

U.S. Department of Transportation Federal Railroad Administration		FRA FACTUAL RAILROAD ACCIDENT REPORT					FRA File # R7-2011-05	IIC 81330 Smialek
Check block with (X) to indicate 5-day or Regional Investigation					5-Day >>	Regional >>		X
1. Name of Railroad Operating Train #1			1a. Alphabetic Code		1b. Railroad Accident/Incident No.			
Utah Transit Authority			UTAX		06082011			
2. Name of Railroad Operating Train #2			2a. Alphabetic Code		2b. Railroad Accident/Incident No.			
3. Name of Railroad Operating Train #3			3a. Alphabetic Code		3b. Railroad Accident/Incident No.			
4. Name of Railroad Responsible for Track Maintenance (single entry)			4a. Alphabetic Code		4b. Railroad Accident/Incident No.			
Utah Transit Authority			UTAX		06082011			
5. U.S. DOT-AAR Grade Crossing Identification Number			6. Date of Accident/Incident		7. Time of Accident/Incident			
254866N			month	day	year	hour	minute	AM/PM
			6	8	11	2:38	AM	PM X
8. Type of Accident/Incident (single entry in code box)		1. Derailment	4. Side collision	7. Hwy-rail crossing	10. Explosion-detonation	13. Other (describe in narrative)		Code
		2. Head on collision	5. Raking collision	8. RR grade crossing	11. Fire/violent rupture			7
		3. Rear end collision	6. Broken train collision	9. Obstruction	12. Other impacts			
9. Cars Carrying HAZMAT		10. HAZMAT Cars Damaged/Derailed	11. Cars Releasing HAZMAT	12. People Evacuated	13. Division			
0		0	0	0	Mid-Jordan			
14. Nearest City/Town			15. Milepost (to nearest tenth)		16. State Abbr.		17. County	
West Jordan					UT		Salt Lake	
18. Temperature (F) (Specify if minus)		19. Visibility (single entry)		20. Weather (single entry)		21. Type of Track		Code
70 F		1. Dawn 3. Dusk 2. Day 4. Dark		1. Clear 3. Rain 5. Sleet 2. Cloudy 4. Fog 6. Snow		1. Main 3. Siding 2. Yard 4. Industry		1
22. Track Name/Number		23. FRA Track		24. Annual Track		25. Time Table Direction		Code
Westbound track		Class (1-9, X)		Density (gross tons in millions)		1. North 3. East 2. South 4. West		4
26. Type of Equipment Consist (single entry)		27. Was Equipment Attended?		28. Train Number/Symbol				
1. Freight Train 4. Work Train 7. Yard/switching 2. Passenger Train 5. Single Car 8. Light loco(s) 3. Commuter Train 6. Cut of cars 9. Maint./inspect. car		A. Spec. MofW Equip.		Code		Code		#53
				2		1. Yes 2. No		1
29. Speed (recorded speed, if available)		31. Method(s) of Operation (enter code(s) that apply)		31a. Remotely Controlled Locomotive?				Code
R - Recorded E - Estimated		a. ATCS g. Automatic block m. Special instructions b. Auto train control h. Current of traffic n. Other than main track c. Auto train stop i. Time table/train o. Positive train control d. Cab signals j. Track warrant p. Other (specify in narrative) e. Traffic control k. Direct traffic f. Interlocking l. Yard limits		0 = Not a remotely controlled operation 1 = Remote control portable transmitter 2 = Remote control tower operation 3 = Remote control portable transmitter - more than one remote control transmitter				0
41 MPH		E		a				
30. Trailing Tons (gross excluding power units)		39. Primary Cause Code:		40. Contributing Cause Code:				
		M302						
137. Synopsis (Enter information below)								

At 2:38 p.m. MDT, June 8, 2011, a westbound light rail train 53 operated by Utah Transit Authority (UTA), struck and fatally injured a pedestrian at the 3200 West 8600 South highway-rail grade crossing, DOT/AAR inventory number 254866N, in West Jordan, UT. The speed at impact of the Siemens S70 light rail vehicle (LRV) was estimated at between 41 and 45 mph. Train 53 was operating on UTA's Mid-Jordan line, which was in pre-revenue testing and was not transporting passengers. There were no injuries to the crew and damage to the LRV was estimated at \$2,665.00. There was no derailment.

