



TRANSPORTATION SYMPOSIUM

2019

Safety Considerations at Railroad Crossings

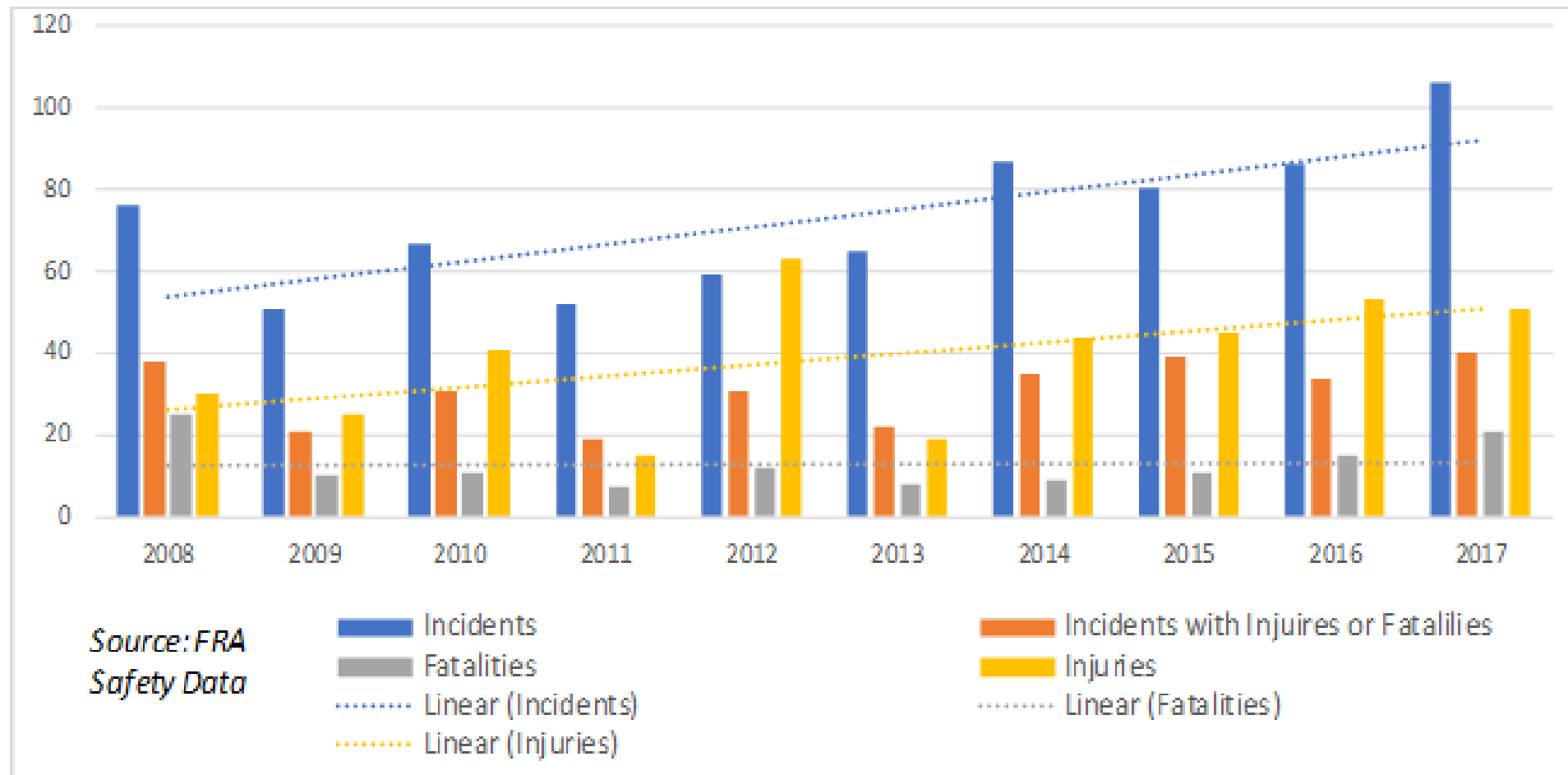
Rob Stapleton and Catherine Bradley P.E.
Central Office

Purpose of Training

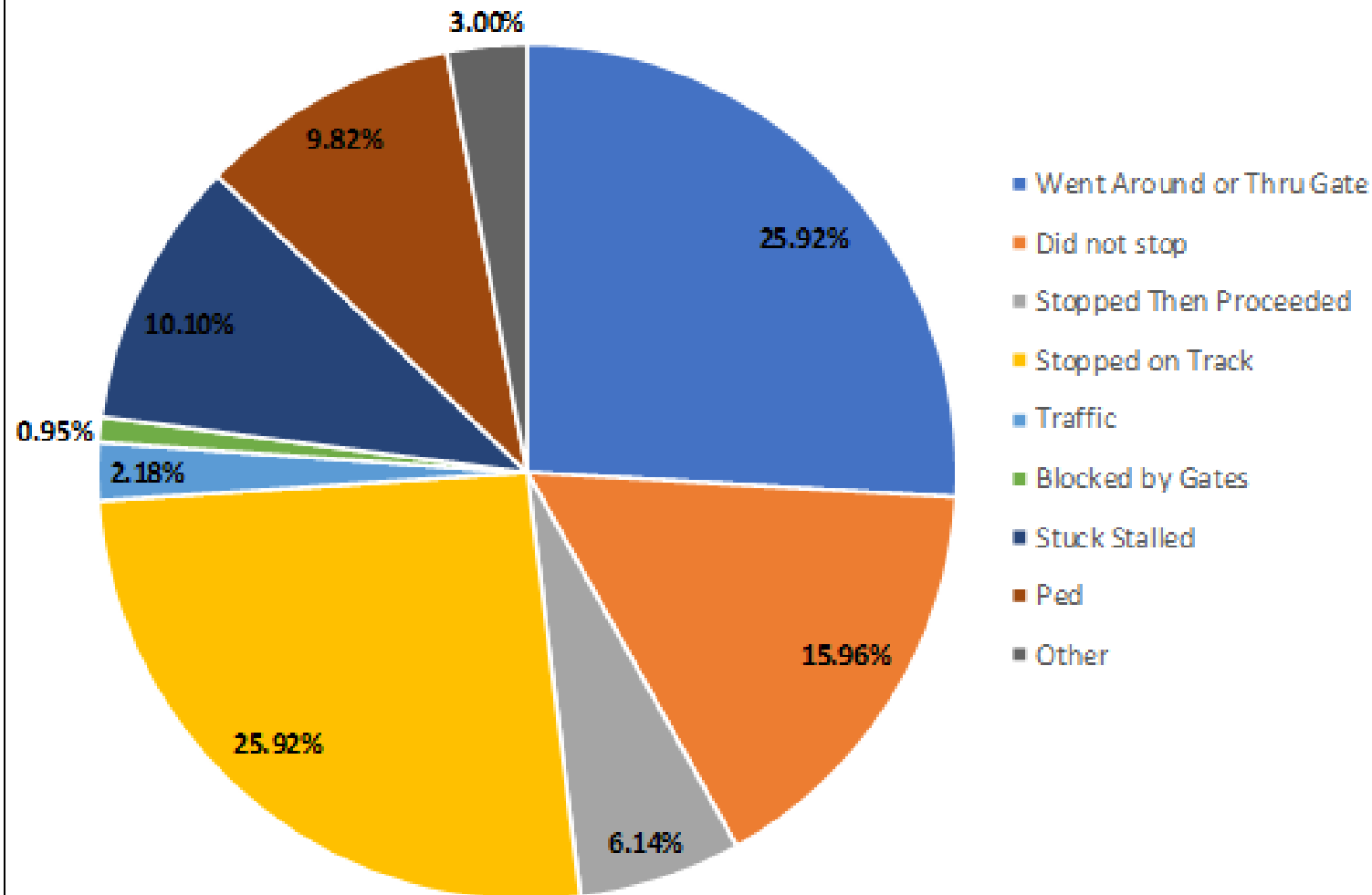
- Operation Lifesaver
- Design Considerations at Crossings
- Railroad Safety Threats
- Opening or Closing At-Grade Crossings
 - Grade Separation
- At-Grade Crossing Upgrade Program
 - Section 130
 - Diagnostic Reviews



