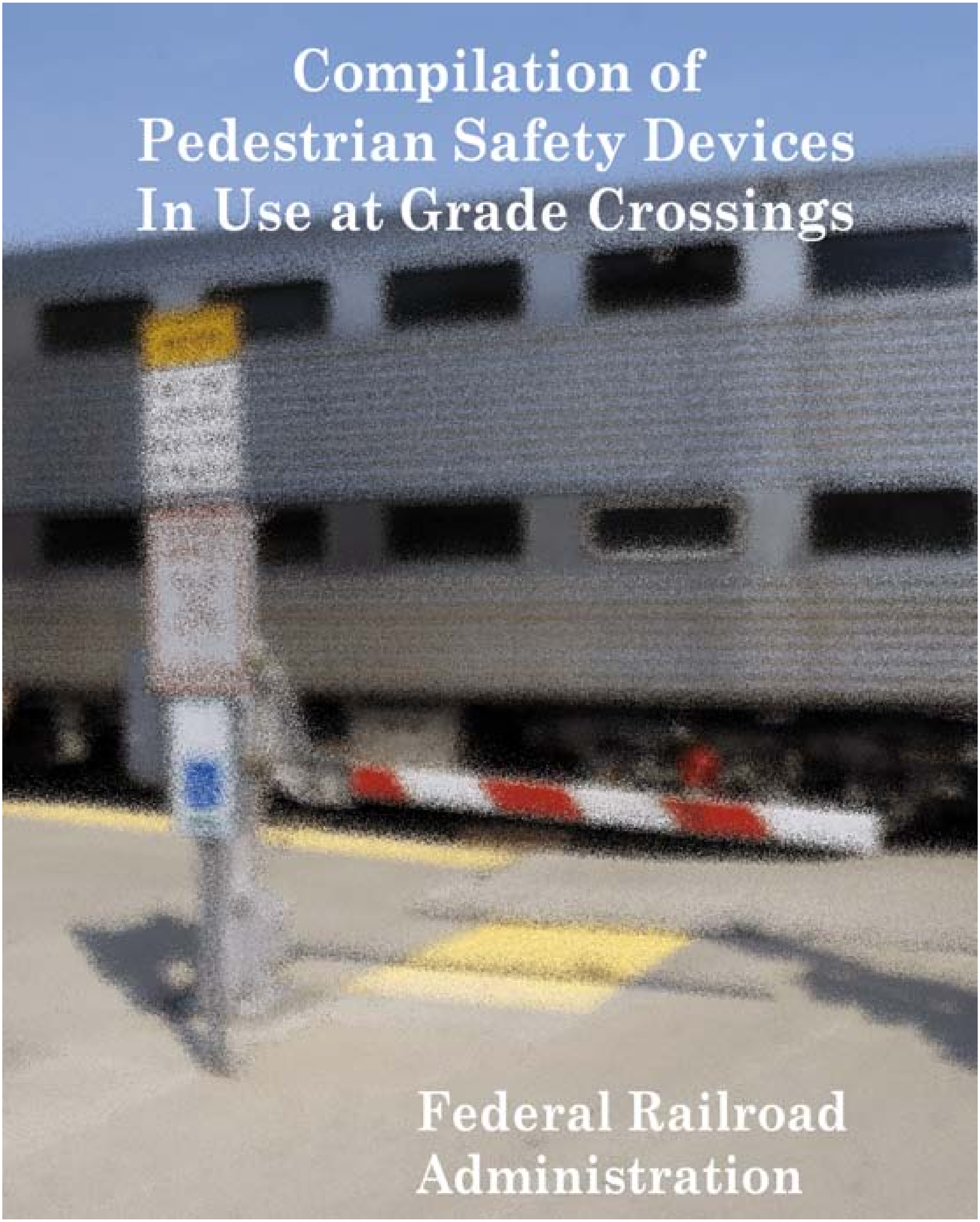
Compilation of Pedestrian Safety Devices In Use at Grade Crossings



Federal Railroad Administration

A COMPILATION OF PEDESTRIAN SAFETY DEVICES IN USE AT GRADE CROSSINGS

Prepared by the Office of Safety, Federal Railroad Administration

As part of the US DOT Grade Crossing Safety Action Plan issued in June of 2004, FRA's Office of Safety has been charged with developing an inventory of pedestrian warning devices in use at grade crossings of all types. From the Action Plan:

> *"...the FRA will make available a compilation of pedestrian safety devices in use at grade crossings. This will represent the current state of the practice of pedestrian accommodation at grade crossings, including pedestrian-only crossings."*

The FRA has worked to gather information on any signs, signals, pavement markings, or other devices used to enhance the safety of pedestrians at grade crossings. State DOTs and rail transit operators have made several submissions, which have included background information and illustrations. These are presented here so that the larger grade crossing safety community might benefit from the work of others in this important area.

The assistance of those who made a submission for this report has been most helpful in FRA's implementation of this important Action Plan initiative. We would like to express our appreciation to these individuals and organizations for their participation in this compilation effort:

Anita Boucher	Railroad Safety Coordinator, Nevada Department of Transportation
William M. Browder,	Director of Operations, Association of American Railroads
Stephen Laffey	Illinois Commerce Commission
Jeff LaMora	Rail Service Project Administrator, Utah Transit Authority
Ray Lewis	Traffic Engineering Division, West Virginia DOT, Division of Highways
Rodney Massman	Administrator of Railroads, Missouri DOT
Brent D. Ogden	Korve Engineering, Inc.
John T. Sharkey	Manager, Technology/ R&D, Safetran Systems Corporation
Mr. Alan Sovey	Crossing Safety Signal Specialist, Oregon DOT
Anya Carroll, Chair.	TRB Highway Rail Grade Crossings Committee AHB60.

DEPICTION OF ITEMS NOT INCLUDED IN THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

It should be noted that several of the devices depicted in this document are not included in the Manual on Uniform Traffic Control Devices (MUTCD). This nationally recognized document contains the standards that govern all traffic control devices. Public agencies rely on the Manual to help them ensure uniformity in the messages conveyed to road users. The MUTCD has the status of law as it pertains to signs, signals and pavement markings, and non-compliance with the Manual can ultimately result in the loss of federal-aid funding, as well as in a significant increase in tort liability incurred by the use of non-standard traffic control devices.

The Federal Highway Administration (FHWA), which is the custodial agency for the MUTCD, has established a process for the incorporation of new devices into the Manual. This process involves rulemaking procedures that are published in the Federal Register and that encourage public involvement. Any interested person or organization may participate by submitting comments to the docket.

Agencies utilizing devices that are not currently included in the Manual are strongly encouraged to participate in the MUTCD incorporation process, which is described in detail in Section 1A.10 of the Manual, entitled "Interpretations, Experimentations, Changes, and Interim Approvals." This (and the entire Manual) can be found on the FHWA's MUTCD website. This incorporation process enables agencies desiring the experimental use of traffic control devices that show promise in the enhancement of safety and mobility to evaluate these devices. Should they prove successful, the wider transportation community may then more readily enjoy the benefits. Such non-standard devices that have been shown to be effective in more than one geographic area through scientific evaluation studies can be proposed for inclusion in the MUTCD through the formal rulemaking process.

In light of the above, and considering the nature of this document as a basic compilation of devices in use by local agencies and organizations, inclusion of any device herein should not be considered as either an endorsement or a requirement of its use.

As envisioned in the 2004 Grade Crossing Action Plan, this document is intended as a first step in the evolution of future guidance on the selection and installation of pedestrian-focused traffic control devices for use where pedestrians may legally cross railroad tracks. The information contained herein has been voluntarily supplied by the agencies making use of the devices shown here, and the experiences described here are those of the submitting agencies.

It is hoped that dissemination of this compilation of traffic control devices will foster the exchange of information and experiences among transportation agencies and organizations that are involved with pedestrian crossings of railroad tracks.

