

# National Transportation Safety Board

Office of Railroad, Pipeline and Hazardous Materials

Washington, DC 20594



RRD23FR001

## **COMBINED GROUP FACTUAL REPORT**

Group Chair's Factual Report

March 8, 2023

## TABLE OF CONTENTS

A.	ACCIDENT.....	3
B.	COMBINED GROUP FACTUAL REPORT .....	3
C.	SUMMARY .....	4
D.	DETAILS OF THE INVESTIGATION .....	5
1.0	OVERVIEW OF PORT AUTHORITY TRANSIT CORPORATION (PATCO) .....	5
2.0	CIRCUMSTANCES PRIOR TO THE ACCIDENT .....	6
2.1	Westbound Train 1 .....	6
2.2	The Roadway Work Group .....	6
3.0	OPERATIONS.....	7
3.1	PATCO Dispatcher Audio Tape review.....	7
3.2	Benjamin Franklin Bridge Surveillance Camera Review .....	8
3.3	Locomotive Download Review.....	8
3.4	Toxicological Texting .....	8
3.5	Cell Phone Usage .....	9
3.6	Interviews .....	9
3.7	Operational Testing.....	9
4.0	TRACK .....	9
4.1	Accident Track Description .....	9
4.2	PATCO Right of Way Safety Plan .....	10
4.3	Entering the Right-of-Way .....	10
4.3.1	Job Safety Briefing .....	10
4.3.2	Procedures for Entering the Right-of-Way .....	11
5.0	MECHANICAL.....	12
5.1	Train Consist Information:.....	12
5.2	Transit car information: .....	12
5.3	Post-accident inspection.....	13
5.4	Inspection Information .....	13
6.0	SIGNAL & TRAIN CONTROL SYSTEM.....	15
6.1	Third-Rail Propulsion Power System.....	15

**A. ACCIDENT**

Location: Camden, New Jersey  
Date: October 14, 2022  
Time: 9:21 p.m. local time  
1:21 a.m. Coordinated Universal Time  
Train: Westbound #1

**B. COMBINED GROUP FACTUAL REPORT**

IIC	Matthew Thompson Investigator-In-Charge National Transportation Safety Board (NTSB)
Group Chair	Ruben Payan Signal Group Chair NTSB
Group Chair	Michael Bachmeier NTSB Operations Group Chair
Group Chair	Troy Lloyd NTSB Track Group Chair
Party Coordinator	Phillip Herbert Federal Transit Administration (FTA) Accident Investigator
Party Coordinator	Eugene Stewart OSHA Compliance Safety & Health Officer
Party Coordinator	Todd Kropilak New Jersey Department of Transportation (NJDOT) Administrative Analyst
Party Coordinator	David Fullerton Port Authority Transit Corporation (PATCO) Safety Director

Party Coordinator

Robert Finnegan  
Delaware River Port Authority (DRPA)  
Chief Security & Safety Officer

### C. SUMMARY

At approximately 9:21 pm on October 14, 2022, two contractor employees from JPC Group Inc. were struck and killed by a westbound Port Authority Transit Corporation (PATCO) train called Westbound #1 on track 2 on the Benjamin Franklin Bridge in Camden, New Jersey.

There was a planned outage on track 2 for contract concrete work. However, at the time of the accident, track 2 had not been taken out of service when the contractors entered the bridge in a close clearance area. The striking train was traveling at a recorded speed of 33 mph. The train was put into emergency braking, stopping about 1 ½ car lengths from where the 2 contractors were struck.



**Figure 1.** Overhead view of the accident location

## D. DETAILS OF THE INVESTIGATION

### 1.0 Overview of Port Authority Transit Corporation (PATCO)

PATCO is a rail line that travels between New Jersey and Pennsylvania, assets are owned by the Delaware River Port Authority (DRPA) and assets are maintained by PATCO. The rail transit line was built by the DRPA between Lindenwold, New Jersey and Center City Philadelphia, Pennsylvania. Both mainline tracks 1 and 2 operate in a geographical timetable east-west direction and extends approximately 14.5 miles on a separated system from Lindenwold, New Jersey to the City of Philadelphia. There are 13 active rail stations that service an estimated 34,000 daily passengers. Ridership at the time of the accident was approximately 50% of the pre-pandemic levels, ridership on 10/14/2023 was 16,797. Ridership on 10/14/2023 was 16,797The line is open for public ridership 24 hours a day, 7 days a week, and 365 days a year. Passengers are transported on 60 married pairs of recently refurbished railcars (120 cars in total).

