

Research Report  
KTC -14-17/SPR-452-13-2F

# **Railway/Highway At-Grade Crossing Management: An Overview**

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**Railway/Highway At-Grade Crossing Surface Management:  
An Overview**

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## **A B S T R A C T**

This report draws on data from around the United States to describe the features of a successful railway/highway at-grade crossing management program; it emphasizes the highway/trackbed structures and crossing surfaces. Developing a structurally adequate crossing system is imperative, as this will produce a smooth surface and a stable highway/trackbed that prolongs crossings' lifespans while keeping maintenance costs low and minimizing the number of disruptions encountered by highway and railway traffic. An overview of the guidance issued by several transportation agencies and organizations to facilitate the design and construction of railway/highway at-grade crossings is included here. Equally important to developing a robust network of crossings is defining a clear division of labor between federal, state, and local transportation agencies and railroad companies. As such, this report discusses administrative procedures and state-level regulations that influence railway/highway at-grade crossing practices. This information is presented for AASHTO, AREMA, FRA, FHWA, MUTCD, as well as several states, including Illinois, Indiana, Iowa, Georgia, Michigan, and West Virginia.

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## **EXECUTIVE SUMMARY**

An ideal railway/highway at-grade crossing is designed to fulfill its primary purpose of establishing a smooth surface while providing for the safe passage of rubber-tired vehicles across railroad tracks. Rehabilitating and/or replacing railway/highway at-grade crossings account for significant track maintenance expenses for public agencies across all levels of government and the railroad industry. However, large numbers of crossings have conventional all-granular trackbed designs that deteriorate at a more rapid rate than the adjacent trackbed and pavement. The primary cause of this deterioration is the structural pressures exerted by the combined railway and highway loadings within the shared crossing area as well as the difficulty in maintaining adequate drainage within the immediate crossing area. This jointly-used area is an expensive unit cost of the railway line and highway. State transportation agencies and railroad companies have expressed mounting interest in recent years in adopting improved trackbed crossing designs that provide enhanced structural resiliency, which in turn lengthens their service lives. This trend has spanned technology-based design parameters and crossing management techniques, with stakeholders working to identify the optimal engineering solutions to ensure that railway/highway at-grade crossing installations have acceptable long-term performances.

Several transportation agencies and organizations now provide guidelines and standards for proper design and construction techniques to use at railway/highway at-grade crossings. This report discusses guidance that has been released by organizations and publications such as the American Association of State Highway and Transportation Officials (AASHTO), the American Railway Engineering and Maintenance-of-Way Association (AREMA), the Federal Railroad Administration (FRA), the Federal Highway Administration (FHWA), and FHWA's Manual on Uniform Traffic Control Devices (MUTCD), as well as several states. This review focuses on administrative regulations and state statutes that inform the renewal of railway/highway at-grade crossings. A number of states have successfully developed standard at-grade crossing management practices. Comprehensive information on crossing renewal was obtained from several states, and detailed descriptions are included of the six effective state-level programs, specifically those in Illinois, Indiana, Iowa, Georgia, Michigan, and West Virginia.

# CHAPTER 1

## Introduction

### Problem Statement

Highway/railway at-grade crossings mark the convergence of two of the most critical portions of the transportation network. For this reason, it is essential that the quality of these crossings is maintained. However, maintaining crossing quality is not an easy task. Due to the combination of highway and railroad traffic, at-grade crossings are exposed repetitively to heavy loads carried by passing trains and trucks. As a result, settlement at these crossings occurs quickly. Settlement greatly affects the quality of the crossing by increasing its surface roughness, which negatively impacts the motoring public and railroads alike. Crossing roughness can be attributed to the roughness of either the highway approach or the immediate crossing surface. Trains deflect wood tie track as much as 0.25-0.50 in. (6-12 mm), while vehicular traffic deflects the highway a miniscule amount. Thus, it is necessary to maintain a stiffer track structure within the crossing area to minimize the wear and abrasion of track components. The variation between the deflection and stiffness in the components of the crossing structure contributes substantially to crossing roughness.

From the perspective of railroads, rough crossings caused by excessive settlement adversely affect railroad operations by potentially slowing trains (increasing slow orders) and increasing maintenance costs. In addition, settlement places in jeopardy the safe movement of trains over crossings because excessive settlement affects the geometric features of the rail line, which increases the likelihood of derailments. Vehicular traffic is affected similarly. Rough crossings not only create undesirable driving conditions, but may also contribute to heightened safety problems. At-grade crossings remain hazardous despite drastic industry-wide safety improvements over the past 40 years. In 2007, 95 percent of rail-related fatalities involved grade crossing collisions or trespassers. Vehicle-train collisions resulting in serious injury and death still occur frequently (FRA, 2013). Rough crossings potentially increase the risk for collisions by forcing motorists to reduce their speed and/or divert their attention from oncoming trains onto the crossing surface.

Minimizing crossing roughness improves the operating efficiency of train and vehicular traffic. Limiting the deceleration of trains near at-grade crossings reduces fuel consumption and minimizes company and consumer costs. Likewise, delays caused by at-grade crossings can impose significant costs in terms of loss of time and energy for vehicular traffic. As railroad and highway volumes continue to mount, the prevalence of rough crossings will increase unless new standards for at-grade crossing rehabilitation and renewal are established.

Because successful grade crossing programs require cooperation between a number of different stakeholders, including state, local, and federal agencies and private railroad companies, developing a designated program is crucial. The multi-jurisdictional nature of state agencies illustrates the need for a coordinated program. Federal legislation over the past 40 years has been instrumental in diminishing the responsibility railroad companies have to fund grade crossing improvement projects. Much of this financial responsibility has since been absorbed by state agencies. This matter is complicated by the fact that federal funds oftentimes do not cover maintenance activities, nor do state agencies' jurisdictions extend to include all crossings. Without a designated program to renew and maintain crossings it is difficult to maintain them in a good state of repair. Our findings suggest that tasking a smaller, more centralized decision-making committee to lead this effort makes coordination and program administration more manageable.

## **Background**

While the beginnings of the railroad industry can be traced to the early 1830s, particular attention to the improvement of at-grade crossings was not paid until many years later. Initial grade crossing programs were aimed primarily at improving safety. In 1916, Congress passed the Federal-Aid Road Act, which stands as the first federal legislation pertaining to at-grade crossings (FHWA, 2007). This program allocated federal funds for improvement projects that sought to eliminate hazards at crossings. Although funding for initial projects was divided equally between the federal government and railroad companies, the majority of financial responsibility wound up falling onto the railroad companies. But following the onset of the Great Depression in 1929, funding responsibility shifted dramatically. The National Industrial Recovery Act of 1933 earmarked \$300 million for states to fund at-grade crossing safety improvement projects (FHWA, 2007). Over the ensuing ten years, 3,844 grade crossings were eliminated, 655 grade separations were performed, and 4,652 crossings were fitted with traffic control devices. In 1944, the Federal-Aid Highway Act provided 100 percent federal funding for hazard elimination at crossings on the Federal-aid Highway System (FHWA, 2007).

The rapid growth in railroad and vehicular traffic volumes over grade crossings fostered a burgeoning recognition of the need for states to provide funding for grade crossing improvement projects. California became the first state to address this concern when, in 1953, it developed a designated crossing fund to pay for grade crossing improvement projects (FHWA, 2007). By 1972, 24 states had established similar funding programs.

Still, the majority of federal initiatives focused on improving safety at grade crossings. In 1970, Congress passed the Highway Safety Act and the Federal Railroad Safety Act, which both contained provisions for eliminating hazards at grade crossings. These programs facilitate awareness by combining an investigative and research-oriented approach. In response to the 1970 Acts, the following year, the Federal Highway Administration (FHWA) and the Federal Railroad Administration (FRA) released a two-part report documenting crossing safety programs

and made recommendations for further safety improvements. Congress responded to the report, and in 1973 Section 203 of the Highway Trust Fund was established. Section 203 allocated \$175 million for crossing improvements on the Federal-Aid Highway System. The program gave each state a mandate to determine the best use of their appropriated funds. By 1975, all public and private crossings had been documented in the U.S. Department of Transportation (DOT) National Highway-Rail Crossing Inventory Program. The inventory highlighted the need to expand the federal funding umbrella. Prior to the 1975 inventory, 77 percent of crossings were not located on the Federal-Aid Highway System, and thus ineligible for federal funding (FHWA, 2007). In 1976, Congress expanded the Section 203 program to include all public crossings. An additional \$250 million was allocated from the Highway Trust Fund for crossings on the Federal-Aid Highway System, and \$168.75 million was authorized for those crossings not included on the Federal-Aid Highway System (FHWA, 2007).

The formal distinction between crossings located on or off of the Federal-Aid System was eliminated when, in 1978, the Surface Transportation Assistance Act expanded the Section 203 program by authorizing \$760 million for safety improvements (FHWA, 2007). Nearly ten years later, the Surface Transportation Assistance Act established Section 130 in Chapter 23 of the United States Code. For the first time, the Federal-Aid Rail-Highway Grade Crossing Safety Program became permanently enshrined into law. Section 130 continues to serve as the chief source of federal funding for transportation improvement projects throughout the country (FHWA, 2013). What the formation of Section 130 triggered was a movement for individual states to develop programs designated for grade crossing surface renewal and maintenance. With federal funds secure, states were able to identify additional sources of statewide funding that enabled the advancement of these grade crossing programs.

One of the most recent major federal initiatives addressing at-grade crossings passed Congress in 2005 when the Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU) was signed into law (FHWA, 2005). The legislation required that each state develop a Strategic Highway Safety Plan (SHSP). SAFETEA-LU was significant in that it continued Section 130 funding by authorizing \$220 million for grade crossing improvement projects (FHWA, 2005). Despite being initially enacted to continue through fiscal year (FY) 2009, the SAFETEA-LU program was extended through FY 2011 before expiring the following year. On July 12, 2012, the Moving Ahead for Progress in the 21<sup>st</sup> Century Act (MAP-21) was signed into law, and serves as the SAFETEA-LU successor for future surface transportation improvement projects. MAP-21 has allocated \$105 billion for this purpose for fiscal years 2013 and 2014, with \$220 million designated for highway-railroad at-grade crossing improvements (USDOT, 2013).

Currently, most states rely heavily on three sources of federal funding for grade crossing surface renewal and maintenance projects. These sources include: 1) the state's federal-aid highway fund, 2) Section 130 funds, and 3) other programs within the SHSP. Additional funds

provided by various state and local agencies may be used, while their administration varies from state to state.

### **Project Objectives**

The Developing a Recommended Standard for Highway/Railway At-Grade Crossing Management Practices Project aims to, first and foremost, recommend to the Kentucky Transportation Cabinet (KYTC) a standard best practice procedure for the construction and rehabilitation of at-grade crossings throughout the state. Ideally, the best practice standard that is implemented will maximize the life cycle of at-grade crossings, improve rideability, lower construction and maintenance expenses, and develop a “fast track” approach that minimizes traffic impediments. A vital component of a statewide standard practice is improving the relationship between railroad companies and KYTC. Developing a consistent standard practice that benefits both the state agency and the railroad company will be instrumental for improving this relationship and creating a more cooperative approach in future projects.

In order to develop a standard best practice procedure, it is necessary to compile information from different sources where these practices have been implemented. Several states across the country have successfully implemented some form of standard at-grade crossing renewal procedures. Studying established management practices for various states and customizing those findings for the State of Kentucky will be critical to helping evolve its program to meet the state’s unique needs.

## CHAPTER 2

### Research Sources

Several transportation agencies and organizations provide guidelines and standards regarding the proper construction and design for railroad-highway at-grade crossings. When constructing at-grade crossings, it is important that the procedures meet the standards established by these agencies. Additionally, administrative regulations and state statutes set up laws that govern railroad and at-grade crossing practices. Together, these organizations and guidelines combine to serve as the foundation for grade crossing design, implementation, and maintenance. The following sections briefly describe some of these agencies and organizations.