A LOOK AT THE CURRENT LEVEL OF PEDESTRIAN INVOLVEMENT IN HIGHWAY-RAIL GRADE CROSSING COLLISIONS

A review of the table below shows that pedestrian fatalities have comprised about 10 to 20 percent of all fatalities at highway-rail grade crossings, public and private, for the last five years.

Calendar Year	Pedestrian Grade Crossing Incidents	Pedestrian Grade Crossing Fatalities	Total Grade Crossing Fatalities	Pedestrian Fatalities as Percent of Total
2001	92	67	421	16%
2002	71	35	357	10%
2003	85	50	334	15%
2004	111	73	372	20%
2005	116	58	358	16%

Source: Federal Railroad Administration Safetydata website, "Highway-rail Incidents by Type Highway User from Form FRA F 6180.57" for the years 2001 through 2005.

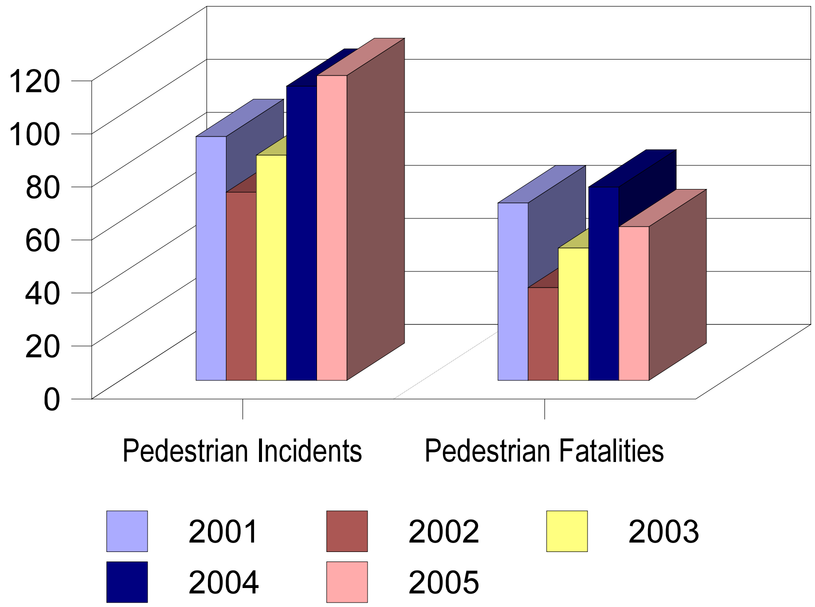
In this table, an "incident" is considered to be any impact between a railroad user and a pedestrian at a designated crossing site, including walkways, sidewalks, and the like, that are associated with the crossing.

As the charts that follow indicate, the trends for pedestrian incidents, fatalities, and percent of total fatalities have not followed the general downward trend of all grade crossing fatalities during the past five years.

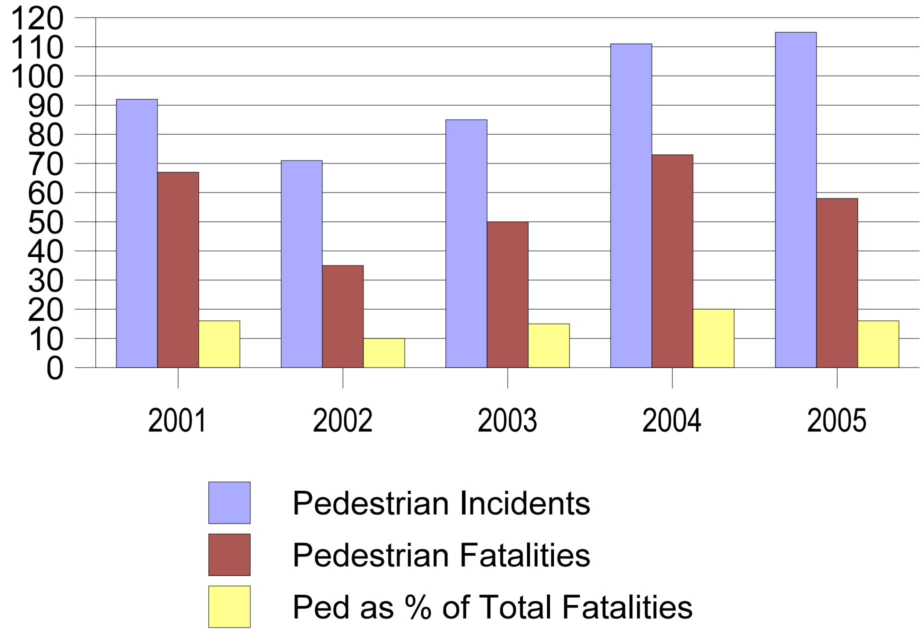
The problem of pedestrian safety at grade crossings is made more difficult to address by the lack of knowledge about the type of devices in use that are directed at pedestrians at grade crossings.

This compilation of currently in-place warning devices will enhance the general understanding of how various safety devices are being employed to enhance pedestrian safety at grade crossings.

Pedestrian Incidents and Fatalities, 2001 - 2005



Yearly Pedestrian Involvement, 2001 - 2005



Source: Federal Railroad Administration Safetydata website, "Highway-rail Incidents by Type Highway User from Form FRA F 6180.57" for the years 2001 through 2005.

EDUCATION, OUTREACH AND ENFORCEMENT ARE ESSENTIAL TO SOLVING THE PROBLEM

Obviously, the best safety devices in the world cannot overcome poor judgement. Examples such as illustrated here indicate the high value of law enforcement when coupled with safety outreach and education programs aimed at high-risk groups. At the same time, it is important for localities to work with railroads and transit operators to reduce excessive blocking of high-use crossings that are on known pedestrian routes, such as in college or university settings, or on access routes to sports facilities or fairgrounds.

It has been widely observed that pedestrians often tend to determine for themselves the shortest distance between where they are and where they want to go, and then proceed along that line, sometimes irrespective of paved pathways, sidewalks, or trails.

In light of this, a guiding principle in the design and development of pedestrian crossing facilities should be to cause as little deviation as is practical from a direct pathway.

Traffic control devices in use at pedestrian crossings can be generally placed in two categories, Active or Passive. This classification is the same for warning devices used at all public highway-rail grade crossings.

Active devices are those devices that change their appearance or position upon receipt of a signal that a train is approaching, usually from some type of train detection system. In this manner, a warning signal, usually in the form of flashing lights and an audible warning such as a bell, is presented to pedestrians approaching the crossing. Sometimes, a gate may be lowered into the pedestrian traveled way as an additional form of warning. While their use is widely accepted at highway-rail grade crossings, there is increasing debate about the effectiveness of ped gates as commonly used on sidewalks and other walkways, given the ease of evasion of a lowered ped gate.

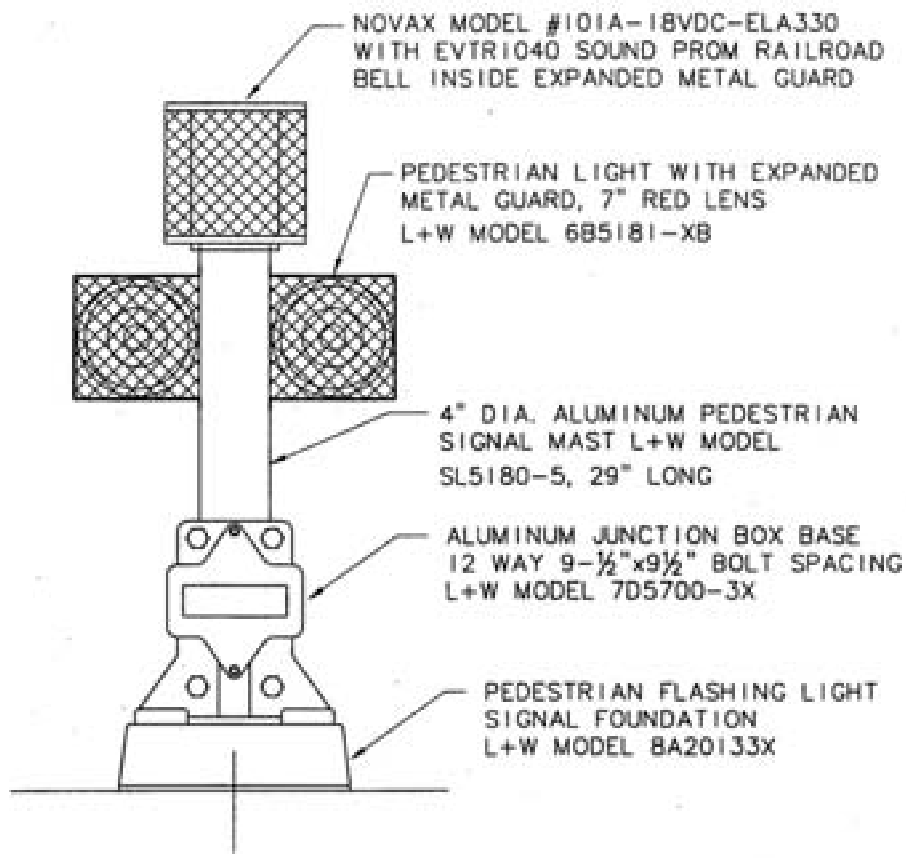
Passive devices do not change their appearance or position. The most common of these is the familiar crossbuck sign.

