INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 16-18
Policy Change

April 18, 2016

TO: **All Design, Operations, and District Personnel, and Consultants**

FROM: ***/s/Kenneth Franklin***
Kenneth Franklin
Director, Utilities and Railroads Division
Capital Program Management

SUBJECT: **Railroad-Highway Crossing Warning Devices**

REVISES: ***Indiana Design Manual*** **(IDM) Section 47-1.05 and Figure 47-1A (added)**

SUPERSEDES: **Design Memo 14-07**

EFFECTIVE: **Immediately**

The Department has established policy and procedures for evaluating railroad-highway grade crossings. The policy is intended to satisfy the requirements of CFR §646.214 and support the goals of the Indiana Strategic Highway Safety Plan. In addition, the policy aims to maintain or improve safety performance at railroad-highway grade crossing statewide and reduce crash risk by upgrading existing devices to a uniform level of warning statewide at all crossings.

The policy establishes the need and type of warning devices to be included in the scope of work when a crossing is located within the limits or near the terminus of a highway project. For the purpose of determining the need for evaluation, the limits include incidental construction and any highway designated for maintenance of traffic. A definition of "near the terminus" has been added to IDM Chapter 47.

The *Policy for Railroad-Highway Grade Crossing Warning Devices* and revised IDM Section 47-1.05 are attachments to this memo. For questions please contact the Utilities and Railroads Division, Doug Gannaway at (317) 232-5050.

KF:ewp

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INDIANA DEPARTMENT OF TRANSPORTATION

Policy for Railroad-Highway Grade Crossing Warning Devices

Kenneth Franklin
Director, Utilities and Railroads Division
Capital Program Management

April 18, 2016

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LIST OF EXHIBITS

Exhibit Title

LIST OF TABLES

Table Title

1.0 POLICY STATEMENT

The Indiana Department of Transportation (INDOT) will evaluate all railroad-highway grade crossings for the need and type of warning devices to be included in the scope of work when the crossing is located within the limits or near the terminus of a highway project. Warning devices as described herein which are deemed necessary by evaluation will be included in the scope of work and must be installed and functioning properly prior to the crossing being open to traffic or accepted by the Federal Highway Administration (FHWA). Exceptions to this policy must be approved by the Utilities and Railroads Division Senior Rail Engineer.

1.01 Purpose

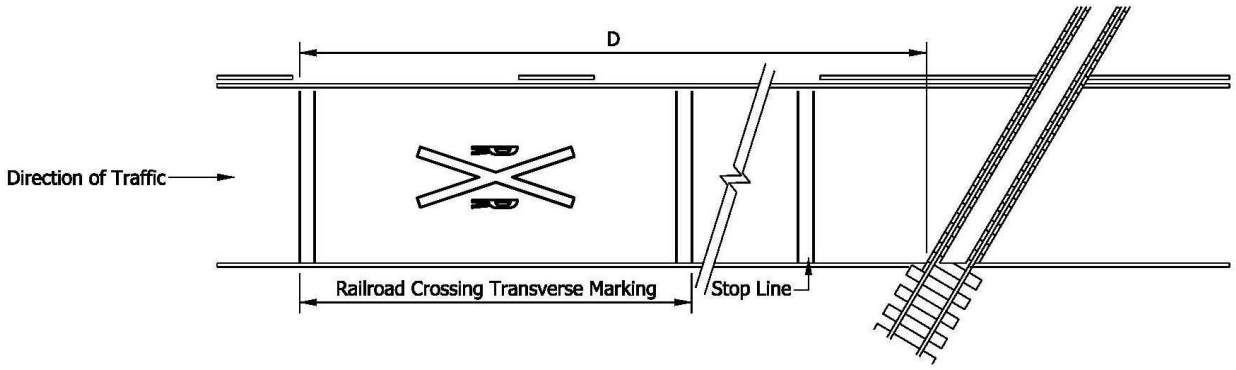
This policy is intended to satisfy the requirements of CFR §646.214 and support the goals of the Indiana Strategic Highway Safety Plan. This policy aims to maintain or improve safety performance at railroad-highway grade crossing statewide and reduce crash risk by upgrading existing devices to a uniform level of warning statewide at all crossings.

The procedures described herein are intended to establish a clear expectation and process to be utilized during the scoping of state and local Federal-aid projects. The procedures will determine the need for and extent of upgrading warning devices.

1.02 Application

The policy and procedures apply to INDOT projects utilizing either State or federal funds and to local projects utilizing federal funds. A project must be evaluated where the railroad-highway grade crossing is within the limits or near the terminus of the project. For the purpose of determining the need for evaluation in accordance with this policy, the limits include incidental construction and any highway designated for maintenance of traffic (MOT). "Near the terminus" is defined in the *Indiana Design Manual* (IDM) and illustrated in Exhibit 1. Rail lines include existing lines, lines to be constructed, and lines that were previously out of service and are now proposed to be re-activated. The policy does not apply to:

1. Railroad crossings located on privately-owned roads.
2. Evaluation of the existing crossing surface or condition.
3. Evaluation of warning devices within the limits of a Federal Railroad Administration (FRA) railroad quiet zone or a FRA 'pre-rule quiet zone'.
4. Crossings where the FRA Track Classification is 6 thru 9 (110 mph and above)
5. Construction of Highway-Railroad Grade Separations.



Controlling Dimension For Determining Crossing Inclusion	
Roadway Design Speed	**D = Distance from nearest rail to controlling pavement marking***
< 35 mph	131 Feet
40 mph	156 Feet
45 mph	206 Feet
50 mph	281 Feet
55 mph	356 Feet
60 mph	431 Feet

* Where the project limits are within the distance D from the nearest rail, the crossing must be included in the project scope.

Example: The design speed is 45 mph and the the project limits are 200 ft from the nearest rail. The crossing must be included in the project scope because 200 ft is less than D (206 ft).

Exhibit 1 Near Terminus

2.0 WARNING DEVICES

The appropriate type of railroad crossing warning improvements in place, or to be installed, at a specific crossing are either active (train-activated) or passive. Warning devices must be in accordance with the current *Indiana Manual of Uniform Traffic Control Devices* (IMUTCD).

2.01 Passive Warning Devices

Passive traffic control devices provide static messages of warning, guidance, and in some instances, mandatory action for the driver. As a minimum, *Indiana Code* requires the installation of cross bucks and a sign indicating the number of tracks at all public railroad-highway grade crossings. Passive railroad warning devices typically include pavement markings and the railroad cross buck. Per the current IMUTCD, a cross buck is defined as an assembly consisting of a post, cross buck, reflectorized striping, and a stop or yield sign. Exhibit 2 shows a typical cross buck installation

Exhibit 2
Cross Buck Installation

Any passive devices retained must be upgraded as described in the IMUTCD. Typically this includes replacing the cross bucks to comply with the current retro-reflectivity standard, adding reflectorized striping to the post, installing a yield or stop sign, and installing or reapplying pavement markings. It is important to note that a stop sign can placed only after an engineering study has been completed. These improvements to passive warning devices shall be included in the project scope.

2.02 Active Warning Devices

Active traffic control warning devices are those that give advance notice of the approach of a train. They are activated by the passage of a train over a detection circuit in the track. These methods are proven to reduce crash risk at railroad-highway grade crossing by making the crossing more visible.

Active or train-activated devices include gates, flashing lights, overhead cantilever, warning bell, and constant warning time (CWT) circuitry. This combination of devices is the minimum acceptable level of active warning. See Table 1, Required Active Warning Devices. Exhibit 3 depicts a modern train activated device installation.

Exhibit 3 Typical Crossing with Active (Train-Activated) Devices

Table 1. Required Active Warning Devices

Existing Protection	Required Active Warning Devices Include
Passive	Flashing Lights, Gates, Overhead Cantilever (FLGOC) with Warning Bell and CWT circuitry
Warning Bell only	
Active Flashing Lights no Warning Bell	
Active Flashing Lights no CWT	
Active Gates with Flashing Lights no Warning Bell	
Active Gates with Flashing Lights no CWT	
Active with Gates, Flashing Lights, and Overhead Cantilever with no CWT	
Active of any configuration with Highway Traffic Signals already Interconnected with Railroad Devices	FLGOC with Warning Bell and CWT circuitry. INDOT District Traffic Engineer, INDOT Traffic Management Division, or Local Traffic Engineer to have input on the need for additional advance warning time, highway pre-signal, etc.
Other Active – Traffic Signals only	Retain existing Highway Traffic Signals no change

3.0 SCOPE CONSIDERATIONS

INDOT's philosophy is to appropriately allocate limited resources and maximize system-wide improvements. This approach targets investment decisions to the roadway system as a whole. To reduce crash risk, uniform warning device configurations are the best practice.

In order to meet the goal of uniform warning device configurations, a basic passive device upgrade is required for all projects. This consists of replacing the existing cross bucks with high retro-reflectivity cross bucks, adding reflectorized striping to the post, and installation of a yield or stop sign, installing any required pavement markings, and installing or upgrading advance warning signage.

If active protection is deemed necessary based on this policy, then the installation of gates, flashing lights, overhead cantilever, warning bell, and CWT is the minimum level of active warning acceptable. No incremental or intermediate improvements to active warning devices are allowed.

Note that flashing lights alone (without gates) are considered obsolete and are no longer allowed as either an upgrade or for a new installation (for example, upgrading from passive to flashing lights with no gates is no longer allowed).

CWT circuitry and warning bells should be incorporated into all improvements. Regarding constant warning time circuitry, the only locations where CWT cannot be installed are some NICTD passenger rail lines with electrified train operations and some low volume rail lines.

4.0 POLICY EXEMPTION

In rare cases where unique conditions exist, a policy exception may be granted by the INDOT Utilities and Railroads Division. For example, flashing lights without gates may have to be installed where roadway, intersection, or site geometry prohibits proper operation of gates. Appendix A shows the policy exemption format. Policy exemptions should be submitted to the Senior Rail Engineer for approval.

