



***Federal Railroad Administration  
Office of Railroad Safety  
Accident and Analysis Branch***

***Accident Investigation Report  
HQ-2016-1160***

***New Jersey Transit Rail Operations (NJTR)  
Hoboken, NJ  
September 29, 2016***

***Note that 49 U.S.C. §20903 provides that no part of an accident or incident report, including this one, made by the Secretary of Transportation/Federal Railroad Administration under 49 U.S.C. §20902 may be used in a civil action for damages resulting from a matter mentioned in the report.***



**SYNOPSIS**

**Synopsis**

On September 29, 2016, at approximately 8:38 a.m., EDT, eastbound New Jersey Transit (NJT) Train No. 1614 struck the bumper block located at the east-end of No. 5 station track, at the Hoboken Terminal, Hoboken, New Jersey. The train was traveling at a recorded speed of 20 miles per hour (mph) when it struck the bumper block.

The train consist was approximately 400 feet in length, and included, from east to west, leading control Cab Car NJTR 6036, which was passenger occupied, followed by three passenger cars numbered 6577, 6575, 6521. The trailing, diesel-electric Locomotive NJTR 4214, was positioned at the west-end of the train consist. There were approximately 358 people on-board the train when the accident occurred.

After striking the bumper block, the train continued eastward with the leading control Cab Car NJTR 6036 derailed. The derailed control cab car road up on top of the bumper block, struck a horizontal station roof support beam and vertical roof support column(s), causing the station roof structure building material to fall. The control cab car then struck the Hoboken Terminal Station building's west wall before coming to a stop.

The accident resulted in one fatality of a civilian on the station platform area. There were 153 reported injuries to passengers, train crew members, and others in and around the terminal. The one fatality was attributed to falling building material, which resulted from the train striking the station roof support structure.

Weather at the time of the accident was overcast, 63 °F with 83% humidity and winds out of the northeast at 18 mph.

The accident resulted in equipment damage estimated to be \$6 million and track and structure damage estimated to be \$12,000.

FRA determined the probable cause of this accident was Automatic block or interlocking signal displaying other than stop indication – Failure to comply (H222).

FRA also determined two contributing causes to this accident; Failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal (H605), and Fixed signal (other than automatic block or interlocking signal) – Failure to comply (H220).



# FRA FACTUAL RAILROAD ACCIDENT REPORT


FRA File #HQ-2016-1160

## TRAIN SUMMARY

1. Name of Railroad Operating Train #1 New Jersey Transit Rail Operations	1a. Alphabetic Code NJTR	1b. Railroad Accident/Incident No. 201609513
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## GENERAL INFORMATION

