From: Roberta cich <rcich7198@gmail.com>
Sent: Thursday, June 11, 2020 11:52 AM
To: Kris Liljeblad <kliljeblad@DuluthMN.gov>
Cc: Taryn J. Erickson <tjerickson@DuluthMN.gov>; Carl Crawford <ccrawford@DuluthMN.gov>; Scott Poska <sposka@alliant-inc.com>; Adam Fulton <afulton@DuluthMN.gov>; Cari Pedersen <cpedersen@DuluthMN.gov>
Subject: Re: 1st Street Conversion / Commission on Disabilities

Hi Kris,

Thank you for your response. Yes, it is my position, and that of the Commission on disabilities, that traffic lights are a safer way for people to navigate Downtown streets than are 4-way stop signs. Although the article, ***Addressing Barriers to Blind Pedestrians at Signalized Intersections*, (September 2000),** did bring forward some challenges for people when traffic volumes are low, this article is 20 years old. We now have a variety of APS available to meet these challenges. Many traffic lights in Duluth already have audible pedestrian signals.

This week, I had the opportunity to consult with Haley Chopp and Nancy Northard from the Lighthouse Center for Vision Loss. Both are Certified Orientation and Mobility Specialists. They teach students who have disabilities to safely travel in our community. Both agree that traffic lights are the safer option. It's even better if there are audible pedestrian signals too. They reported that 4-way stops are more difficult. They told me that their students struggle with 4-way stops because many vehicles come up to stop signs quickly, and either stop very quickly or only roll through. This means it is more difficult to truly determine what a vehicle is going to do.

The position of the Commission on Disabilities is that when streets or intersections are being upgraded, the accessibility features should also be upgraded. Traffic lights are already present on the corners we have discussed. Changing these intersections to 4-way stops is not upgrading accessibility, in fact it is doing the opposite. Traffic lights are safer than 4-way stops. This position is echoed by local experts.

We look forward to having the opportunity to discuss options further.

Thank you,

Roberta

On Tue, Jun 9, 2020 at 9:42 AM Kris Liljeblad <kliljeblad@duluthmn.gov> wrote:

Roberta – Thank you for commenting on this important project. I wish I had attended your meeting so I could have observed the Commissioner's deliberations. Though I had it on my calendar I was under the impression that your group would not have a quorum, and as I start my day at 7 am, I had already left before Carl reached out to me after 3:30. In any case it is apparent that we need to have more dialogue about how best to serve visually impaired pedestrians on First Street in the future. I understand your position that visually impaired people are better able to safely cross streets with traffic signals by interpreting the acoustic cues from the sounds of platooned traffic flowing or stopping with the signal cycles. However, the traffic engineering literature from surveys of visually impaired populations (see ITE Journal, *Addressing Barriers to Blind Pedestrians at Signalized Intersections*, September 2000) indicates that when traffic volumes are low or intermittent, as they are on First Street, especially in non-peak times, the acoustic cues do not provide reliable indications of when pedestrians have the right of way to cross. The traffic volume on First St downtown of about 4,000 average daily traffic (ADT) equates to approximately one car every ten seconds in the peak hour, and less in the off-peak (which is the vast majority of the 24-hour day). That leaves a lot of quiet time between vehicle pass-bys regardless of the type of traffic control. Meanwhile, the consultant's study shows that the proposed change to stop signs rather than traffic signals would significantly reduce average travel delay times for roadway users, even with projected 2045 traffic. For example, at 1st St/4th Ave West the projected average travel delay per user could be reduced from 23 and 42 seconds (EB/WB) to 7 and 10 seconds; one-third and one-fourth as much. A related problem is that when signals are not warranted, roadway users are increasingly tempted to violate them, and in the process may create hazards for others. The expected 5-10 mph speed reduction with the 2-way conversion will benefit pedestrians all along the corridor by making it easier and safer to cross. To conclude, there are a number of considerations to be weighed in evaluating the overall benefits of the 2-way conversion for public safety. I hope we can have more conversation about the proposed traffic controls and how to make First Street work better for everyone, including visually impaired people.