The Bridge Line opened in 1936, connecting 8th & Market Street Station in Philadelphia with City Hall and Broadway Stations in Camden, via subways and a crossing of the Delaware River on the Benjamin Franklin Bridge. The Bridge is 140 feet above the water and is 1.5 mile in length. The bridge is constructed with two mainline tracks that are geographically located to the north and south side bridge spans. Interstate 676/Pennsylvania State Route 30 separate the two main tracks.

PATCO uses the Benjamin Franklin Bridge to provide train service between New Jersey and Pennsylvania. The transit line includes 2.3 miles of downtown subway, with seven stations (one of which, Franklin Square, is permanently closed), and 12.2 miles above ground. PATCO operates 24-hours-a-day service throughout the year. System safety is provided by Pulse Code Cab Signal System and Wayside Signals at interlockings. Train cars operate under an Automatic Train Control, from a Central Train Control Tower located in Camden. Train movement is powered by a 750 VDC third rail electric power system.



**Figure 2:** Overview map of PATCO operations

## **2.0 Circumstances prior to the accident**

### **2.1 Westbound Train 1**

The Westbound #1 consisted of an operator who went on duty at 1:24 p.m. local time. The assigned train consisted of six railcars. These transit passenger railcars are electric multiple unit (EMU) powered by a third-rail propulsion system.

The operator stated Westbound #1 was leaving City Hall on two track and right around Camden Storage it got a red brake light that came on. The operator called Center Tower to let them know the train was stopped due to a red brake light. The Center Tower gave instructions to operate from home signal block to 16<sup>th</sup> Street. The operator said this means the train is running with the Automatic Train Control (ATC) cut out, which takes away the automatic train stop feature. With that feature cut out, his maximum speed was 40 miles per hour.

As the train departed Camden Storage heading west, the operator stated right around Camden Anchorage two people were observed on the right-of-way with their back to the train, leaning overlooking down at the tracks. The operator stated that as soon as the two people were seen, the train was placed into emergency at 9:21:15 at approximately 33 mph and sounded the horn at 9:21:16, but the train did not stop in time. The train struck the two people at approximately 9:21:19 and the train came to a stop at 9:21:24. The operator immediately called the Center Tower to let the dispatcher know to cut the power on the bridge and that two trespassers had just been struck.

### **2.2 The Roadway Work Group**

According to the interviews, after the subject train, there was an intended scheduled maintenance outage to work on the bridge. The outage was from Hall Interlocking to Market Interlocking on track 2. The outage was not to work on the track but to work on the steel columns next to the right-of-way (ROW).

On the night of the accident the subcontractor JPC Group employees met at contractor Skanska's laydown yard for a pre-shift meeting at 8:30 p.m. local time. There were five employees in attendance including the JPC Group supervisor. Contractor Skanska superintendent conducted a job briefing with JPC Group employees, the job briefing did not include ROW information only other safety points and work tasks according to interviews.

The track outage was supposed to be at 9:30 p.m. but it was never consistent at that time due to weather or trains. JPC Group employees and supervisor went to Anchorage yard to get materials, then departed in two vehicles to the bridge work areas. One vehicle had the two subject JPC Group employees that would be working

in the ROW and the other had the JPC Group supervisor and the remaining employees that would be working in a different work area a pedestrian sidewalk away from the ROW.

The two employees that were to work in the ROW were tasked with putting new caulking on 11 columns that were located next to the third rail. This was their third night in that specific work area. The supervisor told the employees, "Just head up; I'll meet you up there and we'll give you a hand". The supervisor dropped his pedestrian sidewalk work crew off and started heading back to the ROW work site when the supervisor observed emergency vehicle lights at the work area.

Subcontractor JPC Group did not communicate with PATCO directly the night of the accident or prior to the accident. The chain of communication was PATCO would be in contact with the contractor Skanska, then Skanska would contact the JPC Group supervisor via cell phone. PATCO employees used radio to communicate and JPC Group used cell phones.

The procedure at the time of the accident was PATCO employee in charge (EIC) would request the track outage through Center Tower (dispatch). Center Tower, when operations permitted would give permission and deenergize the third rail. The EIC would notify the signal maintainers to let them know that it's okay to start placing their safeties and confirm the third rail power's deenergized. Once the signal maintainers confirm to the EIC that all safeties are in place and the third rail is deenergized, the EIC confirms with Center Tower that they have permission to start work. The PATCO EIC contacts the PATCO flagman to inform that the contractors have permission to start work on the ROW. The flagman contacts contractor Skanska, Skanska contacts subcontractor JPC Group supervisor and the supervisor informs the workers that they can start working in the ROW.