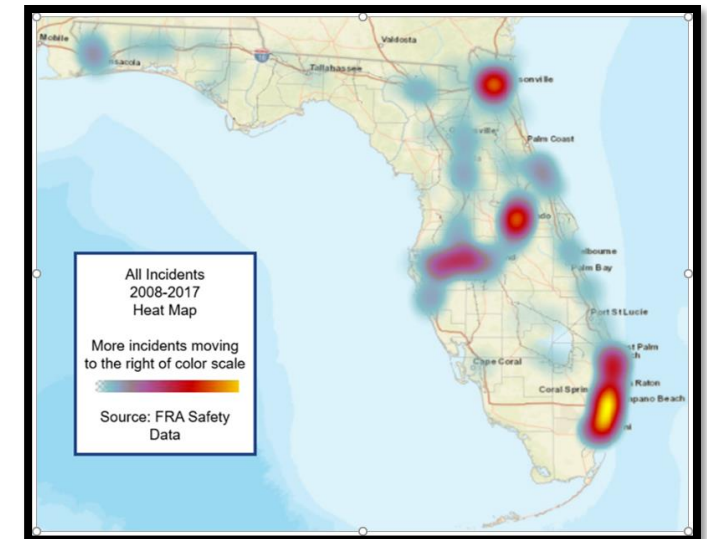
Florida Rail Safety Statistics



Florida Rail Safety Statistics



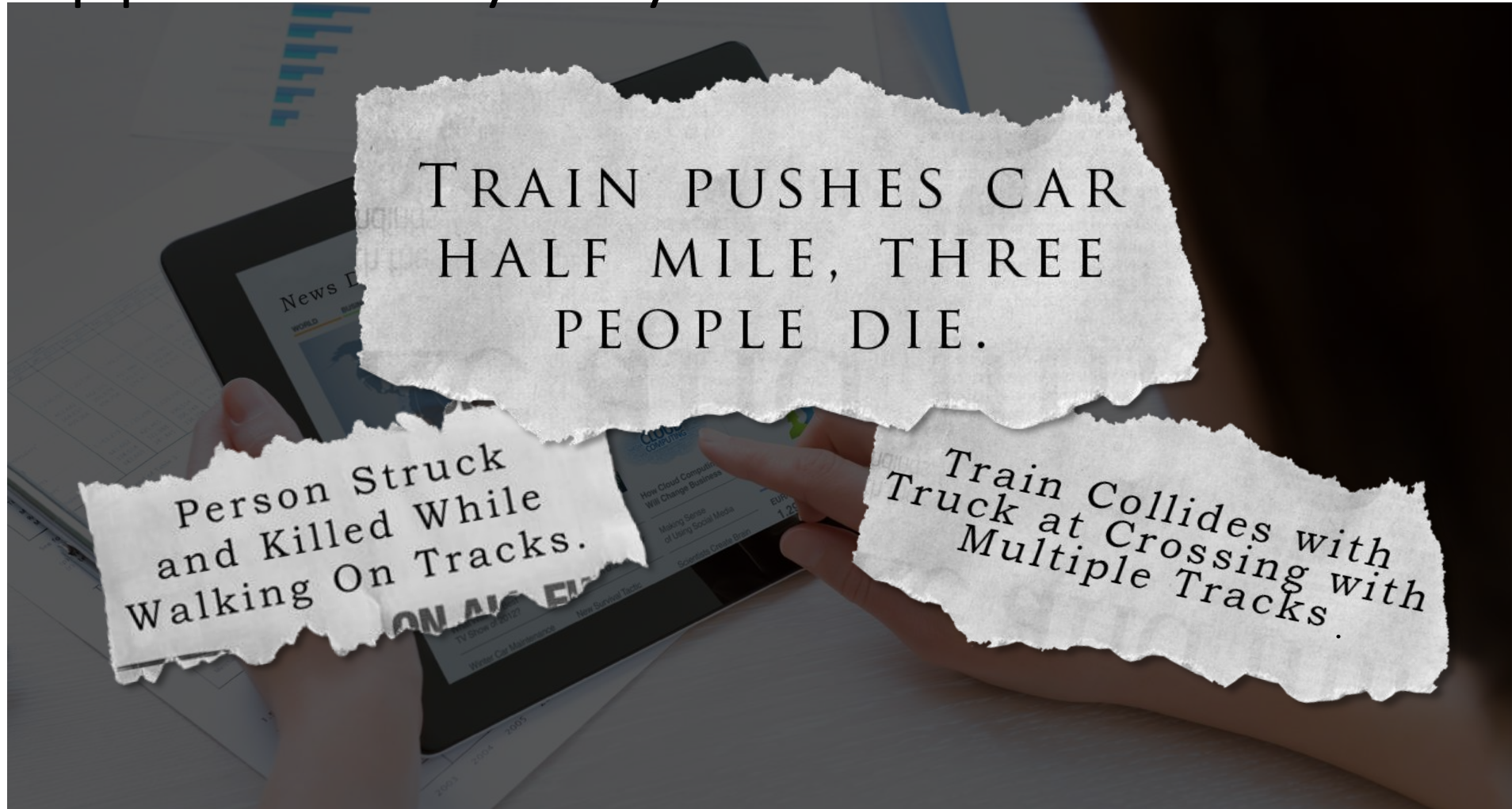
Source: FRA Safety Data





Operation Lifesaver Presents:
In the Interest of Safety

It Happens Every Day...



Any Time is Train Time



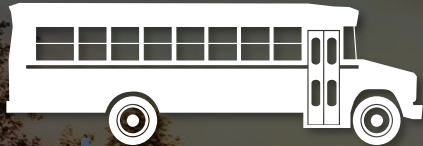
**As you approach a railroad crossing,
always expect a train.**

Freight trains do not run on a schedule. Trains can run on any track, at any time, from either direction.

