# Rail-Highway Operations Manual


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# Manual Notice

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## Purpose

The Texas Department of Transportation (TxDOT) *Rail-Highway Operations Manual* is intended to cover responsibilities and best practices on projects that impact both roadway and railroad rights-of-ways. The manual defines both District and Division TxDOT responsibilities on the various types of projects encountered and coordination efforts required between railroad companies and other entities.

This manual is not a railroad operations manual and does not cover items related with train scheduling, railroad worker safety, or commonly asked questions from the public related to railroad operations.

## Contents

The *Rail-Highway Operations Manual* is a new manual.

## Supercedes

The *Rail-Highway Operations Manual* is a new TxDOT manual and supersedes the *Railroad Operations Volume* published in 1998.

## Contact

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## Archives

This manual is a first edition. Therefore, no archived copies exist.

# Table of Contents

# Chapter 1 — Introduction

**Contents:**

# Section 1 — Overview of Railroads in Texas

## Manual Purpose

Within the state of Texas, there are more than 10,000 miles of railroad tracks and 80,000 highway center lane miles. The Texas Department of Transportation (TxDOT) Rail-Highway Operations Manual is intended to cover responsibilities and best practices on projects that impact both roadway and railroad rights-of-way. The manual defines both TxDOT district and division responsibilities on the various types of projects encountered, and coordination efforts required between railroad companies and other entities.

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## TxDOT Role with Railroads

TxDOT has two divisions that work with railroad companies as a primary function.

The Rail Division (RRD) has the authority to implement rail improvements through public-private partnership agreements and provide investments in freight rail relocation projects, rail facility improvements, rail line consolidations or new passenger rail developments. RRD also manages lease agreements with operators on state-owned facilities and construction contracts for state or federally funded rehabilitation projects on both state-owned and private facilities.

The Traffic Operations Division-Rail Safety Section (TRF-RSS) is responsible for two primary functions:

1. The State Rail Safety Participation Program, which promotes safety in all areas of railroad operations in order to reduce deaths, injuries and damage to property resulting from railroad crashes by conducting railroad investigations and inspection in all five Federal Railroad Administration (FRA) disciplines.
2. Railroad-Highway Grade Crossing Programs, including:
    a. managing the Federal Railroad Signal Program (FSP)
    b. managing the Replanking Program of on-system at-grade crossings
    c. maintaining a database of all public railroad crossings
    d. generating railroad related agreements for TxDOT construction and maintenance work that impacts railroad rights-of-way
    e. assisting with other issues related to public railroad crossings.

District personnel coordinate design, construction, and maintenance of road projects impacting railroads within their district. They are also responsible for reviewing invoices related to railroad construction work and coordinating district activities with their railroad company counterparts.

The Texas Railroad Information Management System (TRIMS) went live in March of 2013 as the database to manage railroad crossing data and rail-highway project information. See Chapter 12 for more information.

See "Rail Safety" on the TxDOT Traffic Operations Division website for more information on rail-highway programs and projects.

## Operating Railroads in Texas

Class 1 railroad companies are defined as having annual carrier operating revenues of $433 million or more (as of 2011).

Currently, there are three Class 1 railroad companies operating in Texas, which account for approximately 84% of freight railroad track (including trackage rights) in the state:

1. Union Pacific Railroad (UPRR) (Approximately 43% of track in Texas)
2. BNSF Railway Company (BNSF) (Approximately 35% of track in Texas)
3. Kansas City Southern Railway (KCS), which includes the Texas Mexico Railroad (Approximately 6% of track in Texas).

The remaining railroad track in the state is operated by more than 50 different short-line railroad companies. Short-line railroad companies are defined as having annual operating revenues of less than $20 million (1991 dollars). These railroad companies are typically regionally located and partner with Class 1 railroad companies for switching railroad car shipments with customers.

Railroad rights-of-way are typically owned and operated by private industry (railroad companies) and widths of the right-of-way can vary.

## Railroad Crossings

There are four general types of railroad-highway crossings:

1. Railroad Over (roadway underpass): Roadway or sidewalk crosses under railroad tracks (grade separation)
2. Railroad Under (roadway overpass): Railroad crosses under roadway or sidewalk (grade separation)
3. At-Grade Crossing: Roadway crosses railroad tracks at-grade (same level as roadway) with or without adjacent sidewalks

4. Pedestrian Pathway Crossings: Sidewalk crosses railroad tracks at-grade, but more than 25 feet from an adjacent parallel roadway.

Crossings are further defined by:

- Public vs. private railroad crossings:
  - Public crossings are typically located on public roadways where both sides of the crossing are maintained by a public agency and the road is open for public use.
  - Private crossings are typically located at driveways and on private roadways or where one or both approaches are maintained by a private entity.
- Active vs. passive warning traffic control devices:
  - Active warning devices contain train-activated components such as mast flashers, cantilevers, bells, and/or gates
  - Passive warning devices are non-train activated roadway signs for traffic control.

As of January 2015, Texas has the following quantities of railroad crossings:

- 16,786 Total Open Crossings (Public and Private)
- 4,768 Open Private Crossings
- 12,108 Open Public Crossings
- 2,380 Open Public Grade Separated Crossings
- 9,728 Open Public At-Grade Crossings
  - 6,081 Open Active Public At-Grade Crossings
  - 3,647 Open Passive Public At-Grade Crossings.

**Types of Railroad Tracks and Common Track and Signal Equipment**

The following are typical types of railroad tracks and facilities encountered:

- Mainline Tracks: Typically higher speed tracks, these represent the majority of track miles. These tracks are used for long distance shipping. There may be multiple mainline tracks adjacent to one another.
- Passing/Siding Tracks: Located adjacent to a mainline track, these tracks are used to store trains waiting for a train traveling the opposite direction to pass or allow faster trains to overtake them.
- Wye Track: A curved track which connects two perpendicular tracks.
- Spur Track: A short section of track which typically branches off of a mainline track to an industry customer.

- Spur Permit Track: Railroad spur that was installed by permit from TxDOT and where the railroad company is responsible for the majority of construction and maintenance of the crossing.
- Switching Track: Used for switching rail cars.
- Switch or Turnout: Used to control movement of train at location of two divergent tracks. Can be mechanical or electrical.
- Diamond: The at-grade crossing of two separate railroad tracks. Controlled by an interlock switch. Also known as an interlock.
- Control Point: Location used to manage train movements that are typically on each side of a siding.
- Rail Yards: Locations of multiple adjacent tracks used for storing and switching of cars.
- Wayside Signals: Railroad signals that are used to control train movements. These can include powered switches, train abnormality detectors and actual train movement signals. This also includes any buried or overhead communication lines.
- Railroad-Highway At-Grade Crossing Signals: Train or railroad personnel activated signals that warn a motorist of an approaching train.

# Section 2 — Rail-Highway Projects

## TxDOT Projects on Railroad Right-of-Way

With few exceptions, an agreement between TxDOT and the operating railroad company must be in place giving TxDOT permission to enter into and perform work on railroad right-of-way. Any work performed by the railroad company in conjunction with the project is usually fully reimbursed by TxDOT, unless the railroad company has crossed TxDOT right-of-way by spur permit or the railroad company has agreed to cost participate on the project. Details of cost participation and reimbursement are provided in the project agreement between TxDOT and the railroad company.

The TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS) serves as the Office of Primary Responsibility for executing agreements with railroad companies on rail-highway projects.

Typically a separate Contractor Right-of-Entry Agreement is required between TxDOT's contractor and the railroad company to allow the contractor to do work on behalf of TxDOT on railroad right-of-way.

## Types of Work with Benefit to a Railroad Company

When designing projects that impact railroad rights-of-way, TxDOT must negotiate with the railroad company on project design, costs, construction schedule, and various terms of the agreement. Designers should be aware of projects which typically provide benefit to railroad companies and projects which are generally discouraged by railroad companies.

Projects that usually provide benefit to railroad companies include:

- closing an at-grade crossing
- grade separating an existing at-grade crossing (overpasses preferred)
- safety upgrades to at-grade crossings, such as installation of lights and gates or traffic signal preemption
- improving drainage on railroad right-of-way.

Projects that are generally discouraged by railroad companies include:

- new at-grade crossings
- widening at-grade crossings (to support increased vehicular traffic)
- overpass projects that do not span the railroad right-of-way or do not meet preferred horizontal and vertical clearances

- underpass projects which do not meet railroad company design requirements or have significant impact on railroad operations during construction
- joint drainage projects which include grading, fill placement or cut lines on railroad right-of-way (highway parallel to rail line)
- any project which restricts addition of future track.

### Maintenance Responsibilities

In Texas, the road authority and railroad company assume both separate and joint maintenance responsibilities at rail-highway grade crossings. The crossing surface panels over the railroad where the roadway crosses the rail line, railroad warning devices within railroad right-of-way, and vegetation on railroad right-of-way are maintained by the railroad company. Since the crossing surface panels extend down the roadway to the edges of the railroad ties, the railroad company maintains the roadway surface from the edge of railroad tie to edge of railroad tie.

The road authority is responsible for maintaining the roadway approaches up to the edge of the crossing surface, advanced signing, and pavement markings.

Joint maintenance responsibilities are typically found with common ditches between a highway and rail line, as well as other drainage and traffic signal preemption features.

While local, state, and federal governmental entities may provide funds for the replacement or upgrade of crossing surface panels and railroad warning devices, the railroad company is generally responsible for performing this work.

See “State Laws Applicable to Rail-Highway Projects” in Chapter 14 for various state laws related to maintenance at railroad crossings.

### Types of Agreements

Examples of common agreements executed with railroad companies include:

- Letter of Authority (LoA): Preliminary engineering agreement to allow the railroad company to charge TxDOT for engineering plan review, create railroad estimates, and other project preliminary engineering work.
- Maintenance Agreement: Simple agreement notifying the railroad company of the type of maintenance work. The agreement will also include an authorization for the railroad company to provide railroad flaggers.
- Joint Use Agreement: Typically used for constructing and maintaining a common ditch or other drainage work that benefits both the railroad company and TxDOT.

- Pipe/ Wireline License Agreement: Used to allow for the installation and maintenance of TxDOT utility structures such as storm drains, wireline crossings for lighting, Intelligent Transportation Systems (ITS) or preemption, etc.
- Construction & Maintenance Agreement: Agreement allowing TxDOT to construct and maintain an existing or new road crossing on the railroad right-of-way and to reimburse the railroad company for their expenses. The agreement may also include property rights descriptions to document railroad right-of-way encumbered by the TxDOT project.
- Contractor Right-of-Entry Agreement: Allows a contractor onto railroad right-of-way to perform intrusive work. The agreement includes indemnification, rules and regulations and other requirements while the contractor is on railroad right-of-way.

These agreements will be discussed in greater detail later in this manual.

# Chapter 2 — Construction Project Development

**Contents:**

# Section 1 — Construction & Maintenance Agreement Timelines

## Preliminary Design to Agreement Execution

When planning construction projects which impact railroad rights-of-way, the following chart gives approximate timelines needed for rail coordination from preliminary design meeting to execution of a Construction & Maintenance (C&M) Agreement.

**C&M Agreement Timelines**

| Project Type | Lead Time (Months) |
|---|---|
| Conduits Under or Over Track | 3-6 |
| Common Ditch, Pipeline, or Joint Usage (Encroachments on Railroad Right-of-Way) | 9-18 |
| Overpasses (New or Modified) | 12-18 |
| At-Grade Roadway Reconstruction or Widening | 12-24 |
| Traffic Signal Preemption | 18-24 |
| Projects Involving Track Construction or Relocation | 24+ |
| New At-Grade Crossings | 24+ |
| Underpasses (New or Modified) | 24+ |

This chart is not intended to represent routine maintenance projects or projects with minimal impact on railroad right-of-way. These projects are covered in Chapter 3 of this manual.

## C&M Agreement Flow Chart

Figure 2-1 presents a flow chart depicting the process for obtaining a C&M Agreement with a railroad company on a construction project.

NOTE: Not all steps are applicable to all construction projects. Project steps and time frames will vary depending on the scope of the project.

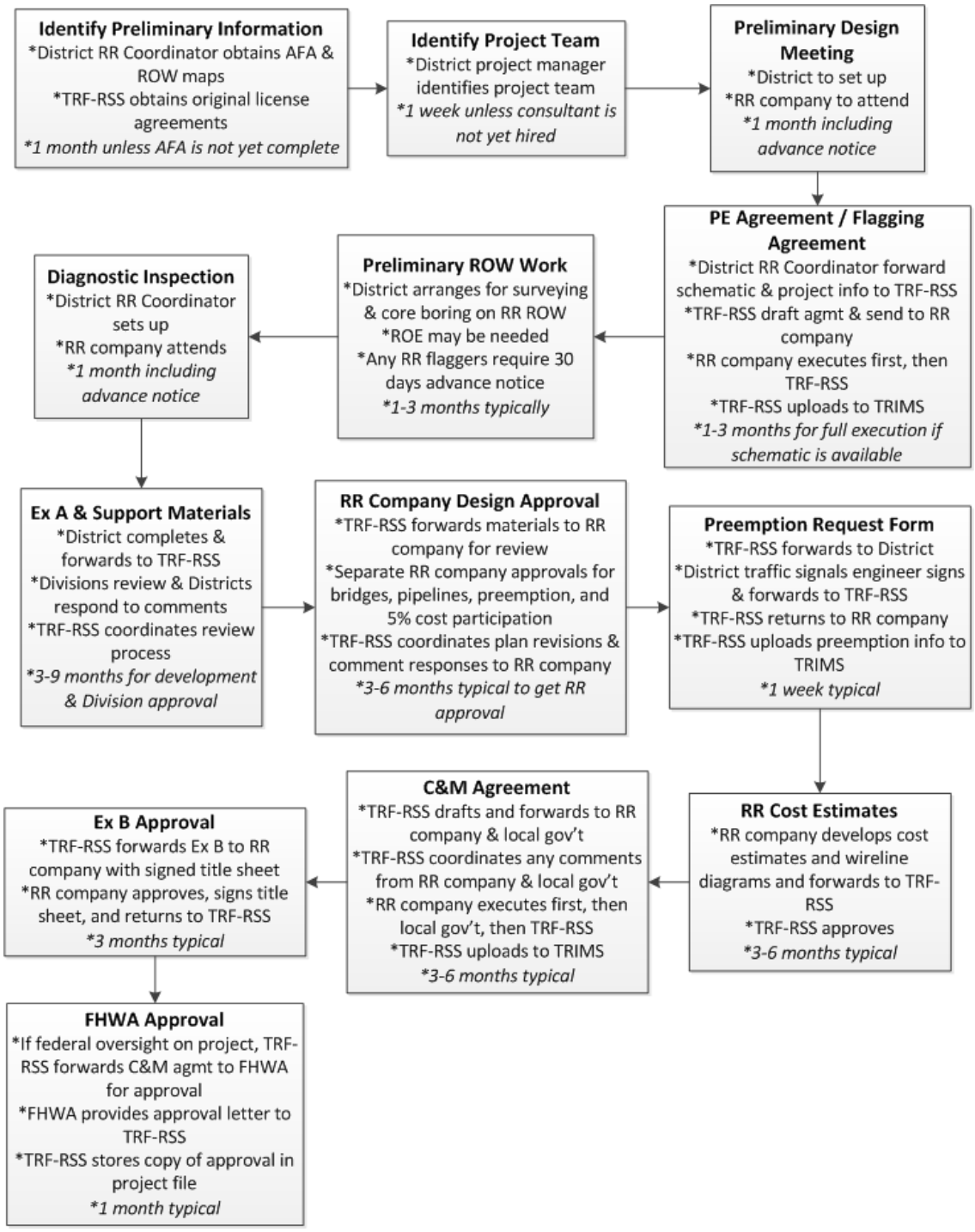


*Figure 2-1. C&M Agreement Flow Chart*

# Section 2 — Preliminary Activities

## Preliminary Information

As Districts identify construction projects impacting railroad rights-of-way, the following documents should be obtained:

- Existing license agreement or spur permit for the crossing or location being impacted by the project
- Advanced Funding Agreements (AFA) between TxDOT and a local government or railroad company for the project
- Right-of-way maps.

If the existing agreement can be obtained, TRF-RSS will verify if TxDOT or the roadway authority has a license to cross railroad right-of-way or if the railroad is crossing the roadway right-of-way via permit. TRF-RSS will also verify what responsibilities were established with all parties in the original agreement and if the new project is impacted by these responsibilities.

An AFA can be used as an attachment to a C&M Agreement to avoid a three-party agreement involving the local government. In this scenario, the C&M Agreement can be executed between TxDOT and the railroad company with the AFA attached to clarify maintenance responsibilities. The AFA also specifies which party is responsible for preliminary engineering (i.e. developing of plans) and which party will construct the project.

Existing license agreements and spur permit agreements are compiled by TRF-RSS, while any AFA and right-of-way maps are compiled by the District Railroad Coordinator.

The TRF-RSS Contract Specialist will determine if an existing safety Federal Signal Program (FSP) or replanking project exists at any of the at-grade crossings on the project. If so, the safety or replanking project may be canceled and paid for under the construction project.

## Project Team

In the early planning stages, there may be several parties needed for proper railroad coordination:

- Railroad Company Point of Contact
- Local Government Point of Contact
- Consultant (if applicable)
- District Project Manager
- District Design Engineer

- District Railroad Coordinator
- Area Engineer
- TRF-RSS Contract Specialist
- Bridge Division Project Manager (bridge projects only).

The railroad company point of contact can determine which contacts from the railroad company may be needed for coordination, given the scope of work in the project. Examples of contacts needed from the railroad company may include: real estate department, legal department, track design, structural engineers, environmental engineers, maintenance, local operations, and flagging.

Consultants with previous track design experience should be used on any projects involving track design (typically underpass projects). Familiarity with both American Railway Engineering and Maintenance-of-Way (AREMA) and individual railroad company track standards is essential.

### Preliminary Design Meeting

Prior to plans and schematics being developed, the District Project Manager should contact the railroad company and local government (if applicable) to schedule a preliminary design meeting. TRF-RSS personnel may be available to attend the meeting. At this meeting, the group should discuss:

- project timelines
- design elements
- preliminary schematic
- at-grade crossing protection devices
- planking (crossing surface)
- bridge horizontal and vertical clearances and crash walls
- railroad company need for future tracks
- railroad company cost participation
- railroad company cost estimates
- work to be performed by railroad company
- any required shoofly tracks, railroad signal relocates, or track work
- adjacent at-grade crossings and wayside signals with existing circuitry that could impact the railroad company cost estimate
- benefit to the railroad company, and if so, how TxDOT can use this in negotiations
- how the contractor will access railroad right-of-way and construct the project
- if railroad right-of-way will need to be acquired

- the need for absolute work windows during construction (when trains cannot be run)
- railroad coordination during project development.

The preliminary design meeting should also clarify how the various railroad agreements and coordination with the railroad company will be handled throughout project development prior to letting. Some questions to be answered include:

- Who will submit and be a party to the Preliminary Engineering (PE) Agreement? (TRF-RSS policy is that all PE Agreements are two-party agreements for simplification. If TxDOT is letting the project, the agreement will include TxDOT and the railroad company. If the local government is letting the project, the agreement will include the local government and the railroad company. In this way, all project invoices from the railroad company go to the same party. NOTE: If a local government is letting the project, TxDOT will typically provide design approval to the local government only and is not a party to the C&M Agreement.)
- Who from TxDOT and the local government will review and approve project documents prior to submittal to the railroad company, including the Exhibit A plans and C&M Agreement?
- Who will be the point of contact to submit all documents to the railroad company?
- Who will be a party to and draft the C&M Agreement? (TRF-RSS prefers that C&M Agreements be two-party agreements between the party letting the project and the railroad company. The AFA is typically attached to the C&M Agreement to clarify the third party's responsibilities on the project.)

NOTE: At the time of this writing, UPRR requires that all traffic signal preemption agreements are three-party agreements if local government traffic signal maintenance is involved.

Meeting minutes from the preliminary design meeting should be sent out shortly after the meeting by the District to the Project Team for comments and concurrence. In some cases, an informal approval from the railroad company may be required for the design features on the project prior to development of Exhibit A plans.

### Preliminary Engineering (PE) Agreements

Many railroad companies require an executed PE Agreement, also known as a Letter of Authorization, to reimburse the railroad company for charges incurred in:

- review and approval of engineering design
- development of cost estimates for work performed by the railroad company
- development of railroad wireline diagrams
- real estate reviews of property impacted by project
- legal review of agreements

- attendance at meetings during project development
- track surveys
- railroad flagging in support of preliminary engineering activities.

These agreements may also provide authorization to the railroad company to provide flagging for preliminary design activities on the railroad right-of-way. At the time of this writing, railroad companies have the following requirements for PE Agreements:

- UPRR: PE Agreements are required for all construction projects other than pipe and wireline installations or general maintenance work on railroad right-of-way.
- BNSF: PE Agreements are only required on projects which involve traffic signal preemption or on underpasses when a consultant is used by BNSF for plan review.
- KCS: PE Agreements are required for all construction projects other than pipe and wireline installations or general maintenance work on railroad right-of-way.
- Shortline Railroad Companies: Check with TRF-RSS for current requirements.

PE Agreements are typically two to three-page letter agreements and often do not include any railroad company cost estimates as attachments, with one noted exception: KCS typically produces an estimate which includes time from both KCS employees as well as consultant labor. These estimates include consultant time for both review of engineering plans as well as construction inspection. The portion of the estimate used for review of engineering plans is typically included in the PE Agreement, while the construction inspection estimate is added to the C&M Agreement.

PE Agreements are typically sent with a project location map and a project schematic if available. Additionally, if an approved Exhibit A is available, it may be forwarded with the PE Agreement. PE Agreements are usually executed by the railroad company within three months of submittal, unless the scope of work is unclear and the railroad company has a difficult time estimating the engineering charges up front.

TRF-RSS drafts any necessary PE Agreements and forwards them to the railroad company for execution. Fully executed PE Agreements are uploaded into the Texas Railroad Information Management System (TRIMS) project management module by TRF-RSS and forwarded to the Finance Division (FIN) in order to obligate funding for preliminary engineering charges from the railroad company and to be uploaded into Finance Imaging.

### Project Schematic

The District initially arranges to have a project schematic developed. The project schematic is a very general profile view showing the roadway alignment with the railroad and clarifying if any crossings of the railroad are at-grade or grade separated.

### Other Preliminary Agreements

Preliminary activities on the railroad right-of-way may require separate letter agreements with the railroad company. The agreements clarify insurance and Right-of-Entry requirements, as well as provide authorization to the railroad company to provide flagging services. These agreements are typically between the party (TxDOT or local government) providing engineering services on the project and the railroad company. Some preliminary activities could include:

- boring
- Subsurface Utility Engineering (SUE)
- environmental mitigation (asbestos, lead, etc.).

TRF-RSS drafts these agreements upon notification by the District Railroad Coordinator.

Alternatively, a contractor may execute a survey permit directly with the railroad company provided that the District determines how to reimburse a contractor for any flagging provided by the railroad company.

### Diagnostic Inspection

After the preliminary design meeting, the District Railroad Coordinator should arrange a diagnostic inspection with the railroad company and project team to visit the project location and discuss:

- train operations, including train speed and counts
- safety requirements
- at-grade crossing safety devices
- impact to track, wayside signals and equipment, if any
- phased construction
- other railroad company and TxDOT projects which could impact the project
- existing billboards on railroad right-of-way that may need to be relocated
- utility relocation
- design issues.

Notes from the diagnostic inspection should clarify all topics discussed with the project team as well as list all attendees. The District Railroad Coordinator compiles the notes.

### Utility Relocation

Utility companies with facilities which are located on railroad right-of-way have separate existing agreements with the railroad companies. These utilities may also not appear on statewide one call

utility location services. The railroad company normally has their own one call center. These utilities may not respond to any request for location without going through the railroad.

If these utilities need adjusting to accommodate a construction project, TxDOT or the local government will need to coordinate the relocation activity with the utility owner.

Railroad utility relocation and railroad company staff coordination of third-party utility relocation costs will be handled through the C&M Agreement.

# Section 3 — Project Design Phase

## Exhibit A and Support Documentation

The District produces or uses a consultant to produce an Exhibit A, which is typically a 30% PS&E detailing the work to be performed within railroad right-of-way. Depending on the scope of work involved, various support documents will need to be reviewed and approved by the railroad company before rail coordination can continue.

Further guidance on how to develop an Exhibit A is provided in Chapter 7.

## Underpass Plans

Underpass projects are generally more complicated than all other types of projects and typically require four stages of submittals ranging from:

- Project concept/schematic
- 30% plans (Exhibit A)
- 60% plans
- 100% plans (Exhibit B).

## Required Documents

Below is a list of required documents for each type of project. Documents may be needed for design approval, for the C&M Agreement, or both.

- Overpass (new or modification):
  - Exhibit A
  - Design Conformance to Railroad Guidelines Report (DCRG)
  - Metes & Bounds Property Description
  - Photos
  - Boring Logs (if any columns in railroad right-of-way)
  - 5% Theoretical Cost Estimate (if needed)
  - Hydraulic Analysis (if conditions change from existing)
  - Overhead Checklist (KCS projects only)
  - Railroad Work Matrix (if needed).
- Underpass (new or modification):
  - Exhibit A

- Boring Logs (if new underpass is being built)
- Typical Selection Report (TSR) (if new underpass is being built)
- Metes & Bounds Property Description
- Photos
- Cooper E-80 Loading Calculations (for new or modified bridge)
- Hydraulic Analysis (if conditions change from existing or underpass is new)
- Railroad Work Matrix (if needed).

◆ At-Grade Crossing (new or modification):

- Exhibit A
- Metes & Bounds Property Description (if new or widening from existing)
- Photos
- Railroad Work Matrix (if needed).

◆ If traffic signal preemption is involved:

- Exhibit A
- Preemption Form (TxDOT Form 2304)
- Traffic Signal Timing Data.

◆ Culverts, drainage pipes, or conduits on or over railroad right-of-way:

- Exhibit A
- Pipeline or Wireline License Request Form (UPRR only)
- Hydraulic Analysis (if conditions change from existing)
- Cooper E-80 Loading Calculations (for culverts or pipes under new or existing track)
- Railroad Work Matrix (if needed).

◆ Common usage (ditch, sidewalk, etc.) or longitudinal encroachments:

- Exhibit A
- Metes & Bounds Property Description (if project is on railroad right-of-way)
- Photos
- Hydraulic Analysis (if conditions change from existing)
- Railroad Work Matrix (if needed).

### Design and C&M Agreement Approval Documents

A brief description of each type of document is provided in the subsections below.

### Exhibit A

Typically a 30% plan set which details work to be performed within railroad right-of-way and clarifies which work is being performed by the railroad company and by the project contractor. For further guidance, see Chapter 7 of this manual.

### Boring Logs

Logs to document soil conditions at varying depths below ground in the vicinity of the project. The logs are produced following testing in the field.

### Design Conformance to Railroad Guidelines (DCRG) Report

This report is typically a one to two-page report which details how the proposed overpass design meets or does not meet railroad company design guidelines. Sample elements to be described include:

- a brief description of the project and need
- if the overpass spans railroad right-of-way (bridge bents outside of right-of-way)
- the angle that the overpass crosses the rail line
- vertical clearance
- horizontal clearance
- lighting for railroad
- fencing on bridge
- utilities and any relocations
- excavation and demolition work
- preparation work on railroad right-of-way (tree removal, etc.)
- if drill shaft locations are within zone of railroad live load surcharge and if shoring will be required
- how drainage is blocked from falling on railroad right-of-way
- where future tracks may be placed
- the need for crash walls, assuming future tracks are in place.

### Metes & Bounds Property Description

The Metes & Bounds Property Description is a legal property description to define the railroad right-of-way encumbered by the construction project, complete with a description and map of par-

cels. The area encumbered may also include area needed temporarily to facilitate project construction.

### Photos

Photos should show the area where the project will occur and clarify if any billboards located on railroad right-of-way will need to be relocated. Photos should be from an actual site visit and not taken from online images.

### 5% Theoretical Cost Estimate

In certain cases where an existing at-grade public crossing with active warning devices is being replaced with a bridge, and federal funds are used, the railroad or another entity will need to participate in the project funding. See 23 CFR §646.210 for details. This theoretical cost will be based on the following design criteria:

- The approach roadway geometry will be designed using the minimum design criteria allowed for the functional class and annual average daily traffic (AADT) of the subject roadway (i.e. minimum k-values, design speed, grades, vertical clearance, etc.). Approach roadway for the theoretical structure will terminate as soon as the grade has returned to the existing roadway profile.
- The bridge length will be the minimum length possible to fully span the railroad right-of-way. Any other features that would need to be spanned based on actual conditions (ie. other roadways, waterways, etc.) are not considered.
- The bridge superstructure type for the theoretical structure will be the same as for the proposed bridge span crossing the railroad right-of-way.
- The width of the theoretical structure will be the same as the proposed bridge width if the number of lanes is kept the same as the number of lanes on the existing grade crossing. If the proposed bridge has more lanes than the existing grade crossing, the theoretical structure will be the width of the proposed bridge minus the width of the number of extra lanes for the proposed bridge.
- If retaining walls are used for the proposed bridge to limit the amount of embankment, retaining walls will be used for the theoretical structure.
- Other design features that are required for the proposed structure, such as culverts, illumination, attenuators, riprap, etc., will be included with the theoretical structure.

The geometry of the theoretical structure will be presented as a .pdf file which contains an elevation view showing vertical geometry of the structure and approaches, and a typical section showing the theoretical bridge cross-section.

An estimate will be prepared in spreadsheet form based on the quantities for the theoretical structure. Costs for each item associated with the theoretical structure should be similar to a current project estimate. If no current project estimate is available, the most up-to-date statewide average low bid unit prices should be used.