5.0 EVALUATION PROCEDURE

Appendix A contains information regarding data collection and analysis as well as finding DOT crossing information.

Step 1: Collect the existing condition and basic criteria defining the highway-railroad grade crossing, as shown in Table 2, Minimum Data Collection Required for Analysis. Additional information may be added where needed.

Step 2: Fill out Table 3, Basic Criteria for Requiring Active Warning Devices to begin the analysis phase. Generally the six safety criteria shown in Table 3 determine the need for the installation or upgrading of active warning devices, not the work type or scale of the highway project. Table 3 shows basic criteria, if satisfied, require an upgrade to the level of warning. Note that the Hazard Index (Criteria 1) captures both the number of trains and the number of vehicles (AADT) within the index formulas. Therefore, the number of trains and AADT are not broken out separately in this policy as threshold values indicating a need for up grading the level of warning. Generally crossings with a large number of vehicles and trains have a greater crash risk, and a higher Hazard Index, than lesser used crossings.

The formulas for the Hazard Index were originally developed for motor vehicles; therefore, the entry should be marked N/A for shared-use paths.

Step 3: Determine the Level of Warning Device Needed

If none of the criteria in Table 3 are met (yes), go to Step 4. If the answer to any of the six basic criteria in Table 3 is yes, then the crossing requires active warning devices. This means that if passive devices are in place, the installation of gates, flashing lights, overhead cantilever, warning bell, and CWT is required to meet the minimum level acceptable as defined in section 2.02. If a crossing already has some active devices such as flashing lights without gates, the level of warning shall upgraded to the minimum level acceptable as defined in section 2.02. These devices must be installed as part of the highway project and be fully functional prior to being open to traffic or accepted by FHWA.

Note that when the existing railroad crossing signals are interconnected with highway traffic signals the highway traffic signals may also have to be modified per this policy. The INDOT Traffic Management Division would participate in the scoping for INDOT projects. Typically, the warning systems should be designed to clear vehicles from the railroad-highway grade crossing prior to the arrival of a train.

Step 4: Other Factors that Require Active Devices

If none of the criteria in Table 3 are met (yes), active warning devices may be required. See Tables 4, 5, and 6 for active warning requirements on Added Capacity projects, Special Cases, and for New Construction.

Table 2. Minimum Data Collection Required for Analysis

Item	Description	Notes
1	Determine Project Definition, that is adds road capacity or not or if project is new construction on new alignment.	(a) Existing Road (b) Construct New Crossing on new alignment -Road (c) Construct New Crossing on new alignment - Multi-Use Path-Pedestrian, Bicycle (d) New Rail Line Construction
2	Determine Railroad Name and DOT Crossing Number	Includes determining the operating rail road.
3	Determine Hazard Index value from WBAPS or calculate using equations	See Appendix A.
4	Determine Number of crashes in the most recent 5 year period	FRA Crash Data
5	Determine FRA Track Classification	FRA Web Site
6	Determine Total Day Thru Trains + Total Night Thru Trains= Total Trains at Crossing (per 24 hrs)	FRA Web Site; the total number of trains per 24 hr period (freight and passenger).
7	Determine if regularly scheduled passenger service such as AMTRAK, NICTD, or others operate on the rail line	FRA Web Site
8	Determine Number of Tracks	FRA Web Site
9	Determine number of school buses using crossing per day	Use FRA Web Site but it is preferable to have the FRA Web Site record verified by the local school district
10	Determine Intersection Angle	Field inspection or measure from Map or aerial photo.
11	Determine Road Type--US, SR, State Maintained Road, or Local Road	State Maintained Road includes state roads that connect to state parks and state facilities but are not numbered.
12	Describe Existing Road Conditions (a) Road paved or not? (b) Number of travel lanes and Auxiliary lanes (c) Lane width (d) AADT (e) Note the existing horizontal and vertical alignment of the approach roadway (f) Determine road classification-	Note that the FRA inventory street name is the 'official' name of the road.

Item	Description	Notes
	such as arterial, collector etc. (g) Determine if road is on the National Highway System (h) Determine INDOT planning classification (i) Commercial Vehicle Percentage (j) Median Present?	
13	Describe configuration of existing railroad warning devices in detail- (a) Note Passive or Train activated (b) Number of gates (c) Number of FL pairs (d) Flashing light pair lens diameter note either 8 inch or 12 inch; (e) Overhead Cantilevers present? (f) Number of warning bells (g) Determine warning device circuitry type (h) Determine age of warning devices if possible (i) Crossing located within established FRA Quiet Zone?	
14	Determine if any nearby highway Traffic Signals are interconnected with the train activated warning devices and are preempted by approaching trains	Contact INDOT District Traffic Engineer, INDOT Traffic Management Division, or Local Traffic Engineer
15	Describe Pavement Markings and advance warning signage description	Site Evaluation
16	Describe Type of Drainage	
17	Determine if Culverts need to be extended?	
18	Describe Overhead Utility or any other utility Conflicts?	
19	Determine Tree Trimming or sight distance correction necessary?	
20	Obtain District Environmental Section Comments	
21	Obtain District Rail Utility Coordinator Comments	

Table 3. Basic Criteria for Requiring Active Warning Devices

Criteria	Description	Yes, No, N/A
1	Is the calculated Hazard Index value 0.100 or greater?	
2	Have there been two or more crashes in the recent 5 year period? This is also defined as a multi crash location.	
3	Is the rail line classified as FRA Track Class 4 or greater? On Class 4 track, freight trains can operate up to 60 mph.	
4	Is there regularly scheduled passenger service such as AMTRAK or NICTD or others operating on the rail line?	
5	Are there two or more tracks? An additional track can be a railroad siding that is signalized where trains can operate in either direction.	
6	Is the measured Intersection Angle 30 degrees or less? (or 60 Degree Skew Angle or greater)	

Table 4. Active Warning Devices for Added Capacity Projects

Type of Road Improvement	Existing Crossing Protection	Applicable Road System	Warning Device Upgrade Mandatory?	Notes
Existing Paved Surface – Capacity improvement, Add travel lanes, add Auxiliary lane or add center TWLTL	Passive	Local , US and State Road	**Yes**	
Existing Paved Surface – Capacity improvement, Add travel lanes, add Auxiliary lane or add center TWLTL	Active with Flashing Lights, no Gates	Local , US and State Road	**Yes**	
Existing Paved Surface – Capacity Improvement, Add Travel Lanes, add Auxiliary lane or add center TWLTL	Active with Flashing Lights and Gates (no Cantilever, bell, or CWT)	Local , US and State Road	**Yes**	
Highway intersection near crossing; Existing Paved Surface – Capacity improvement, Add travel lanes, add Auxiliary lane or add center Turn Lane	Highway Traffic Signals at Nearby Intersection are Already Interconnected with the Railroad Train Activated Warning Devices	Local , US and State Road	**Yes**	Check With INDOT District Traffic Engineer, INDOT Traffic Management Division, or Local Traffic Engineer for Local Roads for input on improvements to the train activated warning devices and traffic signals.

Table 5. Active Warning Devices for Special Cases

Type of Road Improvement	Existing Crossing Protection	Applicable Road System	Warning Device Upgrade Mandatory?	Notes
Upgrade two lane Gravel Road to two Lane Paved Road	Passive	Local Only	**No**	Only If one or more conditions in Table 3 apply add FLGOC with Warning Bell and CWT. If not, Passive devices only.
Highway intersection located where there are street running trains Any type of project	Other Active Traffic Signals only, no railroad devices	Local, US, SR, State Maintained Road	**No**	Table 3 conditions do not apply. No upgrade even if one or more conditions in Table 3 are met. Usual location is highway traffic signals in urban area where track is located in the center of the street (street running train). Engineering analysis is recommended a case by case basis.

Table 6. Active Warning Devices for New Crossing Constructed on New Alignment

Roadway	Type of Improvement	Applicable Road System	Mandatory to Install Train Activated Devices?	Notes
Paved, all roadways, any number of lanes, including interchange ramps	Construct New Crossing on New Alignment	US, SR, State Maintained Road	**Yes**	All new state roads at grade highway rail crossings, including interchange ramps, require installation of train activated devices. An application for a Policy Exemption should be processed if Passive devices are proposed to be installed on new construction new alignment crossings on a state maintained road.
Paved 4 travel lanes or more with TWLTL	Construct New Crossing on New Alignment	Local Road	**Yes**	All new multilane at grade highway rail crossings require installation of train activated devices. An application for a Policy Exemption should be processed if Passive devices are to be installed.
Paved 4 travel lanes or more	Construct New Crossing on New Alignment	Local Road	**Yes**	All new multilane at grade highway rail crossings require installation of train activated devices. An application for a Policy Exemption should be processed if Passive devices are to be installed.
Paved 2 lanes	Construct New Crossing on New Alignment	Local Road	**See Notes**	Only If one or more of the six conditions in Table 3 apply install train activated devices. If not, Passive devices only. An application for a Policy Exemption should be processed if Passive devices only are to be installed if one or more of the six conditions in Table 3 apply.
Paved 2 lane with TWLTL	Construct New Crossing on New Alignment	Local Road	**Yes**	All new multilane at grade highway rail crossings require installation of train activated devices. An application for a Policy Exemption should be processed if Passive devices only are to be installed.

Roadway	Type of Improvement	Applicable Road System	Mandatory to Install Train Activated Devices?	Notes
Gravel two lane	Construct New Crossing on New Alignment	Local Road	**See Notes**	Only if one or more of the six conditions in Table 3 apply install train activated devices. If not, Passive devices only.
Paved shared use or Multi-use Path	Construct New Crossing on New Alignment	Local	**See Notes**	Only if one or more of the conditions in Table 3 apply, then install FLG with Warning Bell and CWT. If not, could install Passive devices. Overhead cantilever not required for a path. The Hazard Index calculation does not apply to shared use paths since the formulas were originally developed for motor vehicles. A Hazard Index cannot be calculated for a shared use path.
Gravel or crushed aggregate shared use or Multi-use Path	Construct New Crossing on New Alignment	Local	**See Notes**	Only if one or more of the conditions in Table 3 apply then install FLG with Warning Bell and CWT. If not, could install Passive devices. Overhead cantilever not required for a path. The Hazard Index calculation does not apply to shared use paths since the formulas were originally developed for motor vehicles. A Hazard Index cannot be calculated for a shared use path.
Paved Sidewalk	Construct New Crossing on New Alignment	Local Sidewalk	**No**	Table 3 conditions do not apply. Instead, a diagnostic team and engineering study is necessary to determine warning device needs on case by case basis.