ACTIVE WARNING DEVICES FOR PEDESTRIANS AT GRADE CROSSINGS

Light rail transit systems often include pedestrian grade crossings. As a result, they are also the greatest source for warning devices aimed at pedestrians. Some examples are discussed here. This low-rise flashing pedestrian signal is in use on the Portland, OR, light rail transit system. This device was studied locally, and was found effective (in conjunction with the fencing used as a pedestrian channelization improvement) based upon before and after data.

The intended pathway for pedestrians in this situation is clearly defined. A design drawing for this device, developed by Tri-Met, the light rail system in Portland, Oregon, is included on the next page.

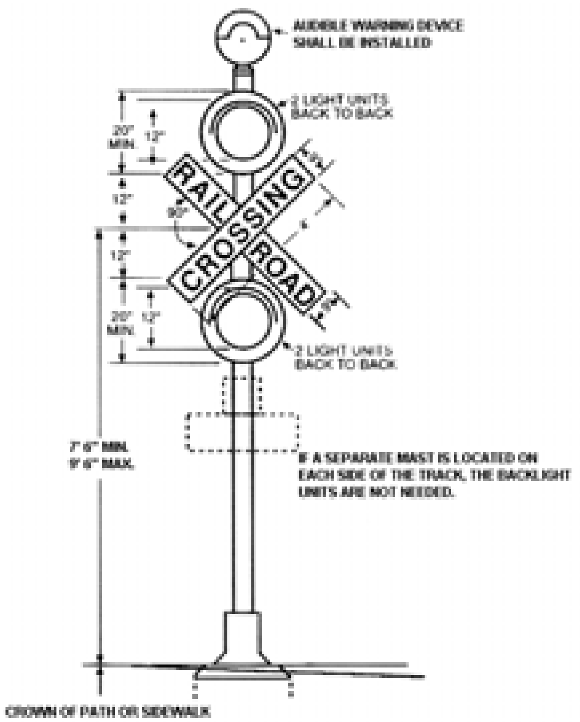
FIGURE 15.6.5L AUDIBLE/VISUAL WARNING GATED CROSSING



TRI-MET	CAPITAL PROJECTS AND FACILITIES DIVISION 710 N.E. HOLLADAY STREET PORTLAND, OREGON 97232		STANDARD DETAIL AUDIBLE/VISUAL WARNING GATED CROSSING	
DRAWN BAL	DESIGN DI	CHECKED DI	APPROVED DI	DATE 10/21/99
SCALE	FILE NAME STD-26		CONTRACT NO	SHEET NO 1506.5L

STANDARD NO. 2P

MULTI-USE PATH FLASHING LIGHT SIGNAL

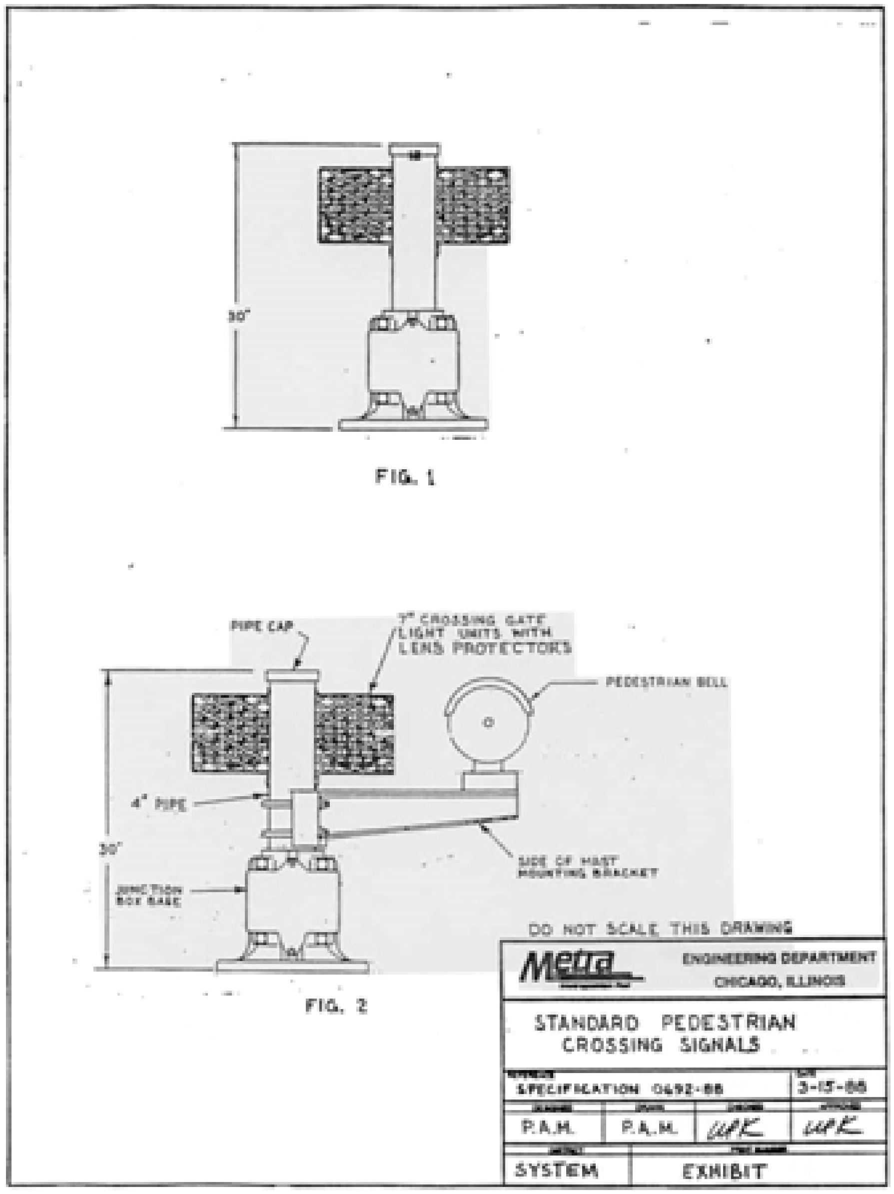


OAR 741-110-0030(3)(c)
OAR 741-110-0040(4)

FIGURE 9

The State of Oregon has developed a pedestrian signal that has been used at stand-alone, “multi use” crossings. It is similar to a standard flashing light signal except the lights are oriented in a vertical line, rather than the more commonly seen horizontal alignment. One of Oregon’s most recent installations of these devices is shown in the photo above, at a new pathway grade crossing in Tualatin, OR. The railroad is the Washington County Commuter Rail line between Beaverton and Wilsonville. Commuter rail service is anticipated to be underway within the next couple of years.

