

Highway Grade Crossing Safety and Costs Making the Right Decision for a Small City

Student Task

Big Idea:

- Accidents involving highway grade crossings occur every year. Some accidents occur at active crossings where motorists or pedestrians choose to ignore train warning devices. But, many accidents occur at passive public crossings where there are no active warning devices to alert motorists and pedestrians of an immediate oncoming train.
- The costs to eliminate or upgrade a passive highway grade crossing can be high. On-time train schedules are important to passengers and transit and rail agencies. Communities desire quiet crossings and efficient road systems.
- Transit and rail agencies that provide transportation services throughout the country are faced with making decisions regarding highway grade crossing safety, schedule efficiency, operating costs and comfort level of the surrounding communities.
- The decisions transit and rail agencies make will influence the safety of the highway grade crossing, the reliability of the trains, and the comfort level of the surrounding community.

Essential Questions:

- Given limited budgets and community concerns, how should transit and rail agencies improve passive highway grade crossings?
- What federal, state and local regulations and criteria govern the location, design, construction and maintenance of highway grade crossings and train operation through these crossings?

Goal:

Your goal is to examine the various highway grade crossing options available to transit and rail agencies. You will recommend an approach to a small city faced with wanting to improve their public passive highway grade crossings while at the same time avoiding imposing any new taxes or reducing transportation service in an area already faced with economic hardship. The surrounding community also desires a quiet crossing area, so noise must be kept to a minimum. Your recommendations, once accepted, will become part of a marketing campaign to inform the public of the changes.

Role:

You have been hired as a consultant by a small city in the United States to help improve a public passive highway grade crossing and maintain the city's reputation as

environmentally comfortable without adversely affecting transportation services and taxpayers who fund those services.

Audience:

You will be presenting your highway grade crossing improvement recommendations to the Board of Directors responsible for approving highway grade crossing changes that will best serve the environment and transportation needs of the community. If your recommendations are accepted, you will need to develop information to share with the public who will be concerned with the changes the city is making to its passive highway grade crossings and the impact those changes will have on existing train services and taxes.

Situation:

A small US city has just experienced another fatal accident where a vehicle was struck by a train at a notorious passive public highway grade crossing where several accidents have occurred over the last five years. The rail agency is currently experiencing significant increases in rail traffic through the city. City and surrounding area residents are crying out for change at the crossing, but insist on maintaining a quiet community and no additional taxes given difficult economic times.

After an investigation, it was recommended that the city must review the public passive highway grade crossing and determine if appropriate improvements to the grade crossing are needed.

Considerations must be made for track layout; views of the track at the highway grade crossing; train volume and speeds through the highway grade crossing; types and costs of potential improvements; federal regulations for highway grade crossings; comfort level of communities in the surrounding area; and, the efficiency of the road system around the highway grade crossing. Results of the study will be presented to the City Board and interested community members.

Products:

You will need to create a final 5 – 7 minute multi-media presentation including elements from the products below on your findings and recommendations.

Data Representation

Research other highway grade crossings with accident reports and/or similar highway grade crossing configurations. Indicate what warning systems are used, if any improvements have been made along with the outcome of those improvements and economic implications. Conduct research to determine possible impacts on the local communities for improvements and lack of improvements to the highway grade crossing. Considerations for the amount of traffic (pedestrian, vehicle, and train), speeds (vehicle and train), surrounding communities and area should be accounted for in your

presentation. Use the data to help determine your recommendations for your final report and presentation.

Making a Research Plan

http://www.sciencebuddies.org/science-fair-projects/project_background_research_plan.shtml#makingabackgroundresearchplan

Scientific Analysis & Drawing

Develop a scale drawing of the highway grade crossing from different angles and represent recommendations from your research and findings. Using regulation information for warning times and train speeds in the area, provide a mathematical description for how any additional warning systems will provide further protection for the public.

Scientific Analysis & Drawing Examples

1. Drawing a Scientific Diagram

http://www.slideshare.net/cristalbeam/drawing-scientific-diagram?qid=66d83398-8359-4fb8-9b0d-bec57472f7d7&v=default&b=&from_search=4

2. DIY – Scientific Drawing – Boise State Edu

<http://edtech2.boisestate.edu/bretrane/502/webquest/start.html>

3. Science Buddies – Transportation Engineer

http://www.sciencebuddies.org/science-fair-projects/science-engineering-careers/CE_transportationengineer_c001.shtml#whatdotheydo

4. Adapted from Worm Watch

<http://www.naturewatch.ca/english/wormwatch/resources/drawing.html>

How to Create a Scientific Drawing

The communication of ideas is an important part of our everyday lives. One of the ways that scientists communicate is to use drawings. It is important to make a scientific drawing clear, neat, and accurate.

