National Transportation Safety Board

Railroad Accident Brief

Union Pacific Railroad Derailment and Employee Fatality

Arlington, Texas

September 22, 2017

The Accident

On September 22, 2017, about 11:06 a.m., local time, Union Pacific Railroad (UP) train Y-GW51R-22 derailed during a coupling operation in the UP Great Southwestern (GSW) Yard in Arlington, Texas. (See figure 1.)[1] At the time, a helper controlled the train remotely from the rear car.[2] A foreman was positioned on the lead locomotive of the train and maintained radio communication with the helper. As the train traveled in reverse through a switch at a speed of 8 mph to couple with eight cars on track 001, the train's emergency brakes activated, and a "man down broadcast message" went out over the railroad radio.[3] The foreman attempted to radio the helper. After receiving no response, he went to the rear of the train and saw that a car had derailed and that the helper was between the third and fourth cars of the train. (See figure 2.) The foreman said he made an emergency call on the radio requesting help and for someone to call 911. The helper died from injuries sustained during the accident.[4]

[1] All times in this document are local time unless otherwise noted.

[2] (a) A *helper* is a second person assigned to assist with moving rail cars and motive power in the switching of rail cars by remote control. (b) *Remote control locomotives* (RCL) are equipped with specialized equipment that allows operation of the locomotive(s) through use of a remote radio transmitter operated by a qualified crew member.

[3] The "*man down*" feature is a safety function of the remote control transmitter that transmits an emergency message over the radio whenever the RCL transmitter senses tilting beyond prescribed limits. Union Pacific Railroad (UP) rules require monitoring of remote control operation radio transmissions for "man down messages" transmitted by the RCL radios. Following a "man down message" transmittal, employees must follow UP Train Handling and Air Brake Rules, Rule 35.4.1 (Effective January 20, 2012, updated July 2, 2013) at http://rgpcops.net/images/abth.pdf.

[4] For more detailed information about this accident investigation, see the the public docket at www.ntsb.gov/investigations/dms.html and search for accident number DCA17FR013.

Figure 1. Derailed train.

