planned Capital Improvements Program or be a more immediate response to local conditions or community advocacy. When such construction is undertaken, the new work must incorporate accessibility features. Jurisdictions may have additional obligations for existing facilities under the Title II and 504 regulations (see Chapter 2, Alterations).



This urban arterial passes through a neighborhood that is undergoing rapid revitalization, with many projects under construction temporarily occupying existing sidewalk space. In this example, the contractor has provided a temporary pedestrian route in the curb lane of the roadway, separating it with Jersey barriers and installing a temporary concrete ramp to the street level walkway. Still needed: detectable warnings at the cross street.

Therefore, before developing the scope of work for a planned new project, the design team should contact the jurisdiction or agency ADA/504 Coordinator to identify accessibility improvements that may be needed within or near proposed project boundaries, such as:

- curb ramp transition plans and schedules;
- requested individual accommodations, including APS, parking, curb ramps, and sidewalk repairs; and
- bus stop/transit accessibility improvements.

Often, such improvements can be included in a pending project at a more modest cost than undertaking them independently. Evaluate existing conditions near the project site to determine if key accessibility features or needed maintenance could be provided more economically by slightly expanding the project scope of work. Some agencies have developed 'spot improvement' programs that use resident requests as input to project scoping. Coordination with transit agencies, which have their own ADA obligations for new construction, alterations, and existing facilities and programs, will indicate whether bus stop locations and shelter space and access requirements would best be addressed within a planned project scope. By gathering this information during preliminary project planning, the engineer can avoid potentially costly oversights and under-designs.

Resources: FHWA's 'Metropolitan Planning' at:
http://www.fhwa.dot.gov/hep/metropol.htm
FTA's civil rights/accessibility page at:
http://www.fta.dot.gov/civilrights/civil_rights_2360.html
Transition Plan, City of Nashville, TN at:
http://www.nashville.gov/gsa/ADA/doj_2047143_final_textonly.htm (see Section VIII: Compliance Strategies for Public Right-of-Way)
State of Hawaii Title II Self Evaluation and Transition Plan at:
http://www.state.hi.us/dlnr/dsp-dp/dsp/rules/draft-transition-plan-self-evaluation.pdf
A newly-funded (2006) National Cooperative Highway Research Project developing guidance for highway agencies on preparing transition plans and meeting program access expectations at:

http://www.trb.org/TRBNet/ProjectDisplay.asp?ProjectID=1247

Planning the Scope of Work

Defining the scope of a planned alteration project establishes the physical and contractual parameters of the work. If right-of-way is to be acquired for a project, it is important to purchase enough to accomplish all project objectives; if an existing right-of-way is to be reapportioned, the scope of work will fix the balance between motor vehicle, cycling, and pedestrian uses. Under-scoping a project may leave or create barriers that will have to be corrected; an oversight that renders a significant part of a planned project inaccessible can entail costly remediation.

New technologies such as central on-street parking pay stations and pedbutton-integrated APS must be carefully placed for usability. Signaling and utility equipment locations and sizes must be anticipated and the accessibility effects of street furniture (benches, bike racks, bus shelters, signage and other appurtenances) must be assessed before right-of-way needs can b e finalized. Private uses of public space for ATM access, sidewalk dining, and newspaper vending all have space and geometric design implications for accessibility.

Street and sidewalk modifications may also affect access to abutting properties. This can raise complex issues of engineering, coordination, and policy, particularly with private sector entities that have obligations under Title III of the ADA to provide accessible approaches and entrances. For example, correcting excessive cross slope as part of a sidewalk improvement project should not result in new steps at entrances to adjacent businesses. A detailed site study that includes consideration of beyond-the-right-of-way implications will best serve public/private coordination efforts and suggest design approaches and solutions (see Chapter 4), which will be helpful in addressing existing constraints in alterations, particularly those of modest scope.

A comprehensive scope of work description will include the following:

- WHAT the proposed project is intended to do, including pedestrian accessibility objectives;
- WHERE the project limits and bounds will be and how new and existing facilities will meet; and
- HOW the project will be funded, including sources, availability, and limitations arrayed against estimates of design and construction costs (note the overview of funding sources for accessibility improvements included in the Appendix).

This streetscape improvement in a historic downtown works with the street slope to provide individual entrance platforms at existing businesses. Level landings on the upside connect back to the downside with steps. A clear passage of 1.5 m (5 feet) is maintained between the furniture zone at the curb and the stepped entrance platforms.

From this, the planning team will identify possible constraints that may affect roadway, pedestrian, and accessibility objectives. Several design schemes may have to be developed and analyzed before the project scope can be fully determined. The designer should document the decision making process, including the evaluation that led to the selection of the preferred alternative(s).

The scope of work that is defined for an alterations project should reflect pedestrian planning and analysis for accessibility/usability that is commensurate with the overall roadway design work effort.

Examples

Let's use the classic 4Rs of highway design to illustrate how establishing the scope of work relates to access planning (see Appendix for TxDOT's definitions). Most 4R projects involve roadway pavement,

although many other elements of construction can also be included:

1. Reconstruction

Reconstruction of roadway facilities is an ambitious undertaking of comprehensive scope under which most objectives can be fully realized for both roadway and sidewalk design. Projects of this complexity should be able to meet or exceed minimum accessibility criteria.

Example: A 1.5-mile length of residential street was reconstructed and re-aligned and water, fire hydrant, and sanitary and storm sewers rehabilitated as part of the project. New curbs and gutters were provided throughout. Accessibility features included new aligned curb ramps with detectable warnings at all crossings. Sidewalks were replaced and driveway aprons reconstructed where needed to meet cross slope limits.

2. Rehabilitation

Rehabilitation projects typically raise subgrade issues. Feasibility is a factor here and 'work-arounds' will require case-by-case design solutions.

Example: Storm drainage improvements (new inlets) are planned for one side of an existing developed streetscape. Sidewalk and roadway surfaces and subgrade facilities are removed at each corner, but the sidewalks they connect to will remain. When sidewalk segments are replaced or repaired, the new work must provide accessibility/usability. But it must also meet the grades of existing sidewalks at the project boundary. Providing intermediate transition segments between the new and existing work (rather than matching the old) will serve users best. Future work then need only improve the transition segment and the existing sidewalk. In addition, the scope of work for this alteration must include new curb ramps (and the improvement of existing ones, as feasible). The agency should consider adding opposite-side curb ramps to the scope of work, as well.