If the highway or rail line is relocated to eliminate the at-grade crossing, the 5% theoretical cost will be the lesser of the:

- actual cost of relocation project
- estimated cost of relocation project
- estimated cost of a theoretical overpass as described above.

### Hydraulic Analysis

An analysis showing contours and direction of water flow with calculations.

### Overhead Checklist

Also known as the overhead grade separation data sheet, this form gives a general description of design features on overpass projects, including horizontal and vertical clearances, fencing, and lighting.

### Railroad Work Matrix

Some projects may require a greater amount of rail coordination. Sample projects could include:

- Highway Underpass Replacements
- New Highway Underpasses
- Highway Overpasses over Rail Yards
- Highway Underpass to Overpass Conversion
- Track Work.

These projects require a detailed outline of the division of labor and materials in order to properly bid out the project to a TxDOT contractor, obtain a proper estimate from the railroad company, and coordinate the project construction schedule. Typical questions that need to be addressed include:

- Will the railroad company or TxDOT contractor perform track installation and removal?
- Will the railroad company or TxDOT contractor perform track tie-ins to live track?
- Are absolute work windows required when the railroad company may not run trains? How long are the requested windows?

- Who will be supplying the track materials (rail, ties, ballast, subballast)?
- Will derailers or guardrail be needed? If so, who will provide and install?
- Who will perform site grading and ground work?
- Who will provide and install any drainage features?
- Who will adjust utilities?
- How will materials be delivered to the project site?
- Who will deliver the materials?
- Where will the material(s) be stockpiled?
- Will live tracks need to be closed to facilitate construction?
- What equipment will be needed on railroad right-of-way to construct the project?

### Typical Selection Report (TSR)

Used on underpass projects, the Typical Selection Report (TSR) identifies materials and construction methods to be used on the railroad bridge proposed to be built or modified by TxDOT or the local government. In the rare case that an underpass bridge is being developed on a new road alignment or a road alignment with an existing at-grade crossing, the method will typically involve an at-grade shoofly track alignment that routes the railroad around the footprint of the proposed structure to allow for its construction. If this method is performed in a cut excavation, longitudinal shoring will likely be required under the influence of railroad live load.

More commonly, a railroad underpass replaces an existing underpass structure due to deficient vertical or horizontal clearance in conjunction with a safety or added capacity project. In this case, there are three separate options considering maintenance of rail traffic.

- **Option 1:** Build the proposed underpass adjacent to the existing underpass and develop a revised railroad alignment that ties into the approaching railroad alignment. The railroad company may be open to this option if there is already a horizontal curve at this location or if the design speeds are low enough that a "jog" in the railroad alignment is acceptable. For tangent existing track alignments, the railroad company typically does not approve of providing such a permanent realignment.
- **Option 2:** Build the proposed underpass on the same alignment as the existing and construct a bypass shoofly alignment with a temporary bridge structure (if maintenance of highway traffic is required). This temporary bridge structure can be of lower cost open-deck construction with shorter spans and vertical clearance less than the final ultimate condition for the short duration of its usage. Phasing of the lower roadway construction should be considered in developing the temporary shoofly bridge and new mainline bridge layouts. A subset of the second option involves building a permanent bypass shoofly alignment. This is only entertained if it proves

more cost effective overall than a temporary structure and if the railroad company cost participates in providing what effectively is provision for a future second track.

- **Option 3:** Construct a "roll-in" where the replacement structure is built near or adjacent to the existing bridge and physically lifted or slid into place on new substructures in a short duration process that limits the duration of complete closure of the railroad (usually 72 hours max). While the "roll-in" technique can generate significant cost savings in avoiding a temporary structure and approach track alignment, it also carries measureable construction risk considering the delay potential to the railroad company. TxDOT has had limited success in achieving railroad company approval of "roll-in" replacements, and they should only be pursued if early coordination with the railroad company is undertaken and if the railroad line has limited traffic.

Structure selection should consider the railroad company's preferred structure selection if it is feasible. Refer to railroad company published guidelines for preferred structure types. Generally, railroad companies prefer multi-girder steel deck girder bridges due to weight savings (ease of removal replacement) and ease of repair. TxDOT preference is multi-girder composite pre-stressed girder bridges due to construction cost savings, but these have limited span capability and higher vertical clearance requirements in railroad company guidelines.

In the case of replacements involving limited vertical clearance or long span applications, a through plate girder bridge may be needed to minimize structure depth below the rail or span roadways with a large number of lanes and/or clear zone. The designer should be aware that this is the railroad company's least favorable structure type due to its fracture critical nature and expense. Clear safety improvements or cost savings (e.g. avoiding a pump station or major railroad grade raise) will need to be demonstrated to successfully gain railroad company approval of a through girder structure. Ballasted deck structures are required for all underpass projects over a roadway, and TxDOT preference is for a composite concrete deck in lieu of a steel plate deck if railroad company approval can be obtained and target vertical clearance is achievable.

### Preemption Form (TxDOT Form 2304)

This form clarifies the amount of advanced preemption time needed from the railroad company for a traffic signal adjacent to an at-grade crossing.

NOTE: See the Traffic Operations Division website for instructions and policy updates regarding this form.

### Traffic Signal Timing Data

If a traffic signal controller is existing, data should be downloaded from the controller to show minimum green, yellow change, and red clearance times during normal and preemption phases as well as delay time and track clearance green time. If a traffic signal controller is not existing, show proposed times to be programmed into the controller.

### Pipeline or Wireline License Request Form

This form is provided to the railroad company to clarify exact location in regards to the railroad where pipe or wire will be installed, material used for pipe or conduit, and what the line will carry.

### Cooper E-80 Loading Calculations

Cooper E-80 Loading Calculations are calculations for underpass bridges or culverts under a track to verify that proposed element meets Cooper E-80 standard.

### Design Approval Process

After the aforementioned documents have been approved by the District, the District Railroad Coordinator forwards them on to the TRF-RSS Contract Specialist who then coordinates the review of the documents with the proper Division personnel. Division reviews may include:

- Bridge Design
- Grade Crossing Warning Devices
- Traffic Signal Preemption
- Track Design
- Hydraulics
- Roadway Design
- Pedestrian Elements
- Landscape Architecture.

After all comments have been resolved from the divisions, the TRF-RSS Contract Specialist forwards the documents to the railroad company for review.

It is not TRF-RSS practice for consultants or districts to send documents for review directly to the railroad company without a prior Division review. Division reviews verify that project design not only meets railroad company requirements, but also meets TxDOT requirements. In some cases, TxDOT may not agree with all design requirements with the railroad company and will request an exception as stated in the DCRG or TSR.

### Preemption Request Form

When traffic signal preemption is involved, some railroad companies may request that a preemption request form is completed and signed. The form clarifies which preemption circuits are requested on the project.

The TRF-RSS Contract Specialist will arrange to have the form signed by the District Traffic Signals Engineer. Preemption forms, reports, and request forms are uploaded into the TRIMS project management module by TRF-RSS.

### Design Approval Expiration

Design approval from a railroad company typically lasts for three years. If a project has design approval and is subsequently pulled from letting, the Exhibit A and support materials will need to be reviewed again if the three-year period has expired. Railroad companies update design standards from time to time, so if design approval was given previously, it may be rejected in the future.

### Railroad Company Cost Estimates

Construction projects will typically require an estimate from the railroad company for labor and materials provided by the railroad company on the project. Typical construction activities requiring a railroad company cost estimate include:

- flagging
- inspection
- planking or replanking (crossing surface)
- installation, relocation, or removal of grade crossing warning devices
- railroad circuitry adjustments
- installation or adjustment of drainage structures under tracks (in some cases)
- relocating utilities on railroad right-of-way (that run parallel to track).

Prior to drafting a C&M Agreement, TRF-RSS will review the estimates to verify:

- project location and description information is correct
- estimates are accurate given comparable projects in recent past
- quantities of major items match design shown in Exhibit A. Major items for grade crossing warning devices typically include: gates, cabins, mast flashers, cantilevers, foundations, signs, and flashing light pairs. On planking projects, verify length and size of crossing surface panels and that rail and tie quantities are reasonable.
- profit is not being charged by a railroad company.
- a maximum 5% overhead rate is charged if an audited rate does not exist for a contractor or railroad company. FHWA approved additive rates are used by railroad companies as indicated on the railroad estimate.

Any railroad wireline diagrams should also be verified to ensure:

- correct location of shunt placement given any preemption time requested and speed of fastest train on each track
- location of warning devices matches design in Exhibit A
- warning devices and flashing lights shown match design in Exhibit A
- gate and cantilever lengths match Exhibit A
- cabin location matches Exhibit A. However, the railroad company may change quadrant location and install in another quadrant. In this case, the Exhibit A should be updated.
- distances between cabin, warning devices, roadway, and rail match Exhibit A or accepted railroad standard
- roadway design (number of lanes, medians, shoulders, and widths of these items) matches Exhibit A
- if needed, phased implementation shown to match Exhibit A.

# Section 4 — C&M Agreements

## Drafting the C&M Agreement

TRF-RSS will draft the C&M Agreement if a project is being constructed by TxDOT. Before a C&M Agreement is submitted by TRF-RSS to the railroad company, a few steps are required:

1. TRF-RSS must have received and approved the railroad cost estimate.
2. Design approval from the railroad company is required on all bridge and drainage projects.
3. Railroad company approval of as-let PS&E (Exhibit B) is required for underpass projects.
4. If the C&M Agreement involves more than two parties (TxDOT & the railroad company), a draft C&M Agreement must be submitted to all parties for comment and approval.
5. Approval of Metes & Bounds (as needed).
6. Approval of the Theoretical (5%) cost share (as needed).

## Types of C&M Agreements

TRF-RSS works with the railroad companies to minimize the number of C&M Agreement templates. Typical C&M Agreement templates include:

- Overpass: new, replaced, or modified with no railroad company cost participation.
- Overpass with 5% Railroad Company Cost Participation: used when a new overpass removes an existing active at-grade crossing and federal funding is used on the project.
- Underpass: new, replaced, or modified or when an existing underpass is converted to an overpass or brought to grade when the roadway is removed.
- Force Account: typically used when the railroad company provides services such as signal or track work on projects involving roadway widening, new at-grade crossings, planking, etc.
- Preemption: similar to Force Account Agreements, but used when project includes traffic signal preemption.
- Common Ditch or Joint Usage: typically used for highway projects which parallel a rail line and work encroaches onto the railroad right-of-way; also used for culvert projects which either encroach on railroad right-of-way or go under tracks.
- Conduit Under or Over Track: typically used for Intelligent Transportation Systems (ITS) conduits crossing railroad right-of-way.
- Supplementary Spur Permit: used on TxDOT projects where the railroad company has crossed TxDOT right-of-way by spur permit. In these agreements, the railroad company is typically responsible for all costs incurred for work performed by the railroad company.

- Crossing Closure: used when an existing at-grade crossing is closed and approaches to an at-grade crossing are removed.

### C&M Agreement Content

Although there are several forms of C&M Agreements, most of these agreements are similar in nature and include:

- a description of work and responsibilities on the project by all parties signing the agreement
- a statement of license the railroad company is providing to TxDOT and local government for use of railroad property
- a statement of any fees TxDOT or other party will pay to railroad company
- clarification of maintenance responsibilities for all parties in the agreement both during and upon completion of project
- a statement requiring TxDOT and local government to require contractors to provide railroad insurance and enter Right-of-Entry Agreement with the railroad company prior to working on railroad right-of-way
- a payment article that clarifies that the railroad company must have Authority to Order Materials from TxDOT or the local government before ordering materials and must have a Work Order from TxDOT or the local government before beginning installation of track work or railroad signals and warning devices
- a termination article that allows any signatory party to cancel the agreement
- a fiber optic article to clarify that the TxDOT contractor will contact the railroad company for locating fiber optic cable prior to construction
- various articles required on all TxDOT agreements
- signature blocks for all parties signing the C&M Agreement
- exhibits attached to the agreement typically include:
  - Exhibit A plan set
  - Exhibit B (as let PS&E plan set) title sheet signed by all parties (overpass or underpass projects only)
  - Railroad company estimate for labor and materials provided by the railroad company
  - Metes & Bounds Property Description for project footprint on railroad right-of-way
  - Sample railroad company Right of Entry Agreement
  - Previously executed PE Agreement (if applicable)
  - Previously executed AFA (if project involves local government)
  - Previously executed design build contract (if agreement involves developer who is designing and building project)

- 5% Theoretical Cost Estimate for railroad company cost participation (if applicable).

In some cases, a project may occur at a location where the railroad track crosses a highway facility by spur permit where TxDOT owns the right-of-way. In these cases, a supplementary Spur Permit Agreement is executed with an attached Exhibit A showing all work to be done by the railroad company or private industry owning the track with no attached cost estimate since all cost is borne by the railroad company or private industry.

For more information on spur permits, see Chapter 6 of this manual.

### Easements vs. License Agreements

It is standard TxDOT practice to pursue license agreements on construction projects impacting railroad rights-of-way. TxDOT does not pursue easements on railroad rights-of-way and TRF-RSS works with the Right-of-Way Division to negotiate any terms and fees related to license agreements with railroad companies.

### Agreement Execution

Railroad company review of the C&M Agreement typically requires internal approval from several parties, including:

- Engineering
- Legal
- Real Estate
- Track Planning (depending on project scope).

After all railroad companies and local governments have executed the C&M Agreement, TRF-RSS will execute the agreement and the agreement is considered fully executed.

The agreement is then uploaded into the TRIMS project management module by the TRF-RSS Contract Specialist. TRF-RSS will send original copies of the agreements to all signing parties and send scanned copies to the District Railroad Coordinator as well as FIN. The agreements are uploaded into the Finance Imaging Database by FIN.

### Exhibit B Approval

On overpass projects, the C&M Agreement will typically require that all signatory parties sign the title sheet of the as-let PS&E (Exhibit B) before the contractor can access railroad right-of-way. Exhibit B submittal from the TRF-RSS Contract Specialist to the railroad company will occur:

- after the project lets if C&M Agreement is executed prior to letting

- with the fully executed C&M Agreement if C&M Agreement is executed after project has let.

The Exhibit B signed title sheet is then attached to all original copies of the C&M Agreement.

On underpass projects, the Exhibit B must be signed by all parties prior to execution of the C&M Agreement.

### C&M Agreement Submittal to Federal Highway Administration (FHWA)

On projects which involve federal oversight, TxDOT may be required to submit a copy of the fully executed C&M Agreement to the Federal Highway Administration (FHWA). The FHWA will review and approve the C&M Agreement by signing the title sheet on a copy of the C&M Agreement.

TRF-RSS provides a copy of the C&M Agreement to the Design Division (DES), which coordinates FHWA review and approval.

### Agreement Amendments

If an agreement needs to be modified after the C&M Agreement has been fully executed, TRF-RSS will draft an agreement as needed. An agreement amendment is typically needed when:

- the scope of work for the project has changed
- a new required article is needed in the C&M Agreement as determined by the Contract Services Office (CSO)
- a mistake in the C&M Agreement or any of its attachments is identified.

TRF-RSS will coordinate signatures from all parties.

An agreement may be terminated by a letter from TxDOT to the railroad company.

# Section 5 — Design Build Projects

## Overview

TxDOT typically employs a bid-build project delivery method where the:

- District designs the project in house or hires a consultant to design the PS&E
- Construction Division (CST) assists in letting the project to a contractor
- contractor constructs the project after approval from Texas Transportation Commission.

However, on larger construction projects, TxDOT has adopted a design-build project delivery method where a single contractor is hired to both design and build the project on an accelerated schedule. These projects are often corridor projects which may cross multiple rail lines owned by multiple railroad companies.

Comprehensive Development Agreements (CDAs) may also be utilized as a form of design-build project delivery. CDAs may include provisions for a developer to maintain the facility upon completion of the project.

## Design-Build/Developer Contract

Answers to the following questions should be discussed up front on design-build projects prior to execution of the Design-Build Contract between TxDOT and the developer:

- Does the Design-Build Contract clarify that the developer is responsible for all documents and meetings necessary for C&M Agreement execution and that the developer is required to enter into a Right-of-Entry Agreement and provide proper railroad insurance?
- If the project includes overpass or underpass work, will the project have an Exhibit A and Exhibit B? (On these types of projects, the Exhibit A may be the 100% PS&E since construction may begin very shortly after approval. This differs from bid-build projects where the Exhibit A may be completed approximately 18 months before the Exhibit B.)
- How will Exhibit A plans and support materials be reviewed by TxDOT, and will the developer be contractually obligated to respond to the comments and revise these items?
- Will there be a need for TxDOT or the developer to issue an Authority to Order Materials or a Work Order? If so, who will issue it?
- Will preliminary project activities require flagging from the railroad company? Which party will execute the flagging agreement with the railroad company and pay flagging invoices?
- Which party will execute a PE Agreement and pay the invoices from the railroad company?

- Is there a date that TxDOT PE and other agreements transfer to the developer, including responsibility for paying invoices?
- How will the developer access railroad right-of-way during construction? Will temporary at-grade crossings be needed?
- Which parties will perform inspection and pay invoices for any track or signal work performed by the railroad company?
- Which party will pay any real estate and Right-of-Entry fees required by the railroad company?
- What maintenance responsibilities will the developer have upon completion of the project?
- Who will draft the C&M Agreement? Which parties will sign the C&M Agreement?
- Will the Right-of-Entry Agreement be tied to the C&M Agreement?
- If TxDOT is responsible for review and paying invoices, who at TxDOT will review the invoices?

**Design and C&M Agreement Phases**

Sections 1-4 of this chapter clarify processes on bid-build projects. In general, all of the steps shown in these sections apply to design-build projects, but often many of the processes normally performed by the District Railroad Coordinator or TRF-RSS may be performed by the developer. Examples of these tasks include:

- development of Exhibit A and all support documentation
- drafting the PE Agreement and any other preliminary agreements
- drafting the C&M Agreement
- issuance of Authority to Order Materials and Work Orders
- project inspection
- approving and paying railroad company invoices
- paying any permitting fees to the railroad company.

Refer to the terms in the design-build contract or CDA for clarification of responsibilities of TxDOT, the developer, and any local government.

Although TRF-RSS may not draft the C&M Agreement, TxDOT will always be a party to the agreement for any state highway. The C&M Agreement should clarify responsibilities of all parties as described in this section and may vary significantly in content from a C&M Agreement for a bid-build project.

# Chapter 3 — Maintenance Projects

**Contents:**

# Section 1 — Letter Agreements

## Timelines

Letter agreements for maintenance work and other work with minimal impacts to railroad rights-of-way typically require one to three months for execution. As the need is identified, the District Railroad Coordinator contacts the TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS) Contract Specialist with:

- a description of the work to be performed on railroad right-of-way
- a location map
- the number of days of flagging required
- clarification if work is invasive or non-invasive. Invasive work generally includes any excavation or milling of roadway surfaces.

## Types of Work Requiring a Letter Agreement

On maintenance projects or projects with minimal impact to railroad right-of-way, authority to perform the work and allow the railroad company to provide flagging services is accomplished with a letter agreement. The following types of work are typically handled via a letter agreement:

- Seal coat & pavement maintenance
- Overlays and inlays
- Bridge inspection
- Minor bridge repair or maintenance
- Some types of maintenance work on an underpass
- Surveying
- Mowing
- Barrier or guardrail repair
- Installation or replacement of roadside signs
- Culvert or ditch maintenance
- Conduit & cable replacement or realignment
- Traffic signal maintenance
- Traffic control plans over an at-grade crossing
- Removing rail on abandoned rail line within railroad right-of-way

- Activity outside of railroad right-of-way with equipment that could tip over the tracks.

### Letter Agreement Considerations

Letter agreements for minor work on railroad right-of-way are typically one to two pages in length and are two-party agreements between TxDOT and the railroad company. In general, three main points must be considered on letter agreements:

- Flagging: The letter agreement should clarify how many days of flagging are anticipated for the work to be performed and the estimated daily cost of flagging to be charged by the railroad company. If there is any work within 25 feet of nearest rail, or if any heavy equipment could tip over the railroad tracks, a flagger will be required. The railroad has the final authority when flagging is needed. NOTE: On spur permit crossings, the railroad company provides flagging free of charge.
- Insurance: The letter agreement should clarify the insurance limits the contractor will carry if working on railroad right-of-way.
- Right-of-Entry Agreement: The letter agreement should clarify if the contractor performing the work will be required to execute a Right-of Entry-Agreement. Right-of-Entry Agreements are required if any invasive work is performed within railroad right-of-way. Types of work that would typically not require a Right-of-Entry Agreement are seal coats, overlays, and non-invasive surveying.

### Letter Agreement Execution

Letter agreements are typically submitted by TRF-RSS to the railroad company electronically. The railroad company executes and returns the agreements to be fully executed by TRF-RSS and forwarded to FIN to be uploaded in the Finance Imaging Database.

Executed letter agreements are uploaded into the TRIMS Project Management Module by the TRF-RSS Contract Specialist.

# Section 2 — Types of Work Not Requiring a Letter Agreement

### Striping and Street Sweeping

Since this type of work is performed with a moving vehicle, a letter agreement is not required with the railroad company.

### Removing Rail Line Not on Railroad Right-of-Way

Since work is not on railroad right-of-way, a letter of notification is provided as courtesy if the railroad company formerly operating on the line is known.

### Maintenance Work on an Overpass

Any work on top of an overpass which does not protrude over the side of the bridge does not require a letter agreement. The District is encouraged to contact TRF-RSS to issue a courtesy letter to the railroad company of the impending work.

If, however, repair is required on the bridge barrier, or if equipment is required over the edge of the bridge such that equipment or parts could fall onto the railroad tracks or vertical clearance is reduced, a letter agreement may be required.

### Maintenance Work at an Underpass

If work is performed on a roadway underpass underneath a railroad bridge, a letter agreement is typically not needed. The District is encouraged to contact TRF-RSS to issue a courtesy letter to the railroad company of the impending work. However, the following exceptions apply:

- If an overlay will reduce vertical clearance, a letter agreement will be required which clarifies the existing and new vertical clearance.
- If signs are to be replaced on the underpass bridge to reflect the new vertical clearance, a letter agreement will be required and a contractor will be required to enter into a Right-of-Entry Agreement with the railroad company.
- If any changes are being made to barrier protection of piers, or if embankment is being modified to accommodate new lanes or sidewalks, design approval will be required from the railroad company and a letter agreement will be required.
- If environmental abatement or painting is being performed on the piers, environmental approval may be required from the railroad company in the form of a Right-of-Entry Agreement.

# Chapter 4 — Safety Projects (Federal Railroad Signal Program)

**Contents:**

# Section 1 — Overview

## Federal Railroad Signal Program (FSP)

The Federal Railroad Signal Program (FSP) is funded under the Surface Transportation Program (STP), Title 23, United States Code (USC) Section 130. It is managed by the TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS) under Category 8 (Safety) of the Unified Transportation Program (UTP) as a bank balance allocation program. Each year, the Texas Transportation Commission authorizes the total amount of funding and the method of project selection. This provides flexibility within each program year to cancel and add projects to the program without Commission action.

The FSP is funded with 90% federal and 10% state funds. Funding for the program is typically around $15 million annually, with funds set aside from the Highway Safety Improvement Program (HSIP) out of Category 8, excluding any cost participation from local governments and railroad companies.

All open public at-grade crossings are eligible for the FSP, except for industry spur track crossings located on the state highway system where the spur track has crossed an existing highway.

Typical safety projects include:

- installation/adjustment of railroad lights and gates
- traffic signal preemption
- crossing closures
- crossing corridor improvements
- signing and striping improvements
- roadway or crossing surface improvements.

Any crossing locations identified for safety upgrades via the FSP which may have an existing construction project should be funded and constructed under the construction project unless TRF-RSS Management and the District agree otherwise.

## FSP Project Agreement Flow Chart

Figure 4-1 presents a flow chart depicting the process for obtaining a project agreement on a Federal Railroad Signal Program (FSP) project.

NOTE: NOTE: Not all steps are applicable to all FSP projects. Project steps and time frames will vary depending on the scope of the project.

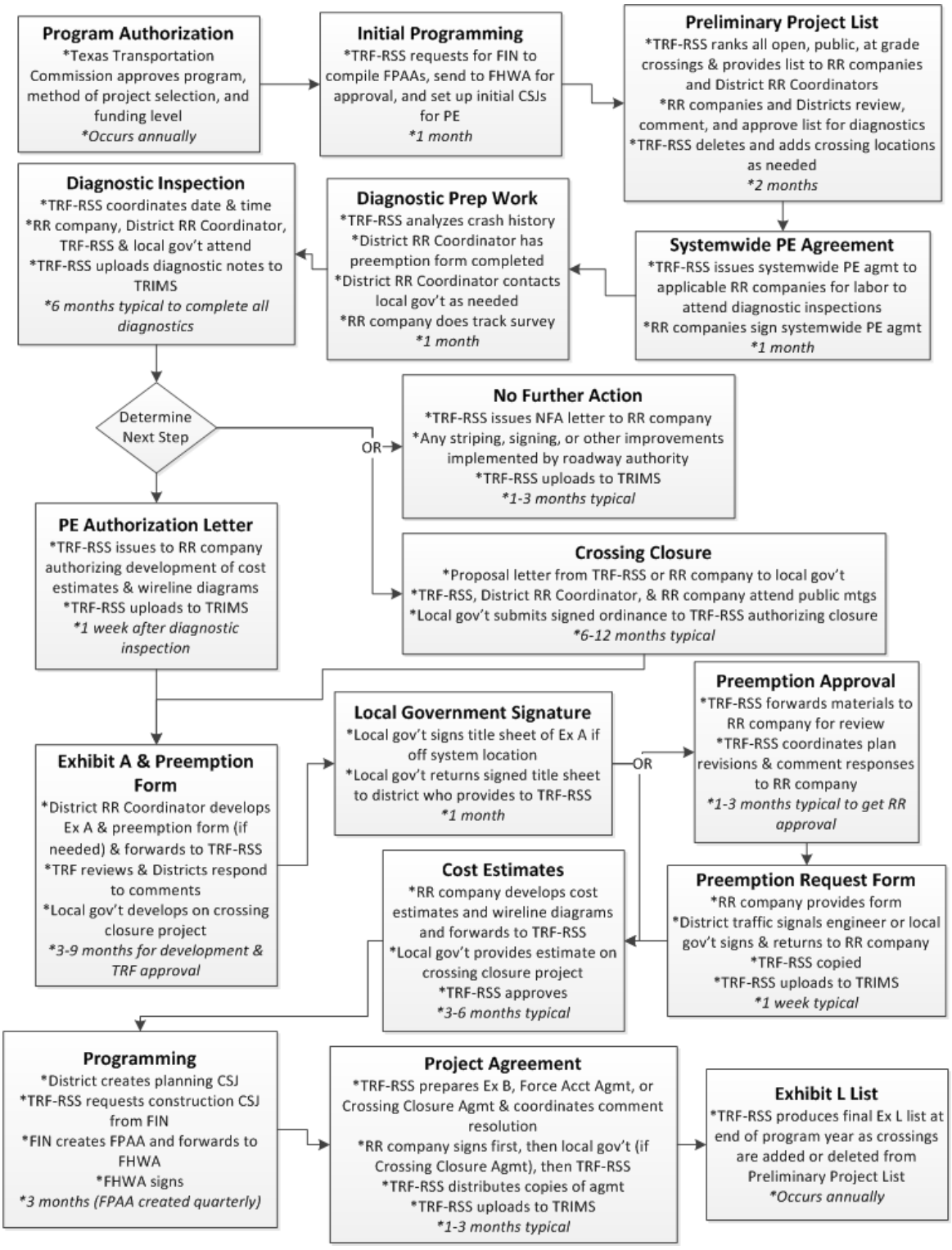


*Figure 4-1. FSP Project Flow Chart*

# Section 2 — Preliminary Activities

## Initial Programming

TRF-RSS will compile estimated preliminary engineering costs for FSP projects and request a separate Control-Section-Job (CSJ) from the Finance Division Letting Management Section to be set up for system-wide preliminary engineering for:

- UPRR
- BNSF
- KCS
- Shortline railroad companies (all under the same CSJ).

The Finance Division Letting Management Section will compile a Federal Project Authorization & Agreement (FPAA) to be sent to the Federal Highway Administration (FHWA) for each of these CSJs. The FHWA will review and approve the FPAAs to obligate federal funds for preliminary engineering. This occurs prior to issuing a System-wide PE Agreement to the railroad companies.

These funds are used for all activities up to and including TRF-RSS issuing the Exhibit B. At that time, any funds for the work will be part of the Construction CSJ and under the review and approval of the District.

## Project Selection

Statewide ranking of projects is performed by TRF-RSS annually based on the Revised Texas Priority Index ($TPI_{REV}$) process. The $TPI_{REV}$ process separates active and passive crossings and evaluates each set independently.

## Active Crossings

Active crossings are evaluated under a formula which includes a crash prediction model and a five-year crash history. Factors and weightings used in the crash prediction model are based on historical crash data for at-grade crossings in Texas. These factors include:

- whether the roadway is paved or not
- whether the crossing is in an urban or rural area
- the number of roadway lanes over the crossing
- the number of railroad tracks at the crossing
- the maximum train speed at the crossing

- the minimum train speed at the crossing
- total daily trains
- AADT
- whether there is a nearby road intersection
- the highest roadway approach speed limit at the crossing.

### Passive Crossings

Passive crossings are evaluated under a four-step process:

1. Eliminate any crossings with less than two (2) daily trains and no (0) crashes in the past five years.
2. Eliminate any crossings meeting non-qualification criteria.
3. Apply warrants.
4. Rank by Texas Passive Crossings Index (TPCI).

### Step 1: Initial Non-Qualification Criteria

Any passive crossings with less than two (2) daily trains and no (0) crashes in the past five years are eliminated from consideration.

