Pedestrian Countdown Indication - Market Research and Evaluation

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SUMMARY

This brief summary paper discusses the successful engineering and market research evaluation, led by the Minnesota Department of Transportation's (Mn/DOT) Metro Division, of countdown pedestrian indications (CPI) which were implemented as a traffic safety tool in 1999 at five sites within the Twin Cities (St. Paul and Minneapolis) and suburban metropolitan area. Installation, operation and maintenance attributes of the CPI were satisfactory. The pre- and post installation market research performed showed that the additional information (a numerical descending countdown of the flashing don't walk clearance interval) was intuitively understood and used successfully by pedestrians. The market research consisted of observational data gathering (percent stepping off of curb at various intervals) and intercept interviews (general understanding of symbols, reaction to countdown display). 372 observations were made before CPI installations, and 535 observations were made after CPI installations. A full report of the market research and evaluation, including any updates, can be accessed at the Metro Division Traffic Engineering web site dot.state.mn.us/metro/trafficeng.

WHAT IS A COUNTDOWN PEDESTRIAN INDICATION, WHAT PROBLEM DOES IT ADDRESS, AND WHY STUDY IT?

Pedestrians of all ages frequently do not understand the international pedestrian crossing symbols (walking person, flashing hand, or solid hand) or English text ("WALK", flashing "DON'T WALK" and solid "DON'T WALK") and therefore cannot make informed judgements about what time they have been provided to cross a signalized intersection. The walking person/"WALK" indication is intended to provide pedestrians with an opportunity to step off of the curb and begin their crossing. The flashing hand/flashing "DON'T WALK" indication is intended to provide the pedestrian, who has already begun crossing, with adequate time to finish the crossing; a clearance interval. The solid hand/solid "DON'T WALK" indication is intended to keep all pedestrians from being in the intersection at that time. The countdown pedestrian indication (CPI) provides pedestrians with additional information, specifically a descending numerical countdown of the flashing hand clearance interval, which indicates to the pedestrian the time available for their crossing and is intended to be intuitively understood. With this additional information, the pedestrian can make better decisions about their crossing. Since this is new information being presented to pedestrians, the Minnesota Department of Transportation (Mn/DOT) feels it is necessary to determine if this information is understood correctly and used appropriately.

STUDY PARAMETERS

Six evaluation sites within the Twin Cities metropolitan area were chosen by a group of Mn/DOT and local transportation professionals and included locations with elderly, school age, college age, and mixed age pedestrians. One of the sites experienced major roadway reconstruction and was therefore not used in the market research study. The five sites used in the study were all trunk highway (T.H.) and local agency intersections and are operated by Mn/DOT:

T.H.36 at Margaret Street in the City of North Saint Paul, Ramsey County
T.H.13 at Portland Avenue in the City of Burnsville, Dakota County
T.H.65 at 40th Avenue in the City of Columbia Heights, Hennepin County
T.H.169 at Main Street in the City of Anoka, Anoka County
T.H.61 at 4th Street in the City of White Bear Lake, Ramsey County

The pedestrian crossing across the trunk highway at each of these intersections, which is the longest crossing as compared to the local cross street, was used in the evaluation and study since these are the crossings that require the most amount of time. These are also the crossings that generate the most pedestrian concerns for time available to cross due to the high volume of vehicular traffic and the potential for conflict.

The operation of the countdown pedestrian indications was chosen to only count down during the flashing hand (flashing "DON'T WALK") clearance interval, despite the product's technical availability of also counting down during the walking person ("WALK") interval. Emergency vehicle preemption operation is prevalent within the Twin Cities metropolitan area and can cut short the "WALK" interval. Since the CPI displays the interval information obtained from the last cycle, it was clear that correct information would only be available and consistent if the countdown only used the clearance interval information, which is not affected at these intersections by emergency vehicle operation. The operation of the pedestrian crossings was not substantively altered during the market research or operation evaluations.

INSTALLATION, OPERATION, AND MAINTENANCE EXPERIENCES

Countdown pedestrian heads (models PCS444 – single unit with walking person, hand and countdown, PHS555 – 12 inch x 12 inch walking person/hand unit and PCS333 – 12 inch x 12 inch countdown unit) manufactured by Tassimco Technologies Inc. were used for this evaluation. Prior to field installation, the pedestrian indications were bench tested to allow operation and maintenance staff to become familiar with their operation. Concurrent with our request, Tassimco Technologies, Inc. changed the color of the countdown indication to Portland orange. While other comments and suggestions were generated for the manufacturer, the countdown indications and the international symbol indications were considered to be appropriate for field installation once some initial equipment malfunctions were corrected.