3. Restoration

Restoration projects return pavement structure, riding quality, or other roadway characteristic in an existing cross-section to near-new condition. Because the work affects the usability of the surface, it is considered an alteration and must include curb ramps at pedestrian crossings.

Example: An existing rutted roadway surface will be restored. Subgrade structure will be improved and a new surface added without disturbing adjacent existing sidewalks. Curb ramps added in an alteration of this limited scope will be usable by many, but may not be optimal in location, wayfinding, slope, width, or other feature until a later alteration to the sidewalk is undertaken.

4. Resurfacing

Most resurfacing will be viewed as an alteration—a change that affects surface usability. However, spot patching and liquid-applied seals are described as maintenance not requiring curb ramps in DOJ technical assistance publications. FHWA guidance distinguishes between structural and non-structural resurfacing.

Temporary Routes

Interim pedestrian accommodations put in place as part of a temporary traffic control plan are considered alterations subject to the 'maximum extent feasible' limit in the standard. The Manual on Uniform Traffic Control Devices (MUTCD) includes detailed requirements on maintaining pedestrian access through or around a work zone. Project planning must include a temporary usable route that provides the accessible features of the disrupted route, perhaps even including APS.

Resources: MUTCD Chapter 6 at:
http://mutcd.fhwa.dot.gov/HTM/2003r1/part6/part6d.htm
ATSSA work zone safety grant at:
http://www.atssa.com/cs/Federal-Highway-Administration-work-zone-safety

Identification of Constraints and Opportunities

An on-the-spot survey of existing development at the project location is the first step in identifying physical constraints that may require work-arounds or feasibility assessment. There will be a need to evaluate the pedestrian route with respect to width, setback, running grades, cross slopes, lateral and vertical clearances, and sidewalk appurtenances and to identify opportunities to work with the current grade or make use of the parking lane or roadway space, tighter corner radii, and other potential sources of flexibility.

FHWA has developed an inventory process to document existing sidewalk conditions that includes forms and checklists for field information to aid in project scoping, analysis, and design. The forms can be adapted to meet the needs of a particular agency and will be particularly useful in project planning. Because the survey forms do not include pedestrian signalization considerations, agencies adapting its format for local use should add the APS criteria outlined in the NCHRP 3-62 report posted to the website of the Pedestrian and Bicycling Information Center. A separate chapter addresses retrofitting an intersection with APS.

Resources: Sidewalk Inventory Form, in 'Designing Sidewalks and Trails for Access' at:
http://www.fhwa.dot.gov/environment/bikeped/Access-1.htm
APS criteria in NCHRP 3-62 at:
http://www.walkinginfo.org/aps/home.cfm

Complex engineering design utilizes topographic, elevation, and geometric design information for the design of curb ramps, landings, slopes, clearances, and signal locations in a substantial project. It is important that such surveys include entrance elevations for abutting facilities. Many agencies use an inexpensive rotating laser for this purpose. An electronic level can pinpoint excessive slope and cross slope locations.

During the site design survey and pedestrian route assessment for an alteration project, carefully identify any condition that is likely to affect route accessibility. Examples of existing infrastructure elements that may influence project planning include drainage structures, manholes, utility poles, sewers, water mains, and underground conduits and vaults. In narrow rights-of-way, street trees, building entrances, and basement extensions from adjacent buildings will limit design flexibility unless relocation has been included in the project scope.

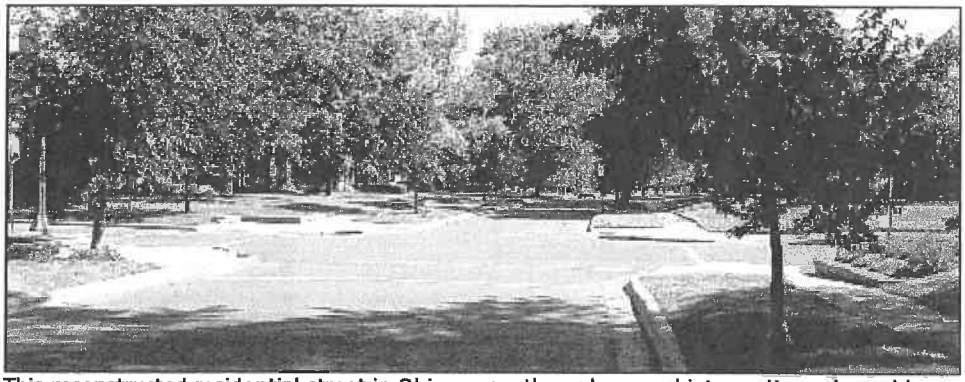
Development of Alternatives

When the designer is faced with constraints that affect conformance with accessibility objectives, alternative designs need to be developed and assessed. Chapter 5 addresses accessible design alternatives under a wide range of existing conditions.

Project Documentation

It is common practice in all project designs to document the analysis of certain problem types, including a description of the alternatives considered and decisions made. A street pavement thickness design, for example, will consider the bearing soils, the future truck traffic loads, pavement type, amount of excavation, cost of pavement materials, and other variables. The final selected pavement thickness will be justified by this analysis of relevant variables and their effects on each other. The engineering judgment(s) that lead to the final decision are documented and become part of the permanent project record.

For alteration projects where some improvements may fall short of new construction standards, documentation is very important. The structural design of a bridge includes a very careful analysis of all the components to assure that the bridge will not collapse and cause injury or death. This same standard of care should be exercised with respect to accessible design. Documentation reveals the standard of care that guided engineering judgments made in the course of the work. In the event of a challenge at a future time, documentation can be retrieved from project archives in support of the agency's decisions.



This reconstructed residential street in Ohio curves through several intersections skewed by as much as 30 degrees. Although aesthetically pleasing, this posed some design challenges for accessibility. As can be seen in the photograph, low retaining walls were required on many corners. The project included new water mains, fire hydrants and services, sanitary and storm sewer rehabilitation, new curbs and gutters, driveway entrance replacements (to allow ADA-compliant sidewalks across the driveways), and full-depth street reconstruction for approximately 1.5 miles of suburban streets. Paired curb ramps with detectable warnings were constructed at all intersections.

