

## **Accommodating Pedestrians in Work Zones**

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**ABSTRACT**

Most work-zone traffic control efforts have focused either on motorists or on construction and maintenance workers. These efforts have generally involved attempts to slow traffic, make drivers more aware of potential hazards, or ensure worker conspicuity. Considerably less attention has been focused on pedestrian accommodation needs. Yet attention to pedestrians in work zones is important for a variety of reasons, including their acute vulnerability to dangers in work zone environments as well as the dependence of many populations on pedestrian facilities for basic mobility.

Pedestrians can be found virtually everywhere in urban areas, including low-density suburban settings. Their exposure may not be as great in some places as in others, but the risks they face in work zones are very real. This paper responds to the need for better information about how pedestrians (including those with disabilities) can be accommodated in work zones efficiently, effectively, and safely. The paper provides background information and context for individuals who are responsible for planning, designing, managing, or maintaining work zones. It provides a concise synthesis of the existing literature on work zone pedestrian accommodation practices, and presents the results of a survey of pedestrian accommodation practices and associated field visits.

## INTRODUCTION

The nearly continuous presence in urban areas of construction and maintenance work zones has become a normal – through sometimes frustrating – part of daily life. Work zones can be found everywhere, from heavy construction sites in downtown areas to minor tree-trimming operations along local roadways. Partly due to the growing number of work zones, those responsible for construction and maintenance projects have become increasingly aware of the need to minimize disruptions caused by construction and maintenance activities and to ensure safety for workers and the general public in work zone environments.

To date, most of the attention on work zones has focused on motorists, construction workers, and maintenance workers. The focus on motorists has primarily involved efforts to slow traffic through work zones, make drivers more aware of the potential hazards they pose to workers, and minimize overall disruption and delay to the roadway transportation network. The attention to workers, in contrast, has largely focused on the need to ensure their conspicuity to motorists and to each other (e.g., through retro-reflective clothing) or on the need to modify behaviors to reduce risks.

The problem of accommodating pedestrians in work zones has received somewhat less attention. Yet attention to pedestrians is important for a variety of reasons:

- Pedestrians are particularly vulnerable to dangers in work zone environments. This is partly due to their lack of physical protection from potential hazards (such as would be available to a person in a vehicle). Pedestrian deaths (including workers) in roadway work zones have averaged about 120 per year - about 14 percent of all work zone fatalities - over the past decade (1).
- Work zones are often located along travel routes used by children to walk to school. Children are of special concern in work zone environments because their natural curiosity creates a tendency for them to wander into unsafe areas. Also, their small stature makes them relatively less visible to construction workers and motorists.
- Many people in the US have physical or other disabilities that make driving difficult, if not impossible, and use of pedestrian facilities essential. Successfully accommodating this population requires careful attention to design and maintenance of pedestrian facilities so that they are accessible to users with a wide range of needs and abilities.
- People who do not own or have access to motor vehicles depend heavily on walking for access to public transit services, shopping opportunities, schools, work sites, and other travel destinations. To them, the availability of safe and convenient pedestrian facilities - including through work zones - is critical to basic mobility.
- Walking is a non-polluting travel mode and - where walking conditions are safe - is generally a good way to maintain personal health. It should thus be encouraged whenever possible.

Pedestrians typically represent a large proportion of the traveler population in places such as downtowns or near universities and other large trip generators. But observational evidence also suggests that pedestrians can be found virtually everywhere in urban areas, including in low-density suburban settings. Their absolute and relative numbers may not be as large in these settings as elsewhere, but the risks and difficulties they face traversing work zones remain. For this reason, accommodating pedestrians should be an integral part of all work zone traffic control planning efforts, regardless of location.

## **PURPOSE AND SCOPE**

This paper is a product of a larger project to synthesize information on best practices in work zones for incorporation into printed brochures and other communication tools for use by those responsible for planning, designing, or managing construction and maintenance environments. Both the project and the paper respond to a need for more insight into how the concerns of pedestrians - including those with disabilities - can be accommodated in work zones in an efficient, effective, and safe manner. Specific goals of the paper include: 1) providing a concise summary of existing literature on work zone pedestrian accommodation practices, standards, and guidance and, 2) presenting the results of the research team's investigation of current pedestrian accommodation practices in work zones.

