Highway Accident Brief

Train and Truck Crash on Railroad Right-of-Way and Subsequent Fire

Accident Number:	(NTSB) HWY15MH006
Accident Type:	Train and truck crash on railroad right-of-way and subsequent fire
Location:	Near intersection of East Fifth Street and South Rice Avenue, Oxnard, California
Editing:	This is not an official NTSB document. On February 11, James McGillis created this document and claims copyright to its content and conclusions.

Crash Description

On Tuesday, February 24, 2015, in the predawn hours, Metrolink commuter train 102, operated by Amtrak, was en route from Oxnard, in Ventura County, California, to Los Angeles. As the train approached the South Rice Avenue grade crossing about 5:44 a.m., it collided with a 2005 Ford F450 service truck towing a two-axle utility trailer.

Precrash Events

Truck Driver Activities

In Oxnard, the truck driver traveled south on South Rice Avenue on approach to the intersection with East Fifth Street, which is located just 57-feet beyond the railroad grade crossing. This protected highway–railroad at-grade crossing is marked by a combination of warning lights, gates, signs, and pavement markings (figure 4). (No mention here about the deteriorating ~~conditions in February 2015~~, with road markings either worn or non-existent, especially at the actual grade crossing) According to the driver, he had intended to turn right at the intersection and to proceed west on East Fifth Street; however, he turned his vehicle too soon and entered the railroad right-of-way.

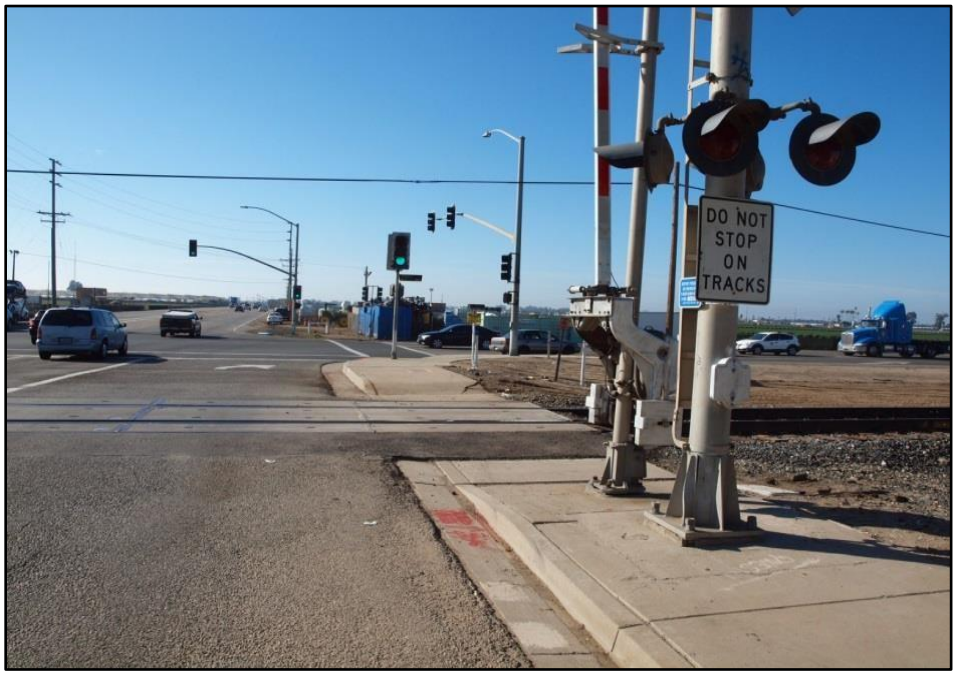


Figure 4 (Above). View of southward approach to East Fifth Street from right lane of South Rice Avenue, with grade crossing in foreground, 57 feet from East Fifth Street. (Subsequent to the February 2015 collision.)

At some point prior to the arrival of the train, the driver exited the truck, leaving the headlights and hazard lights on, and the driver door open. Based on an analysis of GPS data obtained from the driver's cell phone, about 12-minutes elapsed between the time the truck became lodged on the tracks and the collision with the train.

