

Chapter 6A

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Highway-Rail Grade Crossing Accident Guide

FRA frequently investigates highway-rail grade crossing accidents. Things to consider are:

The police report can be the basis for your report.

There must be a site visit, but it doesn't have to be done immediately. You can wait several days if need be.

You must perform a thorough evaluation of the crossing, to include:

If active protection: find out how the system has performed (reliability). To do so:

- Review railroad records.
- Talk to local law enforcement officers.
- Interview local citizens who live or work adjacent to the crossing.
- Interview any survivors of the highway vehicle.
- Interview the railroad signal maintainer.

If active or passive: get the following information:

- Type of warning device protection.
- Advance warning signs and pavement markings (state what wasn't there as well as what was there).
- Sight distance and obstruction information, to include the physical surroundings, and the sight distances from the locomotive and highway vehicles.
- Get photos of the immediate area. Show all obstructions in the photos.
- Find out what the state, county or municipal responsibilities are. For example, how would a decision be made that the crossing protection is or isn't adequate?
- Find out what the railroad responsibilities are. This includes not only active warning device obligations, but also whether or not they are required to maintain the pavement on each side of the crossing.
- See if there are joint municipal/railroad responsibilities. This might include situations where highway signals are connected to railroad signals.
- If there were adjacent tracks, would rolling equipment obstruct the view of the crossing? If so, under what circumstances does the railroad place cars on the track and how do they deal with the obstruction issue?

If you need information you can't obtain, call the Office of Safety Analysis.

The investigator must perform a thorough evaluation of the crossing, to include:

If active warning devices: If a signal inspector has not been assigned and any question arises regarding the operation of the warning devices (past or present), the assistance of a signal inspector should be sought (e.g., an allegation that they failed to operate, or that there has been a history of excessive failsafe operation). The first task is to determine how the system performed and its history. To do so:

- If at all possible, the investigator should be on-site for the post-accident warning device test. Alternatively, the investigator should witness an additional test.
- Obtain a copy of the record kept by any event recorder installed at the crossing.
- Document type(s) and length of circuits and major components included in the warning system.
- Determine if there are any preemption circuits and if any highway signals are interconnected to the warning system.
- Review railroad records.
- Talk to local law enforcement officers.
- Interview local citizens who live or work adjacent to the crossing.
- Interview the railroad signal maintainer.

Include in the final report, in addition to items mentioned above:

- The police report
- Accident history for the crossing (available from RRS-21.3)
- Inventory record for the crossing (available from RRS-21.3) noting any discrepancies
- Coroner's reports
- A sketch plat of the crossing to include tracks, highway, warning devices, site obstructions and measurements. Note positions from which witness observations and key photographs were made. Also, note directions of travel, final post-accident position of train, highway vehicle and bodies. Indicate "North."

The following text has been excerpted from the FRA General Manual. Minor editing changes have been made.

Accident Investigation Procedures

All Accidents – Things to Consider

1. Applicable operating rules in the accident area
2. Current timetable instructions in the accident area.
3. Pertinent bulletins, instructions, or messages for the accident area.
4. Railroad official's statement of method of operation in vicinity of the point of accident.
5. Carrier's interpretation of operating rules involved. (Important)

6. If train orders, clearance cards, messages, or dispatcher's train order book are involved, obtain one duplicate copy, preferably a photostat, of each order, message, etc.
7. Copies of statements made to agent or inspector by railroad employees or officials.
8. Transcript of testimony taken at carrier's hearing.
9. Print showing alignment of track(s) in vicinity of the point of accident. A scale of 100 to 200 feet per inch is desirable. The print should be made specifically for the accident under investigation and must contain valuation chaining stations (plus marks) showing the following:
 - (a) Point of accident.
 - (b) Point of each switch, if involved.
 - (c) Each signal involved.
 - (d) Beginning and end of each curve, spiral or tangent involved.
 - (e) Railroad station, or station sign or station point. (If a station or station sign is not shown on print, the print must show the distance between the point of accident and the nearest station in each direction, as shown in the timetable).
 - (f) Point where front end of locomotive(s) stopped.
 - (g) All important objects, structures, etc. in the vicinity of the point of accident that are mentioned in the transcript of the railroad's hearing or in statements.
 - (h) If involved, include point where track motorcar, highway vehicle, etc. stopped.
10. Print, on the scale of 50 feet to the inch, showing where each derailed locomotive or car stopped. This print should include, if practicable, any point, structure, etc. involved as mentioned in Item No. 7 above.