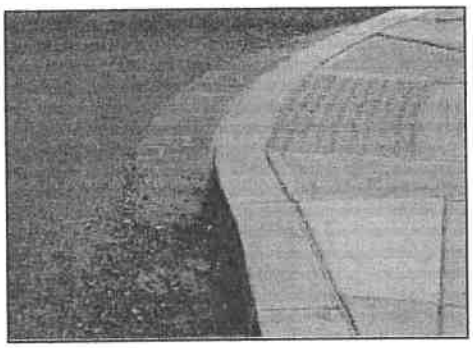
Example: As part of a SR25, several existing sidewalk segments will be connected through a small neighborhood commercial area. A tree of substantial caliper shades a 30-inch-wide sidewalk; a retaining wall occupies the property line. The two-lane roadway is also narrow and provides no parking lane. Providing an accessible crossing to a more generous sidewalk on the other side of the street may be an acceptable solution in this instance if the pedestrian crossing is improved and safety considerations are addressed. Alternatively, the town may determine that a preferable course for student safety is to acquire right-of-way and relocate the retaining wall to provide adequate sidewalk width. At the tree, a lesser walkway width (32 inches is the ADAAG minimum for a 24-inch length) can provide the required usability for this limited distance in an existing facility (it wouldn't be an acceptable choice in new construction, however). In the permanent record file for the project, the city engineer should document his efforts to conform to the ADA criteria and his/her decision to build a portion of the sidewalk that is not in strict compliance with new construction standards.

Several state highway agencies have established processes to document infeasibility in a project element or elements under state code requirements or regulations. They offer an opportunity to explain the existing physical or right-of-way constraints that limited conformance to the ADA standards and may be called Design Details of Nonconforming Elements, Design Deviations, Modification of Standards, or other. While useful in the project record, there is no process at the Federal level (where the ADA and Rehabilitation Act are principally enforced) by which review and approval, exceptions, or variances can be granted. For a typical city agency, the designer or the project manager would make the determination of 'maximum extent feasible', document the engineering judgment that was used in the evaluation of alternatives, and describe the solution that was selected.

The ADA is a civil rights law and by nature it gains clarity through litigation. Careful documentation will not protect against complaint, but evidence of the considerations that led to the specific project solution may be persuasive in court or in discussions with users. Taking a proactive stance towards solving access issues in the right-of-way may allow issues to be addressed and solved without risking a complaint.

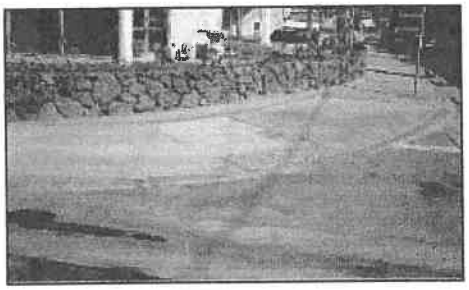
Resources: Texas Department of Licensing and Regulation (TDLR) at:
http://www.tdlr.state.tx.us/ab/abrules.htm#6831
Maryland State Department of Transportation at:
http://www.sha.state.md.us/businessWithSHA/bizStdsSpecs/ohd/ada/adaguidelines.asp
Nashville, TN at:
http://www.nashville.gov/gsa/ADA/procedures-forms.htm

Case Study—Narrow Sidewalks



- When this roadway in Washington, DC was resurfaced, existing non-compliant curb ramps were replaced.
- The counterslope of the brick gutter at the toe of this curb ramp was eliminated in order to extend the ramp through the gutter. This allows the ramp to be shorter, because it meets the crown of the roadway at a higher point.
- It also eliminates ponding at the toe.

Case Study—Typical Parallel Curb Ramp



- The limited width of the right-of-way along this street dictated the need for a parallel curb ramp.
- Detectable warnings are shown along the leading edge of the central landing as specified in the draft PROWAG.

Case Study—crowded corners

- This urban corner is crowded with existing signal poles, signal boxes, and utility boxes that limit curb ramp design and placement.
- One solution, shown in the first photo: reduce curb radius to maximize available corner area and ease flares to fit the available space. Still needed: detectable warnings.
- Another option, shown in lower photo: shield ramp sides against pedestrian travel with pedbutton poles and sidewalk furnishings. By eliminating the flares, more corner area is gained. Bonus: returned curb offers useful wayfinding cues for non-visual travel. Note that the curb ramp here is the full width of the crosswalk, another pedestrian benefit. This example is from Barcelona, Spain.

CHAPTER 4: DESIGN SOLUTIONS

by Daniel L. Dawson, PE, Otak, Inc & ITE; Elizabeth Hilton, PE, Texas Department of Transportation; Lee R. Kenderdine, PE, and Chuck Yancey, Metropolitan Government of Nashville and Davidson County, Tennessee

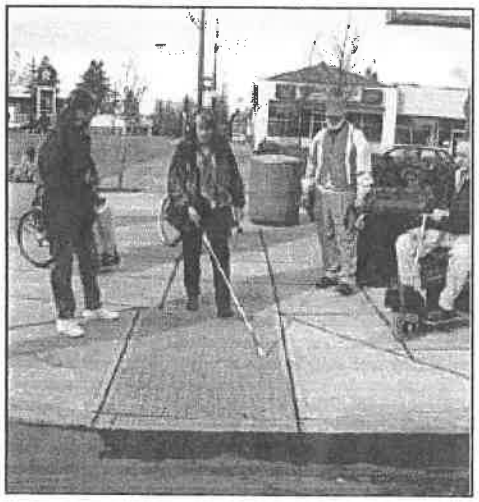
Until recently, there have been few design tools available to transportation practitioners for creating accessible pedestrian facilities. For the most part, pedestrian systems have been designed for a user who is agile and who sees, hears, and understands the roadway environment. But just as vehicular ways are engineered for users who have particular requirements—transit, large trucks, and emergency vehicles—so, too do sidewalks need to be planned for a broad range of pedestrians. Implementing accessible design results in a safer and more usable system for all, not just those with disabilities, in part because it requires that a greater level of detail and attention be given to pedestrian issues and improvements.

In the past, design of accessible pedestrian features has been inconsistent because authoritative design guidance has been lacking. And adjusting the geometrics in an existing system—the subject of this technical assistance—takes a much greater degree of creativity, thought, and engineering know-how than starting from scratch on a new project.

Resources

This section includes hypothetical situations and potential design solutions that will vary depending on roadway conditions. The discussions and solutions in this chapter are based on practical applications, research, recommendations, and existing design standards from:

- Building a True Community (January 2001), Public Rights-of-Way Access Advisory Committee's report to the US Access Board;
- Designing Sidewalks and Trails for Access, Part II (August 2001), Federal Highway Administration;
- Notice of Availability of Draft Public Rights-of-Way Accessibility Guidelines (June 2005), US Access Board;
- Manual on Uniform Traffic Control Devices and draft changes approved for 2008;



PROWAAC members observe a thin-film detectable warning retrofit on an existing curb ramp in a pilot project in Portland, OR.