Weather at the time of the accident was cloudy/overcast and temperature was approximately 70 degrees Fahrenheit.

The probable cause of the accident was the failure of the pedestrian to heed the active grade crossing warning devices for motor vehicles and to yield the right of way to the oncoming train. Contributing to the accident was UTA's failure to address line of sight issues and to install pedestrian warning devices in accordance with its own design plans prior to commencement of pre-revenue testing.

Circumstances Prior to the Accident

The crew of UTA train 53 consisted of an operator and a supervisor/trainer, referred to as a Line Platform Instructor (LPI). The operator went on duty at the Jordan River Service Center (JRSC) at 9:00 a.m., while the supervisor went on duty at the same location at approximately 12:00 p.m.

As the Mid-Jordan line was in pre-revenue testing, the operator was on-duty to complete five round trips that day between the Lovendahl Maintenance Facility and the station at 5300 South for familiarization and certification to operate. He had completed three round trips earlier that day and was on the outbound leg of his fourth trip when the accident occurred. For the first three trips, the operator had another supervisor on board. For this fourth trip, however, the supervisor on board was riding with the operator for his first and only trip of the day. The supervisor planned to make one round trip and then return to the Lovendahl Facility at its end.

The operator stated his first three trips and the outbound leg of his fourth trip were uneventful prior to the accident. Approaching the accident site, he was seated at the controls of the Siemens S70 LRV, which is positioned in the middle of the operator's cabin at the front of the train. The supervisor was standing immediately behind and slightly to the right of the operator. From these positions, both were afforded an unobstructed view of the track ahead.

Approximately a minute prior to the arrival of westbound train 53 to the 3200 West highway-rail grade crossing, eastbound UTA train 52 was making a test station stop at the 2700 West platform. As it departed the station, it entered the grade crossing circuit that activated the grade crossing warning devices at 3200 West. As it neared the crossing on the outside (eastbound) track, the operator and supervisor aboard train 52 observed two female pedestrians standing on the sidewalk on the northeast corner of the crossing facing south. According to the crew, the pedestrians' attention was directed towards the oncoming eastbound train 52. The gates were fully down and locked and signal lights were flashing as confirmed by the Grade Crossing Indicator (GCI) lights viewable to the train crew. At the same time, train 52's crew observed westbound train 53's approach to the same crossing. Sensing a potentially dangerous situation developing for the pedestrians, according to the crew's statements, one or both emphatically gestured with their hands to the oncoming train to alert them to the pedestrians at the crossing.

The Accident

As westbound train 53 neared the 3200 West crossing, the operator saw one of the pedestrians begin to cross the track directly in front of the train, approximately 30 feet ahead. He responded by immediately placing the train in emergency braking but struck the pedestrian on the front right side of his vehicle, fatally injuring her. The train came to a stop 246.5 feet beyond the point of impact.

The supervisor exited the LRV to assess the scene and instructed the operator to remain in the cab. The supervisor did not know if both pedestrians had been struck and he checked under the LRV for another body. Finding none, he returned to the cab and called the emergency into the controller (dispatcher). UTA officials and West Jordan Police and Fire Department immediately responded to the scene. The police interviewed crew members and eyewitnesses and all attested to the fact that the grade crossing warning devices for motor vehicles were active.

Post-Accident Investigation

Immediately after the accident, UTA conducted its own accident investigation along with a representative from the State Safety Oversight agency, the Utah Department of Transportation (UDOT). UTA also ordered a safety stand down and suspended its pre-revenue testing for 30 days until a system-wide review of the Mid-Jordan line construction was made.