Train Crew Activities

The train departed the Oxnard station at 5:39 a.m., with the student engineer at the controls. He did not exceed 40-mph until he determined that the following signal was clear. He then accelerated the train in the full throttle position while approaching Rose Avenue. About 0.75 mile after passing Rose Avenue and 0.25 mile before reaching the South Rice Avenue grade crossing, the train passed the whistle board for the crossing, and the student engineer reduced the throttle. (According to the out-facing video camera, [see official time sequence, below] for sixty-one seconds past the "whistle board", the locomotive operated at full throttle. Only then, did the student reduce the throttle to idle.) As he was doing so, he recognized an obstruction on the track and placed the train into emergency braking. (According to the video transcript, five seconds elapsed between placing the engine in idle and the application of the emergency brakes.) About 8 seconds transpired between activation of the emergency brakes and the collision with the truck.

- Fitness for service: From the Student Engineer Interview:
  - Q: "So Monday morning you showed up at 4:20 (AM), 4:30 (AM) in the morning, Monday morning, right, to work this same trip?
  - A: "I showed up approximately 4: 00 that morning, I think --.
  - Q: "And where had you driven from on that one?"
  - A: "Riverside (California)."
  - Q: "So (Sunday night) you departed Riverside when?"
  - A: "I don't recall. Usually I would leave between 1:30 (AM) and 2:00 (AM).
  - Q: "So when did you go to bed Sunday night?"
  - A: "I think I was able to go to bed around 8:00 (PM).
  - Q: "Do you know what (time)you actually set your alarm for?"
  - A: "I set my alarm for 1:00 AM."
  - Q: "Saturday; try to think about the sleep cycle you had between Saturday and Sunday."
  - A: "Saturday, I went to sleep at 2, got up at 10 in the morning Sunday morning."
  - Q: "How far is that drive, hour-wise?"
  - A: "Approximately an hour and a half, 2 hours."
  - Q: "(On Monday) you worked the morning coming into L.A., and then what do you do when you get to L.A.? Do you have to do a quick flip, flex flip, or anything like that? (the "quick flip" and "flex flip" are never defined)
  - "A: "No. That job, it goes to the hotel in Burbank. Glenn does not go -- he has reverse lodging, so he stays usually at the Taylor Yard. And then comes back on duty." (What is reverse lodging? Where and when did Glenn Steele last sleep prior to the collision? If he stayed in the Taylor Yard, there is nothing better than a lounge chair for him to gain some rest? Steele's hometown is Homeland, in Riverside

County, California. Homeland is 144 miles from Ventura, and it takes 2:21 hrs. to travel that distance. We know the whereabouts of the student prior to the collision, but there is no public record of Glenn Steele's last few days.

- Q: "So hotel about 9 a.m., and when do you go back on duty?"
- A: "I believe it's around 1:30 (PM), back on duty. Then we take a double set back to the station (Union Station)."
- Q: "During that 4-hour break, right, do you get-- do you sleep at the hotel? It would have been Monday."
- A: "Yeah, Monday. I usually would have stayed in the quiet room, but since I didn't use the hotel the night before, I-- or in Ventura Sunday night, I believe I went to-- did I go? I went to the Burbank hotel."
- Q: "You were tired?"
- A: "Well, I was -- I get a little better sleep in the hotel than the quite room sitting in a recliner. So I was like, yeah, I'll go there and get some better sleep than I would normally."
- Q: "Okay. So you-- how long do you think you-- (you slept)?"
- A: "Probably -- usually I get about 3 hours in, 3 good hours of sleep."
- Q: "So Monday, midday from 10 to 1 or so, you probably were out?
- A: "--9 to 12, I was--."
- Q: "Okay, okay. Quiet room, you have slept in the quiet room, but it' s not--?" (This question directly contradicts what the student just said, that he slept three hours in a hotel.)
- A: "Yeah." (The student agrees with the contradiction. Which was it; did he sleep in a hotel or the quiet room?)
- Q: "And Engineer Steele, that's where he-- you say reverse. So he always has to use the quiet room on his split shift?"
- A: "Yes."
- Q: "How much on the Ventura line?"
- A: " I'd say about 2 months in total on that territory between my two instructors." (There are no published logs to corroborate the student's assertion that he had two month's experience on the Ventura County Line. Metrolink "Efficiency Test" records for student begin in February 2014 and end in January 2015; none of his tests happened on the Ventura County Line anywhere west of Moorpark, California.
- Q: "You did (work the Ventura Line) Monday and Tuesday of the accident week. Had you worked it the week before?
- A: "Yes. This was the second week being back up there, yeah."
- Q: "Okay. And this was the second time -- or second week with Engineer Steele or had you worked with him before?
- A: "I had worked with him a week before. Several months ago--.They didn't have anyone to qualify me at the time, so they moved me to a different territory. And then the week prior to the accident, they moved me back to qualify me, and they (Steele) qualified me Friday and Monday.