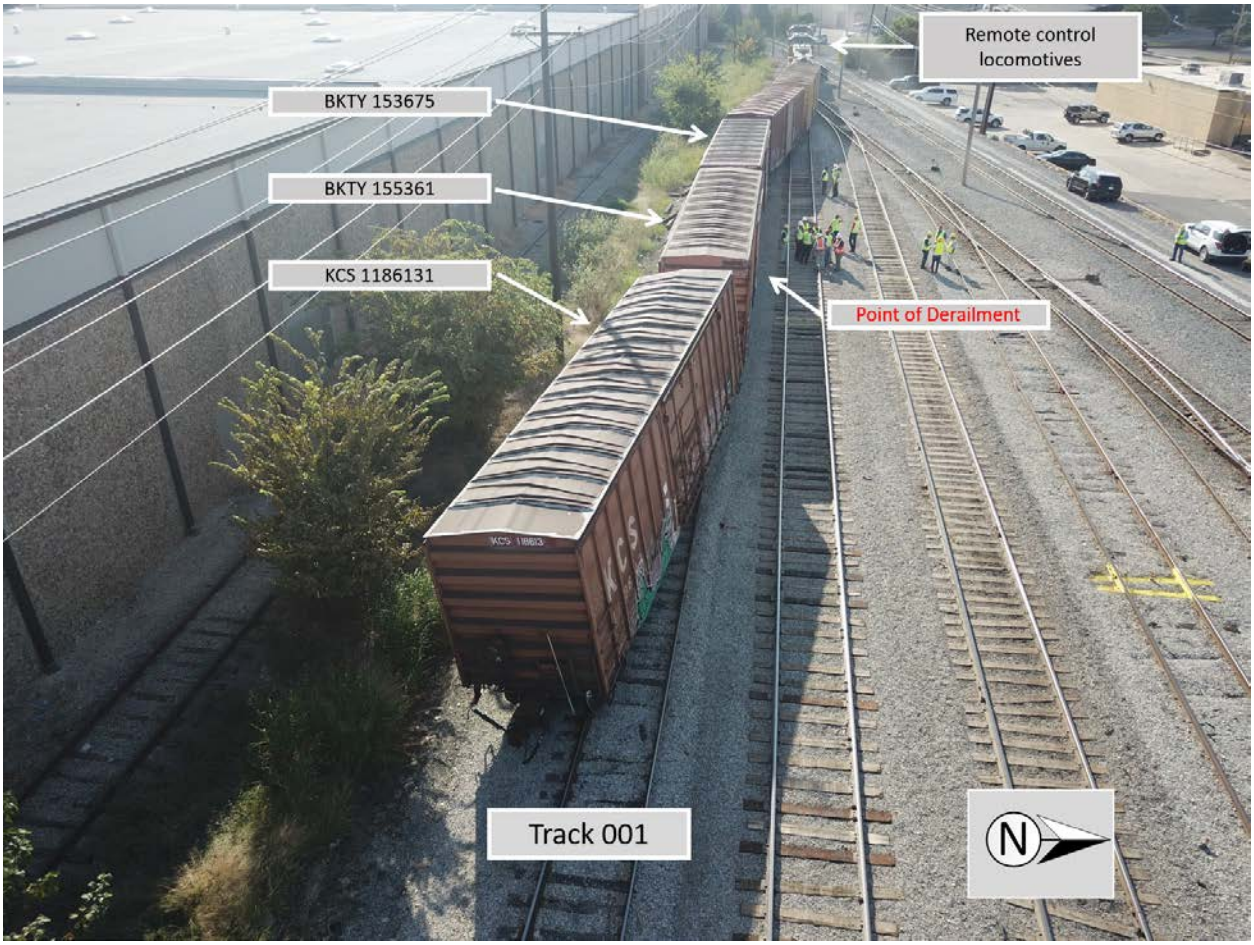

Figure 2. Derailed train cars.

The UP GSW Yard is located on the Dallas Subdivision of the Fort Worth Service Unit and includes two remote control locomotive (RCL) zones designated in the Dallas subdivision timetable that encompass all tracks.[5] All tracks within the yard were designated as Federal Railroad Administration (FRA) Excepted Track.[6]

On the day of the accident, the train was designated for RCL operation and was made up of three locomotives and five empty box cars, with locomotives UPY 2618 in the lead and setup as the controlling locomotive facing forward.

The train crew went on duty at 6:01 a.m. at the UP Garrett Yard office on September 22, 2017. During an interview with investigators, the foreman described the day as normal up to the time of the accident. He said that the helper was in good spirits that morning and

[5] (a) UP Dallas Subdivision Timetable No. 5, effective September 28, 2015, Page 9. (b) Remote control zones comprise one or more tracks within defined limits designated in the timetable, special instructions, or other railroad publication, within which RCLs may be operated without an employee assigned to protect the pull-out end of the remote control movement, for example, the end on which the locomotive is located.

[6] *Federal Railroad Administration (FRA) Excepted Track* is a clearly defined track segment that a railroad may designate as such after meeting a number of conditions. An excepted track segment is subject to only a small number of FRA track safety standards delineated in Title 49 *Code of Federal Regulations* (*CFR*) 213.4 Excepted Track.

that he did not note anything out of the ordinary in his behavior. They performed their job as they normally did, which included a conversation with the night shift manager about work to be accomplished. Then the crew planned their work for the day. The foreman said that they conducted a job briefing before leaving the yard office, including review of cars in the yard. Another crew told them the delivery was in track 002.[7] The foreman said they went through the job briefing book, bulletins, and safety briefing for the week, and there were no changes. The foreman ran the list for the day's work; they reviewed it and marked it up.[8] Their work for the day included switching out cars loaded with salt and taking those rail cars to an industry track and pulling five empty cars from a packaging company.