6.0 PROJECT CONSIDERATIONS

Existing Crossings - No Highway Capacity Added

If there is no highway capacity added as part of the project, and none of the six conditions in Table 3, Basic Criteria for Requiring Active Warning Devices are met, the warning devices can be maintained at the current level of warning. However, if one or more of the six criteria are met, active warning devices to achieve the minimum level acceptable are required as part of the highway project.

Existing Crossings – Added Highway Capacity

If roadway capacity is increased as part of the project, active warning devices to achieve the minimum level acceptable are required as part of the highway project. Active warning devices are required regardless of meeting or not meeting the criteria in Table 3.

Table 4 defines capacity improvements which generally consist of adding a travel lane, center two-way left turn lane (TWLTL), or auxiliary lane to an existing facility. Even if none of the six conditions (*Basic Criteria for Requiring Active Warning Dev*ices) are met, the warning devices still should be upgraded to active. For example, if the crossing currently has cross bucks only and highway capacity is added, the level of warning shall be upgraded to train activated minimum level acceptable.

New Construction on New Alignment - Road

The decision whether to construct a new at grade crossing or grade separation on a new alignment will be based on the results of an engineering study. When a new at grade crossing is proposed, closing at least one or more nearby at grade crossings on the rail line should be considered. The goal is not increase the total number of at grade crossings. A grade separation is the most desirable crossing type for any new roadway alignment that crosses a railroad track. If a grade separation cannot be economically justified or there are no other viable alternatives, then an at grade crossing may be considered.

For new crossings constructed where none previously existed, and one or more of six conditions (*Basic Criteria for Requiring Active Warning Dev*ices) are met, then active devices are required as part of the road project. If none of the six conditions are satisfied, then check Table 6 for specific scenarios where train activated devices are required. Generally, any new construction at grade crossing requires installation of train activated warning devices and not just passive (cross bucks) devices.

New Construction on New Alignment - Railroad

Note that the Policy can apply where a new rail line is to be built on new alignment and crosses a public road at grade. Grade separations are always the most desirable type of highway rail crossing for any new crossing on new alignment. If a grade separation cannot be economically justified or there are no other viable alternatives, then use Table 6 to determine the warning devices required to be placed at each new public at grade crossing.

The six basic criteria form Table 3 would have to be calculated or estimated by the engineer for each proposed at grade crossing based as part of the engineering study for the railroad. In general, active devices meeting the minimum level acceptable are required on new construction to provide uniform warning for drivers.

At any proposed crossing where at least one of the six basic criteria is met, active warning devices are required. Table 6 shows where train activated devices would have to be installed regardless of Table 3.

Special Cases

See Table 5 for Policy conditions that apply to gravel roads and instances where the railroad track is located in the center of an urban street. Exhibit 4 shows the special case of street running trains where warning is provided by the highway traffic signals without railroad signals. Typically, such crossings are found where trains operate on a track located in the center of an urban street. The existing protection would be noted as Other Active – Traffic Signals Only. No warning device upgrade is required per this policy. Generally, with street running trains, the existing warning devices, either passive or train activated, can be retained as is. However, an engineering study is recommended for mainline tracks with daily operation. A study need not be completed for dead end industrial spur tracks. Where an engineering study is performed, the study team should be qualified in assessing traffic safety of all users and road facilities. The recommended content of an engineering study for street running trains includes the following.

1. Existing conditions, including rail and street operations
2. Most recent 5-year crash history and local crash experience (near misses)
3. Local law enforcement observations
4. Railroad input
5. Prior engineering studies
6. Local input regarding relocation options
7. Engineering judgment on the placement of warning devices and determination of level of warning
8. Indiana MUTCD guidelines for light rail and what might be appropriate for heavy rail

9. Results of consulting the Railroad-Highway Grade Crossing Handbook - Revised Second Edition August 2007
10. Conducted by a team that is adequately qualified, both individually and as a team. Broad enough to consider the safety of all users and road facilities.
11. Study recommendations. Recommendations should produce fewer, less severe crashes.

Exhibit 4. Highway Traffic Signals on Railroad

Utilities and Environmental

Another important issue for initial scoping is the position of overhead utilities (power lines) located at the highway rail crossing. All utilities at the site should be identified early in the development phase. Also, drainage structures and streams should be evaluated and an environmental document is usually required if federal funds are to be used. An environmental categorical exclusion is usually issued for highway rail crossings. The INDOT District environmental section should be contacted while the project scope is being developed.

Policy for Railroad-Highway Grade Crossing Warning Devices

Appendix A

Cover Sheet for Data Collection and Analysis

Date

Owner Agency

Contract Number Des. No.

District County City/Town

Route

RP if State Route

Project Location _____
location as shown in SPMS

Description _____
Work type as shown in SPMS

Highway capacity increased? ☐ Yes ☐ No

Road Project on new alignment? ☐ Yes ☐ No

Railroad Company Name

DOT Crossing Number

Proposed crossing closures? ☐ Yes ☐ No

If yes, list crossing location DOT numbers

Prepared By _____
name and consulting firm or INDOT location

Data Collection for Analysis

Item	Description	Notes	Data
1	Determine Project Definition, that is adds road capacity or not or if project is new construction on new alignment. (a) Existing Road (b) Construct New Crossing on new alignment -Road (c) Construct New Crossing on new alignment - Multi-Use Path- Pedestrian, Bicycle (d) New Rail Line Construction		
2	Determine Railroad Name and DOT Crossing Number	Includes determining the operating rail road.	
3	Determine Hazard Index value from WBAPS or calculate using equations		
4	Determine Number of crashes in the most recent 5 year period	FRA Crash Data	
5	Determine FRA Track Classification	FRA Web Site	
6	Determine Total Day Thru Trains + Total Night Thru Trains= Total Trains at Crossing (per 24 hrs)	FRA Web Site; the total number of trains per 24 hr period (freight and passenger).	
7	Determine if regularly scheduled passenger service such as AMTRAK, NICTD, or others operate on the rail line	FRA Web Site	
8	Determine Number of Tracks	FRA Web Site	
9	Determine number of school buses using crossing per day	Use FRA Web Site but it is preferable to have the FRA Web Site record verified by the local school district	
10	Determine Intersection Angle	Field inspection or measure from Map or aerial photo.	

Item	Description	Notes	Data
11	Determine Road Type--US, SR, State Maintained Road, or Local Road	State Maintained Road includes state roads that connect to state parks and state facilities but are not numbered.	
12	Describe Existing Road Conditions (a) Road paved or not? (b) Number of travel lanes and Auxiliary lanes (c) Lane width (d) AADT (e) Note the existing horizontal and vertical alignment of the approach roadway (f) Determine road classification- such as arterial, collector etc. (g) Determine if road is on the National Highway System (h) Determine INDOT planning classification (i) Commercial Vehicle Percentage (j) Median Present?	Note that the FRA inventory street name is the 'official' name of the road.	
13	Describe configuration of existing railroad warning devices in detail- (a) Note Passive or Train activated (b) Number of gates (c) Number of FL pairs (d) Flashing light pair lens diameter note either 8 inch or 12 inch; (e) Overhead Cantilevers present? (f) Number of warning bells (g) Determine warning device circuitry type (h) Determine age of warning devices if possible (i) Crossing located within established FRA Quiet Zone?		
14	Determine if any nearby highway Traffic Signals are interconnected	Contact INDOT District Traffic	

Item	Description	Notes	Data
	with the train activated warning devices and are preempted by approaching trains	Engineer, INDOT Traffic Management Division, or Local Traffic Engineer	
15	Describe Pavement Markings and advance warning signage description	Site Evaluation	
16	Describe Type of Drainage		
17	Determine if Culverts need to be extended?		
18	Describe Overhead Utility or any other utility Conflicts?		
19	Determine Tree Trimming or sight distance correction necessary?		
20	Obtain District Environmental Section Comments		
21	Obtain District Rail Utility Coordinator Comments		

Basic Criteria for Requiring Active Warning Devices

Criteria	Description	Yes, No, N/A
1	Is the calculated Hazard Index value 0.100 or greater?	
2	Have there been two or more crashes in the recent 5 year period? This is also defined as a multi crash location.	
3	Is the rail line classified as FRA Track Class 4 or greater? On Class 4 track, freight trains can operate up to 60 mph.	
4	Is there regularly scheduled passenger service such as AMTRAK or NICTD or others operating on the rail line?	
5	Are there two or more tracks? An additional track can be a railroad siding that is signalized where trains can operate in either direction.	
6	Is the measured Intersection Angle 30 degrees or less? (or 60 Degree Skew Angle or greater)	

Note: (1) Hazard Index not applicable for shared or multiuse paths.

Summary of Data Analysis

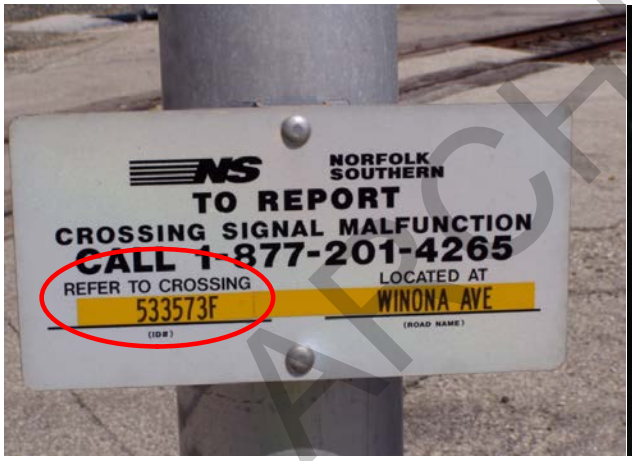
The data cover sheet, data collected and the completed Basic Criteria for Requiring Active Devices table should be included with a summary of the analysis and a recommendation or preferred alternative.

