



**NATIONAL TRANSPORTATION SAFETY BOARD**

**OFFICE OF RAILROAD, PIPELINE AND**

**HAZARDOUS MATERIAL INVESTIGATIONS**

**WASHINGTON, D. C. 20594**

**HWY17MH010**

**CSX TRAIN COLLISION WITH TOUR BUS at MAIN**

**STREET HIGHWAY/RAIL GRADE CROSSING**

**On CSX NO&M Subdivision**

**Biloxi, Mississippi**

**March 7, 2017**

**SIGNAL GROUP FACTUAL REPORT**

**Prepared by: Timothy J. DePaepe, Signal Group Chairman**

**Accident:**

Type: Train and Tour Bus Crash at Main Street Highway/Rail Grade Crossing  
Date and Time: March 7, 2017 at 2:15 p.m. (CST)<sup>1</sup>  
Location: Biloxi, Mississippi  
Vehicle #1: Van Hool Motorcoach  
Vehicle #2: CSX Northbound Freight Train Q606-07, Lead locomotive CSXT 230, 27 loads , 25 empties, 3990 tons, 3164 feet in length.  
Fatalities: 4  
Injuries: 40  
Uninjured: 5  
NTSB #: HWY17MH010

**Signal Group:**

Mr. Tim DePaepe Railroad Accident Investigator – Signals  
National Transportation Safety Board,  
Office of Railroad, Pipeline & Haz-Mat Investigations

Mr. John Parr, Assistant Chief Engineer, C&S Operations South – CSX Transportation

Mr. Craig Harrell, FRA Inspector  
Signal & Train Control

Mr. George James Jr., Manager  
Electronic Engineering CSX  
Transportation

**Synopsis:**

For a summary of the crash, refer to the *Crash Summary Report* in the docket for this investigation.

**Description of Railroad Signal System and the Grade Crossing Signal System**

The CSX NO&M Subdivision is on the Atlanta division, timetabled in a north/south direction (East/West geographically). The CSX track structure through Main Street in Biloxi consists of single main track territory, tangent track. The Control Point on the north side of the crossing is the South End Ocean Springs. The Control Point on the south side of the crossing is the North End Beauvoir.

Main Street crosses the tracks in a geographical north and south direction and intersects with Esters Blvd. adjacent to the tracks about 50'. The posted speed limit is 25 MPH for street traffic. The method of train operation is by signal indication of a Traffic Control System (TCS). Authorized Timetable Train speed through Main Street is 45 MPH for both passenger and freight.

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<sup>1</sup> All times are Central Standard Time unless otherwise noted.

## **General Description of Grade Crossing Signal System Activation**

The highway-rail grade crossing warning system at Main Street, MP 726.61, DOT 340185W, consists of 16, 12-inch diameter LED (light – emitting diode) flashing lights, 2 gates, 1 electronic bell, 2 cross buck signs, and 2 emergency notification system (ENS) signs, all of which are mounted on 2 separate 5-inch diameter signal masts that are attached to concrete foundations in the ground.

The northwest quadrant signal consists of a total of 8 lights - one set of back to back 12-inch LED's on the mast, one set of back to back 12 inch LED's on the mast arm, one gate arm, a cross buck sign, and an Emergency Notification (ENS) sign.

The southeast quadrant signal consists of a total of 8 lights - one set of back-to-back 12-inch LED's, a jury arm consisting of one set of back to back 12 inch LED's, one gate arm, a bell, a cross buck sign, and ENS sign

The warning devices are controlled by a Safetran Grade Crossing Predictor Model 3000ND<sup>2</sup> bi-directional redundant unit which is mounted inside a 6x6 aluminum bungalow. Additional equipment mounted inside the case consists of a Hawk Data Recording Unit, 3 NRS Battery Chargers, Model ELC-12/20-S and three battery banks.

The circuit plans show the eastbound approach length at 2636' (the measured distance was 2634') and southbound approach length at 2098' (the measured distance was 2095') with the program of the GCP 3000 unit designed to allow for 30 seconds of constant warning time. The circuit plans show the island circuit design at 132' (the measured distance was 133').

All operational tests, downloads, photographs, and documentation revealed that the highway-rail grade crossing warning system functioned as designed and intended at the time of the accident. A download of the data from the Hawk Unit revealed the unit detected the train and a warning time of 30 seconds was provided. (Federal regulation requires a minimum of 20 seconds).

The following is a general description of how the grade crossing signal system works, when activated:

- The system detects the approach of a train once it enters the termination shunts;
- After factoring in speed and distance the GCP-3000 determines when to activate the grade crossing signal system so that 30 seconds of warning time is achieved at the crossing;
- Within one to two seconds, the lights and bell begin to activate;

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<sup>2</sup> The 3000 Grade Crossing Predictor (GCP) is a microprocessor-controlled system that is deployed to continually monitor the approach(es) to railroad grade crossings. In operation, the 3000 GCP may function either in the Predictor or Motion Sensor (MS) modes. It detects approaching trains; computes train speed and distance; predicts train arrival time at the crossing; activates crossing-protection equipment at a set (programmed) time prior to the predicted arrival of the train at the crossing threshold of approximately 2 MPH activates crossing-protection equipment at time of train detection.