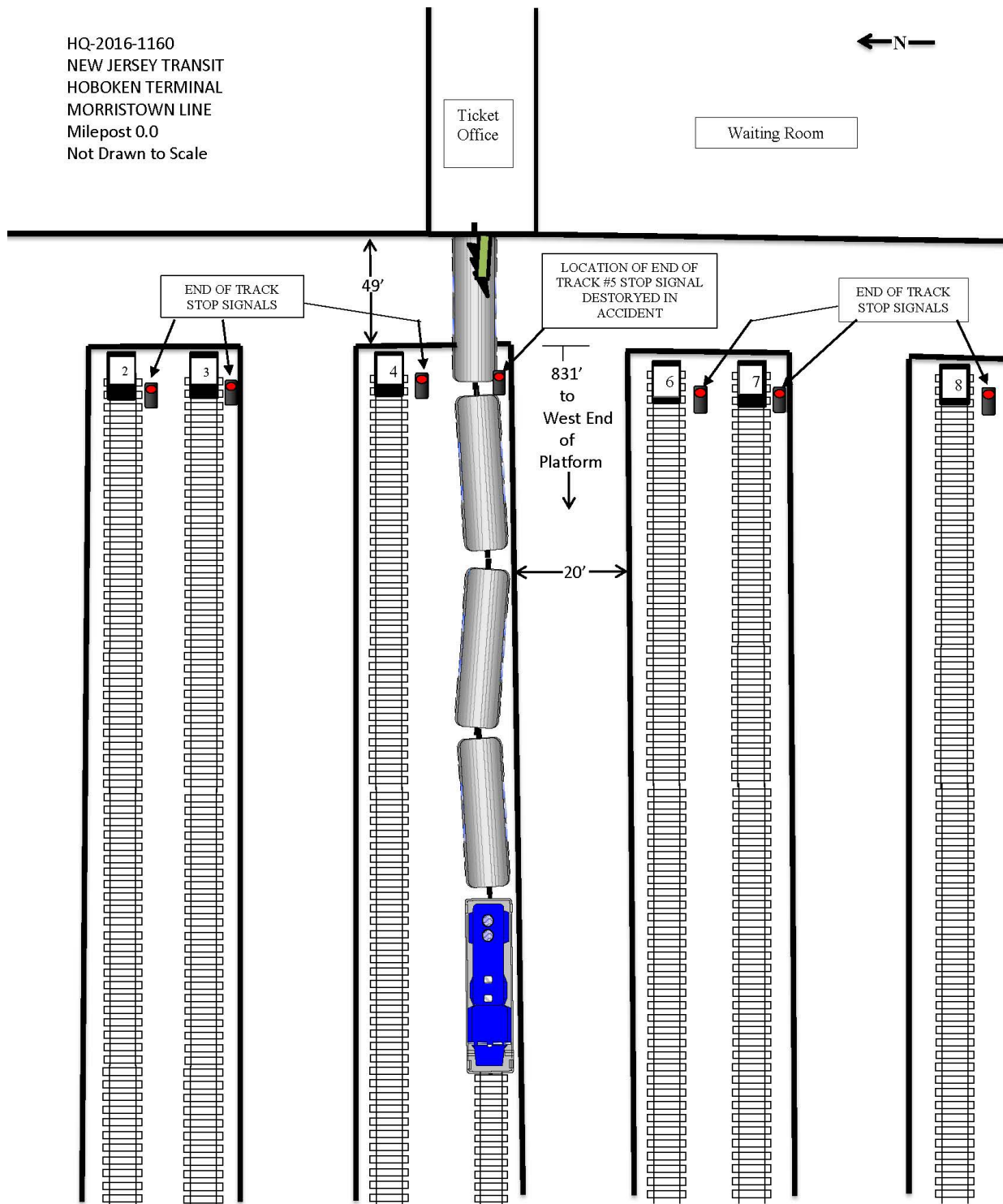
1. Name of Railroad or Other Entity Responsible for Track Maintenance New Jersey Transit Rail Operations		1a. Alphabetic Code NJTR		1b. Railroad Accident/Incident No. 201609513	
2. U.S. DOT Grade Crossing Identification Number		3. Date of Accident/Incident 9/29/2016		4. Time of Accident/Incident 8:38 AM	
5. Type of Accident/Incident Obstruction					
6. Cars Carrying HAZMAT 0	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0	9. People Evacuated 0	10. Subdivision Hoboken	
11. Nearest City/Town Hoboken		12. Milepost (to nearest tenth) 0.1	13. State Abbr. NJ	14. County HUDSON	
15. Temperature (F) 63 °F	16. Visibility Day	17. Weather Cloudy		18. Type of Track Main	
19. Track Name/Number Track No. 5		20. FRA Track Class Freight Trains-10, Passenger Trains-15		21. Annual Track Density (gross tons in millions)	22. Time Table Direction East

