

Track and Engineering Group Chairman Factual Report

NATIONAL TRANSPORTATION SAFETY BOARD

**Office of Railroad, Pipeline and Hazardous Materials Investigations
Washington, DC**

**TRACK AND ENGINEERING GROUP CHAIRMAN
FACTUAL REPORT**

RRD19FR011

**Head-on Collision between Two Sacramento Regional Transit District (SRTD)
Passenger Trains**

Sacramento, CA

August 22, 2019

Report Prepared by:
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Track and Engineering Group Chairman

Date: September 19, 2019

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Synopsis

For a summary of the accident, refer to the Accident Summary report in the docket for this investigation.

Aerial View



Figure 1. Aerial photo of the point of collision site. (source: local news photo)

Circumstances Prior to the Accident

SRTD Train 103

On Thursday, August 22, 2019, at about 9:38 p.m. PDT, a Sacramento Regional Transit District (SRTD) Train 103, a revenue passenger train, was operating in an outbound direction (geographically northeast) on SRTD's Blue Line in double main track territory on the outbound main track collided with another SRTD train. An SRTD train operator was in control of the train movement for train 103. Train 103 made a routine station stop at the Marconi Station and departed the station; however, the train was running about 15 minutes behind schedule. Upon leaving the Marconi Station, the train consisted of four cars carrying 27 passengers. The train continued operating outbound on a yellow signal positioned near the station. As train 103 approached the intermediate signal (signal N672) location, the operator stated he observed the signal aspect change and the headlight of an oncoming train. He placed the train into emergency braking but collided head-on with a "maintenance train" operating in the opposite direction (inbound towards Sacramento).

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SRTD Train 319

Before SRTD's train equipment (passenger cars) are placed into revenue service after undergoing mechanical maintenance, SRTD requires that the equipment undergoes a series of acceleration and braking tests to ensure the equipment is safe and ready for service. Train 310, a maintenance train consisting of two cars with an operator and two Siemens technicians on board, had recently been scheduled to complete those types of tests on the night of the accident. About 9:24 p.m. PDT, train 310 entered the outbound main track after the train operator contacted the controller to gain permission to enter the outbound main track to conduct the tests. The train entered the main track by leaving a maintenance facility yard area and proceeded initially in an outbound direction on SRTD's outbound main track; however, the operator of the maintenance train switched to the inbound end of the train where he operated the train to continue conducting tests or in an inbound direction. According to the controller's interview, he said that he instructed the maintenance train operator to wait to enter the main track until "after" a scheduled train (train 103) passed his location at the main track switch location at the repair facility. However, train 310 entered the outbound main track before train 103 had passed by his location and although he initially proceeded outbound, he eventually changed operating from the inbound end towards the Marconi Station while conducting accelerating and stopping functions. Train 310 collided head-on with train 103 near the intermediate signal location near milepost 6.72 or in the vicinity of intermediate signal N672. According to the operator of the maintenance train, he stated in his interview that he saw the oncoming train and recognized that it was on the same track and that he had stopped his train prior to the collision.

Track Description

SRTD's officials estimated that this portion of the Blue Line (in aggregate, both main tracks) operates an average of 136 transit trains daily between Marconi Station and Roseville Road Station in Sacramento, CA. SRTD officials do not have an estimated gross million tons annual figure.

SRTD maintains two main tracks on the Blue Line to Federal Railroad Administration (FRA) Track Safety Standards (TSS) for Class 3 track in the vicinity of milepost 6 to 7, which allows for a maximum operating speed of 60 mph for passenger train operation. The timetable maximum authorized speed in the accident curve is 55 mph for passenger train operation or within FRA Class 3 standards.

Both main tracks are constructed of 115-pound continuous welded rail (CWR) resting in 7 ¾" by 13" double shoulder crosstie plates affixed to the rails by one inside and field spike. Wooden crossties spaced about 24 inches (center to center) support and distribute the load to the ballast section (there are some concrete crossties present, as well). The rails are restrained by two different types of channel lock anchors that are box anchored every other crosstie for tangent track and fully box anchored on every crosstie in curves.

