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Docket TR-100098
Witness: Kathy Hunter

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

CITY OF FIFE, **Petitioner,** **v.** **UNION PACIFIC RAILROAD,** **Respondent.**	**DOCKET TR-100098**

EXHIBIT TO TESTIMONY OF

Kathy Hunter

STAFF OF
WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION

U.S. Dep't of Transportation, Federal Highway Administration
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16. Abstract

The purpose of the *Railroad-Highway Grade Crossing Handbook – Revised Second Edition* is to provide a single reference document on prevalent and best practices as well as adopted standards relative to highway-rail grade crossings. The handbook provides general information on highway-rail crossings; characteristics of the crossing environment and users; and the physical and operational improvements that can be made at highway-rail grade crossings to enhance the safety and operation of both highway and rail traffic over crossing intersections. The guidelines and alternative improvements presented in this handbook are primarily those that have proved effective and are accepted nationwide.

This handbook supersedes the *Railroad-Highway Grade Crossing Handbook*, published in September 1986. This update includes a compendium of materials that were included in the previous version of the handbook, supplemented with new information and regulations that were available at the time of the update. Updates were drawn from the current versions of relevant legislation, policy memoranda, Federal Register notices, and regulatory actions.

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traffic at location C (these signs would activate when queues are detected at location A).

- Provide exclusion zone diagonal striping as described elsewhere in this handbook. (The use of diagonal striping to provide an area where motorists cannot stop is standard practice in Illinois at all grade crossings that are interconnected to an adjacent traffic signal. The NCUTCD grade crossing committee is considering provisions for future versions of the manual).

In the event that such a queue management strategy were provided, the grade crossing would in principle be clear of highway users at all times, whether or not a train was approaching the crossing, and the use of preemption would operate more as a fail-safe measure rather than a primary measure for keeping the tracks clear.

J. Pedestrian and Bicycle Considerations

Non-motorist crossing safety should be considered at all highway-rail grade crossings, particularly at or near commuter stations and at non-motorist facilities, such as bicycle/walking trails, pedestrian-only facilities, and pedestrian malls.

Passive and active devices may be used to supplement highway-related active control devices to improve non-motorist safety at highway-rail crossings. Passive devices include fencing; swing gates; pedestrian barriers; pavement markings and texturing; refuge areas; and fixed message signs. Active devices include flashers; audible active control devices; automated pedestrian gates; pedestrian signals; variable message signs; and blank-out signs.

These devices should be considered at crossings with high pedestrian traffic volumes; high train speeds or frequency; extremely wide crossings; complex highway-rail grade crossing geometry with complex right-of-way assignment; school zones; inadequate sight distance; and/or multiple tracks. All pedestrian facilities should be designed to minimize pedestrian crossing time, and devices should be designed to avoid trapping pedestrians between sets of tracks.

Guidelines for the use of active and passive devices for non-motorist signals and crossings are found in MUTCD Section 10D, Part 10.[108]

108 *Guidance on Traffic Control Devices at Highway-Rail Grade Crossings.* Washington, DC: FHWA, Highway/Rail Grade Crossing Technical Working Group, November 2002.

K. Roundabouts

In the event that a grade crossing is included in a roundabout, design considerations include the provision of traffic control (such as crossing gates and flashing lights) at the grade crossing consistent with treatments at other highway-rail grade crossings. In addition, where queuing could occur (such as gridlocking within the roundabout), additional measures may be necessary up to and including the installation of supplementary devices such as traffic signals to preclude blockages of the track that cannot be cleared in advance of the arrival of a train.

At the June 2006 meeting of NCUTCD, the council approved provisions that would require an engineering study of the potential for traffic to back up across a grade crossing due to a roundabout and the identification of appropriate countermeasures, including possible use of traffic signals.

L. Site and Operational Improvements

In addition to the installation of traffic control systems, site and operational improvements can contribute greatly to the safety of highway-rail grade crossings. Site improvements are discussed in four categories: removing obstructions, crossing geometry, illumination, and safety barriers.