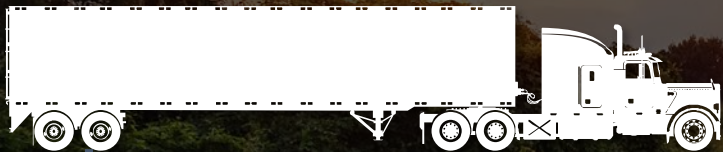
Approximate Stopping Distance



200 Ft.



230 Ft.



300 Ft.



600 Ft.



>5280 Ft.



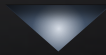
When traveling at
55MPH

Stopping distance of the average freight train is a mile or more. **That's 18 football fields.**

Trains can stop, but they can't stop quickly.

Weight Ratio

3,000 lbs.



12 oz.

4,000 to 1
weight ratio

12 Million lbs.

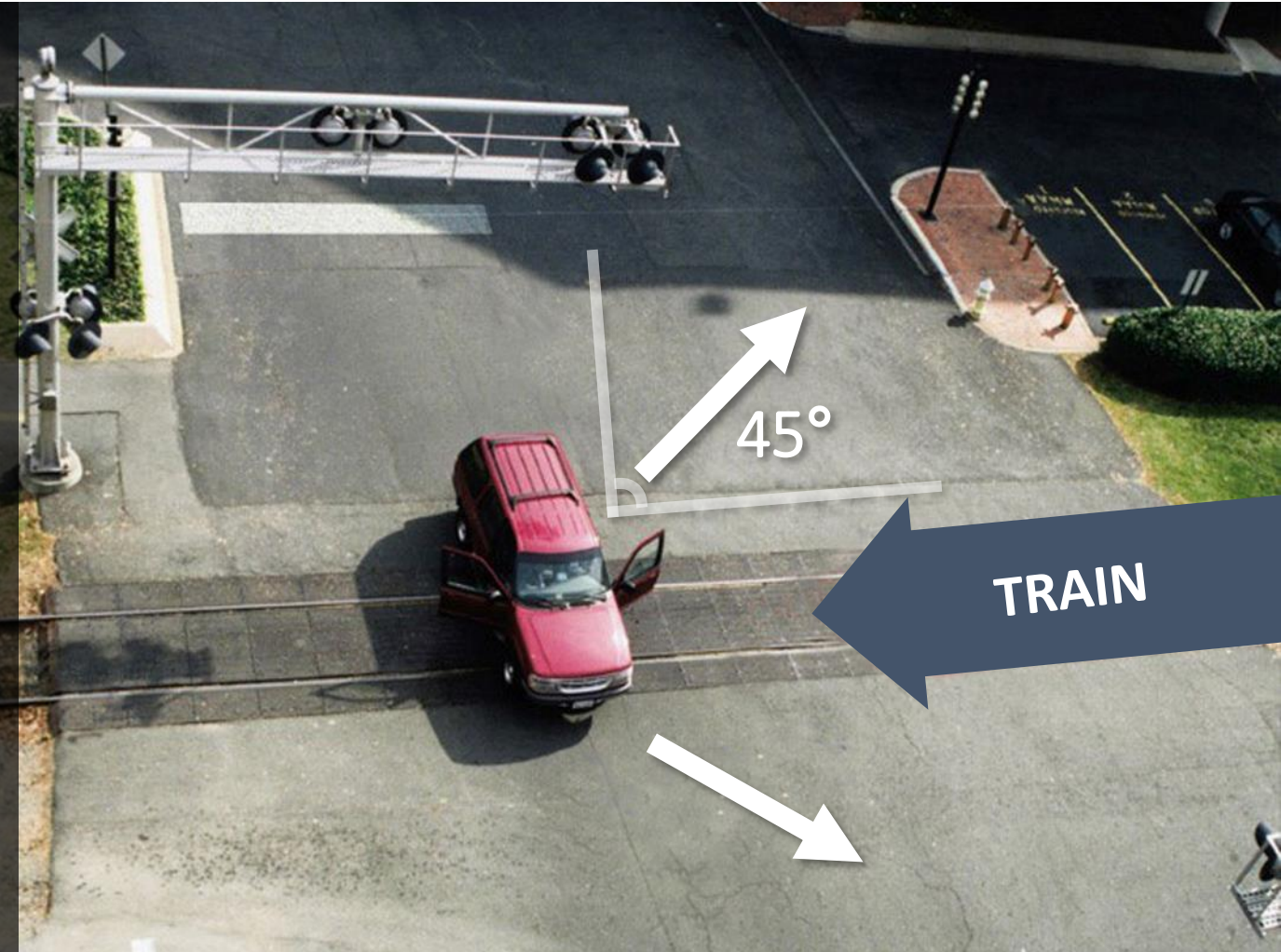


3,000 lbs.