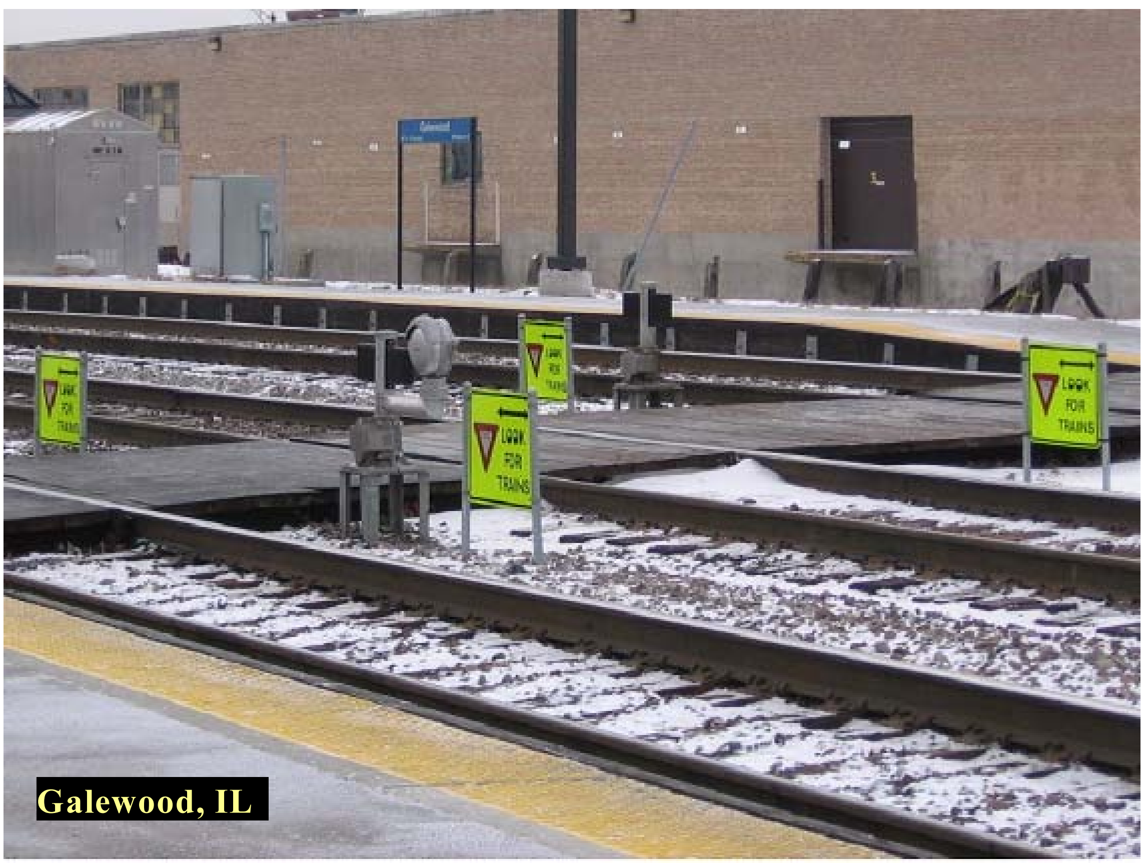
Oregon also routes any pedestrian facility 5' behind any crossing gate arm assembly to account for the position of the gate arm counterweight when the gate is horizontal. Additionally, Oregon has expressed interest in the use of some sort of train-activated, in-pavement flashing lights at high profile, high traffic pedestrian locations. To date, there have been none installed in Oregon. Such a train-activated device will likely involve coordination with the railroad involved, given the need to establish (or interface with) a train detection system for device activation.



Metra, one of the commuter railroads in the Chicago area, has developed the standard drawing shown here for two of its pedestrian warning devices, intended for use mainly in station areas. Illustrations of this and other similar devices are shown on the following pages.

This is Lombard, IL, on Metra's UP District West Line to Elburn.

This is a warning sign that the Illinois Commerce Commission, in cooperation with the Northeast Illinois Regional Commuter Rail Corporation (Metra), is currently field testing at four locations on Metra's Milwaukee West commuter line: Mont Clare, Galewood, Mars, and River Grove.



Glenview, IL

LaGrange, IL

ABOVE: Glenview, IL, on Metra's Milwaukee District North Line, has established a $250 fine for any pedestrian who violates railroad warning devices. Warning devices include both a bell and flashing light signals.

LEFT: This signing is in place at LaGrange Road Metra station. The numerous pedestrian crossings in this area make tougher sanctions necessary to prevent tragedies.

Stone Avenue Metra station (ABOVE) in LaGrange, IL features these pedestrian warning devices between inbound and outbound platforms. Short gate arms (BELOW) are used at the LaGrange Road station.

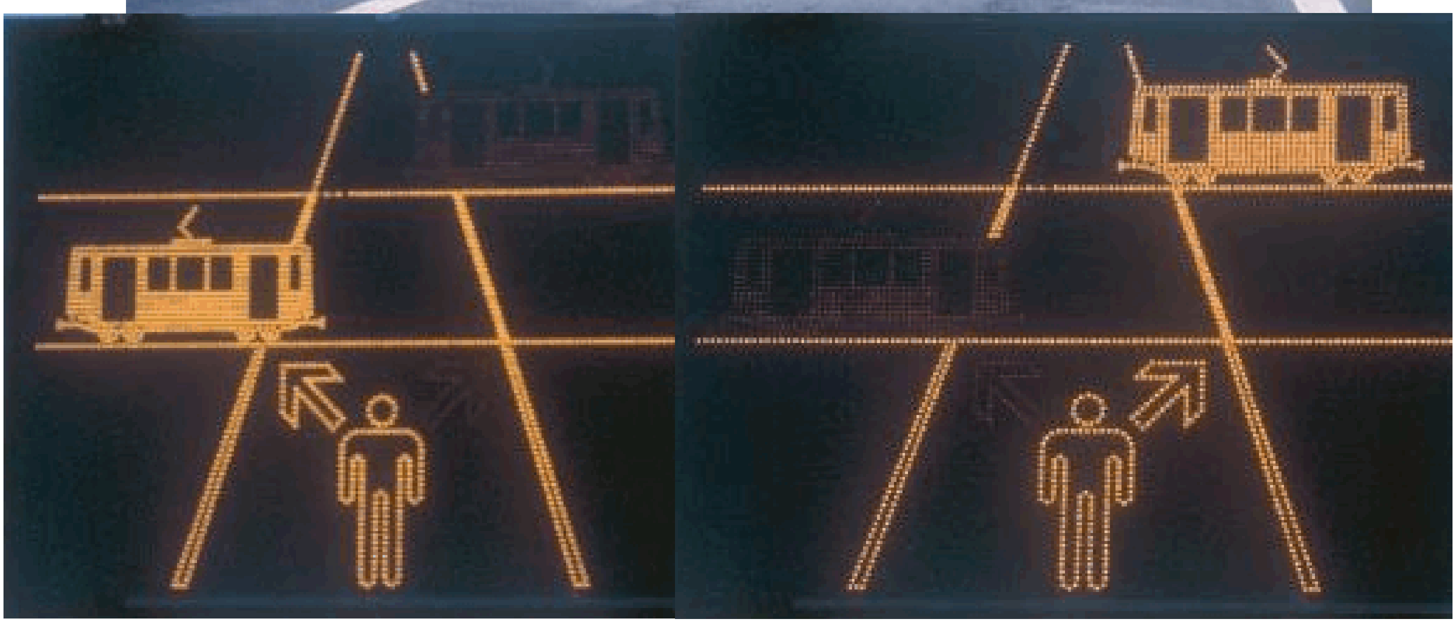
LEFT: In Henderson, Nevada, along Horizon Drive, both the bike lane and the sidewalk are included in the same crossing. With the warning device assembly located behind the sidewalk, a single gate arm serves pedestrians, bicyclists and motor vehicle traffic. The crossing surface is continuous across the tracks to the other side, delineating the safe crossing path for pedestrians.