- After about a 3-4 second delay, the gate arms begin to descend to the horizontal position;
- After approximately another 11-14 seconds the gate arms are in the full horizontal position;
- After another 10 to 20 seconds the train enters the highway crossing;
- Once the entire train passes through the highway crossing (which is the Island Circuit) the gates begin to move to the vertical position (approximately 5-8 seconds);
- Once the gates are back in the full vertical position the lights and bell deactivate.

When a GCP-3000 is configured to provide a constant minimum warning time of 25 seconds for approaching trains before they occupy the crossing at any speed up to the maximum allowable speed, actual warning time may differ by +/- (plus/minus) variant of three seconds. This variance is within manufacturer specifications.

No exceptions were identified with the design of the grade crossing signal system and all systems performed as designed and intended.

### **Roadway Measurements and Markings**

Main Street is a two-lane, paved city street with a posted speed limit of 25 mph and intersects the crossing at approximately a 90-degree angle. There are no obstructions or issues with the site distance in either direction when stopped at the road crossing. The grade crossing consists of asphalt and the width of the road at the crossing is 27'.

Travelling north on Main Street from the intersection of Dr. MLK Jr. Blvd., at approximately 337' there is an advance warning sign on the east side of the road, at 538' is the RR advance warning pavement markings, at 645' is the intersection of Esters Blvd (Esters Blvd runs parallel to the tracks on the south side) and at 695' is the stop bar at the grade crossing. (From the intersection of Esters Blvd., the distance to the stop bar is approximately 50'.)

Travelling south on Main St., on approach to the crossing there is an advance warning sign located on the west side approximately 218' from the intersection of Esters Blvd N. The stop bar on the pavement at the crossing is located approximately 231' from the advance warning sign. There are no RR advance warning pavement markings. (Esters Blvd N runs parallel to the tracks on the north side and intersects Main St. approximately 13' from the grade crossing.)

There is no center line on the road on the north side. The distance from the track to the painted stop bars is approximately 25 feet for both sides.

### **Grade Crossing Signal System Event Recorders**

Preliminary information received from downloads made from Main Street Highway/rail grade crossing showed the accident train approached the grade crossing with a recorded warning time of 30

seconds. The predictor event recorder only recorded as far as the train passing through the island circuit. After predicting the movement, the unit recovered the warning devices with a level of 4 EZ.

### **Post Accident Inspection Of the Grade Crossing Signal System and the Train Signal System**

On March 9, 2017, the signal group consisted of CSX management, CSX signal workers, FRA and NTSB investigators. A job briefing was held and work to restore the highway/rail grade crossing signal system began at 14:30. The highway/rail grade crossing signal system bungalow did not show any indication of tampering or vandalism that would interfere with the operation of the grade crossing signal system. At 14:45 investigators instructed CSX personnel to break the seal and access the Main Street grade crossing signal bungalow. At 15:15, under the observation of federal investigators CSX personnel downloaded the GCP-3000 data at the Main Street Highway/Rail grade Crossing. At the 15:35 CSX construction crew members started the repair work at Main Street grade crossing. At 16:30 the cable for the destroyed signal gate and flasher was tested and results recorded. At 19:40 all relays in the grade crossing bungalow were tested and results recorded. At 20:35 installation of the new signal and signal foundation was completed. At 22:05 all electrical connections were hooked up, the grade crossing flashers were aligned and the gate arm installation was completed. At 23:15 track circuit shunt tests performed satisfactorily and Main Street highway/rail grade crossing was put back in operation.

Investigators also inspected the circuit plans and program sheet, wire tagging, nomenclature of tags, number of battery cells and amp hour (AH) rating, flash rate of flasher lights, flashing sequence of lights, checked gate delay timing for when gates began to descend, checked timing of gates to horizontal position, checked measurements of gate arm heights when horizontal, measured the eastbound approach distance (northbound on timetable), measured the length of the island circuit and measured width of road at crossing.

No exceptions were identified with the design of the grade crossing signal system and all systems performed as designed and intended.

On March 9, 2017, CSX conducted a job briefing with the signal group members and the group began the data downloads of signal data at Control Point (CP) N.E. Beauvoir, MP 730.31. The signal bungalow did not show any indication of tampering or vandalism that would interfere with the operation of the signal system. The data download provided information on the status of the 4 signal which was the last control point signal just prior to the accident area. Investigators determined that the CSX dispatcher selected the route of 4 signal at CP N.E. Beauvoir for the accident train. When the train approached 4 signal it displayed an aspect of green over red.

