



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

***Accident Investigation Report  
HQ-2014-7***

***Norfolk Southern Railway Company (NS)  
Sewickley, PA  
July 2, 2014***

***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.***

**TRAIN SUMMARY**

1. Name of Railroad Operating Train #1 Norfolk Southern Railway Company	1a. Alphabetic Code NS	1b. Railroad Accident/Incident No. 111162
2. Name of Railroad Operating Train #2 Norfolk Southern Railway Company	2a. Alphabetic Code NS	2b. Railroad Accident/Incident No. 111162

**GENERAL INFORMATION**

1. Name of Railroad or Other Entity Responsible for Track Maintenance Norfolk Southern Railway Company		1a. Alphabetic Code NS	1b. Railroad Accident/Incident No. 111162	
2. U.S. DOT Grade Crossing Identification Number N/A		3. Date of Accident/Incident 7/2/2014	4. Time of Accident/Incident 1:39 PM	
5. Type of Accident/Incident Rear End Collision				
6. Cars Carrying HAZMAT 88	7. HAZMAT Cars Damaged/Derailed 0	8. Cars Releasing HAZMAT 0	9. People Evacuated 150	10. Subdivision Pittsburgh Division
11. Nearest City/Town Sewickley		12. Milepost (to nearest tenth) 12.9	13. State Abbr. PA	14. County ALLEGHENY
15. Temperature (F) 85 °F	16. Visibility Day	17. Weather Clear		18. Type of Track Main
19. Track Name/Number FORT WAYNE #3 MAIN		20. FRA Track Class Freight Trains-60, Passenger Trains-80		21. Annual Track Density (gross tons in millions) 125.5
				22. Time Table Direction West





**CROSSING INFORMATION**

<b>Highway User Involved</b>				<b>Rail Equipment Involved</b>			
1. Type N/A				5. Equipment N/A			
2. Vehicle Speed ( <i>est. mph at impact</i> ) 0		3. Direction ( <i>geographical</i> ) N/A		6. Position of Car Unit in Train 0			
4. Position of Involved Highway User N/A				7. Circumstance N/A			
8a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? N/A				8b. Was there a hazardous materials release by N/A			
8c. State here the name and quantity of the hazardous material released, if any. N/A							
9. Type of Crossing Warning 1. Gates      4. Wig wags      7. Crossbucks      10. Flagged by crew 2. Cantilever FLS      5. Hwy. traffic signals      8. Stop signs      11. Other ( <i>spec. in narr.</i> ) 3. Standard FLS      6. Audible      9. Watchman      12. None N/A				10. Signaled Crossing Warning		11. Roadway Conditions N/A	
12. Location of Warning N/A			13. Crossing Warning Interconnected with Highway Signals N/A			14. Crossing Illuminated by Street Lights or Special Lights N/A	
15. Highway User's Age 0		16. Highway User's Gender N/A		17. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train N/A		18. Highway User N/A	
19. Driver Passed Standing Highway Vehicle N/A			20. View of Track Obscured by ( <i>primary obstruction</i> ) N/A				
Casualties to:		Killed	Injured	21. Driver was N/A		22. Was Driver in the Vehicle? N/A	
23. Highway-Rail Crossing Users 0		0	0	24. Highway Vehicle Property Damage ( <i>est. dollar damage</i> ) 0		25. Total Number of Vehicle Occupants ( <i>including driver</i> ) 0	
26. Locomotive Auxiliary Lights? N/A				27. Locomotive Auxiliary Lights Operational? N/A			
28. Locomotive Headlight Illuminated? N/A				29. Locomotive Audible Warning Sounded? N/A			

10. Signaled Crossing Warning

- 1 - Provided minimum 20-second warning
- 2 - Alleged warning time greater than 60 seconds
- 3 - Alleged warning time less than 20 seconds
- 4 - Alleged no warning
- 5 - Confirmed warning time greater than 60 seconds
- 6 - Confirmed warning time less than 20 seconds
- 7 - Confirmed no warning
- N/A - N/A

Explanation Code

- A - Insulated rail vehicle
- B - Storm/lightning damage
- C - Vandalism
- D - No power/batteries dead
- E - Devices down for repair
- F - Devices out of service
- G - Warning time greater than 60 seconds attributed to accident-involved train stopping short of the crossing, but within track circuit limits, while warning devices remain continuously active with no other in-motion train present
- H - Warning time greater than 60 seconds attributed to track circuit failure (e.g., insulated rail joint or rail bonding failure, track or ballast fouled)
- J - Warning time greater than 60 seconds attributed to other train/equipment within track circuit limits
- K - Warning time less than 20 seconds attributed to signals timing out before train's arrival at the crossing/island circuit
- L - Warning time less than 20 seconds attributed to train operating counter to track circuit design direction
- M - Warning time less than 20 seconds attributed to train speed in excess of track circuit's design speed
- N - Warning time less than 20 seconds attributed to signal system's failure to detect train approach
- O - Warning time less than 20 seconds attributed to violation of special train operating instructions
- P - No warning attributed to signal systems failure to detect the train
- R - Other cause(s). Explain in Narrative Description

**SYNOPSIS**

A Norfolk Southern Railway (NS) westward train, 65KC201 (65K), struck the rear of a NS Intermodal Train 25ZC101 (25Z), at Sewickley, Pennsylvania, on July 2, 2014. The collision occurred at 1:39 p.m. at Milepost (MP) 12.9 on Main Track Number 3 of the NS Fort Wayne Line. The Engineer and Conductor on the 65K were injured when their locomotive derailed and rolled onto its side. The 25Z crew was not injured. Although the 65K contained 82 residue ethanol cars, no cars containing hazardous materials (hazmat) derailed. The three locomotives and one lead buffer car (non-hazmat) on the 65K derailed. The two rear platforms of an empty five-unit intermodal car derailed on the 25Z.