What To Do

1. Use unlined paper and a sharp pencil. You will also need a ruler and make sure you use a good quality eraser to make your corrections.
2. Give yourself plenty of space. Your diagram should be at least 1/2 page in size., You want to have the space to add labels and captions to your drawing.

3. Labels identify the parts of the object you are drawing. Place labels on the right side of your drawing unless putting them all on the one side would make your drawing cluttered. Use your ruler to draw lines to the different structures. Make sure none of your label lines cross.
4. Draw only what you see and keep your drawing simple.
5. Shading or coloring is not usually found on scientific drawings. If you want to indicate a darker area, you can use stippling (a series of dots).
6. If you do use colors, try to be as accurate as you can. Choose ones that are as close as possible to the color of the original..
7. Label the different structures carefully.
8. Give your drawing a title. You can also include the scale of your drawing.

Photostory

Design a slide show illustrating research illustrating similar highway grade crossing and warning systems used for those highway grade crossings. Within each slide, indicate how those warning devices impact the crossing safety. Considerations for the amount of traffic (pedestrian, vehicle, and train), speeds (vehicle and train), surrounding communities and area should be accounted for in each example.

Photostory Example

Impact of Bridges on Environment in Oregon

http://www.oregon.gov/ODOT/HWY/OTIA/Pages/Environmental_Photo_Story.aspx

Report on Recommendations for Improvements

Develop a formal report for the City Board with your findings addressing all aspects of the problem. Use the data and examples found to support your recommendations. Indicate governmental agencies that need to be involved and any regulations that must be followed.

Press Release / Webcast

Develop a 3 – 5 minute webcast to communicate to the public the situation, considerations and the potential solution as presented in your report. Considerations for all aspects of the highway grade crossing problem and the potential audiences must be accounted for in the presentation.

Press Release Example

<http://transport.house.gov/news/documentquery.aspx?DocumentTypeID=2545>

Webcast Example

1. Webopedia – define webcast
<http://www.webopedia.com/TERM/W/Webcast.html>
2. Website – NY Dept of Transportation Previously Held Webcasts
<https://www.dot.ny.gov/webcast>

Optional Exercise

Tweet Station

Develop a Twitter page to gather public input on the situation

Tweet Station Example

<http://transportation.house.gov/tweets/>

References/Resources:

AAR

Association of American Railroads

Safety page on highway rail grade crossings

<https://www.aar.org/safety/Pages/Grade-Crossing-Safety.aspx>

AREMA

American Railway Engineering and Maintenance-of-Way

Regulations and mathematical equations for warning times

<http://www.arema.org/>

FHA

Federal Highway Administration

Highway Grade Crossing Handbook – Section 4 Identification of Alternatives

http://safety.fhwa.dot.gov/xings/com_roaduser/07010/sec04b.htm

FRA

Federal Railroad Administration

Federal recommendations and oversight

<http://www.fra.dot.gov/Page/P0001>

LIRR

Long Island Railroad

Article on a response by LIRR to increase in fatalities at local highway grade crossings.

<http://newyork.cbslocal.com/2013/09/16/lirr-launches-new-grisly-ad-campaign-promoting-safety-at-railroad-crossings/>

MUTCD

Manual on Uniform Traffic Control Devices

<http://mutcd.fhwa.dot.gov/>

NTSB

National Transportation Safety Board

Examples of past investigations and accident reports.

<http://www.nts.gov/>

Operation Lifesaver

Highway grade crossing safety education resource.