### Step 2: Non-Qualification Criteria

Any passive crossings remaining after Step 1 are eliminated from consideration if all of the following criteria are met:

- There have been no crashes in the past five years
- The crossing has only one (1) track
- No passenger trains at the crossing
- AADT is below median of initial subset (crossings after Step 1)
- Maximum train speed is less than or equal to 30 mph
- Less than five (5) daily trains
- No nearby intersection (within 500 feet)
- Crossing angle is 60 degrees or greater.

**Step 3: Apply Warrants**

Any crossings remaining after Step 2 are ranked first based on the number of warrants met. These warrants include:

- At least one (1) crash in the past five years
- Trains per day ≥ 95% cumulative percentile (urban and rural crossings evaluated separately)
- School buses per day ≥ 94% cumulative percentile (of subset of crossings serving school buses)
- Number of tracks at crossing ≥ 2
- Maximum train speed ≥ 49 mph and AADT ≥ 75% cumulative percentile (urban and rural crossings evaluated separately)
- AADT or Exposure (train counts x AADT) ≥ 95% cumulative percentile for rural areas or ≥ 90% cumulative percentile for urban areas
- Average number of heavy vehicles per day ≥ 95% cumulative percentile
- Passenger trains per day ≥ 1
- Highway parallel to and less than 75 feet from tracks when roadway speed limit is greater than 30 mph and exposure ≥ 75% cumulative percentile (urban and rural crossings evaluated separately) or school buses per day ≥ 50% cumulative percentile or average number of heavy vehicles per day ≥ 75% cumulative percentile.

**Step 4: Rank by TPCI**

The TPCI ranking formula is needed to distinguish between crossings meeting the same number of warrants in Step 3. TPCI is a formula that evaluates and weights the following factors:

- Crashes in the past five years
- Trains per day
- School buses per day
- Number of railroad tracks at the crossing
- Train speed
- AADT
- Presence of nearby traffic signal
- Heavy vehicles per day
- Presence of nearby intersection (non-signalized)
- Highest roadway approach speed limit at the crossing

- Crossing angle with roadway
- Presence of humped or dipped crossing.

It is noted that the crossing prioritization process currently does not include stopping distance or sight distance information due to a lack of existing data.

### Preliminary Project List

The percentage of active and passive crossings chosen for the program year will determine how to integrate the two lists together. For example, if the list includes 300 total crossings with 200 active crossings and 100 passive crossings, the top two ranked active crossings will be ranked 1st and 2nd with the top ranked passive crossing ranking 3rd. Or if 300 total crossings were chosen with 150 active crossings and 150 passive crossings, the top ranked active crossing will be ranked 1st with the top ranked passive crossing 2nd. Active and passive crossings will be integrated together in the same format until the total number of desired crossings is obtained.

Before a finalized list of crossings selected for diagnostic inspections is completed, adjustments are made to the $TPI_{REV}$ ranking by the following processes:

- TRF-RSS removes any crossings that may have an existing FSP project.
- Districts may remove crossings that have invalid data.
- Districts may recommend other crossings to be added for safety or preemption upgrades.
- Railroad companies may remove crossings that have invalid data.
- Railroad companies may recommend other crossings be added for safety or preemption upgrades.
- Railroad companies may recommend upgrades be performed as part of a corridor improvement.

### Corridor Improvements

Although the FSP has limited funding each year, corridor improvements to upgrade a series of at-grade crossings along the same track may be eligible for funding under the FSP if:

- deemed high priority to TxDOT
- the railroad company chooses to cost participate
- significant savings could result by upgrading all crossings at the same time.

TRF-RSS will evaluate any proposed corridor improvements with the District and the railroad company to determine eligibility.

### System-wide PE Agreement

Some of the railroad companies will require a System-wide PE Agreement prior to attending diagnostic inspections. TRF-RSS will issue the list of crossings to each of the railroad companies, commonly referred to as the Preliminary Project List, for signature and concurrence on the initial list for diagnostic inspections. A fully executed System-wide PE Agreement provides a method to pay the railroad companies and railroad consultants for:

- travel and per diem costs related to diagnostic inspections
- labor for attending diagnostic inspections
- track surveys.

# Section 3 — Diagnostic Inspection

## Diagnostic Preparation Work

Prior to the diagnostic inspection, the following activities are recommended:

- Crash reports are analyzed and brought to the diagnostic by the TRF-RSS Project Manager.
- Broken gate, vehicle on track, or near miss reports may also be analyzed and brought to the diagnostic by the TRF-RSS Project Manager or railroad company; these reports are produced by the railroad company.
- District Railroad Coordinator arranges to have any traffic signal preemption forms (TxDOT Form 2304) filled out, if needed.
- District Railroad Coordinator contacts the local government to discuss any current issues at the crossing or pending projects by the local government.

Diagnostic inspections are coordinated by the TRF-RSS Project Manager.

## Diagnostic Inspection Team Composition

The Diagnostic Inspection Team typically includes:

- District Railroad Coordinator
- TRF-RSS Project Manager
- Railroad company Project Manager
- Railroad company Signal Maintainer (as needed)
- Local government representative (as needed)
- FHWA or FRA representative (as needed).

## Diagnostic Inspection Activities

The diagnostic inspection is conducted on site at the crossing to discuss and take notes on:

- existing and future traffic counts
- future roadway projects
- train operations and future plans
- Quiet Zone considerations (existing or proposed)
- safety upgrades such as lights and gates, signing and striping, and traffic signal preemption
- upgrades to a corridor to be considered

- adjustments to civil features such as curb & gutter, culverts, guardrail, or retaining walls
- tree trimming or other measures to increase sight distance
- median installation
- required utility adjustments
- how to bring power to the crossing
- if closing the crossing is possible
- who will provide materials and labor for the proposed improvements
- which items will be eligible for federal and state reimbursement
- cost participation from both railroad company and local government
- how inspections will be performed during construction
- how invoices will be reviewed and approved.

A sketch of the proposed crossing with safety enhancements is prepared by both the railroad company Project Manager and TRF-RSS Project Manager along with any applicable notes.

Items shown on the sketch typically include:

- any existing gates, cantilevers, or mast flashers labeled as to be removed or relocated or to remain
- any proposed gates, cantilevers, or mast flashers
- any proposed or existing front, side, or back lights
- distances to any relocated or proposed gates, cantilevers, or mast flashers from edge of roadway
- distances to any relocated or proposed gates, cantilevers, or mast flashers from edge of nearest rail (to the tip of the gate) or center of tracks (to the center of signal mast)
- any proposed or existing railroad cabins (in proximity to railroad crossing)
- distances from edge of roadway and edge of nearest rail to near edge of cabin, both distances measured perpendicularly
- distance between adjacent gate and cantilever
- distance between near edge of sidewalk and center of gate, cantilever, or mast flasher
- proposed or existing medians
- proposed or existing curb
- drainage features, metal beam guard fence, or retaining wall needed for installing railroad active devices
- any utility poles that might impact the railroad signals

- all roadway lanes, lane widths, and shoulder widths
- number of tracks and distance between tracks ("track centers"), as well as any tracks to be removed
- estimated length of gates (optional)
- estimated length of cantilevers
- existing or proposed sidewalks or shared use pathways
- locations of bores, ground boxes, and traffic signal cabinet for preemption projects
- name of roadway crossing the tracks and any parallel roads
- distance to parallel roads
- north arrow
- If applicable, show lane assignments, through only, right turn only, etc.

A diagnostic inspection form is also completed on site. See Chapter 14 for an example.

The sketch and diagnostic inspection form are uploaded into the TRIMS Project Management Module by the TRF-RSS Project Manager.

### After the Diagnostic Inspection

Typically, there are three separate paths FSP projects will follow after the diagnostic inspection:

- Pursue safety enhancements with railroad company force account work.
- No further action letter.
- Pursue crossing closure.

### Project Engineering Authorization Letter

The diagnostic team may recommend safety upgrades with any railroad force account work including:

- adjusting railroad signal circuitry
- providing or changing active warning devices
- providing traffic signal preemption
- replanking the crossing surface.

In these scenarios, the TRF-RSS Project Manager will then issue a Project Engineering Authorization Letter to authorize the railroad company to begin developing cost estimates for work by the railroad company and develop any necessary wireline diagrams. Depending on the terms in the

Master Agreement or Project Engineering Authorization Letter, this letter may or may not be signed by the railroad company.

Project Engineering Authorization Letters are uploaded into the TRIMS Project Management Module by the TRF-RSS Project Manager.

### No Further Action Letters

In some cases, the diagnostic team may determine that railroad company force account work is not recommended. Some reasons may include:

- train counts or AADT are not accurate for the crossing
- difficulty in providing power to the site
- TxDOT or the local government has plans for future construction project impacting crossing
- local opposition to project
- safety upgrade for previous crash history not easily identified
- crossing is already gated with signals up to current standards, and preemption already provided or crossing not near a highway intersection.

The TRF-RSS Project Manager will issue a letter to the railroad company with a copy to the local government and District Railroad Coordinator informing them of the decision. In some cases, minor upgrades may still be recommended to the local government or District via a separate letter or memo. These may include:

- signing and striping upgrades
- roadway surface improvements
- tree trimming or removal of sight obstructions.

No Further Action Letters are uploaded into the TRIMS Project Management Module by the TRF-RSS Project Manager.

# Section 4 — Crossing Closure Projects

## Introduction

When TxDOT, the local government, and the railroad company collectively agree to consolidate and close crossings, TxDOT makes funding available to local governments to make the following related improvements:

- Remove the existing pavement at the crossing
- Construct a satisfactory terminus of the roadway at the removed crossing
- Install proper signs acknowledging the closing of the crossing
- Upgrade the existing railroad signals
- Improve existing streets in the vicinity of the closed crossing to handle the diverted traffic.

No funding is provided to the railroad company, as the crossing closure is considered a benefit to them. A signed agreement between TxDOT, the railroad company, and the local agency will be executed before the work is authorized.

A crossing closure project which is subsequently denied by a local government may then follow a new path to include various safety upgrades. TRF-RSS reserves the right to cancel a closure project after a predetermined time frame, typically one year from the date of the closure Proposal Letter (defined below).

## Two Programs Available

TxDOT administers two programs for funding the closures of redundant, non-essential at-grade crossings in Texas:

- FSP
- Basic Closure Program.

## Federal Signal Program

Under the FSP, funding in an amount of up to $150,000 can be offered to the local government to close the crossing and improve safety in the vicinity of the closed crossing by making operational roadway improvements. The railroad company may cost participate to cover any additional costs. This program is offered for crossings on the FSP Preliminary Project List.

### Basic Closure Program

The Basic Closure Program offers limited funds (up to $7,500 from TxDOT with at least matching funds from the railroad company) to the local government. The railroad company may add incentive dollars, which can be used at the local government's discretion. The local government must use the funds from TxDOT only for roadway, safety, and operational improvements associated with the crossing closure within the vicinity of the closed crossing, as approved in advance by TxDOT. This program is offered for crossings not on the FSP Preliminary Project List.

### Contracting (FSP or Basic Closure Program)

The work activities associated with the closure of the crossing may be performed under the following conditions:

- Using local government forces
- Using forces from other governmental entities
- Using private contractors.

In the event the local government determines that the work will be performed using private contractors, the local government must solicit for a minimum of three bids and have one person working directly on the project complete the Local Government Project Procedures for the Texas Department of Transportation training course. If three bids cannot be obtained, the local government should notify TxDOT to explain the circumstances surrounding the bid solicitation. The local government must award the work to the lowest responsive qualified bidder.

### Closure Approval

The following steps must take place for a crossing closure project to proceed:

1. Once the proposal is developed, a Proposal Letter is sent to the local government from TRF-RSS or the railroad company to clarify the intention of removing the crossing and anticipated adjacent roadway improvements associated with the project.
2. TRF-RSS, the District, and the railroad company should attend and participate in all public meetings.
3. The local government submits a signed ordinance/resolution to TRF-RSS stating the crossings to be closed. (Note: This can be attached by the local government when they execute the Crossing Closure Agreement.).

# Section 5 — Design Phase

## Exhibit A Preparation

The District prepares the Exhibit A plan set following the diagnostic inspection to show all work to be done on the project by TxDOT, the local government, and railroad company.

For crossing closure projects, the local government may choose to prepare the Exhibit A plans showing details of the closure or may seek assistance from the District.

All Exhibit A's must be signed, sealed, and dated by the engineer designing the plans.

On local roadways, the following items of work are typically constructed and paid for by the local government:

- Median installation
- Civil features such as curb & gutter, guardrail, retaining walls, and culverts
- Traffic signal adjustments
- Utility adjustments
- Removing sight distance obstructions such as vegetation
- Signing & striping (may be performed by TxDOT)
- Roadway alignment improvements
- Installing conduit for traffic signal preemption (typically reimbursed by TxDOT).

Districts may assume costs of these items for crossings on TxDOT roadways. The railroad company may be willing to perform these duties as part of negotiating the final agreement.

The railroad company provides materials and labor for:

- active warning devices and railroad cabin
- track circuitry
- traffic control
- providing a preemption connection between railroad cabin and traffic signal cabin
- replanking (crossing surface).

These items are reimbursed by TxDOT under FSP funding.

For details on how to develop an Exhibit A plan set, see Chapter 7 of this manual.

TRF-RSS will review and approve Exhibit A's, as well as any preemption forms, prior to preparing the individual project agreement.

### Local Government Signature

If a local government manages the road at the at-grade crossing, the title sheet of the Exhibit A must be signed prior to submitting the Exhibit B to the railroad company. By signing the title sheet, the local government agrees to the work shown on the Exhibit A, responsibilities shown in the Master Agreement, and the cost participation shown in the estimate. The District Railroad Coordinator arranges to have the sheet signed.

### Preemption Request Form

The railroad companies will review any preemption forms submitted for an FSP project. After approval, some railroad companies may request that a Preemption Request Form is completed and signed. The form clarifies which preemption circuits are requested on the project.

TRF-RSS will arrange to have the form signed by the District Traffic Signals Engineer. Preemption forms, reports, and request forms are uploaded into the TRIMS Project Management Module by the TRF-RSS Project Manager.

### Cost Estimates

An estimate and wireline diagram is provided from the railroad company for labor and materials provided by the railroad company. The local government will produce an estimate for any labor and materials provided by the local government. Estimates will clarify any cost participation by the railroad company or local government. With the exception of funding TxDOT provides to local governments for closing crossings, materials and labor provided by the local government are usually not reimbursed via FSP funding.

For crossings on the state highway system, the District will pay for any TxDOT labor or materials out of District funds. This work is typically similar to work provided by a local government on an off-system crossing. Work by a TxDOT contractor is also paid out of District funds. An estimate for TxDOT services or TxDOT consultant services is not necessary since it is not attached to an individual project agreement.

The TRF-RSS Project Manager will review and approve all estimates prior to development of the Exhibit B, Force Account Agreement, or Crossing Closure Agreement.

For further information on reviewing railroad company cost estimates and wireline diagrams, see Chapter 2 of this manual.

**Programming**

TRF-RSS will request planning CSJs from the District Railroad Coordinator for all projects which will utilize federal funding to reimburse the railroad companies and local governments. After obtaining the planning CSJs, TRF-RSS will request each quarter that the Finance Division Letting Management Section provide construction CSJs for each of the planning CSJs. The Finance Division Letting Management Section will create a new FPAA to include the construction CSJs for an amount based on estimates to be paid out to railroad companies and local governments. FHWA will review and approve the FPAA.

# Section 6 — Project Agreements

## Master Agreements

TRF-RSS has Master Agreements with all of the Class 1 railroad companies and some of the short-line railroad companies to facilitate individual project agreements on FSP projects. These agreements typically cover:

- program and project documents and required approvals
- construction and maintenance details for preparing and approving plans, specifications, and estimates
- construction and maintenance responsibilities TxDOT will hold a local government responsible to for off-system public crossings
- cost participation
- Authority to Order Materials and Work Orders
- subcontracting requirements
- federal-aid policy guide requirements, policy, and guidance
- methods of payment
- conditions for reimbursement.

A full agreement for an individual crossing is not required if a Master Agreement exists.

## Reimbursement Methods

There are three methods for reimbursing a railroad company. The appropriate method depends on the scope and complexity of the project and whether the railroad company uses its own forces or a contractor to perform the work.

## Railroad Company Uses Own Forces

If the railroad company uses its own forces to perform the work, reimbursement is usually made on an actual cost basis. However, if TxDOT and the railroad company agree, reimbursement can be based on a lump sum cost estimate. This would typically occur on smaller projects where actual cost to the railroad company is easily estimated. Project costs and method of reimbursement (actual or lump sum) are approved in the individual project agreement.

### Railroad Company Uses a Contractor on Continuing Contract

The railroad company may use a contractor to perform the work under a continuous agreement with the railroad company. The continuous agreement must be for a minimum of three years. The contractor's costs are included in the project estimate and reimbursed at actual cost during construction unless a lump sum arrangement is shown in the individual project agreement. The railroad company directly invoices TxDOT and reimburses their contractor separately.

The railroad company may also provide labor (inspection, etc.) and include estimated costs in the individual project agreement. Reimbursement to the railroad company will be at actual cost.

### Railroad Company Uses a Contractor for Individual Project

The railroad company may choose to solicit bids for the project from a minimum of three contractors. The lowest qualified bid will be accepted and reimbursed at actual cost. If three bids are not received, TRF-RSS may still accept the lowest qualified bidder if at least three contractors were contacted and one or more chose not to bid the project.

The railroad company directly invoices TxDOT and reimburses their contractor separately.

The railroad company may also provide labor (inspection, etc.) and include estimated costs in the individual project agreement. Reimbursement to the railroad company will be at actual cost.

### Individual Project Agreement

Typically, there are three separate paths FSP projects will follow after Exhibit A's, cost estimates, and railroad wireline diagrams are completed:

- Exhibit B
- Force Account Agreement
- Crossing Closure Agreement.

### Exhibit B

If a Master Agreement exists between TxDOT and the railroad company, TRF-RSS prepares an Exhibit B as per terms of the Master Agreement. The Exhibit B normally consists of:

- signed cover page providing TxDOT's approval of work and cost estimates
- Exhibit A (with signature from local government)
- cost estimates from the railroad company
- cost estimates from the local government (if applicable)

- railroad company wireline diagrams.

Depending on the terms in the Master Agreement, the Exhibit B may or may not need to be executed by the railroad company.

The fully executed Exhibit B is uploaded into the TRIMS Project Management Module by the TRF-RSS Project Manager.

### Force Account Agreement

If a Master Agreement does not exist with the railroad company, TRF-RSS prepares and negotiates a Force Account Agreement for the crossing project. The Force Account Agreement will typically include the items listed above shown in both the Master Agreement and Exhibit B.

TRF-RSS will coordinate any comments on the proposed Force Account Agreement from the railroad company and revise the agreement as needed. The agreement will be executed first by the railroad company and then by TRF-RSS.

The fully executed Force Account Agreement is uploaded into the TRIMS Project Management Module by the TRF-RSS Project Manager.

### Crossing Closure Agreement

For crossing closure projects, TRF-RSS will prepare a Crossing Closure Agreement regardless of whether a Master Agreement exists with the railroad company. The Crossing Closure Agreement typically includes similar articles and attachments as listed above for both a Master Agreement and Exhibit B and will also include a copy of the signed ordinance/resolution stating the crossing to be closed. A local government is typically given two years from the date of the executed Crossing Closure Agreement to invoice TxDOT for any improvements to adjacent roadways identified in the agreement.

TRF-RSS will coordinate all comments on the proposed Crossing Closure Agreement from participating parties (District, railroad company, local government) and revise the agreement as needed prior to submitting to all signing parties for execution. For three-party agreements, the agreement is usually executed first by the railroad company, then the by the local government, and finally, by TRF-RSS. For two-party agreements, the agreement will be executed first by the railroad company and then by TRF-RSS.

The fully executed Crossing Closure Agreement is uploaded into the TRIMS Project Management Module by the TRF-RSS Project Manager.

### After Project Agreement is Executed

TRF-RSS distributes a copy of the executed Exhibit B, Force Account Agreement, or Crossing Closure Agreement, to:

- the District
- FIN
- the railroad company (original copy as needed)
- the local government (original copy as needed).

### Exhibit L

At the conclusion of each program year, TRF-RSS will track the final list of crossing locations selected for improvements with Section 130 funding. This list will consist of the preliminary project list, with any No Further Action projects removed, and any additional projects added. The list is referred to as the Exhibit L.

# Chapter 5 — Replanking Projects

**Contents:**

# Section 1 — Program Overview

## Background

The Replanking Program, a state designated program, is used to provide dedicated state highway funds for replacing at-grade crossing surfaces located on the state highway system. This is codified in 43 TAC §7.106. The TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS) manages the program.

## Program Authorization and Funding

The Replanking Program is managed under Category 10 (Supplemental Transportation Projects) of the UTP as a bank balance allocation program. Each year, the Texas Transportation Commission authorizes the total amount of funding and the method of project selection. This provides flexibility within each program year to cancel and add projects to the program without Commission action. It is funded with 100% state funds, excluding any cost participation from railroad companies. Funding for the program is typically around $3.5 million annually.

Program funds are used to reimburse the railroad company for labor and materials involved in replacing crossing surface panels (concrete or other), but not rail, ties, or ballast.

Program funds are not typically used for:

- traffic control and detours
- advertising roadway closures in advance on portable changeable message signs
- engineering labor in developing Exhibit A layouts
- roadway work (level up to match crossing surface panels)
- any base material or concrete work directly beneath subballast at crossing
- temporary riprap crossings installed adjacent to the at-grade crossing if roadway cannot be closed during construction
- striping (and signing as needed).

These activities are funded out of the District maintenance budget.

## Ineligible Crossings

The following types of at-grade crossings are ineligible for the Replanking Program:

- Private crossings
- Closed, out of service, or abandoned crossings

- Off system crossings (roadway owned by local government, not TxDOT)
- Locations where the railroad crossed TxDOT right-of-way via a spur permit or other agreement.

Additionally, any crossing locations identified for replanking which may have an existing construction project should be funded and constructed under the construction project.

An at-grade crossing may use funding from both the FSP and Replanking Programs to fund safety and surface upgrades if the crossing qualifies under the prioritization scheme of both programs.

### Replanking Project Agreement Flow Chart

Figure 5-1 presents a flow chart depicting the process for obtaining a project agreement for a replanking project.

NOTE: Not all steps are applicable to all replanking projects. Project steps and time frames will vary depending on the scope of the project.

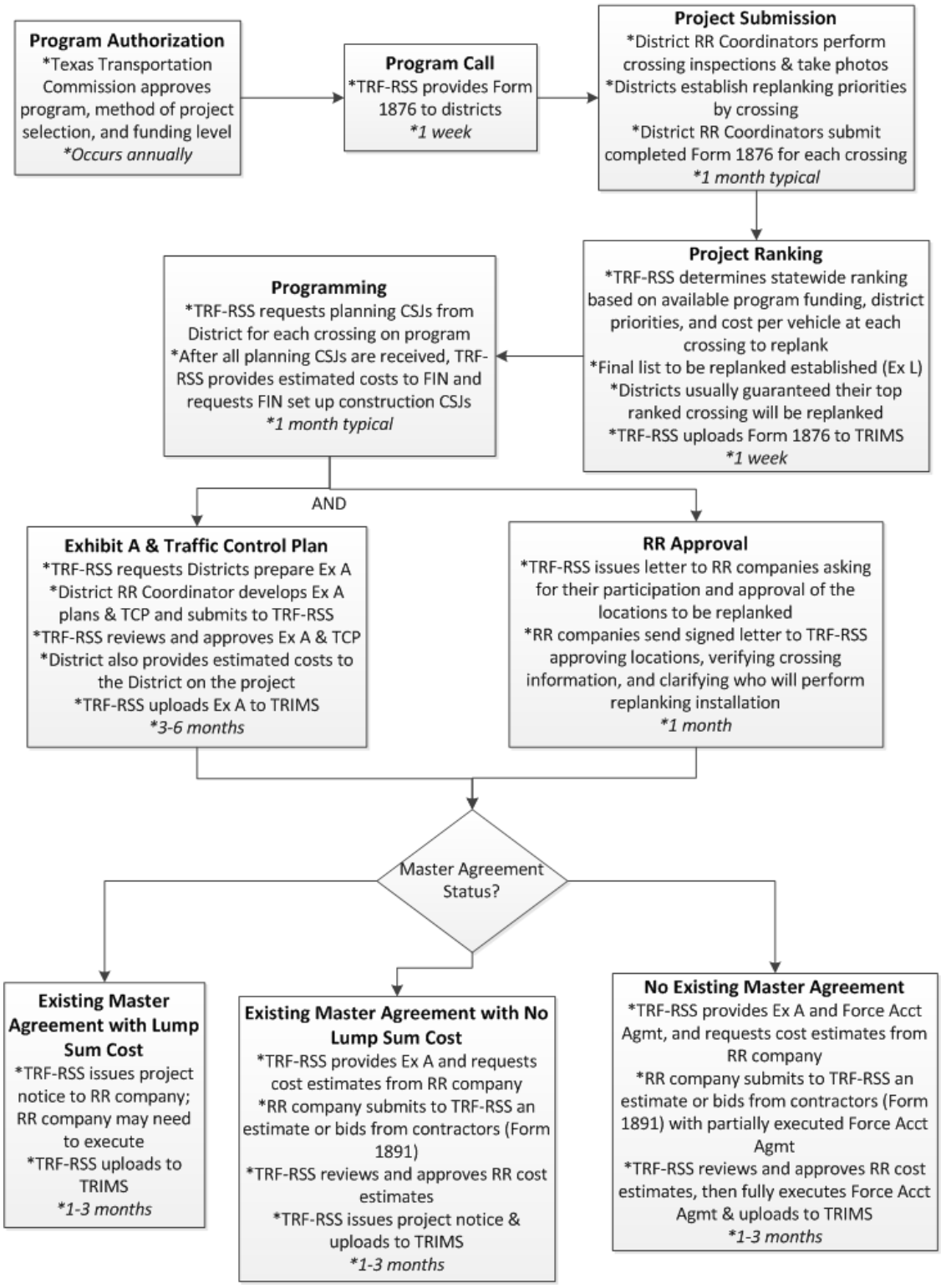


*Figure 5-1. Replanking Project Flow Chart.*

# Section 2 — Railroad Crossing Surfaces

## Crossing Surface Details

Railroad crossing surfaces typically include the following characteristics:

- Surface is made of precast concrete panels 8 feet in length along the length of the track.
- Composite material may be used in lieu of concrete in areas of significant truck traffic where material will not degrade in climate conditions.
- Asphalt may be used in lieu of concrete, particularly for temporary crossings during construction.
- Timber crossings are rarely used anymore.
- Panels are bolted directly into railroad ties beneath.
- Panels installed between the rails are referred to as gauge panels while panels between the rails and the roadway surface are referred to as field panels.
- Rubber flangeways are installed between rails and concrete panels to prevent electrical shorting of the rails.
- A drainage pipe may be installed parallel to the rail on either or both sides of the rail.
- When replacing panels, the railroad company typically replaces the subballast, ballast, ties, and rail at the crossing and beyond roadway edges.
- Track panels are typically assembled in 80 foot preassembled sections, which include rail and ties bolted together (without crossing surface panels).
- Existing track is cut and removed and new track panel is jointed (bolted) to existing rail.
- New track panel is welded to existing track after crossing surface panels are installed.
- The railroad company uses a tamping machine to install and adjust ballast.
- Surfaces may take a few days or weeks to settle after train and truck traffic use the crossing.
- Adjustment of roadway elevation may be needed after crossing surface settles; this is typically done by adding asphalt level-up near the crossing surface.

## Inspecting Crossing Surface Panels

Crossing surface panels wear over time due to:

- truck traffic
- train traffic
- presence of a humped or dipped crossing

- soil conditions
- lack of base material
- drainage problems.

Typical crossing surface panels may last from seven to 15 years depending on various conditions, but can last for shorter periods of time in particularly harsh environments. Before deciding to replace a crossing surface panel, consider the following:

- Does the entire surface need to be replaced or only portions with obvious wear?
- Are panels rocking? If so, are trucks snagging the edges of the field panels due to a humped crossing condition?
- Is the crossing draining properly so existing soil is not settling under the crossing?
- Would changes to the material or thickness of material under the subballast improve the crossing?
- Would a different crossing material work better than what is existing based on the truck traffic and climate?
- What can be done on the crossing approaches to smooth the crossing?

These factors should be considered in whether or not the Replanking Program should be used or supplemented as a means to improve the crossing surface. The railroad company has final authority in determining if a crossing can be repaired or a full replacement is needed.

# Section 3 — Project Selection

## Program Call and Project Submission

Each year TRF-RSS issues a program call for candidate crossings by providing the Railroad Grade Crossing Replanking Project Submission Form (TxDOT Form 1876) to each district. Prior to completing the form, the District Railroad Coordinator should visit crossings on the state highway system to determine the need for crossings requiring new planking. The District Railroad Coordinator should then complete the form by:

- performing a site inspection to verify condition of the crossing and taking a photo of the crossing rather than attaching an outdated image
- completing basic crossing info
- verifying AADT in TRIMS or performing a field count
- rating the condition of the crossing and describing the condition of the crossing
- contacting the Transportation Planning and Programming Division (TPP) if the AADT shown in TRIMS does not match existing counts.

The District completes one form for each crossing submitted and ranks each crossing according to district priority. TRF-RSS strives (within funding limitations) to include each district's top priority ranked submission in the current year's program.

The District should also note if a full closure would be allowed or if cost estimates for partial closures should be prepared by the railroad company. The District will have the final authority in approving a full closure. See Section 4 of this chapter for more details.

## Project Ranking

TRF-RSS establishes each program year's crossings by:

1. calculating the cost of replanking the highest ranked crossing in each District for all 25 Districts
2. calculating a cost per vehicle to replank all other crossings submitted and prioritizing these crossings across the state by lowest cost per vehicle (highest priority)
3. determining which crossings from Step 2 can be funded from available program funds for the program year.