- Further Excerpts from Student interview, regarding the collision:
  - Q: "Okay. How far do you think you were?"

- A: "Oh, let's see. I think we had already crossed -- blew at the whistle board, so --less than 1,000 feet, to me."
- Q: "When you first saw it, what did you think it was?"
- A: "I wasn't sure. It appeared to be a light, but it almost looked like two lights facing different directions. It didn't look like an automobile or -- it almost looked like maybe a maintenance-of-way guy was parked too close to the tracks or something. It didn't appear -- I couldn't tell if it was on the tracks. I know it may have been fouling at the angle it was at, but I couldn't tell what type of obstruction it was.
- Q: "Was it a few seconds?"
- A: "It was almost like as soon as I asked him (Glenn Steele), I could tell like, oh. Then I could notice it was -- yeah, it was just a few seconds.
- Q: "Did you have any trouble getting out because of the two seats being there?"
- A: "I had more trouble getting out of the seat itself, because it's so close to the console. I had to squeeze through there. And I'm kind of a big guy and I had to --. The seat being too close to the console is sometimes a concern. (The student engineer is 5'-8" tall. Postcrash, when he when checked into the hospital he was 293 lb., which qualifies him as morbidly obese).
- Q: "Are you taking any drugs currently?"
- A: "(Redacted) and I believe it's a name brand or something, a muscle relaxer, and ibuprofen."
- Q: "Do you know what the milligrams are on the hydrocodeine?"
- A: "No, I don't."
- Q: "If he wasn't taking them the day of the crash -- and I don't believe you were?" (Here, the interviewer leads the student to say that he did not take the hydrocodeine on the day of the collision.)
- A: "No."
- Q: "Yeah, yeah, yeah." (Another attempt to gloss over any potential drug taking by the student).
- A: "No."
- Q: "All right. Anything -- UNIDENTIFIED SPEAKER: Hope not. UNIDENTIFIED SPEAKER: Yeah, that's irrelevant." (Unidentified interviewer says, "Hope not" to the concept that the student could have taken the hydrocodeine on the morning of the collision, but never asks if he did.)
- A: (No answer).
- (The interviewer tells the student that he was not taking the drugs and the student answers ambiguously, partly because the interviewer changes the question. Did he or did he not take the hydrocodeine prior to the collision and was it still in his system? Why was there no postcrash drug testing of the student engineer? Why didn't Metrolink demand one?)
- Q: "Do you wear glasses?"
- A: "No. Safety glasses, yeah. Prescription, no."
- Q: "So how would you describe your health?"
- A: "Average. (Actually, the student was morbidly obese and taking prescription "muscle relaxers". According to Drugs.com, "Hydrocodeine is a semi-synthetic

opioid synthesized from codeine, one of the opioid alkaloids found in the opium poppy.").

- Q: "How old are you?"
- A: "Thirty-one".
- Q: "What's your height and weight?"
- A: "About 5'8" and right now, probably-- I believe it's 292 lbs. (Actually 293 lbs. at the time of the crash)
- Q: "How would you describe your alcohol use?"
- A: "I can't even remember the last time I had a drink." ("I can't even remember" is not an adequate answer. One of the side affects of alcohol abuse can be memory loss.)
- Q: "How about your vision? Any issues with your vision?"
- A: "No. I've passed every vision test I've ever had." Q: "Do you know what-- do you know what your eyesight was rated at?
- A: "No."
- (Vision tested in October 2014 by an unknown optometrist. Specific results unknown. He "passed". No field-vision test ever conducted. No night-vision test conducted. No colorblindness test ever conducted.)
- Q: "Anything you think of that might make things safer, might help other people?"
- A: "No, just the issues with the cab car doors and chairs and-- I mean, because I know I' m a big guy with the chairs, but I'm not the biggest. There are guys bigger than me."
- Q: "Yeah."
- A: "You know, could be an issue." (If the 293 lb. student was "wedged in" behind the console, did that affect his blood pressure, judgement or even his eyesight? Twice in the interview, he mentions problems with his size, relative to the seating arrangement.)