The research team's investigation of current pedestrian accommodation practices included a survey of urban transportation professionals, as well as a series of field visits. The field visits included nearly 50 individual sites in eight cities in six states and the District of Columbia. The sites encompassed a wide variety of maintenance and construction activities in a wide variety of contexts. One objective of the field visits was to determine whether conclusions reached by earlier researchers on pedestrian accommodation practices remain valid today. Another objective was to gain a sense of the kinds of practices now employed in the field - especially given the adoption of the Americans with Disabilities Act (ADA) and the evolution of professional guidelines over the past decade.

## **LITERATURE REVIEW**

The literature on pedestrian accommodation in work zones includes studies of work zone practices, as well as guidelines and standards for pedestrian accommodation in several key professional resources.

### **Studies of Pedestrian Accommodation Practices**

Much of the existing literature on pedestrian accommodation practices grew out of research conducted for the Federal Highway Administration by Chadda and others in the late 1970s. Chadda and his colleagues published several papers describing the work zone guidance and practices that existed or prevailed around that time. The scope of their work included reviews of national, state and local manuals, interviews with federal, state and local officials, and field visits to nearly 100 sites throughout the country. The goal of their research was to identify both good and bad practices. Their work was supplemented by research conducted by Noel a decade later.

Chadda and Brisbin (2) found little attention to work zone pedestrian accommodation in either the manuals they reviewed, the interviews they conducted, or their field investigations. They found that federal, state and local manuals tended to focus almost exclusively on vehicular - rather than pedestrian - traffic control. Their interviews likewise revealed little concern for pedestrians in work zones. Reasons cited ranged from "There are no pedestrians on our highway jobs" to the "MUTCD does not specifically require a plan for pedestrians in construction areas." The interviews also revealed that if adjacent sidewalks either didn't exist or were poorly maintained, few officials perceived any need to achieve a higher standard through work zones. They noted that some officials believed that a lack of complaints provided sufficient basis for concluding that pedestrians had been successfully accommodated. They concluded that the accommodation level generally depended on whether pedestrian concerns were incorporated into design plans or whether field engineers perceived a need to address them.

Chadda and Brisbin's field investigations were designed to evaluate pedestrian information, guidance, separation, and protection needs with respect to traffic control plans to determine adequacy at each site. They concluded that pedestrians could be found in nearly every work zone, pedestrian accommodation of

some type was usually provided at major building construction sites and construction zones in urban areas, the choice of traffic control devices and barriers mostly reflected the judgment of construction supervisors, signs in work zones tended to vary widely in size, color and material, and construction managers tended to accommodate pedestrians only where they perceived problems with pedestrian volume and safety.

Chadda, McGee and Ligon (3) focused primarily on work zones involving roadway construction projects, though they also considered projects involving buildings, public works, and utilities. Their work also found that most traffic control plans and efforts were directed primarily toward vehicular traffic and rarely made reference to pedestrians. Available techniques for accommodating pedestrians were “very general in nature” and their use was not specified with respect to site conditions – i.e., type of work zone, duration of construction activity, pedestrian activity levels, vehicular traffic, and degree of hazard. Field visits showed that roadway work zones tended to lack separators, protection, and guidance devices for pedestrians. Specific problems included: 1) partial blockages or closures of sidewalks and other pathways with no alternate routes identified or adequate information provided, 2) improperly placed traffic control devices - signs, barriers, separators - that created hazards and tended to confuse both pedestrians and motorists alike, 3) inconsistent use of techniques between different sites and even between different areas on the same site and, 4) failure of construction managers to modify techniques to meet changes in work zone environments over time.

Chadda, McGee and Ligon cited several reasons for accommodating pedestrians, but contrasted these with reasons why construction managers tended to ignore them. Reasons for accommodating pedestrians included providing access to abutting properties, minimizing adverse impacts on commercial establishments, reducing exposure to tort liability, and accommodating the needs of special groups such as children, elderly and handicapped. Reasons cited for failures to accommodate pedestrians included lack of awareness of the pedestrian safety problem, lack of information (including guidance, standards, legal precedence, and safety statistics), and the absence of enforcement policies and procedures.

Noel (4) confirmed what others had earlier discovered. He found that safe pedestrian accommodation was often neglected by state and local governments, with the problem being especially pronounced at the local level. Few localities included written guidelines in work zone traffic control manuals, with many cities having no reference material whatsoever on pedestrian accommodation. Although larger cities and counties had traditionally relied on building codes for pedestrian control in downtown areas, these rarely included any procedural guidelines for selecting and placing pedestrian protection devices unrelated to utility work or building construction. The use of pedestrian canopies and fencing was generally the result of progressive building codes or special efforts by contractors and developers to minimize tort liability.