Include an approximate cost estimate, including Railroad PE, Railroad CN as well as cost of any highway traffic signal modifications.

Include photos or other attachments as needed.

Finding DOT Crossing Information

DOT crossing numbers can be obtained from signage placed by the railroad on the warning device posts. Highway rail crossings are identified by the DOT crossing number which is a six digit identifier followed by a letter. For example, 533573F defines a highway rail crossing.



DOT Crossing Inventory Sheet data and FRA crash records are available from the INDOT Rail crossing locator, see Exhibits B1 and B2. The rail crossing locator will allow the user to obtain the inventory record, crash data, and photos of the crossing.

DOT crossing numbers can also be obtained from INDOT Rail crossing locator map available at http://dotmaps.indot.in.gov/apps/RailCrossings/default.asp

Exhibit B1. Rail Crossing Locator

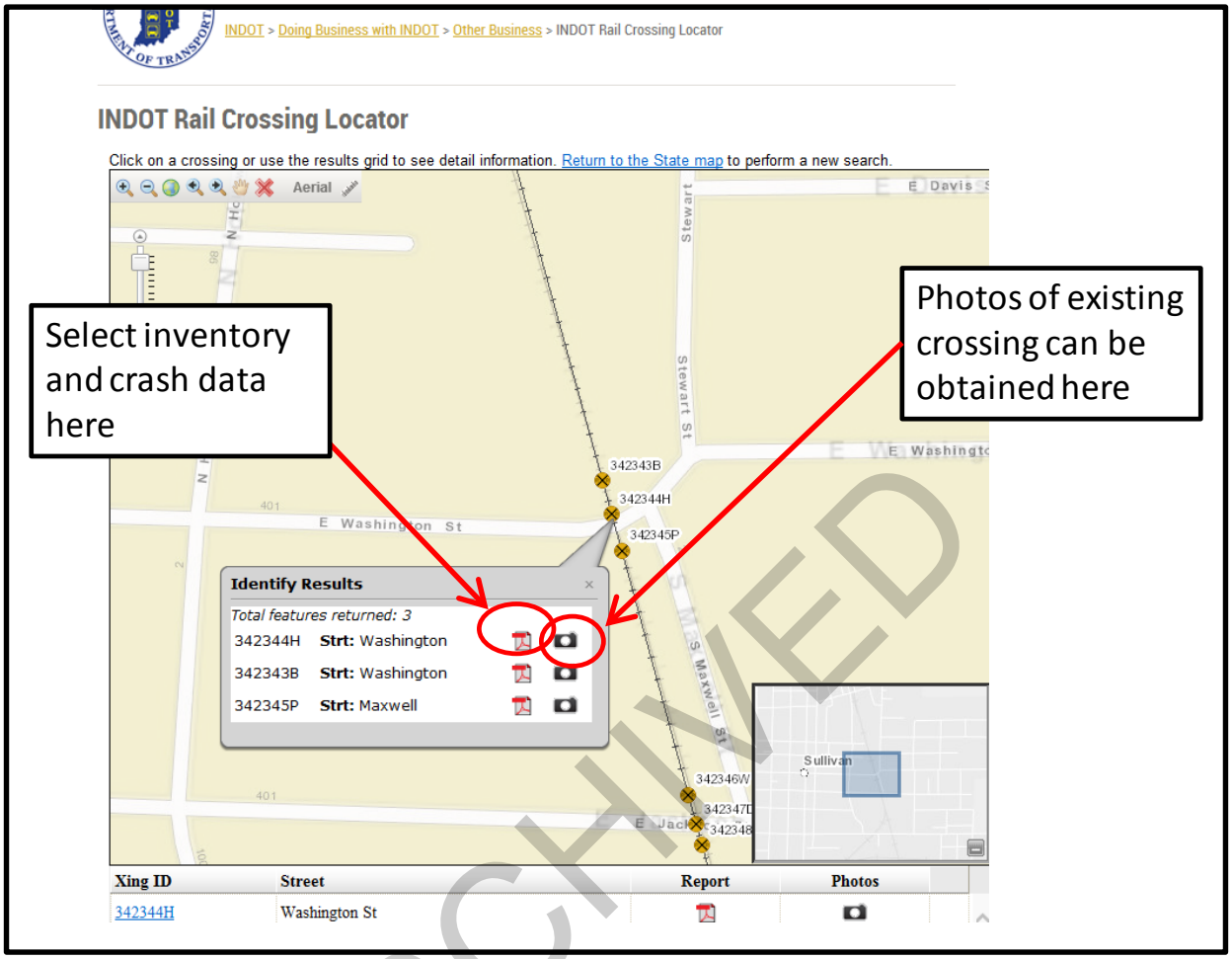
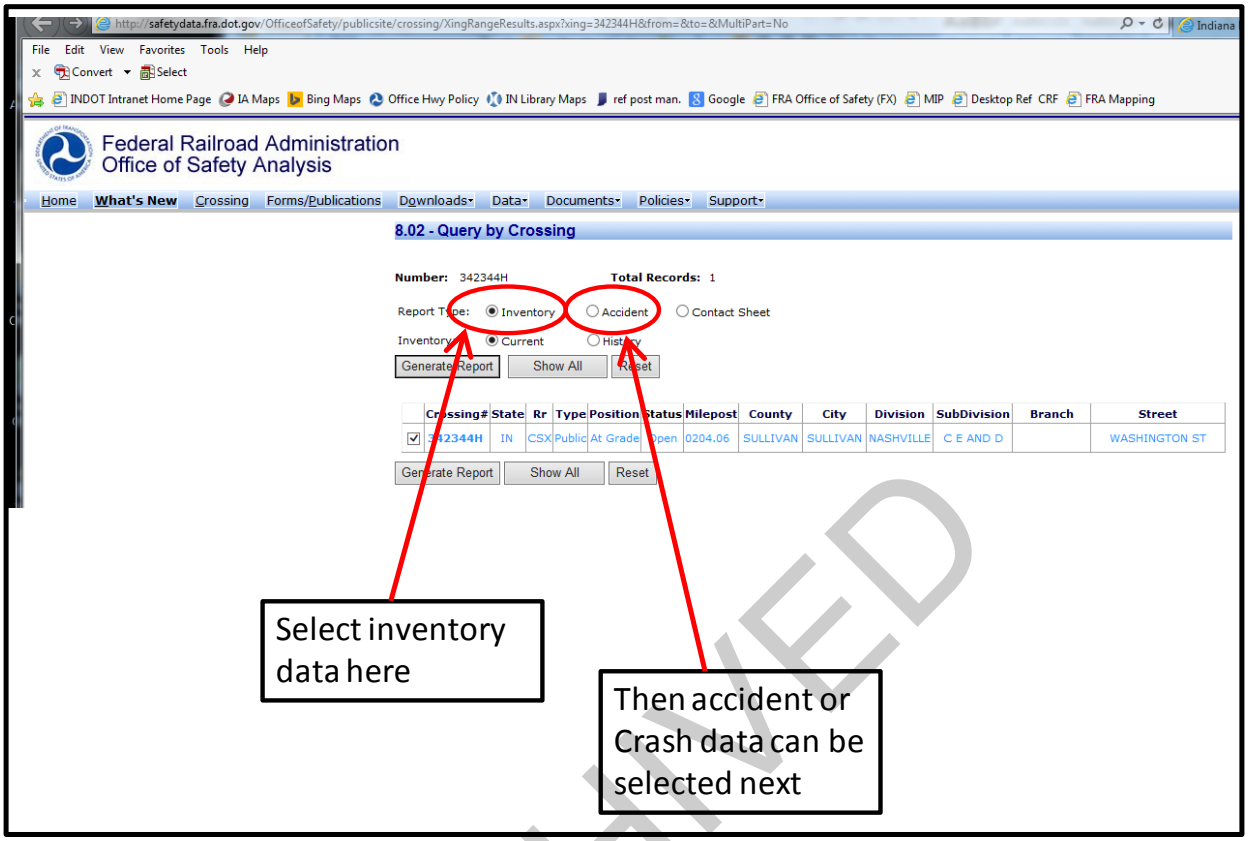


Exhibit B2. DOT Crossing Inventory Sheet and Crash Data



The first of the basic criteria is the Hazard Index. A Hazard Index of 0.100 or greater indicates a crossing is performing poorly with regards to crash risk. The Hazard Index is the number of crashes expected per year. The Hazard Index for an existing crossing is readily available from the Web Based Accident Prediction System (WBAPS) on the FRA safety website.

http://safetydata.fra.dot.gov/webaps/

Search by 'crossing' and then enter the DOT Crossing Number.

Exhibit B3 shows WBAPS output results for a single crossing. Note that the Hazard Index is labeled *Predicted Collis*. in WBAPS but note they are actually the same thing.

If the road project includes multiple highway rail crossings, then data for each individual crossing should be collected. In order calculate the Hazard Index for a new construction rail crossing on new road alignment, use inventory data obtained from a nearby crossing on the same rail line.

The Hazard Index can be calculated using the formulas for a new crossing on new alignment or calculated from the formulas if the engineer wishes to develop various

scenarios with different train counts or highway AADT. The accident and severity prediction formulas developed by the Federal Railroad Administration compute the expected number of accidents at crossings based on information available in the grade crossing inventory and crossing accident data files. The formulas utilize five years of crash history at the crossing, highway and train traffic, number of through trains per day, maximum timetable train speed, number of main tracks at the crossing, is the highway paved (yes or no), and number of highway lanes in the calculations. Use formulas from US DOT Accident Prediction Model found in the Railroad-*Highway Grade Crossing Handbook - Revised Second Edition August 2007.* Or use formulas from *Rail Highway Crossing Resource Allocation Procedure DOT/FRA/0S-87/10*.