Once they completed the job briefing, the foreman and the helper drove their personal vehicles from the UP Garrett Yard to the UP GSW Yard. As they were getting their work equipment out of the car, the helper told the foreman he had received zone authority and that he had talked with the manager of yard operations on duty.[9] They headed over to the locomotives about 8:00 a.m. The foreman said that the helper got on locomotive UPY 2618 while he got on locomotive UPY 840. They began the locomotive inspections. The foreman said he signed the inspection card on UPY 840, and the helper signed the other inspection cards.[10] They linked the remote control transmitters to the controlling locomotive and went through the required remote control train testing.[11]

The foreman said that the helper lined the switch controlling access to track 002 for the train to mechanically couple to and pull out the two rail cars loaded with salt for placement on an industry track. Then they completed an air brake test and headed toward the industry track. At this point, the foreman said the day was progressing normally.

When placing the two loaded rail cars at the salt facility, the foreman said he got off and made the cut, and the helper stayed on the head end.[12] They inspected the cars and then headed toward the packaging facility. The helper controlled the train to the packaging facility. The foreman said he lined the switch at the packaging facility. They pulled the five empty cars out of the

[7] *Delivery* refers to the rail cars scheduled for delivery to customer facilities.

[8] *List* is the switch list for the train that includes the location, track, and line number, of the cars located in the UP Great Southwestern (GSW) Yard for switching and spotting at customer facilities and the location of rail cars scheduled for pulling from customer facilities. A list serves as the train consist documentation and includes any hazardous materials information.

[9] *Zone Authority is* protection on a portion of track(s) within definite limits designated in the timetable special instructions and is described in Union Pacific Railroad's (UPRR) General Code of Operating Rules (GCOR), Seventh Edition, Effective April 1, 2015, available at http://fwwr.net/assets/gcor-effective-2015-04-01.pdf.

[10] 49 *CFR* 229.21 required completion of a daily inspection of all locomotives at least once during each calendar day and a written report of the inspection. The *inspection card* documents the required daily inspection.

[11] UP publication PB-14252, RCL II/BELTPACK II, Technical Reference Card documented the steps for the locomotive inspection and remote control setup.

[12] A *cut* (of cars) is a group of cars coupled together to be moved as a unit (generally to be either added to or dropped from a train.

packaging facility, stopped to reset a derail device protecting the entrance to the packaging facility, and made a transfer air brake test.[13]

The foreman told investigators that upon completion of the transfer air brake test at packaging, they returned westward to the GSW Yard and that he was controlling the train. He said that as they approached the yard, he told the helper they would run through track 003 and then move to track 001, where an earlier train had left some outbound cars. (See figure 3.) He said that they went through track 003 and stopped at the yellow clearance mark on the track. The helper walked to the switch, lined the switch, and signaled for the foreman to come ahead. The foreman operated the train westward around a slight curve, where the helper stopped him once clear of the 1 switch. At this time, the foreman transferred control of the train back to the helper.