- Guidelines for Accessible Pedestrian Signals, NCHRP 3-62, University of North Carolina Highway Safety Research Center;
- Guide for the Planning, Design, and Operation of Pedestrian Facilities (July 2004), American Association of State Highway and Transportation Officials; and
- Chapter 6 of this special report

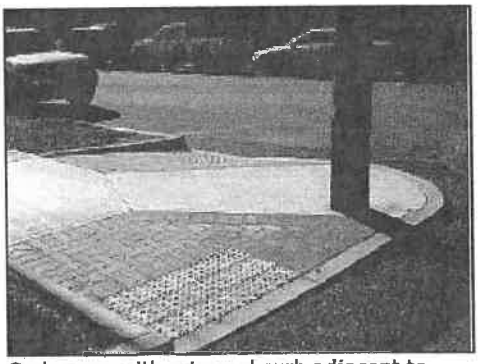
Accessible Design is a Safety Best Practice

Pedestrian interactions with motor vehicles bring safety risks. For instance, the lack of pedestrian signage and signal information in usable formats puts people with visual disabilities at a greater risk than those who can see. The 30-year-old cuckoo-chirp technology for providing crossing information to people with visual disabilities has been replaced by modern electronics that tick, talk, vibrate, audibly advertise their presence, adjust to ambient sound, and provide a wide range of other information (mapping, street names, special messaging, audio beaconing). Over 30 manufacturers now provide stand-alone or pedbutton integrated APS devices, including some that are receiver based for individual use.

The MUTCD includes standards and guidance for the placement and application of APS in Chapter 4. APS technology can significantly improve the access and safety of pedestrians with impaired vision because the crossing information is provided in multiple formats. As with other accessible design criteria, the usability of APS technology will depend on attention to detail and consistent inclusion of APS when designing and constructing signal systems. Where push buttons are placed at crosswalks and curb ramps, two buttons at each corner (one at each curb ramp) are critical for people with disabilities to understand which street crossing has the 'walk' phase and to position themselves at the crossing before the walk phase starts.

The boundary between the sidewalk and roadway is not easy to detect if a person cannot see it, and stepping into the street without knowing it can be a significant safety problem. People with visual disabilities relied on curbs for that information before the advent of curb ramps. Detectable warnings (DWs), a pattern of low truncated domes, placed where the curb has been eliminated to provide wheelchair access, provide underfoot information on where the sidewalk ends and the street begins.

The safety of wheelchair users is compromised when all four wheels do not maintain contact with the ground. This happens when sidewalk surfaces and transitions to the curb ramp and crosswalk are warped or there is a change in level—very common occurrences in the pedestrian environment. Steep grades and cross slopes can create similar stability, control, and tipping and falling problems for ambulatory pedestrians who use mobility devices. Many of these situations could be eliminated with greater attention paid to detailing pedestrian facilities during the design phase.


Curb ramp with returned curb adjacent to landscape strip

All these issues are accessibility and safety issues; the two are difficult to separate from one another in the pedestrian environment.

Information in This Chapter

The Case Studies used as examples in this report represent different, and not always optimal, approaches to streetscape alterations under a range of existing conditions. Some solutions are more successful than others and PROWAAC Subcommittee members did not agree on every photograph included here. Their use in this document should not be interpreted to indicate that they represent satisfactory or complete solutions. Each situation needs to be evaluated on a case-by-case basis using applicable standards, or, where standards are absent or inapplicable, best practices developed in

- Do not use this design unless constraints, such as drainage structures, vaults, etc. require its use; paired ramps area always preferred.
- 8-foot grass area or furnishing zone between curb and PAR.
- Moves the crosswalk closer to the intersection.
- Where curb ramps are the sole connection to the street, designers should consider providing wider curb ramps where pedestrian volumes are high.
- Curb ramps that do not align with the direction of travel on the crosswalk direct visually impaired and blind pedestrians toward the center of the intersection and wheelchair users have to make a directional adjustment in the roadway.
- Single shared landing eliminates the ability to separate the APS push buttons on two poles. Will require the use of speech walk messages and additional features to clarify walk indication.

Case Study—Linking to Shop Entrances

- When this sidewalk was reconstructed, new level platforms were included that link the store entrances to the sloping city sidewalk.
- This design minimizes warping of the sidewalk surface near the bottom steps so wheelchairs can stay on all four wheels when approaching the shops.

CHAPTER 7: RESOURCES

by Barbara McMillen, Pedestrian Accessibility Specialist, and others

US Department of Justice

website **http://www.ada.gov/**

Americans with Disabilities Act (ADA), (Pub. L. 101-336), Title II, implementing regulations for Nondiscrimination on the Basis of Disability in State and Local Government Services, 28 CFR PART 35, Final rule, which prohibits discrimination on the basis of disability by public entities.
http://www.ada.gov/reg2.html

- ADA Standards for Accessible Design (1991). The ADA Standards for Accessible Design are the Access Board's 1991 ADA Accessibility Guidelines (ADAAG), adopted on July 26, 1991: **http://www.ada.gov/stdspdf.htm**
- Title II Technical Assistance Manual (1993) and Yearly Supplements. A 56-page manual that explains in lay terms what state and local governments must do to ensure that their services, programs, and activities are provided to the public in a nondiscriminatory manner. Many examples are provided for practical guidance: **http://www.ada.gov/taman2.htm**
- Title II Highlights. An 8-page outline of the key requirements of the ADA for State and local governments. This publication provides detailed information in bullet format for quick reference: **http://www.ada.gov/t2hlt95.htm**

- ADA Guide for Small Towns . A 21-page guide that presents an informal overview of some basic ADA requirements and provides cost-effective tips on how small towns can comply with the ADA. FAX # 3307
  - ADA Guide for Small Towns (HTML): **http://www.ada.gov/smtown.htm**
  - ADA Guide for Small Towns (PDF): **http://www.ada.gov/smtown.pdf**
- The ADA and City Governments: Common Problems . A 9-page document that contains a sampling of common problems shared by city governments of all sizes, provides examples of common deficiencies and explains how these problems affect persons with disabilities.
  - ADA and City Government: Common Problems (HTML): **http://www.ada.gov/comprob.htm**
  - ADA and City Government: Common Problems (PDF): **http://www.ada.gov/comprob.pdf**
- An ADA Guide for Local Governments: Making Community Emergency Preparedness and Response Programs Accessible to People with Disabilities. A publication that provides guidance on preparing for and carrying out emergency response programs in a manner that results in the services being accessible to people with disabilities: **http://www.ada.gov/emergencyprep.htm**