At the request of the Federal Transit Administration (FTA), FRA and FTA conducted a joint accident investigation during the week of August 22-26, 2011. The team included officials from FRA and FTA. The FRA officials included the Acting Regional Administrator for Region 7; the Staff Director, Passenger Rail Division from FRA headquarters, who represented the operating practices discipline; two members of the Passenger Rail Division with experience in motive power and equipment and transit/light rail operations; the investigator-in-charge (IIC), a Region 7 Chief Inspector; and Region 7 field safety inspectors in the track, signal and train control, and motive power and equipment disciplines. The FTA officials included the Regional Administrator and Engineer from Region 8, and a Safety and Security Specialist and Attorney from FTA headquarters. Team leaders were designated and team members were aligned to each of the four discipline-specific groups.

Following an entrance interview with UTA, the investigative team reviewed video from eastbound train 52 and westbound train 53. The video from train 52 clearly shows the two pedestrians standing on the northeast side of the grade crossing sidewalk with their attention focused on the oncoming eastbound train on the outside track. Train 53's video then shows train 52 approaching and the first pedestrian taking three to four steps forward (south) towards the tracks without turning her head in the direction of the oncoming westbound train on the inside track. The aftermath is also recorded by a rear-facing camera position aboard train 53.

In the 75 days between the date of the accident and the start of the investigation, UTA made extensive modifications to the grade crossing warning devices for pedestrians, as well as to the line of sight area surrounding the 3200 West

crossing. For the purpose of this investigation, the accident team relied on photographs taken of the scene before UTA modified the crossing protection and compared them to the scene as viewed during the post-accident investigation phase.

Background - Mid-Jordan line and Pre-revenue testing

The Mid-Jordan line is an extension of UTA's existing TRAX light rail transit service that has been in operation since December, 1999. As with the TRAX North-South line, the Mid-Jordan line is a temporally separated/shared corridor, along which two freight railroads operate, i.e., the Utah Railway (UTAH) and the Savage, Bingham and Garfield Railroad (SBG), based at the Midvale Yard. TRAX operates between 5:00 a.m. and midnight daily, and the freight railroads operate between midnight and 5:00 a.m. UTA controllers (dispatchers) issue train orders to the freight operators, which must be off the alignment and returned to the Midvale Yard office to allow TRAX to operate. Maximum operating speed for LRV's is 65 mph, while speeds for the freight railroads vary between 15-30 mph.

Pre-revenue testing is intended to perform various operational, maintenance and testing functions on all aspects of the line without passengers on board. Included in the functions are systems integration testing, familiarization with the line, qualification runs for the operators and supervisors, and testing of the schedules (timetable) and communications. UTA also introduced a new light rail vehicle to its fleet, the Siemens S70 model, to go along with its S160, S100 and UTDC vehicles. The S70 model was intended to exclusively run on the Mid-Jordan line but could also be used on other parts of the TRAX system.

Signal and Train Control – Highway-Rail Grade Crossing System

Light rail and heavy/freight rail movements on the Mid-Jordan line are governed by Automatic Train Control System (ATCS) by UTA controllers (dispatchers) located at the Jordan River Service Center (JRSC). The maximum authorized speed for LRV train movement is 65 mph. For each direction of vehicle traffic, the warning system consists of one mast located near the edge of the roadway. Attached to each mast is a crossbuck, a sign indicating two tracks over the crossing, an audible warning bell, 12-inch LED flashing light units, and gate arm extending to the center median. Three GE AFTAC II units [FM Audio Overlay] for each track provides train detection on an approach circuit sufficient to allow at least 25 seconds of minimum warning time during train movements.