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Point of Collision

Investigators identified the point-of-collision (POC) as a location about 150 feet south of intermediate signal N672 on the outbound main track. Investigators observed mechanical debris dropped in-between the rails where the equipment first collided. North of the POC, investigators observed wooden crosstie damage between the rails from a knuckle and draw bar of train 103 that dropped to track level after the collision (POC).



Figure 2, View of POC.

Damages Estimates

SRTD engineering personnel estimated the total track structural damages at \$2,500. This figure includes costs for the installation of crossties, associated ballast and track materials. No equipment derailed in this incident; however, the collision caused the knuckle and drawbar assembly to drop and those parts of train 103 caused damage to the track structure.

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Post-Accident Inspection/Testing of Track

On August 24 and 25, 2019, track measurements were taken at marked stations on 15-foot 6-inch intervals beginning at about milepost 6.69 (at the POC) extending in both directions to capture the track field notes measurements for the final approach of both trains. All the track geometry measurement figures are static measurements (unloaded track structure—no equipment on the track). Investigators did not observe fouled ballast conditions or longitudinal rail movement in the areas inspected and/or measured for this report.

The track inspection field notes noted:

- The maximum measurement allowed for gauge in FRA Class 3 track, a maximum authorized speed of 60 mph for passenger trains, is 57 3/4 inches. Investigators determined that the widest gauge in both directions accounting for both train movements prior to and including the POC was 56 5/8 inches; or about 7/8 of an inch under the FRA maximum allowable limit. **Note:** Investigators did not observe gage widening at the POC.
- The maximum allowable deviation from zero crosslevel at any point on tangent or reverse crosslevel elevation on curves may not be more than 1 3/4 inches for Class 3 track. Investigators determined from the field notes measurement data that the maximum crosslevel deviation on the spiral and body portions of the curve was 1/8 of an inch; or 1-5/8 inches under the FRA maximum allowable limit.

Investigators measured the degree of curvature along with superelevation and determined that the curve's maximum operating speed was allowable for 57 mph (using FRA's Vmax formula: curvature of 3 degrees and 15 minutes; superelevation of 4 1/2 inches in the full body). The curve is currently authorized for 55 mph. This is the last segment of track that each train traversed prior to the POC.

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Figure 3. Looking in the direction of the travel for train 103 as the train traversed a curve into the POC area. (daylight view)



Figure 4. Looking in the direction of travel of the maintenance train. Resting position after collision south of signal N672. (See Mechanical Group Chairman Factual Report for more detail--daylight view)

Geometry Tests

SRTD operated a pushcart geometry data collection device over their entire main track structure in 2018. The geometry data indicated no geometry exceptions at or near the vicinity of the accident.

Rail Maintenance Grinding

According to a SRTD Wayside Manager, SRTD last conducted rail maintenance grinding out-of-face of SRTD's Blue Line mainline at an undetermined time in the past.

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On May 24, 2019, an ultrasonic rail test was conducted on SRTD's Blue Line by Sperry Rail Service. No defects were recorded in the vicinity of the collision or on the other portions of the Blue Line.

Track Inspection

FRA regulations found in 49 CFR 213 require that a rail carrier's track inspection records be prepared and signed on the day of the inspection for frequency for compliance with the FRA Track Safety Standards (TSS). FRA track inspection records are required to reflect actual field conditions and deviations from the FRA TSS. However, transit operators can elect a standard other than FRA's to establish their main track maintenance standards and track inspection frequency. FRA standards require that the track be inspected twice weekly. SRTD is not required to adhere to that portion of the FRA standard and inspects the main tracks weekly.

Regulatory Track Inspection History

The California Public Utilities Commission (CPUC) Rail Transit Safety Branch (RTSB) staff conducts regular and random safety inspections of rail transit agencies within California. These inspections include inspections of a transit agency's operations, mechanical, signal, track, and structures.