US Department of Justice Technical Assistance Letters . Covers state and local government's responsibilities for complying with provisions in the ADA, Title II regulations. Compliance topics:

- Sidewalks, transition plans, alterations, new constructions: **http://www.usdoj.gov/crt/foia/ltr205.htm**
- Obligations to follow design standards for sidewalks: **http://www.usdoj.gov/crt/foia/tal680.txt**
- Snow removal on sidewalks: **http://www.usdoj.gov/crt/foia/tal684.txt**
- Roadway resurfacing and the need to provide curb ramps in alterations: **http://www.usdoj.gov/crt/foia/tal679.txt**

US DOJ Settlement Agreements . Involve public rights-of-way, State of Delaware, Voluntary Agreement with terms and conditions to bring certain roads under the jurisdiction of the state into further compliance with the Americans with Disabilities Act of 1990: **http://www.usdoj.gov/crt/ada/deldot.htm**

Project Civic Access. A Title II compliance program that includes:

- Settlement agreements with over 150 towns, cities, counties, and States (See "Sidewalks" in each for those that include public right-of-way issues: **http://www.ada.gov/civicac.htm**)
- Fact sheets: **http://www.usdoj.gov/crt/ada/civicfac.htm**
- Tool Kit for State and Local Governments (Chapter 6 covers curb ramps): **http://www.ada.gov/pcatoolkit/chap6toolkit.htm**

Precedent-setting Court Cases

Kinney v. Yerusalim, 9 F.3d 1067 (1993) **http://www.access-board.gov/prowac/yerusalim.htm**

U.S. DOJ amicus to court finding that resurfacing of city streets is an alteration requiring installation of curb ramps to comply with regulations promulgated under ADA: **http://www.usdoj.gov/crt/foia/pa2.txt**

Barden v. City of Sacramento, CA

On January 22, 2004, the court granted final approval of the settlement in Barden v. Sacramento. This

http://www.fhwa.dot.gov/environment/bikeped/Access-1.htm

Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide :
http://www.fhwa.dot.gov/environment/sidewalk2/index.htm

FHWA two-part guidebook on planning and designing sidewalks and trails for access. Created to provide planners, designers, and transportation engineers with a better understanding of how sidewalks and trails should be developed to promote pedestrian access for all users, including people with disabilities.

Design Guidance Accommodating Bicycle and Pedestrian Travel: A Recommended Approach . A policy statement adopted by the United States Department of Transportation. USDOT encourages public agencies, professional associations, advocacy groups, and others to integrate bicycling and walking into the transportation mainstream:
http://www.fhwa.dot.gov/environment/bikeped/Design.htm

Freedom to Travel Survey . The Bureau of Transportation Statistics (BTS),(USDOT), survey designed to identify the impact of transportation on the work and social lives of people with disabilities, and the extent to which such impact is unique to that population:
http://www.bts.gov/publications/freedom_to_travel/

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations Final Report and Recommended Guidelines . Includes recommendations on how to provide safer crossings for pedestrians: **http://www.tfhrc.gov/safety/pubs/04100/index.htm**

How to Develop a Pedestrian Safety Action Plan . Guide and resource for improving pedestrian safety intended to assist agencies in enhancing their existing pedestrian safety programs and activities, including identifying safety problems and selecting optimal solutions through redesign and engineering countermeasures. **http://www.walkinginfo.org/pp/howtoguide2006.pdf**

Accommodating Pedestrians in Work Zones . Illustrated brochure:
http://safety.fhwa.dot.gov/wz/wzp3.htm

OTHER RESOURCES

Guides, Manuals, Reports, Research, Data

AASHTO guides can be purchased through the AASHTO web site at:
http://www.transportation.org

- Guide for the Planning, Design and Operation of Pedestrian Facilities (2004). The American Association of State and Highway Transportation Officials (AASHTO), presents effective measures for accommodating pedestrians on public rights-of-way. The guide recognizes the profound effect that land use planning and site design have on pedestrian mobility and addresses these topics as well.
- A Policy on Geometric Design of Highways and Streets , (Green Book), AASHTO, 2001

Accessible Design for the Blind website contains information on detectable warnings and APS:
http://www.accessforblind.org/

Institute of Transportation Engineers (ITE) Accessible Public Rights-of-Way: Planning and Designing for Alterations; Electronic Toolbox for Making Intersections More Accessible for Pedestrians Who Are

Blind or Visually Impaired: **http://www.ite.org/accessible/**

The following publications can be purchased through the ITE web site at **http://www.ite.org** :

- Design and Safety of Pedestrian Facilities: A Proposed Recommended Practice of the Institute of Transportation Engineers , ITE Technical Council Committee 5A-5.
- Alternative Treatments for At-Grade Pedestrian Crossings , an informational report documenting studies on pedestrian crossings.
- Improving the Pedestrian Environment Through Innovative Transportation Design .

Pedestrian and Bicycle Information Center (PBIC), a clearinghouse with information on pedestrian design, planning, research, safety and education: **http://www.walkinginfo.org/**

American Council of the Blind (ACB) Pedestrian Safety Website , a clearinghouse with resources for pedestrian safety, wayfinding, and accessible travel: **http://www.acb.org/pedestrian/index.html**

- Pedestrian Safety Handbook provides resources on understanding and details for improving travel for people with visual disabilities: **http://www.acb.org/pedestrian/handbook.html**
- Survey of Signalized Intersection Accessibility. ACB surveyed 158 pedestrians who are legally blind regarding their experiences in independently crossing at intersections with and without audible signals.
    - 91% of respondents indicated that they sometimes had difficulty knowing when to begin crossing (difficulty hearing surge of traffic on street beside them), which they attributed to one or more of four reasons.
    - 79% of respondents indicated that they sometimes had difficulty traveling straight across the street, for one or more of three reasons.
    - 90% of respondents had experienced one or more problems with pushbuttons.
    - 71% of respondents had experienced one or more difficulties with existing accessible pedestrian signals.

http://www.acb.org/pedestrian/phd2a.html#ped09

NCHRP , an industry research program overseen by TRB

Accessible Pedestrian Signals; A Synthesis and Guide to Best Practices , NCHRP Research Project 3-62, Guidelines for Accessible Pedestrian Signals provides an introduction to APS research: **http://www.walkinginfo.org/aps/home.cfm**