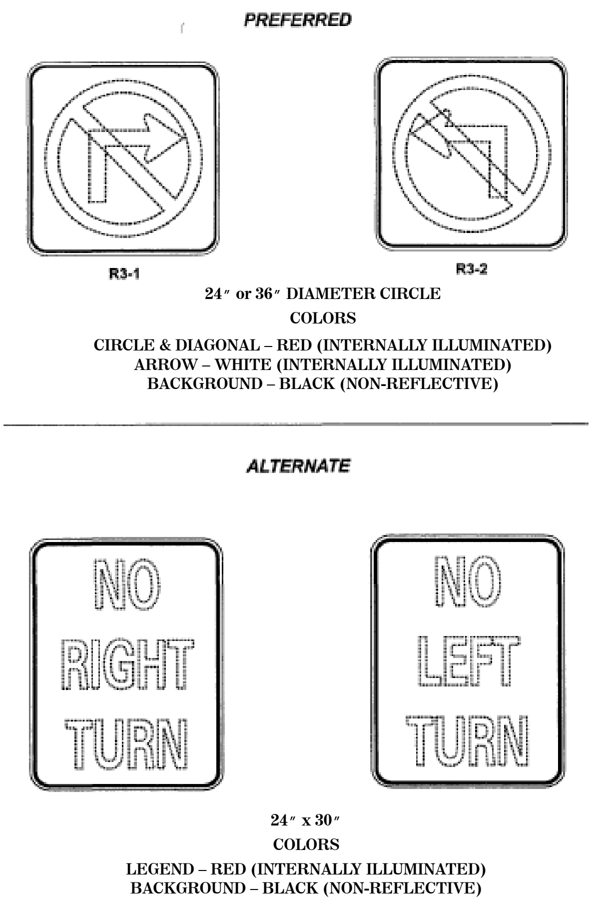
1. Removing Obstructions

The following text identifies treatments to address various sight distance needs, previously discussed in Chapter III as part of the diagnostic study method.

Approach. To permit this, three areas of the crossing environment should be kept free from obstructions. The area on the approach from the driver ahead to the crossing should be evaluated to determine whether it is feasible to remove any obstructions that prevent the motorist from viewing the crossing ahead, a train occupying the crossing, or active control devices at the crossing.

Clutter is often a problem in this area, consisting of numerous and various traffic control devices, roadside commercial signing, utility and lighting poles, and vegetation. Horizontal and vertical alignment can also serve to obstruct motorists' view of the crossing. Clutter can often be removed with minimal expense, improving the visibility of the crossing and associated

Figure 69. No Turns Internally Illuminated Signs



Source: Korve, Hans W., Jose I. Farran, Douglas M. Mansel, et al. Integration of Light Rail Transit into City Streets. *Washington, DC: Transit Cooperative Research Report 17, Transportation Research Board, 1996.*

Note that the action of the NCUTCD council at the June 2005 meeting would broaden the use of the train icon sign (W10-7) to include any location where traffic crosses an LRT trackway.

2. Use of Crossbuck Sign with LRT

When Part 10 was added to the *Manual on Uniform Traffic Control Devices* (MUTCD), text was included that could be interpreted to mean that the crossbuck sign (R15-1) is required at every LRT crossing, regardless of the presence of any other traffic control devices. However, it is not customary practice to install the crossbuck sign at LRT grade crossings where the tracks are within a roadway and the primary traffic control device is a traffic signal. At the June 2005 meeting of NCUTCD, the council approved clarifying language indicating that the use of a crossbuck sign is optional for semi-exclusive or mixed alignments where other traffic control devices are present.

3. Pedestrian Crossing Treatments

Although collisions between LRVs and pedestrians occur less often than collisions between LRVs and motor vehicles, they are more severe. Furthermore, pedestrians are often not completely alert to their surroundings at all times, and LRVs, when operating in a street environment, are nearly silent. For these reasons, appropriate pedestrian crossing control systems are critical for LRT safety.

Flashing light signal. At non-gated, unsignalized, pedestrian-only crossings of semi-exclusive LRT rights

Table 53. Use of Active Internally Illuminated Signs for Parallel Traffic Turning Across LRT Tracks

Alignment type	Intersection traffic control device	"No Left/Right Turn" sign	Train icon sign for left/ right turns[a]
Semi-exclusive gated	Stop[c]	Recommended	May
	Traffic signal without arrow[d]	Recommended [b]	May
	Traffic signal with arrow[e]	Not recommended	May
Semi-exclusive non-gated	Stop[c]	Recommended	May
	Traffic signal without arrow[d]	Recommended [b]	May
	Traffic signal with arrow[e]	Not recommended	Recommended