Noel also found wide variation in field practices and devices. There was little uniformity in the design and application of pedestrian control devices. Pedestrian information signs varied in message, size, color, and placement. Barriers, canopies, and fences varied by material and type, with building codes often being the primary basis for contractors to determine which type to use. Pathway delineation included both traditional (e.g., cones) and non-traditional methods (e.g., plastic safety mesh fences). Contractors and others often gave inadequate attention to geometry and surface quality of temporary pathways.

Noel noted that “the abuse of pedestrian rights in work zones” could be attributed, in part, to the fact that much roadway and building maintenance work was not adequately inspected by city officials or was reviewed and approved by people who lacked adequate training. Most review processes for traffic control, he argued, provided ample opportunity for determining whether or how pedestrian needs could be accommodated, but such opportunity was often not realized in practice.

Despite these problems, Noel was able to find positive examples of effective policy-level pedestrian accommodation practices in some places:

- ♦ *Building Codes.* In some cities, building codes require contractors to adhere to pedestrian safety requirements in public rights-of-way. Contractors are typically expected to exercise their own judgment, with occasional review by local officials to assess safety and recommend additional safety measures.
- ♦ *Building Permits.* The permitting process for building projects in some cities requires review of traffic control plans to ensure appropriate measures during construction. This forces contractors to show evidence prior to the issuance of permits of their intent to set up work zones properly.
- ♦ *Coordinated Traffic Management.* In some places, coordination between state engineers, local traffic engineers, police, and contractors is required for major, long-duration construction projects. The coordination compels those involved with projects to develop mutually agreeable traffic control plans for all stages of construction, with police playing a major enforcement role.
- ♦ *Traffic Control Plans.* Some agencies require detailed pedestrian safety measures in traffic control plans for projects where significant foot traffic is anticipated.
- ♦ *General Specifications.* Some agencies provide a general statement about construction specifications or traffic control plans that indicate a need for contractors to address pedestrian safety.
- ♦ *Coordinated Policy on Construction Safety.* Some communities seek to coordinate the activities of several divisions of local government – e.g., maintenance, traffic engineering, building permits, police and street cleaning – to ensure pedestrian accommodation. However, for this to be successful, a general policy for ensuring continuing enforcement and a connection between review policies, enforcement policies, and field practices are helpful.

### **Guidelines for Pedestrian Accommodation**

Guidelines for pedestrian accommodation in work zones have been produced by a number of researchers; extensive guidance has also now been incorporated into a variety of professional resources.

Chadda, Ligon, and McGee (5) recommended that construction managers give pedestrians the same right to traverse (or properly detour around) a work zone as any vehicle. They proposed that pedestrian routes should be well marked, safe, and easy to follow and that adequate pedestrian access should be provided to all properties abutting the work zone. They noted that pedestrians tend to follow logical and direct paths, not circuitous ones with grade changes or other obstacles. And they observed that special devices are often needed to accommodate elderly and disabled persons. On the basis of these and other observations, they recommended that pedestrians should be accommodated where sidewalks existed prior to the commencement of construction, where the work zone is located along a designated route to school, where there is evidence of pedestrian use (e.g., well-worn paths), and where existing land uses generate pedestrian traffic.

Chadda and McGee (6) developed a framework for considering pedestrian accommodation that classifies work zones by construction type, work duration, and pathway treatment option. They also developed guidelines based on their classification scheme. In presenting the guidelines, they emphasized that pedestrian activity can generally be found at most sites, with the level of activity reflecting nearby land

uses. They also emphasized that, while the type and duration of a construction project and existing pathway conditions are important to consider in selecting appropriate work zone controls, pedestrian needs should always be considered with respect to the actual level of hazard present. For instance, some sites – such as those with building construction or deep excavation activities – will always require careful attention to accommodating pathway users regardless of the level of pedestrian activity.

In another paper, Chadda and McGee (7) noted that where work zones offer no separation, protection, or guidance, people on foot are forced to choose their own paths through debris and other obstructions. They pointed out that pedestrians are exposed to hazards from both roadway vehicles and construction equipment. Furthermore, inadequate pedestrian access can adversely affect businesses near work zones, especially if construction activity blocks pedestrian access over a long period. They noted the possibility of tort liability claims arising as a result of inadequate pedestrian accommodation. The advice they gave for addressing these concerns is for construction managers to consider the pedestrian activity level, project type, project duration, and hazard level and to provide accommodation when there is evidence of existing pedestrian use, an existing path, or a nearby walk-trip generator, and where there is need to close, block, restrict, or increase the hazard level of a walkway as a result of work activity.