<http://oli.org/>

Video Intro: <http://oli.org/video/view/imagine>



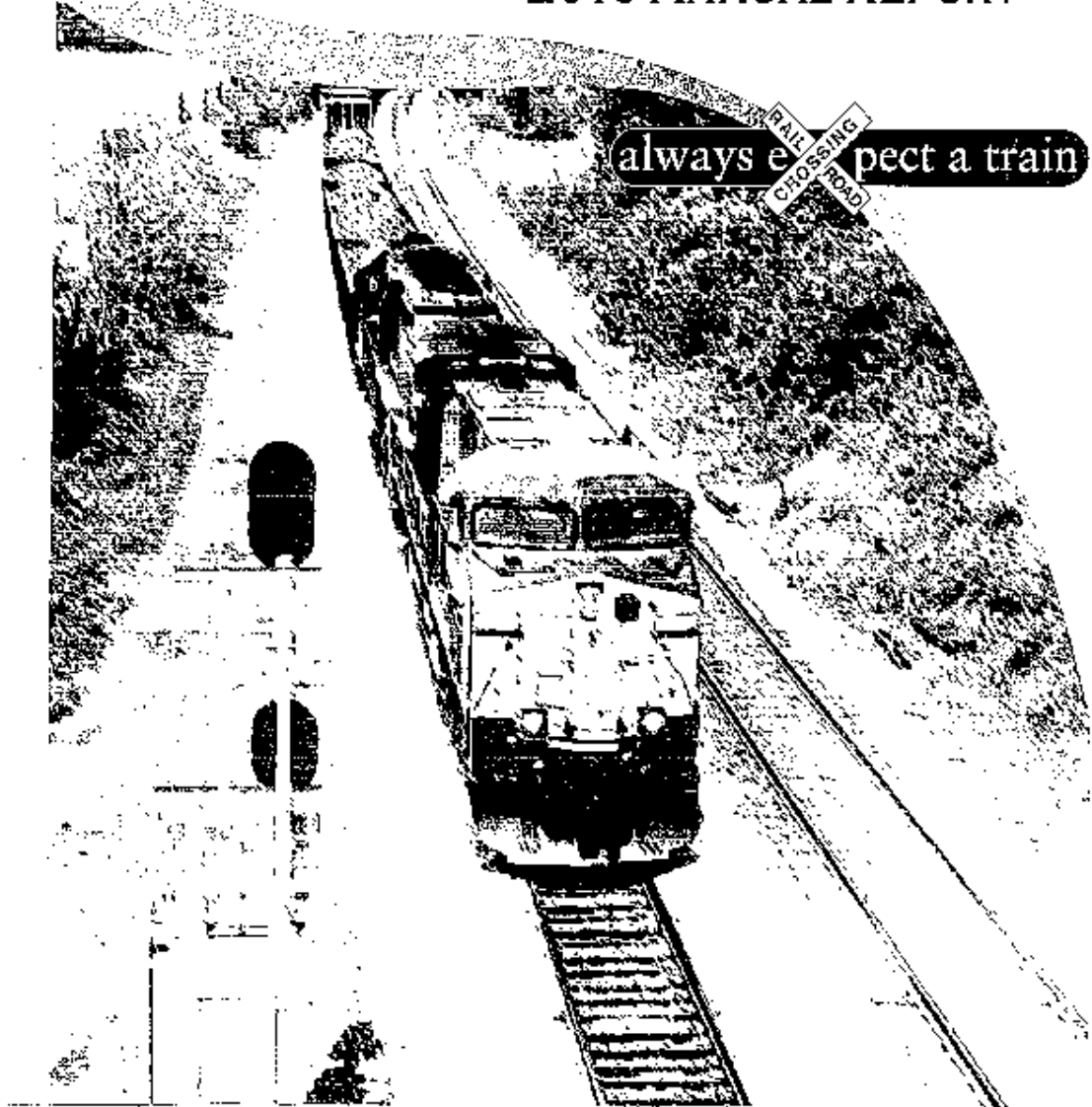
<http://oli.org/video/view/imagine>



U.S. Department of Transportation
Federal Railroad Administration

RAILROAD SAFETY STATISTICS

2010 ANNUAL REPORT



Highway Grade Crossing Safety and Costs
 Making the Right Decision for a Small Community