#### American Association of State Highway and Transportation Officials (AASHTO)

AASHTO is a nonprofit association that represents highway and transportation departments in each of the 50 states and serves as the chief body for the development of highway design and construction guidelines. The Green Book focuses primarily on highway design; its contribution to at-grade crossing standards is centered on the highway aspects of the joint crossing area. In 2011, AASHTO released its 6<sup>th</sup> and most recent edition of “A Policy on Geometric Design of Highways and Streets”. While much of the handbook consists of highway design specifications, Chapter 9.12 is devoted entirely to railroad-highway at-grade crossings. Information concerning standard horizontal and vertical alignment of highway approaches to at-grade crossings is provided in this section of the handbook. Additionally, the handbook offers guidance on crossing design and sight distance requirements at crossings. For years, the standard guidelines developed by AASHTO have served as the benchmark for the design of highway approaches to at-grade crossings. Figure 2.1 depicts the alignment specifications for a typical railroad-highway grade crossing as defined by AASHTO (AASHTO, 2011).

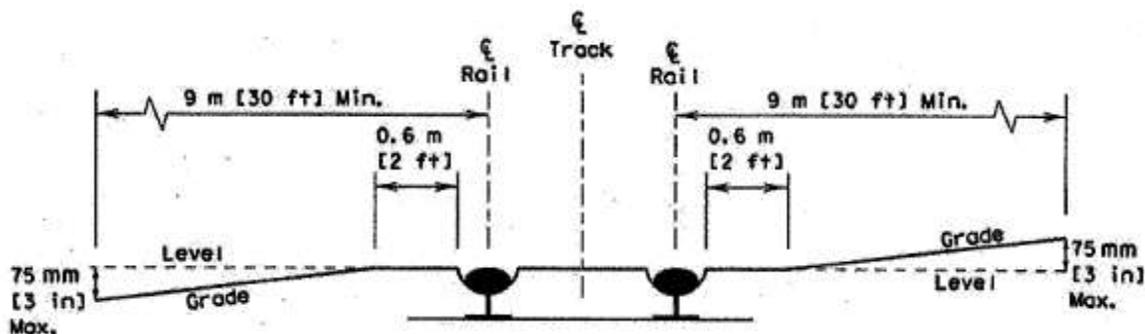


Figure 2.1: Highway-Railroad At-Grade Crossing

## **The American Railway Engineering and Maintenance-of-Way Association**

The American Railway Engineering and Maintenance-of-Way Association (AREMA) is a technical association that specializes in the development and advancement of knowledge in the railroad industry. Since its inception in 1997, AREMA has released numerous publications focusing on establishing recommended practices pertaining to the design, construction, and maintenance of railway infrastructure. Each year, AREMA releases a new edition of its “Manual for Railway Engineering”, which serves as the primary source for railroad design specifications. The manual is prepared by a collection of railroad professionals with extensive expertise in the railroad industry. It provides specifications and design recommendations for all aspects of the railroad, including the track, structures, infrastructure, passenger facilities, and systems management. Part 8 of Chapter 5, Volume 1 (Track) of the “Manual for Railway Engineering” is dedicated entirely to design recommendations for railroad-highway at-grade crossings. This section contains a broad range of recommendations for several dimensions of at-grade crossings, including: general crossing design, roadway alignment, roadway approach pavement, roadway approach grades, general safety regulations, crossing locations, highway work zone traffic control, railroad coordination, track crossing surface maintenance and rehabilitation, subgrade, ballast, ties, fastening devices, rail, crossing width, and flangeway width and depth (AREMA, 2013). AREMA routinely updates its publications to keep pace with ongoing research, so it is important that state and federal agencies, as well as railroad companies, maintain consistent knowledge of the wealth of information that AREMA has at its disposal.

## **Federal Railroad Administration (FRA)**

The FRA is an agency in the United States Department of Transportation that enforces railroad safety regulations. The FRA regulates the aspects of grade crossing safety related to the railroad, including track safety; train-activated warning devices; type of lighting to be placed on a locomotive; the audibility of the train horns; the inspection, testing, and maintenance standards for active grade crossing signal system safety; and train safety. The FRA has been the primary organization that has spearheaded the movement for increased safety awareness in the railroad industry. The agency has developed the Highway-Rail Crossing Safety and Trespass Prevention Program, which aims to reduce the number of collisions at-grade crossings. The FRA also provides research on technical aspects of grade crossing safety. Through coordination with other transportation administrations, including the U.S. Department of Transportation (USDOT) and the Transportation Research Board (TRB), the FRA has focused research efforts on critical safety measures, including visual and audio warnings, motor vehicle and train-presence detection, crossing geometry, crossing-gate and flashing-light technologies, Intelligent Transportation System (ITS) prototype demonstrations, and the impact of developing the National ITS Architecture. Increased safety awareness, training, and research administrated by

the FRA have helped reduce the number of fatalities at railroad-highway at-grade crossings by 45 percent since 1994 (FRA, 2013).

### **Federal Highway Administration (FHWA)**

The FHWA is the chief agency that supervises the construction, maintenance, and preservation of the nation's highways. It also provides assistance to local agencies and conducts ongoing research. With respect to at-grade crossings, since 2005, the FHWA has administered the distribution of funds authorized by the Safe, Accountable, Flexible, Efficient Transportation Equity Act (SAFETEA-LU) and the Moving Ahead for Progress in the 21<sup>st</sup> Century Act (MAP-21) to each state. As mentioned above, the Section 130 Fund allocated \$220 million annually for railroad-highway at-grade crossing safety improvement projects from fiscal years 2006-2011 (FHWA, 2013). Allocation to states varied, with each state receiving a minimum of 0.5 percent. The FHWA mandated that 50 percent of the funds go to traffic control device improvement, with the remaining percentage to be used at the discretion of individual states. The SAFETEA-LU Act has been instrumental in improving safety at crossings, having helped prevent an estimated 10,500 fatalities and 51,000 nonfatal injuries (FHWA, 2005). Following its expiration in 2012, funds that had previously been disbursed via SAFETEA-LU were provided by MAP-21, which is the most recent federal legislation regarding transportation improvement projects. Similar to SAFETEA-LU, MAP-21 has extended Section 130 funds and allocates \$220 million for railroad-highway at-grade crossing improvement projects for fiscal years 2013 and 2014 (USDOT, 2010). The FHWA has maintained its role as the chief distributor of funds provided by this program.

Many states rely heavily on this federal funding for at-grade surface renewals and rehabilitation projects. The \$220 million allotment has remained relatively unchanged during the last twenty years (varying from \$140 M-\$155 M since 1987), as has the method for the allocating funds to the states (FHWA, 2013). The distribution of the Section 130 Fund is apportioned based on a formula developed at its inception in 1987. Half of the funds are distributed to each state based on the ratio of the number of public crossings in the state to the number of public crossings in the country. The remaining 50 percent is divided on the basis of area, population, and road mileage. The Section 130 Fund for at-grade crossing safety improvements is available at a 90 percent federal share, with the remaining 10 percent covered by the State, local agencies, or railroad companies. Under some circumstances, the Section 130 fund may constitute a 100 percent federal share. The decision to allow 100 percent federal funding lies with the individual states.

In addition to administering funds allocated by SAFETEA-LU and MAP-21, the FHWA finances significant research efforts in the transportation field. The FHWA is responsible for publishing two of the most widely used handbooks used in the transportation industry: the Manual on Uniform Traffic Control Devices (MUTCD) and the Grade Crossing Handbook. These handbooks receive periodic updates, after which representatives that work for the FHWA

distribute them. Each handbook is a vital source for developing guidelines for various transportation projects, particularly those associated with railroad-highway at-grade crossings.

### **Manual on Uniform Traffic Control Devices (MUTCD)**

The MUTCD defines the standards used for the installation and maintenance of traffic control devices on all public roads. The MUTCD is published by the FHWA for the purpose of standardizing all traffic control devices, including road markings, highway signs, and traffic signals nationwide. It plays an instrumental role in providing standards that contribute to safer transportation facilities. Since its initial launch in 1971, the MUTCD has been updated regularly to meet the ever-evolving transportation demands and to account for the development of new technologies in the transportation field. Part 8 of the MUTCD contains specific guidelines for railroad-highway at-grade crossings. This section provides a comprehensive set of guidelines outlining the proper design, size, and placement of signs, pavement markings, light signals, and traffic control signals at-grade crossings (FHWA, 2009). In addition to providing guidelines, the manual includes depictions of signs along with appropriate dimensions and requirements for their placement in relation to the crossing surface. Guidelines provided by the MUTCD continue to serve as the principal source for traffic control devices at-grade crossings.

### **Railroad-Highway Grade Crossing Handbook**

In 2007, in coordination with the United States Department of Transportation, the FHWA released the revised second edition of the “Railway-Highway Grade Crossing Handbook.” The handbook is the most comprehensive source for information regarding at-grade crossings. It compiles information from the various agencies that administer design and construction guidelines for at-grade crossings, including the “Manual on Uniform Traffic Control Devices” and “A Policy on the Geometric Design of Highways and Streets.” In addition, the handbook provides salient information from several of the governing agencies, including the Federal Railroad Administration, the USDOT, the Transportation Research Board, AASHTO, and AREMA. The handbook contains general information about the development of at-grade crossings and the laws that govern them; a detailed analysis of the components that make up the crossing; an assessment of crossing safety and operation; an analysis of the use of proper traffic control devices; a discussion outlining the proper implementation of crossings, including funding, accounting, design and construction, and traffic control; a description of maintenance techniques; an evaluation of projects and programs; and a brief overview of supporting programs (FHWA, 2007). Furthermore, excerpts from various state grade crossing policies, including sample collision reports, crossing evaluation reports, crossing consolidation and closure strategies, and preemption calculation procedures are included in the appendices (FHWA, 2007). Among the general information provided in the handbook is an extensive discussion on safety improvements in the railroad industry; there are accompanying figures and tables prepared by the USDOT and the FRA. Whether it is for the casual individual just interested in learning about at-grade crossings, or the professional engineer searching for design standards, the “Railroad-

Highway Grade Crossing Handbook” provides valuable information for a wide array of functions. The handbook has been an especially important source for gathering information summarized in this report.

### **State Administrative Regulations**

Administrative regulations govern the activities of administrative agencies in the United States government. In many states, administrative regulations specify the extent to which governing agencies hold jurisdiction over grade crossings. This may include the distinction between public and private crossings as well as the relationship between railroad companies and local or state agencies. Administrative regulations also enforce the laws that dictate the grade crossing and railroad domain. In the State of Kentucky, administrative regulations give the Transportation Cabinet authority to oversee railroads and confer to it powers previously held by the Railroad Commission. Title 603 of the Kentucky Administrative Regulations (KAR) outlines the powers of the Kentucky Transportation Cabinet’s (KYTC) Department of Highways. Most of the regulations focused on railroad companies and grade crossings are in this section. A broader depiction of the powers of the KYTC is included in Title 600 of the KAR.

### **State Statutes**

Statutes are formal laws written and enacted by legislative bodies. Statutes differ from administrative regulations and case law in that legislative bodies enact them, whereas case law emerges from court rulings, and regulations are determined by governmental agencies. While in most states, administrative regulations spell out the jurisdiction of governing agencies over at-grade crossings, state statutes enshrine into the law the various aspects of grade crossing programs. In cases where states do not maintain a designated grade crossing program, statutes define specific regulations pertaining to railroad companies or grade crossings in particular. Chapter 277 of Title XXIV of the Kentucky Revised Statutes (KRS) governs the organization and operation of railroad companies in the state. Most of the information relating to grade crossings can be found in this chapter. Regulations mandating the now-defunct Railroad Commission are included in Chapter 276, and Chapter 174 of Title XV provides broad guidelines for KYTC.