Chadda and McGee identified three options for providing a safe pathway in a work zone environment: 1) reusing an existing walkway, 2) providing a bypass and, 3) providing a detour. They recommended providing a bypass when construction or storage of material, equipment, or debris requires sidewalk closure and when space is available adjacent to the work zone for an alternate path. They recommended providing a detour when construction or storage of material, equipment, or debris requires sidewalk closure and there is no possibility of constructing a bypass.

Chadda and McGee recommended that pathways should be wide enough to accommodate expected or observed pedestrian volumes and meet the needs of disabled populations. They should be logical, visible, direct, continuous, and safe and should reflect the type of work activity, duration, degree of blockage, pedestrian and traffic volumes, and level of hazard. They should be clearly delineated and provide positive direction to lead pedestrians safely through the work zone. And they should be stable and slip resistant, with a choice of surface material reflecting the project duration, pedestrian volume, types of base material, climate, and cost.

Eck and Czulak (8) developed a technique for identifying hazards and appropriate countermeasures at the preconstruction stage of urban work projects. Their approach seeks to synthesize existing knowledge on work zone accommodation by providing a single resource for identifying and addressing specific potential safety problems. The technique identifies a wide range of different hazards and assigns each to different types of construction activities (e.g., excavation, material storage). One or more appropriate countermeasures are specified for each hazard present at various stages or in various locations at a construction site.

Part 6 of the *Manual on Uniform Traffic Control Devices* (9) now contains extensive information on accommodating pedestrians in work zones. The MUTCD specifically calls for the “needs and control of all road users” - including pedestrians - to be “an essential part of highway construction, utility work, maintenance operations, and the management of roadway incidents.” It notes that temporary facilities are subject to ADA accessibility requirements, and that pedestrians are to be “guided in a clear and positive manner while approaching and traversing” work zones. Providing guidance through work zones for people with visual disabilities is a special concern highlighted in the MUTCD as indicated in Table 1.

**Table 1. Accommodating People with Visual Disabilities in Work Zones**

- The MUTCD notes that the “most desirable way” to provide guidance through work zones for people with visual disabilities is “a speech message provided by an audible information device.” The best devices are those providing “speech messages in response to passive pedestrian actuation”; however, devices that “continuously emit a message” or “emit a message in response to use of a pushbutton” are also acceptable. The *Manual* explains that, while it is now possible for guidance and warning information to be transmitted to personal receivers, these are not likely to be carried by pedestrians with visual disabilities. Finally, it advises that audible information “might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with visual disabilities.”
- Detectable edges should be firmly attached to the ground (or other devices) and be continuous through the work zone so that visually disabled pedestrians with long canes can effectively use them for guidance. Edges should protrude at least 6 inches above the walkway surface, with the bottom being no more than 2.5 inches above the surface. Prefabricated curbing, formed-in-place curbing, or other continuous devices placed along walkways (with adjacent sections interconnected for stability) constitute acceptable edges. Individual channelizing devices, tape or rope used to connect individual devices, other discontinuous barriers and devices, and pavement markings should not be used as edging because they are not detectable by persons with visual disabilities.

Source: Reference 9.

Though it includes only a relatively brief discussion of pedestrian issues, the *Traffic Control Devices Handbook* (10) provides useful guidance to address non-motorist needs. It advises practitioners to “plan early” for traffic and pedestrian control and offers six fundamental principles for successfully accommodating pedestrians:

1. Make pedestrian safety an integral and high-priority element in every project, from planning through design and construction.
2. Inhibit pedestrian movements as little as practical, and plan work zones to reduce exposure to potential hazards.
3. Guide pedestrians to, through, and from work sites in a clear and positive manner.
4. Perform routine inspection of traffic control devices.
5. Properly train personnel so they are qualified to make work zone safety decisions regarding the selection, placement and maintenance of traffic control devices.
6. Replicate, as nearly as possible, the elements of existing paths when providing pedestrian routes through work zones.