Railroad Safety Statistics – Annual Report 2010 – Final

April 4, 2012

TABLE 1-12 TOTAL HIGHWAY-RAIL GRADE CROSSING INCIDENTS BY STATE

States	At Public Crossing					At Private Crossing					At Public Crossing			At Private Crossing		
	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	Cnt	Kld	Nonf	Cnt	Kld	Nonf
Alabama	114	95	78	60	66	13	9	7	10	3	413	46	169	42	2	9
Alaska	1	1	1	4	1	-	-	-	-	-	8	1	1	-	-	-
Arizona	45	32	22	18	26	3	6	-	2	3	143	14	49	14	3	5
Arkansas	75	64	64	40	50	5	8	5	4	2	293	41	116	24	5	5
California	143	142	125	105	117	27	26	23	12	10	632	153	301	98	12	21
Colorado	35	23	27	20	15	10	9	4	4	3	120	27	49	30	1	13
Connecticut	6	2	3	4	2	2	1	1	1	1	17	1	6	6	-	3
Delaware	5	5	-	3	3	2	1	1	1	-	16	-	11	5	-	1
Dist Of Columbia	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
Florida	106	81	64	40	53	12	9	12	10	14	344	64	132	57	13	64
Georgia	119	114	89	95	62	16	24	21	12	6	479	42	170	79	4	13
Idaho	19	20	18	8	12	3	1	2	2	4	77	8	17	12	1	3
Illinois	152	133	131	82	116	22	27	22	24	10	614	123	271	105	4	36
Indiana	134	148	131	87	108	6	16	11	11	3	608	70	196	47	5	14
Iowa	60	74	64	47	49	9	8	8	5	6	294	24	101	36	2	8
Kansas	53	49	37	39	41	6	8	6	7	6	219	36	85	33	6	13
Kentucky	55	60	40	53	43	12	15	12	5	13	251	27	91	57	6	20
Louisiana	126	95	98	71	89	18	27	15	13	17	479	57	256	90	5	31
Maine	7	6	6	4	2	-	-	-	-	-	25	2	8	-	-	-
Maryland	15	13	11	11	10	9	3	7	2	3	60	1	19	24	1	8
Massachusetts	10	7	7	3	7	1	2	1	2	1	34	4	39	7	1	1
Michigan	74	62	53	46	46	8	5	6	4	6	281	31	93	29	3	18
Minnesota	53	48	54	35	40	8	11	3	5	3	230	29	79	30	2	11
Mississippi	77	64	68	38	43	5	5	2	4	4	290	44	167	20	1	11
Missouri	48	34	38	32	45	12	9	8	7	7	197	36	91	43	7	20
Montana	12	15	12	10	12	7	3	7	5	7	61	6	15	29	2	9
Nebraska	28	41	40	35	21	9	11	8	6	10	165	21	70	44	6	9
Nevada	2	1	3	3	-	2	-	3	1	1	9	-	2	7	-	3
New Hampshire	1	1	2	2	-	1	1	1	-	-	6	-	3	3	-	-
New Jersey	34	26	30	37	28	9	4	3	4	-	155	20	53	20	-	5
New Mexico	8	11	9	11	6	2	3	1	2	2	45	13	24	10	7	9
New York	24	39	39	21	25	8	10	1	10	8	148	21	35	37	6	13
North Carolina	57	57	60	50	36	18	11	9	5	13	260	28	124	56	3	20
North Dakota	12	11	13	15	19	-	2	1	1	2	70	9	29	6	1	-
Ohio	113	114	83	55	65	16	6	14	8	9	430	45	139	53	8	12
Oklahoma	66	55	56	42	41	4	4	2	6	-	260	41	147	16	1	5
Oregon	19	19	12	7	18	9	7	1	2	4	75	7	16	23	1	3
Pennsylvania	51	56	48	35	48	11	25	14	11	8	238	16	73	69	1	13
South Carolina	39	58	53	36	44	8	8	10	5	6	230	30	82	37	5	11
South Dakota	15	12	13	16	8	1	-	-	1	1	64	7	32	3	-	-
Tennessee	56	63	55	52	35	12	10	8	4	7	261	20	85	41	4	9
Texas	298	259	189	151	185	42	38	39	28	28	1,082	123	479	175	19	95
Utah	11	16	10	13	10	3	1	2	-	1	60	5	20	7	-	-
Vermont	2	3	2	7	3	1	1	1	2	1	17	2	6	6	1	2
Virginia	26	19	28	23	21	18	16	16	12	18	117	6	37	80	4	18
Washington	37	38	24	17	27	13	10	12	15	11	143	15	30	61	9	21
West Virginia	18	13	9	15	15	14	13	7	8	8	70	11	22	50	1	13
Wisconsin	52	53	60	42	28	6	9	9	4	5	235	11	72	33	2	8
Wyoming	3	2	3	2	-	1	1	1	2	1	10	1	2	6	-	2
Total	2,516	2,354	2,082	1,642	1,741	425	424	347	289	276	10,335	1,339	4,114	1,761	165	608

Twenty First Century Student Outcomes

Creativity and Innovation

Works Creatively with Others

- Develop, implement and communicate new ideas to others effectively
- Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work
- Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas
- View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Critical Thinking and Problem Solving

Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Analyze and evaluate major alternative points of view
- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis
- Reflect critically on learning experiences and processes

Solve Problems

- Solve different kinds of non-familiar problems in both conventional and innovative ways
- Identify and ask significant questions that clarify various points of view and lead to better solutions

Communication and Collaboration

Communicate Clearly

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions

- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
- Communicate effectively in diverse environments (including multi-lingual)

Collaborate with Others

- Demonstrate ability to work effectively and respectfully with diverse teams
- Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Information Literacy

Access and Evaluate Information

- Access information efficiently (time) and effectively (sources)
- Evaluate information critically and competently

Use and Manage Information

- Use information accurately and creatively for the issue or problem at hand
- Manage the flow of information from a wide variety of sources
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information

Media Literacy

Analyze Media

- Understand both how and why media messages are constructed, and for what purposes
- Examine how individuals interpret messages differently, how values and point of view are included or excluded, and how media can influence beliefs and behaviors
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media

Create Media Products

- Understand and utilize the most appropriate media creation tools, characteristics and conventions
- Understand and effectively utilize the most appropriate expressions and interpretations in diverse, multi-cultural environments

ICT (Information, Communication and Technology Information) Literacy

Apply Technology Effectively

- Use technology as a tool to research, organize, evaluate and communicate information
- Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies

Leadership and Responsibility

Guide and Lead Others

- Use interpersonal and problem-solving skills to influence and guide others toward a goal
- Leverage strengths of others to accomplish a common goal