Crash and Postcrash Events

- Excerpts from the NTSB Preliminary Report, dated August 26, 2016:
  - Both the engineer-in-training and the senior engineer were in the cab-control car of Train #102. The engineer-in-training was operating the train and the senior engineer was monitoring.
  - (Apparently, Glenn Steele was <u>not</u> monitoring. He remained seated quietly behind the student's high-back chair, not looking out the front of the cab, as one would do if "monitoring".)
  - While sounding the train horn, the engineer-in-training noticed something ahead that appeared to be on the tracks, and placed the train into emergency braking.
  - (Not true… The audio/video record shows that the student vacillated over the controls, and then asked Steele's opinion about what might lie ahead. Only when Steele instructed him to do so, did the student apply emergency braking.)

The train's forward-facing video camera showed the truck straddling the south rail, positioned to the right of center of the track bed, relative to the eastbound movement of the train. NTSB investigators performed a postcrash sight-distance test to determine how soon the student engineer could have seen the truck. The test showed that the truck was visible from a distance of more than 0.5 mile; however, at that distance, the headlights of approaching highway vehicles traveling west on East Fifth Street converged with the truck headlights. (In his interview, the

student engineer never mentions other lights. It is conjecture as to any traffic on the highway that morning. During the "observation exercise", there may have been convergent lights from Fifth St., but there is no indication that there were convergent headlights obscuring the scene during the original event. Viewing of the actual video would clear this up.) This masking of the obstruction-and the unexpected condition of having a vehicle on the track in advance of the crossing-might have made it difficult for the student engineer to identify and comprehend the hazard. (The student did not need to know what the hazard was in order to show caution. With Steele not monitoring and the student first not seeing and then not acting, valuable time and distance passed by with no action.)

Observation Exercise:

- Two data points were captured. One was when the train cab occupants could first see the truck and the second was when the train cab occupants could determine that the truck was obstructing the track. (During this observation, all of the train cab occupants understood beforehand what they were looking for near the crossing.)
  - The train cab occupants agreed the truck was visible when the train was 4,644 feet from the truck. (Almost .88 miles.)
  - The train cab occupants agreed that the truck was obstructing the track when the train was 3,430 feet from the truck. (About .65 miles)
- From the Student Interview:
  - Q: "Was Glenn sitting or standing inside the cab? It's pretty tight in there, I know.
  - A: "I believe he was sitting. He's normally sitting and it seemed like his voice was at my level."
  - Q: "Just about have to be if you're going to watch out the window, but --."
  - A: "Yeah."
  - (If seated in the jump seat behind the student, Glenn Steele could not see out the front window. If his voice was "at the same level" as the student, Steele was not looking out the front. Actual video will prove or disprove this point. The interviewer assumes Steele is looking out the front window, but in my opinion, he was not.)

Video File

- Metrolink #645 contained three camera angles:
  - Exterior, forward facing);
  - In-cab, profile (side-view); and
  - In-cab, control stand (view from behind the student engineer). One or more of the in-cab cameras recorded audio from inside the cab.
  - All times are hours: minutes:seconds (ex. 5:41:51 [AM]). "ET" means "Engineer in Training", which is the student engineer.

5:41:30	645 Fwd Facing	Lead car of train passed Milepost 405 sign and reflectorized sign with an "X" (Whistle Board). (.25 miles from Rice Ave. grade crossing)
5:41:52	645 In-Cab Control Stand	ET moved right hand from 1st button from right to 3rd button from right and pressed 3rd button from right (electronic bell).
5:41:56	645 Fwd Facing	White lights of accident truck first appeared to pulsate; however, due to camera resolution limitations and the distance from the truck, it was not clear what the source of the flashing was or the actual color of the flashing source.

5:42:15	645 Fwd Facing	As the train got closer to the truck, details became clearer: the two headlights of the accident truck were distinguishable forward of the train; one headlight was right of the right rail, the other was between the two rails.
5:42:23	645 Fwd Facing	As the train got closer to the truck, the pulsating lights on the accident truck were identifiable as follows: two white, steady headlights; two yellowish-orange hazard lights below the headlights.
5:42:31	645 In-Cab Control Stand	ET moved left hand to Throttle and moved Throttle forward to idle position.
5:42:32	645 In-Cab Control Stand	ET adjusted posture in seat, moved torso upright and forward. ET: "You see that, a car?"
5:42:33	645 In-Cab Profile	OJTI (Steele) began to move forward and up from jumpseat; looking forward.
5:42:34	645 In-Cab Control Stand	ET moved right hand to Automatic Brake Valve Handle. OJTI (Steele): "Yeah, yeah, plug it."
5:42:36	645 In-Cab Control Stand	ET moved Automatic Brake Valve Handle all the way forward to the emergency position. White indicators on Duplex Air Gauges began to move counter-clockwise towards the 7 o'clock (zero psi) position.

