

# Pedestrian Accommodations in Work Zones: Systematic Literature Review and Research Needs

tech transfer summary

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## RESEARCH PROJECT TITLE

Field Testing of Non-Motorized Road User Accommodations for Work Zones

## SPONSORS

Smart Work Zone Deployment Initiative  
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The Smart Work Zone Deployment Initiative (SWZDI) is a transportation pooled fund that supports research investigations into better ways to improve the safety and efficiency of traffic operations and highway work in work zones. The primary objective is to promote and support research and outreach activities that focus on innovative practice-ready policies, processes, tools, and products that enhance the implementation and constructability, safety, and mobility impacts of all types of work zones. The fund is administered by Iowa State University's Institute for Transportation, and the lead agency is the Iowa Department of Transportation.

The sponsors of this research are not responsible for the accuracy of the information presented herein. The conclusions expressed in this publication are not necessarily those of the sponsors.

Adequate pedestrian accommodations in work zones can improve pedestrian safety and mobility during construction, especially for people with visual, sensory, or cognitive disabilities.

## Background

Billions of dollars are spent each year on roadway, utility, and other projects that directly affect pedestrian safety and mobility during construction. Although construction issues affect all pedestrians, they have disproportionate impacts on people with disabilities, who currently comprise about a quarter of the noninstitutionalized US adult population.

Approximately 120 pedestrian fatalities in work zones are reported by law enforcement agencies in the United States each year. Nonfatal injuries, many of which are not reported to law enforcement, are also a substantial problem. Analysis of hospital data suggests that pedestrians suffer thousands of slip-and-fall injuries each year, resulting in billions of dollars in losses each year to the injured, insurers, government healthcare programs, and employers.

The 2009 *Manual on Uniform Traffic Control Devices* (MUTCD) established some basic criteria for work zone pedestrian accommodations, including requirements to maintain “adequate” pedestrian access during construction and provide barriers detectable by visually impaired pedestrians at sidewalk closures.

## Problem Statement

Many transportation practitioners are unaware of the extent of the dangers that work zones pose for pedestrians because they rely on law enforcement data that are mainly limited to vehicle-pedestrian crashes. Additionally, noncompliance with MUTCD and other requirements is widespread, in part because existing guidelines often lack clarity, are overly stringent, and are not informed by formal research into pedestrian needs.

## Goals

This project aimed to identify and evaluate previous research related to pedestrian safety and mobility in work zones, review design guidance issued by state departments of transportation (DOTs) on pedestrian accommodations, and summarize research needs that would help elucidate the accommodation needs of pedestrians in work zones.

## Research Description

A systematic literature review was conducted to identify studies published from 2004 through mid-2021 related to pedestrian safety and mobility in work zones. Seven engineering-oriented scholarly databases were searched, and the identified studies were filtered for their relevance and usefulness for understanding the topic.

A supplemental “grey literature” search of publicly available guidelines, technical standards, and informal reports was conducted to identify the work zone pedestrian accommodations recommended by state DOTs and European agencies and organizations. Guidelines for eight state DOTs and three European organizations were summarized.

The research needs identified during the systematic literature review and grey literature search were synthesized and summarized. Categories of research needs include, for example, the extent of and reasons for noncompliance with technical guidance, surfacing materials, and wayfinding.

To begin addressing the research needs, the project team developed the concept for a Pedestrian Test Track to evaluate various pedestrian accommodations in a realistic but traffic-free setting.

## Key Findings of the Literature Reviews

- The systematic literature review identified only nine relevant studies: one summarizing work zone pedestrian safety research before 2004, five addressing temporary facilities, and three focusing on conveying detour information to visually impaired pedestrians.
- Almost all of the results reported in the primary studies were qualitative or subjective, leading to substantial risk of bias. The small scale and short duration of the studies precludes quantitative analysis of the effects of the interventions studied on casualties and mobility.
- Several publications identified shortcomings in the design and implementation of temporary pedestrian accommodations for work zones. Some studies proposed solutions, but no formal evaluations of the effects of these interventions were found.
- The grey literature search found that the guidance provided to practitioners varies widely in scope, with agencies in predominantly rural states tending to provide less guidance than those in more urbanized states.
- In general, the states with relatively detailed guidance have mainly derived it from a set of recommendations and device drawings developed by the Minnesota DOT (MnDOT) a decade ago.

- With the exception of North Carolina, no guidelines were found that relate the design of temporary accommodations to objective criteria such as pedestrian traffic volume, motor vehicle traffic volume, roadway speed, roadway type, land use, or project duration.