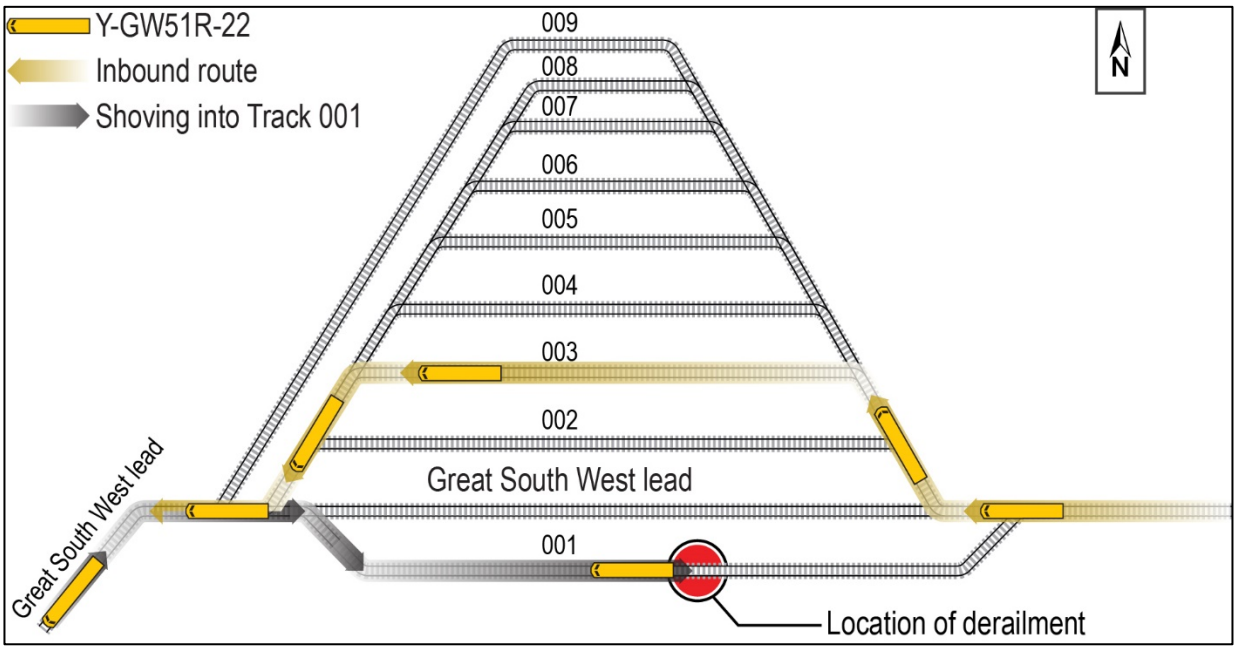

Figure 3. Train Y-GW51R-22 movements.

The helper began to shove (move) the train eastward into track 001. The train traveled about 537 feet into track 001when the foreman said he heard the broadcast announcement, "man down, man down." He said he called out to the helper on the radio to ask if he was OK but got no response. The foreman went back to check on the helper, who he found underneath the train. He said he made an emergency call on the radio requesting help and for someone to call 911, giving the location as the west end of the yard.

[13] (a) A *Transfer train* is a train that travels between a point of origin and a point of destination not exceeding 20 miles. Title 49 *CFR* 232.215 governs the brake test (transfer test). (b) A *derail* is a track safety device designed to guide a car off the rails at a selected spot as a means of protection against collisions or other accidents; it's commonly used on spurs or sidings to prevent cars from fouling the main track.

Method of Operation

At the time of the accident, the method of operation was remote control operation (RCO). All tracks in the UP GSW Yard are classified as FRA Excepted Track, with a maximum authorized speed of 10 mph.

Crewmembers were governed by UP's latest revision of the General Code of Operating Rules, Safety Rules, Air Brake and Train Handling Rules, System Special Instructions, Timetable No. 5, and applicable general orders and yard notices.[14]

Personnel Information

The foreman was 61 years old, with 39 years of railroad experience, all in the GSW Yard. The helper was 48 years old, with 19 years of railroad experience.

A review of the work records for the 30-day period preceding this accident for the foreman and the helper showed that both crewmen complied with Title 49 *Code of Federal Regulation* (*CFR*) Part 228 Hours of Service Act. These records indicated that both crewmembers had consistently worked the day shift during this period.

Each was trained to perform their respective duties and had attended all required training and passed all examinations. Both held current certifications to operate remote control trains, pursuant to 49 *CFR* Part 242. The foreman's most recent certification was dated September 22, 2017, and the helper's most recent certification was dated September 22, 2017.

A review of UP efficiency testing records for rules compliance for the foreman found that prior to this accident, the foreman was tested a total of 206 times with 202 meeting the standard and 4 requiring coaching for improvement, and the helper was tested 132 times, with 127 of those meeting standards and 5 requiring coaching.