- From the time that the disabled truck was first visible until the student placed the engine in the "idle" position, thirty-five seconds [35] elapsed.
- At 79 miles per hour, the train was traveling 115 feet per second. From the truck's lights became visible and the time the student placed the engine in idle, the train had traveled 1025 feet.)
- By the time the student applied emergency braking, a total of forty seconds [40] had elapsed since the lights became visible.
- The student applied no braking action until Steele directed him to do so.

Train Wreckage

The train wreckage was examined to determine if structural issues may have contributed to the severity of the crash. The train was operating in a cab-car-forward configuration. The lead car was a Hyundai Rotem bilevel passenger cab car, the second was a Bombardier bilevel passenger coach car, and the third and fourth were Hyundai Rotem bilevel passenger coach cars. The locomotive was located at the rear.

The first three cars were a mismatched "consist" of heavy – light – heavy. Although the couplers are compatible, their design and energy-absorption characteristics were very different. The mismatch in weight and coupler design may have contributed to the breaking of the coupling and the separation of Coach Number 206 from the train at both its ends.

- SCAX 645 – Hyundai/Rotem Cab car: 140,000 pounds length, 85 feet. Cab car (coach) / Hyundai Rotem – Double-deck, in-service February 2011.
- SCAX 206 - Bombardier Coach Car: 110,000 pounds length, 85 feet. Coach / Bombardier – BiLevel. In-service April 2002
- SCAX 211 – Hyundai/ Rotem Coach Car: 145,000 pounds length, 85 feet. Coach / Hyundai Rotem – Double-deck. In-service December 2011.

The coupler heads of both the A-end, and the B-end (of Coach Number 206), mechanical couplers that were fitted to the car, were observed to have fractured at the "head-to-shank transition", and had separated from the shanks of the respective couplers… (In any other report, this would be a "catastrophic failure". Read on to see the inconsequential conclusions of the Final Report.)

The coupler of the Bombardier bilevel passenger coach car was sent to the NTSB materials laboratory for further examination. NTSB investigators determined that the coupler exhibited some workmanship issues, including porosity features, improper weld repair of a retained casting pin, a wall thickness just under the minimum allowed, and gate stubs inside the shank. However, stress calculations confirmed that the coupler could have passed a proof test regardless of its workmanship. Furthermore, it could not be determined if the coupler would have failed had the workmanship not been an issue.

- (This is saying, "Maybe the couplers did and maybe they did not contribute to the severity of the collision". In the event of a collision, the goal of the new Metrolink fleet was to keep all cars attached and on the tracks. Coach Number 206 was a weak link in the train, with catastrophic coupler failures at each end.)

The railcar interiors exhibited no loss of occupant survival space and were not damaged by fire. Many of the passenger injuries were to the head, spine, and upper body. An analysis of seating location and injuries found no correlation between injury severity, the railcar occupied, or the seating position within the railcar. (Not true. Marc Gerstel was in Coach Number 206 and other than Glenn Steele; he had the most severe injuries in the accident.) Instead, the primary cause of injury was determined to be the overturning of the railcars and subsequent passenger impacts with hard interior surfaces.

- From the NTSB Preliminary Report:
  - A number of Metrolink passenger railcars are fitted with "workstation" tables (also referred to in a manufacturer's technical manual as a "work table") that are located between certain paired seating sets of opposing passenger seats. The workstation tables are integrally configured with "energy absorbing" features to help ameliorate injury in the event of passenger impact (e.g., during a high-deceleration occurrence, such as a train-to-train collision).
  - Coach 206, (second in line) had not been retrofitted with energy absorbing tables. For proof, gain access to the coach at the Metrolink storage yard in Moorpark. Passenger Marc Gerstel was seated at one of the old tables during the collision and suffered multiple injuries to the back and neck.
  - (On the Hyundai-Rotem coaches) "push-back" mechanical couplers are fitted to the car that provides kinetic energy attenuation, and [in the event of a derailment] facilitate keeping the cars upright and aligned with the track.
  - Coach Car - Number 206: The subject railcar was manufactured by Bombardier, with an in-service date of April 2002. That coach utilizes a pair of conventional AAR short shank Type H interlocking [railroad car] mechanical couplers, as fitted to conventional "single cushion" draft gear.
  - Although technically compatible with the Hyundai Rotem couplers, the Bombardier design did not employ crash energy management (CEM) in its couplers, resulting in catastrophic failure.