State DOTs

Wisconsin DOT, Curb Ramp Detectable Warning Fields: Truncated Warning Dome Installations Technical Note (June 2005). Provides technical information on installations of curb ramp detectable warnings/truncated domes: **http://www.dot.wisconsin.gov/library/research/docs/finalreports/tau-finalreports/warningdomestechnote.pdf**

WisDOT Truncated Warning Dome Systems for Handicap Access Ramps (Nov. 2003). Product trials—A study in partnership with the FHWA and the City of Madison Engineering Division. Product trials of truncated dome warning systems for ramps to evaluate constructability, durability, aesthetics, cost, and conformance to the standard: **http://www.dot.wisconsin.gov/library/research/docs/finalreports/tau-finalreports/warningdomes.pdf**

Georgia DOT Pedestrian & Streetscape Guide . Provides a tool kit and technical information on "best practices" that apply to situations encountered in project development, examination of pedestrian

characteristics, and other factors that influence pedestrian travel, spatial analysis, ways to prioritize projects using Geographic Information Systems (GIS), referencing the Latent Demand Model and Portland, OR's Pedestrian Potential Index: **http://www.dot.state.ga.us/dot/plan-prog/planning/projects/bicycle/ped_streetscape_guide/toolkit%202%20final.pdf**

Indiana DOT Standard Specifications (2006). Section 604, Sidewalks, Curb ramps, Steps and Handrails: **http://www.in.gov/dot/div/contracts/standards/book/2006MasterSpecBook.pdf**

Oregon DOT, Standard Drawings for Sidewalks & Ramps (Roadway 700—Curbs, Islands, Sidewalks, and Driveways):
http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/roadway_drawings.shtml#Roadway_7

Washington State DOT Pedestrian Design Considerations Design Manual , May 2006. Planning, design, and operations guidance:
http://www.wsdot.wa.gov/EESC/Design/DesignManual/desEnglish/1025-E.pdf

Arizona DOT Statewide Bicycle and Pedestrian Plan (2003). A guide for making pedestrian-related transportation decisions at the state and local level: **http://www.azbikeped.org/statewide-bicycle-pedestrian-intro.html**

Pedestrian planning, design, and operation policies: **http://www.azbikeped.org/appendix%20c/08_DG.pdf**

Vermont DOT Pedestrian and Bicycle Facility Planning and Design Manual , Chapter 3, Pedestrian Facilities. Provides policy, planning and design guidance for sidewalks and walkways, street corners and intersections, and street and driveway crossings:
http://www.aot.state.vt.us/progdev/Documents/LTF/FinalPedestrianAndBicycleFacility/Ch

California DOT Pedestrian and Bicycle Facilities in California , Technical Reference Report (2005). Provides guidance on policy, planning, and design:
http://www.dot.ca.gov/hq/traffops/survey/pedestrian/TR_MAY0405.pdf

Colorado DOT directive for ADA Accessibility Requirements for CDOT Transportation Projects . Includes policies and procedures for pedestrian accessibility in roadway resurfacing projects:
http://www.dot.state.co.us/DesignSupport/ADA/ADA%20Accessibility%20Requirements%20in%20CDOT%20Transportation%20Projects%2010-20-2003%20.pdf

Colorado DOT Standard Specifications for Detectable Warnings , Section 608, May 26, 2005 Revision:
http://www.dot.state.co.us/DesignSupport/Construction/1999PSP/608dw.doc

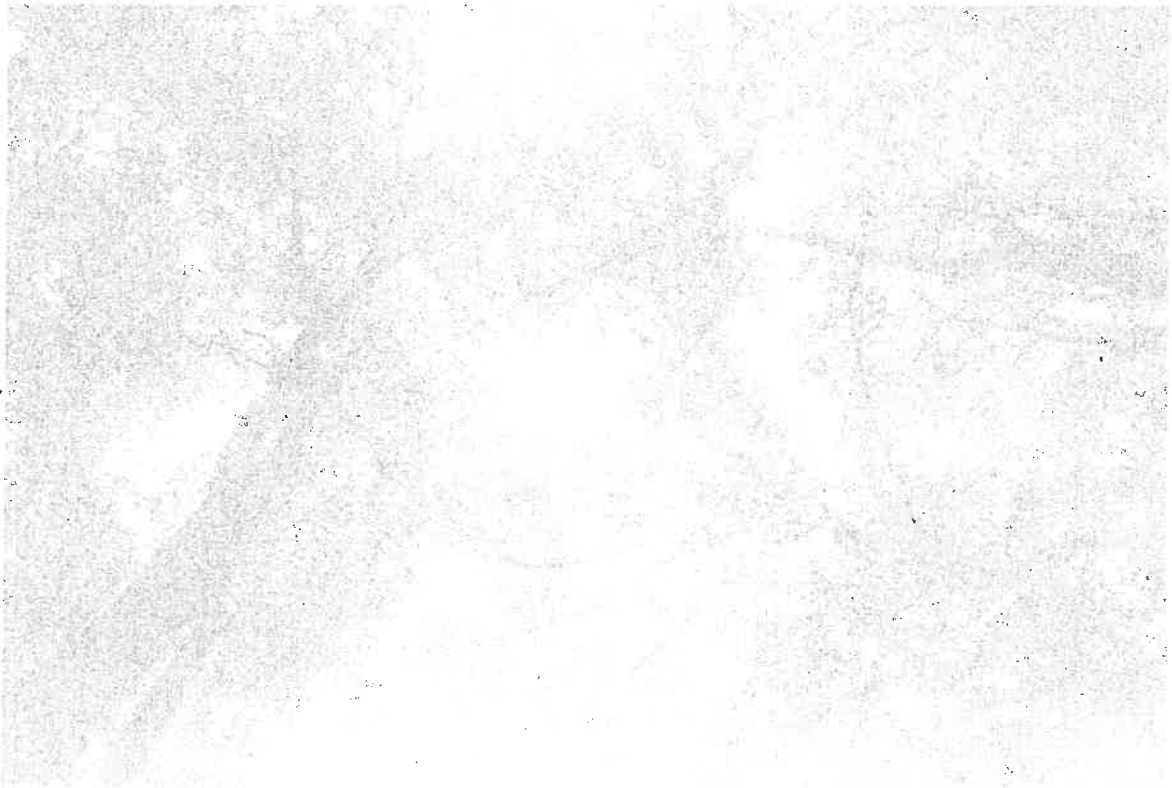
Maryland State Highway Administration Accessibility Policy and Guidelines for Pedestrian Facilities Along State Highways:
http://www.sha.state.md.us/businesswithSHA/bizstdsspecs/ohd/ada/adapolicy.asp