A car crushing a can is the same as a train crushing a car.

What Will You Do if You Stall on the Tracks?

1. Get out!
2. Get away from the tracks, even if you do not see a train.
3. Locate the Emergency Notification System sign and call the number provided, telling them about the stalled vehicle.
4. **If a train is approaching, run toward the train but away from the tracks at a 45 degree angle. If you run in the same direction a train is traveling, you could be injured by flying debris.**



Emergency Notification System (ENS)

**REPORT EMERGENCY
OR PROBLEM
TO 1-800-555-5555
CROSSING 836 597 H**

**In case of emergency,
look for this blue sign
that shows an
emergency phone
number.**

- Call the number and give the Department of Transportation (DOT) crossing number found on the sign to identify your location.

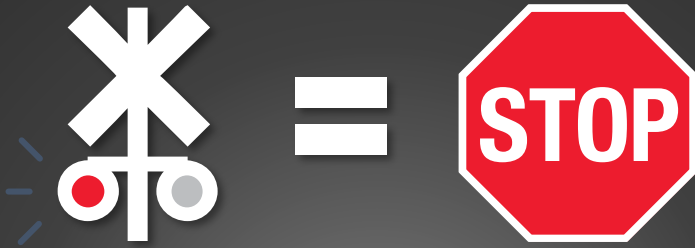


Passive Crossing



- A passive crossing does not have flashing lights or automatic gates.
- The crossbuck sign, required at all public railroad crossings, means to yield the right of way to the train.
- A painted line identifies the safe place to stop when a train is approaching. If there isn't a line, stop no closer than 15 feet and no farther than 50 feet from the closest rail.

Active Crossing – Warning Devices



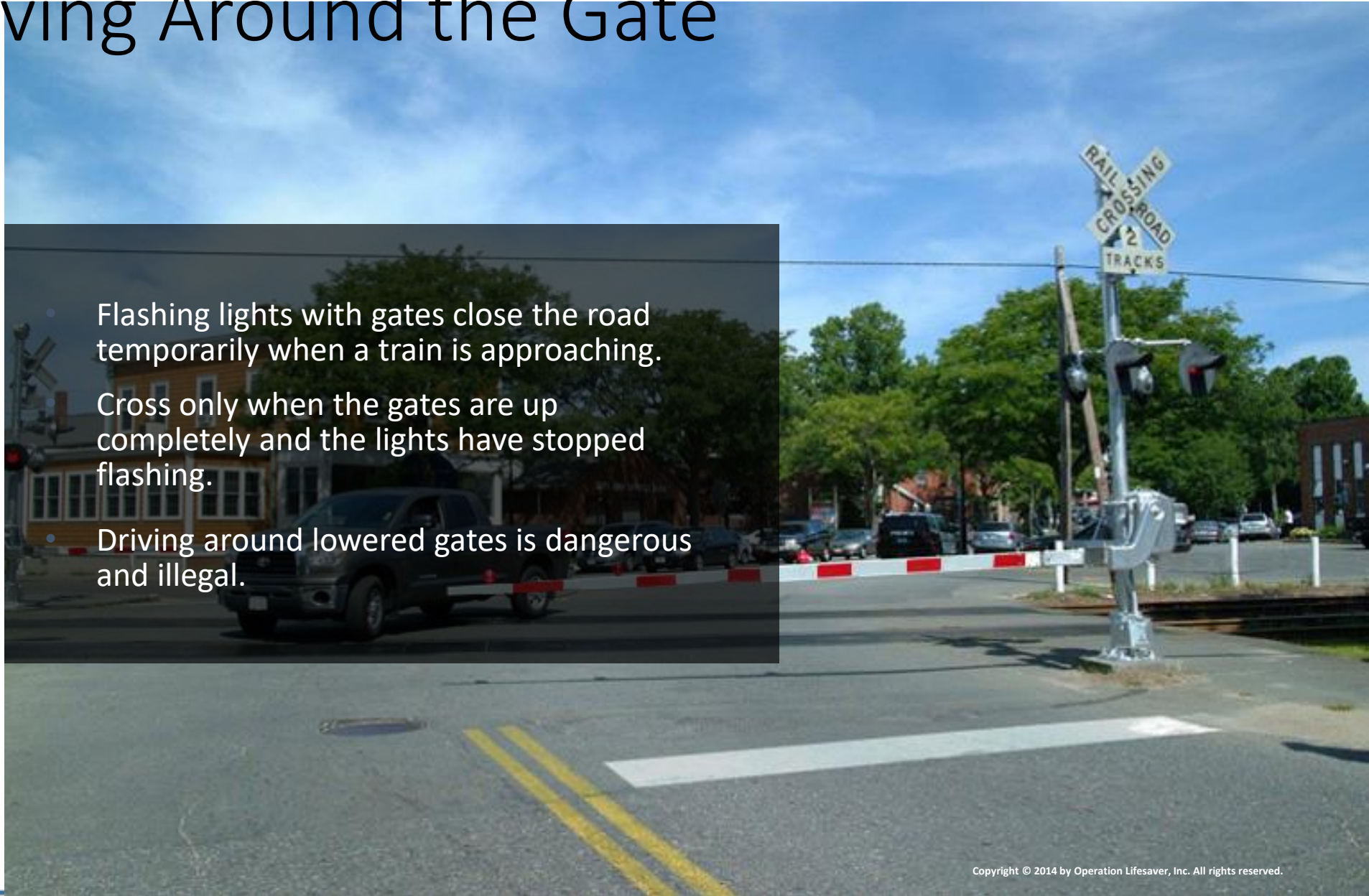
Flashing red lights warn of an approaching train and must be treated like a stop sign.

- At crossings with flashing lights and no gates, you must stop. Proceed only when it is safe to do so.
- Trains **always** have the right-of-way.



Driving Around the Gate

- Flashing lights with gates close the road temporarily when a train is approaching.
- Cross only when the gates are up completely and the lights have stopped flashing.
- Driving around lowered gates is dangerous and illegal.