The recently published AASHTO *Guide for the Planning, Design and Operation of Pedestrian Facilities* (11) contains a wealth of information on meeting pedestrian needs and concerns along roadways. The *Guide* cautions transportation professionals to understand that there is no single “design pedestrian,” but that pedestrian needs and concerns can vary widely among individuals. The *Guide’s* chapter on planning for pedestrians should serve as an especially valuable educational resource for those responsible for addressing pedestrian concerns in work zones, as it succinctly reviews how needs and concerns can vary.

With respect to work zones, the *Guide* advises that “proper planning for pedestrians ... is as important as planning for vehicle traffic, especially in urban and suburban areas.” It also notes the importance of maintaining pedestrian access to building entrances, bus stops, and crosswalks. Key considerations for ensuring pedestrian safety in work zones include the need to separate pedestrians from work vehicles, equipment and operations, to separate pedestrians from conflicts with mainline traffic, and to provide



pedestrians with a safe, accessible, and convenient travel path that duplicates, as nearly as possible, the most desirable characteristics of sidewalks or footpaths.

*Designing Sidewalks and Trails for Access* (12) provides extensive and very readable guidance on how to comply with both the letter and the spirit of the ADA in the provision of pedestrian facilities. It emphasizes the importance of ensuring that such facilities meet the needs of all potential users, not simply those of a hypothetical “standard” pedestrian (whose characteristics may be highly idealized).

The guidebook notes that pedestrian facilities in the U.S. have traditionally been designed to accommodate only one user group – young adult males of “normal” body size and function. Contrary to traditional assumptions, however, travel speeds, endurance limits, physical strength, stature, and judgment abilities of pedestrians can vary tremendously. Moreover, demographic trends tend to widen the range of personal abilities among different groups in the population. These trends include:

- An increasing proportion of older adults.
- An increasing percentage of people with disabilities (currently around 20 percent).
- Decreasing mortality rates associated with disabling illnesses and injuries, leading to more people living with functional limitations over a longer period of time.
- An increased prevalence of obesity.

The guidebook highlights the design concerns of people with mobility impairments. It reminds readers that the members of this population must “incorporate knowledge of barriers and the location of accessible travel routes” simply to participate fully as members of the community. The accessibility of travel paths and facilities strongly affects the choice of where they can go and what they can do once they get there. This is as true of temporary accommodations in work zones as it is of permanent facilities.

The guidebook’s discussion of work sites in the context of accessibility references several specific problems disabled people might encounter in a work zone, including:

- Lack of a continuous, accessible pathway around or through the construction area.
- Reduction of effective pathway width or total blockage of a pathway by materials or equipment.
- Failure to ensure that visibility-impaired people can easily detect and avoid the work activity.
- Blocked access to curb ramps.
- Failure to provide safe, accessible routes to businesses or other destinations affected by the work.
- Use of ineffective or unusable barriers, such as plastic tape, around the site.

The guidebook recommends several measures for reducing potential safety and access problems at or near work zones:

- *Maintain a continuous, accessible route for all pedestrians at all times.* It is not acceptable to close a pedestrian facility without identifying an alternate route. Because people with disabilities may not be able to improvise routes or use unofficial alternatives (e.g., travel along an adjacent grass surface), alternate routes must always be accessible to people with disabilities.
- *Ensure that on-site work zone information is relevant and accessible to all users.* It is important to ensure that all warning and guidance information related to a work zone is relevant and accessible to all potential walkway users. Persons with vision or cognitive impairments are not always able to read or understand traditional signs or written information.

- *Supplement on-site information with off-site information when possible.* It is helpful to provide information on work zones to pedestrians via the internet, telephone, etc.; however, such information should only supplement - rather than substitute for - information provided on site.
- *Use barriers to define routes and keep pedestrians out of hazardous areas.* It is essential to use barriers to help define travel routes and keep pedestrians from either intentionally or unintentionally encountering hazards. Barriers should be solid, continuous and constructed at ground level. It is not appropriate to use flagging tape, ribbon, or signs to prevent or discourage entry to hazardous areas.

## INVESTIGATION INTO CURRENT PRACTICES

The current investigation of pedestrian accommodation practices included a survey of transportation professionals supplemented with a series of telephone interviews and site visits. One objective of this work was to understand the extent to which the conclusions reached by earlier researchers on pedestrian accommodation practices remain valid. Another objective was to gain a better sense of the kinds of practices now being employed by agencies and contractors in the field - especially given the adoption of the ADA and the evolution of professional guidelines over the past 10 to 15 years.