Investigators cleared 4 signal at CP N.E. Beauvoir for the same route as the accident train. Investigators verified all track circuits between CP N.E. Beauvoir and the accident scene. Investigators verified that 4 signal went to red and remained red during the simulated movement of a train.

No exceptions were identified with the design of the train signal system and all systems performed as designed and intended.

## **Main Street Grade Crossing Signal System Trouble Tickets**

Investigators examined trouble tickets for one year prior to the accident date. There were 12 incidents with either vehicles stuck on the tracks or trains striking vehicles on the tracks. NTSB highway investigators requested an additional four years of trouble tickets (March of 2012, to March of 2016). The following are a brief description of the trouble tickets 2/7/16 to 3/7/17.

- 1) 3/7/17 Train struck Tour Bus stuck on tracks.
- 2) 1/5/17 Train struck Pepsi truck stuck on tracks.
- 3) 1/2/17 Report of Semi-truck stuck on tracks.
- 4) 10/21/16 Report of truck stuck on tracks.
- 5) 10/17/16 Report of truck stuck on tracks.
- 6) 9/21/16 Train struck a car on the tracks.
- 7) 6/21/16 Report of truck stuck on tracks.
- 8) 5/10/16 Report of truck stuck on tracks.
- 9) 5/2/16 Report of tanker truck stuck on tracks.
- 10) 4/23/16 Report of truck stuck on tracks.
- 11) 4/18/16 Report of truck stuck on tracks.
- 12) 3/12/17 Report of car stuck on tracks.



**Figure 2. Photo of the repaired signal gate and flasher. White circle highlights low ground clearance sign.**

*508 Text – This photograph shows a Union Pacific engine traveling on the Main Line track through the Main Street Grade Crossing. A low clearance sign is clearly visible on the right hand side of the street positioned near the grade crossing signal system automatic gate. The railroad gates are in the down position to indicate to the traveling public that a train is in the area. The grade crossing signal system light is illuminated.*

### **Interviews**

The signal group did not conduct any interviews.

### **Signal Damages**

Signal damage due to the incident included one gate mechanism, including mast, one doll arm, two sets of LED lights, an 18-foot aluminum gate and foundation which cost \$9, 979.90. Straight time man hours equaled 40 hours and overtime man hours equaled 80 hours. A man-hour is fringed at \$65 per hour. Total labor for repairs, tests and inspections is \$10,400.

Damage was made to the southeast geographical quadrant foundation, mast, gate mechanism, and flasher assembly. The CSX engineering personnel estimated the total grade crossing signal system damage is approximately \$20,000.00.

## ATTACHMENTS

- 1) All inspection records for one year prior to the date of the accident (Both Scheduled and unscheduled tests) at Main Street Grade Crossing Biloxi, MS;
- 2) Last Relay test record prior to the date of the accident for the relays in Main Street Grade Crossing Biloxi, MS;
- 3) Last cable insulation test record prior to the date of the accident for the grade crossing equipment at Main Street Grade Crossing Biloxi, MS
- 4) A copy of the event recorder download for the GCP-3000 at Main Street Grade Crossing, Biloxi, MS
- 5) A copy of the event recorder download for at the two Control Points (CP) within the accident area.
- 6) All post-accident test records for all locations. Main Street Grade Crossing Biloxi, MS; and any Signal System tests, i.e., track circuit verification and testing of train signals. (I realize this is ongoing at the time of this request)
- 7) Circuit plans for Main Street Grade Crossing Biloxi, MS highway-rail crossing warning system.
- 8) Straight line plan showing signals approaching the accident area;
- 9) Signal aspect chart;
- 10) The last test record for all tests quarterly, annually, bi-annually, etc., for the grade crossing signal system and the train signal system at Main Street;
- 11) Train signal downloads from two CP's in the accident area.
- 12) Meggering tests for all cables done at Main Street Grade Crossing Biloxi, MS as a result to the damage to the grade crossing signal equipment;
- 13) Estimate of monetary damages of grade crossing equipment;
- 14) Copy of the System Time Table.
- 15) Dispatcher screen shots of the accident train movement and/or dispatcher screen video.
- 16) WASP information of the signals for the accident train movement.



**Party to the Investigation - Acknowledgment Signatures**

The undersigned designated Party to the Investigation representatives attest that the information contained in this report is a factually accurate representation of the information collected during the investigation, to the extent of their best knowledge and contribution in this investigation.

/s/ \_\_\_\_\_ Date 6-5-17  
Timothy J. DePaepe, NTSB

/s/ \_\_\_\_\_ Date 6-5-17  
Mr. Craig Harrell, FRA

/s/ \_\_\_\_\_ Date 6-5-17  
Mr. George James Jr., CSX