Note: A print showing details of signal layouts is not necessary, unless the accident involves a question concerning the proper functioning of a signal or signals or necessary to explain the operation of the signals involved.
11. Print showing profile of track in vicinity of the point of accident. This print may be incorporated with the print (Item No. 7) showing alignment of tracks.
12. Transcript of train sheet showing only the movement of train(s) involved and pertinent "remarks" entered by the train dispatcher.
13. Consist of train(s) involved.
14. If passenger train is involved, furnish information as to whether cars were of all-steel or steel-underframe construction. Itemize.
15. Record of persons killed and/or injured (F6180.55a reports for each railroad involved). Itemize to show number of passengers, railroad employees, Pullman employees, post-office employees, etc. Show occupation and train of each railroad employee.
16. Estimate of monetary damage to track and equipment. Itemize.

17. Train and engine employees' daily time returns and delay reports involved in the hours-of- service on the day of the accident. (Such records relating to service on previous trips are unnecessary unless there is a question concerning an employee's fatigue or a violation of the hours of service law). Explain station symbols, if any.
18. Service records of employees involved. Any such record should show age of employee, qualifications, date of last physical examination, etc. If a physical disability is an important factor, furnish medical details concerning the disability.
19. Photostat of tape from speed-recorder device, if any, with statement of qualified railroad official's analysis of recording on tape.
20. Photographs showing equipment, damage, track layout, views approaching point of accident, etc. Do not mark face of photos.
21. If single-track accident, include statement showing total number of train movements in the 30-day period immediately preceding date of accident. Itemize to show movements in each direction on each day.
22. If the construction or equipment of a car had any bearing upon an accident other than a derailment, include a print of the car with information as suggested in Item No 6 under "All Derailments."
23. If the lading of a car is involved in an accident other than derailment, include information as suggested in Items No 6 and 7 under "All Derailments."
24. If a condition of a locomotive contributed to the cause of an accident, notify the Washington office immediately.

All Derailments

In addition to information required for "All Accidents," submit the following in cases of derailments:

1. Print showing marks on track structure. All marks directly involved should be located with use of plus marks and with reference to the point of derailment, and be described in detail. Scale of print should not exceed 50 feet per inch.
2. Furnish photographs of marks of initial derailment of track structure. (Where marks on rails, frogs, etc., are of such nature that they will not show clearly on photographs, marking with white chalk will improve results.)
3. Track measurements to be taken at rail joints and rail centers. Such measurements should be taken from a point as near as practicable to the point of derailment to a point a considerable distance in the rear. The measurements should include the following:
 - (a) Cross levels under load
 - (b) Cross levels not under load
 - (c) Gage
 - (d) Curvature
 - (e) Any irregular alignment
4. A description of track structure, showing the following:

- (a) Length and weight of rail.
 - (b) Manufacturer.
 - (c) Year rolled.
 - (d) Whether new or re-laid.
 - (e) If cropped, show length of rail.
 - (f) The kind and length of joint bars.
 - (g) The number of bolts per joint.
 - (h) The size of ties used.
 - (i) Number of ties per rail length.
 - (j) Kind of wood (or other material) and whether treated or untreated.
 - (k) Type of tieplates in use, whether double-shoulder or single-shoulder.
 - (l) Type and number of rail-holding and plate-holding spike per tieplate.
 - (m) The number of rail anchors per rail length. Were they applied as required by the carrier?
 - (n) Kind of ballast and depth under ties.
 - (o) Was ballast maintained in accordance with carrier's requirements for standard ballast section?
5. Date track was last inspected, by whom, and results of inspection. Date and method used in last resurfacing of track.
6. If the failure of a car contributed to the cause of the derailment, furnish the following:
- (a) Initial and number of the car.
 - (b) Type of car.
 - (c) Print showing dimensions of car. Include outside and inside length, width, and height: length of car over striking castings, and distance between truck centers.
 - (d) Brief description of car. (All steel, steel underframe, etc.)
 - (e) Date built.
 - (f) Lightweight, nominal capacity, and load limit.
 - (g) Type of truck, number of wheels per truck, wheelbase of truck.
 - (h) Type and dimensions of wheels and axles.
 - (i) Date journals last repacked.
 - (j) Type of brake equipment. Dates of last cleaning and in-date testing.