Mn/DOT's Electrical Services Section maintenance personnel performed the field

installations during late May, 1999. Some field modifications to the heads were necessary due to the retrofit nature of the project, but no insurmountable problems were encountered with the installations and no additional wiring was required. New pedestrian instruction stickers were installed with each installation. The new stickers included a graphic of the pedestrian countdown indication and the flashing hand for the clearance interval operation and describe in English text the correct interpretation of the international crossing symbols. Depending on the type of pedestrian indication currently in place at the individual signals, either two part heads or single housing (ICC) heads were installed for the international symbols and the countdown indication.

Since the countdown pedestrian indication measures the clearance interval from the previous cycle, and since the pedestrian clearance intervals for the crossings evaluated remain constant, no specific operation activities were required to make these indications operational.

No complaints were received regarding the operation of any of the intersections with the countdown pedestrian indications. Depending upon the location, either no positive comments have been received or numerous positive comments have been received.

The countdown pedestrians indications have been in operation for over 11 months and have not required any field maintenance whatsoever.

Given these installation, operation and maintenance experiences, the countdown pedestrian indication has performed successfully.

MARKET RESEARCH

The intent of the market research, conducted by Cook Research and Consulting, Inc. of Minneapolis, Minnesota, was to determine whether the new pedestrian indication was understood by pedestrians, as measured by pedestrians who were successfully serviced by the new pedestrian indication when compared to pedestrians who were successfully serviced by the two current styles of pedestrian crossing signals (international symbols and English text). In addition, at intersections where the new pedestrian indications had been installed, pedestrians who crossed at these intersections were invited to participate in an interview designed to measure their understanding of, and interest in, the new style of pedestrian crossing signal.

Pedestrians were defined as people who traveled through the intersection on foot, by bicycle, in-line or roller skates, or who were running or jogging.

An “experimental design” methodology was used in a two-phase market research project. In the first part of Phase 1, pedestrians were observed crossing at intersections (where the new pedestrian crossing indications were to be installed) while the current signals were still present (before condition, Phase 1). Once the new pedestrian indications had been installed (the second part of Phase 1), pedestrians were again observed crossing at these same intersections (after condition, Phase 1). The persons

monitoring the observed crossings recorded the crossing behaviors of the pedestrians, which were then summarized into five categories. The definitions for observed pedestrian crossings are in Table 1.

Each recorded pedestrian crossing was tallied once; even though many of the single tallies were for pedestrians crossing in groups of two or more. The groups were counted as a single tally (as were pedestrians crossing alone) due to the assumption that when crossing as a group, there is probably a "single" decision to cross or not. Of the 372 observed crossings prior to the CPI installations (before condition), 42 recorded crossings were for pedestrians crossing in groups. After the CPI were installed (after condition), within the 535 recorded pedestrian crossings there were 196 observed crossings as groups. The breakdown of these observations is presented in Tables 2 and 3.

In Phase 2 of the market research, pedestrians who were observed crossing at intersections served by the new countdown pedestrian indications (after condition) were stopped after completing their crossings and asked to participate in a brief interview. Adults and older teens were asked to participate in the interviews (representing demographics of the areas); pedestrians who appeared to be younger than 16 years of age were not stopped, due to the fact that most were not accompanied by an adult who could grant permission to interview younger pedestrians. There were a total of 211 interviews completed in the months of June and July, 1999. While not presented here, the questions and responses to the intercept interviews can be reviewed in the full report at the dot.state.mn.us/metro/trafficeng web site.

The market research for the CPI took place over several days and was conducted during times when pedestrians would be expected to cross at the intersections – prior to and after school hours, during lunch hours, during prime shopping hours. Prior to the installation of the CPI, there were 372 observed crossings in May, 1999; after installation there were 535 recorded, observed pedestrian crossings during June, 1999.