Speed Misperception

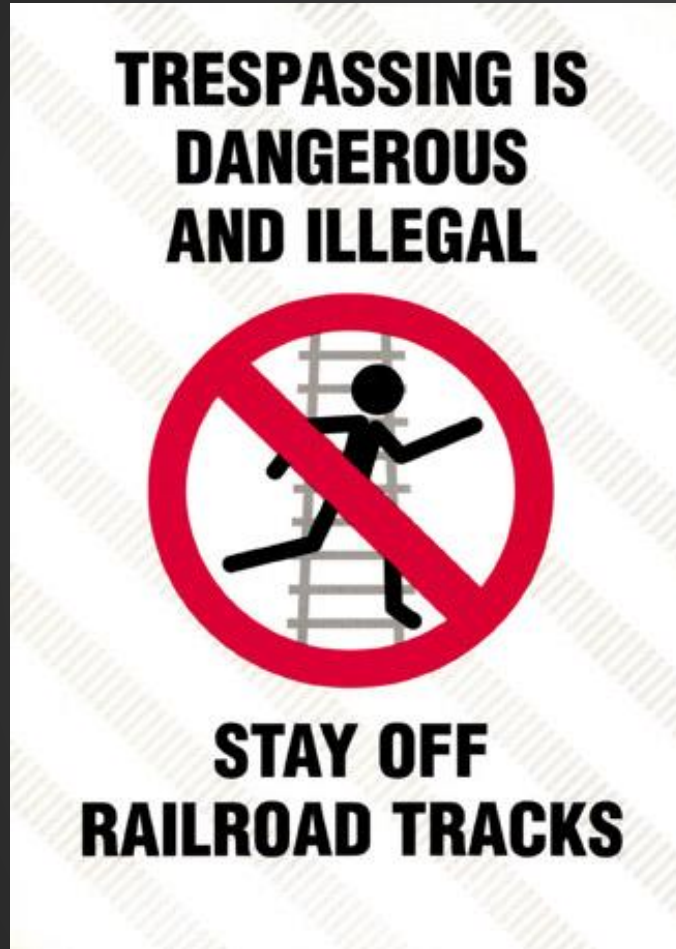


Airplanes look like they are almost hanging in mid-air but their landing speed is **over 150 mph**. The effects of the optical illusion are the same with trains.



Because of their size, trains **appear** to be much further away and

Stay Off! Stay Away! Stay Alive!®



Railroad property is private property.

Being on railroad tracks or property without permission is trespassing, even if a sign is not posted.

Taking a shortcut across the tracks can get you seriously injured or killed.

Tre



**Stay Off!
Stay Away!
Stay Alive!®**

- Recreational activities do not mix with railroad tracks—you **are trespassing.**
- Listening to music near railroad tracks may prevent you from hearing the train horn.
- Train crews are not expecting people on or near the tracks. You may not be able to hear a warning in time.

Hump Crossings!

- Due to close clearance to the road, trucks and many trailers are prohibited from using these crossings.
- When you see this warning sign, find another way across the tracks.
- Be aware that crossings may not have this sign, so pay attention to the roadway at all times.



Train and Car Collisions



- Two construction workers were late for work.
- They approached a properly operating railroad crossing with the gates down.
- After waiting for the train to pass, they drove around the lowered crossing gates thinking it was safe.
- They were struck by an oncoming train on the other tracks.

Never drive

Design Considerations

- At-Grade Crossings
- Grade Separations
- Preemption
- Humped Crossing
- Incorrect Turns

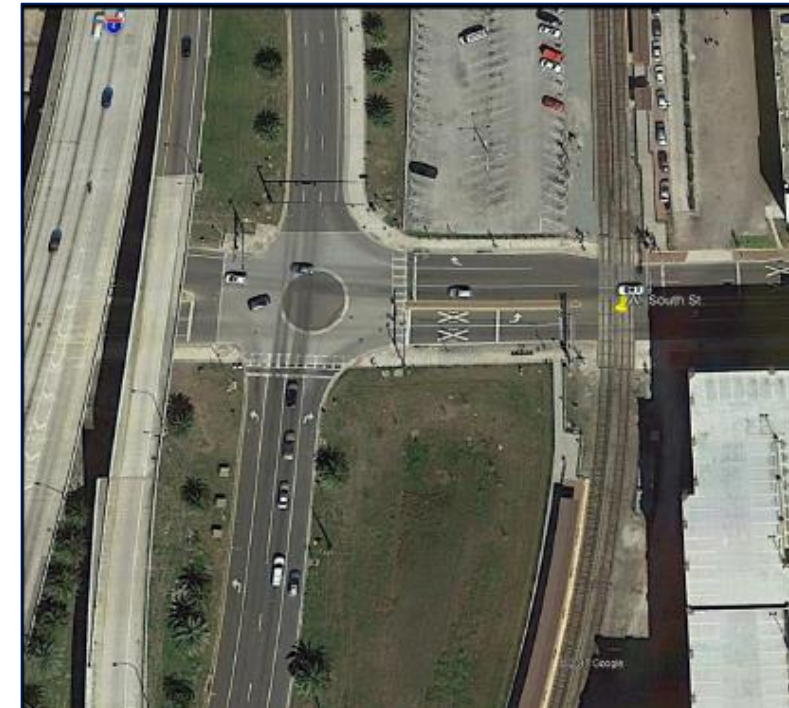
At-Grade Crossings



- At Grade Crossings Near or Within Project Limits must be upgraded accordance with Title 23 United States Code (U.S.C.), Chapter 1, Section 109(e) and C.F.R. 646.214(b).
 - Existing Agreements
 - Consider benefits of Grade Separation
 - Diagnostic Review
 - Include District Rail Coordinator, railroad, possibly representative from traffic operations
 - Consider roadway type, volumes, speeds, pedestrian, bicycle, geometrics, incidents