Kris

From: Roberta cich <rcich7198@gmail.com>
Sent: Monday, June 8, 2020 8:47 AM
To: Kris Liljeblad <kliljeblad@DuluthMN.gov>; Carl Crawford <ccrawford@DuluthMN.gov>
Subject: 1st Street Conversion

Hello Kris,

I am writing this on behalf of the Duluth Commission on Disabilities. At the Commission's June 3rd meeting, we had a discussion about the 1st Street conversion and the replacement of several stop lights with 4-way stop signs. Commissioners shared the concerns I discussed with you at the Public Meeting held last week. The Commission feels these changes will have a negative impact on people with disabilities who are pedestrians.

If we understand correctly, there would be no traffic lights on 1st Street between Lake Avenue and 6th Avenue West. There would also be no traffic lights at 1st and 2nd Avenues East. This is concerning to the Commission because 4-way stops are more difficult to navigate for people with disabilities – especially those who have low vision or are blind. This is a safety concern. These are avenues that lead up to the Government Services Center, the Court House and City Hall.

Stop lights allow for ease of access throughout our Downtown. Stop lights on 1st Street also provide consistency with what is already on Superior Street. Stop lights provide better pedestrian access for people with disabilities, people who are elderly and parents walking with small children. As we make changes to our Downtown, we need to consider the benefits not only to traffic, but also to those who are walking. We are asking that you reconsider the decision to remove that many stop lights on 1st Street.

Thank you,

Roberta Cich

Chair

Duluth Commission on Disabilities

Addressing Barriers to Blind Pedestrians at Signalized Intersections

THE AUTHORS PRESENT THE RESULTS OF A SURVEY OF ORIENTATION AND MOBILITY SPECIALISTS REGARDING THE PROBLEMS STUDENTS WITH VISUAL IMPAIRMENTS WERE EXPERIENCING AT SIGNALIZED INTERSECTIONS.

BY BILLIE LOUISE BENTZEN, JANET M. BARLOW AND LUKAS FRANCK

THE ORGANIZING MEETING (January 1998) of the Institute of Transportation Engineers (ITE) Committee on Accessible Intersections for People who are Blind or Visually Impaired identified the need for more than anecdotal information about difficulties that visually impaired pedestrians experience at signalized intersections. Members of Division 9 (Orientation and Mobility) of the Association for Education and Rehabilitation of the Blind and Visually Impaired (AER) were surveyed to document the nature and causes of difficulties.

AER Division 9 is the professional organization of orientation and mobility specialists, individuals who are professionally trained to teach people who are blind or visually impaired to travel independently. In the practice of their profession, they regularly provide instruction in crossing streets at signalized intersections.

BACKGROUND

Pedestrians who are visually impaired travel independently in urban, suburban and rural areas. Many of them frequently cross streets at signalized intersections. People who are blind, like their sighted counterparts, often travel in unfamiliar places for work, education, medical attention, recreation and pleasure. Under the Americans with Disabilities Act they have a civil right to access to information provided to other pedestrians. This information may be necessary to enable them to travel independently in unfamiliar places.

Visually impaired pedestrians need to perform a number of tasks to cross safely and independently at signalized intersections. Many of these tasks are easier at familiar intersections. First they must recognize the boundary between the sidewalk and street to know they have come to an intersection. Curbs used to provide a definite cue to blind pedestrians that they had come to an intersection. Curb ramps now make identification of the boundary between the sidewalk and street much more challenging, requiring the use of such clues as the slope of a curb ramp, the presence of a sloping curb beside the ramp, traffic, the end of a line of buildings, and changes in sun and wind.[1,2]

Next, blind pedestrians determine as much as possible about the geometry of the intersection. Such factors as the angle of the intersection, the width of the street and the presence of splitter islands or medians affect the strategies that blind pedestrians use for crossing. Most of the information for determining intersection geometry comes from vehicular sounds. When and where there is little traffic, it may be difficult or impossible to determine the intersection geometry. Even in the presence of moderate traffic flow, islands and medians may be difficult to discern.

The next task is to determine the nature of traffic control. The presence of a signalized intersection can often be determined by platooning vehicles. At fixed timed intersections having concurrent pedestrian phases, pedestrians who are blind can determine the order of phases, including the onset and duration of the pedestrian phase, by listening to traffic flow. Pedestrian and vehicular actuation make auditory analysis of traffic control more difficult, since the timing and order of phases varies.