### **3.0 Operations**

#### **3.1 PATCO Dispatcher Audio Tape review**

The working group reviewed audio recordings. Below is the timeline from the recordings:

<b><u>Time</u></b>	<b><u>Respondent</u></b>	<b><u>Message</u></b>
21:20:05	Dispatcher:	ATC cut operating home signal to 16 <sup>th</sup>
21:20:13	Engineer:	Home signal to 16 <sup>th</sup>
21:21:34	Engineer:	West bound on the bridge cut the power, cut the power
21:21:52	Engineer:	I need some help on the bridge
21:21:59	Dispatcher:	confirms he needs help

22:21:59	Engineer:	Two construction workers on the track, made contact with them
21:22:04	Dispatcher:	Roger, uh, power de-energized
21:22:25	Engineer:	Julie, we need them here ASAP
21:22:33	Dispatcher:	Roger
21:23:08	Dispatcher:	Ram, are you guys ok to walk up to the train on the bridge? There were contractors on the track, possibly struck by the train, need you guys to go up there and help me out
21:23:19	Signal maintainer:	Camden storage on 2-track, headed towards summit
21:23:24	Dispatcher	Roger, 3 <sup>rd</sup> Rail power is de-energized, confirm on your way up.
21:23:34	Signal maintainer:	Graham, Jay, I am on the way up, there now.

### 3.2 Benjamin Franklin Bridge Surveillance Camera Review

The working group reviewed the surveillance camera. Below is the timeline from the surveillance camera:

<b>Time</b>	<b>Event</b>
21:15:33	JPC Vehicle arrives on scene.
21:16:14	JPC employees gets out of vehicle.
21:19:56	JPC employees cross over barricade to enter the right-of-way.
21:21:19	Employees struck by Westbound Train #1

### 3.3 Locomotive Download Review

On review of the download, the working group noted the train operator placed the train into emergency at 21:21:15 at approximately 33mph. Operator then sounded the horn at 21:21:16. The train was traveling around 33mph at the time the train was placed into emergency brake and took 9 seconds to come to a complete stop.

### 3.4 Toxicological Texting

Post-accident toxicological testing of the train operator for alcohol and drugs was negative.



### **3.5 Cell Phone Usage**

Video evidence shows the actions of the train operator, and it shows he was not using a cell phone when the accident occurred. Please see the Onboard Image Recorder's factual report.

### **3.6 Interviews**

The investigative team conducted six interviews on Monday, October 17<sup>th</sup>, 2022, at the DoubleTree Inn in Cherry Hill, NJ with the two PATCO signal maintainers, flagman, dispatcher, Skanska Superintendent, and a JPC Group Foreman. The team also interviewed three additional employees on February 16, 2023, at the DoubleTree Inn in Cherry Hill, NJ. Please refer to the docket for the full interview transcripts.<sup>1</sup>

### **3.7 Operational Testing**

PATCO has a written program called "Rules Checks" which is to ensure employee compliance and know and understand the rules. During calendar year 2022, the operator was safety rule checked 14 times. The operator was found to comply with all safety rule checks. The operator was also checked 8 times for operating rules and complied with all operating checks. He was also checked 11 times for reporting for duty and complied all 11 times.

## **4.0 Track**

### **4.1 Accident Track Description**

The accident occurred in a close clearance area (Red Zone) along a portion of the Ben Franklin Bridge on Main Track 2. PATCO defines a close clearance area as an area where there is no space for a person and a train at the same time. These areas require authorization from the dispatcher to occupy. Main Track 2 is located along the north side spans of the bridge. Main Track 2 is described as tangent track and both rails being continuous welded rail (CWR). Inside the anchorages, the track is directly fixated to the concrete plinths (track bed) with elastomer fasteners and Pandrol e-Clips. Once outside the anchorages, the track is fastened to timber crossties with Pandrol e-Clips. The timber crossties are J-bolted to the bridge structure. The track gauge averaged 56 ½" with no superelevation at the accident

---

<sup>1</sup> The full interviews will located in the docket at this web address: [NTSB Docket - Docket Management System](#)

site. The line of sight for trains and roadway workers operating at the accident site is described as clear, with no sight obstructions.

## **4.2 PATCO Right of Way Safety Plan**

PATCO's right of way (ROW) safety plan governs both PATCO and contractors while performing facility inspections, construction, maintenance, and repair duties on the system. The current plan has an effective date of January 5, 2019. The plan states that compliance with PATCO's ROW safety rules are mandatory, and failure to comply with may result in disciplinary action.