**Typical Rubber/Asphalt Crossing Surface**

## CHAPTER 3

### Model State Case Studies

Several states throughout the country have successfully developed standard at-grade crossing management practices. Many of these states have generously provided information for the purposes of this research project. Illinois, Indiana, Iowa, Georgia, Michigan, and West Virginia have been the most forthcoming with comprehensive information. Detailed descriptions of the programs that have been implemented in these states are provided in this section of the report.

#### Illinois

Two entities manage the rehabilitation of grade crossings in the State of Illinois. Crossings that exist on the state road network fall under the jurisdiction of the Illinois Department of Transportation (IDOT), while the Illinois Commerce Commission (ICC) manages crossings located on local roads and streets. The ICC oversees the majority of grade crossing renewal projects throughout the state. Of the 7800 at-grade crossings statewide, only 760 are located on state roads. Therefore, the ICC has the challenge of managing over 7000 crossings in Illinois. The following sections of the report discuss the two separate grade crossing authorities and the manner in which each handles grade crossing surface renewal projects.

#### **Illinois Commerce Commission**

In 2011, the ICC established the Grade Crossing Protection Fund (GCPF). The GCPF serves as the primary source of funding for grade crossing surface renewal projects. Upon implementation of the GCPF in 2011, \$750,000 was allocated for surface renewals each year. By 2015, this amount will be doubled to \$1.5 million if the ICC can offer documented evidence that the projects executed to date have measurably enhanced crossing safety. GCPF assistance is granted on a per-request basis. Railroads may apply for assistance on grade crossing projects that affect local roads and streets only. When applied, GCPF funds are used solely for material cost reimbursement. The railroad company involved in the project is responsible for all other costs associated with the surface renewal, including labor. Material costs that are eligible for reimbursement include contractual services for asphalt paving and work zone traffic control in addition to the crossing surface material. Design materials for surface renewal projects are selected by the railroad with the aid and supervision of county engineers. A sampling of GCPF documents is included in Appendix B.

To qualify for assistance, selected grade crossings must meet several requirements set forth by the ICC. Crossings that are located on a segment of track that is scheduled for major track rehabilitation improvements within twelve months from the date of submission are

ineligible for GCPF assistance. Crossings identified for a surface renewal must be consistently maintained by the railroad to meet specifications provided in 92 Illinois Administrative Code 1535. The GCPF will cover the selected material costs only under the condition that the chosen design meets ICC standards. These standards are based upon Annual Average Daily Traffic (AADT) and whether a crossing is along a designated truck route. The design criteria fall in one of three AADT categories: AADT volumes less than 500 vehicles per day, AADT volumes between 500 and 5,000 vehicles per day, and AADT volumes greater than 5,000 vehicles per day. Additional design and construction measures are required for designated truck routes.

Railroad companies can appeal for assistance from the GCPF by submitting a formal letter of request. For each state fiscal year, the ICC prepares a list of potential crossing renewal projects. Railroads are given 60 days to submit a list of crossings in need of surface renewal as well as cost information associated with the scope of work. The ICC then selects the crossing renewal locations, and a Stipulated Agreement is prepared for each railroad company. The Stipulated Agreement outlines the scope of work, technical specifications, and division of costs. Once all of the agreements have been negotiated, the ICC Rail Safety Section submits an Order to the Commission recommending assistance from the GCPF. After completing the Order by the Commission, a railroad company must finish surface renewal within the time designated in the Commission Order. The railroad bears responsibility for any future maintenance costs for the new crossing surface. GCPF-assisted surface renewals are typically completed within 180-270 days of the authorization date. The ICC specifies apportionment of the GCPF based on railroad class. Class I railroads receive 75 percent of the GCPF assistance, while regional and short-line railroads receive between five percent and 20 percent, respectively. Appendix A includes a sample of a typical Grade Crossing Inventory.

### **Illinois Department of Transportation**

The Illinois Department of Transportation (IDOT) has jurisdiction over the 760 at-grade crossings on the state road network. IDOT is divided into nine local districts. Each district employs a railroad liaison that has extensive expertise in the railroad industry and an intimate knowledge of the district. The railroad liaison oversees all at-grade crossing surface renewal projects in their district. Selecting which surface renewal projects are chosen is a decision made primarily by the railroad liaison and/or railroad company. District residents are also encouraged to voice complaints if certain grade crossings are hazardous to vehicular traffic. The railroad liaison evaluates the complaints, and based on their professional judgment, decides which grade crossings require surface renewal. After a project is selected, the local liaison and railroad company negotiate the design criteria. There is a diligent effort to have the liaison maintain an upstanding relationship with the railroad companies in the district so that their advice on certain aspects of the design and construction are applied. Further, the liaison is present at the construction site throughout the project's entirety to ensure that it progresses in a manner that is consistent with IDOT standards.

The primary funding source for IDOT grade crossing surface renewal projects is the Federal Safety Fund (Section 130). Additional local and state funds may also be used. As is the case with projects funded by the GCPF, the Section 130 fund covers only the cost of materials. Additional costs, including labor and miscellaneous costs are absorbed by the railroad.

IDOT developed a roughness and rideability scale that quantifies the performance of at-grade crossings. The scale is based on driver-perceived vehicle response when moving over a crossing. Each crossing is assigned a value of 0-5. Table 3.1 summarizes the ratings and their corresponding definitions. Appendix C includes a complete sample of the roughness and rideability scale.

**Table 3.1. IDOT Roughness and Rideability Scale**

<b>Rating</b>	<b>Description</b>
0	Vehicle is Severely Jolted - Bad Condition (Nearly Stopped or 10 MPH or less)
1	Very Uncomfortable- Poor Condition (Urban: 10-15 MPH, Rural: 25-30 MPH)
2	Noticeable Jar- Fair Condition (Urban: 30 MPH, Rural: 50 MPH)
3	Bump Felt- Good Condition (Urban: 30 MPH, Rural: 50 MPH)
4	Very Slight Bump- Excellent Condition (Urban: 30 MPH, Rural: 50 MPH)
5	Very Smooth (Urban: 30 MPH, Rural: 50 MPH)

Crossings that receive a low rating are flagged for potential surface renewal. Ultimately, it is up to the district liaison and the railroad company to determine which crossings will be renewed. The materials used for the surface renewal is a decision made by the liaison and is based on a number of factors, including train volume and speed, AADT, and truck volume. For crossings that experience low-tonnage, low-speed trains and heavy vehicular traffic, a Startrack crossing with an eight inch (200 mm) thick asphalt underlayment is the preferred surface design. The railroad ties do not extend under the Startrack. “Turkey Grit” fiber is also placed between the asphalt and concrete to prevent concrete particles from penetrating the asphalt surface. Generally, four or five 10-ft (3 m) long ties are set adjacent and parallel to both sides of the Startrack to increase stability. For crossings that feature higher-tonnage train traffic, Startrack is not permitted. The preferred surface material on crossings that convey high-speed, high-tonnage trains and persistent truck traffic is rubber. All crossing surfaces extend eight feet (2.4 m) beyond the pavement. When pedestrian facilities are present, crossing surfaces are lengthened based on site evaluations. The majority of crossings, irrespective of surface material used, are fitted with asphalt underlayment. Although the construction time for crossings varies based on the project’s magnitude, most surface renewals are wrapped up in four or five days.

## **Indiana**

The Indiana Department of Transportation (INDOT) uses procedures similar to IDOT to inform the management of at-grade crossings. The Utilities and Railroad Branch within INDOT has jurisdiction over all crossings on state routes. In addition to the representatives in this branch, the six districts across the state each have a designated railroad coordinator that oversees projects and coordinates utilities within their district. Projects are normally executed after the railroad coordinators receive complaints from the public and/or recognize, independently, the need for crossing renewal. They then advance a recommendation to the railroad company about the need to move forward with rehabilitation. While most projects are deferred to the specific companies, the railroad coordinators and central branch representatives may suggest what materials would be preferred for upgrades. Recommendations made about material upgrades are usually at the discretion of the district coordinators and the branch representatives. Concrete and rubber is the most commonly recommended surface throughout the state. In addition, Startrack tubs are used sparingly, and only on slow-moving, light tonnage tracks where train traffic is less than 10 mph. Upgrades are typically funded using state, county, or city funds. Indiana's allocation from the Section 130 fund (\$7.2 million per annum) is used only on projects that involve signaling. No designated funding is available for at-grade crossing projects.

## **Iowa**

The Iowa Department of Transportation (IaDOT) first instituted an at-grade crossing management program in 1973 with the introduction of the Grade Crossing Surface Repair Fund. At that time, an annual allocation of \$600,000 was set aside for surface renewal projects. In 1983, the program was revised into a structure that remains today. Today, it is referred to as the "60-20-20" program. The "60-20-20" name references the distribution of funding responsibility for surface renewal projects. The Grade Crossing Surface Repair Fund covers 60 percent of project costs, while 20 percent is funded by the railroad and 20 percent by the jurisdictional agency. The Grade Crossing Repair Fund now allocates \$900,000 each year for surface repair. In addition to the \$900,000 set aside for surface repair, additional funding comes from the Section 130 Fund, which provides \$1 million a year for transportation safety improvement projects. While the Section 130 fund was not originally intended to underwrite surface repair, the federal government determined that it could legally be used in this manner because surface repair is a matter of public safety. Typically, \$300,000 of the available funds is used for grade crossing surface renewal. The Grade Crossing Repair Fund is used primarily for material reimbursement, providing \$400 per linear foot for materials, which include: the surface, rail, ballast, ties, welds, and premium fasteners. On rare occasions, funding comes from money allocated for signals, which totals \$3-4 million annually. Typically, funds designated for surface repair are withdrawn in \$500,000 increments from this source. Crossing renewal projects located on city and county roads are covered primarily by the Grade Crossing Surface Repair Fund, while projects on state roads are covered by the Section 130 fund. In 2004, the waiting list for surface renewals was

nearly 10 years. In an effort to maximize the number of renewal projects executed throughout the year, the Section 130 fund was designated specifically for grade crossing renewal projects. As a result, significantly more crossing renewal projects are completed on a yearly basis, and the waiting time has diminished substantially; this shift in policy has eliminated the waiting list, with all projects now being evaluated based on their own merits. A sample of pertinent documents regarding the Grade Crossing Surface Repair Fund is included in Appendix D.

A ranking system is used to evaluate which crossing surface renewal projects should be prioritized. The prioritization of renewal projects depends on 19 factors specified by the IaDOT. These factors include:

1. Vehicles reduced speed
2. Tie condition
3. Vehicles weaving
4. Rail stability
5. Rideability
6. Fouled ballast
7. Header area
8. Drainage pattern
9. Elevation differential
10. ADT
11. Approach profile
12. Percent of Trucks
13. Cross section
14. Number of Trucks
15. Approach pavement
16. Speed Limit
17. Surface deterioration
18. Number of daily trains
19. Surface stability

Once potential renewal projects have been identified, the jurisdictional agency and railroad negotiate an agreement to finalize payment distribution. A written notification – called an Exhibit A agreement – is then sent to IaDOT. This agreement includes the American Association of Railroads—Department of Transportation (AAR-DOT) crossing number, the estimated cost of the repair, and a statement that confirms the railroad and the jurisdiction have each agreed to pay 20 percent of the repair costs. A sample of an Exhibit A agreement is provided in Appendix E. The IaDOT is charged with resolving whether the work constitutes a surface repair project and is therefore eligible for funds provided by the Grade Crossing Surface Repair Fund. If permitted, the department issues agreement papers to the jurisdictional agency and the railroad. Upon completion of the project, the department determines if the work was performed satisfactorily.

Once all aspects of the project have concluded, the department assumes 60 percent of the total cost of the project. The remaining 40 percent is split evenly between the jurisdictional agency and the railroad. Choices about which grade crossings merit rehabilitation take place one year in advance of project execution.