- Note that different formulas are used for each of the three categories of traffic control devices—passive, flashing lights, and gates.
- In the formulas the final predicted collisions or Hazard Index is known as '*A'* Note that the predicted collisions value in WBAPS is '*A'*.
- First complete the initial collision prediction calculated which is '*a';* Then '*a'* is corrected by equations incorporating the total number of crashes for the last five years and that result is known as '*B'*. Finally, '*B'* is multiplied by a normalizing constant found on the FRA website

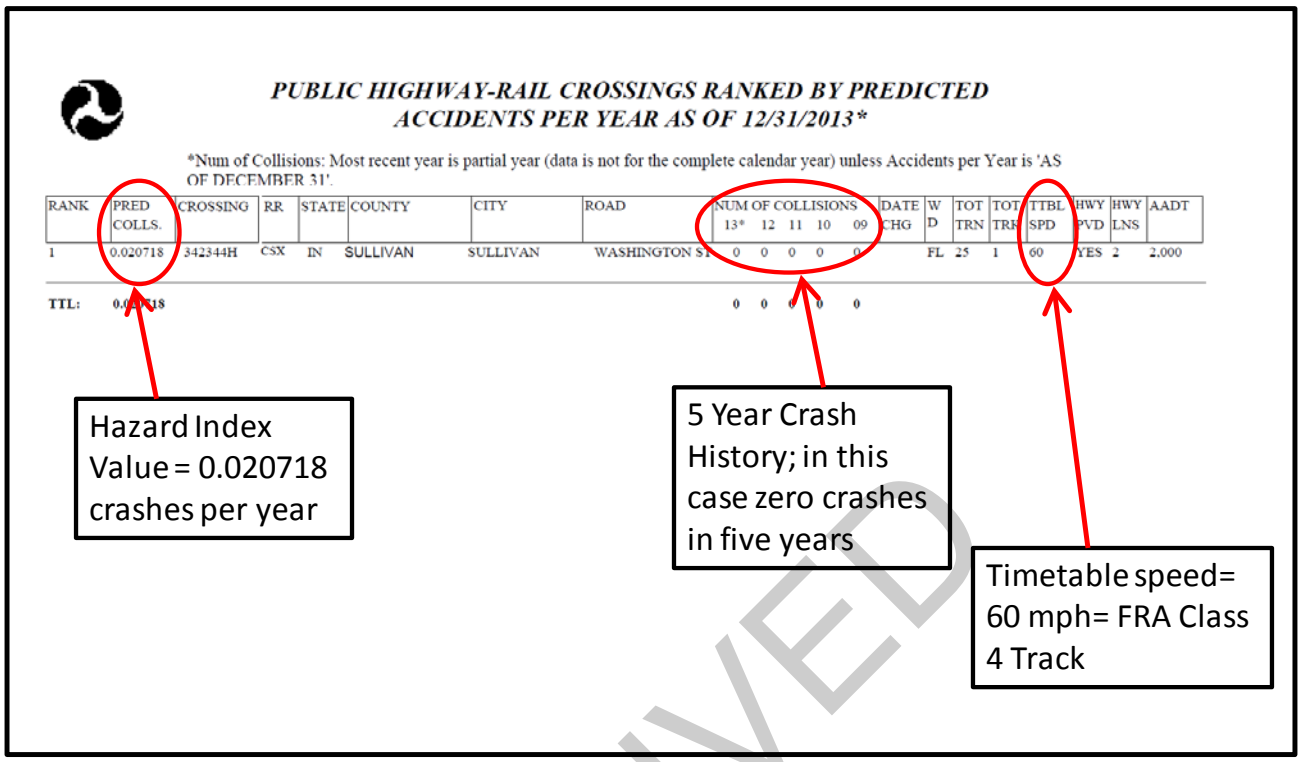
  https://www.fra.dot.gov/eLib/Details/L02852

  The final result obtained is '*A'*.

The number of crashes in the recent 5 year period would be assigned zero for calculations for new crossings on new alignment.

The Hazard Index calculation does not apply to shared use paths since the formulas were originally developed for motor vehicles only. As such, the Hazard Index cannot be calculated for a shared use path.

Exhibit B3. Web Based Accident Prediction System Results



*PUBLIC HIGHWAY-RAIL CROSSINGS RANKED BY PREDICTED ACCIDENTS PER YEAR AS OF 12/31/2013**

*Num of Collisions: Most recent year is partial year (data is not for the complete calendar year) unless Accidents per Year is 'AS OF DECEMBER 31'.

RANK	PRED COLLS.	CROSSING	RR	STATE	COUNTY	CITY	ROAD	NUM OF COLLISIONS 13*	12	11	10	09	DATE CHG	W D	TOT TRN	TOT TRK	TTBL SPD	HWY PVD	HWY LNS	AADT
1	0.020718	342344H	CSX	IN	SULLIVAN	SULLIVAN	WASHINGTON ST	0	0	0	0	0		FL	25	1	60	YES	2	2,000
TTL:	0.020718							0	0	0	0	0								

Hazard Index Value = 0.020718 crashes per year

5 Year Crash History; in this case zero crashes in five years

Timetable speed= 60 mph= FRA Class 4 Track

Criteria 2 is the recent crash history at the crossing. Two or more crashes in a recent 5 yr interval is the threshold value at an individual crossing. A multi crash location is defined as a crossing having two or more crashes in a recent 5 yr interval. The number of recorded crashes at a crossing reflects the actual safety performance. The recent five year period crash records are available from WBAPS or crashes can be obtained from the individual crash records in the FRA railroad crash history. The *Highway Rail Grade Crossing Safety Action Plan* encourages evaluation of multi crash locations and determination of mitigation methods to reduce crashes.

Criteria 3 is the FRA Track Class. Determine if the FRA Track Class is 4 (60 mph) or a greater value and see Exhibit B4 for definitions. The FRA track classification is available from WBAPS (Exhibit B3) or FRA Railroad Inventory Sheet (Exhibit B6). On high speed, high volume rail lines it is always good practice to equip all crossings on the particular rail corridor with train activated devices regardless of the highway AADT.

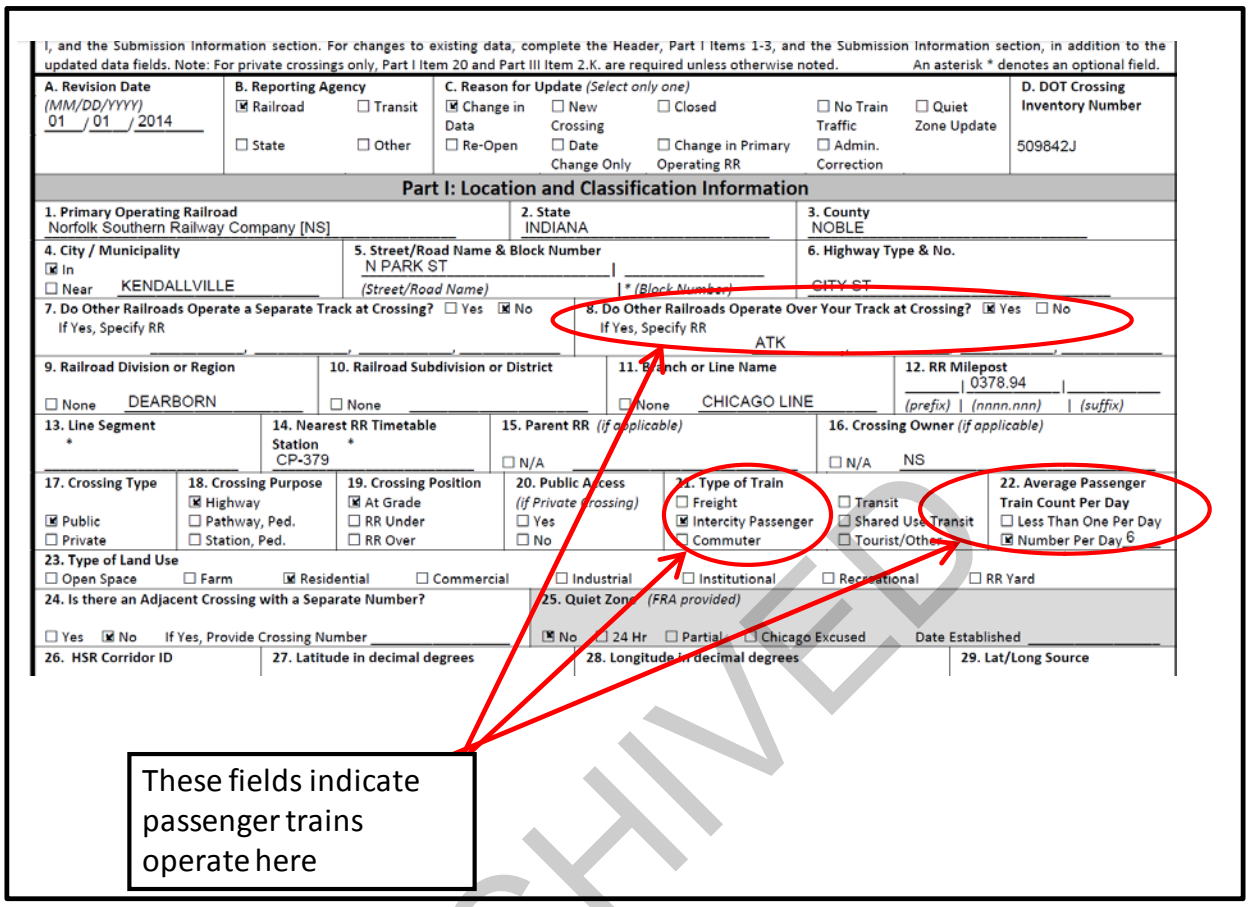
Exhibit B4. Maximum Train Speeds by FRA Class of Track

Class of Track	Freight (mph)	Passenger (mph)
Class 1	**10**	**15**
Class 2	**25**	**30**
Class 3	**40**	**60**
Class 4	**60**	**80**
Class 5	**80**	**90**
Class 6	**110**	**110**
Class 7	**125**	**125**
Class 8	**160**	**160**
Class 9	**200**	**200**

Criteria 4 is the number of regularly scheduled year round passenger trains operating such as AMTRAK or NICTD on the subject rail line (see Exhibit B5). One or more regularly scheduled passenger train per day makes a warning device upgrade necessary. Crashes with passenger trains pose a greater injury risk since the train passengers can be injured as well. The FHWA suggests that crossings located on passenger lines be protected with gates. The primary goal of the SHSP is to reduce injury and fatal crashes, so upgrading warning devices on passenger lines is desirable to protect both the motorist and rail passengers.