Railroad and Roadway Infrastructure

Roadway

From August 2010 to January 2015, 21 crashes occurred at the East Fifth Street–South Rice Avenue intersection, of which six were located near the grade crossing. One crash involved a train striking a vehicle that had turned right onto the tracks from South Rice Avenue. Another crash involved a passenger vehicle traveling on South Rice Avenue that failed to stop at the railroad crossing and collided with an Amtrak train.

Figure 8 shows the approach to the intersection from South Rice Avenue. The distance from the nearest rail to the nearest point of the intersection is about 57 feet. On the southbound approach to the grade crossing, parallel white stop lines are located 11 feet from the automatic gate arm; on the northbound approach, parallel white stop lines are located 5 feet from the gate arm. Thirty-foot-high LED street lights are located on each quadrant of the intersection. The streetlights were tested on February 26, 2015, and found to be in full working order and performing as designed.

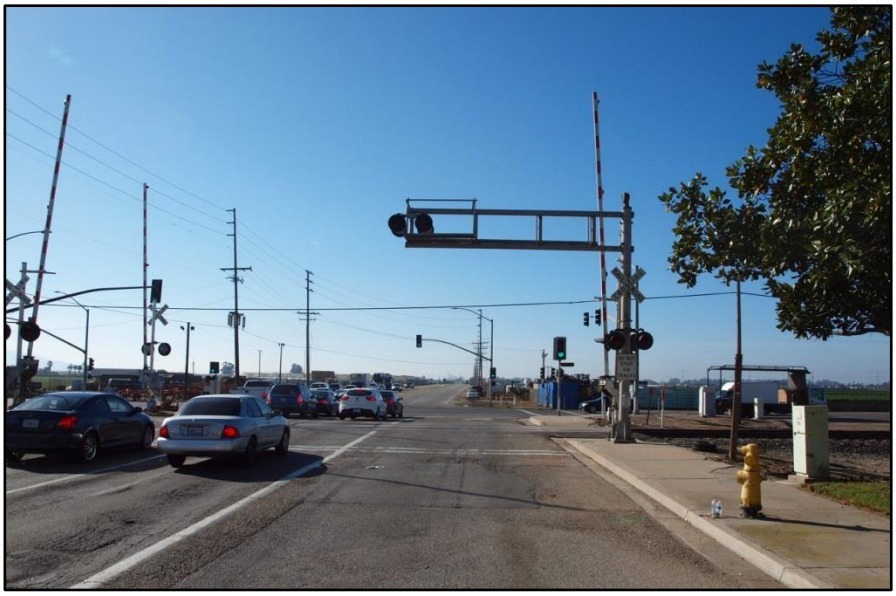


Figure 8. View of southbound approach to East Fifth Street intersection from right lane of South Rice Avenue. (Prior to postcrash "improvements".)

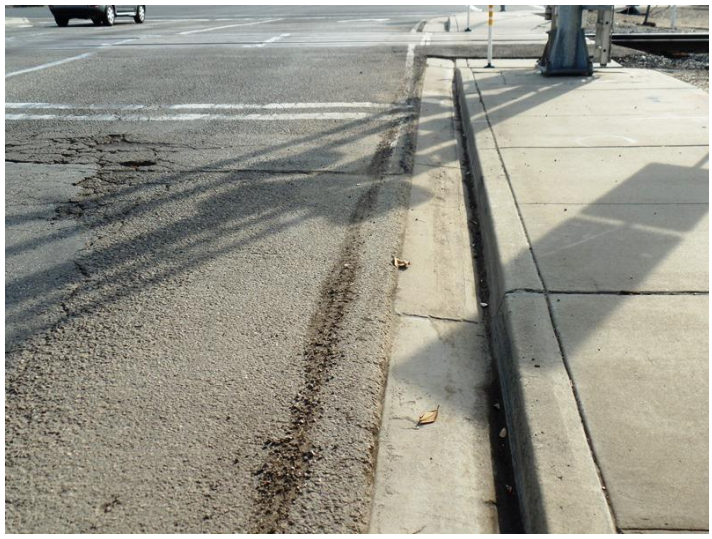
In addition to the grade crossing warning devices and markings shown in figure 7, grade crossing pavement marking symbols are located in the southbound and northbound through lanes of South Rice Avenue on approach to the grade crossing. The center of the southbound pavement marking symbols is located 463 feet from the nearest rail, and the center of the northbound pavement marking symbols is located 400 feet from the East Fifth Street–South Rice Avenue intersection.