[a] *Left-turn signs are for median and side-aligned LRT alignments; right-turn signs are for side-aligned LRT alignments only.*
[b] *Alternatively, an all-red phase for motor vehicles and pedestrians may be used in combination with "No Turn On Red" (R10-11a) signs.*
[c] *"Stop" refers to a STOP sign-controlled intersection.*
[d] *"Without arrow" refers to a signalized intersection at which the turning traffic has no red arrow displayed when an LRV is approaching but has either a steady green ball, a red ball, or a flashing red ball displayed.*
[e] *"With arrow" refers to a signalized intersection at which the turning traffic has a red arrow displayed when an LRV is approaching. When a turn arrow traffic signal indication is used, TCRP Report 17 recommends that an exclusive turn lane be provided.*

Source: Korve, Hans W., Jose I. Farran, Douglas M. Mansel, et al. Integration of Light Rail Transit into City Streets. *Washington, DC: Transit Cooperative Research Report 17, Transportation Research Board, 1996.*

Figure 73. ADA Dynamic Envelope Delineation in Sacramento, California

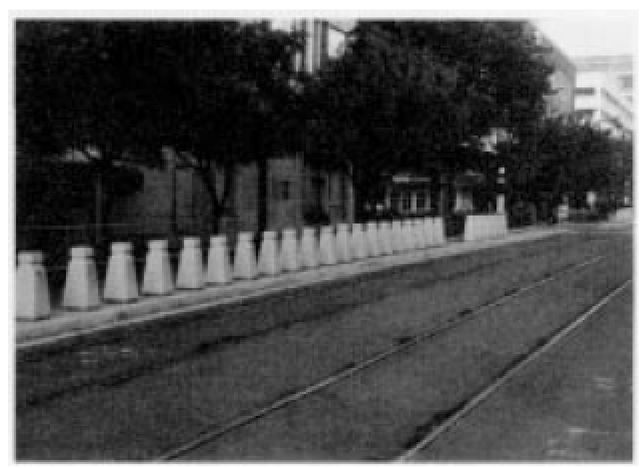
Source: Korve, Hans W., Jose I. Farran, Douglas M. Mansel, et al. Integration of Light Rail Transit into City Streets. *Washington, DC: Transit Cooperative Research Report 17, Transportation Research Board, 1996.*

bedstead barriers, fences, and/or bollards and chains) be provided along side-aligned LRT operations where LRVs operate two ways on a one-way street (contra-flow operations). They may also be provided for one-way side-aligned LRT operations for normal flow alignments. As shown in Figure 74, the San Diego, California LRT system uses bollards along C Street to warn pedestrians of the LRT tracks.

Pedestrian automatic gates. Pedestrian automatic gates are the same as standard automatic crossing gates except that the gate arms are shorter. When they are activated by an approaching LRV, the automatic gates are used to physically prevent pedestrians from crossing the LRT tracks. TCRP Report 17 recommends that this type of gate be used in areas where pedestrian risk of a collision with an LRV is medium to high (for example, whenever LRV stopping sight distance is inadequate).

The preferred method is to provide pedestrian automatic gates in all four quadrants, installed as follows: Where right-of-way conditions permit, TCRP Report 17 recommends that the vehicle automatic gate be located behind the sidewalk (on the side that is away from the curb), so that the arm will extend across the sidewalk, blocking the pedestrian way (see Figure 75, option A). Longer and lighter gate arms make this installation feasible. However, experience suggests a maximum gate arm length of 38 feet for practical operation and maintenance. At crossings requiring the gate arm to be longer than 38 feet, a second automatic gate shall be placed in the roadway median. (Note that the effective coverage is less than 38 feet due to set-back requirements and the size of the gate mechanism.)