The cost-per-vehicle metric is used to ensure that the best program value is obtained considering the volume of traffic using the crossing. In other words, a crossing with greater traffic volumes will

have higher priority than another crossing with lower volumes with the same estimated cost of replanking.

After the finalized list of crossings for replanking is established, TRF-RSS furnishes a list to each district and railroad company. This list is typically referred to as the Exhibit L.

Each Form 1876 for projects selected for the program is uploaded into the TRIMS Project Management Module by TRF-RSS.

### Corridor Improvements

Although the Replanking Program has limited funding each year, corridor improvements to upgrade a series of at-grade crossings along the same track may be eligible for funding under the Replanking Program if:

- deemed high priority to TxDOT
- the railroad company chooses to cost participate
- significant savings could result by upgrading all crossings at the same time.

TRF-RSS will evaluate any proposed corridor improvements with the District and the railroad company to determine eligibility.

### Calculating Cost Per Vehicle

The total estimated cost of replanking a single crossing is obtained by multiplying the estimated cost of replanking per track-foot by the width of the crossing. For the purposes of this calculation, "the width of the crossing" is the length of the track traversing the roadway plus three (3) feet beyond the edge of the pavement or sidewalk on both sides of the roadway (a total of an additional six [6] feet). The total cost includes the cost of replanking multiple tracks at the same crossing if multiple tracks are to be replanked.

The estimated cost per vehicle is the total estimated cost of the project divided by the AADT at the crossing. AADT is determined by an actual count if available or an estimated count provided by the Transportation Planning and Programming Division (TPP). AADT is not determined based on a future projected count.

### Programming

TRF-RSS will request a planning CSJ from each district for each crossing to be replanked under the Replanking Program. After all planning CSJs are received, TRF-RSS will compile estimated costs of each crossing and request that construction CSJs are set up by the Finance Division Letting Man-

agement Section. Construction CSJs are provided to the District Railroad Coordinator to be shown in the Exhibit A plan set.

### Cancellations

Replanking projects may be canceled for the following reasons:

- The railroad company abandons the tracks.
- The railroad company plans to resurface crossing on their own.
- A TxDOT construction project may be used to replank the crossing.
- Cost estimates are too high.
- Temporary roadway closures are not feasible.

TRF-RSS will reallocate the funds on a case-by-case basis. The funds may be used to:

- Resurface another crossing in the same district.
- Supplement cost overruns on other crossing projects.
- Benefit the Replanking Program in another way.

# Section 4 — Design Phase

## Exhibit A and Traffic Control Plan

The District prepares the Exhibit A plan set describing the work to be done at the crossing, along with a traffic control plan (TCP). All plan sheets and non-standard TCPs must be signed, sealed, and dated by a licensed professional engineer.

Whenever practical, the highway should be closed for 36-48 hours and traffic detoured during construction, allowing the railroad company to replank the entire roadway in order to reduce construction time and provide a more durable crossing surface. Closing one side at a time, a typical practice on roadway construction projects, is usually not feasible on replanking projects due to issues in matching grades on the crossing surface panels and mobilization of railroad company crews. However, the crossing may be replanked at night, or on a weekend in some cases, and this should be noted on the Exhibit A. Alternatively, a temporary riprap crossing adjacent to the roadway may be deployed if the roadway cannot be closed.

For details on how to develop an Exhibit A plan set, see Chapter 7 of this manual.

TRF-RSS will review and approve Exhibit A's prior to preparing the individual project agreement. Each Exhibit A is uploaded into the TRIMS Project Management Module by TRF-RSS.

## Railroad Company Approval

TRF-RSS will issue a letter to each railroad company with crossings on the Exhibit L and associated crossing data. The railroad companies will review the list, and comment on any crossings as necessary. After all comments are resolved, the railroad companies send a signed letter to TRF-RSS to:

- approve crossings on the list
- verify crossing data shown on the list
- clarify who will perform replanking work (railroad company forces or contractor).

## Cost Estimates

If a Master Agreement which includes a provision for lump sum payment does not exist, TRF-RSS provides the Exhibit A to the railroad company to produce an estimate for work involved in replanking the crossing. Items not eligible for reimbursement include rails, tie plates, rail anchors, track spikes, and other material or labor intrinsic to maintenance of the railroad tracks.

The District also prepares a cost estimate for labor and materials provided by the District, although this work is not funded out of the Replanking Program.

TRF-RSS will review and approve railroad company cost estimates prior to preparing the individual project agreement. For further information on reviewing railroad company cost estimates, see Chapter 2 of this manual.

# Section 5 — Project Agreements

## Master Agreements

TxDOT has Master Agreements with all of the Class 1 railroad companies and some of the short-line railroad companies to facilitate individual project agreements for work on Replanking Program projects. These agreements typically cover:

- the process for adding and deleting crossings for the program each year
- the program and project documents and required approvals
- construction and maintenance responsibilities of TxDOT and the railroad company
- if TxDOT will pay the railroad company on an actual cost basis or fixed cost per track foot of replanking (sometimes broken down by daytime or night/weekend installation rates)
- the process of approving cost per track foot each program year
- Work Orders
- inspection of materials
- conditions for reimbursement
- the statement of materials the State will not pay for (rails, tie plates, rail anchors, track spikes, and other material or labor intrinsic to maintenance of the railroad tracks).

## Reimbursement Methods

There are three methods for reimbursing a railroad company. The appropriate method depends on whether the railroad company uses its own forces or a contractor to perform the work. These methods are discussed in the subsections below.

## Railroad Company Uses Own Forces

If the railroad company uses its own forces to perform the work, reimbursement is usually made on a lump sum basis. The reimbursement for an individual crossing will be determined by multiplying the length of crossing surface panels along the track by the cost per track foot agreed upon with the railroad company. Lump sum reimbursements typically occur when a Master Agreement exists with the railroad company.

Actual cost reimbursement to the railroad company may also be used. In these scenarios, a cost estimate is developed prior to construction by the railroad company and approved by TRF-RSS. Actual cost reimbursement is typically used when a Master Agreement does not exist with the railroad company.

Project costs and method of reimbursement (actual or lump sum) are approved in the individual project agreement.

### Railroad Company Uses a Contractor on Continuing Contract

The railroad company may use a contractor to perform the work under a continuous agreement with the railroad company. The continuous agreement must be for a minimum of three years. A copy of this agreement must be provided to TRF-RSS.

The contractor's costs are included in the project estimate and reimbursed at actual cost during construction unless a lump sum arrangement with the railroad company is shown in the individual project agreement. The railroad company directly invoices TxDOT and reimburses their contractor separately.

The railroad company may also provide labor (inspection, etc.) and include estimated costs in the individual project agreement. Reimbursement to the railroad company will be at actual cost.

### Railroad Company Uses a Contractor for Individual Project

The railroad company may choose to solicit bids for the project from a minimum of three contractors. The lowest qualified bid will be accepted and reimbursed at actual cost not to exceed the original bid. A Form 1891 (Detailed Estimate for Railroad Solicitation of Bids) is filled out for each bidding contractor, which breaks down various costs on the project and helps to ensure balanced bids. If three bids are not received, TRF-RSS may still accept the lowest qualified bidder if at least three contractors were contacted and one or more chose not to bid the project.

Any additional costs incurred by the contractor beyond the original bid will be reimbursed to the contractor by:

- TxDOT, only after receiving written explanation that work was performed out of the scope of the work in the individual project agreement and was previously approved in writing by TxDOT
- the railroad company.

The railroad company directly invoices TxDOT and reimburses their contractor separately.

The railroad company may also provide labor (inspection, etc.) and include estimated costs in the individual project agreement. Reimbursement to the railroad company will be at actual cost.

### Individual Project Agreement

Typically, there are two separate paths Replanking Program projects will follow after Exhibit A's and cost estimates have been completed and approved:

- Project Notice
- Force Account Agreement.

### Project Notice

If a Master Agreement exists with the railroad company, TRF-RSS will prepare a Project Notice. The Project Notice normally consists of:

- a signed cover page providing TxDOT's approval of work, cost estimates, and selection of contractor (if the railroad company solicited bids from contractors)
- an Exhibit A
- cost estimates from the railroad company or the railroad company's continuing contractor (if applicable)
- Cost estimates from bidding contractors (if applicable).

Depending on the terms in the Master Agreement, the Project Notice may or may not need to be executed by the railroad company.

### Force Account Agreement

If a Master Agreement does not exist with the railroad company, TRF-RSS prepares and negotiates a Force Account Agreement for the crossing project. The Force Account Agreement will typically include the items listed above shown in both the Master Agreement and Project Notice.

TRF-RSS will issue the Force Account Agreement to the railroad company for comments. Once comments are resolved, the railroad company will execute the agreement and return it to TRF-RSS for final execution.

### After Project Agreement is Executed

TRF-RSS distributes a copy of the executed Project Notice or Force Account Agreement to:

- the District
- FIN
- the railroad company (original copy as needed).

The fully executed Project Notice or Force Account Agreement is uploaded into the TRIMS Project Management Module by TRF-RSS.

# Chapter 6 — Railroad Capital Improvement Projects

**Contents:**

# Section 1 — Overview

## Introduction

Projects initiated by the railroad companies are referred to as railroad capital improvement projects. Some common railroad capital improvement projects that may impact highways and TxDOT rights-of-way are:

- adding new track parallel to an existing track
- adding a spur track to an industry customer
- maintenance, such as replacement of ties, rail, and ballast including at-grade crossing work
- underpass bridge inspection, repair, and replacement
- upgrades to circuitry and switching
- adjustments related to abandoning, removing, or placing a rail line out of service
- rail yard expansion
- installation of new maintenance driveways.

## Capital Improvement Project Agreement Flow Chart

Figure 6-1 presents a flow chart depicting the process for obtaining a project agreement on a railroad capital improvement project.

NOTE: Not all steps are applicable to all railroad capital improvement projects. Project steps and time frames will vary depending on the scope of the project.

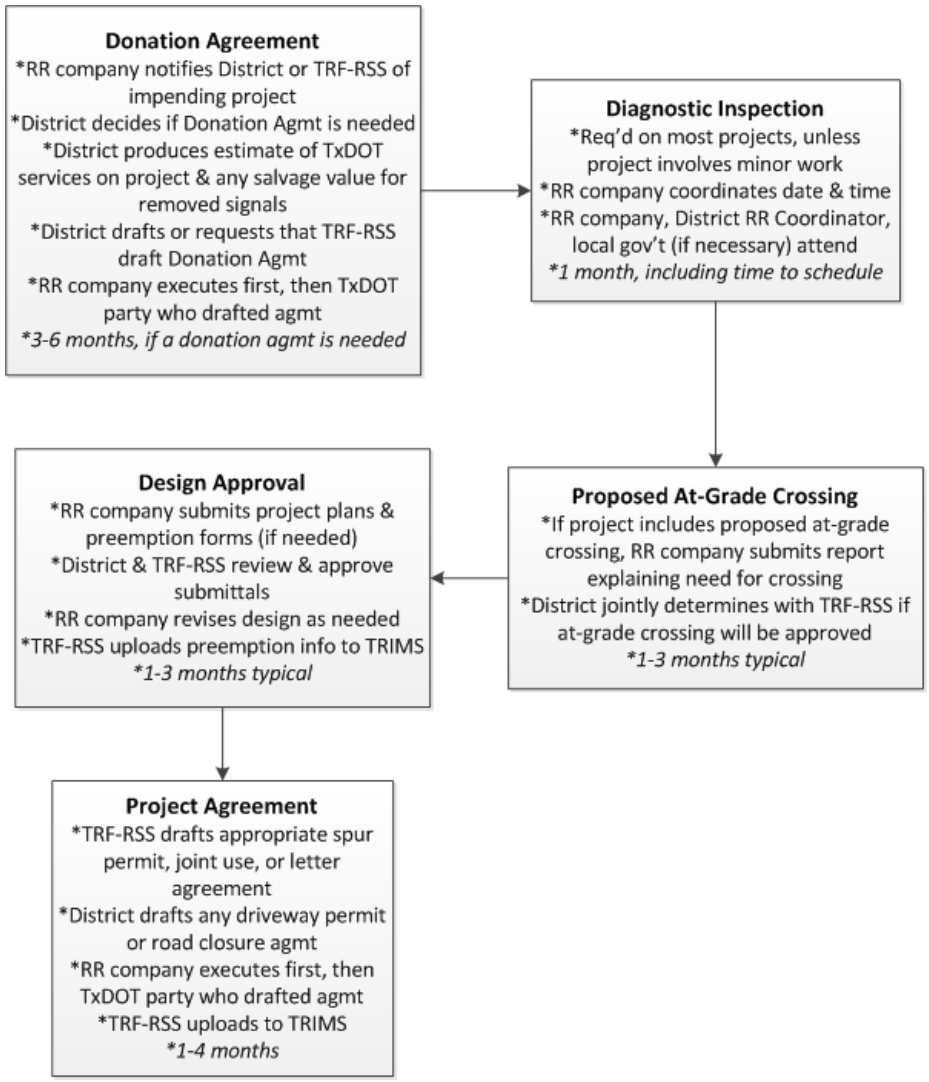


*Figure 6-1. Railroad Capital Improvement Project Flow Chart*

# Section 2 — Preliminary Activities

## Donation Agreements

One key difference between TxDOT construction projects and railroad capital improvement projects is that TxDOT cannot extend credit to another party for services provided prior to reimbursement. Therefore, a Donation Agreement is needed between TxDOT and the railroad company so that the railroad company can provide funding for the work prior to the work being performed. TxDOT employees may charge time and materials to the project. Once the project is complete, any funding paid via the Donation Agreement above what was charged by TxDOT is reimbursed to the railroad company.

Once a district is notified of an impending railroad capital improvement project, a decision must be made by the District on whether a Donation Agreement should be pursued between TxDOT and the railroad company. Donation Agreements allow TxDOT to be reimbursed for labor and materials provided on railroad capital improvement projects. Some examples of TxDOT services may include:

- reviewing railroad company plans and support documentation
- attending project meetings and diagnostic inspections
- drafting permit agreements
- coordinating utility locates and relocates
- traffic control (if TxDOT agrees to provide)
- reviewing traffic control plans
- reimbursement for salvage value of active warning devices paid for by public funds being removed by railroad company
- project inspection
- public outreach efforts
- other labor and materials TxDOT may provide during construction.

A Donation Agreement typically includes an attached estimate of TxDOT services as well as a project location map. The agreement will specify design standards required from the railroad company, requirements on utility adjustments, and insurance requirements for railroad companies working on TxDOT right-of-way.

Donation Agreements usually take three to six months to execute. If the District decides to pursue a Donation Agreement, any plans developed by the railroad company cannot be reviewed until the agreement has been fully executed. In some cases, the District may decide not to pursue a Donation Agreement. Reasons may include:

- the scope of work by TxDOT is minor (plan review only)
- no lane closures are involved
- the project provides benefit to TxDOT
- the project affects other TxDOT project schedules
- TxDOT agrees to forgo Donation Agreement based on negotiations with the railroad company.

If a Donation Agreement is executed, it will be recognized by the Commission typically within one month of the agreement being executed.

**Diagnostic Inspection**

A diagnostic inspection should be conducted for any projects that:

- add additional tracks
- affect traffic flow during construction
- impact grade crossing warning devices.

Maintenance projects or projects that do not impact the traveling public may not require a diagnostic inspection.

The diagnostic inspection should be coordinated between the railroad company and District Railroad Coordinator.

For further information on conducting a diagnostic inspection, see Chapter 4 of this manual.

# Section 3 — Common Design Issues

## Project Work Within TxDOT Right-of-Way

Some railroad capital improvement projects may include work on TxDOT right-of-way. Typical work would include:

- railroad warning devices and crossing surface panels for a spur track or additional trackage
- installing an underpass bridge for a spur track
- installing crash walls on TxDOT right-of-way to support a second track on railroad right-of-way
- retaining walls and guardrail
- grading and drainage features
- new maintenance access to railroad right-of-way.

Installation of warning devices and crossing surface panels will be carried out by the railroad company. For all other work, the District may choose to allow the railroad company (or railroad contractor) to perform the work provided that:

- design is approved
- traffic control and detours are approved in advance
- work is inspected and approved by the area office.

## Proposed Grade Separated Crossings

TxDOT may allow a grade-separated crossing if the private industry or railroad company desiring the crossing agrees to finance and construct it. The District, in conjunction with the Design Division (DES) and the Traffic Operations Division (TRF), determines the need for a grade separation based on:

- projected AADT
- volume, type, and time of train movements
- location of the proposed crossing
- safety of the traveling public
- other pertinent considerations.

### Proposed At-Grade Crossings

Upon receiving a request for a spur track crossing, the District first investigates the possibility of the applicant (railroad company or private industry or both) obtaining rail service by alternate means that will not require an additional highway crossing. This usually means servicing through a different railroad company or through joint use of a nearby existing spur track crossing or rail line. If an alternate plan is impractical, the District should forward the spur track request to TRF-RSS, along with a report and recommendations. The report should include:

- a map showing the location of the proposed spur track crossing
- AADT at this location
- applicant's estimate of the number and length of trains anticipated to cross the highway during each 24-hour period.

### Dismantling Active Warning Devices

If the railroad company decides to remove an existing active warning device, TxDOT may seek reimbursement for salvage value if the device was paid for with public funds and is less than 10 years old.

### Out of Service vs. Abandoned Tracks

After a railroad company determines that an in-service track is no longer needed, the company may choose to either place the track out of service or to abandon the track entirely. If the track is placed out of service, the railroad company should notify TRF-RSS. The following should occur until the track is placed back in service:

- A 'Tracks Out of Service' sign is placed in lieu of crossbuck signs.
- The gate arms and traffic control devices, such as warning signs and pavement markings from the crossing, are removed.
- The railroad signals are either removed, hooded, or turned from view to indicate they are not in operation.
- The railroad company contacts the Federal Railroad Administration (FRA) to have the crossing inventory updated.
- TRF-RSS updates the TRIMS crossing inventory.

The railroad company will remain responsible for maintaining the crossing surface, including the rail and ties. If the track will remain out of service for a long period, or if the railroad ties and/or crossing surface are starting to fail, TxDOT may contact the railroad company to remove the crossing surface, rail and ties, or obtain railroad permission to allow TxDOT to remove the same.

If the track is formally abandoned by the railroad company, the track is typically first removed by the railroad company as well as all at-grade crossing signs and signals. Once a track is abandoned, maintenance of the crossing falls on the roadway authority. The roadway authority may contact the railroad company to purchase the underlying property.

# Section 4 — Project Agreements

## Design Approval

Submittals on railroad capital improvement projects come from the railroad company to the District office. After approval by the District office, the materials are forwarded on to the TRF-RSS Contract Specialist who distributes the materials to the appropriate parties at the Divisions for review and approval. Reviewing parties are the same as for a TxDOT construction project.

For documentation needed on submittals, see Chapters 2 and 3 of tis manual. For review of Exhibit A plan set, refer to the checklists shown in Chapter 7 of this manual.

Preemption forms, reports, and request forms are uploaded into the TRIMS Project Management Module by TRF-RSS.

## Project Agreement Process

After all comments are resolved, the TRF-RSS Contract Specialist will draft an appropriate agreement giving permission for the work to be performed.

- Spur Permit Agreement: used for a new track crossing a highway on TxDOT right-of-way.
- Joint Use Agreement: typically used for double tracking projects, maintenance projects, or other railroad capital improvement projects on railroad right-of-way which impact a highway.
- Letter Agreement: may be used for minor work with minimal impact to highway facilities or TxDOT right-of-way.

These agreements usually specify that the railroad company will be responsible for all costs involved in the construction of the project and will not include any attachments other than an Exhibit A plan set. A cost estimate for work performed by TxDOT would not be included since this would be covered by a Donation Agreement.

Typical timelines for execution of these agreements are six to nine months from initial submittal of Exhibit A plan set to full agreement execution.

Project agreements are uploaded into the TRIMS Project Management Module by TRF-RSS.

If driveway access is needed or driveway locations need to be modified, approval will come from the Area Office via a driveway permit. Districts will issue any required roadway closure agreements.

### Spur Permit Contents

Spur Permit Agreements usually have similar requirements as C&M Agreements, but may include additional requirements that the railroad company or private industry must adhere to in accordance with 43 TAC §7.105.

- Modifications to the Highway: If TxDOT elects to modify the highway in any way that will affect the spur track at-grade crossing, TxDOT will have the right to make such modifications, and the railroad company or private industry will make the necessary changes to the crossing surface and railroad warning devices at their expense.
- No Abnormal Delays in Traffic Flow: No general switching of trains across the highway is permitted. Train operations crossing the highway must be conducted in a way as to not delay traffic flow for more than a normal period of time. If more than the normal time is needed, the railroad company or private industry must notify TxDOT in writing as to the necessity and circumstances for more time.
- Future Need for Grade Separation: If, in the future, TxDOT determines that a grade separation is required, the railroad company or private industry or both will finance and construct the structure. The terms of the grade separation structure will be handled under a separate agreement.

### Other Projects by Outside Parties

Occasionally other parties may have projects which impact rail lines and highways. Work may be on railroad or TxDOT right-of-way. Examples of these projects may include:

- developer or industry projects
- transfer of an agreement from one party to another.

These agreements are unique in nature. TRF-RSS will coordinate review and approval of any:

- design approvals
- cost estimates
- agreement terms.

# Chapter 7 — Exhibit A and PS&E Design

**Contents:**

# Section 1 — Common Rail-Highway Design Issues

## New At-Grade Crossings

Most railroad companies strongly oppose public projects that introduce new at-grade crossings. New at-grade crossings add maintenance and liability costs to a railroad company. However, in some cases, new at-grade crossings are unavoidable and railroad companies are willing to allow them if two to three other existing public at-grade crossings are closed and anticipated traffic counts at the new crossing do not exceed the combined traffic counts of the closed crossings. The TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS) serves as the office of primary negotiation with the railroad companies in these scenarios.

## Frontage Roads

It is recommended that new frontage roads are designed as either:

- overpasses over a rail line
- U-turns before a rail line.

Frontage roads crossing a rail line at grade are not desirable.

A U-turn before a rail line should consider a barrier to ensure errant vehicles do not drive onto the railroad tracks.

## Grade Separations

Although grade separations across the railroad are preferred, overpasses are generally preferred over underpasses. Some of the reasons overpasses are preferred include:

- they provide minimum disruption to rail service during construction
- better drainage
- they simplify future track expansion
- they simplify future highway widening
- clearance issues due to overheight or overwidth vehicles are eliminated
- pedestrian design may be safer
- maintenance costs are lower
- there are higher throwaway costs associated with underpasses such as temporary shoofly track, etc.

When designing overpasses, access to adjacent properties should be considered early during project development.

### Accessing Railroad Right-of-Way

The Project Designer should become familiar with the project site and determine how project work within railroad right-of-way will be constructed. Temporary at-grade crossings are discouraged and may add both project cost and risk. Whenever possible, designers should aim to design any temporary pavement or ramps that assist a contractor in building the project and eliminate the need for a temporary at-grade crossing.

If a temporary at-grade crossing is needed, it should be included in the Exhibit A for the railroad company to review up front and will be included in the C&M Agreement.

### Overheight and Overwidth Vehicles

Whenever railroad protective devices are proposed, the crossing should be evaluated for any overheight and overwidth vehicles which could potentially hit masts or cantilevers. Possible solutions may include:

- avoiding the use of cantilevers
- installation a median with flasher/gate to remove the need for a cantilever
- use of a cantilever that does not cover all approach lanes
- use of a non-standard cantilever with more than 17 feet of vertical clearance
- moving masts further than design minimums from the edge of roadway or shoulder.

### Advanced Flashers

At locations where the approach view of an at-grade crossing may be obstructed, the use of ground-mounted or overhead amber flashing beacons with the Grade Crossing Advanced Warning Sign (W10-1) may be considered. When used, the flashers may operate:

- without any actuation
- with actuation at the same time as the railroad warning devices
- with actuation with additional time from the railroad warning devices.

Alternatively, a railroad cantilever may be used for increased visibility on the approach.

### Temporary Special Shoring

There may be cases with shoofly track alignments where temporary special shoring is needed to shore a track section adjacent to an open cut for:

- roadway excavation
- construction of new substructure
- construction of new superstructure.

Traditionally, temporary special shoring on transportation projects is designed by the contractor. However, because of the time risk in construction associated with the review of such temporary special shoring by the railroad company, TxDOT recommends that a fully designed temporary special shoring system be provided in the Exhibit A and approved by the railroad company prior to letting.

The shoring should be designed in accordance with AREMA and any guidelines provided by the railroad company.

### Design Guidelines

For development of Exhibit A plans, designers are encouraged to familiarize themselves with the railroad company's design standards, as well as TxDOT annotated exceptions, prior to design. While the railroad company does not formally accept these annotated exceptions, they are published to give designers TxDOT recommended practices where a difference of opinion on certain guidelines exists. Many shortline railroad companies do not have established design guidelines; in these cases it is recommended to follow the BNSF/UPRR joint guidelines.

See the "Rail Safety" section of the Traffic Operations Division website for railroad company design standards. Additional design references are found in Chapter 14 of this manual.

### Standard Sheets

TRF standard sheets which apply to rail-highway projects include:

- Railroad Crossing Signs and Signals (RCSS)
- Railroad Crossing Pavement Markings (RCPM)
- Sign Mounting Details (SMD).

These sheets should supplement other design materials used for at-grade crossing design and are inserted as part of the PS&E on construction projects.

### Railroad or Highway Relocation

Relocating a rail line or highway may be considered as a design option to:

- improve operational problems caused by blocked crossings
- improve environmental characteristics (ie. train horns, pollution, etc.)
- improve safety by reduction of at-grade crossings
- use existing right-of-way for the rail line or highway for another public purpose.

Railroad relocation generally involves the complete rebuilding of railroad facilities, including acquisition of new right-of-way. Designers should strive to avoid at-grade crossings on relocated rail lines. Zoning the property adjacent to the railroad as light and heavy industrial further isolates the railroad corridor from residential and commercial activity. Businesses and industry desiring rail service can locate in this area.

Planning for highway relocations should consider routes that would eliminate rail-highway intersections by avoiding the need for access over railroad tracks or by providing grade separations.

### Humped Crossings

Vertical curves should be evaluated on all approaches going over an at-grade crossing. Significant grades can cause the following problems:

- Low-clearance and long wheelbase vehicles can get stuck on the crossing.
- Field panels can become loose or dislodged if a vehicle catches on the approach edge of the panel.

Adjusting the roadway profile to eliminate problems with humped crossings can add significant cost to the project. It is recommended that the following guidelines are followed in evaluating an at-grade crossing:

- On an existing at-grade crossing, inspect the crossing for damaged and dislodged field panels and for scuff marks on the approach pavement adjacent to the panels to determine if vertical clearance is an issue. The suggested maximum approach grade should not exceed 5% at any point within 30 feet on either side of the centerline of the at-grade crossing (not an average).
- For new at-grade crossings, the field panels should be at the same elevation as the rails while approaches should be within three (3) inches of the rail elevation at a point 30 feet away from the center of the nearest rail on both sides of the crossing.

As railroad companies replace ballast over time during routine maintenance, the elevation of the rail will increase, adding to the problem.

Solutions for humped crossings include:

- installation of Low Ground Clearance Grade Crossing warning signs (W10-5 and W10-5P)
- restricting use of crossing by low-clearance and long wheelbase vehicles via permit restriction to the Texas Department of Motor Vehicles (TxDMV); also report minimum number of inches of vehicle vertical clearance needed for safe clearance of crossing
- if a hydraulic low-clearance vehicle may use the crossing by lifting the trailer, report to the TxDMV the distance before the crossing in feet where the trailer must be lifted and beyond crossing in feet where trailer may be lowered.
- improving approach grades to the crossing.

Any changes to the crossing should be reported by the District Railroad Coordinator to TRF-RSS.

**Passive Crossings**

All passive public crossings should have a stop or yield sign installed with the crossbuck sign. Two common problems at passive crossings should be considered:

- There must be sufficient approach sight distance down the tracks to allow a driver to stop before the crossing when an approaching train is seen.
- There must be sufficient sight distance down the tracks to allow a tractor-trailer to clear the tracks from a stop at the crossing before a train arrives.

All new public crossings are recommended to include active warning devices (preferably gates). Refer to Part 8 of the TMUTCD for guidance on stop or yield signs.

# Section 2 — Crossing Closures & Consolidations

## Introduction

In the interest of public safety, TxDOT, local governments, and the railroad companies strive to consolidate and close existing redundant at-grade crossings, and make other operational or safety improvements to facilitate the elimination of safety hazards at railroad at-grade crossings at selected locations.

When proposing crossing closures within a community, the corridor of crossings over the same rail line should be considered. A corridor should be evaluated for:

- any at-grade crossings that may be closed
- any at-grade crossings that may be improved (both for capacity and safety)
- any at-grade crossings that can be grade separated
- traffic analysis of proposed roadway network.

## General Considerations

Considerations that may influence the decision to eliminate a rail-highway at-grade crossing include:

- traffic analysis of proposed roadway network
- density of crossings, especially when closer than ¼ mile apart
- support from local community
- sight distance restrictions
- traffic and train counts (existing and future)
- roadway speed limit
- train speed
- number of lanes
- number of tracks
- presence of siding or control point that will require a train to stop for extended periods
- roadway profile
- if roadway is paved or not
- adjacent traffic signals or intersections
- emergency vehicle routing

- economic consequences related to businesses or anticipated growth
- crash history and analysis
- delays at existing crossing from trains blocking crossing
- track abandonments or out-of-service tracks.

### Authorization of a Crossing Closure

Once a crossing has been identified for closure and the local government is in agreement, the local government's governing body shall authorize the closure by passing a resolution or ordinance.