 U.S. Department of Transportation Federal Railroad Administration		FRA FACTUAL RAILROAD ACCIDENT REPORT				FRA File #HQ-2016-1160							
OPERATING TRAIN #1													
1. Type of Equipment Consist: Commuter Train-Pushing					2. Was Equipment Attended? Yes		3. Train Number/Symbol NJTR 1614						
4. Speed (recorded speed, if available)  R - Recorded      20 MPH E - Estimated		Code  R	5. Trailing Tons (gross excluding power units)		6a. Remotely Controlled Locomotive? 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			Code  0					
6. Type of Territory  Signalization: <u>Signaled</u>  Method of Operation/Authority for Movement: <u>Signal Indication</u>  Supplemental/Adjunct Codes: <u>A, G, L</u>													
7. Principal Car/Unit		a. Initial and Number	b. Position in Train	c. Loaded (yes/no)	8. If railroad employee(s) tested for drug/alcohol use, enter the number that were positive in the appropriate box		Alcohol	Drugs					
(1) First Involved ( <i>derailed, struck, etc.</i> )		NJTR 6036	1	yes			0	0					
(2) Causing (if mechanical, cause reported)		0	0		9. Was this consist transporting passengers?			Yes					
10. Locomotive Units (Exclude EMU, DMU, and Cab Car Locomotives.)		a. Head End	Mid Train		Rear End		11. Cars (Include EMU, DMU, and Cab Car Locomotives.)		Loaded		Empty		
			b. Manual	c. Remote	d. Manual	e. Remote			a. Freight	b. Pass.	c. Freight	d. Pass.	e. Caboose
(1) Total in Train		0	0	0	1	0	(1) Total in Equipment Consist		0	4	0	0	0
(2) Total Derailed		0	0	0	0	0	(2) Total Derailed		0	1	0	0	0
12. Equipment Damage This Consist 6000000			13. Track, Signal, Way & Structure Damage 12000										
14. Primary Cause Code H222 - Automatic block or interlocking signal displaying other than a stop indication - failure to comply.*													
15. Contributing Cause Code H605 - Failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal.													
Number of Crew Members							Length of Time on Duty						
16. Engineers/Operators		17. Firemen		18. Conductors		19. Brakemen		20. Engineer/Operator			21. Conductor		
1		0		1		1		Hrs: 1      Mins: 52			Hrs: 2      Mins: 7		
Casualties to:		22. Railroad Employees		23. Train Passengers		24. Others		25. EOT Device?			26. Was EOT Device Properly Armed?		
Fatal		0		0		1		N/A			N/A		
Nonfatal		3		136		14		27. Caboose Occupied by Crew?			N/A		
28. Latitude 40.735036000				29. Longitude -74.028009000									

SKETCHES

Sketch

HQ-2016-1160  
NEW JERSEY TRANSIT  
HOBOKEN TERMINAL  
MORRISTOWN LINE  
Milepost 0.0  
Not Drawn to Scale



**NARRATIVE**

**Circumstances Prior to the Accident**

On September 29, 2016, the Conductor and Brakeman of New Jersey Transit Rail Operations (NJTR) Train 1614 (the train) reported for duty at Woodbine Yard in Spring Valley, New York at 6:31 a.m., EDT. The Engineer of the train reported for duty at 6:46 a.m. The train assignment was the first passenger train operating on assignment No. 07, Spring Valley. Prior to proceeding to the train, the crew reported that a safety briefing was conducted with all members of the crew. Train preparation and departure from Spring Valley was reported as normal.

The train consist was made up of one Control Cab Car in the lead (NJTR 6036 occupied by passengers), three passenger cars (NJTR 6577, 6575 and 6521), and a single locomotive (NJTR 4214) on the rear in push/pull configuration. The normal operation of the train includes an additional passenger car and the reduction in cars on the day of the accident resulted in increased crowding of passengers on the train.

The controlling Cab Car NJTR 6036, was a Comet V-series cab car manufactured by Alstom in 2003. The car measured approximately 85 feet (length), by 10 feet and weighed about 107,140 pounds. Two truck assemblies were positioned equally distant from the center of the car near the ends. Each truck assembly contained two axles with four-tread brake units and four inboard disc brake systems. The brakes were controlled by an EPIC/26-C/CS-2 Brake System which is a computer-controlled, electro-pneumatic service braking system, providing service braking, emergency braking, and wheel slip protection.

The rear locomotive was a General Motors, Electro Motive Diesel, GP-40 PH2-B re-manufactured by Conrail in 1994. This unit was a four-axle/two-truck, 3,000 HP diesel-electric locomotive. Each truck was powered by two transversely-mounted DC traction motors, each of which drives an axle by means of a dedicated gearbox. The air brakes were controlled by an EPIC/26-C/CS-2 Brake System which is a computer-controlled, electro-pneumatic air braking system, providing service braking, emergency braking, and wheel slip protection.

All required brake tests were completed by the Engineer of the train prior to departing Woodbine Yard as confirmed by a review of the Cab Car event recorder.