### Survey on Pedestrian Accommodation Practices

The survey on pedestrian accommodation practices was distributed via email to urban areas in each state. The 26 completed and useable returns were relatively diverse in geographic distribution, representing both large and small cities throughout the country.

The survey asked the following:

- Does your agency have a formal policy for accommodating pedestrians in work zones?
- Do you believe that your agency effectively accommodates the needs and concerns of pedestrians in work zones?
- What, if anything, does your agency do to ensure compliance with the ADA in work zones?
- What devices or strategies have you used to accommodate pedestrians in work zones?

About 30% of the respondents said that their agencies have a formal policy for accommodating pedestrians in work zones. Only a few of those who answered “yes,” however, could be specific about what constituted the policy (e.g., “We use the 2003 version of the MUTCD, Chapter 6, Section D.”). Most other respondents were much more vague (“When possible and needed, we ask contractors to provide a walking area near the construction.”).

More than 70% of respondents indicated that their agencies effectively accommodate pedestrians. The meaning of the responses becomes clearer, however, only by reviewing the written comments. These seem to indicate that, in most communities, even when a respondent checked “yes” to the question, there was a fairly high level of selectivity in terms of where, when or even whether pedestrians would be accommodated. For example:

- ◆ Yes and No – “It’s inconsistent. Sometimes pedestrians are accommodated well, sometimes not.” [It depends on who gets involved with the review process.]
- ◆ Yes – “Evaluated on a case by case basis.”

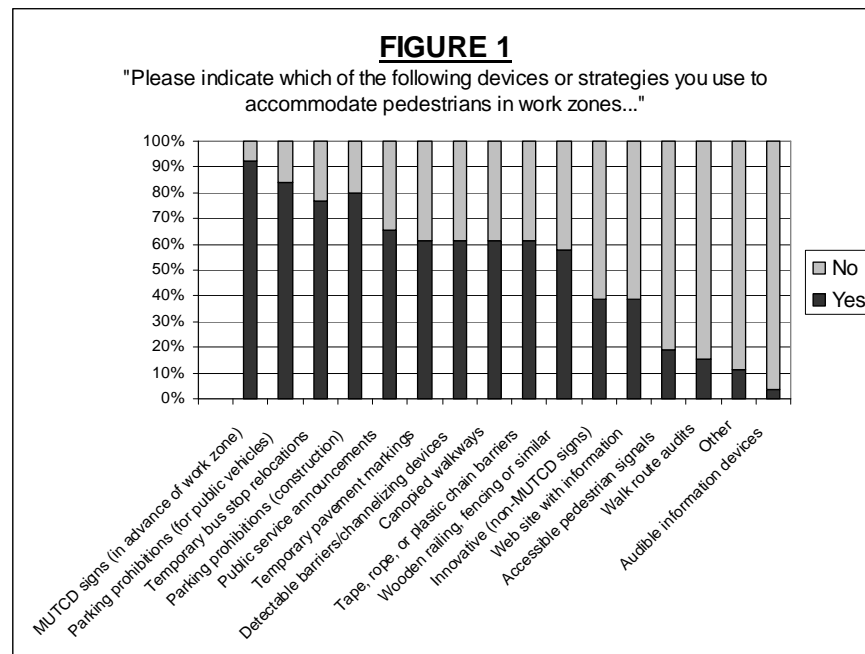
- ◆ Yes – “In most cases sidewalks are closed without alternatives considered (low volume pedestrian activity) unless they are in the downtown area and/or near schools, in which case attempts are made to keep the sidewalk open or provide an alternative route.”
- ◆ Yes – “Generally yes, but we’re far from perfect.”
- ◆ Yes – “In most cases. The streets department and the construction division of the engineering department are charged with enforcement. However, enforcement is difficult because we lack personnel for field inspections. Also, citations are not stringent enough.”
- ◆ Yes – “Plans are reviewed by Traffic and Code Enforcement.”
- ◆ Yes – “In areas of high pedestrian traffic but vehicular traffic is still priority.”
- ◆ Yes – “Our Right-of-way Management Team plus project inspectors are charged with ensuring that pedestrian issues are addressed in the work zones. We work closely with the Mayor’s Commission on Disability Issues to ensure we’re doing all we reasonably can.”
- ◆ Yes – “A small area of the city is a high-density pedestrian area. Signs are provided at ends of construction work.”
- ◆ No – “Pedestrians are not addressed in our work zones.”
- ◆ No – “Not always. We do not have continuous on-site inspection and, when the cat’s away, the mice will play! Constant inspection is the only way to insure contractor compliance. The inspectors also tend not to give the issue enough respect.”