According to the signal/grade crossing warning devices download taken following the accident, the sequence of events for eastbound train 52 and westbound train 53 are as follows:

Eastbound 52: eastbound approach circuit is 1,193 feet ahead of island circuit

Westbound 53: westbound approach circuit 2,855 feet ahead of island circuit

E/B 52	14:37:24 – crossing activates, eastbound approach circuit drops out
W/B 53	14:37:27 – westbound approach circuit picks up
E/B 52	14:37:29 – crossing gates fully activated and horizontal
E/B 52	14:37:57 – eastbound island circuit drops out 40 feet from pavement (33 seconds after activation)
E/B 52	14:38:01 – eastbound approach circuit picks up; rear of train off circuit
E/B 52	14:38:03 – eastbound island circuit picks up
W/B 53	14:38:04 – westbound island circuit drops out

These times indicate westbound train 53 entered the crossing one second after eastbound train 52 exited it and the grade crossing lights continued to flash, and gate arms were still fully activated and horizontal. It should be noted that the signal gongs, the audible warning for the crossing devices, were silenced from the moment the gates were fully activated and horizontal. This was the practice on UTA TRAX as requested by the municipalities along the right of way. Following the accident, UTA changed this practice in the interest of pedestrian safety and all signal gongs are now sounding throughout the crossing activation. However, a 24-hour Federal quiet zone remains in effect on the Mid-Jordan line, which provides that a railroad refrain from routine locomotive horn sounding by light rail vehicles and freight trains at the 3200 West crossing.

An inspection of the highway-rail grade crossing warning system, observations and timing of trains operating over the crossing, and a review of signal inspection records and documentation all indicate the warning systems functioned as designed and intended.

Motive Power and Equipment – Siemens S70 Light Rail Vehicles

The equipment involved in the pedestrian fatality was Siemens S70 light rail vehicles (LRV) 1134, 1117, and 1125. The motive power and equipment team gathered information, documentation and photos on braking, warning devices, and processes of the UTA mechanical personnel following an incident.

Braking

The Siemens S70 light rail vehicle is equipped with two types of emergency braking; one is initiated from the throttle/braking handle, the other is activated by a push button on the operator console. The handle emergency braking employs blended braking, a combination of friction and dynamic braking, relying primarily on dynamic brakes and the traction control system while limiting the overall use of friction brakes, both track and disk brakes. The push button emergency braking consists of only disk and track brakes and does not prevent wheel slide. Information gathered from mechanical and operating personnel during the investigation revealed that operators are trained to use the emergency brake on the throttle and not the push button emergency application. This is due to potential for additional damage to the equipment and the additional stopping distance required due to the lack of traction control.

A post-incident brake test was completed according to UTA mechanical and documents supplied by UTA. The brake test was performed in both directions and at approximately the same speed of the incident. Deceleration rates in both directions were found to be in compliance with the minimum Siemens specifications.

In order to determine the speed of the LRV at which the accident occurred, UTA's practice is to measure the distance required to stop the LRV and do a reverse calculation to compute the speed. The equipment team explored the Train Control Units (TCU) feature on the S70 for more information.

Event Recorder – Train Control Unit (TCU)

LRV's operating on shared use/ temporally separated corridors are afforded the opportunity to apply for waivers of certain parts of FRA's regulations under 49 CFR Parts 200-299 governing their operation. Among those regulations normally applied for is 49 CFR Part 229.135 that requires any train operating faster than 30mph must be equipped with an in-train event recorder in the lead locomotive. In its September 30, 2010 waiver renewal request and safety justification, UTA stated the following:

“UTA requests a waiver from this requirement because the Siemens S70 TRAX vehicles, like the existing TRAX vehicles, will not be equipped with event recorders. However the Train Control Unit (TCU) within each vehicle is capable of capturing all of the information required by the regulation, except for throttle position. Although the TCU is not a continuous recorder, it is activated at anytime a fault is seen and the information captured is saved indefinitely (it cannot be overwritten like it can be on a traditional event recorder). Consequently, in the event of an accident, the TCU will capture virtually all the same information required by the regulation, making this information available to the UTA, State and Federal authorities.”

The equipment team learned that the information logged by the TCU is primarily used as a diagnostic tool for the mechanical department, and the information required by Part 229.135 is generally not available when requested. Additionally, information is not captured indefinitely and can be overwritten. When a download was requested for the subject LRVs on the date of the accident, the team was informed that the information was unavailable because a software update from Siemens overwrote the data.