The Iowa grade crossing management program began with a primary phase. During this primary phase, between 29 and 33 crossings were completed per construction period. A declining number of crossings have been targeted for renewal every year due their increased life cycles. All public crossings throughout Iowa funded by the Grade Crossing Repair Fund and/or the Section 130 fund adhere to a uniform construction and design method. All crossings are modeled as mainline crossings to account for future growth and increased loads. Appendix F contains the Primary Road Grade Crossing Study form. Premium surfaces are used for all projects – primarily rubber and concrete panels. It is recommended that concrete panels extend two ft (0.6 m) from highway pavement. Each crossing features a five ft (1.5 m) cut design, which is a cut made five ft (1.5m) outside of the tie on each side to facilitate compaction. Approach distance extends 60-80 ft (18-24 m) from the railroad track in both directions to ensure that the crossing is level. Normally, a total of six hours is allotted for construction from the time the rail is cut to the time the panel is laid. Clean ballast is laid roughly 20 ft (6 m) from the outside of the panels and corners are blown to increase compaction and improve drainage. One layer of ballast is pre-compacted to accommodate initial settlement.

For crossings that feature asphalt underlayment, the asphalt is placed in a truck during the excavation phase so it is ready for application following ballast compaction. Initial tamping takes place on the first day. The track is then left exposed to overnight loads before being tamped again the following day. This helps with compaction and lessens initial settlement. The maximum settlement that has been observed following this procedure is 1/8 in (3 mm). Typical crossings contain a 12-in. (300 mm) thick asphalt underlayment. The edges of the premium surface panels are sealed with oil to keep water in the edges to avoid freeze thaw. No ties are included under the concrete panels. A 20-ft (6 m) asphalt approach outside of the panel is specified. Currently, three ft (0.9 m) panels are used. However, there have been mounting calls to use nine ft (2.7 m) panels to eliminate seams. Pandrol clips are used at all crossings. During construction, IaDOT has authority to specify detour routes and waive detour routes if they are unneeded. A member of IaDOT is present during all phases of construction to ensure that the project progresses according to plan.

## **Georgia**

In an effort to develop a more manageable statewide at-grade crossing management program, in July 2002 the Georgia Department of Transportation (GDOT) was given full responsibility to ensure compliance with the Official Code of Georgia (O.C.G.A.), Sections 32-6-190, 202, and 203 with respect to at-grade crossing maintenance. O.C.G.A. Section 32-6-190 states, “Any

railroad whose track or tracks cross public road at-grade shall have a duty to maintain such grade crossings in such condition as to permit the safe and reasonable passage of public traffic. Such duty of maintenance shall include that portion of the public road lying between the track or tracks and for two feet beyond the ends of the crossties on each side and extending four feet beyond the traveled way or flush with the edge of a paved shoulder, whichever is greater, of such crossing.” With the adoption of this new management structure, responsibility for potential grade crossing surface renewal projects on all public roads was designated based on one of three scenarios. The first scenario, in which all of the maintenance requirements are confined within the limits of the grade crossing, delegates full responsibility to the railroad company. Under the second scenario, the governing authority assumes full responsibility. This scenario encompasses maintenance requirements that take place entirely beyond the crossing limits. In the State of Georgia, governing authority refers to a municipality, county, or state agency. Responsibility for maintenance work that falls under the jurisdiction of the railroad and the governing agency is split between both parties. Developing full cooperation between the railroad and governing agency is critical to finish the maintenance in a timely and effective manner. While individual maintenance projects are left in the hands of the governing agency or the railroad, the Georgia Department of Transportation is ultimately responsible for the oversight to verify that projects are completed under specified standards. GDOT has issued a set of policies for those projects that affect public roads and are the responsibility of a railroad company. A separate set of policies has been issued for projects that take place on the state highway system and are completed cooperatively by a railroad and a governing agency. The policies and procedures for each of these scenarios are sketched out in the following sections of the report.

### **Policies for Grade Crossing Maintenance on All Public Roads**

GDOT has administered a set of policies and procedures for grade crossing renewal projects that are completed and funded by the railroad companies. Provisions included in the Georgia Code ensure that GDOT maintains control over these projects despite not having direct responsibility. O.C.G.A. Sections 32-6-190, 2202, and 203 declares that if a governing authority requests the maintenance of a grade crossing, and a railroad does not comply, the governing authority can submit a written request for review by GDOT. Once the request has been submitted, GDOT determines if the maintenance is needed. If the maintenance is necessary, GDOT orders the railroad company to complete the specified work or be subject to civil penalty. Formal written requests to the Department carry with them a filing fee of \$500 per crossing, and each request must contain all relevant information regarding the maintenance work that will be performed, including the highway, street, or roadway name and number where the crossing is located, the USDOT crossing inventory number, a detailed description of the problem with the grade crossing, and all correspondence between the railroad and the governing authority. After receiving the request, the Department investigates the matter, and within 30 days of receiving the written request determines if the maintenance should be completed. The investigation may include engineering analysis of the grade crossing and on-site inspections with an appropriate

railroad official. Within 30 days of the railroad company's ordered completion date, the Department reviews the work to determine if the guidelines provided by the order have been met. Failure to comply with the order guidelines may result in a civil penalty in the amount of \$500 per day from 30 days after the receipt of the order until compliance has been achieved. In an effort to maintain a level of consistency on all crossings, GDOT has prepared a set of design guidelines that must be observed by railroad companies for crossing maintenance projects.

### **Policies for Grade Crossing Maintenance on the State Highway System**

Railroad companies and a representative governing agency work cooperatively to complete grade crossing maintenance projects that take place on the Georgia State Highway System. The District Utilities Engineer is used as the primary contact for GDOT and is responsible for coordinating activities with the Department Area Engineer and a representative from the railroad. The railroad representative provides the Area Engineer with notification of pending projects, and an agreement on the scope of work is then hammered out. The agreement may include a scheduled work plan, proposed detour plan, and railroad contact names and phone numbers. The Area Engineer then relays the finalized work plan to the District Utilities Engineer, who releases the plan to the District Communications Office for public notification. For work that extends across both GDOT's and the railroad's jurisdiction, coordinating efforts in performing such maintenance activities as milling, inlay, resurfacing, and traffic control as needed. Typically, the railroad notifies the Area Engineer of proposed maintenance plans at a minimum of 15 days prior to project commencement. For maintenance that requires road closure, the Area Engineer has the responsibility of deciding how long to keep the detour route opened for. After the maintenance activities have been completed, the Area Engineer inspects the work to ensure it complies with the terms that were agreed to.

### **Michigan**

Section 462.309 of the Michigan Railroad Code contains guidelines that the state uses to determine grade crossing jurisdiction, and it ultimately serves as the basis for governing renewal and rehabilitation projects. The code specifies that the railroad company owns and is responsible for maintaining, renewing, and repairing all railroad roadbed, track, and culverts lying between the rails and for a distance of one foot beyond the end of the ties. Accordingly, all maintenance-related expenses are incurred by railroads. The appropriate road authority is responsible for maintaining and renewing the remaining portions of the street or highway at the crossing. Act 354 of the Railroad Code confers responsibility for the full cost of maintaining and repairing existing crossings to the party that initiates the work. Before starting rehabilitation projects, the Michigan Department of Transportation (MDOT) and a railroad company enter into a Master Agreement that establishes the distribution of responsibility as defined by the Railroad Code. MDOT holds complete jurisdiction over public highways existing on the state highway network.

Highways and roadways under the jurisdiction of various counties, cities, and villages are controlled by the local road authority. All projects, regardless of the parties that are directly involved, are supervised by MDOT, and the scope of the work must be agreed upon by the department before the project gets underway.

MDOT maintains an extensive grade crossing inventory that includes general crossing data as well as performance criteria. For each crossing, performance is characterized based on a rating scale from one to five, where one signifies excellent condition and five, poor condition, a surface in need of immediate repair. Three elements of the crossing receive an individual rating based on current performance. These three criteria include: grade crossing surface performance, roadway approach performance, and automatic device/signage performance. Subsequent train and traffic information is provided. Crossings that feature low ratings on the rating scale are given high priority for maintenance and rehabilitation. A sample of a typical Grade Crossing Maintenance Review is located in Appendix G.

### **West Virginia**

In West Virginia, the rehabilitation and maintenance of highway-railway at-grade crossings is primarily handled by the Utilities Section of the Right-of-Way Division in the state's Department of Highways. While the representatives that manage railroad work throughout the state are a part of the Department of Highways, they have vast experience and possess an intimate knowledge of the railroad industry. For most highway/railway at-grade crossing rehabilitation projects, the West Virginia Department of Transportation (WVDOT) covers the cost of material upgrades only. Any other cost, including labor, is borne by the railroad company. For crossing rehabilitation projects that include upgrades, funding is provided solely by the Section 130 funds. West Virginia is allotted \$2 million per year as part of the Section 130 program, and this annual allotment is used specifically to upgrade crossing safety. Along with providing funds for surface upgrades, WVDOT finances asphalt underlayment, traffic control, drainage pipe, and tie differential. In all, WVDOT disburses a total of \$150 per track for at-grade crossing rehabilitation projects. No state funds for railroad work are set aside for railroad, unless awards are granted for special projects.

An average of nine crossings are rehabilitated with asphalt underlayments each year. In 2013, 14 crossings were slated for renewal. WVDOT standards dictate that the minimum crossing service life should be 10 years; this enables the railroad company to skip a crossing at least once for a five-year maintenance plan. WVDOT takes the initiative in triggering crossing rehabilitation projects. Representatives from the Department enlist the work of railroad companies when they see a crossing as negatively impacting public safety. A comprehensive overview of the West Virginia highway-railway at-grade crossing program is provided by the Highway-Railroad Manual maintained by the Utilities Section. This manual contains specific information that defines procedures and standards for at-grade crossing rehabilitation projects.

Various components of a crossing project are discussed in individual sections of the manual, including crossing surfaces and traffic control devices.



**Typical Composite Crossing Surface**



**Typical Concrete Panel Crossing Surface**

# SUMMARY

State transportation agencies and private railroad companies have expressed increased interest of late in incorporating asphalt underlayments and improved trackbed crossing designs and using premium materials in-lieu of traditional all-granular materials. These materials enhance the structural capability and waterproofing capacity of areas proximate to a railway/highway crossing; they will also extend the service lives of crossing surfaces. Technology-based design parameters and crossing management techniques for assessing optimal engineering solutions are now common practice for agencies responsible for crossing management and oversight. Numerous transportation agencies and organizations have issued guidelines and standards for the proper design and construction techniques for railway/highway at-grade crossings, including AASHTO, AREMA, FRA, FHWA, MUTCD, and several states. Comprehensive information was summarized for the States of Illinois, Indiana, Iowa, Georgia, Michigan, and West Virginia. These selected states have been successful in developing standard at-grade crossing management practices.



**Typical Timber/Asphalt Crossing Surface**

## REFERENCES

- Federal Railroad Administration. (n.d.). *Highway-Rail Grade Crossing and Trespass Prevention*. Retrieved June 2013, from <http://www.fra.dot.gov/Page/P0040>
- Federal Highway Administration . (2007). *Railroad-Highway Grade Crossing Handbook: Revised 2nd Edition*. United States Department of Transportation.
- Federal Highway Administration. (2013). *Railway-Highways Crossing (Section 130) Program*. Retrieved June 2013, from <http://safety.fhwa.dot.gov/xings/>
- Federal Highway Administration. (2005, August). *A Summary of Highway Provisions in SAFETEA-LU*. Retrieved July 2013, from Federal Highway Administration: <http://www.fhwa.dot.gov/safetealu>
- United States Department of Transportation. (2013). *Moving Ahead for Progress in the 21<sup>st</sup> Century Act (MAP-21)*. Retrieved August 2013, from <http://www.dot.gov/map21>
- American Association of Highway and Transportation Officials. (2011). *A Policy on the Geomtric Design of Highways and Streets: 6th Edition*.
- The American Railway Engineering and Maintenance-of-Way Association. (2013). *Manual for Railway Engineering*.
- United States Department of Transportation. (2010, February 17). *Transportation Investment Generating Economic Recovery (TIGER) Grants*. Retrieved August 2013, from [http://www.dot.gov/sites/dot.dev/files/docs/Tiger\\_I\\_Awards](http://www.dot.gov/sites/dot.dev/files/docs/Tiger_I_Awards)
- Federal Highway Administration. (2009). *Manual on Uniform Traffic Control Devices: 2009 Edition*. United States Department of Transportation.