- (k) Detailed description of failed part of the car. Include print and large photograph of failed part.
7. If the lading of the car is involved, in addition to Item No. 6, submit the following:
- (a) Description of lading.
 - (b) Manner in which material was loaded.
 - (c) A.A.R. rules pertaining to the loading of the car. Describe any variation from A.A.R. rules.
 - (d) Dimensions of lading, and distance of lading from sides and ends of car.
 - (e) Description of braces and stakes, if used.
 - (f) Photostat copy of waybill.
 - (g) Develop where car was loaded, where and by whom first inspected, when delivered to the carrier, and the results of such inspections. Develop where and by whom it was inspected en route, and the results of such inspections.

Derailment-Overturning Speed or Overturned Rail

In addition to information required for "All Derailments," obtain the following:

- 1. Statement from carrier indicating equilibrium, safe and overturning speeds of locomotive on curve involved.
- 2. Location of the center of gravity of all units of locomotive.
- 3. Estimate of the amount of fuel and water on units at time of the accident.

Derailment – Broken Wheel or Axle

In addition to information required for "All Derailments," Obtain the following:

- 1. Large photograph of broken surfaces.
- 2. Furnish print or sketch showing details of defect in failed material.
- 3. Chemical analysis of failed member.
- 4. In addition to the data requested in Item No 6 under "All Derailments," submit the following:
 - (a) Nominal and actual size of journal and wheels involved.
 - (b) History of wheel and axle involved.
 - (c) Condition of wheel treads and flanges, indicating the amount of service metal on wheels involved.
 - (d) When and where axle was last magnetic particle tested, or tested by other devices.

- (e) If hot journal is involved, develop when and where the journal boxes were last inspected, and the results of the inspection.
- (f) History of any previous overheating.
- (g) Type of wheels. All wheels and axle of failed wheel set.
- (h) Type of journal lubricator.
- (i) If the failed journal was equipped with roller bearings, obtain the following:
 - Type and serial numbers of roller bearings mounted on failed axle.
 - Condition of oil or grease, and date of last attention.
 - Date roller bearings were mounted on axle and, if available, mileage of the car since bearings was mounted.
 - If the roller bearings failed, obtain a description of the failed bearing and prints.

Derailment – Broken Rail

In addition to information required for "All Derailments," submit the following:

1. Large photograph of broken surfaces.
2. Print or sketch showing details of defects in failed material.
3. Print or sketch showing location of ties in reference to failed rail. Scale of print should not exceed 50 feet per inch.
4. Chemical analysis of failed member.
5. Statement as to whether rails in the vicinity of the point of accident had been tested with a detector car or other device. Show frequency of such tests, the date of last test, and the results of the tests.

Derailments – Failure of Cut, Fill, or Structure

In addition to information required for "All Derailments", submit the following:

1. History of cut, fill, or structure.
2. Work performed subsequent to the construction of cut, fill or structure.
3. Description of cut, fill, or structure involved.
4. Description of failure of cut, fill, or structure involved.
5. Weather report for 30 days prior to the accident from the nearest U.S. Weather Station, if weather conditions contributed to failure.

All Signal, Interlocking, Automatic Train-Control Device Accidents

In addition to information required for all accidents, submit the following:

1. Carrier's rules, bulletins, and special instructions governing the operation of these devices.
2. General description of signal system or appliances in use in the territory where accident occurred. Include the following information:
 - (a) Whether signals are of the semaphore type, color-light, color-position-light, or position light.
 - (b) Number of semaphore arms or light units.
 - (c) Whether the signals are approach lighted or continuously lighted.
 - (d) Location of signals involved.
 - (e) Describe functioning of signals under various conditions of track occupancy
3. If indication of signals in doubt, furnish plans of installations.
4. Describe view, and/or obstructions to view, when approaching signals involved. Furnish photographs.
5. Specify the carrier's rule covering each signal involved.
6. Furnish a print of that part of signal system involved.
7. If braking distances are involved:
 - (a) Indicate the distance between signals and the limits of the controlling circuits.
 - (b) Procure statement from the carrier's officials covering the braking distance for a train, similar to the one involved and moving at similar speed.
 - (c) Establish the point from which braking should have been initiated to ensure a proper stop.

Interlocking

In addition to information required for all signal, interlocking and automatic train-control device accidents, submit the following:

1. Kind and location of interlocking machine.
2. Location and method of operation of switches.
3. Photostat or other copy of tape of graphic recorder.
4. The method of operation on main lines used by trains involved approaching the interlocking should be described and should be supported by a statement from the proper official of the carrier.

Automatic Block

If on single track, does the system operate on the absolute-permissive-block or overlap principle?