TABLE 1 – Definitions for Crossing Behaviors

BEFORE CONDITION	AFTER CONDITION
Pedestrian Crossings Observed at Selected Intersections Served Either by Pedestrian Crossing Signals Showing the International Symbols or Showing English Text	Pedestrian Crossings Observed at Selected Intersections Served by Pedestrian Crossing Signals Showing the International Symbols with a **Flashing Hand with Numeric Countdown**
A) Successfully Serviced – Appropriate Start 1) Started crossing and completed crossing when walking person/"WALK" showing 2) Started crossing when walking person/"WALK" showing and completed crossing when flashing hand/flashing "DON'T WALK" showing	A) Successfully Serviced – Appropriate Start 1) Started crossing and completed crossing when walking person showing 2) Started crossing when walking person showing and completed crossing when flashing hand with numeric countdown showing
B) Successfully Serviced – Inappropriate Start 1) Started crossing and completed crossing when flashing hand/flashing "DON'T WALK" showing	B) Successfully Serviced – Inappropriate Start 1) Started crossing and completed crossing when flashing hand with numeric countdown showing
C) Not Successfully Serviced – Appropriate Start 1) Started crossing when walking person/"WALK" showing and completed crossing when solid hand/solid "DON'T WALK" showing	C) Not Successfully Serviced – Appropriate Start 1) Started crossing when walking person showing and completed crossing when solid hand showing.
D) Not Successfully Serviced – Inappropriate Start 1) Started crossing when flashing hand/flashing "DON'T WALK" showing and completed crossing when solid hand/solid "DON'T WALK" showing 2) Started crossing when flashing hand/flashing "DON'T WALK" showing and completed crossing when walking person/'WALK" showing	D) Not Successfully Serviced – Inappropriate Start 1) Started crossing when flashing hand with numeric countdown showing and completed crossing when solid hand showing 2) Started crossing when flashing hand with numeric countdown showing and completed crossing when walking person showing
E) Violators – Inappropriate Start 1) Started crossing and completed crossing when solid hand/solid "DON'T WALK" showing 2) Started crossing when solid hand/solid "DON'T WALK" showing and completed crossing when walking person/"WALK" showing 3) Started crossing when solid hand/solid "DON'T WALK" showing and completed crossing when flashing hand/flashing "DON'T WALK" showing	E) Violators – Inappropriate Start 1) Started crossing and completed crossing when solid hand showing 2) Started crossing when solid hand showing and completed crossing when walking person showing 3) Started crossing when solid hand showing and completed crossing when flashing hand with numeric countdown showing

TABLE 2 – Phase 1 Observational Interviews – Before Condition

BEFORE CONDITION	OBSERVED CROSSINGS			
Pedestrian Crossings Observed at Selected Intersections Served Either by Pedestrian Crossing Signals Showing the International Symbols or Showing English Text	Total	Seniors	Other Adults	Teens
A) Successfully Serviced – Appropriate Start				
1) Started crossing and completed crossing when walking person/"WALK" showing	17%	7%	14%	36%
2) Started crossing when walking person/"WALK" showing and completed crossing when flashing hand/flashing "DON'T WALK" showing	45%	50%	51%	14%
B) Successfully Serviced – Inappropriate Start				
1) Started crossing and completed crossing when flashing hand/flashing "DON'T WALK" showing	5%	-%	7%	3%
C) Not Successfully Serviced – Appropriate Start				
1) Started crossing when walking person/"WALK" showing and completed crossing when solid hand/solid "DON'T WALK" showing	12%	16%	14%	3%
D) Not Successfully Serviced – Inappropriate Start				
1) Started crossing when flashing hand/flashing "DON'T WALK" showing and completed crossing when solid hand/solid "DON'T WALK" showing	4%	2%	5%	2%
2) Started crossing when flashing hand/flashing "DON'T WALK" showing and completed crossing when walking person/'WALK" showing	2%	16%	-%	-%
E) Violators – Inappropriate Start				
1) Started crossing and completed crossing when solid hand/solid "DON'T WALK" showing	11%	5%	6%	34%
2) Started crossing when solid hand/solid "DON'T WALK" showing and completed crossing when walking person/"WALK" showing	3%	2%	3%	8%
3) Started crossing when solid hand/solid "DON'T WALK" showing and completed crossing when flashing hand/flashing "DON'T WALK" showing	1%	2%	-%	-%
Base (# of Observed Crossings):	(372)	(44)	(264)	(64)