The question about ADA compliance in work zones elicited a mixed response. Most agencies seem aware of the ADA issue, but only a few appear to address it carefully and systematically. A few comments help illustrate the point:

- ◆ “This one is difficult. We always keep this situation in mind, but it is difficult to accommodate.”
- ◆ “Any new construction includes ramps and sidewalk design to meet ADA requirements. During construction, compliance is maintained if possible. In many cases we do not have existing ramps close enough to a sidewalk closure and we do not currently construct temporary handicap ramps.”
- ◆ “The city depends on the daily inspection and stops construction until there is compliance. No actual fee is imposed in the citation; however, by stopping construction, the construction company undergoes financial consequences in lost time and wages.”
- ◆ “One of the problems with ADA is lack of clear delegation of authority to enforce requirements.”
- ◆ “It’s case-by-case, but we do make people build ramps for access and things like that.”
- ◆ “We try to leave handicap ramp available at intersections.”
- ◆ “We call out the need to meet the ADA, but we have no Federal enforcement capability. TCPs must meet the Accessibility Standards and we check for that. Enforcing plan provisions relies on the inspector first, and engineer second.”
- ◆ “Our TBM covers this issue thoroughly. It is also addressed during the design phase and pre-construction meetings. Starting [soon] we will have fines in place that include \$500 for closing a sidewalk without a proper permit.”
- ◆ “Require proper clearance at signalized intersections to accommodate pedestrians.”
- ◆ “SIDEWALK CLOSED signs are installed at a location that a pedestrian can cross the roadway to get to the required alternate path of circulation. Message boards are installed one week prior to construction to notify regular users of the upcoming construction. In residential neighborhoods, letters are sent to adjacent residents explaining the construction area and closures required.”
- ◆ “If required, we either divert pedestrian traffic away from the work zone (for example, we force traffic to cross the street to avoid the area) or we create ADA accessible ramps and/or walkways to accommodate pedestrians.”
- ◆ “Barriers and signs are set up at ends of work zones.”
- ◆ “Typically, we have not had a situation where work zone areas needed to be accessed by pedestrians.”

Figure 1 gives an indication of the types of devices and strategies used by public agencies to accommodate pedestrians in work zones. Most responses used MUTCD signs, parking prohibitions for

public and construction vehicles, and temporary bus stop relocations. A smaller portion also relied on public service announcements, temporary pavement markings, detectable barriers, walkway canopies, tape, rope or plastic chain barriers, wooden railing, fencing, or similar devices, innovative (non-MUTCD) signs and web sites. Very few agencies used accessible pedestrian signals, walking route audits, and audible information devices. It is worth noting that devices and strategies in the last category include some that may best accommodate the needs of disabled pedestrians. Clearly, wider adoption of these techniques could improve conditions for this group.



## Work Zone Site Visits

Site visits included nearly 50 individual work zones in eight cities. The sites encompassed a wide variety of maintenance and construction activities and the visits were intended to provide insight into the kinds of practices being employed.

Detailed descriptions about the site visits are contained in the project's final report (13). Some specific observations and insights include:

- *A surprisingly large number of sites had no or only minimal pedestrian accommodation.* Sites with only minimal pedestrian accommodation represented about 30% of the total number visited, while sites with no form of accommodation whatsoever represented about 20%. Sites with minimal accommodation typically included only MUTCD warning signs, with no provision for bypass or detour around the site. Sites with no accommodation ranged from a very short-duration work zone involving tree-trimming to a long-term project involving renovation of a multi-story building in a downtown area.
- *Only about half the sites had either "good" or "very good" pedestrian accommodation.* Sites in these categories generally provided a clear, accessible route through or around the work zone, with

adequate warning and guidance and no obvious exposure of pedestrians to hazards from either construction activity or traffic.