Training, Courses, Presentations

Accessible Sidewalks (DVD), a 4-part video developed by the Access Board to illustrate access issues and considerations, is available free from the Board on DVD. The DVD contains:

- Program 1: Pedestrians Who Use Wheelchairs
- Program 2: Pedestrians Who Have Ambulatory Impairments
- Program 3: Pedestrians Who Have Low Vision
- Program 4: Pedestrians Who Are Blind

APPENDIX D-4



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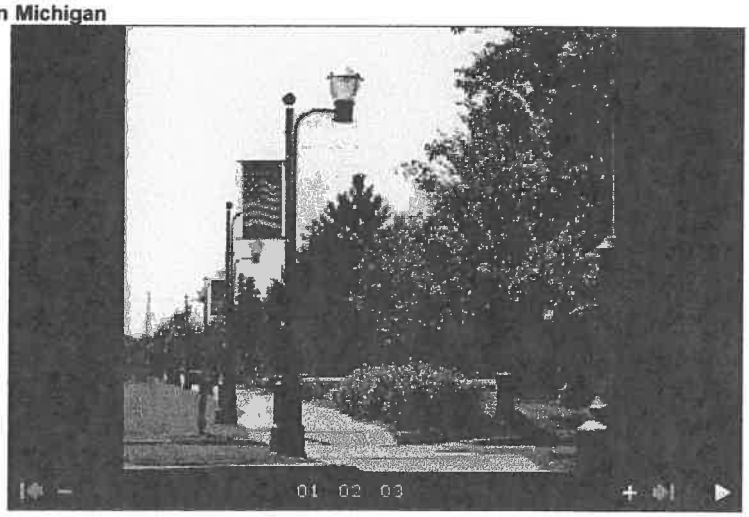
Canton Michigan



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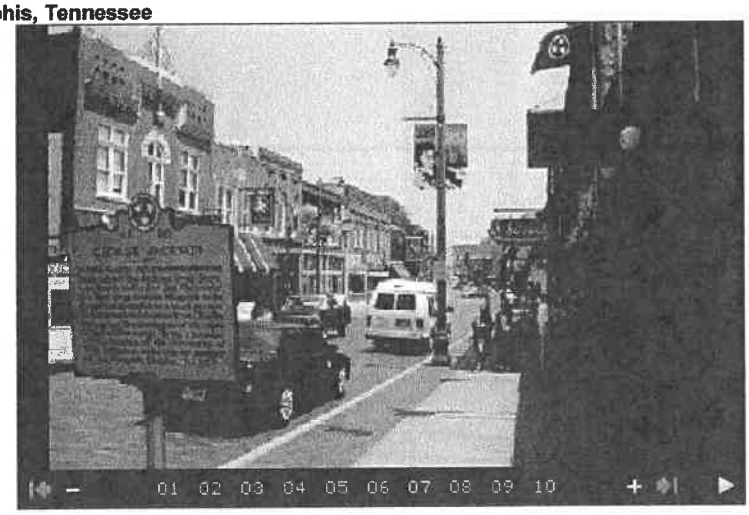
Memphis, Tennessee



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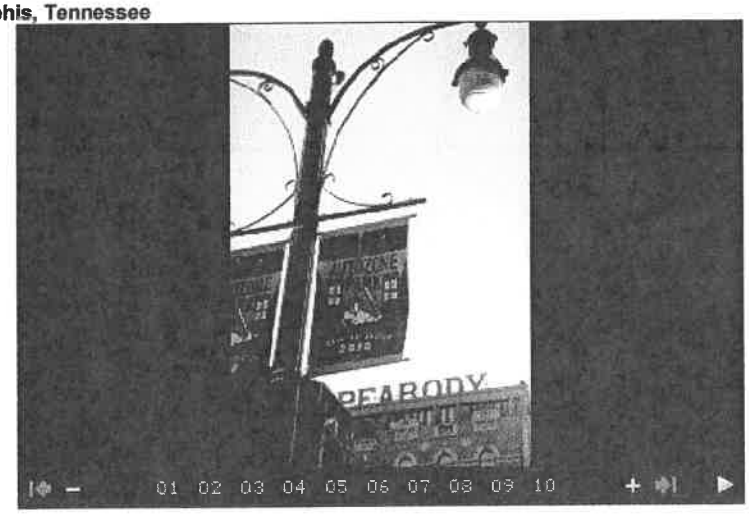

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BRNCL90-AC 14' 3
Regular Price: $1,250.00
On Sale For: $995.00

Highland Streetscape Style Streetlight
Regular Price: $3,790.00
On Sale For: $2,900.00

Kings River Hanging Shade Style Streetlight
Regular Price: $1,295.00
On Sale For: $1,059.00

Kings River Streetlights 12' 6"
Regular Price: $850.00
On Sale For: $740.00

LM Modern Box Parking Lot Lights
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On Sale For: $674.00

Streetscape Madrid 422
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Raytech
635 E. First Street, Suite 203
Tustin, CA 92780
Toll-Free: 1-800-838-5898
raytech@covad.net

Courtyard Lighting

BR Industries Inc. manufactures a complete line of architectural landscape lighting for a variety of residential and commercial uses. These antique reproduction lamp posts, wall sconces and deck lights are found in parks, churches, shopping centers, residential neighborhoods, and office complexes. Our aluminum courtyard lamp posts are manufactured with the same high standards as our commercial lamp posts. They are an excellent source of decorative outdoor lighting and will provide years of reliable service and beauty. Black is the standard color with optional colors available.

Each cast aluminum base has a .25" miminum wall thickness and 1/2" diameter mounting holes on the exterior. The three- inch diameter extruded poles are .120" thick.

All courtyard lamp posts are wired for 110 volt electricity and include installation instructions. Each must be bolted to a concrete pad.

The minimum diameter of the concrete padis determined by the size of the base you select. The depth of the pad is determined by your local frost line and soil conditions. Use an elbow joint of conduit in the concrete for the neccessary wiring.

It is best to have your lamp base before setting the bolts in concrete. If you don't have time to wait for your order to arrive, you can pour the concrete and come back later with expansion bolts and a masonry bit to drill into the concrete.

For your convenience, you can purchase anchor bolts from us. Other options such as time switches and photo controls are available locally and can be installed by your electrician.