Contrary to UTA's waiver request, the TCU will not capture virtually all the same information required by the regulation. For example; while a useful parameter such as speed might be available, the TCU has to log a fault at the exact time of the accident and it must be a fault that would include the speed parameter. Depending on the type of fault logged, the TCU will record only those system parameters that are relevant to the diagnostics of that fault, and no single fault, even if present at the time of an incident, will log all parameters required by the regulation.

From further discussions with UTA staff, the team learned that while the push button emergency brake will create a fault in the TCU fault log, a throttle-initiated emergency brake will not. Although UTA operators were trained to use the push button in an emergency, it was a measure of last resort and was not favored over the throttle-initiated emergency brake. As the vehicles were set up on the date of the accident, without the activation of the push button in an emergency situation, it is not likely that any information critical to an accident investigation would be logged at all.

Track

In the accident area is a double main track with 18 feet centers running west and east. The track is constructed of new 115-pound rail on concrete cross ties spaced 24-inches apart. The right of way on the west bound track has a clearance of 10 feet and 8 inches from the center of the west bound track. The west bound track has an ascending track with 2.678% grade to the west. The track crosses the roadway at a skewed angle.

Line of Sight and Pedestrian Warning Device Issues

The accident investigation team spent considerable time exploring vehicular and pedestrian line of sight issues at the 3200 West crossing. As the investigation was done 75 days after the accident, the team relied on photographs taken of the scene and compared them with site remediation efforts afterwards.

The area surrounding the 3200 West crossing as originally constructed included sound barriers, or sound walls, which are designed to muffle the sound of passing trains from private residences on the north side of the street. The walls were a panel-in-channel design measuring 15-feet in height, 4-inches thick, and were made of sound absorbing and sound reflecting material. They were erected in November 2008 in accordance with a multi-Federal and state agency final environmental impact study (FEIS). The Mid-Jordan line planners understood that freight rail traffic would be routed over the line between midnight and 5:00 a.m. and, along with efforts to design and obtain approval for the crossing and corridor as Quiet Zone compliant, sound walls would effectively reduce the sound of frequent light and heavy rail traffic throughout the day and night. Similar sound walls are found throughout UTA's light rail and commuter rail system.

What became problematic to the layout at 3200 West was the sound wall extended very close to the edge of the sidewalk on the northeast side of the crossing. Additionally, an electrical power pole was located just a few feet to the inside of and close to the wall that created a very narrow gap, possibly only a few inches, to view oncoming rail traffic looking east. While not particularly dangerous for motor vehicle traffic stopped at the crossing, since they are held at a safe distance by the gate arms from the grade crossing warning device system, the placement of the wall and power pole so close to the sidewalk and the field side of the inside track made it difficult for pedestrians to view oncoming westbound traffic. On the day of the accident, the only pedestrian warning device was a yellow tactile pad installed on the sidewalk at a slightly oblique angle to the sound wall, and slightly behind the barrier. The placement of the sidewalk and tactile pad angled pedestrians towards the south west quadrant of the intersection. For a pedestrian standing on the tactile pad as it was on the day of the accident, it would have been virtually impossible to see oncoming westbound train traffic from around the wall and power pole without stepping several feet closer to the field side of the track and turning to gain a view looking eastward. A "NO TRESPASSING – PRIVATE PROPERTY – KEEP OUT" sign was affixed to the power pole but it was oriented to be visible to pedestrians walking north. No other signage is visible in the post-accident scene photographs.

The police interviewed the second pedestrian, a cousin to the decedent, whose statements attested to the line of sight issues presented by the sound wall and power pole. According to the cousin, she "peeked" around the wall and power pole and caught sight of westbound train 53 at approximately the same moment as the decedent began to stride across the tracks as eastbound train 52 was clearing the crossing.