In the interim (until a grade separation is created), the city of Oxnard and the UP have worked together to make short-term improvements to the grade crossing, as noted below:

- Extending the roadway's 4-inch-wide solid white edge lines to the edge of the track.
- Mounting white tubular markers with yellow reflective bands 13 feet from the track center on either side of the track.[33]

These improvements were completed on August 12, 2015, and are highlighted in figure 11.

Figure 11. Interim improvements at grade crossing: 4-inch-wide solid white edge line and two white tubular markers installed postcrash.



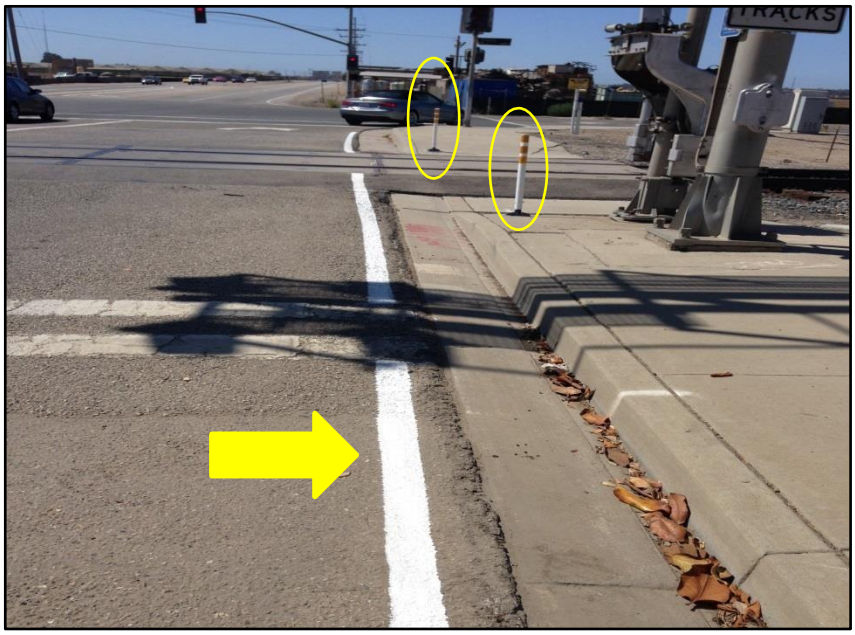


Photo above taken December 6, 2016, by James McGillis. Other than installation of the two traffic delineators installed near the tracks, conditions at the Rice Avenue grade crossing are more decrepit and deteriorated than any time since the 2010 train collision at this spot.

Probable Cause

"The National Transportation Safety Board determines that the probable cause of the Oxnard, California, crash was the truck driver mistakenly turning onto the railroad right-of-way due to acute fatigue and unfamiliarity with the area.

The NTSB does not assign fault or blame for an accident or incident (probable cause only); rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding

proceedings with no formal issues and no adverse parties… and are not conducted for the purpose of determining the rights or liabilities of any person."

- Probable causes of both death and destruction:
  - An inattentive and sleep-deprived driver turning on to the tracks.
  - An inattentive and sleep-deprived train crew failing to see or respond to lights on or near the tracks soon enough to safely stop the train.
  - A commuter train, in which the single coach not inclusive of crash energy management (CEM), experienced catastrophic failure of both its couplers.
  - A poorly maintained grade crossing approach, with twenty-one prior accidents, including one with a driver's wrong turn on to the tracks, resulting in a train collision.

Recommendations

"As a result of its investigation, the National Transportation Safety Board makes the following new safety recommendations:

To Google, Apple, Garmin Ltd., HERE, TomTom NV, INRIX, MapQuest, Microsoft Corporation, Omnitracs LLC, OpenStreetMap US, Sensys Networks, StreetLight Data, Inc., Teletrac, Inc., and United Parcel Service of America, Inc.:

- Incorporate grade crossing-related geographic data, into your navigation applications to provide road users with additional safety cues and to reduce the likelihood of crashes at or near grade crossings."