RIGHT: In Utah, Salt Lake City's UTA TRAX light rail system is evaluating the effectiveness of specialized warning signs for pedestrians. Below is a safety treatment that they installed at one crossing, which is close to a middle school and other sources of pedestrian traffic. Light rail trains run at 55mph over this crossing, so this was felt to be a good test site for these devices intended to provide additional safety awareness to pedestrians. Notice the small sign placed on the crossing gate counterweight.

USING DEVICES TO FOCUS ATTENTION

The use of channelizing devices can help encourage some of the desired behavior in pedestrians when they attempt to cross the tracks. In the case shown above, the use of "swing gates" at this light rail transit station serves to focus the eyes of the pedestrian in the direction from which a train on the near track would be entering the station. This has reduced incidents related to passenger inattention to trains in the station area.

In order to operate the gate, and enter the station, the user must turn in the direction of oncoming train traffic, and then stop to open the gate. This can reduce sudden, inattentive "dart outs" into the path of an oncoming LRT train. In addition, signing is used on each gate : PULL TO OPEN, LOOK BOTH WAYS, along with a large Watch For Trains sign posted in clear view.



SECOND TRAIN COMING ISSUES FOR PEDESTRIANS

An innovative Second Train Coming warning sign at a transit station stop is in use at the Vernon Avenue stop on the Los Angeles Metro Blue Line. The sign features a unique series of picture images intended to remind pedestrians to look in both directions, on both tracks, for approaching trains. This sign was originally designed and installed at Vernon Avenue as a demonstration project funded by the Federal Transit Administration (FTA), under the Transit Cooperative Research Program. The project evaluated the use of a train-activated device to give pedestrians additional warning of the potential for two trains to enter the crossing at the same time.

The Vernon Avenue crossing was selected because it had one of the highest collision counts of any crossing in the system. The crossing has two Blue Line light rail transit tracks adjacent to two Union Pacific general system freight railroad tracks. The entrance to the adjacent Vernon Avenue station is on the crossing, between the two Blue Line tracks.

The effectiveness of the new sign was evaluated by a "before and after" study, along with a survey of pedestrians at the crossing. The intent of the survey was to ascertain pedestrian awareness of the new sign, and to determine the level of understanding of the sign's display.

The sign was found to successfully reduce the frequency of risky behaviors at the Vernon Avenue crossing. The pedestrian survey revealed that over three-quarters (77%) of the 556 people interviewed said that they recalled seeing the new sign.

At the same time, not many of them (4%) actually related its display to the presence of two trains at the crossing at the same time. It should be noted, however, that the overwhelming majority of those asked said that they understood that the sign's display was meant to indicate danger.

The sign has recently had its operation modified so as to illuminate upon the approach of even a single train on any track. It is believed that this will lead to better and more careful observation of the crossing and tracks by pedestrians as they approach the Vernon Avenue crossing and adjacent passenger station.

The California Public Utilities Commission (CA PUC) is a state agency that regulates privately owned utility companies as well as railroads and rail transit within the state. The CA PUC has worked extensively on enhancing safety at pedestrian crossings within the state. They have developed several devices and strategies that focus on channelizing pedestrian flows to safe crossing areas, and then guiding pedestrians across the tracks.

RIGHT: The "zigzag" or "Z-Gate" crossing is a good example of channelization that also can improve pedestrians' observation of any approaching trains as they traverse the crossing approaches. Pedestrians are forced to look in the direction of oncoming trains as they make the turns approaching the crossing. While this type of crossing does increase the distance that pedestrians have to travel, sturdy fencing provides good compliance.

LEFT: As these two examples show, many different types of fencing can be effective as a channelization device. Fencing should be substantial enough to command respect, and provide positive guidance along the desired travel pathway. But at the same time, fencing is an element of the visual environment, and must be reasonably pleasing to the eye.

Fencing does add a fair amount of maintenance responsibility, as fences are prime targets for graffiti and vandalism. Agencies that plan on using fencing extensively need to plan on performing regular maintenance on their runs of fencing, in order to maintain effective channelization as well as a pleasing appearance to the area.

THINGS TO WATCH OUT FOR IN PLANNING AND DESIGN Notice the very close clearances between the lowered gate arm, the pedestrian refuge area, and the Light Rail Transit (LRT) track. This must be a very unsettling place for pedestrians to stand and wait to cross, whether or not the gate arms are lowered.

Light rail systems that are the remnants of streetcar networks constructed in the early 20th century often feature a higher frequency of pedestrian and street crossings. Many of these systems retain crossings with restricted sight distances due to the development that has taken place around the transit line. In this photo, there are railroad wayside signal cabinets adjacent to the sidewalk approaching the light rail station, as well as the controllers for the grade crossing system. For pedestrians walking downhill toward the station, sight distances to the right are extremely limited. This makes the pedestrians very dependent upon the crossing warning devices for notice of an approaching train.

SPECIALIZED SOLUTION - TRAIN OPERATION ACCOMMODATES PEDESTRIANS

In rare circumstances within a station, a transit system may elect to have a safety stop for all outbound vehicles. This stop is used to allow passengers to cross over to the inbound platform, which only has access from this side.

SOME STATE-LEVEL INVESTIGATIONS OF PEDESTRIAN SAFETY ISSUES AT GRADE CROSSINGS

The **Illinois Commerce Commission** performed a study of pedestrian safety issues at grade crossings in northeastern Illinois. At crossings that provided pedestrian access, the adequacy of the warning devices in use was investigated. In addition, each crossing was reviewed with the objective of finding any further safety enhancements that might be employed.

The effectiveness of pedestrian warning devices currently in use was analyzed by means of looking at 39 incidents involving pedestrians struck by trains in northeastern Illinois between 2000 and 2004.

For the purposes of the study, pedestrians, bicyclists and other types of non-motorized road users were all considered to be pedestrians. The 39 pedestrian-train collisions that were included in the study resulted in 25 fatalities and 14 injuries.

With the available data and incident reports, 33 of the 39 collisions were more closely analyzed; of the 33 pedestrian-train collisions, 66 percent were likely caused by pedestrians disregarding or ignoring the pedestrian warning devices (as well as the adjacent highway warning devices).

The conclusions drawn from the study procedure were (*taken from the ICC report*):

1 Sixty-six percent (22 of 33) of these pedestrian-train collisions appear to have been caused by the pedestrian disregarding the warning devices provided that indicated a train was approaching; many of these crossings were equipped with pedestrian gates.

2 Twenty-one percent (8 of 39) of the pedestrian-train collisions occurred at Metra station crosswalks that comprised only ten percent of all grade crossings in northeastern Illinois. This is most likely due to the high volume of pedestrians exposed to train traffic at the Metra station crosswalks.

3 The severity of train-pedestrian collisions is extreme. In northeastern Illinois between 2000 and 2004, 64 percent (25 of 39) of train-pedestrian collisions resulted in a fatal injury to the pedestrian. This represents one of the highest severity rates of all transportation related incidents.

4 Additional research is necessary to address the effectiveness of pedestrian safety measures at rail grade crossings.

5 Pedestrian warning devices, including pedestrian gates, are commonly ignored and easy to circumvent.

Based upon these observations, the ICC made the following recommendations:

Recommendation 1 – Consideration should be given to initiate the research and development of new types of pedestrian warning systems that improve pedestrian behavior when warning of an approaching train is provided. In addition, consideration should be given to installing warning signs at Metra station crosswalks and other pedestrian-rail crossings with similar pedestrian-train exposure rates, where feasible.

Recommendation 2 – Expand efforts of Illinois Operation Lifesaver (OL) to educate the public as to how to safely traverse highway rail grade crossings, as well as to the individual's responsibility related to crossing safety. For example, increasing the number of OL presentations in areas where reports indicate patterns of pedestrian violations and also targeting those areas with additional rail crossing safety public service announcements. In addition, continue Illinois Operation Lifesaver's work with local law enforcement through cooperative efforts, such as the Commission's Public Education and Enforcement Research Study (PEERS).