Centralized Traffic-Control

In addition to the information required for all signal, interlocking and automatic train-control device accidents, obtain the following:

1. Location and type of the control machine.
2. Type of system.
3. Type of locking in detail (mechanical, approach, indication, etc.) Check to see whether complies with R.S.& I.
4. Location and method of operating switches.
5. Photostat or other copy of tape of graphic recorder, if available.

Train-Stop, Train-Control, Cab-Signal

In addition to information required for all signal, interlocking and automatic train control device accidents, obtain the following:

1. Type of system used, whether intermittent contact, intermittent inductive, intermittent magnetic, mechanical trip, continuous or coded type.
2. Location of magnet, inductor, ramp or trip arm with respect to signal with which it is associated.

Grade Crossing Accidents

In addition to information required for "All Accidents" submit the following:

1. A sketch or print (scale not exceeding 50 feet per inch), showing layouts of tracks and highway at the crossing. Indicate thereon the locations of signals, barriers, gates; other important objects, structures, etc. mentioned in testimony.
2. Description of signs, signals, etc. including locations.
3. If automatic highway-crossing warning signals involved, provide data concerning length of controlling circuit.
4. If indication of warning signal in doubt, furnish statement of tests made after accident occurred, results of tests, date of last inspection made before time of accident.
5. Statement of amount of highway traffic over the crossing in a 24-hour period, subdivided hourly and itemized to show movements of automobiles, buses, trucks, and other vehicles.
6. Photographs showing the crossing and approaches thereto.
7. Information concerning driver's age and experience. Operator's license number, and license number of vehicle.

8. Requirements of state law or city ordinances governing the movement of highway vehicles over railroad grade crossings. Submit copy of any law or ordinance directly involved.
9. Detailed description of the highway vehicle involved. Describe cargo.
10. Information concerning skid marks on pavement. Pavement wet or dry?
11. Copy of police report, if available.
12. Statement of driver, if possible.

Track Motor Car/Hi-Rail Accidents

In addition to information required for "All Accidents," submit the following:

1. Description of the track motor car/hi-rail, and trailers involved.
2. Rules for the operation of track motor cars/hi-rail.
3. Maximum authorized speeds for track motor cars/hi-rail.
4. Furnish one copy of any line-up or other written instructions issued to operator of track motor car/hi-rail.
5. Furnish copy of instructions issued by train dispatchers to operators, with reference to providing protection for track motor car/hi-rail movements.
6. When operator of track motor car/hi-rail was last examined in rules.

November 19, 1984

Federal Railroad Administration
Office of Safety

Suggested Word List

One Word

anticlimax, antipollution (but, anti-American)

backflow

backup (noun), back up (verb)

(Examples: The engineer's backup arrived. Back up the train.)

bimonthly

blacktop

boxcar

brakeman

bulkhead

bylaw, bypass, byproduct

car length

carload

carman

chainsaw

checklist

citywide

coalfield

company wide

chief counsel (not chief council)

crewmember

crosslevel

crossover (noun), cross over (verb)

(Examples: The wooden crossover was broken. He will cross over the track.)

crosstie

crosstrack

cutoff (noun) cut off (verb)

(Examples: The cutoff point was reached. Cut off that group of cars.)

decision making

deemphasize

downtime

fact-finding

flatcar

follow-up (adj., noun), follow up (verb)

(Examples: The follow up will begin Tuesday. The Office of Safety will follow up on that accident.)

forklift

gateway

guardrail

handbrake

handhold

hardhat

headlight

hometown

inbound

leadtime

lengthwise

logbook

manmade

metalworker

midday, midpoint

milepost

multipurpose, multinational

nearby

nonexempt, nonrecurring, nonworking (but, non-union)

northeast

ongoing, onward

outdated, outlook, output

overall, overexpenditure, overworked

paperwork

payback (noun), pay back (verb)

(Examples: The safety payback will take too long. Pay back the money.)

percent (not, per cent or %)

piecework

pipeline

policymaker

postpaid, postscript

powerplant, powerline, powersite

preadjust, preexist

railcar

railhead, railway, railroad

ratemaking

recordkeeping

roadbed, roadway

rulemaking

semiannual, semipermanent, semiofficial

shutdown (noun), shut down (verb)

(Examples: The shutdown of the road was complete. Shut down the railroad.)

Sideframe

sidewalk

sometimes (but, at some time)

stockworker, stockroom, stockyard

subcommittee, subdepartment

systemwide

textbook

timecard, timetable

trackman

trainload, trainstop

trainmaster

transload

transshipment

truckline, truckload

turnaround (noun), turn around (verb)

(Examples: Turnaround time is 12 hours. Get the men to turn around the locomotive.)