TABLE 3 – Phase 1 Observational Interviews – After Condition

AFTER CONDITION	OBSERVED CROSSINGS			
Pedestrian Crossings Observed at Selected Intersections Served by Pedestrian Crossing Signals Showing the International Symbols and **a Flashing Hand with Numeric Countdown**	Total	Seniors	Other Adults	Teens
A) Successfully Serviced – Appropriate Start				
1) Started crossing and completed crossing when walking person showing	12%	1.5%	11%	19%
2) Started crossing when walking person showing and completed crossing when flashing hand with numeric countdown showing	61%	65%	65%	52%
B) Successfully Serviced – Inappropriate Start				
1) Started crossing and completed crossing when flashing hand with numeric countdown showing	2%	1.5%	2%	2%
C) Not Successfully Serviced – Appropriate Start				
1) Started crossing when walking person showing and completed crossing when solid hand showing	8%	27%	7%	2.5%
D) Not Successfully Serviced – Inappropriate Start				
1) Started crossing when flashing hand with numeric countdown showing and completed crossing when solid hand showing	4%	1%	5%	2.5%
2) Started crossing when flashing hand with numeric countdown showing and completed crossing when walking person showing	-%	-%	-%	-%
E) Violators – Inappropriate Start				
1) Started crossing and completed crossing when solid hand showing	10%	4%	8%	16%
2) Started crossing when solid hand showing and completed crossing when walking person showing	3%	-%	2%	6%
3) Started crossing when solid hand showing and completed crossing when flashing hand with numeric countdown showing	-%	-%	-%	-%
Base (# of Observed Crossings):	(535)	(74)	(296)	(165)

Additional data was collected and analyzed for the installation of the CPI regarding both the number of seconds remaining when the crossing was completed during the flashing don't walk clearance interval (crossing started when the walking person showing) and the number of seconds that the crossing required when the pedestrian began and completed the crossing during the flashing don't walk clearance interval. This information, included in the full Cook Research and Consulting Inc. report, is presented

in the report at the dot.state.mn.us/metro/trafficeng web site.

The market research of Phase 1 shows that when pedestrians cross at the intersections with a countdown pedestrian indication (CPI) during the pedestrian clearance interval (flashing hand), 75% are successfully serviced. This is an increase from the before condition (no numeric countdown) where 67% of all pedestrians are successfully serviced. In all age groups (seniors, other adults, and teens), the percent of pedestrians successfully serviced increases when pedestrians cross with a pedestrian indication showing a flashing hand with a numeric countdown. Additionally, purposeful violators (crossing illegally) remained nearly constant at 15% before and 13% after CPI installation.

The market research of Phase 2, not presented in detail here, shows that when asked their reactions to the new pedestrian indications, nearly four of every five people interviewed (78%) found the new pedestrian indications easier to understand than the pedestrian indications formerly at the intersections. Four of every five pedestrians (79%) also preferred the new pedestrian indications to what had been there previously. The younger pedestrians preferred the new pedestrian indications (91% preferring) while seniors (65 years of age or older) were less likely to prefer the new indications (CPI) since only 59% preferred the new indications. Even the seniors joined the other pedestrians and decided that the new pedestrian indications (CPI) were much more or somewhat more helpful when crossing the intersections. 92% of all pedestrians found the new pedestrian indications helpful when crossing.

CONCLUSIONS AND NEXT ACTIONS

The market research indicates that pedestrians over the age of 16 do understand the countdown pedestrian indication and use the information appropriately and well. Based on these positive market research findings, positive public input, and the positive engineering experiences with the countdown pedestrian indications, the Minnesota Department of Transportation is moving forward with identifying criteria that will provide guidance to traffic engineers regarding appropriate installations. Once criteria are drafted, local transportation professionals will review and comment to ensure that the region will maintain consistency with installation and operation. Criteria for installation will likely include a combination of the following: unusually long pedestrian crossing distances, crossing pedestrians to a median rather than across the entire roadway, nearby school or senior center that generates pedestrian traffic, high percentage of pedestrians with disabilities, and high pedestrian volumes. Countdown pedestrian indications should not become a standard signal system component since the need for the additional information is not always present, there is a significant cost to install the indications, and maintenance responsibilities are increased.

If approved for use, standard product and operation specifications should be prepared which would include characteristics of importance such as conflict monitoring with the solid hand (solid “DON’T WALK”) interval, blank out characteristics for reprogramming after power outage, rest in walk, light emitting diode indications, and operational

consequences due to stuck push buttons, etc. To improve any malfunction monitoring and provide system conflict monitoring, a product would ideally be designed that has some ability to be monitored by cabinet equipment. If emergency vehicle preemption is used, emergency vehicle detection should be extended as needed so that the flashing hand (flashing “DON’T WALK”) clearance interval would not need to be shortened since that would display incorrect information during the cycle preempted and the following cycle. Extreme care should be taken if changing pedestrian timings when using the countdown pedestrian indications and field reviews should be required for all changes.

Additional market research of children ages 8 – 15 should be completed to ensure that there is complete understanding of the information provided by the CPI. Mn/DOT intends to pursue this additional market research in the third quarter of 2000.

Additional information regarding conclusions and next actions can be found in the extended report at the dot.state.mn.us/metro/trafficeng web site.

AUTHOR INFORMATION

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