The **Nevada Department of Transportation** has established the following standards for pedestrian and bicyclist grade crossings:

- Grade crossing design features follow all standards in the MUTCD, AASHTO Greenbook, FHWA Guidance on Traffic Control Devices at Highway-Rail Grade Crossings (Technical Working Group document), and FHWA Designing Sidewalks and trails for Access Part II.

- All signals are to be set behind the sidewalk, to provide the same level of warning for pedestrians as motor vehicles. If this cannot be done, add pedestrian gates.

- Crossing surface panels must be at least one foot wider than the sidewalk or edge or roadway, if there is no sidewalk.

- There must be a level turn-around area (for wheelchair users) next to the rail that is five feet by five feet wide, on both sides of the track. The sidewalk slope can not increase more than 1 in 12 after that.

- The walkways can be no less than 36" wide but Nevada encourages the use of walkways that are six feet wide.

- With signals set in back of the sidewalks, Nevada has found that they do not run into conflicts with the ADA prohibition of protrusions over the walkway.

- “RxR” pavement markings are applied in bicycle lanes and W10-1 Advance Warning signs are placed next to the pavement markings. This is in addition to the W10-1 signs placed further back for motorists.

Nevada DOT has not constructed any new pedestrian-only crossings in the last fifteen years or so, but they have used these standards in the last two years, while performing diagnostic reviews for some possible pedestrian crossings.

The NV DOT diagnostic review forms were very helpful and focused everyone on the issues. The potential crossing areas turned out to be very unacceptable for pedestrian access, when viewed through the lens of the above manuals and standards.

Nevada’s Diagnostic Review form for pedestrian / bicyclist crossings is included as Appendix A.

POINTS TO CONSIDER DURING DEVICE SELECTION

The selection of a traffic control device for use where pedestrians are intended to cross railroad tracks at grade should be the result of an engineering study whose simplicity or complexity will be determined by conditions at the crossing in question. In general, the factors to be examined during device selection should include the following:

- Collision experience, if any, at the crossing, as it involves pedestrians.
- Pedestrian volumes and peak flows, if any.
- Train speeds, numbers of trains, and railroad traffic patterns, if any.
- Sight distance that is available to pedestrians approaching the crossing.
- Skew angle, if any, of the crossing relative to the railroad tracks.

CONCLUSIONS

Based upon the information received during this compilation effort, it can be seen that effective devices are a necessary complement to law enforcement initiatives and public outreach and education efforts in the enhancement of pedestrian safety at grade crossings.

Observations of pedestrian behavior often reveal that many pedestrians do not think of themselves as part of the overall traffic stream, and therefore not really subject to traffic control devices. Their crossing behaviors often indicate an "I'll go when I want to; after all, I'm just walking" attitude that can prove very difficult to overcome. Effective use of channelizing devices that force pedestrians to look and move in certain directions and to cross tracks at certain places can enhance safety at grade crossings by accumulating pedestrian traffic and flowing that traffic through a single, well-designed crossing point. Many of the devices depicted in this compilation perform such a function, although often in different ways, and to varying degrees.

Another fact that becomes clear upon reviewing the devices compiled herein is that transit properties and local agencies have been developing their own signs, signals and pavement markings, which are frequently not in compliance with the MUTCD, the established national standard. Such non-standard devices are often not without merit, and may incorporate innovative features. Non-standard devices that have been shown to be effective in more than one geographic area through scientific evaluation studies should be proposed for inclusion in the MUTCD, as outlined in Section 1A.10 of the Manual. Inclusion in the Manual makes effective and innovative devices available for use by the wider community of transportation and engineering professionals, and can enhance safety for more of the population.

APPENDIX A

STATE OF NEVADA DEPARTMENT OF TRANSPORTATION
RAILROAD SAFETY DIAGNOSTIC REVIEW FORM
PATHS WITHOUT MOTOR VEHICLES

TEAM MEMBER:	AGENCY:	REVIEW DATE:

CROSSING DATA	**PATH DATA**
DOT Number:	Location:
[redacted]	Type of Path Use: ☐ Shared ☐ Bike ☐ Pedestrian
Railroad Milepost:	Bike/Trail Route/System ☐ Yes ☐ No
[redacted]	Pedestrian AADT:
Track Class:	Bicycle AADT:
[redacted]	Bicycle Speed:
Number of Trains: Passenger ______ Freight ______	Other Crossing Users:
[redacted]	User Destinations:
| Injury	Path Owner:
[redacted]	Level of Service: (A – F)
Principal Rail Line: ☐Yes ☐ No	

TYPE OF EXISTING OR PROPOSED WARNING DEVICES

Automatic Gates:	2-Quad ☐ | 4-Quad ☐	Median ☐	LOOK Signs:	☐ Yes	☐ No
[redacted]			STOP Signs:	☐ Yes	☐ No
Bells:	Gong ☐	Electronic ☐	Emergency Notification	☐ Yes	☐ No
[redacted]			Access Control Devices - List	☐ Yes	☐ No
Multi Track Sign: 2-Track ☐ 3-Track ☐ 4-Track ☐ 6-Track ☐			Lighting:	☐ Yes	☐ No
[redacted]			Swing Gates	☐ Yes	☐ No
Pavement Markings: Stop Bars ☐ RxR ☐ Lane Lines ☐ Dynamic Envelope ☐ Other ☐					
List Other Devices & Condition of Devices:					

PATH SECTION

Development Type: Residential ☐ Industrial ☐ Commercial ☐ Open Space ☐ Institutional ☐		
Are the advance warning signs in good condition?	☐ yes	☐ No
Path width _________' Number of Travel Lanes __ Is Path Wide Enough (shared = 10' + 2' edges)?	☐ Yes	☐ No
Is there adequate capacity?	☐ Yes	☐ No
Does the path have a 2% cross slope?	☐ Yes	☐ No
Is the person's attention being diverted?	☐ Yes	☐ No
Is there an adequate landing platform (10' clear+ decision/reaction on table+ tracks+ 15' between track)?	☐ Yes	☐ No
If the approach is inadequate, can it be adjusted?	☐ Yes	☐ No
Is there an adequate edge	☐ Yes	☐ No
Is there adequate drainage? List drainage present: Size: Location:	☐ Yes	☐ No
Do culverts, drop inlets, etc. need to be adjusted?		
Utilities adjustment needed? Overhead Lines ☐ Buried Lines ☐ Gas Vent Riser ☐	☐ Yes	☐ No
Are there adequate maintenance procedures, funds & RR agreements for path & crossing, including	☐ Yes	☐ No
Are there informational signs for non-standard path conditions, such as grades?	☐ Yes	☐ No

RAILROAD SECTION

Is the track on a curve? Degree of curve: ___° Super elevation: ___ " Cross level: ___%	☐ Yes	☐ No
Are active warning devices needed? Type of circuitry: AC-DC ☐ CWT ☐ MS ☐	☐ Yes	☐ No
Is there adequate warning time from the railroad signals? Need 2.8 seconds per foot to cross + warning.	☐ Yes	☐ No
Can multiple tracks be removed?	☐ Yes	☐ No
Are gates warranted? Standard ☐ Barrier ☐ Swing ☐	☐ Yes	☐ No
Does the track height need to be adjusted?	☐ Yes	☐ No
Is the surface smooth?	☐ Yes	☐ No
Is surface rehabilitation required to facilitate signal installation?	☐ Yes	☐ No