Twofold, threefold, etc.

waterway, waterfront

waybill

weekday

westbound

widespread

workload, workplace (but, work force)

worldwide

yardmaster

Two Words

air hose(s)

bad order

branch line (but, branchline (adj.) track)

coal car

coal mine

diesel electric (no hyphen)

en route

grade crossing

ground work

half way

hazardous materials transport (not, hazardous material)

joint line

main line

short line

No Initial Caps

a.m., p.m. (4 a.m., not 4:00 a.m.)

appendix A

chapter 1column 2

congressional (congressional action, but, First Congressional District)

county coroner

departmental

fence track, a yard track (but, Yard Track No. 13)

figure 7

governmental (but, Federal Government)

house track

lead track

main track

mechanical department (if not exact title)

midcontinent

mid-July

Millham Interlocking

north-central region, (but, Region 4)

page 6, paragraph 2

paramedic

region

regional administrator

table 6

train order No. 658

volume x

Initial Caps

Act, the Act (Staggers Rail Act)

Advance Notice of Proposed Rulemaking (ANPRM)

Bridge 403

Bristol Station

Calumet River Bridge

Camden main track

Class 1 track

Congress

Department of Transportation, the Department

Eastern District, Southern District, Western District

Engine 987

Extra 769 East

Federal (but, federally funded)

Federal Government, Federal, State, and municipal governments

Form Q Train Order (but, the train order directed....)

Glenwood Yard

Interstate 95 (but, the interstate)

Locomotive No. 220 (but, locomotive pantograph)

Nation

Northeast

Northeastern States (but, northeastern region)

Notice of Proposed Rulemaking (NPRM)

Section 401

State government, State legislature, statewide, State of Texas, New York State, North Atlantic

States, Gulf States, State and local governments

Title IX

Track No. 4 (but, 4 tracks)

Train No. 468

U.S. Highway 87

Hyphenate

car-mile

container-on-flatcar (COFC)

cost-benefit analysis

cost-effective

cross-arm

cross-reference, cross-section

in-service

maintenance-of-way, maintenance-of-structures

man-day, man-hour

mid-1958

non-American, nonexistent

north-central region

out-of-date

passenger-mile

profit-and-loss

highway-rail crossing

right-of-way

route-mile

speed-swing crane

ton-mile

trailer-on-flatcar (TOFC)

train-mile

up-to-date

Abbreviations

a.c., alternating current

CWR (continuous welded rail)

FY 1983

TOFC, COFC

16 lbs, 1 lb

4 mph

6 °F.

3 ft

2 in

hazmat

Numbers

Use figures for time, distance, weight, money (any type of measurement), and for any other number that is 10 or over.

1980's (not, '80's)

15 feet

two cars, 11 cars

5 carlengths

four men

10 men

1-degree 58-minute curve

03-percent-descending grade

2- by 4-inch boards (but, 2 to 6 inches wide)

5-day week

June 29, 1935, June 1935 (not, June, 1935 or June 29th 1935)

\$3 (not, \$3.00), 75 cents, 0.5 cent

1,000 (not, 1000)

12 million (not, 12,000,000)

\$2,750 million (not, 2,750,000 dollars)

\$500,000 to \$1 million

one-half inch (not, one-half of an inch, or ½ inch) but, ½-inch pipe

Spelling

acknowledgment

affect (verb, influence), effect (noun, result)

aid (noun, verb)

a while (article and noun, for some time)

awhile (adverb, for a short time)

benefited

bloc (group), block (grants)

buses

canceled, cancellation

cannot

catalog

channeled

collectible

complement (complete), compliment (praise)

connector

farther (distance), further (degree)

finable

flammable (not, inflammable)

focused

forward (ahead), foreward (preface)

fulfilled

funneled

gauge or gage (be consistent)

graveled

insure (protect), ensure (guarantee)

judgment

kerosene

labeled

lay rail, laying rail, laid rail, relaid rail

liaison

likable

liquefy

modeled, modeling

moneys (not, monies)

paneled

pastime

preventive (not, preventative)

principal (chief), principle (proposition)

shoveled

signaled

sizable

tie, tied, tying

through (not, thru)

totaled

traffic, trafficking

transshipment

traveled

Singular

addendum

agendum

appendix

basis

company (co.)

crisis

curriculum

datum

focus

index

No.

radius

Plural

addenda

agenda

appendixes

bases

companies (cos.)

crises

curriculums

data

focuses

indexes

Nos.

radii

Note: This suggested wordlist applies not only to accident investigation reports, but also to all other FRA technical reports and correspondence.

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