Approaching Hoboken Terminal on track No. 5, the site of the accident, the track is level with an 8-degree curve to the north. Track No. 5 runs parallel and adjacent to Track No. 4 to the north, and has a passenger platform on the south side that is 20 feet wide separating track No. 5 and track No. 6. From the west end of the train shed on track No. 5 to the bumping block is 600 feet. All tracks entering Hoboken Terminal are stub end tracks equipped with bumping blocks and fixed end of track stop signals on the east end. The platforms between tracks are connected on the east end by a walkway that is approximately 49 feet wide. East of the walk way, there is a ticket office and waiting area for passengers with a wall divider between them and the walkway. The maximum authorized speed within the terminal is

10 miles per hour (mph) as indicated in the current timetable in effect at the time of the accident.

At the time of the accident, the Engineer was alone in the operating compartment of the Cab Car (NJTR 6036). The Conductor was in the vestibule between the Cab Car and the second car (NJTR 6036 and NJTR 6577), and the Brakeman was in the rear car (NJTR 6521).

The train entered the west end of Hoboken Terminal on track No. 5 at approximately 8:38 a.m. The Engineer reported that as the train was approaching the west end of the platform he looked at his watch to confirm their time of arrival and noted they were 6 minutes behind schedule. He reported his train speed at that time was 10 mph as he began to activate the horn and bell as they entered the station.

During the trip, the Engineer stated that there were no distractions from either inside or outside the operating compartment. Additionally, he stated that his cell phone was powered off and stowed in his bag on the floor of the operating compartment. There was no radio communication between the Engineer and the Dispatcher, and other radio transmissions within the terminal were minimal and did not cause a distraction.

Weather at the time of the accident was overcast, 63 °F with 83% humidity and winds out of the northeast at 18 mph.

### **The Accident**

As the train entered Track No. 5, approximately 781 feet before the bumping block, the recorded speed retrieved from the event recorder was 8 mph. The Engineer then moved the throttle from idle into the fourth throttle position beginning to accelerate 38 seconds prior to impact.

The Brakeman stated he recognized the train was going too fast and attempted to pull the emergency brake lever, but could not reach it before the accident.

Approximately 1-second prior to impact, the Engineer moved the throttle from the fourth position back to idle. Event recorder data showed the train speed at the time the Engineer reduced throttle was 20 mph, then the Engineer initiated an emergency brake application about one-half second and 40 feet before the impact.

The train impacted the bumping block causing the Cab Car to derail and lift upward and over the bumping block onto the walkway and striking an overhead steel support beam, a vertical structural support column, and then into the wall of the Hoboken Station building before coming to rest. The impact caused structural debris to fall onto the walkway resulting in a fatality to a civilian on the walkway.

Immediately after the accident the Conductor asked passengers to stay in the train, but they began to self-evacuate. The Brakeman got off the train and walked to the Cab Car to assist passengers. He observed that the impact with the overhead support beam had collapsed the ceiling of the coach to the top of the seats. He then assisted the Engineer out of the Cab Car.

In addition to the fatality, 136 passengers on the train, all 3 train crew members, and 14 people in the surrounding terminal area were injured.

NJTR Management in the terminal immediately notified NJTR Police, NJTR's Rail Operations Center, and Fire Rescue, who all responded to the scene. NJTR Police and Fire Rescue first responders evacuated the passengers from the train.

The Engineer told investigators that he did not remember the accident, just being on the floor of the operating compartment and being assisted by the Brakeman before being taken to the hospital accompanied by an NJT Police Officer who conducted the first interview.

### **Post-accident/Incident Investigation**

The Federal Railroad Administration (FRA) began an investigation of this accident and assigned Operating Practices (OP), Motive Power & Equipment (MP&E), Signal and Train Control (S&TC), and track inspectors to the accident location.

Upon commencing its investigation, FRA investigators inspected the accident site, all equipment, the track structure, toxicology analysis, fatigue analysis of the train's crew, rules compliance, and cell phone records.

After their on-site inspection and investigation, FRA conducted interviews with the train crew of the train. FRA's investigators also requested and received all records, forms, and other documentation necessary to conduct their final analysis and draw conclusions concerning the pertinent facts of the accident. The following analysis and conclusions, as well as any possible contributing factors and the probable cause in this report, represents the findings of FRA's investigation.