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**Appendix A**  
**Illinois Commerce Commission Grade Crossing**  
**Inventory Sample**

**Illinois Commerce Commission**  
 527 East Capitol Avenue, Springfield, Illinois 62701  
 ICC Transportation Railroad Safety

**Grade Crossing Inventory**

Crossing Number Search | County Search | Advanced Search  
 Show Previous Search Results | Show Google Map | Show Topo Map

Crossing Inventory Collision History Docket History

**Crossing Information**

DOT/AAR Number:	291054G
Status:	Open
Railroad:	Illinois Central Railroad Company
Milepost:	4.30
ICC Line Code:	N
Crossing Type:	Public (At Grade) Crossing
Type of Private Crossing:	Not private
County Name:	Champaign
City Name:	CHAMPAIGN
In Or Near:	In
Street Name:	STALEY RD
Highway Number:	FAP810
Railroad Division:	NORTHERN
Railroad Subdivision:	HAVANA
Number of Main Tracks:	1
Number of Other Tracks:	0
Description of Other Tracks:	
Crossing Surface Type:	Concrete
Average Number of Daily Trains:	2
Train Speed - Timetable:	30
Train Speed - Minimum Likely:	25
Train Speed - Maximum Likely:	30
Maximum Warning Devices:	AFLS-Gates-Cant-over
Highway - Railroad Interconnect:	CWT
Channelization:	Unknown
Signs Other Quantity 1:	0
Signs Other Description 1:	
Signs Other Quantity 2:	0
Signs Other Description 2:	
AADT:	12600
Traffic Lanes:	4
Truck Percent:	7
Land Use:	Commercial
Angle of Intersection - Road to Rail:	60° to 90°
Highway Type:	Other Fed-Aid Hwy
FHWA Road Class:	Othr Principal Arterial, rural
On State Highway:	No
Roadway Paved:	Yes
Pavement Markings:	Both-Line/Symb1
Advanced Warning Signs:	Yes
Track Within Street:	No
Road Intersection Near:	75-200
DOT Structure ID 1:	
DOT Remarks 1:	
FRA Quiet Zone:	(old)
Passenger Train Type:	Unknown
Average Passenger Trains Per Day:	0
Latitude:	40.11296463

**Pictures**



<b>Longitude:</b>	-88.31453323
<b>LAT LONG Source:</b>	Actual
<b>ENS Sign:</b>	Yes
<b>EMERGENCY Phone Number:</b>	
<b>Posted Highway Speed:</b>	0
<b>Narrative Railroad:</b>	
<b>Narrative State 1:</b>	
<b>Data Last Updated:</b>	06/01/2012



## **Appendix B**

# **Illinois Commerce Commission Grade Crossing Protection Fund Sample**

**Guidelines for Railroads  
Applying for GCPF Assistance to Renew  
Public Highway-Rail Grade Crossing Surfaces  
(Local Roads and Streets ONLY)**

Below are guidelines for the renewal of highway-rail grade crossing surfaces located on the local roads and streets system where assistance from the Grade Crossing Protection Fund (GCPF) is requested.

1. When granted, GCPF assistance shall be utilized to reimburse a railroad for the cost of materials associated with the renewal of a highway-rail grade crossing surface(s). All other costs, including labor costs, associated with the renewal shall be the responsibility of the railroad. Eligible material costs will include contractual services for asphalt paving and work zone traffic control.
2. Crossings submitted for consideration should not be located along segments of track that are scheduled for major track rehabilitation improvements within 12 months from the date of submittal. If a crossing selected for renewal is located within an area where a major track rehabilitation project is programmed and crossing surfaces will be replaced as part of the project, the railroad should notify the ICC so that another location can be identified. If a Commission Order has been issued for a surface renewal at a particular crossing, and a railroad's engineering department learns that the crossing is located within an area where a major track rehabilitation project is programmed and crossing surfaces will be replaced as part of the project, the railroad will be required to submit a Supplemental Petition requesting that a surface renewal project be approved for another crossing location.
3. Crossings submitted for consideration shall continue to be maintained to meet the minimum requirement of 92 IL Adm. Code 1535. Railroads shall not ignore maintenance responsibilities at a crossing that has been identified for a surface renewal with assistance from the GCPF.
4. Railroads seeking assistance from the GCPF for crossing renewals shall be required to meet the following criteria:
  - a. For grade crossings with annual average daily traffic (AADT) volumes less than 500 vehicles/day full-depth timber crossing surface construction shall be used. For grade crossings on designated truck routes<sup>1</sup>, a hot-mix bituminous underlayment placed directly on undisturbed hardpan or compacted CA-6 material shall be required. In no case shall the underlayment be placed when standing water is present. The hot-mix bituminous underlayment shall be a minimum 6 inches (6") in depth and 12 feet (12') in width and shall extend a minimum distance of 25 feet (25') beyond each end of the crossing. The bituminous material shall be produced from a State-approved plant and utilize a current State-approved mix design for either binder or surface material.

[<sup>1</sup>Note: The ICC shall provide railroads with current AADT information, as well as information that identifies which crossings are located on designated truck routes.]

The bituminous material shall be placed in a minimum of 2 layers and the top layer must be a minimum of 2 inches (2") thick. Each layer must be compacted with a mechanical tamper, vibrating tamper or self-propelled roller with a minimum of 3 passes. The railroad's standard track construction specifications may be used to complete the reconstruction of the crossing surface from the top of the hot-mix bituminous underlayment to the top of rail. However, in no case shall the depth of the compacted ballast from the top of the hot-mix bituminous underlayment to the bottom of the ties be less than 8 inches (8"), nor more than 15 inches (15"). Nine foot (9') ties will be required at all crossings in this category. Exceptions to the above requirements may be granted upon review and approval of the ICC Rail Safety Section.

- b. **For grade crossings with annual average daily traffic (AADT) volumes between 500 and 5,000 vehicles/day** full-depth timber, rubber or concrete crossing surface construction shall be used. For grade crossings on designated truck routes<sup>1</sup>, a hot-mix bituminous underlayment placed directly on undisturbed hardpan or compacted CA-6 material shall be required. In no case shall the underlayment be placed when standing water is present. The hot-mix bituminous underlayment shall be a minimum 6 inches (6") in depth and 12 feet (12') in width and shall extend a minimum distance of 25 feet (25') beyond each end of the crossing. The bituminous material shall be produced from a State-approved plant and utilize a current State-approved mix design for either binder or surface material. The bituminous material shall be placed in a minimum of 2 layers and the top layer must be a minimum of 2 inches (2") thick. Each layer must be compacted with a mechanical tamper, vibrating tamper or self-propelled roller with a minimum of 3 passes. The railroad's standard track construction specifications may be used to complete the reconstruction of the crossing surface from the top of the hot-mix bituminous underlayment to the top of rail. However, in no case shall the depth of the compacted ballast from the top of the hot-mix bituminous underlayment to the bottom of the ties be less than 8 inches (8"), nor more than 15 inches (15"). Ten foot (10') ties will be required at all crossings in this category. Exceptions to the above requirements may be granted upon review and approval of the ICC Rail Safety Section.

[<sup>1</sup>Note: The ICC shall provide railroads with current AADT information, as well as information that identifies which crossings are located on designated truck routes.]

- c. **For grade crossings with annual average daily traffic (AADT) volumes greater than 5,000 vehicles/day** full-depth rubber, or concrete crossing surface construction shall be used. In addition, a hot-mix bituminous underlayment placed directly on undisturbed hardpan or compacted CA-6 material shall be required. In no case shall the underlayment be placed when standing water is present. The hot-mix bituminous underlayment shall be a minimum 6 inches (6") in depth and 12 feet (12') in width and shall extend a minimum distance of 25 feet (25') beyond each end of the crossing. The bituminous material shall be produced from a State-approved plant and utilize a current State-approved mix design for either binder or surface material. The bituminous material shall be placed in a minimum of 2 layers and the top layer must be a minimum of 2 inches (2") thick. Each layer must be compacted with a mechanical tamper, vibrating

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tamper or self-propelled roller with a minimum of 3 passes. The railroad's standard track construction specifications may be used to complete the reconstruction of the crossing surface from the top of the hot-mix bituminous underlayment to the top of rail. However, in no case shall the depth of the compacted ballast from the top of the hot-mix bituminous underlayment to the bottom of the ties be less than 8 inches (8"), nor more than 15 inches (15"). Ten foot (10') ties will be required at all crossings in this category. Exceptions to the above requirements may be granted upon review and approval of the ICC Rail Safety Section.

5. In general, all crossing surface renewals shall be completed between 180-270 days from date the Commission Order authorizing the improvements is issued, depending on when the Order is issued.

[NOTE: For state fiscal year 2010 (ending June 30, 2010), the ICC will notify all railroads by letter to submit potential crossing surface renewal locations. The letters will be mailed no later than November 30, 2009. Railroads will be required to submit a list of potential crossing locations, including cost information for each location, no later than January 15, 2010. Following receipt of the crossing lists, the ICC will identify the crossing surface renewal locations for each railroad and prepare Stipulated Agreements; one agreement will be prepared for each railroad. It is Staff's intention to submit all Orders authorizing GCPF assistance for crossing surface renewal projects during state fiscal year 2010 no later than May 19, 2010, which is the final authorized submission date for Orders that will be considered for Approval by the Commission at its June 2, 2010 Bench Session.

For all future state fiscal years (FY 2011 and beyond), the ICC will solicit potential crossing surface renewal locations at the beginning of each state fiscal year (after July 1 of each calendar year). Railroads will be given 60 days to submit a list of potential crossing locations, as well as cost information for each location. Following receipt of the crossing lists, the ICC will identify the crossing surface renewal locations for each railroad and prepare Stipulated Agreements; one agreement will be prepared for each railroad. All Orders authorizing GCPF assistance for crossing surface renewal projects will be issued no later than the end of the 3<sup>rd</sup> quarter of each state fiscal year (end of March of each calendar year).]

6. GCPF assistance will be apportioned based on the following ratios:

Class I Railroads:	75%
Regional Railroads:	5%
Shortline Railroads:	20%

[NOTE: percentages based on the number of public grade crossings of local roads & streets attributable to each railroad within each class, per the Illinois Commerce Commission's railroad crossing database.]