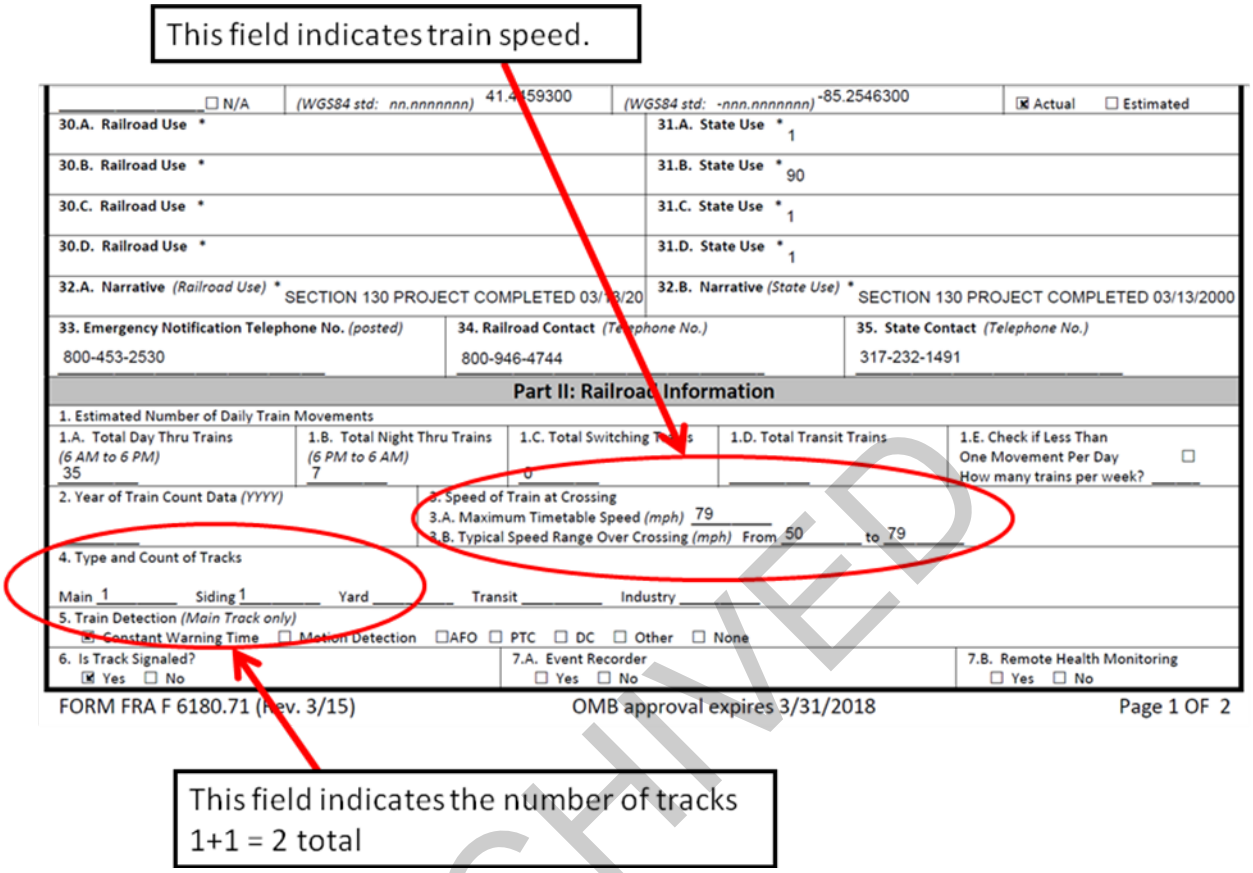
The DOT Crossing Inventory Sheet data usually show the passenger train count per day and operator of the passenger trains. DOT Crossing Inventory Sheet data is not always up to date regarding passenger trains so it is suggested that passenger train operations be verified by contacting the INDOT Rail Office or the railroad directly. Tourist railroads are not considered regularly scheduled passenger operations for Criteria 4. Tourist railroads should be studied on a case by case basis and are not defined by this policy document. A tourist railroad with infrequent or seasonal passenger trains would require a diagnostic team and resultant engineering study to determine the warning device needs (either passive or active).

Exhibit B5. DOT Crossing Inventory Sheet showing Passenger Trains



Criteria 5 is the number of tracks located at the crossing. A crossing with two or more tracks is the threshold value. A field visit to the site to verify the number of tracks at the crossing is desirable. Additional tracks force a driver to make more than one decision when crossing the tracks. Installation of train activated devices provide additional warning of approaching trains on multiple tracks for the driver. The number of mainline tracks is available from WBAPS output (Exhibit B3, column labeled *TOT TRK*) or the FRA Railroad Inventory Sheet Exhibit B6). An additional main track can also be a railroad siding that is signalized where trains operate in either direction on both tracks. If in doubt about how to define the track count at the crossing, the INDOT Rail Office or INDOT Office of Traffic Safety can provide guidance.

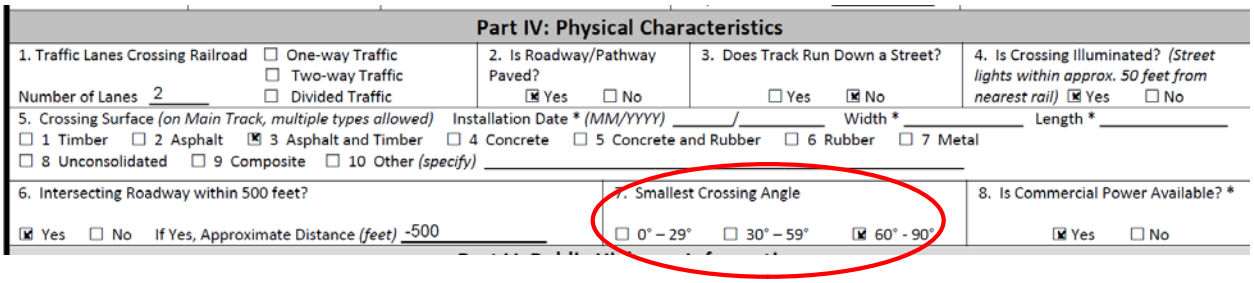
Exhibit B6. DOT Crossing Inventory Sheet showing Number of tracks and Train operating speed.



Note that in Exhibit B6 the inventory record shows one main track and one siding for a total of two tracks.

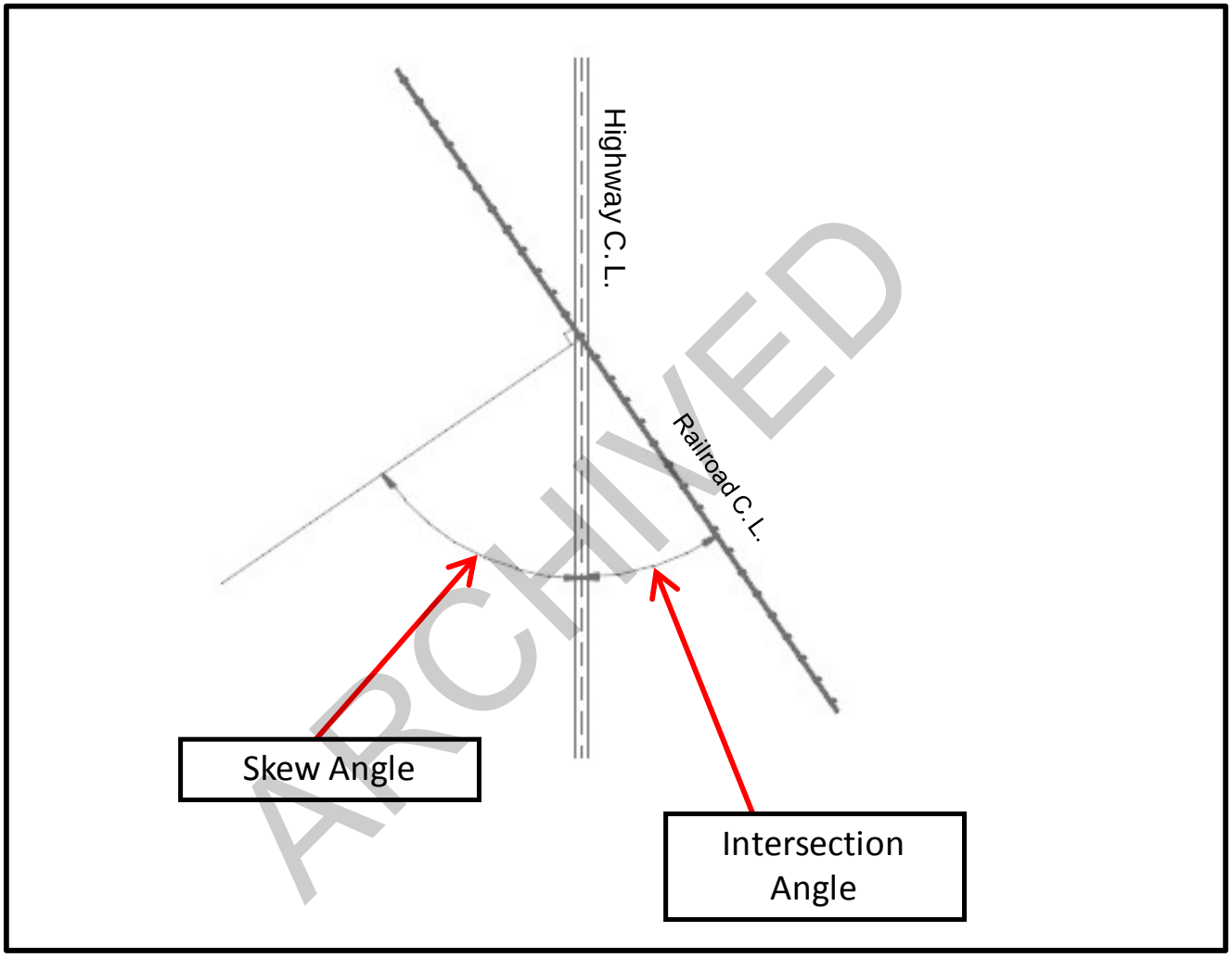
Criteria 6 is the intersection angle. The intersection angle threshold value is 30 degrees or less (60 Degree Skew Angle or greater) measured as defined in Exhibit B8. The actual intersection angle should be obtained from actual field data or aerials, the ranges (Exhibit B7) indicated on the DOT Crossing Inventory Sheet are not specific measurements.