ADA

Are there curb cuts at nearby intersections and a clear path present to curb cuts at nearby intersections?	☐ Yes	☐ No
Are detectable warnings advised?	☐ Yes	☐ No
Is the path width adequate (36" is minimum)?	☐ Yes	☐ No
Are there vertical obstructions (standard: none between 27" to 80" above ground or within path)?	☐ Yes	☐ No
Slope of path transition (standard is 12:1 or less).	☐ Yes	☐ No
Landing platform (standard is level and 5' x 5' or more).	☐ Yes	☐ No
Is surface smooth (standard: passable by a wheelchair, no broken or buckled asphalt, edges < ¼")?	☐ Yes	☐ No
Panel length (crossing surface panel needs to extend 1' behind back of path to be standard).	☐ Yes	☐ No
Are there flange gaps 2½", or less, or flange fillers?	☐ Yes	☐ No
Can full flange fillers be used in low speed applications?	☐ Yes	☐ No
Is grade 5% or less? If grade is over 5%, how long is grade? '	☐ Yes	☐ No
If grade is 8% and 200', 10% and 30' or 12.5% and 10', are there rest areas?	☐ Yes	☐ No
Are there 43" handrails for grades over 5%?	☐ Yes	☐ No
Is widening proposed? How wide? '. When? Consider in project?	☐ Yes	☐ No
Mitigation:		

AWARENESS OF XING

Overall awareness of railroad crossing, including visibility and effectiveness of possible signs, signals and markings.	☐ Acceptable	
Horizontal and vertical alignment considerations.	☐ Acceptable	
Pedestrian Sight Distance: Clearing sight distance of_________' from 17' from rail needed. North/East Side of Xing _________' South/West Side of Xing _________'	☐ Acceptable	
Bicycle Sight Distance 1: *Distance where crossing can be identified.* North/East Side of Xing _________ feet South/West Side of Xing _________ feet	☐ Acceptable	
Bicycle Sight Distance 2: *Need ______' down tracks from ______' down path.* North/East Side Looking East/North ______' West/South ______' South/West Side Looking East/North ______' West/South ______'	☐ Acceptable ☐ Recommend Improvement	
Bicycle Sight Distance 3: *Distance down path to see ______' down tracks if #2 not acceptable.* North/East Side Looking East/North ______' West/South ______' South/West Side Looking East/North ______' West/South ______'	☐ Acceptable ☐ Recommend Improvement	
Bicycle Sight Distance 4: Stopped *17' from rail, need ______' down tracks.* North/East Side Looking East/North _____' West/South _______' South/West Side Looking East/North ______' West/South ______'	☐ Acceptable ☐ Recommend Improvement	
Nighttime visibility, including ambient lighting.	☐ Acceptable	
Skew of Xing: ____° Does skew limit perception?	☐ Yes	☐ No
Are there simultaneous train movements on multiple tracks? Can standing boxcars block the view?	☐ Yes	☐ No ☐
Do Pedestrians and bicycles violate warning devices?	☐ Yes	☐ No
Mitigation of inadequate perception: ☐ Additional Signage ☐ Luminaires & Where ☐ Multiple Track Removal		

STOP AND YIELD SIGNS

THE FOLLOWING CONSIDERATIONS MUST BE MET IN EVERY CASE WHERE A STOP SIGN IS INSTALLED		
STOP or YIELD signs may be used by path authority if there are two or more TADT and xing is **passive**.	☐ Yes	☐ No
Are law enforcement & judiciary committed to enforcement equal to road intersections with STOP signs?	☐ Yes	☐ No
Would installation of STOP sign create a more dangerous situation than would exist with YIELD sign?	☐ Yes	☐ No

ANY OF THE FOLLOWING CONDITIONS INDICATE THAT A STOP SIGN MIGHT REDUCE RISK AT A CROSSING		
Maximum train speeds equal, or exceed, 30 mph.	☐ Yes	☐ No
Train movements are 10 or more per day, five or more days per week.	☐ Yes	☐ No
The rail line is regularly used to transport a significant quantity of hazardous materials.	☐ Yes	☐ No
The path crosses two or more tracks, particularly where both tracks are main tracks or one track is a passing siding that is frequently used.	☐ Yes	☐ No
The angle of approach to the crossing is skewed.	☐ Yes	☐ No

The line of sight from an approaching path user to an approaching train is restricted such that approaching path traffic is required to substantially reduce speed.	☐ Yes	☐ No

THE FOLLOWING CONSIDERATIONS SHOULD BE WEIGHED AGAINST PLACING STOP SIGNS		
There are active warning devices.	☐ Yes	☐ No
STOP sign would cause queuing onto nearby road.	☐ Yes	☐ No
The path is other than secondary in character.	☐ Yes	☐ No
The path is a steep ascending grade to or through the crossing, sight distance in both directions is unrestricted in relation to maximum closing speed, and bicycles or wheelchairs use the crossing.	☐ Yes	☐ No

REVIEW FOR AUTOMATIC GATES

ACTIVE DEVICES WITH AUTOMATIC GATES SHOULD BE CONSIDERED AT CROSSINGS WHENEVER AN ENGINEERING STUDY BY A DIAGNOSTIC TEAM DETERMINES ONE OR MORE OF THE FOLLOWING CONDITIONS EXISTS		
If inadequate sight distance exists in one or more quadrants and ALL of the following are 'Yes':	☐ Yes	☐ No
a. Is it physically or economically unfeasible to correct the sight distance deficiency?	☐ Yes	☐ No
b. Is no acceptable alternate access available? If access exists, then close the crossing.	☐ Yes	☐ No
c. On a life cycle cost basis, would the cost of providing acceptable alternate access or grade separation exceed the cost of installing active devices with gates?	☐ Yes	☐ No
Is the crossing in near schools, industries or commercial areas where there is higher than normal usage.	☐ Yes	☐ No
Are there multiple main or running tracks through the crossing?	☐ Yes	☐ No
Does the expected accident frequency (EAF) for active devices without gates exceed 0.1?	☐ Yes	☐ No
Is there queuing across the tracks from a nearby intersection?	☐ Yes	☐ No
Does the diagnostic team have other reasons?	☐ Yes	☐ No

OPTIONAL USE OF AUTOMATIC GATES

ACTIVE DEVICES WITH AUTOMATIC GATES SHOULD BE CONSIDERED *AS AN OPTION* WHEN THEY CAN BE JUSTIFIED ECONOMICALLY AND WHEN ONE OR MORE OF THE FOLLOWING CONDITIONS EXISTS		
Do multiple tracks exist?	☐ Yes	☐ No
Are there 20 or more trains per day?	☐ Yes	☐ No
Does the posted path speed exceed 40 mph in urban areas, or exceed 55 mph in rural areas?	☐ Yes	☐ No
Does the AADT exceed 2,000 in urban areas, or exceed 500 in rural areas?	☐ Yes	☐ No
Are there multiple lanes of traffic in the same direction of travel?	☐ Yes	☐ No
Does the product of the number of trains per day & AADT exceed 5000 urban, or 4000 rural?	☐ Yes	☐ No
Has an engineering study indicated the absence of active devices would result in the path facility performing at a level of service below Level C?	☐ Yes	☐ No
Does the expected accident frequency (EAF) exceed 0.075?	☐ Yes	☐ No
Is this a new project or are the current active devices being replaced?	☐ Yes	☐ No
Does the diagnostic team have other reasons?	☐ Yes	☐ No

CANTILEVER FLASHING LIGHTS

Two or more lanes the same direction.	☐ Yes	☐ No
High speed paths regardless of number of lanes.	☐ Yes	☐ No
Objects on the side of the path can obstruct the visibility of mast mounted flashing lights.	☐ Yes	☐ No
Horizontal or vertical curves or other topographical features obstruct the mast mounted flashing lights.	☐ Yes	☐ No

WARNING/BARRIER GATE SYSTEM

Crossing with high-speed trains.	☐ Yes	☐ No
Crossing in quiet zones.	☐ Yes	☐ No
As otherwise deemed necessary by the diagnostic review team.	☐ Yes	☐ No

PEDESTRIAN TREATMENTS

Can devices be designed to avoid stranding pedestrians between sets of tracks?	☐ Yes	☐ No
Can audible devices be added if determined necessary?	☐ Yes	☐ No
Would swing gates operate safely for disabled individuals?	☐ Yes	☐ No
Are skirted gates or other warning devices needed?	☐ Yes	☐ No
Can crossing controls/delays be used near stations?	☐ Yes	☐ No
Are added pedestrian signs needed?	☐ Yes	☐ No
List pedestrian signs needed:		
Notes:		