# Section 3 — Traffic Signal Preemption

## Introduction

Traffic signal preemption involves a special timing sequence upon the arrival of a train when an at-grade crossing exists nearby on one or more legs of the signalized intersection. A traffic signal controller is preempted by warning from the railroad company. There are two forms of preemption:

- Simultaneous preemption: occurs when the traffic signal controller is preempted at the same time the active warning devices begin to flash.
- Advance preemption: occurs when the traffic signal controller is preempted prior to the active warning devices beginning to flash.

The primary function of preemption timing is to ensure that a vehicle that may have stopped on the railroad tracks queued at a red light is given sufficient time to clear the railroad tracks prior to the arrival of the train. It is also used to restrict movements toward the tracks from the traffic signal when a train is approaching or within the crossing.

NOTE: Refer to the Traffic Operations Division website for further updates on policy regarding preemption.

## Need for Preemption

Preemption circuitry should be installed any time an at-grade crossing is within 200 feet of a signalized intersection (see Section 8C.09 of the TMUTCD). However, preemption should also be considered any time traffic may back up over the tracks. If traffic backs up over the tracks before an intersection that is not signalized, a traffic signal with preemption may be installed under Warrant 9 in Section 4C.10 of the TMUTCD.

## Preemption Sequence

Most railroad preemption sequences include the following steps:

1. **Right-of-Way Transfer.** This phase clears out any existing vehicular or pedestrian movements when the traffic signal controller first receives a preemption call. The traffic signal controller will ensure that a programmed minimum green, pedestrian walk, and pedestrian clearance time is met prior to terminating the phase. It is also known as a selective phase.
2. **Track Clearance.** This phase clears out the traffic going over the at-grade crossing towards the traffic signal, including a vehicle which may be stopped on the tracks at a red light.

NOTE: The higher the amount of advance preemption time requested from the railroad company, the higher the required track clearance green time will be under most circumstances in the absence of a gate-down circuit.

3. **Dwell or Limited Cycle Phases.** After track clearance, the traffic signal controller serves any phases that do not move over the tracks. If only one phase is served, the traffic signal is said to be in dwell. If multiple phases are served, the traffic signal is said to be in limited cycle.
4. **Exit Phase.** After the preempt call is dropped from the railroad company equipment, the signal transitions into an exit phase. This phase is typically the phase with the heaviest traffic movement towards the tracks and may be the same phase as the track clearance phase.

### Total Preemption Time

The total time requested from the railroad company for traffic signal preemption includes:

- buffer time
- minimum time
- clearance time
- advance preemption time
- equipment response time.

### Buffer Time

Buffer time is additional time provided to account for trains that may accelerate on the approach to the crossing. Although typically at five seconds, buffer time is determined by the railroad company.

### Minimum Time

The minimum time required for active warning devices to flash is 20 seconds prior to the arrival of the train as required by FRA. This includes three seconds of initial flash time prior to the gates descending, and five seconds while the gates are down prior to the arrival of the train.

### Clearance Time

Any additional required time from the railroad company for the active warning devices to begin flashing prior to the arrival of the train is clearance time. Clearance time is typically required at skewed crossings or where multiple tracks exist.

### Advance Preemption Time

Advance preemption time is the additional time requested to preempt a traffic signal controller from the railroad company equipment beyond what is provided to the railroad active warning devices.

### Equipment Response Time

Equipment response time is provided to determine the speed of an oncoming train. Although typically at five seconds, equipment response time is determined by the railroad company.

### Traffic Signal Design

The following are recommendations when designing traffic signals with railroad preemption:

1. At the traffic signal, if the track clearance green phase includes left-turning vehicles and there is through traffic on the opposite side of the intersection, include a left turn arrow for a protected left turn during preemption. The track clearance green phases should include both the through movement and protected left turn. NOTE: The protected left turn movement is not always used during normal operation (when traffic signal is not preempted).
2. Include battery backup at the traffic signal controller.
3. Use a minimum of 8 conductor traffic signal cable between the railroad cabin and traffic signal controller.
4. Include a label in the traffic signal controller to alert technicians of the presence of railroad preemption circuits.
5. Traffic signal poles should not block the view of railroad gates, mast flashers, and cantilevers.
6. Care should be taken to restrict any vehicular movements towards the tracks when the traffic signal is in dwell or limited cycle phases. Restricted left turns or blank-out signs (i.e. No Left Turn) may assist.

### Preempt Priorities

There are many forms of preemption that may occur at a traffic signal controller. Some examples include:

- emergency, fire, or law enforcement vehicle
- bus rapid transit.

The TMUTCD states that railroad preemption should be the highest priority within the traffic signal controller when multiple preempts exists. In addition, the designer should confirm:

- the traffic signal controller has enough preempt plans to support all preempt modes needed

- the traffic signal cabinet has enough relays to support all preempts.

When using multiple preemption circuits for railroad preemption (see below for example circuits), the circuits must be prioritized properly in the traffic signal controller to ensure the preemption functions as designed.

### Other Preemption Design Scenarios

Other scenarios for railroad preemption occur from time to time and require a deviation from generally accepted practice. Some of these scenarios include:

- at-grade crossings which are downstream of a traffic signal on one-way streets where the direction of travel is from the traffic signal to the tracks
- at-grade crossings with an adjacent traffic signal on both sides of the tracks
- signalized intersections where the tracks cross on two legs of the intersection
- pre-signals: may be used when the storage distance between the tracks and near edge of the pavement at the intersection is less than the length of the design vehicle such that the design vehicle would be stopped on the tracks when at a red light
- queue cutter signals may be used when queues at a traffic signal extend over an at-grade crossing at a significant distance beyond the intersection
- an at-grade crossing in the middle of signalized intersection.

See Chapter 14 for other design manuals for assistance.

### Types of Circuits

There are several different types of circuits used with railroad preemption. Some common circuits include:

- advance preemption circuit
- gate down circuit
- supervised circuit.

### Advance Preemption Circuit

The advance preemption circuit sends a call to the traffic signal controller to go into preemption to begin right-of-way transfer.

### Gate-Down Circuit

The gate-down circuit ensures that the track clearance phase terminates when the gates go down. The gate-down circuit provides two separate benefits. First, it eliminates the preempt trap by ensuring track clearance green does not terminate prior to the gates descending. Otherwise, a red indication could occur at the traffic signal and another vehicle could queue back over the tracks. Second, it ensures that the track clearance green is not unnecessarily long when maximum right-of-way transfer time is needed.

### Supervised Circuit

A supervised circuit monitors the cable connection between the railroad company and the traffic signal and has the ability to send the traffic signal into flash if the connection is broken after right-of-way transfer and track clearance phases.

### Constant Warning Circuitry

Constant warning circuitry from the railroad company is recommended. Constant warning circuitry along the rail can detect the speed of an oncoming train and know when to preempt the traffic signal as well as knowing when to drop a preempt call if a train stops on the approach. Railroad circuitry is installed based on the fastest speed allowed over the crossing, but not all trains will travel this speed over the crossing.

### Adjacent Crossings

As circuitry along the tracks may extend beyond adjacent grade crossings, the need for preemption at adjacent crossings should be considered. Otherwise, preempting adjacent crossings at different times can be significantly more costly.

# Section 4 — Track Design

## Introduction

Most railroad companies prefer that any required track work to support a TxDOT construction project be done by a TxDOT contractor. Railroad companies usually assist by:

- cutting rails
- welding or bolting back together new track sections
- installing switches
- relocating signal equipment.

However, this is not common with all railroad companies. Project designers should clarify who will provide materials, remove existing track sections, dispose of materials, and install new materials prior to developing plans and specifications. If this is not done properly up front, TxDOT may be at risk of a change order during construction.

The goal of effective track design is to transform the intense load of the railroad equipment (locomotives, cars, etc.) from the wheel-rail contact point to a moderate, distributed pressure that the earth underneath can support in all weather conditions without settling. This is accomplished using the components in the following subsections ("top down").

## Rail

Rails are classified in weight per linear yard of a single rail (i.e. 132# rail).

The size of rail to be used in a particular project is typically the choice of the operating railroad company. That decision will usually be driven by either using the rail section currently used by the railroad company for their new construction, or by matching the size of rail that exists on that particular segment of track. Heavier weights are typically used on mainline tracks, while smaller sizes may be used on spur and siding tracks.

A railroad company may also specify the use of a particular material, such as head hardened rail.

## Track Panels

In order to facilitate accelerated construction, railroad companies often deliver preassembled track panels to a job site. These panels are typically 80 feet in length and include:

- rails
- tie plates

- ties.

Track panels are particularly useful when replanking an existing at-grade crossing. After the existing rails are cut on both ends, an existing section of track is removed down to the subgrade. After the subgrade, subballast, and ballast are laid down, the track panels are installed, the track panel is bolted on both ends, and a tamping machine installs ballast. The temporary joint bars are then removed, and the rails are welded together. Any crossing surface panels are bolted into the ties.

### Securement

Securing the rails to the ties is usually done by the use of:

- tie spikes and tie plates for timber ties
- tie clips and rail seat pads for concrete ties.

Tie plates and clips also assist in distributing the load of a train over the tie.

### Ties

Ties are typically timber or concrete supporting members to which rail is fastened. They provide distributive support for the rail and assist in maintaining track alignment and separation between rails.

Timber ties are manufactured from hardwoods such as oak or Douglas fir and pressure treated with a creosote/tar solution to prevent decay. Timber tie size is usually 7 by 9 inches by 8 foot 6 inches. Timber tie spacing is usually 18 inches or 19.5 inches on center.

Concrete ties are prestressed with rebar, resist decay, and generally have a longer useful life than timber ties. Concrete tie size is usually 11 inches by 9 inches by 8 foot 6 inches. Concrete tie spacing is usually 20 inches or 24 inches on center.

Switch ties may be timber or concrete ties of varying lengths (generally 9 feet to 20 feet) that are used to support the track structure at the location of a turnout where a track diverges into two or more tracks by means of the turnout and switch mechanism.

In recent years there has been increasing interest in the development and use of ties made of composite materials or primarily polymers mixed with timber or concrete. Composite ties are not in general usage by any of the major railroad companies, though there are some installed at various locations around the country as “test” projects.

### Ballast

Ballast restrains the movement of crossties to prevent lateral movement of the track structure, provides distributive support to the crossties, and provides drainage for the track structure above. Desired ballast depth is within 2 inches of top of the ties and 9 to 12 inches below the bottom of the ties. The width of the ballast section is usually 6 to 12 inches from the ends of the tie with a 2-to-1 slope downward from that point to ground level.

### Subballast

Subballast consists of smaller particles that provide for additional support of the track structure and a foundation course to further aid with drainage. As track structure ages and upper ballast deteriorates, those smaller particles "migrate" downward, effectively deepening the lower ballast layer. Maintenance and rehabilitation projects add newer upper ballast, causing the entire track structure to gradually rise vertically over time.

### Subgrade

On new construction, core samples are usually taken to determine what type and what depth of constructed subgrade (compacted aggregate) should be used to support the track structure. On existing older rail lines, the subgrade is typically the native soils which were present when the railroad was built.

### Track Design Standards

AREMA has standard track components and design plans that are often referenced for track design. The Class 1 railroad companies (BNSF, CN, CP, CSX, KCS, NS, UPRR) also have their own specific engineering and design standards for some components and design that may vary from AREMA standards and supersede AREMA standards. Some of these are also "common standards" that are used by more than one railroad company, such as BNSF/UPRR common standards.

TxDOT has permission from UPRR and BNSF to use their standards and common standard sheets in PS&E packages. The designer should confirm from the railroad company which standard to use prior to developing any track design plans. Track design should only be performed by individuals with prior track design experience who are familiar with both AREMA and railroad company standards.

### Turnouts

A turnout is an assemblage of various components that diverts trains from one track to another. The length of the turnout is determined by the angle of the turnout casting (referred to as a "frog"). The shorter the turnout, the sharper the angle of divergence will be, which restricts train operating

speeds through the turnout. The initial point of divergence where the two tracks effectively meet is referred to as the "switch" and the moveable rails at that location are referred to as a "switch point."

### Grades and Horizontal Curves

Railroad optimum design for grades is 0.5% or less, though up to 1.5% is acceptable in certain circumstances. Steeper grades result in continual reduction in train speed and can actually cause a train to stall if the grade is too steep, or require the use of additional locomotives, which is a major operating cost.

Horizontal curvature is not nearly as critical, though it can affect train speed and handling. The degree of curvature and desired train speed will impact the amount of superelevation used. Consecutive curves also require the design of a tangent length of track between curves to prevent the train from rocking, which can result in derailments.

# Section 5 — Exhibit A Design

## Sheet Layout

The Exhibit A plan set is a:

- 30% PS&E plan set on construction projects
- plan set showing applicable work within railroad rights-of-way on all other projects (FSP, replanking, railroad capital improvement).

Each Exhibit A should include separate sheets, if applicable, for:

- title sheet with Index of Sheets (not required on replanking projects)
- project layout sheet (on large construction projects)
- active warning devices (if installing or modifying)
- signing and striping (if not shown with active warning devices)
- traffic signal layouts and phasing (if preemption is involved)
- plan view of conduits, pipes, and culverts under track
- planking layout (if installing or modifying)
- bridge or roadway plan and profile
- rail survey (bridge projects; out to 1000 feet on both sides of bridge on overpass projects and out to 1500 feet on both sides of bridge on underpass projects)
- roadway typical sections (planking and construction projects)
- rail typical sections (planking and underpass projects)
- ditch cross sections on 100 foot centers (joint drainage projects)
- railroad requirements sheets (construction projects).

Any traffic control plan, detour route, and boring logs sheets are usually considered support material and are not part of the Exhibit A.

The checklists under the following subheadings are provided for development of these plan sets.

## Guidelines on All Exhibit A's

1. Title sheet included with a project map and Index of Sheets.
2. All sheets numbered and named correctly with Index of Sheets.
3. Project info correctly identified: CSJ, County, Roadway, City, District, and CCSJ if applicable.

4. Railroad company, subdivision, milepost, and any DOT numbers identified on the title sheet and in the title blocks of other sheets.
5. If there are multiple tracks, each track labeled and identified: mainline, siding, spur, yard, wye, etc.
6. Train data shown: number of switching and through movements, including speed for each type of movement.
7. AADT and design speed of roadway traffic shown.
8. General Notes: All railroad company work, work done by state, and work done by local government identified correctly.
9. General Notes: Traffic control being provided by the state, not the railroad company (NOTE: Reverse is true on FSP projects).
10. General Notes: Any notes removed that require the railroad company to stencil the DOT number on the mast.
11. Railroad right-of-way shown in plans; width of railroad right-of-way shown.
12. Existing utilities and utility relocations shown.
13. Existing conditions and proposed conditions shown.
14. Number of days of flagging and number of days of inspection shown (if needed).
15. Drawing should be 1:20 scale whenever possible. Text should be large enough to be clearly legible when the sheet is reduced to 8.5x11-inch size.
16. If plans are drawn in colors, colors are clear, well defined, and easily legible when printed or copied in black and white.
17. Final Exhibit A plans should be sealed, signed and dated by the licensed Texas Professional Engineer.

**Guidelines on Construction Project Exhibit A's**

1. Title sheet project description reflects work in railroad right-of-way, not the overall PS&E.
2. Project plan view layout included if work impacts multiple rail lines or crossings.
3. Fencing parallel to track to discourage trespassing shown (if desirable).
4. Impacts to any existing railroad signals shown.
5. Ensure Railroad Requirements Sheets are included at the end of the Exhibit A and are the correct version. Use Bridge or Non-Bridge sheets depending on project scope. Only sheet 1 of 3 may be modified; sheet 1 must be sealed, signed, and dated by the licensed Texas Professional Engineer.

6. Any absolute track windows requested from the railroad company shown. (If so, this needs to be requested from the railroad company. Typically applies to overpasses over rail yards or underpasses.)
7. Any required right-of-way acquisition shown.
8. Direction of increasing railroad milepost shown.

**Guidelines on Projects with Traffic Control Plans**

NOTE: Any construction, safety, replanking, or railroad capital improvement projects where lane closures are involved or phased construction exists should include a proper traffic control plan for review and development of cost estimates.

1. Phased construction shows how railroad right-of-way is impacted during all applicable phases.
2. Any lane closures or shifts over at-grade crossings which impact crossing surface, railroad signals/signs, or preemption shown.
3. Affects to adjacent at-grade crossings shown for any project detours.
4. Pedestrian elements properly detailed during all phases.
5. Any temporary traffic signals and preemption details shown for applicable construction phases.
6. All gates, signs, and cantilevers visible in each phase (driver view not obstructed). Any unnecessary gates deactivated by railroad company when not needed. Any unnecessary signal lights bagged or removed.

**Guidelines on Projects with Overpasses**

1. Note included that drainage slots are blocked over railroad right-of-way and proposed bridge will not increase the quantity or change the characteristics of the drainage flow on the railroad right-of-way.
2. Roadway grades, and widths of lanes, shoulders, and medians shown.
3. Fencing provided over railroad right-of-way, or if not, an explanation is provided in the DCRG. Fence needed on bridge if gap is greater than two (2) feet between structures (NOTE: Fencing is not typically provided unless there are pedestrian elements on the bridge, a rail yard or rail switch is beneath bridge, or there is a history of vandalism in the area.)
4. Splashboard provided on barrier if bridge is in an area where a snowblower could blow snow onto railroad right-of-way.
5. Lighting is provided over tracks, but in a location where changing bulbs is easier and vertical clearance is not reduced (i.e. not directly over tracks). Electrical service located on TxDOT right-of-way. Lighting required when bridge covers 80 feet of track or more, with distance measured along the track.

6. Access is provided to all adjacent property owners in proposed facility.
7. Any right-of-way preparation work (removing trees, etc.) on railroad right-of-way identified.
8. Any temporary at-grade crossings or haul roads shown, including planking work by railroad company. Temporary at-grade crossings should restrict access by the public by locked fence or other means.
9. Hike and bike access is provided on bridge if needed.
10. Any railroad cantilever and flashing light and gates under bridge will not hit bridge.
11. Highway stationing shown.
12. National Bridge Inventory (NBI) number shown if available.
13. Railroad access road shown (if needed).
14. Distance between dual structures shown.
15. Crash walls shown if center of any existing or future track is closer than 25 feet to the face of the column.
16. Note included to stencil in DOT number and railroad milepost on BNSF structures. Note clarifies that BNSF will maintain.
17. Dimensions shown from centerline of rail (both existing and future tracks) to face of footings and columns.
18. Permanent vertical clearance at least 23 feet 4 inches minimum for UPRR; 23 feet 6 inches for BNSF & KCS. Must be shown from edge of railroad right-of-way to edge of railroad right-of-way, with point of minimum vertical clearance identified.
19. Minimum temporary vertical (21 feet 6 inches UPRR & BNSF; 22 feet KCS) and horizontal (12 feet UPRR; 14 feet KCS; 15 feet BNSF) clearances shown.
20. Future tracks shown at 20 foot centers. A future track may be shown on both sides of the existing track at the same elevation as the existing track if no other information is available.
21. All bents and abutments are off of railroad right-of-way. If this is not true, an explanation is provided in the DCRG, including how far design elements encroach into railroad right-of-way.
22. For any demolition, distance below ground structural element must be removed is shown. (UPRR & KCS prefer 3 feet below finished grade and 2 feet below base of rail, whichever is lower; BNSF prefers 3 feet below finished grade and 3 feet below base of rail, whichever is lower).
23. Plan details match information provided in the DCRG.
24. Rail survey provided for all tracks under the overpass.

**Guidelines on Projects with Underpasses**

1. Vertical clearance shown (typically 16 feet 6 inches minimum).
2. Warning signs included for vertical clearance if clearance is less than 20 feet.
3. Details for shoofly bridges included (if shoofly bridge is used during construction).
4. Location and details of shoring included.
5. Details of who is doing work (contractor or railroad company), who is providing materials, and any absolute work windows shown.
6. Bridge columns protected from vehicular traffic with proper barriers and object markers.
7. Details of any adjacent at-grade crossings impacted by construction shown.
8. For any demolition, distance below ground structural element that must be removed is shown. (UPRR & KCS prefer 3 feet below finished grade and 2 feet below base of rail, whichever is lower; BNSF prefers 3 feet below finished grade and 3 feet below base of rail, whichever is lower).
9. Anti-graffiti fence shown (if required by railroad company).
10. Storm sewer and pump station design shown.
11. Plan details should match TSR. Refer to railroad company design guidelines when determining how to design underpass bridge and develop TSR/Ex A. See the Traffic Operations Division website for railroad company design guidelines.

**Guidelines on Projects with At-Grade Crossings**

1. Design matches field notes from diagnostic inspection.
2. Design incorporates findings from crash reports.
3. Are there any adjacent intersections that require preemption or does project include a traffic signal with preemption? Warrant 9 in Section 4C.10 of the TMUTCD may be used as justification for the traffic signal. As an alternative, a four-way stop or a two-way stop (stop signs on roadway parallel to rail line) may be used to assist in moving traffic over an at-grade crossing.
4. Signing:
    a. Do Not Stop on Tracks (R8-8) signs on any approaches over at-grade crossings heading towards an adjacent intersection where vehicles may stop.
    b. Stop (R1-1) or Yield (R1-2) sign at a passive crossing; Stop Ahead (W3-1) and Yield Ahead (W3-2) signs may also be required (see Section 2C.36 of the TMUTCD).
    c. Crossbuck (R15-1) signs on right side of roadway; a second on left may also be present.
    d. Number of Tracks (R15-2P) sign, if more than one track.
    e. Emergency Notification Signs (ENS) on all approaches (I-13, not R15-4)

f. Low Ground Clearance Grade Crossing signs (W10-5; W10-5p) if crossing has a high vertical profile.

g. Grade Crossing Advance Warning Signs (W10-1; W10-2; W10-3; W10-4) on all approaches and parallel roads within 100 feet of the highway intersection; if parallel road is within 100 feet of crossing, install W10-1 sign on opposite side of roadway from tracks.

h. Advance warning signs may be supplemented with No Gates or Lights (W10-13P) plaque at passive crossings.

5. Sidewalks and shared use pathways:
   a. Gates typically are not required, but bell must be present.
   b. Crossbuck signs on both sides of roadway for both approaches.
   c. Sidewalks should cross perpendicular to rail. Sidewalks do not 'stop' at railroad right-of-way.
   d. Railroad masts adjacent to sidewalks include backlights.
   e. ADA ramps and proper crosswalks shown at adjacent traffic signals with pedestrian signals.
6. Crossing has been evaluated for truck traffic:
   a. Turning radii at adjacent intersections.
   b. Turning vehicles will not hit gates & cantilevers.
7. Humped crossings have been evaluated and mitigated.
8. Curbs or islands should not be closer than 10 feet from center of rail, but many railroad companies prefer not closer than 10 feet from nearest rail.
9. Medians:
   a. Needed for island gates.
   b. Protected with painted curb or object marker so they are not hit at night.
   c. 10 foot minimum width (back of curb to back of curb) preferred.
   d. Edge of island is parallel to rail, not perpendicular to roadway.
10. Any culverts under roadway need to be adjusted for roadway widening.
11. Is metal beam guard fence (MBGF) needed to protect gates or for roadway drop-offs? (See Appendix A of the TxDOT Roadway Design Manual.)
12. Any sight distance issues on either approach such as curved approaches? A Train When Flashing (W10-4B) side mounted or overhead device may be used. Alternate method such as a cantilevered flashing light may be used.
13. Superelevation on track accounted for on roadway design.
14. Any track being abandoned should be removed along with crossing surface panels and replaced with same material as adjacent pavement.

15. A Tracks Out of Service (R8-9) sign is used with bagged railroad signals in lieu of the Crossbuck sign (R15-1) for tracks that are temporarily placed out of service.
16. Active or passive devices must be relocated by railroad company if an existing track is removed at a multiple track crossing.
17. Striping is correct:
    a. Stop bars 8 feet from centerline of railroad signal post or 15 feet from near rail for passive crossings; may be located further back based on site evaluation.
    b. Distance to nearest railroad crossing solid line varies based on approach speed (TMUTCD, Table 2C-4, Condition B, Deceleration to 0 mph):

**Solid Line Placement for Railroad Crossings**

| Approach Speed (mph) | Distance from Centerline of Track |
|---|---|
| 20 | 100 |
| 25 | 100 |
| 30 | 100 |
| 35 | 100 |
| 40 | 125 |
| 45 | 175 |
| 50 | 250 |
| 55 | 325 |
| 60 | 400 |
| 65 | 475 |
| 70 | 550 |
| 75 | 650 |

    c. 50 feet from railroad crossing solid line to railroad crossing solid line.
    d. Solid 8-inch white line separates multiple approach lanes and extends 10 feet from back railroad crossing solid line.
    e. Grade Crossing Advanced Warning Sign (W10-1) sign adjacent to railroad crossing pavement markings.
    f. Double yellow line extends back a minimum of 50 feet from nearest rail on two-way left turn lane; area should be hashed out.
    g. Pavement markings required where speed is 40 mph or greater and at all active crossings on all approach lanes; exceptions may be granted at passive crossings in urban areas. (See Section 8B.27 of the TMUTCD.)
18. Sign sizes correct per Table 8B-1 of the TMUTCD.

**Guidelines on Projects with Active Railroad Warning Devices**

1. Gates shown perpendicular to the roadway and not normally parallel to tracks (i.e. skewed crossings).
2. Gates, cantilevers, and striping have correct distances shown. The below information is for reference only; the final design and placement of active warning devices is determined by the railroad company.
    a. 12 feet minimum, 15 feet typical from centerline of railroad signal mast to centerline of nearest track; on skewed crossing tip of gate must be a minimum of 12 feet from centerline of track.
    b. Minimum 4 feet 3 inches from center of gate mast to edge of curb; or 6 feet from center of gate mast to edge of pavement when shoulder is present; or 8 feet 3 inches (9 feet 3 inches for BNSF) from edge of pavement if no shoulder is present.
    c. Minimum 4 feet from center of gate to center of cantilever, but railroad companies prefer 6 feet.
    d. Minimum 6 feet from edge of sidewalk to center of gate.
3. Any cabin relocations or installations identified. Correct dimensions are shown:
    a. 30 feet edge of cabin to edge of pavement or curb.
    b. 25 feet edge of cabin to near rail.
    c. Cabin location not a sight distance issue for vehicles.

NOTE: Cabin location is subject to change by the railroad company.

4. Correct usage of backlights and side lights. Any side streets within 100 feet of rail would require side lights. Back lights required on all two-way non-divided roadways and if pedestrians use roadway.
5. Gate lengths are sufficient (generally not longer than 28 feet). Gates may cover up to two lanes.
6. Generally a median is needed for multiple approach lanes. Median with flasher/gate is normally less expensive than a cantilever.
7. One pair of flashers shown for each approach lane.
8. Railroad company removes, provides & installs gates, cantilevers, mast flashers, and crossbucks.
9. Front lights not needed on both a cantilever and a gate if one is in front of the other; the same applies to back lights.
10. Note included: ‘The Railroad signal circuits and final design location were not designed by the undersigned engineer,’ above engineer’s seal.

11. If warning signals are being removed, ownership of signals identified, including any salvage value.
12. General notes describe the type of railroad circuitry (constant warning, etc.).
13. Clearance time correct for active crossings with skew or multiple tracks.

**Guidelines on Projects with Traffic Signal Preemption**

1. Correct timing is identified on plan sheet (equipment response time, advance preemption time, clearance time, minimum time, and buffer time). Any traffic signal timings shown match timings in preemption form (TxDOT Form 2304).
2. All signal heads shown.
3. Phasing diagram for normal operation shown.
4. Preemption phasing diagram shown with right-of way transfer, track clearance, dwell or limited cycle, and exit (return) phases.
5. Plans identify conduits and traffic signal cable between traffic signal cabinet and rail cabin, including who provides and installs materials.
6. Traffic signal cable should be a minimum 8 conductor cable.
7. Plans clarify who maintains traffic signal.
8. Protected left turn provided for traffic on track clearance phase (if there is conflicting traffic approaching traffic signal from opposite side of intersection).
9. Battery backup provided for traffic signal controller.
10. Traffic signal poles do not block active warning devices.

**Guidelines on Projects with Planking**

1. Crossing surface panels identified by material (concrete, composite, asphalt, timber, etc.) and length to be removed and installed. Planking extends at least three (3) feet beyond edge of pavement or sidewalk.
2. Planking installations shown in eight (8) foot sections along rail line. (NOTE: Some railroad companies may prefer use of nine (9) foot or other size panels.)
3. TxDOT installs subgrade material, railroad company removes existing and installs new sub-ballast, ballast, ties, rail, and planking surface. TxDOT provides level up.
4. If crossing surface panels are being removed, ownership of panels identified, including any salvage value.
5. Plans confirm full width or half width roadway closure.

**Guidelines on Projects with Crossing Closures**

1. Details of railroad company work (removal of warning devices and crossing surface panels, passive signing, roadway on railroad right-of-way, restoring ditch, etc.) shown.
2. Details of how crossing will be blocked from traveling public (curb & gutter to match existing, Type 3 barricade, turnaround, etc.) shown. Embankment should be filled to match existing terrain or ditch to discourage drivers from trying to use crossing.
3. Details shown of adjacent roadway improvements (if required).
4. Proper signs to mark closure are installed (if needed):
    a. No Outlet (W14-2)
    b. Dead End (W14-1)
    c. Type 3 barricades
    d. Two-Direction Large Arrow Sign (W1-7 or W1-7T).