RTSB staff have been conducting CPUC track inspections with SRTD personnel and had recently discovered that SRTD track inspection records and SRTD track inspection methods were not in compliance with regulation and SRTD standard operating procedures. SRTD personnel along with RTSB staff input generated corrective action plans to address the CPUC track inspection findings. CPUC typically requires an agency to develop a corrective action plan (CAP) to address non-compliant safety items brought to their attention. These CAP's included the implementation of additional SRTD inspection personnel conducting inspections during non-revenue hours, retraining of SRTD inspection personnel regarding track inspection records, and additional internal auditing of SRTD track inspection records.

According to SRTD, as a result of CPUC oversight and on-site records inspection, SRTD communicated to investigators that in the past, the weekly track inspections were done by train ride only. However, SRTD personnel commented that recently SRTD had implemented a graveyard crew that is utilizing a hy-rail pickup truck for inspections, while also using train rides to assess ride quality. As for the track maintenance personnel or manpower, SRTD employs two senior rail maintenance workers, nine rail maintenance workers, and two rail laborers.

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Track inspection records for the Blue Line were examined from May 2019, through August 22, 2019. The records show that the frequency of inspections is in compliance with federal regulations.

The track in the area of the derailment was last inspected on August 15, 2019, by a SRTD qualified track inspector (T/I). The T/I noted no defects within the milepost range of the accident curve and the area that includes the collision footprint. SRTD had scheduled for the track to be inspected on the day of the accident; however, the accident occurred about one hour prior to the track inspector going on-duty. The accident occurred at 9:38 p.m. PDT.

Regulatory Track Inspection History

On May 7, 2019, a CPUC track safety inspector conducted a track inspection records inspection of SRTD's system that included the area through the collision site. Two exceptions were noted for track inspection records regarding the minimum required information required in a track inspection record.

Post-Accident Investigation

Investigators drafted visibility and sight distance protocol prior to conducting tests at night with exemplar equipment operating on the outbound Blue Line main track. Those tests were video recorded. During the testing, the equipment made periodic stops according to the operator's perception of the forward view at certain locations along the route and approaching the POC location. The following bullets depict the measured distances from those stopped locations:

For the maintenance train movement from its farthest location away from POC:

- 2,331' from POC, this is where the MT could not be seen by the revenue train.
- 1,972' from POC, this is where the revenue train could see the MT.
- 650' from POC, the MT could tell that the revenue train was on the same track.

For the revenue train (RT) movement:

- 45' from POC, this is where the RT can see that the MT is on the same track.
- 506' from POC, this is where the MT can first see the RT.
- 725' from POC, this is where RT can first see the intermediate signal display (signal N672).

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Figure 5. *Investigators measuring the distance from landmarks post sight distance tests.*

For characterizations of the signal aspect observances during the sight distance tests, see the Group Chairman Factual Reports for Signal, Operations and Human Performance. Only the outbound train was able to preview the signal at N672, there were no signal aspects visible for the maintenance train.

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Parties to the Investigation - Acknowledgment Signatures

The undersigned designated *Party to the Investigation* representatives attest that the information contained in this factual report for NTSB's accident investigation RRD19FR011 for the Sacramento Regional Transit District head-on train collision investigation conducted in Sacramento, CA near intermediate signal N672 is a factually accurate representation of the information collected during the investigation, to the extent of their best knowledge and contribution in this investigation. Note: As part of NTSB's on-going investigative review process, this report will undergo a Technical Review with the Parties at a later date, wherein some minor word changes may occur. Substantive changes to this report will be documented with a subsequent addendum report, if necessary.

//s//
Richard A. Hipskind, NTSB

Date 9/23/19

//s//
Matthew Ames, CPUC

Date 9/23/19

//s//
Allen (Ike) Isenberg, SRTD

Date 9/24/19