Medical History and Toxicology Reports

NTSB investigators reviewed the medical history for the helper and the foreman and found nothing remarkable in their histories. In accordance with FRA regulations (49 *CFR* Part 219 Subpart C), UP obtained a urine specimen from the foreman for postaccident toxicological testing. The results were negative for alcohol and other impairing drugs in the urine.[15] Also, test results indicated that there was no alcohol or other impairing drugs in specimens submitted from the deceased helper.

[14] UPRR GCOR (effective April 1, 2015); UP Safety Rules (effective June 1, 2017, including updates); UP Air Brake and Train Handling Rules (effective May 2, 2016, including updates as of June 1, 2019); UP System Special Instructions (effective June 1, 2017, including updates as of August 2, 2017); and the Dallas/Ft. Worth Timetable No. 5 (effective September 28, 2015).

[15] Urine specimens were analyzed for amphetamines, cannabinoids, cocaine, opiates, phencyclinde, benzodiazepines, and barbiturates. Blood was tested for alcohol.

Track and Engineering

Investigators determined that the point of derailment (POD) occurred at a suspended and bolted rail joint located on the south rail, about 60 feet east of the switch leading into track 001.[16] Figure 4 shows the south rail gage face corner indicating wheel climb at the rail joint. The red circle encloses the derailing wheel flange witness mark beginning at the gage corner and going diagonally across the top of the rail head. The yellow arrow shows direction of travel.

Investigators observed a witness mark at the south rail gage face corner that was created by the flange of the train wheel.[17] The wheel flange witness mark traversed from the gage corner of the receiving rail face and continued to travel up and over to the tread portion of the running rail head, where it extended and angled eastward for about 24 inches toward the field side of the running rail. A corresponding wheel departure mark was identified across the top surface of the opposite running rail head (north rail), matching the POD determination. Evidence of displaced and broken ballast was observed on the field side of the south rail, indicating that the train continued east for another 152 feet after departing the rail at the POD.

Figure 4. South rail gage face corner indicating wheel climb at rail joint.

[16] The *point of derailment* (POD) is the location where the normal wheel and rail interface is disrupted.

[17] *Witness mark* refers to evidence of wheel flange contact on the face of a rail leaving an impact depression scratch or similar mark that is visible.

Track geometry measurements were conducted and recorded by investigators. Measurements taken around the derailment revealed that the train was traversing a straight track as it approached the POD. The track gage measured 57 5/8 inches under load at the POD, in compliance with FRA Excepted Track requirements. Cross-level measurements indicated that the rail joint was 1 5/8 inches lower than the south rail at the POD.[18]

Investigators observed that the rail joint at the POD was extremely loose, allowing static gage and tread rail head mismatch of 1/8 inch. They also observed that the four-hole rail joint was assembled with only three joint bar bolts, indicating that one of the rail ends only had one joint bar bolt at the time of the derailment. Investigators observed a broken joint bar bolt laying in the gage area of the POD. Investigators used a portable track loading fixture (PTLF) at the rail joint to determine an underload measurement at the rail gage and rail tread.[19] They applied 4,000 psi at the rail joint and recorded a loaded measurement at 3/8 inch at both the gage and running surface portions of the rail as part of an examination of the rail, which includes loading the rail to look for changes in measurements taken when it was not loaded.

Track 001 in the UP GSW Yard was taken out of service the day of the accident and remains out of service. Work has been completed to repair and upgrade the track (and other yard tracks) to include the installation of new switch ties and appropriate surfacing with new ballast. UP intends to install new rail to eliminate the rail joints in the curved portion of the track.

The Investigation

Weather, crew qualification, training and certification, fatigue, distraction, equipment, or communications did not contribute to this accident. The focus of the investigation was track condition and track compliance.