### **Analysis and Conclusion**

Analysis – Equipment: On September 30, 2016, an MP&E inspector completed the initial visual inspections of Train No. 1614 at its initial point of rest, Track No. 5, at the Hoboken Terminal. The investigator inspected all wheels on the equipment and took no exception. All brake rigging appeared normal and all brake pads and discs were within tolerance.

No defective conditions were discovered during the visual equipment inspection. Areas of the equipment obscured by wreckage and debris were inspected during the recovery operations, and no equipment defect was noted.

On October 7, 2016, the investigator assembled in the Meadows Maintenance Complex (MMC), in Kearny, New Jersey, after the removal of the accident train from Hoboken Terminal. At MMC, the Cab Car was evaluated to determine if the brake control system, propulsion, and other systems could be repaired to complete train-line testing. The investigator determined the electronic train-line system was destroyed on the Cab Car (NJTR 6036), and the communication network necessary to evaluate brake and propulsion systems could not be repaired. The investigator's focus turned to the key components to assess the mechanical condition of the train mechanical systems. The investigator determined the air brake system could be repaired to evaluate the friction brake system on the car.

Repairs were made to the Cab Car air system to evaluate the air brakes. On October 9, 2016, the car



was then coupled to the incident train and a Class I brake test was completed using the Locomotive NJTR 4214. The air brakes, and all relating systems operated as intended.

Conclusion: The equipment did not contribute to the cause or severity of this accident.

Analysis – Locomotive Appurtenances: October 8, 2016, and October 9, 2016:

The following key components from the Cab Car (NJTR 6036) were identified by the MP&E inspector for functional testing, utilizing another know properly functional Cab Car (NJTR 6047):

- EPIC brake controller
- Throttle
- Translator
- Speed display unit (SDU)
- Alerter
- Radio/PA system - (included the radio head and the control portion)

All components functioned as intended.

Conclusion: Locomotive Appurtenances did not contribute to the cause or severity of this accident.

Analysis – Track: FRA inspectors reviewed NJTR track inspection records. The review concluded that NJTR track inspectors had been performing monthly inspections of switches, reporting defects and remedial actions as required.

FRA conducted a walking inspection of Hoboken Terminal track No. 5 accompanied by NJTR personnel and NTSB investigators. The inspector reported that there were no track defects noted nor any lubricant or foreign matter on the running rail that could have resulted in loss of train braking effort.

Analysis of the Hoboken Terminal Track No. 5 bumper block was also completed, and the track inspector concluded that the bumper block failed because the impact force exceeded the design capacity of the bumper block.

Conclusion: Track conditions did not contribute to the cause or severity of this accident.

Analysis – Signal: FRA S&TC inspectors investigated the signal route utilized by the train on the day of the accident, including analysis of post-accident signal data logs; preliminary event recorder data; and Train Management and Coordination (TMAC) dispatcher log (recorded events of the TMAC system utilized by NJTR rail train dispatchers), including review of NJTR dispatcher console screen shots of the route of the train. Post-accident signal system examination and testing found no defects for the units inspected. The signal system trouble reports were reviewed, including all trouble reports associated with the assigned train's route for a 12-month period prior to the accident date. All maintenance records for inspections and test records were collected and reviewed for monthly, quarterly, semi-annual, annual, 2-year, 4-year, and 10-year Federal required inspections for terminal interlocking signal 6E, 26E, shed Track No. 5 and automatic signal M06T3. No defects were identified during the inspection and review.

Conclusion: Signals did not contribute to the cause or severity of the accident.

Analysis – Sight Distance: An on-site sight distance survey was conducted on December 1, 2016, as part of this investigation with FRA present during the survey. There was no exception taken to sight distance, signal aspect focus, or distance from which each signal aspect could be observed, identified, and responded to appropriately.

In a statement given to FRA, the Engineer reported that visibility was good, and he could see the length of the track to the bumping block and signal at the end of the track as the train entered the west end of the station.

Conclusion: Sight distance did not contribute to the cause or severity of this accident.

Analysis – Toxicological: This accident met the criteria for Title 49 Code of Federal Regulations (CFR) Part 219, Subpart C, Post Accident Toxicology Testing. Testing was performed on the Locomotive Engineer, Conductor, and Brakeman of the train. The results of these tests were negative for drugs and alcohol.