## Key Research Needs

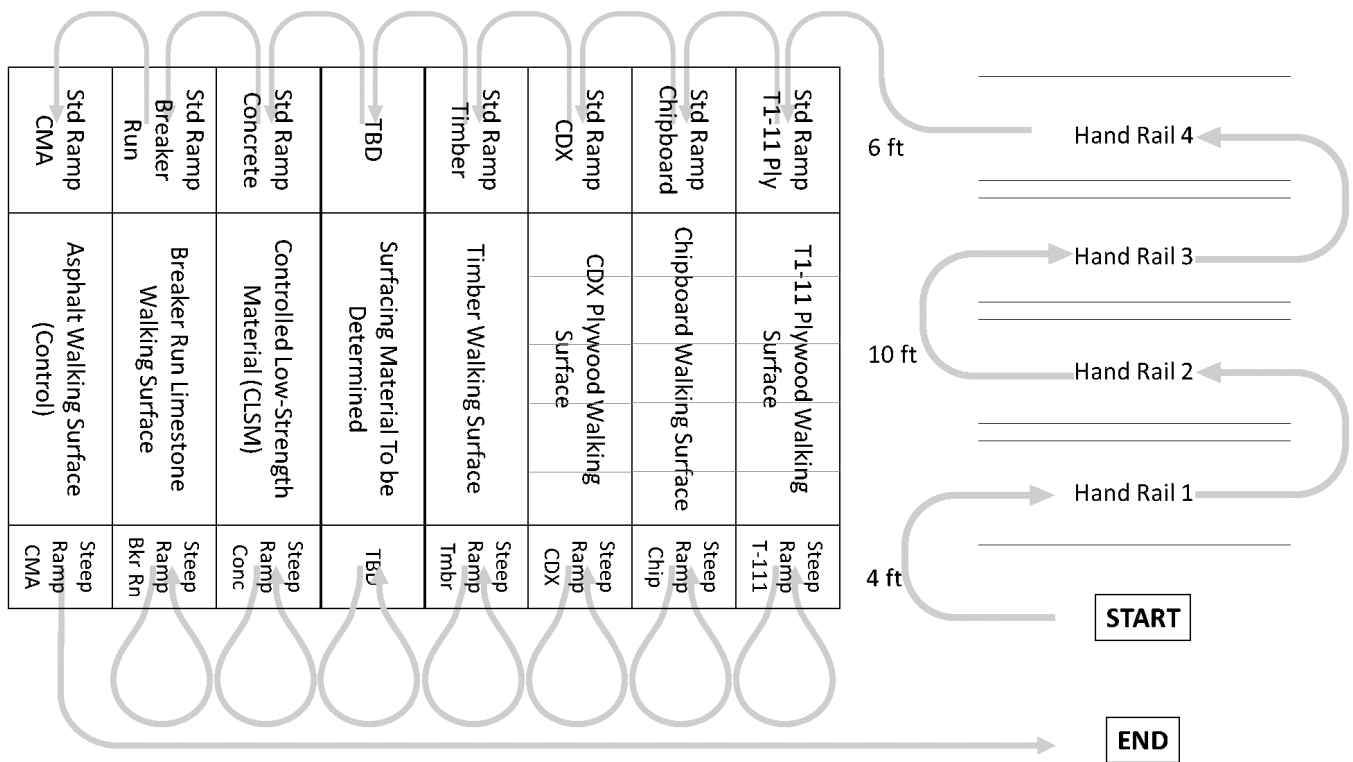
- Data on the characteristics and accommodation needs of temporary pedestrian facility users, including pedestrians with disabilities, could help inform the development, testing, and selection of temporary pedestrian accommodations.
- Research is needed on the basic elements of pedestrian mobility, such as small vertical transitions, pathway widths, and acceptable surfacing materials. The results could help evaluate the extent to which design criteria for permanent pedestrian facilities can be relaxed or adjusted for temporary installations.
- Other important research needs include rational guidance for the selection of pedestrian fencing and creative solutions for managing motorized and nonmotorized traffic in the vicinity of public transit stops during construction.
- There is a notable absence of typical application drawings that cover the full range of temporary pedestrian traffic management situations.
- Research is needed on the navigational needs of pedestrians with visual, sensory, and cognitive disabilities. Research from the interdisciplinary field of space syntax may offer some insights into how facility changes affect these pedestrians, but additional work is needed to identify and test practical solutions.

## Proposed Pedestrian Test Track

To begin addressing the research needs, the project team developed the concept for a Pedestrian Test Track. This research approach would allow temporary surfacing materials, curb ramps, railings, small vertical transitions, and other accommodations to be tested in a realistic but traffic-free setting.

Participants would walk through a short course featuring numbered stations identifying each test surface, ramp, and channelizer. Participants would use a preprinted form to rate the suitability of each surface/device in the context of their personal abilities.

Due to delays related to the COVID-19 pandemic, the Pedestrian Test Track could not be implemented within the timeframe of this project. However, detailed protocols for the track were developed and received approval from Iowa State University’s Institutional Research Board in 2021.



*Conceptual plan view of Pedestrian Test Track, showing test lanes and direction of pedestrian circulation*

## Implementation Readiness and Benefits

Adequate pedestrian accommodations in work zones can improve pedestrian safety and mobility during construction, especially for people with visual, sensory, or cognitive disabilities.

The research needs identified through the literature reviews can help guide future research into the needs of

pedestrians in work zones and the accommodations that would meet these needs. Additionally, the Pedestrian Test Track concept could be applied to future research to help quantify the safety and mobility effects of temporary pedestrian accommodation alternatives.