**CLASS I Railroads**

<b>AAR</b>	<b>Local Rd Xings</b>	<b>% of Total</b>	<b>GCPF</b>
BNSF	1052	19.0	285,000
CN	1247	22.6	340,000
CP	177	3.2	48,000
CSX	587	10.7	160,000
KCS	109	2.0	30,000
NS	870	15.8	237,000
UP	1464	26.6	400,000

**Class I Subtotal:** \$1,500,000

**Regional Railroads**

<b>AAR</b>	<b>Local Rd Xings</b>	<b>% of Total</b>	<b>GCPF</b>
IAIS	136	61.8	61,800
INRD	72	32.7	32,727
WSOR	12	5.45	5,473

**Regional Subtotal:** \$100,000

**Shortline Railroads**

<b>AAR</b>	<b>Local Rd Xings</b>	<b>% of Total</b>	<b>GCPF</b>
BJRY	6	0.47	1,862
BLOL	78	6.05	24,205
BRC	35	2.7	10,860
CCUO	4	0.3	1,241
CGGZ	12	0.9	3,724
CIRY	63	4.9	19,550
COER	52	4.0	16,135
CRL	15	1.1	4,655
CSSSB	2	0.15	620
CTM	33	2.5	10,240
DRI	1	0.08	310
DT	46	3.5	14,275
EIRC	64	5.0	19,860
EVWR	119	9.2	36,928
FFGZ	13	1.0	4,035
IHB	34	2.6	10,550
IMRR	100	7.8	31,032
IR	117	9.1	36,307
JERX	3	0.23	930
KBSR	96	7.4	29,790
KJRY	109	8.5	33,825
KKRX	9	0.7	2,793
MJ	1	0.08	310
MRMZ	16	1.2	4,965
RRCO	4	0.3	1,241
RVPR	2	0.15	620
STR	4	0.3	1,241
SVIZ	1	0.08	310
TPW	148	11.5	45,927
TRRA	34	2.6	10,550
TZPR	59	4.6	18,309
VRRC	5	0.4	1,552
WCRY	3	0.2	931
ZMQE	1	0.08	310

**Shortline Subtotal: \$400,000**

Note: Railroads interested in utilizing GCPF assistance to renew highway-rail grade crossing surfaces located on the local roads and streets system should submit requests that exceed the amount noted above. In case one railroad does not utilize all of its annual allotment, funds set aside for that railroad may be redirected for use by another railroad. Railroads **not interested** in participating should notify this office in writing (letter or email), so the funding allocations can be redistributed.

Outlined below are instructions for railroads interested in applying for assistance from the Grade Crossing Protection Fund for the renewal of existing highway-rail grade crossing surfaces located on the local roads and streets system. If you have any questions, or need additional information, please contact the Illinois Commerce Commission's Rail Safety Section Office. Contact information is noted below.

1. Submit a **Letter of Request** to the following address:

Michael E. Stead  
Rail Safety Program Administrator  
Illinois Commerce Commission  
527 E. Capitol Avenue  
Springfield, IL 62701  
PHONE: (217) 557-1285  
FAX: (217) 524-4637  
mstead@icc.illinois.gov

**[NOTE: Letters of Request may be submitted by regular mail, electronic mail, or FAX.]**

2. The **Letter of Request** should include no more than twenty-five (25) crossing locations where the railroad desires to renew the surface(s) utilizing GCPF assistance. The **Letter of Request** should include the following information for each crossing location:
  - Name of Railroad Company that controls the operation of trains through the crossing(s);
  - Name and location of the public highway-rail grade crossing(s);
  - Average daily highway vehicular traffic (AADT) and average number of trains per day (tpd) over the crossing(s);
  - Identification that the public highway-rail grade crossings are located on a designated truck route;
  - US DOT Crossing Inventory Number and Railroad Milepost for the crossing(s);
  - Description of existing crossing surface type (i.e., asphalt/rubber flangeway; asphalt/timber flangeway; full-depth timber; concrete; rubber; etc.);
  - Approximate age of existing crossing surface(s)
  - Detailed cost estimate for the proposed crossing surface renewal.
3. Upon receipt of a **Letter of Request** the Rail Safety Section will review the information. If a crossing(s) is selected for improvement, the Rail Section will prepare a Stipulated Agreement for the renewal of the surface(s). The Stipulated Agreement will be forwarded to the railroad, the road authority<sup>1</sup> and the Illinois Department of Transportation for execution. The Stipulated Agreement will outline the scope of work, minimum technical specifications and a division of costs for the required work.  
[<sup>1</sup>Local agency with jurisdiction of the roadway involved in the Agreement.]
4. Following receipt of fully executed agreements from all the parties the Rail Safety Section will prepare and submit an Order to the Commission recommending assistance from the Grade Crossing Protection Fund (GCPF) for the crossing surface improvement project.
5. Following entry of the Order by the Commission, the railroad shall renew the subject crossing surface(s) within the time specified in the Commission Order. The railroad company shall pay all future maintenance costs for the new crossing surface(s).
6. Attached as information is a **SAMPLE LETTER OF REQUEST**.

Revised 11/09

**- S A M P L E -**

**LETTER OF REQUEST  
(Use LETTERHEAD of Railroad Company Making the Request)**

Current Date

Mr. Michael E. Stead  
Rail Safety Program Administrator  
Illinois Commerce Commission  
527 E. Capitol Avenue  
Springfield, IL 62701

Dear Mr. Stead:

The **NAME OF RAILROAD COMPANY** requests consideration for assistance from the Grade Crossing Protection Fund for the renewal of the surface(s) at the **STREET NAME(S)** highway-rail grade crossing(s) of the **NAME OF RAILROAD COMPANY**'s track.

- Name of Railroad Company that controls the operation of trains through the crossing(s);
- Name and location of the public highway-rail grade crossing(s) ;
- Average daily highway vehicular traffic (AADT) and average number of trains per day (tpd) over the crossing(s);
- US DOT Crossing Inventory Number and Railroad Milepost for the crossing(s);
- Description of existing crossing surface type (i.e., asphalt/rubber flangeway; asphalt/timber flangeway; full-depth timber; concrete; rubber; etc.);
- Approximate age of existing crossing surface(s)
- Detailed cost estimate for the proposed crossing surface renewal.

The **NAME OF RAILROAD COMPANY** acknowledges that any approved GCPF assistance will be for the cost of eligible construction materials only. The following pertinent information for the/each crossing is enclosed:

Thank you in advance for your consideration of this request. If you have any questions, or desire further information, please do not hesitate to contact us.

Sincerely,

**NAME OF RAILROAD OFFICIAL**  
**TITLE OF RAILROAD OFFICIAL**

Enclosures

Revised 11/09

## **Appendix C**

### **Indiana Department Of Transportation Roughness/Rideability Scale Sample**

## ROUGHNESS / RIDEABILITY SCALE FOR RAILROAD CROSSINGS

### RATING

### DESCRIPTION

- ( 0 )      VEHICLE SEVERLY JOLTED**      A racking experience.  
Crossing should be traversed at a speed less than 10 mph.
- Suggested Speed: URBAN - Vehicle must be nearly stopped  
(10 mph max.)  
RURAL - Vehicle must be nearly stopped  
(10 mph max.)
- COMMENTS: Crossing broken - ties loose, rotted or missing,  
Rails high, low or loose  
(BAD CONDITION)
- ( 1 )      VERY UNCOMFORTABLE**      Vehicle is noticeably jolted or shaken.  
Vehicle definitely has to be slowed down to cross the tracks.
- Suggested Speed: URBAN - Crossing should not be driven across at normal posted speeds  
(10 - 15 mph max.)  
RURAL - Crossing should not be driven across at normal posted speeds  
(25 - 30 mph max.)
- COMMENTS: Crossing broken - rough, area between tracks pot holed,  
Surface too high or too low  
(POOR CONDITION)
- ( 2 )      NOTICIBLE JAR**      Uncomfortable but not severe.  
Vehicle should be slowed down for safety.
- Suggested Speed: URBAN - Uncomfortable - sharp jar at 30 mph  
RURAL - Uncomfortable - sharp jar at 50 mph
- COMMENTS: Crossing loose - rough - loose hardware  
Area between tracks broken up causing rough ride  
(FAIR CONDITION)

## ROUGHNESS / RIDEABILITY SCALE FOR RAILROAD CROSSINGS

<u>RATING</u>		<u>DESCRIPTION</u>
<b>( 3 )</b>	<b>A BUMP FELT</b>	Not serious enough to affect the vehicle occupants.  Suggested Speed: URBAN - Noticeable but not uncomfortable at 30 mph RURAL - Noticeable but not uncomfortable at 50 mph  COMMENTS: A little rough but crossing solid Worn - average degree of roughness, some vibrations (GOOD CONDITION)
<b>( 4 )</b>	<b>A VERY SLIGHT BUMP</b>	Hardly noticed by vehicle occupants.  Suggested Speed: URBAN - Slight bump - comfortable at 30 mph RURAL - Slight bump - comfortable at 50 mph  COMMENTS: Smooth, solid, not worn - above average ride (EXCELLENT CONDITION)
<b>( 5 )</b>	<b>VERY SMOOTH</b>	Almost unnoticeable at highway speeds  Suggested Speed: URBAN - Unnoticeable at 30 mph RURAL - Unnoticeable at 50 mph

EXCELLENT:

In new or nearly new condition and smooth workmanship; excellent bituminous material.

GOOD:

Over a year old but still in good condition. Bituminous material aged but sound condition.

FAIR:

In sound condition, but some age and wear showing. Bituminous starting to crack and wear.

POOR:

Old and starting to break up and split. Also bituminous breaking up and potholed.

## **Appendix D**

# **Iowa Department Of Transportation Grade Crossing Surface Repair Fund Sample**

STATE OF IOWA  
GRADE CROSSING SURFACE REPAIR FUND  
FORCE ACCOUNT AGREEMENT

At the railroad crossing located

County:

Road:

FRA No.:

DIRECT ALL COMMUNICATIONS REGARDING THIS PROJECT TO:

**HIGHWAY AUTHORITY Contact Person:**

Address:

Office Telephone No.:

**Railroad COMPANY Contact Person: Michael Blackley, Mgr Industry & Public Projects**

Address 1400 Douglas Street - STOP 0910, Omaha, NE 68179

Office Telephone No.: 402-544-2029

E-Mail: mgblackl@up.com

**DEPARTMENT Contact Person: Mary Jo Key, Program Manager**

Telephone No. 515-239-1108

E-mail address: mary.jo.key@dot.iowa.gov

Iowa Department of Transportation  
Office of Rail Transportation  
800 Lincoln Way  
Ames, IA 50010

Travis Tinken – Project Inspector, Iowa DOT – Telephone No. 515-290-5055

**AGREEMENT SUBMITTAL: Complete and return three fully executed Agreement forms to Iowa Department of Transportation, Office of Rail Transportation, for each crossing project. Exhibit "A" - Work Statement, and Exhibit "B" - Cost Estimate.**

(Revised 10/27/09)

STATE OF IOWA  
GRADE CROSSING SURFACE REPAIR FUND  
FORCE ACCOUNT AGREEMENT

THIS AGREEMENT, entered into pursuant to Iowa Code Ch. 327G and 761 Iowa Administrative Code, Chapter 821, is between \_\_\_\_\_, Iowa, hereinafter referred to as **HIGHWAY AUTHORITY**, and Union Pacific Railroad Company hereinafter referred to as **COMPANY**, and Iowa Department of Transportation, hereinafter referred to as **DEPARTMENT**.

The **HIGHWAY AUTHORITY** and the **COMPANY** agree to repair the at-grade crossing located at \_\_\_\_\_, Iowa, and further agree as follows.

**SECTION I. Work Statement and Performance.** The **COMPANY** and the **HIGHWAY AUTHORITY** have determined the extent of the repair to be performed at this crossing, including railway, roadway approach modifications, and replacement of existing sidewalks and/or recreational trails. This repair shall conform to the **COMPANY** and **HIGHWAY AUTHORITY** Standards. The agreed work, generally described in the Work Statement identified as Exhibit "A" attached hereto and made part of this Agreement, is to be performed by **COMPANY** forces, except the **COMPANY** may subcontract performance of the roadway approach work or other required incidental work. In the absence of specific **COMPANY** standards, BNSF/Union Pacific Railroad common crossing standards shall be used as guidance.