BRNLP151-14: 8' 1" -13' 1"
Regular Price: $742.00
On Sale For: $595.00

BRNLP151-26: 8' 9"
Price: $0.00

BRNLP162-84M: - 8'5"
Price: $0.00

BRNLP251-26: Height 9'8" or taller
Regular Price: $895.00
On Sale For: $720.00

BRNLP264-84M: 10'1": Available in Incandescent Only
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On Sale For: $990.00

BRNLP551-14: 8' 6" or higher: Available in Incandescent, Metal Halide & High Pressure Sodium
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BRNLP551-84L 8'6" or higher: Available in Incandescent only
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BRNLP563-12A: 8' 7": Available in Incandescent Only
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Lunar Resonance-
Concrete (Linda)

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Toll-Free: 1-800-838-5898
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BR Industries Inc. is a manufacturer of antique reproduction lamp posts, decorative commercial luminaries, commercial wall scones, and deck lights. Turn of the century casting methods combine with modern technology to offer commercial aluminum lamp posts and cast aluminum lamp post bases that will last. Aluminum lamp posts are rustproof, extremely durable, and easy to install. A black polyester powder coat finish will provide years of low maintenance service.
Available with metal halide, High Pressue Sodium or Incandescent bulbs

Our Commercial series Streetlights offer welded pole to base structure. Long lasting Sturdy aluminum.

Our Courtlight Series Streetlights offer the same Sturdy Aluminum with a Timeless Beauty.

BRNCL10AA
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BRNCL10AGA1: 12'6" or higher
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BRNCL13-141
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BRNCL20CMG: 12' 7"
Regular Price: $1,450.00
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BRNCL21=AGB2A
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On Sale For: $1,173.00

BRNCL60ABG2
Regular Price: $1,540.00
On Sale For: $1,229.00

BRN-CL61-AGA1A w/ Oval Band - 13'8"
Regular Price: $1,580.00
On Sale For: $1,254.00

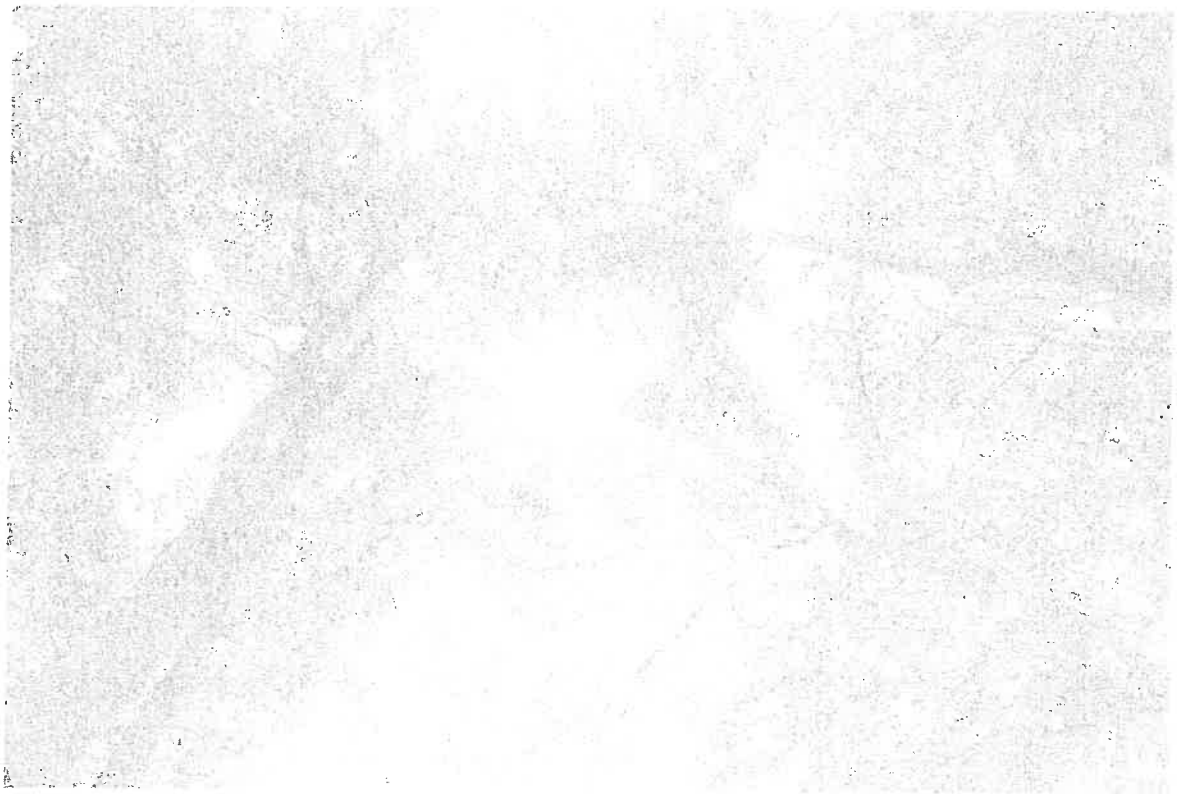
BRN-CL63-AGA-1=CMC1 - 15'6"
Regular Price: $1,595.00
On Sale For: $1,269.00

BRNCL-70 CMC
Regular Price: $1,820.00
On Sale For: $1,495.00

BRNCL80AGA1A W/ OVAL BAND 12' 2"
Regular Price: $1,380.00
On Sale For: $1,150.00

BRNCL-82FG 14' 1"
Regular Price: $1,600.00
On Sale For: $1,359.00

APPENDIX D-5



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Dogwoods
Appalachian Spring Dogwood
Kousa (Venus) Dogwood
White Flowering Dogwood

Flowering Trees
Cherry - Okame
Magnolia Jane
Prairefire Crabapple
Red Bud
Red Bud Forest Pansy

Maples
October Glory Sugar Maple
Sugar Maple
Japanese Red Maple

Oaks
Pin Oak

Pines
White Pine
Austrian Pine

Others
Viburnum Plicatum
Autumn Purple Ash
Cotton Wood

Shrubs

Burning Bush
Holly
Yew
Boxwood

Flowering
Dogwood - Red Twig
Barberry - Crimson Pigmy
Barberry - Royal Burgundy
Forsythia – Show Off
Almond – Pink Flowering
Rhododendron

Perennials

Grasses
Liriope
Little Bunny
Karl Foerster

Flowering Perennials
Oak Leaf Hydrangea
Day Lilies
Black Eyed Susan
Coreopsis
Cone Flowers
Hostas