**Guidelines on Projects with Existing or Proposed Quiet Zones**

1. Quiet Zone public crossings should be gated crossings with Supplementary Safety Measures (SSMs) such as:
    a. Four quadrant gates setup with maximum 2 foot separation between gate tips or 1 foot from median or channelization device with all exit and approach lanes gated.
    b. Medians with non-transversable curbs or channelization devices that extend back 100 feet from gate (or 60 feet with side streets) and all side streets within 60 feet of gate are closed; maximum 1 foot separation of gate end and curb or channelization device and all approach lanes are gated.
    c. On one-way streets, non-transversable curb extends back 100 feet from gate; 2 foot maximum separation between gates or 1 foot separation between gate and curb.
    d. A wayside horn may be used in lieu of an SSM.
2. Any non-transversable curbs are used on roadways that do not exceed 40 miles per hour and must be at least 6 inches high. (See 49 CFR § 222.9, definition of non-transversable curb.)
3. No Train Horn (W10-9) sign or plaque (W10-9P) shown for crossings on all approaches and roadways parallel to rail within 100 feet of rail; time of day plaque shown if applicable.
4. Any private passive crossings in a Quiet Zone include a Stop (R1-1) sign, Crossbuck (R15-1) sign, and No Train Horn (W10-9) sign on all approaches.
5. Any pedestrian crossings include No Train Horn (W10-9) sign on all approaches.

**Guidelines on Projects with Culverts, Drainage Pipes, or Conduits**

1. Notes indicate Class V Cooper E-80 culvert is installed across limits of railroad right-of-way or out to 30 feet from track center.
2. Safety end treatments (SETs) included on culverts.
3. Any conduits (electrical or drainage) rigid metal conduit (RMC).
4. Conduits (electrical or drainage) installed at least five (5) feet below top of rail.
5. Boring pits located at least 30 feet from track center.
6. Wet boring not permitted.
7. Corrugated metal pipe (CMP), precast pipe, or precast box preferred to cast in place construction in order to minimize impact to railroad operations.
8. Open-cut construction must not be utilized unless approved by the railroad company up front or does not impact railroad operations.
9. Minimum concrete cover (with steel reinforcement) on pipe shall be two (2) inches.
10. Dimensions on Exhibit A match pipeline/wireline forms (UPRR only).
11. Top of pipe at least five (5) feet below top of tie and five (5) feet below bottom of ditch.

**Guidelines on Projects with Common Use or Encroachments**

1. Future second track between encroachment area and existing track shown 20 feet from existing track.
2. Orange construction fencing shown 25 feet away from rail so a flagger is not needed.
3. All elements installed or modified in railroad right-of-way clearly identified with distance shown from railroad right-of-way line.

# Section 6 — PS&E Design

## Confirming PS&E Design Matches Exhibit A Design

On construction projects, the Exhibit A design is typically a 30% design done 12 or more months in advance of the final as-let PS&E. Most railroad companies will request a review and approval of the as-let PS&E (often referred to as an Exhibit B on construction projects) to verify that certain elements of the design have not changed. Key elements that should not differ between the Exhibit A and 100% PS&E include:

- horizontal and vertical clearances for overpasses
- location of overpass bents and abutments
- alignment of overpass or underpass
- width of overpass
- any drainage or hydraulic elements on railroad right-of-way
- fence details on overpass
- lighting details on overpass over rail line
- location and design of crash walls
- locations of other features on railroad right-of-way such as sidewalks, light poles, signing, retaining walls, guardrail, etc.
- stencil of DOT number and railroad milepost on overpass (BNSF only)
- haul road details
- railroad company access road details
- underpass material selection and design elements
- protection for underpass bents (barrier or other)
- shoofly track design geometry and materials
- any other track design geometry and standards
- locations and types of railroad warning devices on at-grade crossings
- roadway approach grades on at-grade crossings
- roadway lane widths, shoulders, and medians on at-grade crossings
- construction phasing on railroad right-of-way.

**PS&E Requirements**

As part of the PS&E plan set on TxDOT construction projects, the following railroad specific plan sheets are required:

- Railroad Scope of Work Sheet
- Railroad Requirements Sheets (Bridge or Non-Bridge).

These sheets should be identified in the Index of Sheets under the section heading "Railroad." Do not include the Exhibit A in the PS&E unless there is information which is not contained in the rest of the PS&E, such as track realignments.

The Railroad Scope of Work Sheet is intended as a project-specific sheet which clarifies:

- general railroad information such as DOT number, railroad company, railroad milepost, railroad subdivision, and train movements
- any work to be performed within railroad right-of-way identified as work to be performed by TxDOT contractors and work to be performed by railroad companies
- railroad flagging information
- railroad insurance requirements for TxDOT contractors and subcontractors including percentage of contract work within railroad right-of-way (needed to obtain railroad protective liability insurance)
- whether a railroad Right-of-Entry Agreement is required or not (invasive or non-invasive work) and who will obtain (TxDOT on behalf of contractor or contractor)
- whether a Railroad Coordination Meeting is required as part of the preconstruction meeting
- emergency contact information at the railroad company.

It is noted that on bridge projects, railroad protective liability insurance minimum limits are $5,000,000 single occurrence and $10,000,000 aggregate. On other projects, railroad protective liability insurance minimum requirements are $2,000,000 single occurrence and $6,000,000 aggregate.

The percentage of work within railroad right-of-way is determined by dividing project bid items within railroad right-of-way by total cost of bid items on the project. Project engineering, contingencies, and other costs are not considered.

The Railroad Requirements Sheets clarify various information for contractors, including:

- need for safety training
- operational requirements when working near tracks
- minimum construction clearances

- shoring and demolition requirements (bridge projects)
- construction and as-built submittals (bridge projects).

Information on how to complete the Railroad Scope of Work Sheet, Railroad Requirements Sheets, and approved Right-of-Entry Agreements may be found in the "Rail Safety" section of the Traffic Operations Division website.

The District Railroad Coordinator should assist the Project Designer to include these sheets in the PS&E prior to letting.

### Special Specifications

If track work is involved, special specifications will usually need to be added to the PS&E. Examples include:

- ballasted track construction
- underpass structure
- culverts or drainage pipes under track
- contractor prequalification for track work.

Any pipes underneath the track must meet Cooper E-80 loading requirements.

Designers should pay close attention to any track specifications to confirm the specification correctly identifies if a contractor is:

- providing track materials
- performing track removal
- salvaging track materials
- building track panels
- performing track installation
- performing track tie-ins.

TRF-RSS and the Bridge Division can assist the districts if special specifications are needed.

The following items do not usually require special specifications since they are provided by the railroad company:

- crossing surface panels
- active warning devices (i.e. gates, cantilevers, and mast flashers)
- passive warning devices (i.e. crossbuck signs).

### Force Account Estimates

A railroad company force account estimate should be added to the estimate for all work on the project provided by the railroad company, assuming this information is received prior to letting.

# Chapter 8 — Right-of-Entry Process

**Contents:**

# Section 1 — Overview

## Right-of-Entry Agreement

All Class 1 railroad companies and some shortline railroad companies operating in Texas require contractors to obtain a Right-of-Entry Agreement for invasive work prior to performing work on railroad right-of-way. Invasive work typically includes:

- bridge construction
- concrete repair on railroad right-of-way
- widening a roadway over an at-grade crossing
- adding sidewalks over an at-grade crossing
- grading on railroad right-of-way
- installing structures on railroad right-of-way such as poles, luminaires, guardrail, retaining walls, medians, curb and gutter, barriers, etc.
- fracture critical bridge inspection
- track work
- core drilling
- surveying along tracks.

TxDOT is not a signatory party in these Right-of-Entry Agreements; they are two-party agreements between the railroad company and contractor executed after a project goes to letting and after a C&M or letter agreement has been executed by the state and the railroad company. However, in order to expedite execution of Right-of-Entry Agreements and ensure construction deadlines are met, TxDOT has agreed to facilitate agreement execution of the Right-of-Entry Agreement.

If a Right-of-Entry Agreement is required, the contractor cannot begin work within railroad right-of-way until the agreement is fully executed.

## Process for Obtaining a Right of Entry Agreement

Figure 8-1 presents a flow chart depicting the process for obtaining a Right-of-Entry Agreement on a construction project.

NOTE: Project steps and time frames will vary depending on the scope of the project.

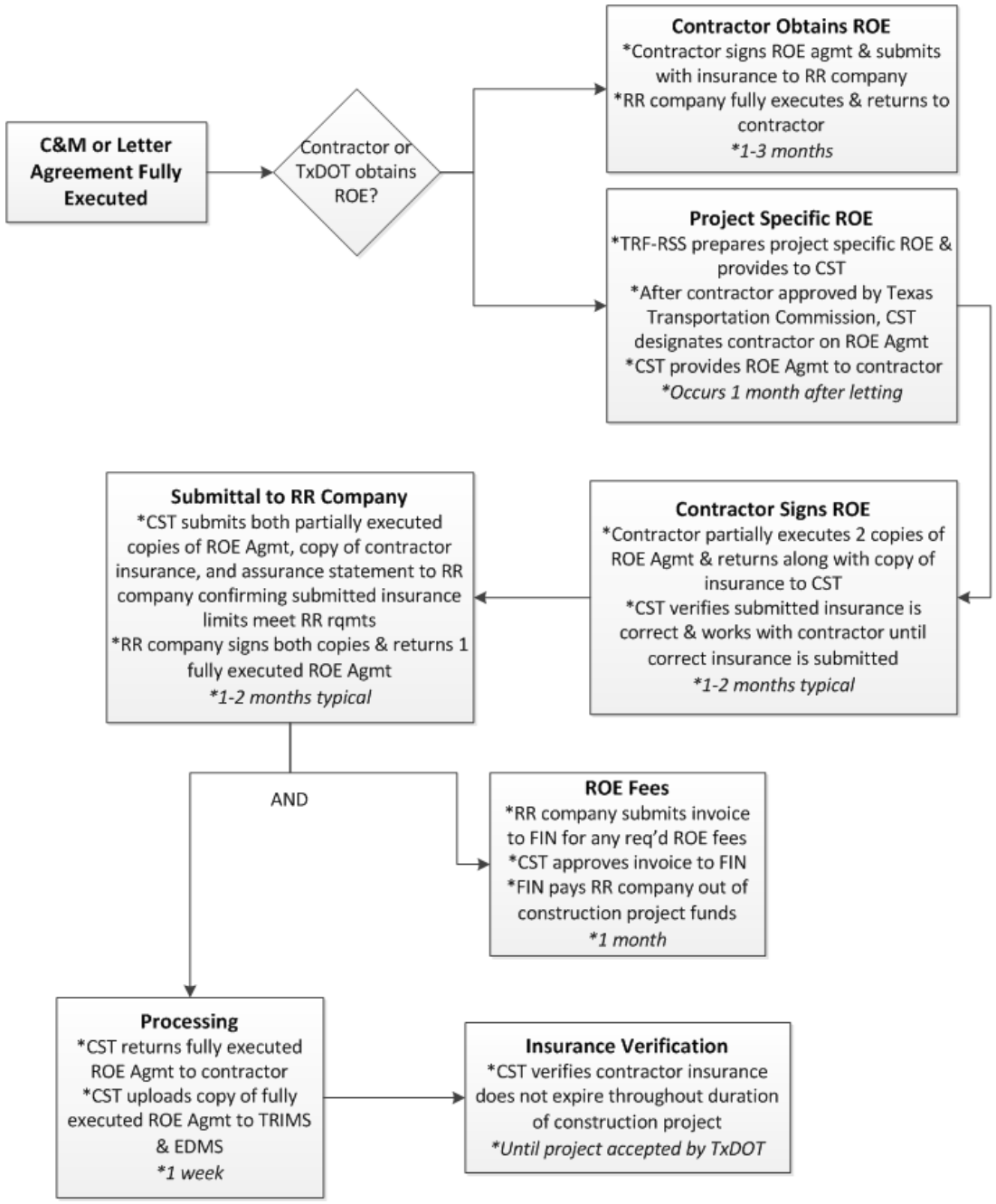


*Figure 8-1. Right of Entry Agreement Flow Chart*

# Section 2 — Process

## Right-of-Entry Agreement Templates

The TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS) coordinates negotiations of Right-of-Entry Agreement templates with the Audit Office and Office of the General Counsel. After TxDOT and the railroad company have agreed on the terms in the agreement, the agreement is then used as an accepted template for TxDOT Construction and Maintenance (C&M) projects and is not to be modified by a contractor.

## Right-of-Entry Agreement Execution for Projects with Agreed Upon Templates

For each C&M or letter agreement requiring a Right-of-Entry Agreement, TRF-RSS provides an approved Right-of-Entry Agreement with project specific information filled out to the TxDOT Construction Division (CST). CST then fills in the appropriate contractor into the agreement after the project lets, and provides two unexecuted copies of the agreement to the contractor. The contractor then partially executes both copies of the Right-of-Entry Agreement and submits back to CST along with a copy of railroad insurance.

CST will verify that the insurance submitted by the contractor matches requirements shown in the Right-of-Entry Agreement (or PS&E) and work with the contractor if the insurance limits are not correct. After approving the insurance, CST forwards the two partially executed copies of the Right-of-Entry Agreement to the railroad company along with a copy of the insurance. After the railroad company fully executes both copies of the Right-of-Entry Agreement, one copy is returned to CST. CST uploads a copy of the agreement into TRIMS and returns the original executed copy to the contractor.

After receipt of the executed Right-of-Entry Agreement, CST will approve payment by FIN to the railroad company for any Right-of-Entry fees. These fees are paid out of the project CSJ.

NOTE: If TxDOT does not yet have an agreed upon template for a Right-of-Entry Agreement with a railroad company, the above process is not followed. Instead, the contractor will have to contact the railroad company separately to execute the agreement, provide a copy of the executed Right-of-Entry Agreement along with railroad insurance to CST, and pay any associated Right-of-Entry fees to the railroad company.

## Insurance Verification

The contractor is required to maintain railroad insurance throughout the duration of the construction or maintenance project. CST monitors the insurance limits throughout the project.

# Chapter 9 — Construction and Inspection Processes

**Contents:**

# Section 1 — Overview

## Construction and Inspection Processes

Figure 9-1 presents a flow chart depicting construction and inspection processes for construction, maintenance, FSP, replanking, and railroad capital improvement projects.

NOTE: Not all steps are applicable to all projects. Project steps and time frames will vary depending on the scope of the project.

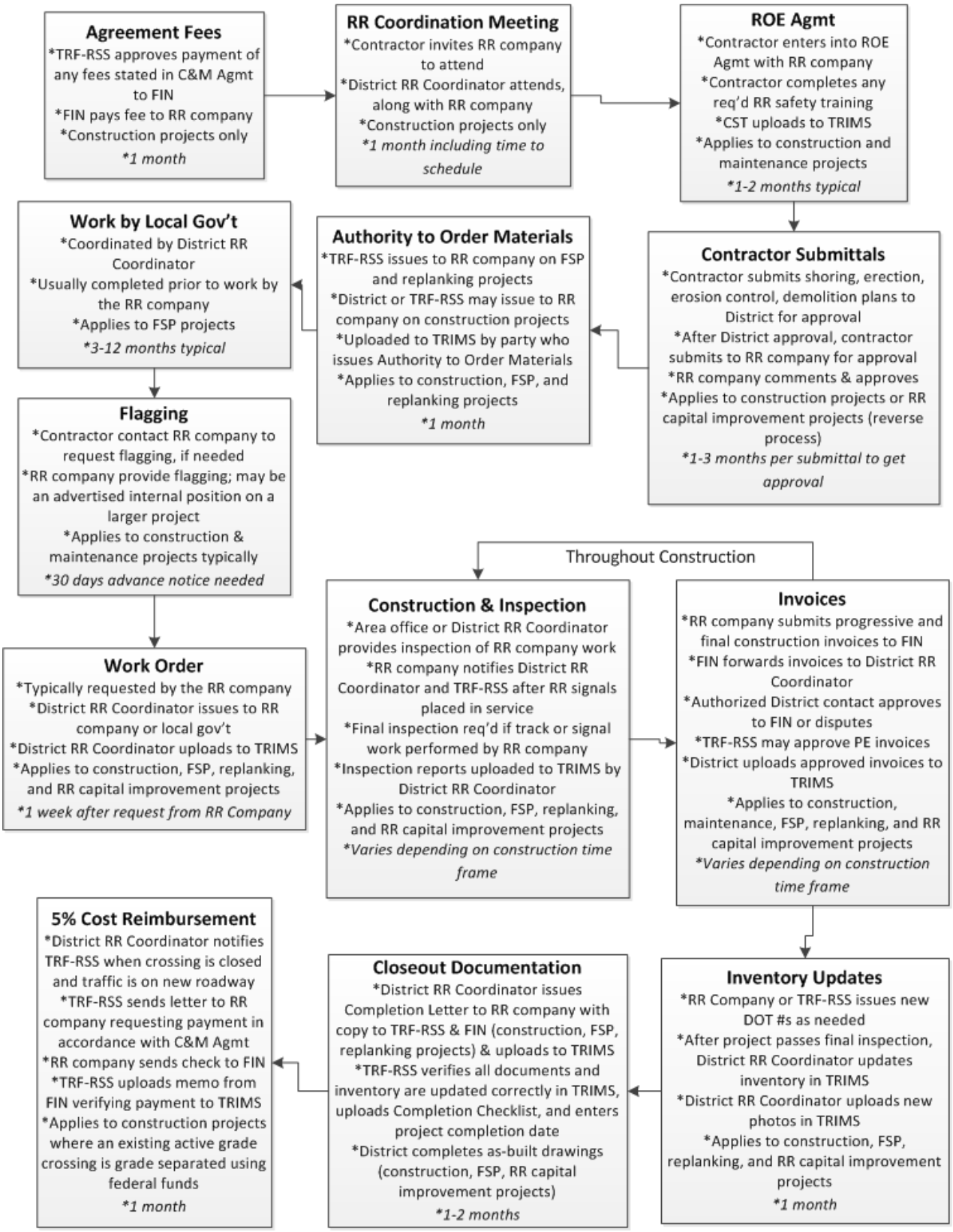


*Figure 9-1. Construction and Inspection Processes Flow Chart*

# Section 2 — After C&M Agreement Execution

## If C&M Agreement Isn't Executed Prior to Letting

On complex projects, a Construction & Maintenance (C&M) Agreement may not be executed until after a construction project goes to letting. In these scenarios, TxDOT may choose to release a construction or maintenance contract to the contractor if a joint concurrence is reached by the:

- TRF-RSS Rail-Highway Branch Manager
- CST Division Director
- District Engineer.

## Agreement Fees

After the C&M Agreement is executed, TRF-RSS will approve payment of any fees TxDOT agrees to pay to the railroad company as stated in the C&M Agreement. The fees are paid for out of the project CSJ. Fees may be agreed upon in the following situations for:

- new overpass (not replacing existing at-grade crossing)
- overpass widening or modification
- electrical or communications conduits under or over tracks or encroaching within railroad rights-of-way
- new underpass
- underpass modification.

TxDOT does not pay fees for at-grade crossing work.

## Railroad Coordination Meeting

A railroad coordination meeting may be required on TxDOT construction projects. This meeting may occur at the same time as the preconstruction meeting. The District is responsible for arranging and conducting the meeting. Items of discussion typically include:

- construction schedule
- scheduling railroad flaggers
- scheduling railroad company signal and track crews
- train operations at the project location
- railroad safety requirements

- Right-of-Entry Agreement and insurance
- construction issues such as stockpiling material near the rail, temporary haul roads and crossings, orange construction fencing parallel with rail, etc.
- shoring and demolition submittals to the railroad company
- how inspections of railroad company work will be performed
- how railroad company invoices will be reviewed and approved.

The following individuals should be present at the meeting:

- District Railroad Coordinator
- Area Engineer
- TxDOT Project Manager
- Prime Contractor
- Subcontractors
- Local Government Traffic Signal Representative (if preemption is involved)
- Railroad Company.

**All parties should be given notice of the meeting a minimum of 21 days in advance in order to provide sufficient time for travel arrangements.**

### Right-of-Entry Agreement and Safety Training

Prior to working on railroad right-of-way, the contractor may be required to enter into a Right-of-Entry Agreement with the operating railroad company if required in the PS&E. See Chapter 8 of this manual for details.

Fully executed Right-of-Entry Agreements are uploaded into the TRIMS Project Management Module by CST.

Most railroad companies require contractors working within their right-of-way to complete an online safety training course. Each individual working within the railroad right-of-way must possess a card certifying completion of the safety training course, including TxDOT personnel. Employees found working on railroad right-of-way not in possession of the card or demonstrating unsafe practices may be expelled from the property and/or fined by federal and/or state safety inspectors. Further clarification on railroad safety training is usually provided in the Right-of-Entry Agreement or by contacting the railroad company.

### Contractor Submittals

TxDOT's contractor will have to provide shoring, erection, erosion control, and demolition plans for review and approval to the railroad company prior to beginning bridge work within railroad right-of-way. Refer to the individual railroad company's guidelines for developing these plans. On underpass projects or projects with shoring within Occupational Safety and Health Administration (OSHA) Zones A or B, shoring guidelines are typically included in the PS&E and would not need to be developed by TxDOT's contractor. See Sheet 1 of the Railroad Requirements for Bridge Construction for further details.

### Authority to Order Materials

On TxDOT construction and FSP projects, TxDOT will issue an Authority to Order Materials letter to the railroad company to begin assembling materials. Assembling materials can take up to six months, so the letter should be issued accordingly. The letter is issued by the District on construction projects unless TRF-RSS issues the letter upon C&M Agreement execution. On FSP projects, the letter is typically issued by TRF-RSS as part of the Exhibit B or with the executed Force Account Agreement.

On replanking projects, the Project Notice or Force Account Agreement typically provides the Authority to Order Materials to the railroad company.

The Authority to Order Materials also provides the railroad company approval to begin any necessary electrical service installation at the project site.

Authority to Order Materials letters are uploaded into the TRIMS Project Management Module by the party who issued the letter.

### Work by Local Government

On FSP projects, the TxDOT District Railroad Coordinator coordinates any work done by the city or county. This work may include:

- median installation
- civil features such as curb and gutter, guardrail, retaining walls, and culverts
- traffic signal adjustments
- utility adjustments
- removing sight distance obstructions such as vegetation
- signing and striping
- roadway alignment improvements
- installing conduit for traffic signal preemption (typically reimbursed by TxDOT).

This work usually needs to be completed prior to any work done by the railroad company and will affect the issuance of the Work Order to the railroad company from TRF-RSS.

### Railroad Flagging

Railroad flaggers are required any time the contractor is working within 25 feet of the rail or is using equipment that could tip onto the railroad tracks. The railroad company has the final authority in deciding if railroad flaggers are needed. Flaggers must be requested from the railroad company 30 days in advance of the project work by the contractor. The contractor is responsible for determining when flaggers will be needed based on the construction schedule.

On some larger construction projects, the railroad company may choose to post a flagging position internally for a dedicated employee (or employees) to support the project throughout the duration of the construction. The Contractor Right-of-Entry Agreement will give detailed instructions on ordering and dismissing railroad flaggers.

The Project Inspector should verify that railroad flaggers are only requested when needed by the contractor since TxDOT usually pays the flagging charges.

### Work Order

On construction, FSP, and replanking projects, TxDOT issues a Work Order to the railroad company to provide labor for installation, modification, and removal of crossing surface panels, railroad warning devices, track and/or other railroad equipment. In some cases, a Work Order may be required for railroad flagging as well. On FSP projects, a Work Order is issued to the local government for any work to be reimbursed by TxDOT.

The Work Order is issued after the District has identified a proper means to inspect the work to be performed, including any traffic control performed by the railroad company's contractor. The railroad company will usually request the Work Order after materials have been assembled and two weeks prior to a crew beginning work.

The District will issue the Work Order on all types of projects. The Finance Division Project Ledgers Section should be copied on all Work Orders in order to set up the proper account for paying construction invoices from the railroad companies.

Work Orders are uploaded into TRIMS by the District.

# Section 3 — Inspections

## Construction Inspection

On construction or railroad capital improvement projects, TxDOT inspection of the railroad company is typically done by an inspector from the area office. On FSP and replanking projects, this is typically done by the District Railroad Coordinator. On FSP and construction projects, a representative from the local government may also provide inspection.

Whenever the railroad company is installing/modifying railroad warning devices and crossing surface panels, the District should inspect the materials supplied by the railroad company prior to installation.

It should be verified that work performed by the railroad company complies with the approved plan layout and specifications.

As district staffing levels vary, each district is given authority to decide the level of inspection provided for railroad company work. Examples include:

- daily inspection by the District Railroad Coordinator or Area Office Inspector
- less frequent inspection by the District Railroad Coordinator or Area Office Inspector
- final inspection only by the District Railroad Coordinator or Area Office Inspector.

The District Railroad Coordinator or Area Office Inspector should keep a diary record of:

- materials delivered to site by railroad company (or contractor)
- materials installed by the railroad company (or contractor)
- number of railroad company workers on site
- equipment being used or rented by railroad company (or contractor)
- flaggers or railroad inspectors on site
- work performed by railroad company (or contractor).

Inspection reports and diary entries are uploaded into the TRIMS Project Management Module by the District Railroad Coordinator.

## Final Inspection

The District Railroad Coordinator should schedule a final inspection of the project as soon as practical with the railroad company after construction is complete and any active railroad warning

devices have been placed in service. At the request of the District, TRF-RSS may arrange the final inspection.

Final inspection should include plan verification and inspection of:

- all work performed by the road authority or contractor
- all work performed by railroad company or contractor
- utility adjustments
- sight distance on approaches to at-grade crossings.

For sample inspection reports for FSP and replanking projects, see the subsection entitled "Other Resources" in Chapter 14 of this manual.

Any findings in the final inspection will be noted in a final inspection report to the railroad company which must be resolved prior to submitting a final invoice.

# Section 4 — Invoices

## Reviewing Invoices

With some noted exceptions below, districts are responsible for reviewing, approving, and disputing progressive and final invoices from railroad companies to be paid by TxDOT. When reviewing, the following guidelines are given:

- Compliance with agreement:
  - Read and understand the terms in the agreement with the railroad company to verify when invoices may be paid.
  - Verify if any cost participation is required by the railroad company, and if so, that this has been deducted on the invoice.
- Verify the project location, railroad milepost, and CSJ in the invoice match the project. In some cases, an invoice may have been charged to the wrong project.
- Check the dates for work performed on the invoice. The dates shown should be on or after the date shown on the applicable agreement or letter authorizing the labor or materials. If the work was performed prior to the proper authorization from TxDOT, contact TRF-RSS on how to proceed. In some cases, there may be provisions in the agreement for partial payment to be made to the railroad company.
- Common project steps include:
  - **System-wide Preliminary Engineering Agreement (FSP projects):** Also known as the Diagnostic Study Authorization Letter Agreement, this provides authorization to the railroad company to perform diagnostic inspections and be reimbursed for labor and other preliminary activities.
  - **Letter Agreement (Maintenance projects):** An executed letter agreement authorizes the railroad company to provide flagging. Most letter agreements specify a maximum number of days needed for flagging. Additional flagging would require further authorization from TxDOT.
  - **Preliminary Engineering (FSP & Construction projects):** These letter agreements authorize the railroad company to attend project meetings, provide preliminary engineering, and develop cost estimates and wireline diagrams. On construction projects, the agreement may also authorize the railroad company to perform real estate services on the project.
  - **Authority to Order Materials (FSP, Construction, Replanking projects):** On FSP projects, Authority to Order Materials is typically given when TRF-RSS issues the Exhibit B. Depending on the terms of the Exhibit B, it may or may not need to be signed by the railroad company. On construction projects, the District typically issues a signed letter to the railroad company authorizing the railroad company to order materials prior to installa-

tion at the project site. Alternatively, Authority to Order Materials may be provided within the C&M Agreement or could be a separate letter issued to the railroad company by TRF-RSS. On replanking projects, Authority to Order Materials is typically issued by TRF-RSS as part of a Project Notice or Force Account Agreement for the replanking work.

- **Work Order (FSP, Construction, Replanking projects):** The Work Order authorizes the railroad company to provide necessary labor for installation. On some construction projects, a Work Order may not be required to authorize flagging or inspection work. The C&M Agreement will clarify if a Work Order is required. A Work Order may be provided in the transmittal letter to the railroad company with the fully executed C&M Agreement.
- **Project Completion Letter (FSP, Construction, Replanking projects):** The Project Completion Letter is issued to the railroad company by the District to verify that the project has passed final inspection and the railroad company should submit a final invoice within a specified time. The letter serves as justification to pay the final invoice and close out the project with FIN.

◆ Track overall amount invoiced by the railroad company against the estimate in the railroad agreement. If the amount invoiced exceeds the amount in the estimate, one of the following scenarios may be occurring:

- The estimate provided by the railroad company did not properly account for all labor or materials. In this case, a revised estimate may be needed from the railroad company or payment may be withheld until a resolution is reached.
- The scope of work needed by the railroad company was not sufficiently accounted for during design of the project. For example, the number of mobilizations needed for the railroad company to install/relocate temporary signals was not considered when the traffic control plan was developed. Replanking in half-width sections would also cause multiple mobilizations. Another example would be that the number of days of flagging was underestimated by the designer. In these scenarios, invoices should be approved when total cost to the railroad company significantly exceeds what was shown on the estimate. Written notification from the railroad company describing the scenario should precede invoice submittal.
- Construction change orders may have impacted the services needed from the railroad company. For example, an unknown utility has caused rework by the railroad company or construction issues have caused the need for additional flagging. In these scenarios, invoices should be approved when total cost to the railroad company significantly exceeds what was shown on the estimate. Written notification from the railroad company describing the scenario should precede invoice submittal.

◆ Check progressive invoices against previous invoices submitted for the same project to verify that the railroad company is not double invoicing. Verify that labor provided does not match dates from previous invoices and that the same materials have not been previously invoiced.