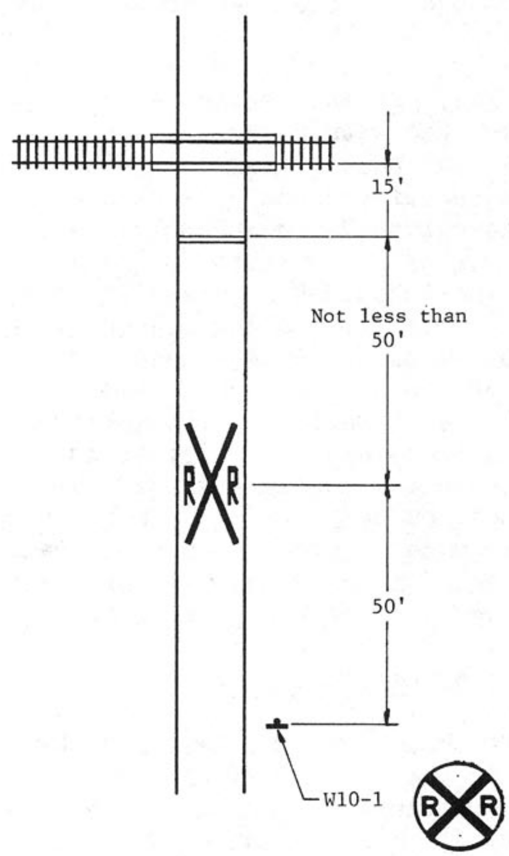
Figure 74. San Diego, California Curbside Pedestrian Barriers



Source: Korve, Hans W., Jose I. Farran, Douglas M. Mansel, et al. Integration of Light Rail Transit into City Streets. *Washington, DC: Transit Cooperative Research Report 17, Transportation Research Board, 1996.*

To provide four-quadrant protection, TCRP Report 17 recommends that two single-unit pedestrian automatic gates also be installed behind the sidewalk, across the tracks, opposite the vehicle automatic gates. This vehicle and pedestrian automatic gate configuration is shown in Figure 76 and is preferred because it keeps the sidewalk clear for pedestrians and minimizes roadside hazards for motorists.

Figure 81. Recommended Sign and Marking Treatment for Bicycle Crossing



Source: Railroad-Highway Grade Crossing Handbook, Second Edition. *Washington, DC: U.S. Department of Transportation, Federal Highway Administration, 1986.*

Pedestrians. The safety of pedestrians crossing railroads is the most difficult to control because of the relative ease with which pedestrians can go under or around lowered gates. Pedestrians typically seek the shortest path and, therefore, may not always cross the tracks at the highway or designated pedestrian crossing.

Because of the variety of factors that may contribute to pedestrian hazards, detailed studies are necessary to determine the most effective measures to provide for pedestrian safety at specific locations.

A variety of preventive measures can be employed. (Refer also to Chapter IX, Part C, “Light-Rail Transit” for safety measures identified in reports issued by TCRP.) As of the preparation of this handbook, the Railroad Technical Committee of NCUTCD has established a pedestrian task force charged with expanding the provisions for pedestrian traffic control devices.

Fencing. Fencing that encloses the right of way may be used to restrict access. A 6- to 8-foot-high chain link fencing, sometimes topped with barbed wire, is commonly used. Fencing is usually placed on both sides of the right of way, but it can be an effective deterrent to indiscriminate crossing if placed on only one side. The main objection to fencing is its cost, which may be in excess of $100,000 per mile for construction. Furthermore, it does not bar entrances at crossings. Alternatively, a single 4-foot fence, placed parallel to the track and across a pedestrian crossing route, might be a lower-priced and somewhat effective deterrent. Fencing is commonly used between multiple tracks at commuter stations. Maintenance is an additional cost.

Separated crossings. To prevent vandalism of continuous fencing, pedestrian crossings might be provided over or under the track(s) at reasonable intervals. Pedestrian grade separations are expensive and should be designed to maximize pedestrian use. If a structure is built, it should be accessible, and pedestrians should be directed to it through the use of barriers, fencing, or signs.

Improved signing. An example whereby pedestrian and trespasser safety near railroads can be enhanced through improved signing concerns electrified rail lines, in particular, their catenaries (the overhead wires used to carry energy to electric locomotives). The electrical current is so great that shocks can result without actual contact with the wire. Warning signs along electrified railroads can reduce collisions. These signs should provide both symbolic representation (such as a lightning bolt) and the warning legend.

Safety education. The education of actual and potential trespassers can reduce the incidence of right-of-way collisions. Individual railroads as well as the Association of American Railroads and Operation Lifesaver have conducted active railroad safety programs for many years through schools.

Surveillance and enforcement. No form of pedestrian safety program can be effective without some level of surveillance and enforcement. At present, trespassing is generally considered a misdemeanor, and law enforcement officials are often indisposed to prosecute. A more effective procedure for some forms of railroad trespassing would be to treat it like jaywalking and issue a citation with automatic imposition of a fine if a hearing were waived. Such a procedure would impose some burden on the trespasser who otherwise might only be reprimanded.