Exhibit B7. DOT Crossing Inventory Sheet Showing Smallest Crossing Angle



Highway Rail Crossing Intersection Angle -- Measure the angle (in degrees) on a map or obtain a direct field measurement at the site. Measure the angle of intersection from centerline of track to centerline of roadway. The intersection angle is defined as zero to a maximum of 90 degrees. A roadway crossing the track at an intersection angle of 90 degrees is the most desirable alignment for traffic safety.

Exhibit B8. Intersection Crossing Angle Definition



For additional guidance on details not specifically covered in this document the reader is referred to U.S. DOT Technical Working Group on highway rail crossings.

http://safety.fhwa.dot.gov/intersection/resources/fhwasa09027/resources/Guidance%20On%20Traffic%20Control%20at%20Highway%20Rail%20Grade.pdf

Glossary

AADT	Annual average daily traffic
AMTRAK	National Railroad Passenger Corporation
ATK	AMTRAK
CWT	Constant warning time
CFR	Code of Federal Regulations
DOT	US Department of Transportation
FL	Train activated flashing lights
FLG	Train activated flashing lights and gates
FLGOC	Train activated flashing lights, gates, and overhead cantilever
FRA	Federal Railroad Administration
HI	Hazard Index
HMA	Hot Mix Asphalt
NHS	National Highway System
NICTD	Northern Indiana Commuter Transportation District
SHSP	Indiana Strategic Highway Safety Plan
TWLTL	Two way left turn lane
WBAPS	Web Based Accident Prediction System

U.S. DOT National Highway Railroad Crossing Inventory = inventory of all highway-railroad crossings maintained by the FRA

Policy Exception Request

A policy exception is required when any part of the policy cannot be met. Submit the items described below to the INDOT Utilities and Railroad Division Senior Railroad Projects Engineer. The preferred format is PDF sent by e-mail.

The request must be submitted by a registered professional engineer. The request must be stamped and sealed. The Senior Railroad Projects Engineer review the request and provide a disposition (either approval or rejection).

Submit the Policy Exception Request to:
Doug Gannaway, Sr. Railroad Projects Engineer
dtgannaway@indot.in.gov

Or the request can be mailed to:
Indiana Department of Transportation
100 N. Senate Ave., ICGN 642
Indianapolis, IN 46204

Cover Sheet

Submitted By: Date (PE stamp and signature required)

INDOT location, Consultant or local agency:

Des. No.
Project No.
Crossing DOT Number:
Railroad:
Route:
Location:
City:
County:
Current Year: 20 Highway AADT:
Highway Functional Classification:
Project Work Type

Policy Exception Content

1. Clearly describe the reason for the policy exception. For example describe why the warning devices do not need to be upgraded from passive to active. If applicable also describe why flashing lights, gates, overhead cantilever, bells, and constant warning time circuitry do not need to be installed.
2. Existing Conditions. Attach a sketch and/ or photo that depicts any issues.
3. Engineering Studies. If available, attach applicable engineering study.
4. Proposed Design. Describe the warning device final configuration desired
5. Calculations (if applicable, typically Hazard Index)
6. Completed Basic Criteria Table (shown below)

Criteria	Description	Yes, No, N/A
1	Is the calculated Hazard Index value 0.100 or greater?	
2	Have there been two or more crashes in the recent 5 year period? This is also defined as a multi crash location.	
3	Is the rail line classified as FRA Track Class 4 or greater? On Class 4 track, freight trains can operate up to 60 mph.	
4	Is there regularly scheduled passenger service such as AMTRAK or NICTD or others operating on the rail line?	
5	Are there two or more tracks? An additional track can be a railroad siding that is signalized where trains can operate in either direction.	
6	Is the measured Intersection Angle 30 degrees or less? (or 60 Degree Skew Angle or greater)	

Policy for Railroad-Highway Grade Crossing Warning Devices
Appendix B

Scoping Analysis Examples

The following are examples of applying the policy to determine the level of warning needed. All of the example projects contain crossings located within the near terminus definition limits. Pavement markings, passive signage installation and/ or upgrades are assumed to be part of the scope and as such are not specifically indicated in the following examples.

1. **Existing State Road; none of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The existing roadway is paved and crossing is equipped with active warning devices. The roadway cross section remains unchanged. The work type is HMA Overlay. In this case, the existing level of warning can remain unchanged since none of the six basic criteria were met. The passive devices would have to be modified and/ or updated to meet the current Indiana MUTCD.

2. **Existing Local Road; none of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The existing roadway is paved, crossing has passive warning devices, and no capacity improvement in the form of either auxiliary or added travel lanes are proposed. The roadway cross section remains unchanged and the work type is HMA Overlay.

   In this case, the existing level of warning can remain unchanged since none of the six basic criteria were met. The passive devices would only have to be modified and/ or updated to meet the current Indiana MUTCD.

3. **Existing Local Road; none of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The existing roadway is paved, crossing is equipped with passive warning devices. Highway capacity is to be increased, on existing alignment, with construction of a center TWLTL. Table 4, Active Warning Devices for Added Capacity Projects indicates it is mandatory that the existing level of warning be upgraded to active. Train activated gates, flashing lights, bell, overhead cantilever, and CWT circuitry would be installed as part of the road project.

   The existing level of warning (passive) cannot be retained since highway capacity is increased. The existing devices need to be upgraded to meet the goal of a uniform level of warning statewide.

4. **Existing State Road; none of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The existing roadway is paved, crossing is equipped with active warning devices; flashing lights with no gates. Highway capacity is to be increased on the existing alignment and the work type is added travel lanes. Table 4, Active Warning Devices for Added Capacity Projects indicates that an upgrade to the existing active warning devices is mandatory. Train activated gates, flashing lights, bell, overhead cantilever, and CWT circuitry would be installed as part of the road project.

   The existing level of warning cannot be retained as is since highway capacity is increased and the existing devices need to be upgraded to meet the goal of a uniform level of warning statewide.

5. **Existing US, SR, or state maintained road; three of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The work type is HMA Overlay. Existing level of warning is flashing lights without gates, bell, and no CWT circuitry.

   Since three of the basic criteria are satisfied, the existing flashing lights and out dated circuitry should be upgraded to the configuration shown in Exhibit 7. Train activated gates, flashing lights, bell, overhead cantilever, and CWT circuitry shall be installed. The existing active devices cannot be retained as is, because at least one of the six basic criteria were met. The warning device upgrade will meet the desired goal of a uniform level of warning statewide.

6. **Existing Local Road; one of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The roadway is paved, warning devices are flashing lights with no gates, bell and no CWT circuitry. The work type is pavement replacement, HMA with no additional roadway capacity added. Train activated gates, flashing lights, bell, overhead cantilever, and CWT circuitry would be installed as part of the road project.

   The existing active devices cannot be retained as is since more than one of the six basic criteria are met and the existing devices need to be upgraded to meet the goal of a uniform level of warning statewide.

7. **Existing Local Road; none of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The work type is drainage ditch correction. The crossing is located on a gravel road with passive devices and the road surface will remain gravel after completion of the project. Since none of the six criteria are satisfied, the current level of warning can be

maintained. The passive devices would only have to be modified/ updated to meet the current Indiana MUTCD.

8. **Existing Local Road; four leg urban street intersection with railroad track running down the center of the major street.** The work type is pavement replacement, HMA. Street is paved and no highway capacity is to be added. Highway traffic signals are the only traffic control device at the intersection. No railroad gates or flashing light posts are installed at the intersection. The highway traffic signals go into railroad pre-emption mode when a train enters the intersection limits. This location is referred to as an 'other warning device' in the FRA inventory and are usually found where the railroad track runs down the center of an urban street (that is, street running trains). One of the six conditions shown in Table 2 Basic Criteria for Requiring Active Warning Devices is satisfied, but note that Table 2 does not apply for street running trains. Use Exhibit 6 instead which indicates not applicable. Only pavement markings or advance warning signage would need to be upgraded.

   The roadway project manager could request a full engineering study to evaluate additional safety concerns, if desired.

9. **Existing State Road; Work type is patch and rehab pavement.** A highway intersection with state maintained highway traffic signals is near the highway rail crossing and the highway traffic signals are interconnected to railroad devices with preemption. Two of six conditions shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The roadway is paved and highway capacity to remain as is. Since at least ONE of the six conditions are satisfied, the level of warning shall be upgraded to the configuration shown in Exhibit 7. In addition, since the railroad crossing signals are interconnected with highway traffic signals the highway traffic signals may have to be modified per this policy. Sometimes, additional advance warning time or traffic signal modifications are necessary. Typically, the system is designed to clear vehicles from the highway rail crossing prior to the arrival of a train. The entire system, including both the train activated devices and highway traffic signals, would be evaluated by the INDOT District Traffic Engineer or INDOT Traffic Management Division. Then, these inputs would be incorporated into the project scope.