CLOSURE

CROSSING SHOULD BE CONSIDERED FOR CLOSURE WHEN ONE OR MORE OF THE FOLLOWING APPLY		
Does the crossing have nearby acceptable alternate bicycle and pedestrian access?	☐ Yes	☐ No
On a life cycle cost basis, would improvement exceed cost of providing acceptable alternate access?	☐ Yes	☐ No
If an engineering study determined any of the following.		
a. FRA Class 1,2, or 3 track with daily train movements		
1. AADT less than 500 in urban areas, acceptable alternate access within ¼ mile, and the median trip length would not increase by more than ½ mile.	☐ Yes	☐ No
2. AADT less than 50 in rural areas, acceptable alternate access within ½ mile, and the median trip length would not increase by more than 1½ miles.	☐ Yes	☐ No
b. FRA Class 4 or 5 track with active rail traffic.		
1. AADT less than 1,000 in urban areas, acceptable alternate access within ¼ mile and the	☐ Yes	☐ No
2. AADT less than 100 in rural areas, acceptable alternate access within 1 mile, and the trip	☐ Yes	☐ No
c. FRA Class 6 or higher track with active rail traffic.		
AADT less than 250 in rural areas, acceptable alternate access within 1½ miles, and the median trip length would not increase by more than 4 miles.	☐ Yes	☐ No
Does an engineering study determines the crossing should be closed because railroad operations will occupy or block the crossing for extended periods of time on a routine basis and it is not physically or economically feasible to grade separate or shift train operations to another location. Such locations would typically include the following areas:	☐ Yes ☐ No	
a. Rail yards		
b. Passing tracks primarily used for holding trains while waiting to meet or be passed by other trains		
c. Locations where train crews are routinely required to stop trains because of cross traffic on intersecting lines, or switch cars		
d. Switching leads at the ends of classification yards		
e. Where trains are required to “double” in or out of yards and terminals		
f. In the proximity of stations where long distance passenger trains are required to make extended stops to transfer baggage		
g. Locations where trains must stop or wait for crew changes		

GRADE SEPARATION

CROSSING SHOULD BE CONSIDERED FOR GRADE SEPARATION WHEN ONE OR MORE OF THE FOLLOWING APPLY		
Is the path designed to have full control access?	☐ Yes	☐ No
Does the AADT exceed 100,000 in urban areas or 50,000 in rural areas?	☐ Yes	☐ No
Is the maximum authorized train speed over 110 mph?	☐ Yes	☐ No
Is there an average of 150 or more trains per day or 300 million gross tons per year?	☐ Yes	☐ No
Is there an average of 75 or more passenger trains per day in urban areas or 30 or more in rural?	☐ Yes	☐ No
Crossing exposure (product of trains per day & AADT) exceeds 1,000,000 in urban, 250,000 rural.	☐ Yes	☐ No
The expected accident frequency (EAF) for active devices exceeds 0.5?	☐ Yes	☐ No
Path user delays exceed 40 vehicle hours per day?	☐ Yes	☐ No

CROSSING SHOULD BE CONSIDERED FOR GRADE SEPARATION WHEN ONE OR MORE OF THE FOLLOWING APPLY AND THE LIFE CYCLE COSTS CAN BE FULLY ALLOCATED		
Is the path designed to have partial control access?	☐ Yes	☐ No
Does the path posted speed exceed 55 mph?	☐ Yes	☐ No
Does the AADT exceed 50,000 in urban areas or 25,000 in rural areas?	☐ Yes	☐ No
Is the maximum authorized train speed over 100 mph?	☐ Yes	☐ No
Is there an average of 75 or more trains per day or 150 million gross tons per year?	☐ Yes	☐ No

Is there an average of 50 or more passenger trains per day in urban areas or 12 or more in rural?	☐ Yes	☐ No
Crossing exposure (product of trains per day & AADT) exceeds 500,000 in urban, 125,000 rural?	☐ Yes	☐ No
The expected accident frequency (EAF) for active devices exceeds 0.2?	☐ Yes	☐ No
Path user delays exceed 30 vehicle hours per day?	☐ Yes	☐ No
Does the engineering study indicate that the absence of a grade separation will result in the path facility	☐ Yes	☐ No

NEW CROSSINGS

PERMITTED AT EXISTING RAILROAD TRACKS AT-GRADE WHEN IT CAN BE DEMONSTRATED ALL FOLLOWING APPLY & NOT ON MAINLINES		
On public paths where there is a clear and compelling need (other than enhancing the value or development potential of the adjoining property).	☐ Yes	☐ No
Grade separation cannot be economically justified (benefit to cost ratio on a fully allocated cost basis is less than 1.0 & the crossing exposure exceeds 50,000 in urban areas & 25,000 in rural areas)	☐ Yes	☐ No
There are no other viable alternatives.	☐ Yes	☐ No

IF A CROSSING IS PERMITTED, THE FOLLOWING CONDITIONS SHOULD APPLY		
The crossing will be equipped with active devices with gates.	☐ Yes	☐ No
The plans and specifications should be subject to the approval of the highway agency having jurisdiction over the path (if other than a State agency), the State DOT or other State agency vested with the authority to approve new crossings, and the operating railroad.	☐ Yes	☐ No
All costs associated with the construction of the new crossing should be borne by the party or parties requesting the new crossing, including providing financially for the ongoing maintenance of the crossing surface and traffic control devices where no crossing closures are included in the project.	☐ Yes	☐ No
Whenever new public path-rail crossings are permitted, they should fully comply with all applicable provisions of the TWG proposed recommended practice, MUTCD, AASHTO, ITE and other standards.	☐ Yes	☐ No
Whenever a new path-rail crossing is constructed, consideration should be given to closing one or more adjacent crossings.	☐ Yes	☐ No

RECOMMENDATION SUMMARY

☐ Closure	☐ Do Not Stop on Tracks Signs (for queuing) R8-8
[redacted]	☐ LOOK Sign R15-8
☐ Crossing Relocation	☐ Bicycle Signs
[redacted]	☐ Additional Signage
☐ Automatic Gates	☐ Pavement Markings (No thermoplastic)
[redacted]	☐ Luminaires
☐ Cantilever Flashing Lights	☐ Crossing Surface Smoothness ¼ ", Width or Rehabilitation
[redacted]	☐ Additional ADA
☐ Bells	☐ Zigzag Approaches
[redacted]	☐ Storage Improvement for Queuing
☐ Active Second Train Coming Sign	☐ Approach & Landing Platform Modification
[redacted]	☐ Detour Signage for Grades
☐ Barrier Gates or Skirted Gates	☐ Parking & Pedestrian Channelization
[redacted]	☐ Railings
☐ Texturing – Detectable	☐ Utility & Culvert Adjustments
[redacted]	☐ Path Surface or Edge
☐ Multi-Track Signs # Tracks _____	☐ Rest Areas on Grades
[redacted]	☐ Fixed Object Removal
☐ STOP Sign R1-1	☐ Maintenance
[redacted]	☐ Other –

RECOMMENDATION DESCRIPTION

PRECONSTRUCTION MITIGATION

What interim measures are needed?

If improvements are needed but will not be done, document reasons.

If no improvement needed, document adequacy of current devices.

TYPE OF PROTECTION DURING CONSTRUCTION

[redacted]	☐ Combination daylight flagging and stop signs.
☐ 24 hour Flagger protection.	☐ Construction of half the crossing at a time with work zone detour.
[redacted]	☐ Temporary signal protection (only under stringent conditions).
☐ Work zone traffic control with lane closures and detours with railroad flagging during working hours.	
☐ Other	

NEVADA PUBLIC UTILITY COMMISSION AUTHORITY REQUIRED

APPLICATION REQUIRED	APPLICATION NOT REQUIRED
☐ New Crossing	☐ Signal Installation, Circuitry improvements, etc.
[redacted]	☐ Surface Improvement, Install Prefab Crossing, etc.
☐ Relocation	☐ Passive Improvement, Signs, Markings, etc.
[redacted]	