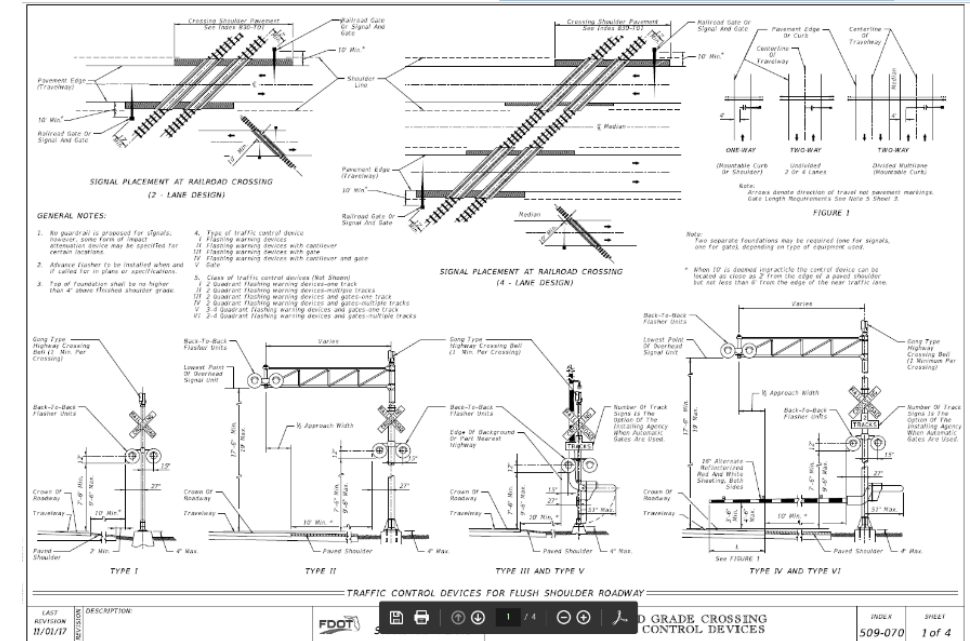
At-Grade Crossing

- Crossings
 - New crossings
 - Public Involvement – Central Office
 - Change in existing crossing
 - New equipment required?
 - Roadway realigned?
 - The cross section of the roadway should be carried through the at grade crossing including
 - Lane width
 - Pedestrian
 - Bike lanes
 - Consider if traffic may back onto railroad crossing
 - Roundabout
 - Stop Condition
 - Reduction of lanes



Design

- Design References
 - Standard Plans (509 -070)
 - FDOT Design Manual Chapter 220
 - Railroad Standards
 - Specifications
 - Reviews
 - MUTCD
 - Railroad-Highway Grade Crossing Handbook
 - <https://www.fra.dot.gov/Elib/Details/L02829>



Grade Separation

- Traffic Volume
 - Florida Administrative Code 14-57.012(2)(a)8. states “When the estimated highway traffic is 30,000 vehicles or more a day across main line tracks, an engineering and benefit-cost analysis must be performed by the applicant to determine if a grade separation is warranted”.
- Safety
- Cost
- Traffic Speed
- Blocked Crossings
- Benefit Cost Analysis



Preemption

- Preemption - When traffic signal and railroad crossings are in close proximity, Preemption requires the railroad and traffic signal control equipment be interconnected.
 - Required when:
 - Traffic signal is within 200 ft. of a highway railroad at grade crossing
 - Highway traffic queues have the potential for extending across a railroad at grade crossing
 - Traffic backed up from a nearby downstream railroad at grade crossing can interfere with the signalized highway intersection
 - A study to determine the need for preemption is required for a traffic signal within 500 ft. of a highway railroad at grade crossing

Preemption



SunRail Traffic Signal Preemption Calculation

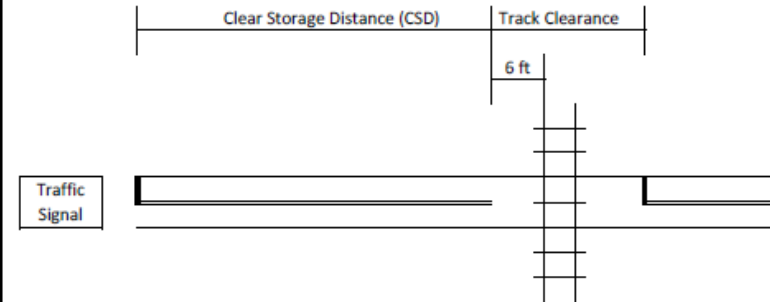
Location

Traffic Signal S. Orange Ave.

Crossing Wetherbee Rd.

DOT # 926153-N

Milepost A-800.77



Time of longest signal phase to clear before beginning pre-emption

8.1 sec

Yellow Time (seconds)

4.8 sec

All Red Time (seconds)

3.3 sec

Time for vehicle at RR crossing stop bar to begin to move

8.4 sec

$[2 + (CSD + \text{track clear dist})/20]$

Clear Storage Distance (ft)

88 ft

(Distance from signal stop bar to 6 ft from track)

Track Clearance Distance (ft)

40 ft

(Distance from end of CSD to RR crossing stop bar)

Dist between signal stop bar and RR crossing stop bar

128 ft

Track Clearance Time

9 sec

(Time to travel through Track Clearance Distance plus Separation Time, see table in documentation)