Before beginning a crossing, pedestrians who are blind try to establish a heading precisely toward the opposite corner. Strategies include listening to traffic going in the direction of travel, using information from building or grass lines and continuing to travel in the direction used on approaching the intersection. These strategies may not be successful when there is little traffic or when the crosswalk alignment does not match sidewalk or travel-lane alignment.

Next, pedestrians who are blind need to determine the onset of the walk inter-

val. Traditionally blind pedestrians have been taught that the walk interval begins with the onset of traffic on the street parallel to their direction of travel. This is an effective strategy at most intersections having fixed timed signals, concurrent pedestrian phases and no right-on-red. However, where there are vehicular or pedestrian actuation, an exclusive pedestrian phase, or right-on-red, the vehicular information from the parallel street may be ambiguous or missing. Additionally, the information may be masked by too much noise or it may be hard to hear because the street is very wide. The need for pedestrian actuation of a walk interval introduces additional complications to the tasks of alignment and recognizing the onset of the pedestrian interval.

Once pedestrians with visual impairments have determined that the walk interval has begun, and listened to be sure there are no cars running the light or turning across their path of travel, they cross the street, concentrating on crossing without veering. In the presence of steady traffic on the parallel street, pedestrians who are visually impaired can usually complete crossings without veering significantly out of crosswalks. However, absent or intermittent through traffic or abundant turning traffic makes it more difficult to avoid veering.

Anecdotal evidence from orientation and mobility specialists has indicated for some time that, as curb ramps become more prevalent, intersection geometry becomes more complex, vehicles become quieter and signalization is increasingly actuated, crossing streets has become increasingly difficult for their visually impaired students. Similar evidence from proficient blind travelers shows that some streets they used to be able to cross confidently now seem very hazardous, or even impossible to cross independently. Research comparing blind pedestrians' ability to cross complex signalized intersections with and without accessible signal information found that crossing safety was compromised where accessible signal information was not available.[3]

THE SURVEY

A survey was mailed to the 1,123 members of the AER Division 9 (Orientation and Mobility) to obtain information on the difficulties orientation and mobility specialists had observed to be experienced by blind pedestrians at signalized intersections and the causes of difficulties that they considered to be most important. Three hundred fifty-six completed surveys were returned.

The survey asked yes/no questions about the following potential categories of difficulties:

- Knowing when to begin crossing (hearing surge of traffic on the parallel street);
- Crossing straight across the street, including aligning to cross the street, veering when crossing the street, knowing where the destination corner is and anticipating medians or islands;
- Using pushbuttons; and
- Using accessible pedestrian signals (APSs).

Respondents were asked to indicate, by checking a box, whether their students had experienced any of these categories of difficulties, and by checking additional boxes, to indicate the causes of the difficulties for each category. Respondents were also asked to indicate the cause of difficulty they considered most important in each category above. They were also asked whether there were APSs in their instructional area.

RESULTS

Knowing when to begin crossing. Ninety-eight percent of respondents indicated that their students sometimes had difficulty knowing when to begin crossing. The causes of the difficulty can be seen in Table 1. In addition, of the 107 respondents whose students had used intersections having exclusive pedestrian phases, 79 percent indicated that students had difficulty knowing when to cross at intersections having an exclusive pedestrian phase.

The causes of the difficulties that were considered most important in knowing when to begin crossing were: traffic was intermittent (47 percent); and right-turning traffic masked the surge of parallel traffic (32 percent).

Crossing straight across the street. Ninety-seven percent of respondents indicated that their students sometimes had difficulty aligning to cross the street. The causes for this difficulty can be seen in Table 2.

Table 1. Causes of difficulty knowing when to begin crossing.

Causes of difficulty	Percent reporting
Traffic flow was intermittent.	85%
The surge was masked by right-turning traffic.	79%
The intersection was too noisy.	65%
The surge of traffic was too far away.	37%

Table 2. Causes of difficulty crossing straight across the street.

Causes of difficulty	Percent reporting
Traffic was intermittent or sporadic at times of the day or week.	76%
The intersection was offset.	71%
There was no acoustic guideline (parallel traffic) to indicate the direction.	64%

Ninety-seven percent of respondents indicated that their students sometimes veered when crossing the street. There were two primary causes. There was no acoustic guideline (parallel traffic) to follow across the street (73 percent); and the street was too wide (59 percent).