- *No site was perfect.* Even the best sites had problems of one sort or other, some significant.
- *There were pedestrians at every site visited.* Pedestrians were seen at every site and in every context. Some observations shocked the researchers. For example, in one city, a surprisingly large number of pedestrians – including a mother pushing a baby stroller and a group of pre-adolescent children – were observed using a sidewalk at a freeway interchange construction site in the middle of a suburban activity center otherwise dominated by automobiles.
- *Pedestrians at the sites varied widely in age and physical ability.* People observed using pedestrian facilities in the work zones rarely conformed to the type of pedestrian idealized in the MUTCD and other professional roadway and traffic engineering manuals. Interestingly, this was true even at university sites, where one might expect most people to be young, healthy and fit. On the contrary, the sites on or near universities seemed to have an especially wide variation in population with respect to age and personal mobility.
- *There was relatively little accommodation of visually impaired people.* The best practices with respect to accommodating blind pedestrians were usually found at sites that had pedestrian canopies or used polyethylene jersey barriers. Even in these cases, conditions were far from perfect, with problems often arising at transition points between permanent and temporary walkways.
- *Institutional culture, attitudes, and training were important.* Communities, developers, contractors, and governmental staff who made conscious and sustained efforts to accommodate pedestrians in work zones seemed to do a better job than those who did not.
- *Lack of enforcement was a problem.* Even if municipal ordinances and permitting processes required accommodation of pedestrians in work zones, accommodation often failed due to lack of inspection and rules enforcement.
- *There was much variation in pedestrian accommodation practices.* A great deal of variation in practices existed between different cities, and even between different sites in the same city. To some extent, the differences seemed to reflect differences in training and attitudes among contractors, municipal staff, permitting and rule systems, and levels of rule enforcement by civic officials.
- *Cleanliness and order in work zones mattered more than expected.* Cleanliness and order seemed to help wayfinding, raise pedestrian comfort levels, improve wheelchair accessibility, and reduce exposure to potential hazards. They also seemed to be associated with less contractor parking on sidewalks.
- *A surprising amount of heavy equipment was parked unnecessarily on sidewalks.* Contractors sometimes seemed to use sidewalks as platforms for heavy construction equipment, even when such use did not seem warranted. Heavy equipment not only blocked passage for pedestrians, but also risked long-term damage to the sidewalks that may or may not have been repaired.
- *Time-of-day and seasonality of work were important.* Accommodating pedestrians means not only providing a physical passageway through or around a work area, but also scheduling work to avoid times, days, and seasons when pedestrians are most likely to be impacted. For example, in at least one college town visited, municipal officials sought to schedule work during months when school was not in session so as to minimize exposure of pedestrians to hazards, inconvenience, and delay.

- *Some pedestrian accommodation devices were found to create security hazards.* A few examples of excessively long canopies or enclosed walkways (e.g., fences on both sides) were found during the site visits. These seemed to present security concerns for pedestrians. For example, in one instance, a long canopy had become a shelter and congregation space for aggressive panhandlers.
- *New products and technologies have helped improve conditions for pedestrians.* Manufacturers and suppliers of work zone traffic control devices now offer many products of benefit to pedestrians that simply did not exist a decade or two ago. For example, the widespread availability of relatively inexpensive interlocking polyethylene “jersey” barriers has greatly improved the ability of contractors to protect pedestrians from vehicles and construction activity, while also channelizing them in a manner that allows all users to pass through work zones reasonably easily (including people with visual impairments).

## SUMMARY

Research conducted 10 to 25 years ago found little, if any, attention to the needs and concerns of pedestrians in work zones. The investigation of recent practices found that, while pedestrian accommodation in work zones has generally improved relative to past years, much more could be done to make conditions better – especially for people with disabilities. While considerably more and better guidance literature is now available to accommodate pedestrians, it does not yet seem to have received widespread use. Finally, while professional attitudes toward accommodating pedestrians seem to have changed for the better, the level of understanding and empathy remains relatively low.

The intent of this paper was to provide information on best practices for accommodating pedestrians in work zones. The literature review summarized past studies of work zone practices, as well as guidelines from several professional references. The paper also summarized an investigation of current pedestrian accommodation practices which included a survey of traffic engineers and transportation planners, as well as site visits to nearly 50 work zones in eight cities.

The survey results indicate that most respondents believe their agencies effectively address pedestrian concerns in work zones; however, written comments by the respondents also seem to indicate that, in most communities, there is still a high level of selectivity with respect to where, when or even whether pedestrians are accommodated. The survey results also indicate that, while agencies employ a variety of techniques to address pedestrian issues, relatively few of the more popular techniques adequately address the needs of all pedestrians (especially those with visual impairments).

The site visits likewise suggest that a number of problems and issues remain for pedestrians in work zones, with relatively few judged to provide a high level of pedestrian accommodation. A variety of problems remain apparent in work zones, though some significant progress seems to have been made relative to conditions that prevailed a decade or two ago.

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