Required Preemption Time

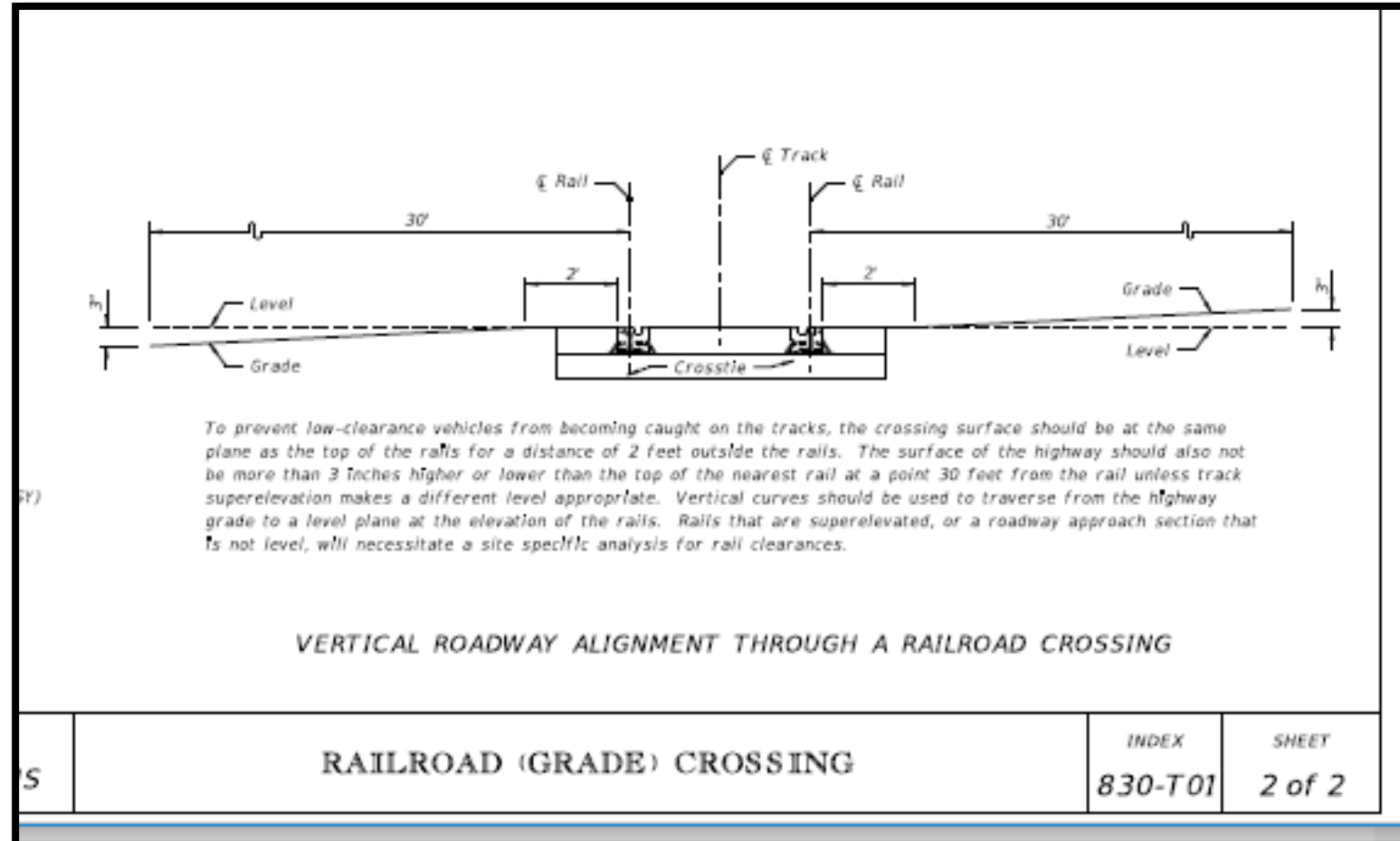
25.5 sec

Humped Crossings



Humped Crossing

- Design Standard



Humped Crossings

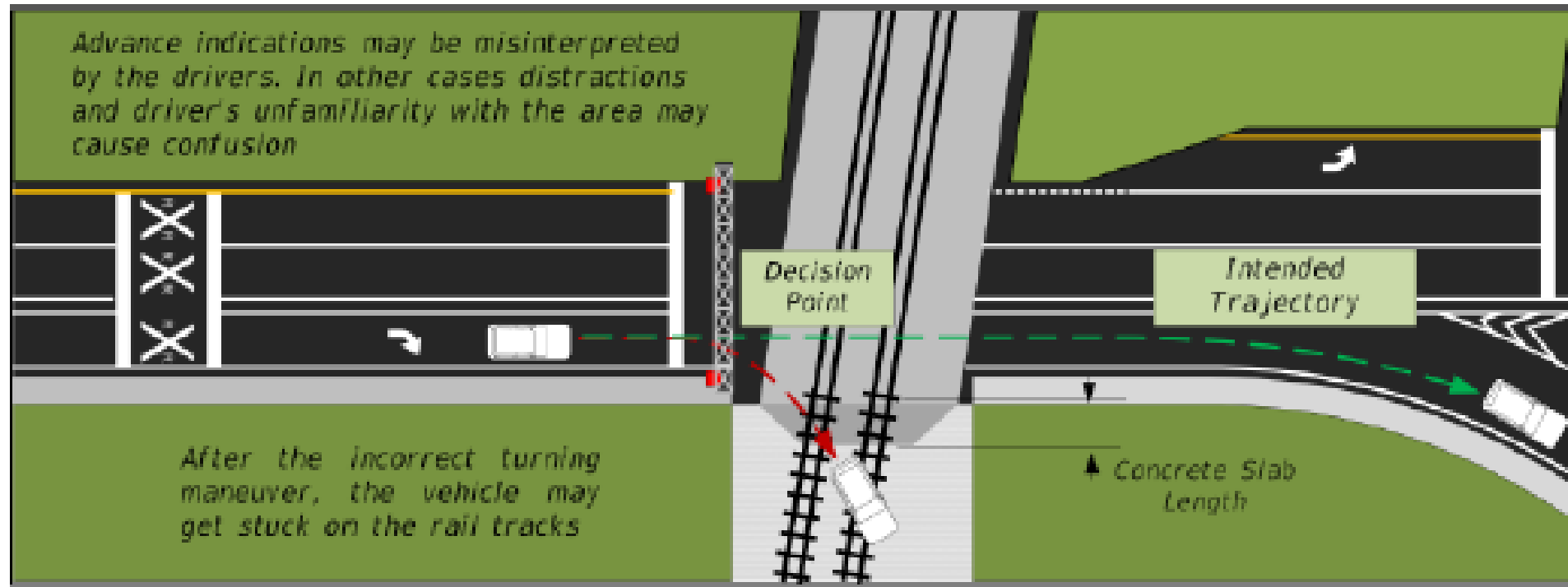
Rail Maintenance can raise the elevation of the track



Humped Crossings



Incorrect Turns



Incorrect Turns



Figure 2 – Example of potentially misleading right-turn sign and pavement markings