Sixty-six percent of respondents indicated that their students sometimes had difficulty knowing where the destination corner was. Sixty-four percent of respondents indicated that their students were confused by unexpected features such as medians or islands.

The causes of the difficulties in crossing alignment that were considered most important were: traffic was intermittent (34 percent); and the intersection was offset (23 percent).

Using pushbuttons. Ninety-four percent of respondents indicated that their students sometimes experienced difficulties using pushbuttons. Table 3 shows four causes of difficulty. The causes of the difficulties in using pushbuttons that were considered most important were: the pushbutton was too far from the crosswalk (34 percent); students did not know there was a button they needed to push (34 percent).

Table 3. Causes of difficulty with pushbuttons.

Causes of difficulty	Percent reporting
Students could not tell whether they needed to push a button.	87%
Students had difficulty locating the pushbutton.	84%
Students could not tell which crosswalk was actuated by the pushbutton.	73%
The pushbutton was so far from the crosswalk that students could not push the button and then return to the crosswalk and prepare for crossing before the walk interval began.	68%

Table 4. Causes of difficulty with audible pedestrian signals.

Causes of difficulty	Percent reporting
Students could not tell which crosswalk had the walk signal.	64%
The signal was too quiet.	52%
Students could not remember which of two sounds was associated with crossing in a particular direction.	41%
Students could not localize the sound of an APS and use it for guidance.	39%
Students were confused by the sound of an APS for another intersection.	25%
The signal was too loud.	24%
Students crossed the street with an actual bird instead of a bird-call signal.	11%
Students did not cross because they thought the signal was an actual bird.	10%

Using audible pedestrian signals. Sixty percent of respondents, coming from 36 states and Canada, indicated that there were audible pedestrian signals in the area in which they currently taught. They attributed the difficulties their students had in using audible pedestrian signals to one or more of the causes indicated in Table 4. The two causes of difficulty in using audible pedestrian signals that were considered most important were: students did not know for which crosswalk the audible pedestrian signal was intended (35 percent); and the audible pedestrian signal was too quiet (20 percent).

Bird-call type signals. California is the only state that has standards or guidelines for APSs. Bird-call type signals are recommended, and are widely used throughout California, although several other types of signals are used in a few cities. Elsewhere in the United States, there is less uniformity in signal type. The bird-call type signal, sounding "cuckoo" for north/south crossings, and "chirp" for east/west crossings, is intended to convey to blind pedestrians unambiguous information about which crosswalk has the walk signal. To obtain data on the success of this strategy, responses of Californians (25) vs. non-Californians (189), who currently teach or who have taught where there are APSs, were compared for two questions.

Seventy-two percent of Californians and 62 percent of non-Californians indicated that students sometimes did not know for which street an APS was intended. Sixty-eight percent of Californians and 32 percent of non-Californians indicated that students sometimes could not remember which sound was for which direction. Therefore, despite the greater use of and familiarity with bird-call type signals in California, which are intended to clearly indicate which crosswalk at an intersection has the walk interval, orientation and mobility specialists in California report a particularly high incidence of problems deciding for which crosswalk an APS is intended.

This may be partly a result of students forgetting which signal is associated with which direction. Other possible causes include students being unaware of either the direction in which they are traveling or the compass orientation of the intersection.

Forgetting which signal is associated with which direction was considered the most important APS problem by 25 percent of Californians who indicated a most important problem with APSs vs. 14 percent for non-Californians; difficulty deciding which crosswalk an APS indicates has the walk signal was considered the most important APS problem by 35 percent of Californians and 35 percent of non-Californians.

DISCUSSION

Frequency vs. importance of difficulties and causes. The frequency of experiencing any of the difficulties included in the survey is influenced by many factors, including the environment in which responding orientation and mobility specialists have taught and the capabilities of the students they have taught. Therefore, the percentages reported here cannot be generalized to all environments and all orientation and mobility specialists or to all blind pedestrians. In addition, the percentage of respondents whose students sometimes experienced various difficulties is not necessarily the same as the perceived severity or importance of those problems. Respondents' indication of the most important causes of four types of difficulties may be a better indicator of problems that need to be addressed than the frequency with which particular difficulties were reported. The eight causes of difficulties that were judged most important are summarized in Table 5.