The Highway Authority will be responsible to have existing sidewalk(s) and/or recreational trail(s) replaced by a contractor or their own forces, in accordance with the Americans with Disabilities Act (ADA) requirements. In the absence of specific Highway Authority standards that are acceptable to the railroad, the Department's Standard Road Plan MI-220 shall be used. As per Standard Road Plan MI-220, the detectable warning is to be installed 12' from the edge of the nearest rail, and the sidewalk is a minimum width of 5'. The project will include the cost of an additional two feet of sidewalk and/or recreational trail, or to the nearest sidewalk and/or recreational trail joint, whichever is less, beyond the detectable warning. Any additional new sidewalk and/or recreational trail beyond that point will be paid by the highway authority and is not part of this project. Truncated domes are the only detectable warnings allowed by ADA Accessibility Guidelines. Grooves, exposed aggregate, and other designs intended for use as detectable warning are too similar to pavement textures, cracks, and joints and are not considered equivalent facilitation, and do not comply with ADA requirements.

SECTION II. Cost Estimate. The estimated cost of the project work is itemized on Exhibit "B" attached hereto, and made part of this Agreement.

SECTION III. Work Start and Completion. The COMPANY shall begin the construction of the project as soon as possible after the date the DEPARTMENT signs this agreement, and shall complete the project within 18 months. Costs incurred prior to DEPARTMENT signing this agreement are not reimbursable under this Agreement. Cost incurred more than 18 months after the DEPARTMENT signs this agreement will not be reimbursed unless the COMPANY has requested in writing, **prior to expiration of the agreement**, and received from the DEPARTMENT a written extension of time for completion. The DEPARTMENT shall have complete discretion, and be the sole authority to grant or deny extensions. Costs incurred for work following the extension time will not be reimbursed.

SECTION IV. Traffic Control. The roadway will be closed during repair. Exhibit "A" describes specific closure conditions. The HIGHWAY AUTHORITY is responsible for the establishment and payment for traffic control (i.e. barricades, signing, detours, detour damage, and runarounds). The COMPANY shall advise the HIGHWAY AUTHORITY Contact Person: 1) a minimum of 60 days in advance of the approximate starting date to allow the HIGHWAY AUTHORITY to implement the detour; and 2) 14 days in advance of the actual starting date to allow the HIGHWAY AUTHORITY adequate time to provide and install appropriate signs on the detour.

SECTION V. Work Notification. The COMPANY shall notify the DEPARTMENT and the HIGHWAY AUTHORITY'S Contact Person **no later than 14 days** prior to the start of its work at the crossing. The HIGHWAY AUTHORITY shall be given ample opportunity to document the materials, equipment, and labor required to complete the project. The DEPARTMENT and HIGHWAY AUTHORITY shall have the right to inspect the project work at any time. **The HIGHWAY AUTHORITY shall perform on-site inspection of the project work each day.**

SECTION VI. Project Completion. After the COMPANY has completed the required work, the **COMPANY shall notify the DEPARTMENT and the HIGHWAY AUTHORITY in writing.** The DEPARTMENT shall arrange an inspection with the HIGHWAY AUTHORITY and the COMPANY to determine whether the project work has been completed in accordance with the terms of this Agreement or Amendments thereto. Pavement markings and stop lines shall be placed by the HIGHWAY AUTHORITY as required by Part 8 of the Manual on Uniform Traffic Control Devices for Streets and Highways. If the existing traffic control devices at a multiple-track highway-rail grade crossing become improperly placed or inaccurate because of removal of some of the tracks, the existing devices shall be relocated

and/or modified at COMPANY expense pursuant to the Manual On Uniform Traffic Control Devices, Part 8. If the roadway is widened or relocated, the existing devices shall be relocated and/or modified at HIGHWAY AUTHORITY expense pursuant to the Manual On Uniform Traffic Control Devices, Part 8. Relocation of the traffic control devices will be completed prior to removal of the detour. When the work has been completed in accordance with the Agreement, the COMPANY, HIGHWAY AUTHORITY, and DEPARTMENT shall sign a Certificate of Completion and Acceptance form at the project site following final inspection.

SECTION VII. Reimbursable Costs. The COMPANY will keep an accurate and detailed account of actual and necessary reimbursable costs incurred under this Agreement. Replacement of existing sidewalk(s) and/or recreational trail(s), and subcontracted work costs shall be included in the Company billing. The cost of labor, material, all associated additives and subcontracted work costs are reimbursable, and shall be billed on a force account basis in accord with Title 23 Code of Federal Regulations, Part 140, Subpart I. The cost of COMPANY equipment will be reimbursed at the audit accepted Maintenance of Way equipment additive rate applied to direct track labor cost. Accounting costs will be reimbursed at the audit accepted Finance additive rate applied to direct track labor cost. The cost of preliminary project engineering, construction inspection, track inspection, relocation of existing signals, signal wires, and switches, or the construction of runarounds will not be eligible project reimbursable costs.

SECTION VIII. Cost Sharing. The HIGHWAY AUTHORITY and COMPANY each agree to incur a cost equal to twenty percent (20%) of the reimbursable costs defined in SECTION VII for work described in Exhibit "A". The DEPARTMENT agrees the Grade Crossing Surface Repair Fund shall be used to pay the remaining 60 percent (60%) of these costs.

SECTION IX. Progressive Payments. The COMPANY may submit accurate progressive bills prior to project completion to both the DEPARTMENT and HIGHWAY AUTHORITY for material, labor, and subcontracted costs included in Exhibit "B." The billing for material shall be for those materials that have been delivered to the project site or specifically purchased and delivered to the COMPANY for use on the project. The DEPARTMENT and HIGHWAY AUTHORITY may make progressive payments to the COMPANY for one-hundred percent (100%) of each party's billed participation.

SECTION X. Final Billing. If applicable, the HIGHWAY AUTHORITY will submit a detailed billing to the COMPANY for the actual sidewalk and/or recreational trail replacement costs. Upon completion of the project the COMPANY shall submit an accurate final itemized billing in three (3) counterparts. The final bill shall include a summary of all incurred costs.

SECTION XI. Final Payment. The DEPARTMENT, upon receipt of the final bill and Certificate of Completion and Acceptance form, shall review, and forward the final bill to the DEPARTMENT'S Office of Audits for final audit. Reimbursement to the COMPANY shall be governed by the DEPARTMENT'S Certification of Audit. The DEPARTMENT shall make payment to the COMPANY equal to 60 percent (60%) of the final reimbursable amount, less previous payment. The COMPANY shall promptly reimburse the DEPARTMENT in the amount of any overpayment.

The HIGHWAY AUTHORITY shall make payment equal to 20 percent (20%) of the COMPANY final billing or the estimated cost noted on Exhibit "B" of the agreement, less previous payment, within 30 days of its receipt of the COMPANY final billing. In the event of overpayment by the HIGHWAY AUTHORITY as determined by the DEPARTMENT audit of COMPANY records, the COMPANY shall pay the HIGHWAY AUTHORITY the amount of overpayment within 30 days of its receipt of the DEPARTMENT final audit.

SECTION XII. Maintenance and Abandonment. Upon completion of the project, the COMPANY shall maintain the crossing surface to provide a safe and sufficient crossing for vehicular travel. If the track is removed from both sides of the crossing, the COMPANY shall remove the surface material, rail and cross ties from the crossing and shall restore the roadway void to the satisfaction of the HIGHWAY AUTHORITY, all at COMPANY expense. If the existing traffic control devices at a multiple-track highway-rail grade crossing become improperly placed or inaccurate because of removal of some of the tracks, the existing devices shall be relocated and/or modified at COMPANY expense pursuant to the Manual On Uniform Traffic Control Devices, Part 8. Future maintenance of the sidewalk(s) and detectable warning device(s) will not be the responsibility of the COMPANY.

SECTION XIII. Standard Title VI Assurances. The COMPANY shall comply with all applicable State and Federal laws, rules, ordinances, regulations, and orders. The COMPANY, and all agents of the COMPANY that participate in the project, shall also comply with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d-42 U.S.C. 2000d-4, and all requirements imposed by or pursuant to Title 49, Code of Federal Regulation, Department of Transportation, Subtitle A, Office of the Secretary, Part 21 – to the end that no person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving financial assistance from the DEPARTMENT.

SECTION XVI. Successor and Assigns. This agreement shall be binding upon all successors or assigns. The COMPANY shall provide written notice to the HIGHWAY AUTHORITY and the DEPARTMENT of any assignment of this Agreement.

SECTION XV. Project Contact Persons. All notices and communications essential to complete the work required by this Agreement shall be made to the Contact Persons specified on the cover page of this Agreement.

SECTION XVI. Integration and Amendment. This Agreement and its Exhibits constitute the entire Agreement between the DEPARTMENT, the COMPANY, and the HIGHWAY AUTHORITY concerning this project. **If the DEPARTMENT determines a substantial change is to be made in the project work described in Exhibit "A", the DEPARTMENT will furnish the written approval of the change.**

SECTION XVII. Termination for Convenience. In the event of non-appropriation of funds, this Agreement may be terminated in whole, or in part, when the DEPARTMENT, HIGHWAY AUTHORITY, and the COMPANY agree that the continuation of the Project would not produce beneficial results commensurate with the future disbursement of funding. The DEPARTMENT, HIGHWAY AUTHORITY, and COMPANY shall agree upon the termination conditions. The COMPANY shall not incur new obligations after the effective date of the termination and shall cancel as many outstanding obligations as reasonably possible. The DEPARTMENT will allow full credit to the COMPANY for the DEPARTMENT share of the non-cancelable obligations allowable under the Agreement and properly incurred by the COMPANY prior to termination. The DEPARTMENT will pay the COMPANY for the DEPARTMENT share of the non-cancelable obligations allowable under the Agreement and properly incurred by the COMPANY prior to termination.

SECTION XVIII. Merged Documents. This agreement may be executed and delivered in three or more counterparts, each of which so executed and delivered shall be deemed to be an original, and all shall constitute but one and the same original.

If any section, provision, or part of this Agreement shall be found to be invalid or unconstitutional, such judgment shall not affect the validity of any section, provision, or part thereof not found to be invalid or unconstitutional.

IN WITNESS WHEREOF the COMPANY, the HIGHWAY AUTHORITY and the DEPARTMENT hereto have caused this Agreement to be executed by their duly authorized officers as of the dates indicated below.

Executed by the COMPANY this

Union Pacific Railroad Company

\_\_\_\_ day of \_\_\_\_\_, 201\_\_

By: \_\_\_\_\_  
Name and Title

Executed by the HIGHWAY AUTHORITY this

\_\_\_\_\_, Iowa

\_\_\_\_ day of \_\_\_\_\_, 201\_\_

By: \_\_\_\_\_  
Name and Title

Executed by the DEPARTMENT this

Iowa Department of Transportation

\_\_\_\_ day of \_\_\_\_\_, 201\_\_

By: \_\_\_\_\_  
Tamara Nicholson, P.E., Director  
Office of Rail Transportation

**Appendix E**  
**Iowa Department Of Transportation Exhibit A**  
**Sample**

**60-20-20 PRECONSTRUCTION (Exhibit A) MEETING**

DATE \_\_\_\_\_ FRA # \_\_\_\_\_

This is a preconstruction meeting checklist. After each of the following items is discussed, agreed documentation will be made on the Exhibit A. The Exhibit A is part of the executed agreement; however, this document is for information only.

**Notifications/Work Schedule**

Highway Jurisdiction

- Public, Media, School buses, Emergency Vehicles
- Elevator Manager - secure name & phone number (if applicable)
- List of celebration dates
- Discuss future street improvements

Railroad

- Notify Hwy Jurisdiction minimum 60 days in advance of approx. start date
- Notify Hwy Jurisdiction 14 days in advance of actual start date for detour preparation
- Notify DOT of actual start date
- One Call (includes fiber optics)

**Detour Issues/Signing:**

- Bridge/street/road embargoes on detour route
- Other adjacent closures at same time that may affect existing closure

**Crossing Safety:**

- Sight triangle
- Clear brush, trim trees
- Move vehicles & items on ROW in sight triangle

**Existing Sidewalks:**

- # of sidewalks within scope of project
- Any city ordinances regarding replacement of existing sidewalks

**Drainage Issues:**

- Clean ditches & intakes for proper drainage flow
- Remove fouled ballast from site
- Hwy Jurisdiction/RR equipment availability (brush chipper, bobcat w/miller, etc)
- Mark drainage outlets/intakes before completion of project

**Approaches & Headers:**

- Determine track elevation
- Identify curb, gutters, drainage, sidewalks
- Header will have 3 lifts, each compacted separately, with taper at end of approach
- Pavement crown?
- Gravel roads - 25' asphalt approach - 8-10" depth - minimum of 2 lifts
- Humped crossing (Problems? Impact visibility? Possible closure?)
- Length of sidewalk within scope of project \_\_\_\_\_.