Accident Re-enactment

UP conducted a re-enactment of this accident on September 24, 2017, with video recording devices positioned to capture footage of the rail joint as the cars traversed the track at the POD. Review of this video footage seemed to show that the rail end mismatch was significantly greater than the previous measurement taken using the PTLF. An exact measurement could not be determined.

The re-enactment of the accident used the same equipment from the accident train with investigators observing. The first move across the identified POD was at walking speed, and the speed increased gradually in subsequent movements until reaching the approximate speed of 4 mph. The re-enactment train did not derail; therefore, UP positioned a drone on the field side of the tracks about 24 inches above ground to video the wheel/rail interaction as the train traversed the POD. UP positioned two video cameras at strategic locations within the gage of the rail to capture the wheel/rail interaction as the train moved across the POD. Investigators observed a

[18] *Cross level* is the distance one rail is above or below another.

[19] A *portable track loading fixture* (PRLF) applies 4,000 psi to the rail heads and is used to determine compliance with the FRA track safety standards on territories that have been designated Gage Restraint Measurement System territory. See 49 *CFR* 213.13 Measuring Track Not Under Load and 49 *CFR* 213.110 Gage Restraint Measuring System.

vertical mismatch of about three quarters of an inch on the field side rail (south rail) as the train traversed over the joint near the POD. This mismatch would be enough to cause a derailment.

FRA Excepted Track

The intent of excepted track designation is to permit certain portions of low-density main tracks, associated yard tracks, and sidings to be maintained to a lower track safety standard. A track designated as excepted track is a clearly defined track segment that must meet several conditions and comply with FRA track safety standards delineated in 49 C*FR* 213.4 Excepted Track, which states that railroads may designate a section of track as excepted, provided:

(a) The segment is identified in the timetable, special instructions, general order, or other appropriate records which are available for inspection during regular business hours;

(b) The identified segment is not located within 30 feet of an adjacent track which can be subjected to simultaneous use at speeds in excess of 10 miles per hour;

(c) The identified segment is inspected in accordance with 213.233(c) and 213.235 at the frequency specified for Class 1 track;

(d) The identified segment of track is not located on a bridge including the track approaching the bridge for 100 feet on either side, or located on a public street or highway, if railroad cars containing commodities required to be placarded by the Hazardous Materials Regulations (49 *CFR* Part 172), are moved over the track; and

(e) The railroad conducts operations on the identified segment under the following conditions:

  (1) No train shall be operated at speeds in excess of 10 miles per hour;
  (2) No occupied passenger train shall be operated;
  (3) No freight train shall be operated that contains more than five cars required to be placarded by the Hazardous Materials Regulations (49 *CFR* Part 172); and
  (4) The gage on excepted track shall not be more than 4 feet 10¼ inches. This paragraph (e)(4) is applicable September 21, 1999.

(f) A track owner shall advise the appropriate FRA regional office at least 10 days prior to removal of a segment of track from excepted status.

Because of the excepted track designation, conditions were present at the POD that otherwise would not be permitted if the track was designated as Class 1 or higher. The conditions included a loose and improperly fastened rail joint and rail surface mismatch.

Probable Cause

The NTSB determines that the probable cause of the switching employee fatality was a single car derailment caused by a loose, improperly fastened rail joint, which allowed the car's wheel to climb the mismatched rail. Contributing to the accident was the designation of the

accident track as excepted track under the current FRA Track Safety Standards, which allowed inadequate track conditions to exist on track used regularly.

For more details about this accident, visit www.ntsb.gov/investigations/dms.html and search for NTSB accident number DCA17FR013.

Report Date: September 16, 2020

The NTSB has authority to investigate and establish the facts, circumstances, and cause or probable cause of a railroad accident in which there is a fatality or substantial property damage, or that involves a passenger train. (49 U.S. Code §1131 - *General authority*)

The NTSB does not assign fault or blame for an accident or incident; 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." 49 *Code of Federal Regulations*, Section 831.4. Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report. 49 *United States Code*, Section 1154(b).