Additional comments. A number of respondents wrote extensive comments regarding their frustrations in teaching independent travel skills in the current environment. Comments came from a varied group, which included orientation and mobility specialists working with blind and visually impaired individuals of all ages in all types of environments, ranging from very rural to large cities. Many respondents detailed difficulties with getting an APS installed when requested, and a lack of responsiveness of traffic engineers or public works agencies to their concerns. Numerous comments regarding problems in street detection, alignment and veering caused by curb ramps were also received.

The following are representative of the general comments:

- "Twenty-four years ago, I felt confident that a blind person could safely

Table 5. Most important causes of difficulty at signalized intersections.

Difficulty	Causes of difficulty
Knowing when to begin crossing	• Traffic was intermittent. • Right-turning traffic masked the surge of parallel traffic.
Crossing straight across the street	• Traffic was intermittent. • The intersection was offset.
Using pushbuttons	• The pushbutton was too far from the crosswalk. • Students did not know there was a button they needed to push.
Using audible pedestrian signals	• Students did not know for which crosswalk the audible signal was intended. • The audible signal was too quiet.

cross at traffic light controlled intersections. Today, the congestion, noise, and disregard of pedestrians makes me less and less confident!"

- "One of the biggest problems for independent travel—particularly in unfamiliar areas—is the inconsistency in type and placement of pedestrian buttons. Also, there is difficulty in determining whether an intersection is actuated."
- "I see the major problems being curb cuts that are so widely varied it is difficult to anticipate, . . . right-turn-on-red, traffic actuated signals, and the absolute insensitivity of the driving public."

Comparison with responses of pedestrians who are visually impaired. The American Council of the Blind, one of two major national organizations of people who are blind in the United States, conducted a somewhat parallel survey of some of its members.[4] In general, the same difficulties and causes were experienced by the 163 blind respondents as were observed by orientation and mobility specialists.

CONCLUSION

Increasing complexity of intersection design and signalization are unquestionably decreasing the safety and independence of pedestrians who are visually impaired. Difficulties are experienced in determining when to cross, crossing straight to the opposite corner, using pushbuttons and using APSs. Some of these problems can be solved by installation of appropriate APSs. Some new APSs provide a quiet button locator tone to inform blind pedestrians that they need to push a button, and to give directional guidance to the button. Some APSs that are new to the United States provide tactile arrows and/or voice output to indicate which crosswalk is controlled by the pushbutton.[5]

Bird-call type signals do not provide unambiguous information about which crosswalk has the walk interval. Signals comprised only of a bird-call, bell or buzz from the pedhead do not indicate the presence or location of a pedestrian push button. They do not solve one of the most important problems associated with pushbuttons: difficulty knowing whether pedestrian actuation is required.

The results of this survey are being used by the ITE Committee on Accessible Intersections for People who are Blind or Visually Impaired in planning a toolbox on making intersections accessible. The results gave guidance to the National Committee on Uniform Traffic Control Devices in addressing accessible pedestrian signals in proposed language for the *Manual on Uniform Traffic Control Devices*. The results are also being used by the orientation and mobility profession in determining continuing education needs. ■

References

1. Bentzen, B.L., and J.B. Barlow. "Impact of Curb Ramps on Safety of Persons who are Blind." *Journal of Visual Impairment and Blindness 89* (July-August 1995): 319–328.

2. Hauger, J., J. Rigby, M. Safewright and W. McAuley. "Detectable Warning Surfaces at Curb Ramps." *Journal of Visual Impairments and Blindness 90* (November-December 1996): 512–525.

3. Bentzen, B.L., W.F. Crandall and L. Myers. "Wayfinding System for Transportation Services: Remote Infrared Audible Signage for Transit Stations, Surface Transit, and Intersections." *Transportation Research Record 1671* (1999): 19–26.

4. Carroll, J., and B.L. Bentzen. "Survey of Signalized Intersection Accessibility." *The Braille Forum 38* (January 2000): 11–15.

5. Bentzen, B.L., and L. Tabor. *Accessible Pedestrian Signals*. Washington, DC, USA: U.S. Access Board, 1998.

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