60-20-20 PRECONSTRUCTION (Exhibit A) MEETING  
DATE \_\_\_\_\_ FRA # \_\_\_\_\_

**Construction Methods/Material:**

- Type of ballast
- Minimum 8" ballast depth under railroad ties
- Asphalt underlayment
- Wedge at end of concrete panels
- Secure spikes prior to placement of concrete panels
- Pedestrian crossing

**Signage & Pavement Markings: (Take copy of Chapter 8 MUTCD to meeting)**

Railroad

- Condition of crossbucks
- # of tracks sign

Highway Jurisdiction

- Pavement Markings
- Advance Warning signs

**Clean Up:**

- Reseed disturbed area
- Old crossing materials removed from area
- Remove obsolete utility poles within sight triangle
- Construction site free of wheel ruts and piles of dirt

**Past experiences with crossing renewals under this program:**

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Iowa Department of Transportation

IOWA GRADE CROSSING  
SURFACE REPAIR (PRIMARY)

Meeting \_\_\_\_\_ County \_\_\_\_\_  
FRA No. \_\_\_\_\_ Highway Authority Iowa Dept. of Transportation  
State Crossing # \_\_\_\_\_ RR Company \_\_\_\_\_  
Location \_\_\_\_\_

To Be Completed By Railroad Company

1. Crossings Reconstructed

- A) Company will reconstruct 1 crossings. Total feet of material \_\_\_\_\_.
  - B) Requires \_\_\_\_\_ feet of crossing material through traveled roadway.
  - C) Requires \_\_\_\_\_ feet of crossing material through shoulder or sidewalk area.
  - D) Requires \_\_\_\_\_ sets of crossing surface material equaling \_\_\_\_\_ feet.
2. Track will be elevated \_\_\_\_\_ inches above the existing roadway.
3. Track opening of \_\_\_\_\_ feet is required.
4. General description of other work (tracks retired, etc) : \_\_\_\_\_
5. Cost of Railroad material to include: Ties, rail & OTM, field weld kits, ballast, concrete panels with rubber inserts, & freight. The Reimbursement of these material costs will be \$400 per lineal ft. of pre-cast concrete surface panels.

To Be Completed By Highway Authority (DOT)

1. Roadway Work

Taper Length - \_\_\_\_\_ foot taper on the \_\_\_\_\_ side of the crossing and \_\_\_\_\_ foot taper on the \_\_\_\_\_ side of the crossing, requires \_\_\_\_\_ ton of asphalt material (estimated).

- A. General description of approach work: \_\_\_\_\_

**2. Estimated Sidewalk Work**

Requires \_\_\_ feet of existing sidewalk on N/A side(s) of the crossing. Requiring an estimated \_\_\_ cu. yds. The sidewalk construction will meet both the MUTCD guidelines and ADA requirements.

**3. Estimated Material Quantities**

Asphalt approach	___ Ton	Pavement markings	SEE MUTCD
Concrete approach	___ Cu. Yard	Signs	_____
Asphalt Headers	___ Ton	Rock	_____
Asphalt underlayment	___ Ton	Expansion joint	_____
		Facing Board	___ L.F.
Geotextile	___ L.F.	Drain pipe	___ L.F.

4. Closure and Detour Concerns: \_\_\_\_\_.

5. Drainage location and Concerns: \_\_\_\_\_.

6. Attendance Block

\_\_\_\_\_  
Railroad Representative

\_\_\_\_\_  
Highway Authority Representative

Additional Attendees:

FRA No. \_\_\_\_\_

# **Appendix F**

## **Iowa Department Of Transportation Primary Road Grade Crossing Study Sample**

PRIMARY ROAD GRADE CROSSING STUDY				Add Comments	Add/View Complaints		
USE UPPERCASE FOR ALL ENTRIES		U.S. DOT CROSSING #	484063R	TRACK NUMBER	1	COUNTY NAME:	MONROE
Delete Record		CITY NAME:	ALBIA	LOCATION:	US34	RAILCODE	APNC
RAILROAD		DATE BEGIN	7/31/2006	DATE FINISH	8/10/2006	PROJECT NO:	
EXISTING DRAINAGE		MOIST		BALLAST TYPE	GRANITE	HIGHWAY	
Subballast (Y/N)		N		PARTICLE SIZE	3/4 - 3	APPROACH RIDABILITY-Before	GOOD
SUBBALLAST DEPTH				PERCENT FINES	<10%	TRACK TO ROAD DIF. -Before	0
SUBBALLAST MATERIAL				BALLAST SHAPE	ANGULAR	Profile Date	
Subballast Fabric (Y/N)		N		TOTAL BALLAST DEPTH	11	APPROACH RIDABILITY-After	
Length beyond end of Crossing				TIE - NEW OR USED	NEW	TRACK TO ROAD DIF. -After	0
GEOGRID Y/N		N		TIE - Concrete or Wood	Wood	Humped Appr. Before	0
GEOGRID BRAND				TIE - Plate Fastener Type	LAGS	Humped Profile Date:	
GEOGRID TYPE				Rail Spring Fast	Galvanized Spring	Humped Appr. After	0
GEOGRID-LENG BEYOND END OF CROSSING				TIE PLATES TYPE	PANDROL	PAVEMENT TYPE	CONCRETE&ASPHALT
ASPHALT UNDERLAY (Y/N)		Y		TIEPADS	N	TOTAL PAVEMENT THICK. EDGE	13
ASPHALT MIX		1/2 SURFACE		RAIL WEIGHT	115RE	EXPANSION JOINTS	BOTH SIDES
ASPHALT # OF LIFTS		1		RAIL NEW -USED	USED	DISTANCE NW	50 FT INCHES
ASPHALT LIFT THICKNESS				RAIL ANCHORS		DISTANCE SE	70 FT INCHES
ASPHALT- TOTAL THICKNESS		10		CROSSING SURFACE		HWY ASPHALT TYPE	1/2 SURFACE
ASPHALT COMPACTION METHOD		8 T ROLLER		BRAND	OMEGA	HWY ASPHALT # LIFTS	1
ASPHALT - WIDTH		20 FT IN.		CURVATURE PERCENT		HwyLiftThickness:	5
DISTANCE BEYOND END OF CROSSIN		10		SUPER ELEVATION		HWYTOTAL DEPTHS OF ASPHALT	4
SUB DRAINAGE PRESENT?		N		CR. SURF. MATERIAL		HWY COMPACT METHOD	3 TON
SUB DRAINAGE TYPE		FRENCH		TOTAL LENGTH	8 FT 2 IN	HEADER CONDUIT	N
SUB DRAINAGE LOCATION				PANEL LENGTH	40 FT 8 IN	DIST. FROM TRACK CENTERLINE	
SUB DRAINAGE DISCHARGE TO		DITCH		TRK CONST METH	STICK	DEPTH BELOW TIE (Inches)	
BALLAST PLACEMENT		DOT PRE ROLLED		OPENING WIDTH	20 FT IN	HEADER PLATE MATERIAL	FIBER BOARD
BALLAST NUMBER OF LIFTS		1				HEADER ASPHALT TYPE	1/2 SURFACE
DEPTH		10				ASPH # OF LIFTS	3
DOT VIB. ROLLER		8 TON				ASPH LIFT THICKNESS	5
DISTANCE BALLAST PLACED FROM EACH END OF CROSSING	NW	20				TOTAL DEPTH OF ASPHALT	14
	SE	20				HEADER COMPACT METHOD	3 TON

# **Appendix G**

## **Michigan Department Of Transportation Grade Crossing Maintenance Review**

# Grade Crossing Maintenance Review

FILE NO.: 04041    N.I. NO.: 000265C    REVIEW DATE: 04/30/2009

## CROSSING IDENTIFICATION

### RAILROAD

Owner: MDOT	Maintaining Party: GLCR	RR Div.: SYSTEM
N.I. # Posted: Yes	Primary Railroad: GLCR	RR Subdiv.: ANN ARBOR DIST
Railroad(s) Operating Over...	Same Tracks: NONE	Separate Tracks: NONE

### ROADWAY

Road Name: Chilson Road	Trunkline: No	City: Crossing Not In City
Road Auth(s): Livingston County Road Commission		County: Livingston
Township(s): Hamburg	Section(s): 09	

### NEARBY ROADWAYS

Name: Legacy Drive	Dir.: W	Auth.: Livingston County Road Commission
Name: Hydale Drive	Dir.: E	Auth.: Livingston County Road Commission

## GENERAL INFORMATION

### CROSSING INFORMATION

Rating Scale: 1 - Excellent condition ... 5 - Poor, in need of immediate repairs

Crossing Rating: 2	Road Rating: 2	Auto. Device / Signage Rating: 2
Crossing Material: Asphalt	Flangeway Material: Flange/Mud	Crossing Angle: 90 °
Railroad Approaches: Tangent	Crossing Length: N/A	Direction of Tracks: N/S
Crossing Status: Active	Simultaneous Occupancy: No	Switchpoint Distance to Road: N/A
# of Main Tracks: 1	# of Siding Tracks: 0	# of Spur Tracks: 0
Total # of Tracks: 1	# of Unused Tracks: 0	Stop & Flag: No

### TRAIN INFORMATION

Maximum Time Table: 40	Passenger Train Speed: 0	Freight Train Speed: 40
Freight Moves: 2 Daily	Passenger Moves: 0	Switching Moves: 0

### TRAFFIC INFORMATION

# Lanes Thru Crossing: 2	# Roadway Lanes: 2	# Parking Lanes: 0	One Way: No	ADT: 5649 - 2003
# Turn Lanes: 0	Boulevard: No	Road Width: 21	Shoulder Width: 2	Curb: No
Road Direction: SE/NW	Vehicle Speed: 45	Posted: Yes	Guardrail: No	Road Paved: Yes
Road Approaches: EB-Curve Descending / WB-Tangent			Approach Material: Asphalt	

## SIGNAGE & AUTOMATIC DEVICE INVENTORY

### SIGNAGE

Crossbucks: 2	AWS - W-10-1: 2	Pavement Markings: 2	Supplemental AWS: 0
No Passing Lines: 2	Stop Signs: 0	Stop Ahead Signs: 0	Track Signs: 0
Stop Bars: 2	Yield Signs: 0	Yield Ahead Signs: 0	Don't Stop on Track Signs: 0
Inventory Tags: 1	Humped Xing Signs: 0	Other Signs: 2	bump signs

### AUTOMATIC DEVICES

Flashing Lights: 2	Back-To-Back 8" Lens	Side Lights: 0	Cantilevers: 0
Gates: 0		Bells/Gongs: 2	Stop on Red Signs: 2
No Turn Signs: 0		Other Automatic Devices: 0	Black/White
Overhead Lighting: No		Signal Boxes Locked: Yes	Signals Interconnected: No

## SIGHT DISTANCE INFORMATION

Appr. Dist.	NE		NW		SW		SE		Priv.
	Sight Dist.	Obstacle	Priv.	Sight Dist.	Obstacle	Priv.	Sight Dist.	Obstacle	
BAR	962	No	No	962	No	No	962	No	No
	0	No	No	0	No	No	0	No	No
	0	No	No	0	No	No	0	No	No