   The project required installation of new train activated gates, flashing lights, bell, overhead cantilever, and CWT circuitry. In addition, the traffic signals were modified based on recommendations from the INDOT Traffic Management Division. The completed project scope included definition of the road project, the

required rail warning device upgrades, and the highway traffic signal modifications.

10. **Existing Local Road; Work type is patch and rehab pavement**. A highway intersection with highway traffic signals is located near the highway rail crossing; a local agency maintains the traffic signals; two of six conditions shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The roadway is paved, no roadway capacity improvements are proposed, local highway traffic signals are interconnected to railroad train activated devices with preemption. Since at least ONE of the six conditions are met the train activated warning devices shall be upgraded to the configuration shown in Exhibit 7. In addition, the local agency Traffic Engineer or Traffic Engineering Consultant should evaluate the system and any additional advance warning time or traffic signal should be incorporated into the design.

    Typically, the system should be designed to clear vehicles from the highway rail crossing prior to the arrival of a train. The entire system, including both the train activated devices and highway traffic signals, would be updated based on design inputs from the local Traffic Engineer or consultant.

    The project required installation of new train activated gates, flashing lights, bell, overhead cantilever, and CWT circuitry. In addition, the traffic signal controller was modified based on recommendations from the local Traffic Engineer. The completed project scope included definition of the road project, the required rail warning device upgrades, and the highway traffic signal modifications.

11. **New Local Road construction with crossing constructed on new alignment**, proposed roadway cross section is to be two lanes paved. Note that grade separations are the most desirable type of highway rail crossing for any new crossing on new alignment. A grade separation was not economically justified and there were no other viable alternatives, so an at-grade crossing was proposed. None of six conditions shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. Per Exhibit 10, train activated devices are not mandatory for two lane local roads unless Table 2 criteria applies.

    Passive devices (cross bucks) could be installed at this new crossing.

12. **New Local Road construction with crossing constructed on new alignment. None of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met, proposed roadway cross section is 2 lanes paved with a center TWLTL. Note that grade separations are the most

desirable type of highway rail crossing for any new crossing on new alignment. A grade separation was not economically justified and there were no other viable alternatives. Exhibit 10 defines the level of warning at a new public at grade crossing. The new road crosses a railroad industrial spur line at grade, track is not considered a main line.

Train activated warning devices are specified per Exhibit 10. But, it is known that very few trains operate thru the crossing and only on an as needed basis for the factory the railroad serves. The track is operated by a local short line. The roadway project manager initiated a Policy Exception Request since passive devices were the preferred alternative. If the Policy Exception Request is approved by the INDOT Rail Office, then passive devices only could be installed based on a Policy Exception Request.

13. **New trail construction with crossing constructed on new alignment, Shared or Multi-Use paved path, one of the conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. The Hazard Index calculation does not apply to shared use paths since the formulas were originally developed for motor vehicles. A Hazard Index cannot be calculated for a shared use path. The paved path crosses a mainline railroad at-grade. Per Exhibit 7, active protection with flashing lights, gates, CWT, and warning bell shall be required. Overhead cantilever not required for Shared or Multi-use paths.

14. **New Railroad Track Construction on new alignment**, a new three mile long railroad spur is being constructed to access a new industrial park. Grade separations are the most desirable type of highway rail crossing. If a grade separation cannot be economically justified or if here are no other viable alternatives, then use Exhibit 10 to determine the warning devices required to be placed at each new public at grade crossing.

    The six basic criteria can be calculated or estimated by the engineer for each proposed grade crossing based on an engineering analysis. At any proposed crossing where at least one of the six basic criteria is met, active warning devices would need to be installed. Even though this is a only a railroad spur line, if active devices are required by policy, then train activated gates, flashing lights, bell, overhead cantilever, and CWT circuitry are required to provide uniform warning for drivers.

15. **New Shared or Multi-Use Path construction with crossing constructed on new alignment, none of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met. A paved pedestrian and bicycle trail is to be constructed. The Hazard Index calculation does not apply to shared use paths since the formulas were originally developed for motor vehicles. A Hazard Index cannot be calculated for a shared use path.

    Passive devices (cross bucks) might be installed. The roadway project manager initiated an engineering study to determine the best configuration of passive devices to meet site conditions.

16. **New Local Road construction with crossing constructed on new alignment, two of six conditions** shown in Table 2 Basic Criteria for Requiring Active Warning Devices are met, proposed roadway cross section at the new crossing is 2 lane paved with center TWLTL. New crossing is located within the limits of an established quiet zone.

    The policy does not apply to established quiet zones. Projects located within a quiet zone are beyond the scope of this policy and should be considered on a case by case basis instead.

47-1.05 Crossing Warning Devices [Rev. Apr. 2016]

The Department must comply with 23 CFR §646.214 regarding railroad-highway grade crossing improvement for each Federal-aid project. The Department's philosophy is to appropriately allocate limited resources and maximize system-wide improvements. This approach targets investment decisions to the roadway system as a whole. To reduce crash risk, uniform warning device configurations at all railroad-highway grade crossings are the best practice.

Where a railroad-highway grade crossing is located within or near the terminus of the project limits, the crossing must be evaluated for inclusion of railroad warning devices in the project scope of work. The limits also apply to maintenance of traffic. Near the terminus or "near terminus" is defined below. The Department's *Policy for Railroad-Highway Grade Crossing Warning Devices* provides the evaluation procedures for determining the level of warning protection, either passive or active (train-activated) that is required. The district or Central Office railroad coordinator should be contacted to assist in the evaluation. The evaluation recommendation must be reviewed and approved by the Utilities and Railroads Division Senior Rail Projects Engineer.

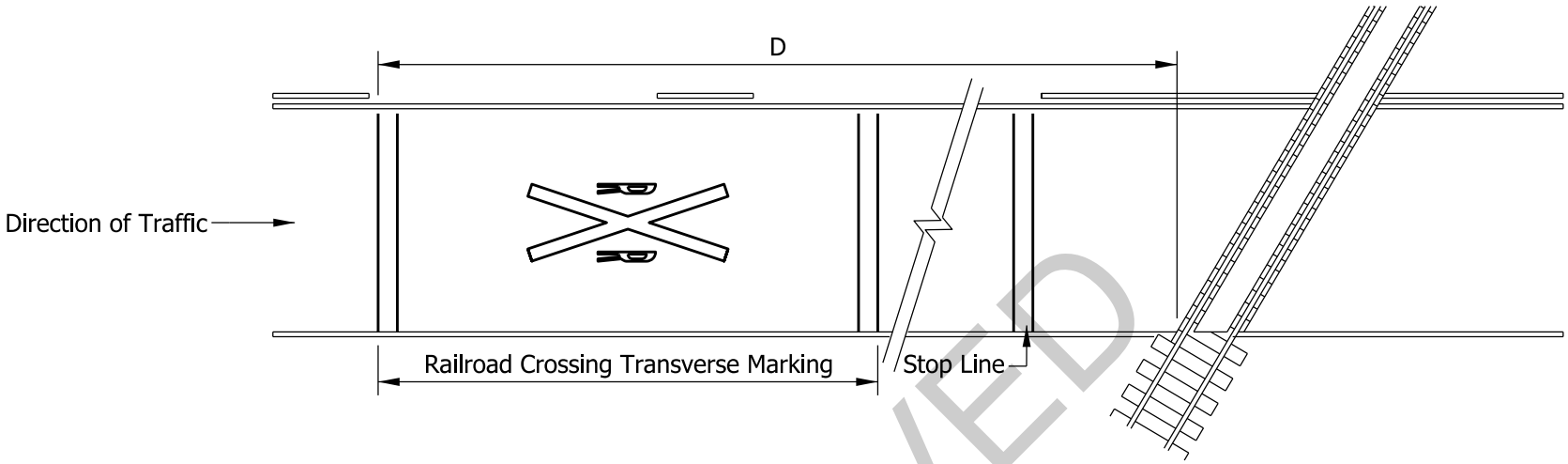
Warning Devices

A basic passive device upgrade is required for all projects that include a railroad-highway grade crossing within or near the terminus of a project. A passive device upgrade consists of replacing the existing cross bucks with high retro-reflectivity cross bucks, adding reflectorized striping to the post, and installation of a yield or stop sign, installing any required pavement markings, and installing or upgrading advance warning signage. Note that per the IMUTCD an engineering study is required prior to the installation of a stop sign.

If active protection is deemed necessary based on the policy, then the upgrade or installation of gates, flashing lights, overhead cantilever, warning bell, and constant warning time (CWT) circuitry is the minimum acceptable level of active warning. No incremental or intermediate improvements to active warning devices are allowed.

Near Terminus

The decision point used to determine if the location of the crossing is near the terminus of a project is based on the transverse pavement markings from the nearest rail. The markings are shown in the INDOT *Standard Drawing* 808-MKPM-06. The decision point, or near terminus, is the leading perpendicular line of the railroad crossing pavement marking. The distance from the nearest rail to the near terminus varies with design speed, and is shown as dimension D in Figure 47-1A. Where the project limits are within the distance D, the crossing must be included in the project scope of work. The near terminus applies regardless of the actual presence of pavement markings on the roadway.



Controlling Dimension For Determining Crossing Inclusion	
Roadway Design Speed	**D = Distance from nearest rail to controlling pavement marking***
< 35 mph	131 Feet
40 mph	156 Feet
45 mph	206 Feet
50 mph	281 Feet
55 mph	356 Feet
60 mph	431 Feet

* Where the project limits are within the distance D from the nearest rail, the crossing must be included in the project scope.

Example: The design speed is 45 mph and the the project limits are 200 ft from the nearest rail. The crossing must be included in the project scope because 200 ft is less than D (206 ft).

NEAR TERMINUS DEFINITION

Figure 47-1A