The plan states that the Employee-In-Charge (EIC) is responsible for on-track protection and safety of employees. The plans defines an EIC as a PATCO employee that is qualified to established protection for roadway workers and work groups. The ROW plan states that the EIC is responsible for the following safety actions: 1) determine the method of protection, 2) responsible for establishing on-track protection, 3) conduct job safety briefings, 4) the placement of protection flagmen, and 5) responsible for removing tracks from service, and authorizing their in-service release.

PATCO utilizes the following methods of ROW safety protection to protect PATCO and contract employees along the ROW:

1. Individual Protection for Lone Workers
2. Train Approach Warning [PATCO safety rule 183]
3. Traffic Protection [Dispatchers- General Instructions C-24 H]
4. Track Out of Service

## **4.3 Entering the Right-of-Way**

### **4.3.1 Job Safety Briefing**

Before entering the ROW, EIC must lead and document a job safety briefing to review operational and safety conditions. If conditions change, an additional job safety briefing must be held to discuss the new conditions. Job safety briefings should be conducted face to face, however when not practical or possible to do so, telephone communication can be utilized.

- A job safety briefing must include, but is not limited to, the following topics:
- a) Personal Protective Equipment (PPE)
  - b) ROW Worker Certification Verification
  - c) The nature of the work to be performed.
  - d) Operational and safety hazards known to be present or that may be encountered relative to the tasks to be performed.

- e) Current information on Bulletin Orders or other Notices that could affect safety.
- f) The means by which on-track protection is to be provided, including any necessary protection on adjacent tracks.
- g) The means of communication to be used between ROW Workers
- h) The location where employees will clear the track, when required.
- i) Identification and location of key personnel, including the Employee in Charge, flag person, watchperson / lookout, and
- j) Any known special operating conditions

A job safety briefing must not be considered complete until all affected ROW Workers acknowledge an understanding of the information conveyed. A job safety briefing form must be completed by the EIC and signed by all ROW Workers participating in the briefing, when practical.

#### **4.3.2 Procedures for Entering the Right-of-Way**

- 1.** Each person is responsible for his own safety and the safety of those around him, and must make safety a top priority when working on or near the PATCO ROW as described in the ROW Safety Plan.
- 2.** ROW Workers shall expect, and be vigilant for, train or equipment movement on any track in any direction at any time.
- 3.** All ROW Workers must attend training, demonstrate required proficiency, and be certified by their management prior to entering the ROW.
- 4.** The use of prescribed safety devices, including personal protective equipment is required by all ROW Workers.
- 5.** Authorization from the Dispatcher at PATCO Center Tower is required prior to entering the ROW.
- 6.** Authorization from the Dispatcher at PATCO Center Tower is required prior to moving trains and equipment on the ROW.
- 7.** Authorization from the Tower Supervisor is required prior to entering Lindenwold Yard, and for all train and equipment movement within the Yard.
- 8.** A Job Safety Briefing led by an EIC is required to be performed and documented prior to entering the ROW to perform work.
- 9.** There shall be no fouling of tracks or entry into the ROW unless absolutely necessary to perform your job.

## 5.0 Mechanical

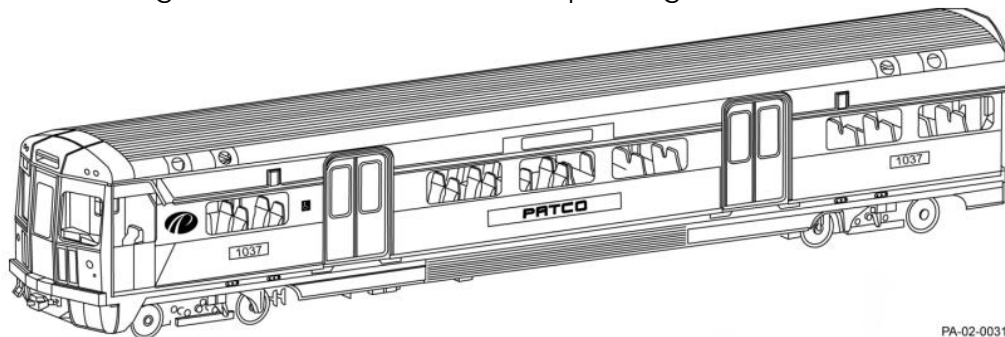
### 5.1 Train Consist Information:

PATCO train "Westbound 1" consisted of six railcars. The transit passenger railcars are electric multiple unit (EMU) powered by a third-rail propulsion system.