- Various rates shown on the invoice do not need to be verified. These rates may be audited by the FHWA or other entity and are not the responsibility of the District to verify. Some of these rates may include:
  - overhead/Federal Highway Labor Rates/Additive Rates (unless no audited rate)
  - insurance rates
  - equipment vehicle rates
  - billable percentage
  - per diem rates
  - hourly labor rates
  - shipping and handling rates.
- Profit should not be charged by the railroad company, but is acceptable for a railroad contractor. If a profit rate is included, verify it matches what was shown in the project estimate.
- A maximum 5% overhead rate may be charged for a contractor or railroad company that does not have an audited rate.
- Invoice clerk charges should not be disputed unless the hours shown seem unreasonably high. Typically, only a few hours should be shown per invoice.
- For materials invoiced, if an area office inspector, District Railroad Coordinator, or TxDOT contractor was present, a journal entry should verify approximate quantities of materials used. Smaller items, such as ballast, wire, etc. do not need to be verified for quantity. Larger items, such as foundations, gates, LEDs, cantilevers, mast flashers, cabins, etc. should be verified with journal entries and against the original estimate. If an inspector was not present, and the railroad company had a valid Work Order, a field visit after receiving the invoice may verify materials.
- For materials invoices, inspected materials on the job site serves as justification for payment. However, if materials are invoiced prior to being shipped to the job site, the invoice should be paid provided Authority to Order Materials was given to the railroad company. If materials fail inspection at a future date, payment can be withheld on future invoices until the issue is resolved.
- For labor invoiced, verify that the number of laborers shown on the invoice matches what is shown in a construction diary if available. It is not necessary to verify labor hours, as this is not realistic, and the total hours shown may not match actual due to railroad union rules.
- Actual labor is paid, not what is shown in the estimate. For example, if a letter agreement includes an estimate for flagging at $1000/day, and an invoice shows $1200/day, there may be multiple reasons for the discrepancy. Rates may have increased since the agreement was executed, or the flagger was required to work overtime or on a weekend.

- Travel will be invoiced when railroad company employees must travel to and from a job site. This will include per diem, lodging, and travel costs such as mileage, parking fees, toll fees, etc. Lodging invoices should be at a location within one hour of the project site.
- Some invoices may include credit card, lodging, and meal expenses for an entire month. However, this does not mean that all of the expenses are being charged to the invoice. Check the invoice details to verify which travel expenses are actually being charged to the project.
- For preliminary engineering invoices, a cost estimate and/or wireline diagram serves as justification for payment. In many cases, other labor may be charged to preliminary engineering such as a local manager's time for attending project meetings, performing site visits, etc. If an invoice for preliminary engineering is received prior to receiving an estimate and/or wireline diagram from the railroad company, the invoice should be paid provided the total charges for preliminary engineering are in accordance with the PE Agreement. If the estimate and wireline diagram are not received in a timely manner and a preliminary engineering invoice has been paid, contact TRF-RSS for resolution. Preliminary engineering invoices are reviewed and approved by TRF-RSS.
- Project flaggers may be governed by railroad union rules. This means that even if a flagger was not on the project site for eight hours, eight hours will still be invoiced. Keep in mind that a flagger must arrive at a job site before work begins and stay after the work for the day ends, in order to set up and remove warning devices along the railroad to warn oncoming trains of downstream construction work. Time is also charged for travel to and from the job site. If a flagger is needed for 30 days or longer, and it is determined the flagger is not needed, the flagger will still need to be paid even when the contractor is not working. In the event the flagger is not needed when scheduled, the area office will need to determine if TxDOT will be reimbursed by the contractor for flagging charges due to a problem created by the contractor.
- On replanking projects, TRF-RSS has Master Agreements with some of the railroad companies authorizing a cost per track foot (currently UPRR and BNSF). On these invoices, verify that the correct amount is included on the invoice and that work was sufficiently completed.
- On larger construction projects, the railroad company may create multiple internal work orders for track work, signals work, inspection, etc. In these cases, it is helpful to create a spreadsheet to track all of the railroad work order numbers from the railroad company and check off when a final invoice is received under each railroad work order. A final invoice under a TxDOT construction project does not necessarily mean it is the final invoice to be received from the railroad company for the entire TxDOT project since other railroad work orders may still be open.
- Some construction projects may require a real estate fee to be paid to the railroad company. Examples could include new overpasses built over a railroad, or pipe and wire installations under the railroad tracks. These invoices are reviewed and approved by TRF-RSS after negotiation with the railroad company and in accordance with the fee shown in the C&M Agreement.
- On FSP projects designated as crossing closure projects, TxDOT is invoiced by the local government. These invoices are reviewed and approved by TRF-RSS and not by the districts.

Invoices are to be paid after the work to close the crossing and any additional work identified in the Crossing Closure Agreement on adjacent streets has been completed by the local government and verified by the Area Office. The invoice is paid in accordance with the amount shown in the Crossing Closure Agreement between TxDOT, the railroad company, and the local government.

- Contractor Right-of-Entry fees are approved by CST in accordance with the fee shown in the Right-of-Entry Agreement.

**Invoice Process**

Invoices are sent from the railroad company to FIN and forwarded to the appropriate District Railroad Coordinator. Invoices are subsequently approved, disputed with appropriate justification, or forwarded over to TRF-RSS or CST for approval (depending on the type of invoice). Only employees with invoice signature authority are allowed to approve invoices by sending an appropriate email to the Finance Division Voucher Processing Section.

Invoices are paid or disputed within 30 days of submittal. If an invoice is disputed, the District contacts the railroad company directly with an e-mail copy to FIN and TRF-RSS. For questions regarding invoice reviews or disputes, districts are encouraged to contact TRF-RSS.

All approved invoices are uploaded into the TRIMS Project Management Module by the approving party.

# Section 5 — Project Closeout

## Inventory Updates

Digital photographs are taken by the District Railroad Coordinator after construction is complete. For at-grade crossings, there are six photos taken:

- DOT number (usually on Emergency Notification Sign or on railroad cabin)
- facing north (whether it be looking up the road or up the track)
- facing east
- facing south
- facing west
- crossing surface.

On overpass or underpass projects, only a photo of the DOT number (written on a sheet of paper) and one (1) photo of the bridge showing the roadway and rail line is needed. Any work performed at locations not at crossings does not require photos.

The District Railroad Coordinator is responsible for uploading the photos and updating crossing inventory data in TRIMS.

## DOT Numbers

On construction or railroad capital improvement projects that introduce new crossings (at-grade or grade separated), the railroad company or industry must obtain a new DOT number for the crossing. The DOT number is typically assigned by the railroad company, but may be issued by TRF-RSS in some cases.

Other projects which will require new DOT numbers assigned for existing crossings include:

- converting an at-grade crossing to a grade separated crossing or vice versa
- converting an underpass to overpass or vice versa
- relocated at-grade crossing (usually).

A widened crossing typically would not require a new DOT number.

## Completion Letter

After passing final inspection on construction, FSP, and replanking projects, the District issues a Completion Letter to the railroad company requesting a final invoice within 90 days from the date

of the letter. The Completion Letter is uploaded by the District Railroad Coordinator into the TRIMS Project Management Module, with a copy to TRF-RSS and FIN. The Completion Letter is typically submitted with the final inspection report.

TRF-RSS will:

- verify photos have been uploaded in TRIMS
- verify crossing inventory is updated correctly in TRIMS
- verify crossing inventory is updated correctly in the FRA database
- verify all project documents have been uploaded in TRIMS
- upload a Project Completion Checklist in TRIMS
- enter a completion date for the project in TRIMS.

Any discrepancies identified during final project review will be identified and corrected prior to the completion date being entered in TRIMS.

### As-Built Drawings

On FSP projects, the District Railroad Coordinator will arrange to prepare as-built drawings by modifying any information in the Exhibit A which may have changed during construction. Typical changes would include:

- distances from railroad warning devices and railroad cabin from roadway and rail line
- side and back light adjustments
- signing and striping
- other changes from plan design.

As-built drawings are not required on replanking projects. On construction projects, the as-built drawings are completed for the entire construction project.

### 5% Cost Reimbursement

On projects including a 5% cost participation from the railroad, the District Railroad Coordinator will notify TRF-RSS in writing when traffic has been shifted onto the new roadway and the at-grade crossing has been removed. TRF-RSS will issue a letter to the railroad company requesting that the 5% cost participation amount shown in the C&M Agreement be paid to TxDOT.

FIN will confirm with TRF-RSS and the District when payment has been received. Receipt of payment from FIN is uploaded into TRIMS by TRF-RSS.

# Chapter 10 — Other Rail-Highway Programs

**Contents:**

# Section 1 — Railroad Signal Maintenance Payment Program

## Overview

The Railroad Signal Maintenance Payment Program is managed under Category 10 (Supplemental Transportation Projects) of the Unified Transportation Program (UTP) as a bank balance allocation program to provide a fixed annual unit payment to railroad companies for maintenance of railroad signals. Each year, the Texas Transportation Commission authorizes the total amount of funding for the program.

Only open, public, in service, active at-grade crossings on the state highway system are eligible for the program, excluding any industry spur track crossings located on the state highway system covered by a rail spur permit. It is funded with 100% state funds. Funding for the program is typically around $1.1 million annually, and payment is provided per crossing on the following schedule:

- Mast Flashers: $289
- Cantilevers: $385
- Gates: $770.

Payment for a crossing is made based on the highest level of protection present at the crossing. For example, if a crossing includes both gates and cantilevers on both approaches, $770 would be paid for the entire crossing.

Schedule of payment is subject to change on an annual basis.

## Verification of Warning Devices

Before payment to the railroad company can be made under the Railroad Signal Maintenance Payment Program, the type of warning devices in place must be verified. The Traffic Operations Division-Rail Safety Section (TRF-RSS) runs an inventory report annually via the TRIMS database and sends a letter with the following information to each railroad company:

- listing of all public on-system at-grade crossings listed as active or passive
- type of warning devices at each of the active crossings.

A warning device must be in place at the beginning of TxDOT's fiscal year to be eligible for payment for that fiscal year. TxDOT's fiscal year begins September 1 and runs through August 31.

For example, if a mast flasher was upgraded to a gate on September 15, 2015, payment for a gate would not occur until fiscal year 2017. For fiscal year 2016, payment would be paid for a mast flasher.

Any discrepancies are coordinated by TRF-RSS with the railroad company and District Railroad Coordinator. If necessary, TRF-RSS will update inventory data in TRIMS.

The railroad company must sign and return the letter verifying inventory prior to TxDOT issuing payment.

### Payment of Rail Safety Inspection Fee

TxDOT rail safety investigators conduct safety inspections of railroad facilities and equipment. Each year, railroad companies are required to pay a fee to TxDOT, authorized under 43 TAC §7.41, in support of this program.

TxDOT will not pay a railroad company under the Railroad Signal Maintenance Payment Program until the railroad company is current in payment of TxDOT rail safety program fees.

### Programming

TRF-RSS will request a single CSJ to be set up each program year by the Finance Division Letting Management Section based on funding for the program in that year.

### Payment to Railroad Companies

After concurrence is reached on the inventory list between TxDOT and the railroad company, TRF-RSS issues a memo to FIN to pay the railroad company, and the railroad company has paid any rail safety inspection fees. Payment is made prior to the end of the TxDOT fiscal year.

# Section 2 — Railroad Grade Separation Program (RGS)

## Overview

The Railroad Grade Separation Program (RGS) is funded under Category 6 (Structures Replacement and Rehabilitation) of the UTP. Annual funding for the program varies, but is currently at $25 million. Projects and funding are approved on an annual basis by the Texas Transportation Commission. Funding is 80% federal and 20% state.

Projects eligible for the program must be on the state highway system, with a functional classification greater than local road or rural minor collector.

The program is divided into two program areas:

- grade separations of existing at-grade crossings
- replacement of functionally deficient highway underpasses.

The Texas Transportation Commission approves the funding levels and methods used to prioritize and select projects by Commission Minute Order authorizing the Statewide Transportation Improvement Program (STIP).

## Installation of Grade Separations at Existing At-Grade Crossings

Projects for the construction of grade separations at existing highway-rail at-grade crossings under the RGS Program are prioritized by TRF-RSS using a cost-benefit index (CBI). The CBI ranks the estimated savings (in millions of dollars) that would be realized over 50 years with construction of grade separated structures.

In order to compute the CBI, the following data is first required for each crossing:

- AADT
- trains per day (both through and switching movements)
- total fatalities
- total injuries
- total crashes.

The total fatalities, total injuries, and total crashes should be based on a recent set of data that represents current conditions at the crossing. For example, if a recent safety project upgraded the crossing with lights and gates, the data should be based on a time frame after the lights and gates were installed.

The following assumptions are made in the CBI calculation:

- cost per fatality
- cost per injury
- cost of property damage per crash
- time average train occupies a crossing (5 minutes)
- personnel costs per hour per car
- personnel costs per hour per truck
- cost per stop per car
- cost per stop per truck
- average delay per vehicle stopped by a train (3 minutes)
- 80% of vehicular traffic is cars
- 20% of vehicular traffic is trucks.

The cost per fatality, cost per injury, and cost of property damage per crash are provided by the National Safety Council. Personnel costs are updated annually by CST based on multiplying the previous year's numbers by the Consumer Price Index.

The CBI for each at-grade crossing is calculated by completing the following steps:

1. Calculate the crash cost per year.
2. Calculate vehicles stopped per year.
3. Calculate the personnel delay cost per year.
4. Calculate the equipment delay cost per year.
5. Calculate the CBI.

### Step 1: Calculate the Crash Cost Per Year

Calculate the costs of fatalities, injuries, and property damage separately. Then add the three costs for a total crash cost:

- (1) Total fatalities x Cost per fatality = Total Fatality Cost
- (2) Total injuries x Cost per injury = Total Injury Cost
- (3) Total crashes x Cost of property damage per crash = Total Property Damage Cost
- Sum of (1), (2), and (3) = Total Crash Cost.

Determine the crash cost per year by dividing the total crash cost by the year range of crash data:

- Crash cost per year = Total Crash Cost / Year Range of Crash Data.

**Step 2: Calculate Vehicles Stopped Per Year**

The following assumptions are implied:

- Time a train occupies a crossing is 5 minutes, or 5/60 hour
- Vehicles per hour = 1/24 x AADT
- Vehicles stopped per train = 5/60 x 1/24 x AADT
- Vehicles stopped per day = 5/60 x 1/24 x trains per day x AADT.

Therefore:

- Vehicles stopped per year = 365 x 5/60 x 1/24 x trains per day x AADT
- Vehicles stopped per year = 1.26736 x trains per day x AADT.

**Step 3: Calculate the Personnel Delay Cost Per Year**

Using the assumptions shown previously:

- Personnel cost per stop = 3/60 x (Personnel costs per hour per car x 0.80 + Personnel costs per hour per truck x 0.20)

Therefore:

- Personnel delay cost per year = Personnel cost per stop x Vehicles stopped per year.

**Step 4: Calculate the Equipment Delay Cost Per Year**

Using the assumptions shown previously:

- Equipment cost per stop = Cost per stop per car x 0.80 + Cost per stop per truck x 0.20

Therefore:

- Equipment delay cost per year = Equipment cost per stop x Vehicles stopped per year.

**Step 5: Calculate the CBI**

The CBI is calculated using the crash cost, personnel delay cost, and equipment delay cost. Costs are estimated over a 50 year expected life cycle of the grade separation and divided by $1,000,000 for simplicity.

- CBI = (crash cost per year + personnel delay cost per year + equipment delay cost per year) x 50 / $1,000,000.

### Replacement of Functionally Deficient Highway Underpasses

Selection and funding for the replacement of functionally deficient highway underpasses under the RGS Program are determined by a Bridge Inventory, Inspection, and Appraisal Program (BRINSAP) sufficiency rating. The following factors are considered:

- roadway width
- vertical clearance
- right lateral clearance
- AADT per lane
- estimated construction cost per AADT.

In addition to improving horizontal and vertical clearance, underpasses may be converted to overpasses under the RGS Program.

### Integrating Grade Separation Projects with Underpass Projects

TRF-RSS works with the Bridge Division to jointly prioritize the highest priority grade separation and underpass projects. Areas for consideration in prioritizing these projects include:

- cost of construction
- constructability and design issues
- available program year funding
- district or TxDOT priority projects
- primary and secondary freight networks
- status of PS&E, utilities, and right-of-way
- railroad company priorities.

After projects are selected and funding is obligated on the projects, TRF-RSS works with the districts and railroad companies to secure the proper agreements as described in Chapter 2 of this manual.

# Section 3 — Other Programs

## Crossing Closure Program

Under the Basic Closure Program, TxDOT may offer up to $7,500 to a local government to close a public at-grade crossing that is not shown on the FSP Preliminary Project List. Funding for the Basic Closure Program is offered via the FSP.

TxDOT may offer $150,000 to a local government for a crossing closure under the FSP if the crossing is identified on the Preliminary Project List via the $TPI_{REV}$ process.

For more information, see Chapter 4 of this manual.

## Highway Safety Improvement Program (HSIP)

TRF-RSS participates in the Railway-Highway Grade Crossing portion of the Highway Safety Improvement Program (HSIP), with the following goals:

- Grade separation of public at-grade crossings.
- Closing redundant or unnecessary crossings.
- Enhancing safety at public at-grade crossings.
- Improving inventory tracking of crossings and rail-highway projects.

Each year, TRF-RSS reports progress to the FHWA, including:

- crash data on at-grade crossings
- quantity of public crossings, separated as active, passive, and grade separated
- annual funding obligated under the FSP
- procedures for prioritizing projects under the FSP
- how TxDOT is analyzing crash data and tracking effectiveness of safety upgrades from the FSP
- other efforts to improve grade crossing safety.

For more information, see the Highway Safety Improvement Program Manual.

## Temporary Programs

Utilizing funding from the FSP, TRF-RSS may implement other programs designed to enhance safety at at-grade crossings. Examples may include:

- replacement of crossbuck signs
- improving reflectivity of various signs
- installation of stop and yield signs at passive crossings
- programs to support implementation of federal or state laws
- programs to improve safety based on statistical analysis or research on at-grade crossings.

TRF-RSS identifies the need for these programs, method of implementation, and required coordination efforts with District Railroad Coordinators and railroad companies.

# Chapter 11 — Quiet Zones

**Contents:**

# Section 1 — Overview

## Quiet Zones

A Quiet Zone refers to a section of a track that contains one or more consecutive public crossings at which locomotive horns are not required to be routinely sounded when trains pass through at-grade crossings. In the absence of a Quiet Zone, railroad companies are required by law to sound the horn on the approach at least 15 seconds before the train arrives at the crossing in advance of all public at-grade crossings until the train has passed through the crossing.

The Federal Railroad Administration (FRA) allows local governments to apply for Quiet Zones to restrict the sounding of the horn when certain safety requirements are met. The requirements are intended to ensure that the safety features along the corridor of crossings are equal to or better than safety benefits provided by the sounding of the horn. As such, the local government will initiate the Quiet Zone process.

Quiet Zones involving more than one local government must include participation and approval by all local governments. If the Quiet Zone includes a TxDOT-managed road see "Safety Upgrades on TxDOT Roadways" in Section 4 of this chapter.

A Quiet Zone may apply throughout the day, or between the hours of 10 p.m. and 7 a.m., known as a Partial Quiet Zone.

Detailed requirements are found within 49 CFR Part 229 and are subject to change.

Figure 11-1 presents a flow chart depicting the process for establishing and maintaining a Quiet Zone.

NOTE: Not all steps are applicable to all Quiet Zone projects. Project steps and time frames will vary depending on scope of the project.

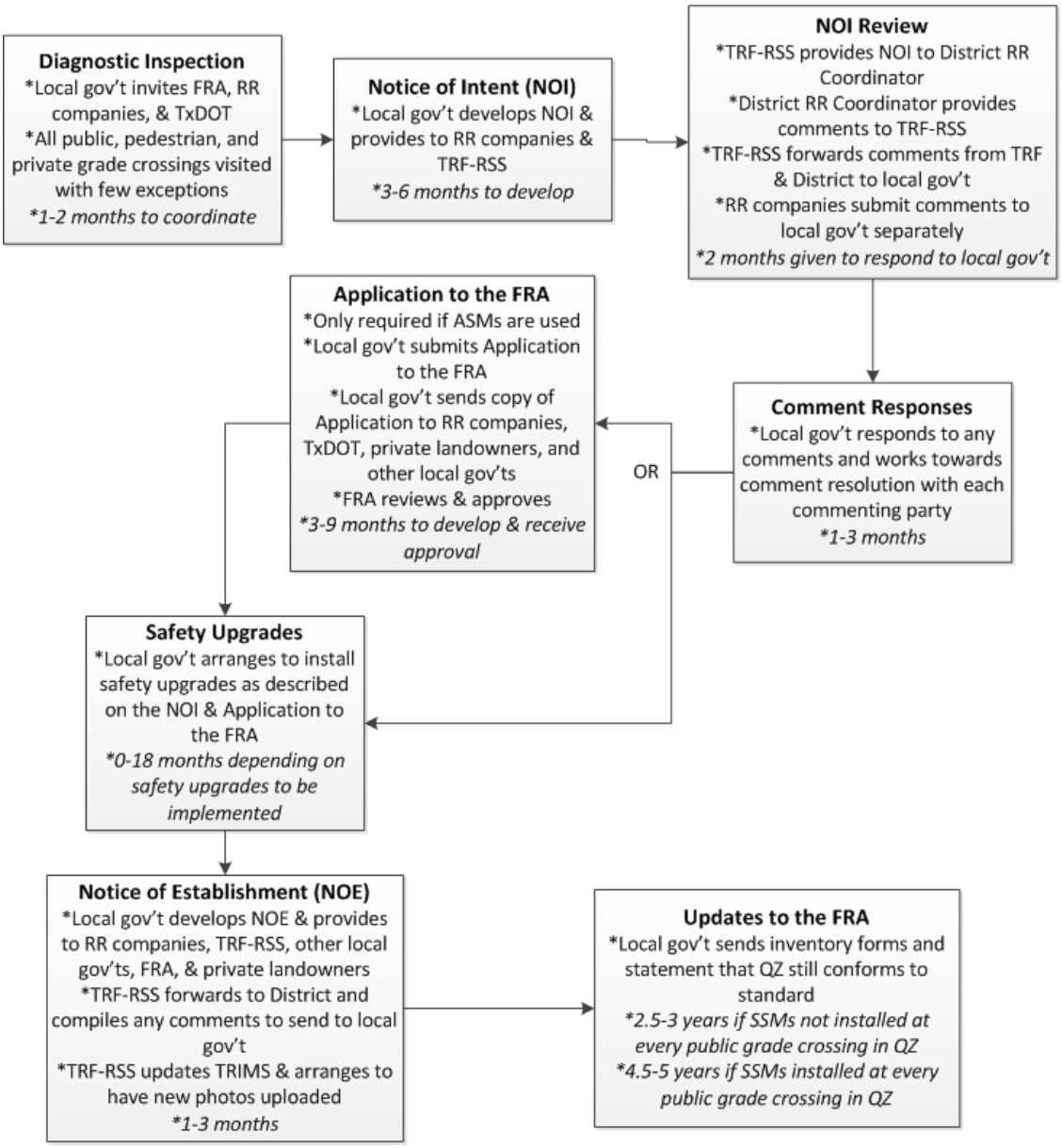


*Figure 11-1. Quiet Zone Project Flow Chart*

# Section 2 — Preliminary Activities

## Diagnostic Inspection

A diagnostic inspection is required prior to development of the Notice of Intent. The local government applying for a Quiet Zone sets up a diagnostic inspection to visit:

- all public at-grade crossings
- all pedestrian crossings
- any private crossings that the public can access or which access commercial or industrial property.

The following parties are invited to the diagnostic inspection with the local government:

- FRA
- railroad companies operating on crossings within the Quiet Zone
- TxDOT (acting as state agency responsible for grade crossing and road safety).

TxDOT is not required to attend the diagnostic inspection, but must be informed of the diagnostic inspection in advance by the local government applying for the Quiet Zone. The District Railroad Coordinator may attend, or a representative from the TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS).

Diagnostic inspections for Quiet Zones should identify:

- recommended safety improvements at all crossings
- how the proposed Quiet Zone will qualify
- any other concerns at crossings when a train horn is not sounded
- any discrepancies found with FRA inventory.

For more information on diagnostic inspections, see Chapter 4.

## Notice of Intent (NOI)

Following the recommendations of a diagnostic inspection, a local government will produce a Notice of Intent (NOI), to be provided to:

- railroad companies operating on crossings within the Quiet Zone
- TxDOT (acting as the state agency responsible for grade crossing and road safety).

All parties are given 60 days to comment on the NOI. Any parties not responding within 60 days are assumed to not have any comments.

### Requirements of an NOI

NOI documentation must include:

- a list of each public, private, and pedestrian at-grade crossing within the proposed Quiet Zone, including DOT numbers and street or highway names
- a statement of time period when the train horn will not be sounded
- an explanation of existing safety devices or safety improvements that the local government will implement at each crossing in order to qualify for the proposed Quiet Zone
- a point of contact at the local government
- names and addresses of all individuals who were sent a copy of the NOI for comment
- a copy of the FRA Quiet Zone Calculator report if the Quiet Zone does not have Supplementary Safety Measures (SSMs) at all public at-grade crossings within the Quiet Zone or a spreadsheet of calculations.

All open public at-grade crossings within a new Quiet Zone must have:

- gates that cover all approach lanes
- railroad constant warning circuitry (if reasonably practical)
- railroad power-off indicators
- no Train Horn (W10-9) warning sign on all approaches, including hours in effect for Partial Quiet Zones (unless a wayside horn is present)
- no Train Horn (W10-9) warning sign on any parallel roadways to rail within 100 feet of rail, including hours in effect for Partial Quiet Zones (unless a wayside horn is present)
- bells, if pedestrians use the crossing.

All open private at-grade crossings within a new Quiet Zone must have:

- a crossbuck and stop sign on all approaches
- no Train Horn (W10-9) warning sign on all approaches, including hours in effect for Partial Quiet Zones (unless a wayside horn is present).

All open pedestrian at-grade crossings within a new Quiet Zone must have:

- no Train Horn (W10-9) warning sign on all approaches, including hours in effect for Partial Quiet Zones (unless a wayside horn is present).

In addition, the Quiet Zone must meet the following requirements:

- Quiet zone must be a minimum of ½ mile long along track.
- There must be at least one open public at-grade crossing on either end of the Quiet Zone (not in Quiet Zone) separating it from other Quiet Zones.
- Must be compliant with the TMUTCD.

The new Quiet Zone may not be ½ mile long if it is being added to an existing Quiet Zone, provided locomotive horns are not sounded within ½ mile of the New Quiet Zone.

# Section 3 — Approving a Quiet Zone

## Qualifying for a Quiet Zone

A Quiet Zone may be established without approval of the FRA if:

- one or more Supplementary Safety Measures (SSMs) is installed at all public at-grade crossings within the Quiet Zone
- the Quiet Zone Risk Index (QZRI) is at or below the Nationwide Significant Risk Threshold (NSRT) after any necessary SSMs are installed
- the QZRI is at or below Risk Index with Horns after any necessary SSMs are installed.

The NSRT is an average value established for all gated public crossings in the U.S. where train horns are sounded. It is updated annually by the FRA and published on the FRA website. Any Quiet Zones which qualify under this rule no longer qualify if a revised NSRT drops below the QZRI.

Local governments may also establish a Quiet Zone with approval of Alternative Safety Measures to be approved by application to the FRA.

## Supplementary Safety Measures (SSMs)

Approved Supplementary Safety Measures (SSMs), to be installed on all approaches to an at-grade crossing, with associated effectiveness, include:

- temporary closure of at-grade crossing during hours which Partial Quiet Zone is in effect (Effectiveness: 1.0)
- four-quadrant gate systems with no presence detection (Effectiveness: 0.82)
- four-quadrant gate systems with presence detection (Effectiveness: 0.77)
- four-quadrant gate systems with traffic of at least 60 feet with or without presence detection (Effectiveness: 0.92)
- gates with channelization devices (Effectiveness: 0.75)
- gates with non-transversable curbs with or without channelization devices (Effectiveness: 0.80)
- one-way street with gates (Effectiveness: 0.82)
- permanent closure of at-grade crossing (Effectiveness: 1.0).

The effectiveness represents the ability of the SSM to reduce grade crossing crashes. For example, closing a crossing reduces 100% of at-grade crossing crashes while installing gates with channelization devices reduces 75% of crashes. Effectiveness values are subject to change by the FRA.

The following requirements apply when installing SSMs:

- All approach and exit lanes must be covered by gates in a four-quadrant system.
- Horizontal distance between two gate ends must not be more than two (2) feet.
- Horizontal distance between a gate and a raised median or channelization device or curb must not be more than one (1) foot.
- Medians or channelization devices must extend at least 100 feet from gate arm, or if there is an intersection within 100 feet of the gate, the median or channelization device must extend at least 60 feet from the gate arm.
- Non-transversable curbs must be a minimum of 6 inches in height and only used when the roadway speed limit is 40 mph or less.
- Any streets, alleys, or commercial driveways within 60 feet of at-grade crossing (parallel with rail) must be closed if medians or channelization devices are proposed.
- Non-transversable curb must extend back 100 feet from the gate if only one gate is used on a one-way street.

### Alternative Safety Measures (ASMs)

Alternative Safety Measures (ASMs) may also be proposed to the FRA who will determine the effectiveness used in Quiet Zone Risk Index calculations. There are three types of ASMs:

- Modified SSMs (i.e. channelization devices that are less than 60 feet long)
- Non-Engineering ASMs (i.e. traffic law enforcement program)
- Engineering SSMs (i.e. engineering improvements to address sight distance).

### Quiet Zone Risk Index (QZRI)

A Quiet Zone Risk Index (QZRI) must be calculated whenever SSMs are not installed at all crossings. To calculate a QZRI, the following procedure is followed:

1. Determine the crossing Risk Index with Horns (RIWH) for each public at-grade crossing in the Quiet Zone prior to any adjustments for SSM effectiveness.
2. Determine the crossing Risk Index (Crossing Risk Index = RIWH x 1.668 x [1-Effectiveness]) for each public at-grade crossing in the Quiet Zone after any current or planned SSMs/ASMs are installed.