Notably absent were any other active or passive pedestrian warning devices. The investigation revealed approved design plans called for several improvements to the crossing, specifically directed at warning pedestrians to the dangers of train traffic but these improvements had either not been made or completed and functioning, even though pre-revenue testing had commenced a month prior.

Operating Practices

The Operating Practices team interviewed key UTA officials and reviewed documentation to gain an understanding of the Mid-Jordan line construction and certification-to-operate approval process. The following synthesizes the results of their investigation:

- a. UTA failed to follow its own certification process, in that final certification walkthroughs of the line were not conducted before pre-revenue testing began.
- b. UTA failed to follow design criteria table 19.7.3 for the crossing at 3200 West, in that the criteria required basic treatment items, such as "Look Both Ways" signage, "Stop Here" markings, and pedestrian channeling, none of which was present on the day of the accident; and active treatment items, such as vehicle flashing lights, audible warning for pedestrians, and automatic pedestrian gates, which also were either not present or were not completed and functioning on the day of the accident. Only one basic treatment item, the tactile pad or strip, was installed and present on June 8.
- c. UTA's controllers (dispatchers) were told the line was certified except for "a few punch list items". One of the punch list items was the "Look Both Ways" signage, which was scheduled to be installed on June 2, 2011. The controllers were never told the pedestrian crossing at 3200 West did not have the prescribed pedestrian treatments. These treatments were not installed until after the accident of June 8, 2011.
- d. It was clear that UTA knew line of sight was a concern at 3200 West and other locations. There were plans to install additional pedestrian treatments and UTA failed to take steps to adequately protect movement over the crossing until the treatments were complete.
- e. At the time of the accident the line had been turned over to operations for pre-revenue testing with no restrictions other than for operators to comply with operating rule 3.05, Use Best Judgment, while operating on Mid-Jordan extension. Rule 3.05 was said to apply at all times and in all situations.

- f. Prior to the accident, the UTA Rail Safety Administrator, working with a committee comprised of Capital Development and Operations personnel, identified the pedestrian crossing at 3200 West and two other pedestrian crossings, 2200 West and 2700 West, as locations of concern with limited line of sight attributed to sound walls. The committee determined that removing or reducing the sound walls would impact the completed environmental impact study. The committee recommended installing “active pedestrian warning indicators” and channelized walkways, sometimes referred to as S-, C- and Z-crossings. At the time of the accident the active warning indicators had not been installed and the channelized walkway (Z-crossings) was not complete. There was no notification to train operators to use caution or operate at any reduced or restricted speed while operating over the 3200 West crossing or any other crossing where line of sight problems had been identified. It is important to note that the design criteria for crossings with “severe sight distance restrictions” called for “basic treatment,” channeling and automatic gates for pedestrian crossings. As indicated, basic treatment requires Look Both Ways signage, tactile warning strips and Stop Here markings.
- g. A review of the Rail Service Safety Committee Meeting minutes for March 10, 2011, and May 12, 2011, contain discussion of the concerns for the 2700 West grade crossing. The rail safety administrator noted there were other locations where Z-crossings were lacking and that, if the situation was not corrected, speeds would have to be reduced in these areas.

Training

The interviewing team examined UTA’s light rail operator training and discussed the program with the training managers/administrators. Much attention was paid to UTA TRAX operating rule 3.05, Use Best Judgment, which was cited as a standing order for all LRV operators and applicable during the certification trip by westbound train 53 on the day of the accident. Rule 3.05 is quoted as follows:

“Any action by employees responding to emergencies, hazardous, and unsafe conditions must be made consistent with good judgment. Employees in doubt or uncertain in any situation must take the safe course of action; such actions must be immediately reported to Control and to one’s immediate supervisor.”

In further discussions with the training department about the application of Rule 3.05 as it relates to the accident, an inference could be drawn to the LRV operator’s use of the rule provided he was made aware in advance of dangerous conditions along his route of travel. As previously stated in the investigation narrative, there was no information given to the controllers (dispatchers) or through the operations channels of line of sight issues or of incomplete pedestrian treatments along the Mid-Jordan line, which may have prompted speed restrictions or other safety/precautionary measures or directives.