Conclusion: Toxicology did not contribute to the cause or severity of this accident.

Analysis – Fatigue: FRA performed a fatigue analysis using the Fatigue Avoidance Scheduling Tool (FAST). FRA uses an overall effectiveness rate of 77.5 percent as the baseline for fatigue analysis. At or above this baseline, the FRA does not consider fatigue as probable for any employee. Inputs into the FAST software vary based on information obtained from each employee. FRA obtained fatigue-related information, including a 10-day work history for the train's Engineer, Conductor, and Brakeman. The crew's FAST analysis did not indicate fatigue was probable for any of the crew.

During an interview with the FRA investigators, the Engineer told investigators he participated in a in-home sleep study with his private physician. Testing concluded that the Engineer was suffering from obstructive sleep apnea (OSA). OSA renders the person affected in a constant fatigue state.

Considering the Engineer's OSA diagnosis, the FAST analysis would be nullified; however, the Engineer told investigators in a post-accident interview that his speed and the time were "clear in his mind" as they entered the train shed approximately 781 feet before point of impact. Additionally, the Engineer stated that he did not feel fatigued, and the day was "normal" and "uneventful" until the accident occurred.

While fatigue was possible due to the post-accident diagnosis of OSA for the Engineer, facts gathered by FRA inspectors during the post-accident interview indicated the Engineer was awake and situationally aware as they entered the station. FRA determined that fatigue was not the cause of the accident.

Conclusion: FRA determined that fatigue did not contribute to the cause or severity of this accident.

Analysis – Operating Practices: The interlocking signal leading to Track No. 5, displayed a slow

approach indication. The Engineer of the train was not operating his train in compliance with NJTR operating rules and in violation of 49 C.F.R. § 240.305(a)(2).

The speed limit going into the train shed in Hoboken was 10 mph. The event recorder shows that approximately 38 seconds prior to striking the bumping block, the train was travelling 8 mph and the Engineer moved the throttle from idle position into the fourth throttle position increasing his speed to 20 mph. Approximately 1-second prior to striking the bumping block, NJTR Train 1614 was traveling at 20 mph and the Engineer moved the throttle from the fourth throttle position to idle and then initiated emergency braking immediately prior to impact.

The movement of the throttle from idle position to the fourth throttle position is a cognitive effort that requires lifting of the throttle control handle and pulling the throttle control inward toward the Engineer.

During the investigation, MP&E confirmed that the throttle control handle on the Cab Car (NJTR 6036) was equipped with a locking mechanism. This is a designed safety feature which required the Engineer to lift the handle up before the throttle could be moved from idle position to any power throttle position.

After the throttle position was moved from idle (coast) position to throttle (T4) power position, which was done approximately 781 feet from the bumper block, the train then began to accelerate, and during a recorded time of 31.6 seconds, the train speed steadily increased from 8 mph to 20 mph as it traveled the remaining distance to the bumper block.

Conclusion: The Engineer failed to comply with the signal indication entering Hoboken Terminal, and the stop signal at the end of Track No. 5. Additionally, FRA determined the train increased speed while entering track No. 5 to 20 mph. This is 10 mph over the maximum authorized speed in Hoboken Terminal.

FRA determined Operating Practices was the probable cause of this accident.

Analysis – Outside Agency Findings: NJTR Police investigators obtained the Engineer's cell phone records and confirmed that the Engineer's cell phone was powered off as required by 49 C.F.R. Part 220, Subpart C.

Conclusion: FRA concluded that cell phone use did not contribute to the cause or severity to this accident.

### **Overall Conclusion**

The Engineer was not in compliance with the interlocking signal displaying other than a stop indication and restricted speed. The Engineer also passed by a fixed signal at the end of track displaying a stop indication, likely due to a loss of situational awareness.

### **Probable Cause**

FRA determined the probable cause of this accident was Automatic block or interlocking signal displaying other than stop indication – Failure to comply (H222).

FRA also determined two contributing causes to this accident; Failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal (H605), and Fixed signal (other than automatic block or interlocking signal) – Failure to comply (H220).