3. Determine the RIWH (average of crossing RIWH in absence of any existing or proposed SSMs for all public at-grade crossings in the Quiet Zone).
4. Determine the QZRI (average of Crossing Risk Index for all public at-grade crossings in the Quiet Zone).

The initial RIWH calculation may be determined from the FRA website Quiet Zone Calculator and is a calculation based on:

- AADT
- the trains per day
- the number of day through trains
- the total switching trains per day
- the number of main tracks
- the number of other tracks
- if the crossing is in an urban or rural location
- if the roadway is paved or not
- the maximum train speed
- the number of roadway lanes
- the number of years of crash data
- the number of crashes in crash data years.

NOTE: Any existing grade separated or closed crossings may not be considered when calculating the QZRI. For any proposed closed crossings, the existing traffic counts at the crossing must be distributed among adjacent crossings for AADT calculations.

Visit the FRA website Quite Zone Calculator for more information.

### Wayside Horns

Wayside horns may be used in place of locomotive horns at individual or multiple at-grade crossings within Quiet Zones and are considered a one-for-one substitution for train horns. The wayside horn is a stationary horn located at a rail-highway at-grade crossing which directs noise down the roadway rather than at surroundings. Any at-grade crossing with a wayside horn is not considered when calculating the QZRI.

### TxDOT Review

TRF-RSS is mailed a copy of an NOI by the local government. TRF-RSS forwards the NOI to the District Railroad Coordinator for any comments and compiles these comments with any comments from TRF-RSS for response to the local government.

NOIs are reviewed to ensure the proposed Quiet Zone:

- meets requirements described in this chapter
- meets requirements typically included on Federal Signal Program (FSP) projects
- is calculated correctly if the Quiet Zone applies because the QZRI is less than or equal to the RIWH or NSRT
- individual crossing data (traffic counts, train counts, etc.) is correct if the Quiet Zone applies because the QZRI is less than or equal to the RIWH or NSRT
- includes all crossings along the section of rail indicated as shown in TRIMS.

For more information on reviewing plan sets, see Chapter 7.

Any data discrepancies noted between the NOI and TRIMS are verified between TRF-RSS, the local government, and the railroad company. TRF-RSS coordinates any inventory updates in TRIMS and with the FRA.

### Application to the FRA

If any ASMs are included on the NOI, the local government will have to submit an application to the FRA for approval of the proposed Quiet Zone.

The following parties are provided a copy of the application to the FRA by the local government:

- railroad companies operating on crossings within the Quiet Zone
- TxDOT (acting as state agency responsible for grade crossing and road safety)
- any private landowners with private crossings within the Quiet Zone
- any other government agencies with jurisdiction over public crossings within the Quiet Zone.

The application must include:

- inventory forms for all crossings prior to any Quiet Zone upgrades. Any changes to reported inventory information must be transmitted to TRF-RSS.
- explanation of safety improvements the local government will implement in order to qualify for the proposed Quiet Zone
- a copy of the recommendations of the diagnostic team and a list of anyone who attended the diagnostic inspection

- a copy of comments from TxDOT and all operating railroad companies in response to the NOI and any response to the comments
- commitment to implement proposed safety improvements
- data analysis that shows proposed improvements will reduce QZRI below NSRT or RIWH
- five-year projected vehicular and rail traffic counts for any new crossings located within proposed Quiet Zone.

# Section 4 — Implementing a Quiet Zone

## Notice of Quiet Zone Establishment (NOE)

A local government may issue an NOE after:

- all parties have been given 60 days to comment on the NOI
- all comments from the NOI have been resolved with all commenting parties
- the FRA application has been approved (if ASMs are proposed)
- any required safety upgrades have been implemented and inspected.

The following parties are provided a copy of the NOE by the local government:

- railroad companies operating on crossings within Quiet Zone
- TxDOT (acting as state agency responsible for grade crossing and road safety)
- any other government agencies with jurisdiction over public crossings within the Quiet Zone
- FRA
- any private landowners with private crossings within Quiet Zone.

The NOE must include:

- the date the Quiet Zone will be established (no sooner than 21 days of the mailing date)
- a list of all crossings and street names within the Quiet Zone
- a statement of which provision of 49 CFR §222.39 that the Quiet Zone qualifies under
- a copy of Quiet Zone Calculations if SSMs weren't installed at all public crossings
- a copy of FRA approval if application was sent to the FRA
- a statement that operating railroad companies and TxDOT were invited to attend the diagnostic inspection
- a copy of recommendations of the diagnostic team
- a statement of when the train horn will not be sounded
- inventory forms for all crossings prior to any Quiet Zone upgrades
- inventory forms for all crossings after implementation of any Quiet Zone upgrades
- a statement that an NOI was provided to operating railroad companies and TxDOT along with the date it was mailed
- confirmation that all comments were resolved or all parties had no comments if an NOE is established within 60 days of the NOI

- contact information for the person responsible for Quiet Zone compliance at the local government and their contact information
- listing of dates and names of all parties receiving a copy of the NOE
- statement signed by the head of the local government agency that information on the NOE is accurate to the best of their knowledge.

TRF-RSS will forward any NOE information to the District Railroad Coordinator and compile any comments to be sent back to the local government if necessary.

TRF-RSS will make any necessary updates in TRIMS after receipt of the NOE, and request new photos of crossings if needed.

### Safety Upgrades on TxDOT Roadways

If the local government applying for the Quiet Zone proposed any upgrades on TxDOT facilities, an AFA must be executed between the local government and TxDOT. TxDOT may arrange for the improvements or decide to have the local government perform the work. Any safety upgrades are generally funded by the local government.

If TxDOT constructs the safety upgrades, a Construction & Maintenance (C&M) Agreement will be required with the railroad company. See Chapter 2 for more information.

### Quiet Zone Updates to the FRA

Periodic updates are required to be submitted by the local government to the FRA. The updates are required:

- every 2.5-3 years if SSMs are not installed at every public crossing within the Quiet Zone
- every 4.5-5 years if SSMs are installed at every public crossing within the Quiet Zone.

The updates to the FRA must include:

- a statement that the Quiet Zone still conforms to the standard under which it qualified
- an accurate inventory form for every public, private, and pedestrian crossing within the Quiet Zone.

### Termination of a Quiet Zone

A Quiet Zone may be terminated by:

- request of local government
- the FRA after review of the Quiet Zone at any time

- the FRA if the Quiet Zone qualified because the QZRI was originally below the NSRT, the NSRT has now fallen below the QZRI, and the local government does not take proper steps to implement safety upgrades within the Quiet Zone.

The party terminating the Quiet Zone must contact all parties who were provided a copy of the initial NOE. TRF-RSS updates TRIMS as needed.

# Chapter 12 — Database

**Contents:**

# Section 1 — Crossing Database

## Crossing Identification Numbering System

Every at-grade or grade separated crossing is assigned a unique U.S. Department of Transportation (USDOT) identification number, also referred to as a DOT number, consisting of six numeric characters and an alphabetic character. This applies to all public and private crossings.

At at-grade crossing locations, the DOT number is typically seen on the Emergency Notification Sign (ENS) at the crossing or on a sign found on the railroad cabin.

## FRA Database

The FRA maintains a database with data on public and private crossings within the United States. The database contains information for each crossing, including:

- inventory form with basic information about the crossing
- crash reports filed with the Federal Railroad Administration (FRA)
- contact information
- historical changes to the inventory data.

Data on the FRA website is updated continually on request by both railroad companies and public agencies to the FRA. The crossing inventory form submitted to the FRA includes data provided by both the railroad company and by roadway authority. The TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS) is the only agency in Texas authorized to update the public portion of the FRA Database.

# Section 2 — Texas Railroad Information Management System (TRIMS)

## Overview

TxDOT has adopted the Texas Railroad Information Management System (TRIMS) as a statewide database for tracking various data related to rail-highway applications. TRIMS is a geospatial database which employs roadway maps and satellite images from Microsoft Bing, as well as rail line data from the TxDOT Transportation Planning and Programming Division (TPP).

Some of the features of TRIMS include:

- a crossing inventory module, including photographs of each crossing
- a project management module for tracking rail-highway projects and tying these to the crossing inventory via DOT numbers
- ability for outside users to view crossing inventory data and submit requests to update any incorrect data
- ability for TxDOT users to edit inventory and project data
- ability to view which data has been edited over time.

See the "Railroad Crossing Information Management" on the Traffic Operations Division website for information on obtaining a TRIMS login.

## TRIMS Versions

There are three versions of TRIMS with various capabilities:

- CoreTRIMS
- WebTRIMS
- FieldTRIMS.

## CoreTRIMS

The most advanced version of TRIMS, CoreTRIMS, allows users to view and edit data in both the crossing inventory and project management modules, depending on user access. CoreTRIMS is accessed on TxDOT workstations only.

## WebTRIMS

WebTRIMS is accessed via a web browser and is intended for non-TxDOT users. Access is provided to the crossing inventory module, but not to the project management module. Users cannot

update data, but can enter comments regarding incorrect data. TRF-RSS investigates the comments and updates the data as needed.

### FieldTRIMS

FieldTRIMS is a mobile data collection tool that does not need connection with the central TRIMS database. Users can update crossing inventory and take photos of crossings in the field. This data can later be synced up with the central TRIMS database when internet service is available.

### Crossing Inventory Data Integrity

Integrity of inventory data in TRIMS is extremely important. Some of the uses of the crossing data include:

- prioritization of at-grade crossings for safety upgrades under the Federal Signal Program (FSP)
- prioritization of at-grade crossings for grade separation under the Rail Grade Separation (RGS) Program
- various reports needed for state and federal government.

Some critical data at each at-grade crossing requiring regular updating includes:

- train counts (through and switching)
- minimum and maximum train speeds
- AADT
- special vehicle movements
- percent trucks
- roadway speed limit
- FRA reported crash history.

Other data requiring updates after a project impacting the crossing is completed includes:

- crossing status (open, closed, abandoned, out of service, or under construction)
- crossing type (public, private, or pedestrian)
- crossing position (at-grade, railroad over, railroad under)
- roadway type (one-way or two-way)
- types and quantities of warning devices
- presence of medians or channelizing devices
- whether an adjacent intersection or traffic signal exists

- number of tracks at crossing
- crossing surface type
- crossing length
- if Quiet Zone exists
- number of lanes at crossing
- if truck lane exists at crossing
- number of sidewalks at crossing
- roadway surface
- roadway width
- shoulder type and width
- signs at crossing and on approaches
- pavement marking and illumination information
- ENS information
- if crossing has low clearance issue
- highway functional class
- area land use and development type
- stopping sight distance and related information for passive crossings
- changes to rail lines (removals, additions, relocations)
- photos of crossing.

Any changes to rail line data is coordinated through TPP for updates to the statewide rail map and server that links to TRIMS to reveal this information.

Crossing data found in TRIMS that does not typically require updating includes:

- DOT number
- roadway approach directions
- railroad company, division, subdivision, and milepost
- highway and street name
- city, county, and TxDOT District
- National Bridge Inventory (NBI) bridge number
- latitude, longitude, and elevation
- crossing angle

- track orientation direction
- adjacent crossing information.

### Crossing Data Responsibilities

On an annual basis, or as railroad capital improvement projects are completed, railroad companies should submit to TRF-RSS accurate:

- train counts (through and switching)
- minimum and maximum train speeds.

TRF-RSS receives annual updates from TPP to:

- AADT
- roadway speed limit
- roadway functional classification
- percent trucks.

This information may be found on the Statewide Planning Map maintained by TPP.

TRF-RSS typically receives updates from districts on special vehicle movements.

Average daily traffic in TRIMS is calculated using either the AADT estimation provided by TPP or by a Programmed Annual Average Daily Traffic (PAADT) if available. A PAADT is an actual count performed in the field by either TxDOT or local government. Since a PAADT represents actual counts taken, the PAADT is used in lieu of the AADT for the purposes of performing FSP or RGS program rankings.

TRF-RSS updates crash data in TRIMS on a monthly basis based on data found within the FRA database.

### Crash Records Information System (CRIS)

The Crash Records Information System (CRIS) is a statewide database used for filing police reports for crashes on any public roadway in Texas. CRIS can serve as a separate source of data for verifying crash data provided in the FRA database. CRIS data is not currently incorporated into TRIMS.

Crash reports may be obtained online.

## TRIMS Project Management Module

The project management module in TRIMS includes information for all types of rail-highway projects. Some data in the project module includes:

- CSJ and project numbers
- project type (construction, replanking, or safety)
- DOT numbers impacted
- location info (city, county, roadway, district)
- letting dates
- listing of project steps and completion dates
- project attachments including diagnostic notes, preemption forms, PE Agreements, C&M Agreements, Authority to Order Materials, Work Orders, inspection notes, approved invoices, Completion Letters, Completion Checklists, etc.
- description of project and scope of work
- journal entries
- basic cost information.

TRF-RSS and District Railroad Coordinators share responsibility for project updates in TRIMS. TRF-RSS creates the projects, adds basic project info and steps, and typically uploads any agreement information and Completion Checklists to the project. Work orders, inspection diaries, approved invoices, and Completion Letters are uploaded by Districts.

Only TxDOT users have access to the TRIMS Project Management Module.

# Chapter 13 — Maintenance

**Contents:**

# Section 1 — Grade Crossing Maintenance

## Railroad Company Responsibilities

Railroad companies are generally responsible for maintenance of:

- crossing surface from edge of tie to edge of tie on at-grade crossings (panels, rail, ties, ballast, and subballast)
- active warning systems (gates, mast flashers, cantilevers), including energy charges
- crossbuck, Number of Tracks, Stop, Yield, and ENS signs
- vegetation and sight obstructions within 250 feet of at-grade crossing on railroad right-of-way
- railroad circuitry, including preemption circuitry and operation from railroad cabin
- superstructure of underpasses.

Although the railroad companies maintain these items, TxDOT does provide assistance for railroad crossing surface replacement on state routes via the Replanking Program. See Chapter 5 for details.

District Railroad Coordinators should make an effort to routinely inspect crossing surfaces to identify candidates for the Replanking Program. Additionally, any operational or maintenance issues regarding active warning systems, crossbuck signs, or sight distance obstructions should be coordinated with the TxDOT Traffic Operations Division-Rail Safety Section (TRF-RSS) and the railroad company. Typical issues may include:

- broken gates
- malfunctioning gates or flashing lights
- gates, cantilevers, crossbuck signs, or mast flashers that have been hit by vehicular traffic
- non-reflective signs (must be inspected at night)
- missing signs
- vegetation that is causing sight distance issues
- scrape marks on gauge crossing surface panels or panels that rock or have shifted
- damaged crossing surface panels
- clogged or blocked drainage pipes at a crossing.

## TxDOT Responsibilities

On state routes, TxDOT is generally responsible for the maintenance of:

- pavement up to crossing surface panels on both sides of at-grade crossings. This includes pavement between multiple sets of railroad crossing panels.
- base material beneath subballast at at-grade crossings
- design features such as guardrail, retaining walls, medians, curbs, and sidewalks at at-grade crossings
- signing, striping, raised pavement markers, delineators, and object markers (not including crossbuck signs) at at-grade crossings
- retroreflective tape on crossbuck signs
- timing settings and maintenance of preempted traffic signals
- inspection and maintenance of overpass structures, including drainage, fencing, and DOT Number stenciling
- lighting and energy charges for lighting over a railroad track on an overpass
- substructure (columns), guardrail, barriers, all roadway and sidewalk features, and vertical clearance signs at underpasses
- any pavement, curb and gutter, signs, lighting, or other features on railroad right-of-way not at at-grade crossings.

District Railroad Coordinators should make an effort to visit on-system at-grade crossings to inspect the applicable items above as time permits. Typical issues may include:

- missing stop bars and approach striping
- missing or incorrect railroad crossing pavement markings (should be adjacent to W10-1 Grade Crossing Advance Warning Sign)
- missing railroad crossing warning signs on both approaches and on parallel streets within 100’ of rail
- nonreflective signs and pavement markings (must be inspected at night)
- pavement cracking due to truck loadings or humped crossings
- broken or missing raised pavement markers, delineators, and object markers.

**Joint Responsibility**

Areas of maintenance that generally require a joint effort by TxDOT and the railroad company or may be governed by a specific agreement include:

- common ditches
- pipes, culverts, and conduits on railroad right-of-way or under tracks

- traffic signal preemption and associated interconnection with the railroad cabin (See Section 2 for details.).

Any sight inspections of crossing locations should be verified against existing inventory in TRIMS and corrected as needed. Photographs of the crossing should also be taken and uploaded as the most current photos of the crossing.

# Section 2 — Preempted Traffic Signals

## Maintenance and Operations

Various settings in the traffic signal controller must be verified for compliance with the operation of the traffic signal controller and the preemption form (TxDOT Form 2304) for which the circuit was designed. The following procedures must be used when inspecting a traffic signal for preemption:

- Ensure controller delay time matches what is shown on preemption form (line 1).
- If delay time is used, ensure memory is set to non-locking so the controller does not accept false calls from the railroad company.
- Ensure minimum green time during preemption right-of-way transfer matches what is shown on preemption form (line 5).
- Ensure yellow change and red clearance times during preemption right-of-way transfer, after track clearance green, and after transition out of preemption, are **not** less than what is programmed for normal operation of the signal for any phase (when signal is not under preemption) per Section 4D.27 of the TMUTCD.
- Ensure yellow change and red clearance times during preemption right-of-way transfer match what is shown on the preemption form (lines 7 and 8).
- Ensure pedestrian walk time matches preemption form (line 11).
- Ensure pedestrian clearance time matches preemption form (line 12).
- Ensure track clearance green time matches what is shown on preemption form (line 51).
- Ensure track clearance, dwell/limited cycle, and exit phases are programmed properly in the controller.
- If a train passes through the crossing, verify that track clearance green does not terminate prior to the gates going down.
- If the gate-down circuit is used and a train passes through crossing, confirm that track clearance green terminates when gates go down and gate down preempt becomes active.
- Document any changes made to signal timings in the logbook in the traffic signal controller.
- Ensure preemption form and traffic signal layout design sheets are available in the cabinet.
- Ensure a warning label is present in the housing indicating the presence of the interconnection and that the cabling shall not be tampered or disconnected.
- Ensure battery back-up system is connected and functioning properly.
- Ensure interconnection conductor and conduit are functional.

Railroad companies are required to test preemption circuits on a monthly basis. Although the District Railroad Coordinator would not typically be present with the railroad company to verify that advanced preemption time is correctly functioning from the railroad company, the timing settings in the controller should be verified from time to time to verify the preemption is functioning as designed on the preemption form.

### Traffic Signal Design Changes

Another common concern involves when traffic signal timing modifications are made due to changes in speed limits or lane configurations. Ultimately, if changes are made, the yellow change and red clearance times during preemption cannot be less than what is programmed for normal operation of the signal for any phase. If the yellow change and red clearance times increase under normal operation, the times must also increase under preemption and other time during preemption must be sacrificed. This could typically occur by reducing delay time, minimum green time during right-of-way transfer, pedestrian timing during right-of-way transfer, or separation time, and would require that the preemption form be updated by the District Railroad Coordinator.

If a traffic signal is upgraded to accommodate pedestrian movements, the preemption setup should also be evaluated to see if pedestrians should be considered during preemption.

Finally, any changes to a roadway intersection adjacent to a railroad crossing should be coordinated with the affected railroad company. This includes if all work is performed off of railroad right-of-way to ensure there are no traffic impacts to the railroad crossing or preemption setup.

# Chapter 14 — Policy

**Contents:**

# Section 1 — References

## Manuals

The following manuals are commonly referenced for rail-highway projects:

- **Texas Manual on Uniform Traffic Control Devices (TMUTCD).** Published by TxDOT, the TMUTCD provides legally enforceable design standards for pavement markings, signs, traffic signals, and work zone setups. Applicable sections include Section 4C.10 (Warrant 9, Intersection Near a Grade Crossing), which describes a warrant that may be used for installing a traffic signal with preemption, and Part 8 (Railroad), which provides design standards for signing, striping, and grade crossing warning devices.
- **Railroad-Highway Grade Crossing Handbook.** Published by the FHWA, the Railroad-Highway Grade Crossing Handbook presents a comprehensive set of design guidelines for at-grade crossings.
- **The American Railway Engineering and Maintenance-of-Way Association (AREMA) Communications & Signals Manual of Recommended Practice.** The AREMA Communications & Signals Manual of Recommended Practice provides standards for various signaling equipment used by railroad companies. Of particular use is Section 3 (Highway-Rail Grade Crossing Warning Systems) which provides design guidelines for warning systems and preemption at at-grade crossings, and Section 1.3 (Recommended Contracts & Agreements) which provides guidelines for provisions and cost estimates in agreements between railroad companies and public agencies.
- **The American Railway Engineering and Maintenance-of-Way Association (AREMA) 2014 Manual for Railway Engineering.** The AREMA 2014 Manual for Railway Engineering provides design guidelines for railroad projects. Although the majority of this manual is not generally applicable to highway projects, Chapter 5, Track, Section 8, Highway/Railway Grade Crossings, provides guidelines for at-grade crossings.
- **Preemption of Traffic Signals Near Railroad Crossings.** Published by the Institute of Transportation Engineers, this report describes various recommended best practices for traffic signal preemption.
- **A Policy on Geometric Design of Highways and Streets.** Published by AASHTO, this policy describes various aspects of highway design. Of particular importance is Chapter 9.12, Railroad-Highway Grade Crossings, which provides guidelines for roadway elevations at at-grade crossings to eliminate vehicle hang-ups and a procedure to determine proper sight distance at an at-grade crossing.
- **TxDOT Roadway Design Manual.** The TxDOT Roadway Design Manual provides guidelines on roadway design, including roadway alignment, lane widths, medians, drainage facilities, shoulder design, roadway grades, superelevation, and use of guardrail.

- **TxDOT Bridge Project Development Manual.** The TxDOT Bridge Project Development Manual describes design criteria and processes for bridge projects, including the Railroad Grade Separation (RGS) Program.

### Other Resources

The following other resources are also available for reference for rail-highway projects:

- FSP Diagnostic Inspection Form (Form 2567)
- Railroad Signal Final Inspection Report (Form 2568)
- Concrete Planking Installation Inspection Form (Form 2566).

# Section 2 — Laws Impacting Rail-Highway Projects

## State Laws Applicable to Rail-Highway Projects

- **Texas Administrative Code (TAC), Title 43 (Transportation), Part 1 (Texas Department of Transportation), Chapter 7 (Rail Facilities).** 43 TAC 7 establishes requirements and responsibilities for at-grade crossings.
- **Texas Transportation Code, Title 6 (Roadways), Subtitle Z (Miscellaneous Roadway Provisions), Chapter 471 (Railroad and Roadway Crossings).** Chapter 471 establishes requirements and responsibilities for at-grade crossings.

## Federal Laws Applicable to Rail-Highway Projects

- **Code of Federal Regulations (CFR), Title 23 (Highways), Chapter 1 (FHWA, DOT), Subchapter G (Engineering and Traffic Operations), Part 646 (Railroads).** 23 CFR Part 646 includes various regulations related to contractors providing insurance when working on railroad rights-of-way, and executing agreements between states and railroad companies.
- **Code of Federal Regulations, Title 23 (Highways), Chapter 1 (FHWA, DOT), Subchapter B (Payment Procedures), Part 140 (Reimbursement), Subpart I (Reimbursement for Railroad Work).** 23 CFR Part 140 provides policies and procedures for reimbursement to the states for railroad company work on projects.
- **Code of Federal Regulations, Title 23 (Highways), Chapter 1 (FHWA, DOT), Subchapter J (Highway Safety), Part 924 (Highway Safety Improvement Program).** 23 CFR Part 924 provides regulations for the HSIP program, including at-grade crossings.
- **Code of Federal Regulations, Title 49 (Transportation), Subtitle B (Other Regulations Relating to Transportation), Chapter 2 (FHWA, DOT), Part 234 (Grade Crossing Safety, Including Signal Systems, State Action Plans, and Emergency Notification Systems).** 49 CFR Part 234 provides regulations for grade crossing safety, including maintenance and testing requirements by railroad companies.
- **United States Code (USC), Title 23 (Highways), Chapter 1 (Federal-Aid Highways), Section 130 (Railway-highway crossings).** 23 USC 130 establishes provisions for the elimination of hazards at at-grade crossings and provisions for funding. This is the funding source for Federal Signal Program (FSP) projects.
- **United States Code, Title 49 (Transportation), Subtitle 5 (Rail Programs), Part B (Assistance), Chapter 225 (Federal Grants to States for Highway-Rail Grade Crossing Safety).** 49 USC Chapter 225 establishes provisions for federal grants on grade crossing programs, including safety improvements, state action plans, and Operation Lifesaver.

## Tabular List of Laws

The table below lists various state and federal laws related to specific issues commonly encountered with rail-highway projects and operations. Refer to the specific code for clarification.

**State and Federal Laws Related to Rail-Highway Projects and Operations**

| Code | Issue |
|---|---|
| 49 CFR Part 222 | Laws requiring railroad companies to sound horn at at-grade crossings and provisions for Quiet Zones |
| 23 CFR §646.210 | Requirement that railroad companies participate 5% on grade separation projects of existing active crossings when federal funds are used. |
| 23 USC §130(i) | Requirement that railroad companies must match at least $7,500 for crossing closure projects for locations not on a prioritized list of crossings for FSP upgrades |
| Tex. Transp. Code §471.009 | Pavement marking standards for local governments for at-grade crossings not on the state highway system when state or federal funds are used for the pavement markings |
| 49 CFR §§234.309-234.311 | Laws and standards regarding ENS signs |
| 49 CFR Part 840;<br>49 CFR §234.7;<br>49 CFR Part 225;<br>43 TAC §7.33;<br>43 TAC §7.86 | Reporting requirements by railroad companies for crashes at at-grade crossings |
| Tex. Transp. Code Ch. 191;<br>23 CFR Part 646B<br>43 TAC §7.36 | Minimum requirements for vertical and horizontal clearance for structures and bridges over railroads |
| 49 CFR §213.37;<br>49 CFR §213.321;<br>43 TAC §7.37 | Railroad company responsibilities for trimming vegetation and reducing visual obstructions near at-grade crossings |
| Tex. Transp. Code §§471.002 and 471.004;<br>43 TAC §7.102 | Crossbuck maintenance and state requirements for affixing retroreflective tape on crossbuck signs |
| 43 TAC §7.103;<br>Tex. Transp. Code §471.005 | Requirements for railroad companies dismantling warning devices on active rail lines |
| 43 TAC §7.104 | Division of maintenance responsibilities at a railroad underpass |
| 43 TAC §7.105 | Requirements for spur permits when railroad company spur tracks cross existing state highways |
| 43 TAC §7.106;<br>Tex. Transp. Code §§112.058, 112.059, and 471.001 | Law that railroad companies shall not charge fees for at-grade crossings; requirements for maintenance of railroad crossing surfaces |
| Tex. Transp. Code §545.251 | Law clarifying it is illegal to drive around, through, or under a descending gate or go through an at-grade crossing if a train can clearly be seen |

**State and Federal Laws Related to Rail-Highway Projects and Operations**

| Code | Issue |
|---|---|
| 43 TAC §7.41 | Requirement that railroad companies operating in Texas pay an annual rail safety program fee |
| Tex. Transp. Code §545.252 | Law providing authority for state to install stop signs at at-grade crossings |
| 49 CFR §234.261 | Requirement that traffic signal preemption circuits are tested at least once per month by railroad companies |
| 49 CFR §1152 | Procedures for abandoning a rail line |
| Tex. Transp. Code §545.302 | Illegal to stop on an at-grade crossing or park within 50 feet of crossing |
| Tex. Transp. Code §544.005 | Illegal for individual to interfere with railroad sign or device |
| Tex. Transp. Code §544.006 | Illegal to place device that blocks view of railroad sign or signal |
| Tex. Penal Code §28.07 | Illegal to trespass on railroad right-of-way or interfere with railroad operations |
| 23 CFR §646.214 | Requirement that all access-controlled facilities be grade separated from railroad crossings |
| 23 CFR §646.214 | Requirement that all traffic control devices proposed at at-grade crossings are compliant with the MUTCD |
| 23 CFR §646.214 | Conditions where gates must be installed at at-grade crossings on construction projects with federal aid |
| 49 CFR §213.347 | At-grade crossings not allowed on Class 8 or Class 9 railroad tracks (160 or 200 mph train speed) |
| 49 CFR §234.11<br>49 USC §22501 | Requirement that the 10 states with the most grade crossing crashes, on average, from calendar years 2006-2008, produce a grade crossing action plan |
| 49 CFR §234.9 | Requirement for railroad companies reporting malfunctioning active grade crossing warning systems within 15 days of failure |
| 49 CFR §234.223;<br>49 CFR §234.225 | Requirements that:<br>◆ Flashing lights must flash for three (3) seconds before a gate arm descends<br>◆ Flashing lights must activate at least 20 seconds prior to arrival of train at an at-grade crossing<br>◆ Gates must be horizontal for at least five (5) seconds prior to arriving train |
| Tex. Transp. Code §§545.253, 545.2535, 545.254, 545.255, and 647.010 | Laws requiring various types of vehicles to stop at at-grade crossings unless exempt |
| 23 USC §409 | Reports, surveys, lists, or data for evaluating railroad crossings shall not be admitted for evidence in a federal or state court |
| TMUTCD Section 8B.10 | Requirements that:<br>◆ Gate arms shall be removed and signal heads removed or hooded or turned from view if a track is placed out of service<br>◆ Traffic control devices must be relocated or modified if a track is closed at a multiple track crossing |