Interviews

Interviews of crew members aboard eastbound train 52 and westbound 53 substantiated without contradiction the facts preceding and following the accident.

Post-Accident Remedial Actions

Line of Sight

Following the accident, UTA ceased all operations on the Mid-Jordan line for 30 days, during which a comprehensive, system-wide review of all safety issues was conducted. Those issues included line of sight remediation, installation of all basic and active treatments, pedestrian channeling and more. Prior to re-starting pre-revenue testing, a special train was operated over the alignment that carried key UTA, Utah Department of Transportation (UDOT), and Federal Transit Administration (FTA) staff and officials to show the changes that were made during the stand-down. Additional comments received from UTA operations personnel were also solicited and implemented. Finally, UTA Police Officers were posted at the 3200 West, 2700 West and 2200 West highway-rail grade crossings to educate pedestrians on how to safely cross the tracks and to properly use the installed pedestrian safety equipment.

As late as November 2011, UTA purchased additional private property at the 3200 West crossing and re-engineered and constructed a new sound wall segment that affords a more open view of the tracks while still providing sound dampening for homes along the right of way. In early December 2011, the power pole was also relocated approximately 30 feet east and five feet further north from its original position to also improve line of sight looking eastward.

Vehicle Event Recorder Information

In September 2011, FRA presented a letter to UTA which detailed the deficiencies noted in the Siemens S70 vehicle’s Train Control Unit (TCU) as it applies to non-conformance with 49 CFR Part 229.135, event recorders. The letter directed UTA to develop an immediate solution to capture required data for any LRV involved in an accident on

shared-use track in accordance with Part 229.135(e) and to amend and enforce standard operating procedures to collect and preserve same. The letter also requested UTA develop a long-term plan to investigate and resolve similar issues and deficiencies in other LRV's within its fleet, i.e., Siemens S160, S100, and older UTDC's, that operate over FRA controlled track. UTA's reply to the initial requirement for data capture appears to satisfy the requirement of Part 229.135(e). FRA will closely monitor UTA's overall program to develop a fleet-wide plan for event recorder data information.

Analysis and Conclusions

Track

A review of all records of tests, inspections, construction standards and post-accident observations excluded track as contributing to the accident.

Mechanical

A review of all records of tests and inspections on the Siemens S70 LRV excluded mechanical issues as contributing to the accident.

Signal

A review of all records of tests, inspections, construction standards and post-accident review of downloaded signal data indicate the signal/grade crossing system functioned as intended and is excluded as contributing to the accident.

Line of Sight

Although not within FRA's jurisdiction, the investigation team cannot overestimate the significant roles the sound wall barrier and power pole played in potentially masking the decedent's view of the oncoming westbound train. This dangerous condition should not have been allowed to exist and site remediation should have occurred prior to the start of pre-revenue activities.

Overall conclusions

Known hazards at the 3200 West crossing should have been addressed and resolved prior to the start of pre-revenue testing. Safety concerns expressed by the rail safety administrator were not heeded and meetings to discuss and remediate hazards were either not held or cancelled and a full build-out of approved safety enhancements should have been completed prior to the start of pre-revenue testing. A more thorough explanation of the status of the line and remaining "punch list items" should have been given to operations at the time the contractor certified the line as complete. Resolution of known line of sight issues and installation of pedestrian warning devices should have been priority items. There was a general, all-around failure to do a critical safety evaluation of the line prior to the start of pre-revenue testing.

Probable Cause and Contributing Factors

FRA has concluded the probable cause of the accident was the failure of the pedestrian to heed the active grade crossing warning devices for motor vehicles and to yield the right of way to the oncoming train. Contributing to the accident was UTA's failure to address line of sight issues and install pedestrian warning devices in accordance with its own design plans prior to commencement of pre-revenue testing.