Incorrect Turns



After II-Design A

Pavement Markings with Guidance Information



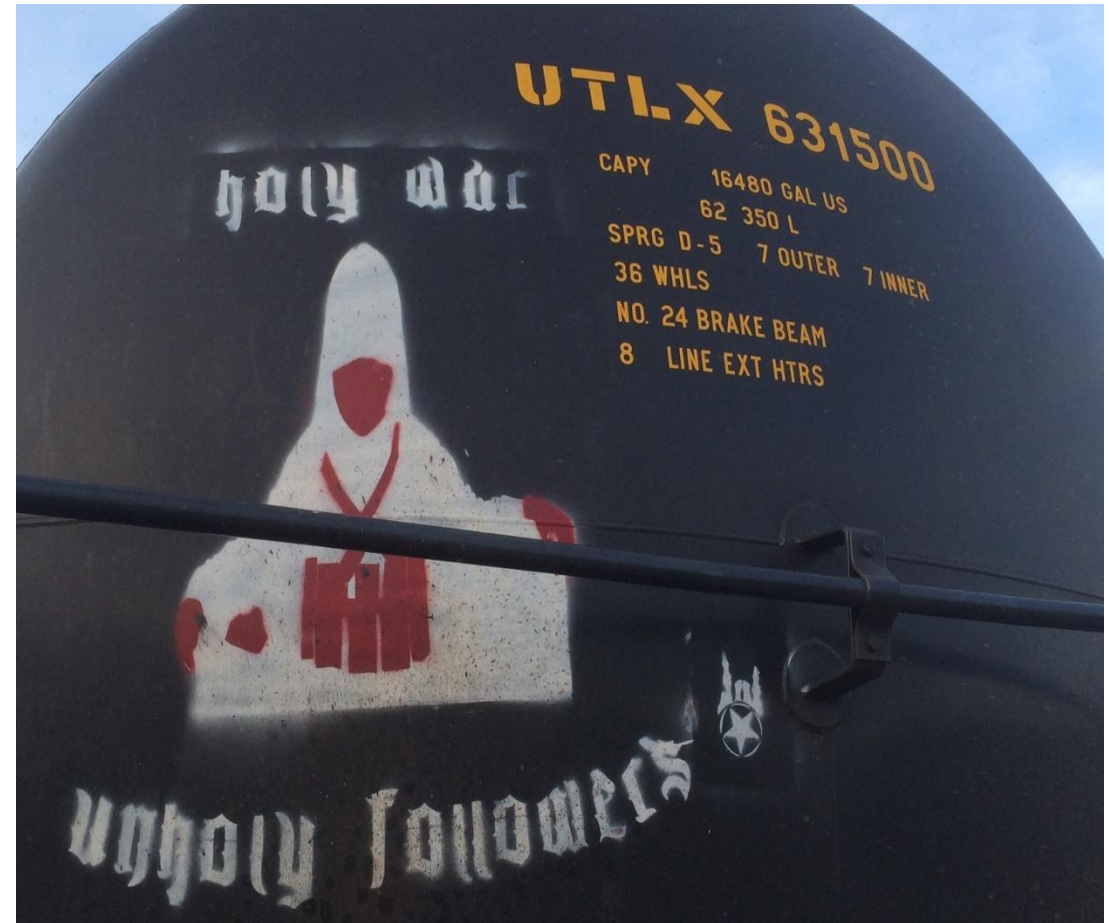
After II-Design B

Pavement Markings with Guidance Information

Figure 5 – Countermeasure II: Implementation of pavement markings

Tanker Threat

Trains are easy targets with thousands of unsecured track miles



Derail Threat

Al Qaeda published an entire magazine on how to derail trains in Europe and America.

Not considered a “martyrdom op” and “can be repeated.”

Source: Business Insider

Alexandra Ma Aug. 16, 2017, 9:42 AM



The cover of Al Qaeda's "Inspire" magazine. Inspire magazine via Jihadology

- Al Qaeda magazine contains an 18-page guide on how to build a tool that could derail trains.

Project Management – Early Coordination

Coordination with the Railroad and local government is required for any project that includes construction, reconstruction or closing of a highway-rail grade crossing in accordance with:

1. Section 337.11, Florida Statutes
2. Chapter 14-57, Florida Administrative Code

Note: Railroads companies can stop or greatly delay a project. Good communication and partnership is key.

Florida's Rail-Highway At-Grade Crossing Opening-Closure Program – Central Office

The Florida Department of Transportation has regulatory authority over ***all public railroad*** highway grade crossings in the state, including the authority to issue permits which ***shall be required prior*** to opening and closing of such crossings.

Florida Statute 335.141



Process to Open or Close a Railroad Highway At-Grade Crossing – Central Office

- An application is submitted to FDOT
- FDOT reviews the application and seeks input from all stakeholders
- If agreed upon, FDOT will draft a Stipulation of Parties
- If the parties do not agree, FDOT will issue a Notice of Intent to permit or deny the opening
- The stakeholders have 21 days to challenge
- If challenged, the petition is referred to the Division of Administrative Hearings
- An Administrative Law judge conducts a hearing and issues a Recommended Order
- A Final Order is then executed by the FDOT Secretary

Overpass (Grade Separation) vs At-Grade Crossing

- Traffic Volume
 - Florida Administrative Code 14-57.012(2)(a)8. states “When the estimated highway traffic is 30,000 vehicles or more a day across main line tracks, an engineering and benefit-cost analysis must be performed by the applicant to determine if a grade separation is warranted”.
- Safety
- Cost
- Traffic Speed
- Blocked Crossings
- Benefit Cost Analysis



Rail-Highway at-Grade Crossing Safety Improvement Program

- 23 USC 130 (Section 130 Safety Funds)
 - Authorizes the Rail-Highway At-Grade Crossing Safety Improvement Program to use federal funds for the construction cost of projects that eliminates hazards of railway-highway crossings.
- Implementation:
 - Identification of hazardous public rail-highway grade crossing locations;
 - Enhancing safety through installing or upgrading public rail-highway at-grade crossing warning devices, circuitry, and/or surfaces;
 - Conducting corridor reviews to identify roadway and signalization improvements needs to eliminate hazards, ie...LED light upgrades and Yield Signs;
 - Identifying redundant and unnecessary public rail-highway at-grade crossings for potential roadway closure; and by evaluating and reporting on the effectiveness of safety improvement projects.

Section 130 Projects FY 2019

- The Rail-Highway Crossings Program (Section 130) provides funds for the elimination of hazards at rail-highway crossings.
- Completed diagnostic reviews of high priority projects, typically between 10-20 per District.
- Selected 45 projects for FY 2019 funding for a total of \$9.8 million:
 - D1: 9
 - D2: 9
 - D3: 4
 - D4: 5
 - D5: 11
 - D6: 2
 - D7: 5



Central Office Contacts

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