- 1092
- 1091
- 1044
- 1043
- 1001
- 1002

### 5.2 Transit car information:

PATCO's fleet consists of one hundred twenty (120) electric rail cars. Seventy-five (75) were manufactured in 1968 by the Budd Company of Philadelphia and of those, fifty (50) were married pairs and twenty-five (25) were singles. The remaining forty-six (46) rail cars were manufactured by Canadian Vickers and were married pairs. The Canadian Vickers cars were placed in service in 1980. A fleet wide overhaul of those original cars was performed by Alstom Transport, the first overhauled married pair returned to service in 2015 with the last married pair returning March 2019, PATCO will have 60 married pairs which will be known as Series 1000 cars. The remaining single car (116) was used to support repairs throughout the overhaul project; this single train car will not return to revenue service. The transit cars weigh approximately 82,000 pounds, 67 feet 10 inches in length, 10 feet 1.5 inches wide, 12 feet four inches high and seat a maximum of 76 passengers.



**Figure 3.** PATCO EMU Railcar Diagram

### **5.3 Post-accident inspection**

On October 17, 2022, NTSB investigators visited PATCO's facility in Lindenwold, NJ to examine the lead transit railcar 1092. Investigators observed testing of the three actions the brake system will go into emergency braking, and all three were functioning as intended.

- Master controller placed in the emergency braking position.
- Releasing the master controller handle.
- Pressing the emergency stop button on the operator console.

### **5.4 Inspection Information**

Train consist westbound 1, with transit cars 1092, 1091, 1044, 1033, 1001 and 1002 had a successful pre-revenue inspection by train operators on October 14, 2022, 7:03 a.m. at the PATCO Lindenwold, NJ facility. No exceptions were noted during this inspection.

Pre-revenue inspection is the following inspection and tests:

All Console/Cab Doors Locked  
Emergency Windows Seal Intact  
All Sliding Windows Locked  
Mirrors (both ends)  
Anti-Climber Level  
End Doors  
All Electrical/Circuit Breaker Doors/Locked  
E/P-Truck Cutout Lockers Secure  
Overhead Blowers Working  
Fire Extinguisher in Place  
Radio / PA Working (both ends)  
All Handbrakes Released  
Brake Release (Both Ends)  
Emergency Signage Posted  
All Sliding Doors Working  
Interior Lighting Working  
All Door Lights Lit (when doors are open)  
Horn Working (both ends)  
Cab Signals Illuminated  
Defroster Indicator Light  
Departure Test Successful  
PEI Sounds on Console (both ends)  
End Destination Signs Properly Displayed  
Suspicious or Unauthorized Item  
Safety Chains/Barriers in Place

Proper FIP Lights Extinguished  
Headlights/Taillights Illuminated (both ends)  
Windshield Wipers/Washers Working (both ends)  
All Required Switches Normal & Sealed (both ends)  
Slipping or Falling Hazard  
Sun Visor Not Obstructing Operating Cab Camera  
Miscellaneous Defects

Doors, Door Lights, and Cab Signals (Departure Test) will only be checked on trains departing from Lindenwold Yard.



**Figure 4.** - Lead Railcar 1092

The most recent scheduled maintenance was completed on 1091/1092 set on August 19, 2022. 1044/1043 the maintenance was completed on September 15, 2022, and cars 1001/1002 the maintenance was completed on August 31, 2022.

Scheduled maintenance includes inspection and tests on:

- Carbody
- Couplers
- Interior
- Operator's cab
- Friction brakes
- Trucks

## **6.0 Signal & Train Control System**

PATCO train movements are governed by an Automatic Train Control (ATC) system using coded cab signals and wayside interlocking signals on two main tracks. The main tracks are oriented in an east/west geographic direction between Lindenwold, New Jersey and Philadelphia, Pennsylvania. Main track 1, (northern track) is normally used for eastbound train traffic and the main track 2 (southern track) is normally used for westbound train traffic.

Wayside signals can display red, lunar and flashing lunar aspects. The cab signal system provides a speed control function to enforce the maximum authorized train speed. Trains receive continuous cab signal indications and speed commands which are displayed on the train operator's aspect display unit located in the operating cab. PATCO trains can receive speed commands of 20 mph, 30 mph, 40 mph, 65 mph or "Stop." A "Stop" speed command is denoted by the absence of a permitted speed command rather than a distinct additional speed command. Trains operating on the Benjamin Franklin Bridge can operate at a maximum speed of 40 mph.

### **6.1 Third-Rail Propulsion Power System**

Train propulsion power is supplied by a covered, top-contact electrified third rail with 750 volts, direct-current (Vdc).

The third rail allows for the contact rail shoes affixed to the rail cars to contact the top of the third rail as it moves. In the area of the accident, the third rail is located to the south of the track structure. The height of the third rail is positioned slightly higher than the running rails.

Submitted by:

Matthew Thompson  
IIC