Train 25Z had 56 intermodal cars. Eight intermodal containers in the train contained hazmat. The rear 7 cars were empty. About 150 to 200 people were evacuated from nearby homes and businesses as a precautionary measure when leaking diesel fuel from two locomotives caught fire. The evacuation was lifted 2 hours later. The recorded speed at the time of the collision was 25 miles per hour (mph). The crew on 25Z was preparing to pull forward from a stopped position when their train was struck by Train 65K.

At the time of the collision, it was 85 degrees Fahrenheit. The weather was sunny and clear with wind from the southwest gusting from 6 to 12 mph.

Crew members from both trains were tested under Title 49, Code of Federal Regulations (CFR), Part 219, Subpart C. The post-accident testing results were negative. Cell phone records were reviewed and indicated that neither crewmember of the 65K used their cell phones while on duty.

Combined train equipment damages were adjusted and estimated to be \$924,210, with the latest track damage estimates to be \$87,873.

The derailed equipment was cleared from the main track and seven track panels were installed by 5:00 p.m. on July 3, 2014. The last two derailed locomotives were re-railed by 5:00 p.m. on July 3, 2014. Main Track Number 3 was placed back in service a short while later. NS has two additional main tracks in the vicinity and was able to continue moving trains within 5 hours of the accident. This is an Amtrak route.

Train movement is authorized by automatic block signal. The last controlled signal was approximately 9 miles prior to the collision point. Railroad Timetable direction is west. The geographic direction is northwest. The railroad timetable direction of west will be used throughout this report.

Impact speed was 25 mph with Train 65K striking the rear of Train 25Z about 713 feet past MP 12.9. The 65K was placed in emergency 970 feet prior to the collision.

The operating certificates of the Engineer and Conductor on Train 65K were revoked following a company investigation.

The Federal Railroad Administration's (FRA) investigation has determined the probable cause of the collision was the crew of Train 65K's failure to comply with an approach signal indication and to begin reducing to medium speed at once approaching the next signal prepared to comply with a restrictive signal indication to stop short of train ahead. FRA cause codes are reported listing the primary cause code as H222 (automatic block or interlocking signal displaying other than a stop indication – failure to comply) and a contributing cause code H605 (failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal).

**NARRATIVE**

**CIRCUMSTANCES PRIOR TO THE ACCIDENT**

**Train 65KC201**

The crew of Norfolk Southern Railway (NS) Train 65KC201 (65K) consisted of a locomotive engineer and conductor. The crew went on duty at their away from home terminal in Altoona, Pennsylvania (PA), at 7:20 a.m., EDT, on July 2, 2014. The employees received more than the statutory off-duty period prior to reporting to work. The Engineer was off-duty 12 hours and 3 minutes and the Conductor was off-duty 12 hours and 5 minutes. The Engineer had 14 years of railroad experience and worked as a conductor until 2006. He worked as an engineer regularly since 2010. The Conductor had 3 years and 11 months of service. Both employees were qualified and worked regularly on the territory.

Train 65K consisted of 3 locomotives (NS 8402, UP 5594 and UP 3780) with two non-hazardous materials (hazmat) buffer cars and 80 residue tank cars last containing, UN 1987, Alcohol NOS (Ethanol), Class 3, Packing Group II. The empty buffer car was on the head-end of the train and the loaded buffer car was on the rear. Train length was 5,115 feet with 2,756 trailing tons.

Train 65K originated at Port Reading, New Jersey, and was re-crewed at Harrisburg, PA, and Altoona, PA. Train 65K departed Altoona at about 8:30 a.m., on July 2, 2014. A Class I air brake test was performed at Point Reading.

The Engineer was sitting in the engineer's seat on the northwest side of the lead locomotive. The Conductor was seated in the conductor's seat on the southwest side of the locomotive.

In this area of the railroad, trains approaching the collision site navigate a right-hand continuing compound curve that varies from 0.1 degree to a maximum 1.5 degree and back to 1.2 degree. Milepost (MP) 12.9 is located to the left side of the track in the west spiral of the curve. The collision occurred 713 feet past the signal. Grade varies from 0.15 percent ascending to -0.4 percent descending. Maximum freight train speed is 60 miles per hour (mph). Train 65K was restricted to 50 mph. NS has three main tracks at this location.

The last dispatcher-controlled signal was at Control Point (CP) Bell MP 4.8. Automatic block signals authorize train movement between CP Bell and CP Leets MP 15.

Train 65K's Engineer stated he had no problems with train's air brakes or engine dynamic brakes. The speed indicator was accurate on the Leader Monitor (Trip Optimizer), but was 1 to 1 1/2 mph slow on the Engineer's CRT monitor. The Engineer said the train was light and he had no problem climbing the mountain (Cresson Summit) without a helper.

Train 65K had been following several westbound trains. Train 65K was about 20 minutes behind NS Train 25ZC101 (25Z) at CP Bell (MP 4.8).

Train 65K entered the equipment detector at MP 12 at 1:37 p.m., and moved over the detector at a speed of 46 to 48 mph.

**Train 25ZC101**

The 25Z crew consisted of a locomotive engineer and conductor. The crew went on duty at their away from home terminal in Harrisburg, at 3:30 a.m., EDT, on July 2, 2014.

The employees received more than the statutory off-duty period prior to reporting for work. Previous time off for each employee was 13 hours and 30 minutes. The Engineer has 20 years of railroad experience and has been an engineer for 15 years. The Conductor has 7 years and 5 months service. Both employees were qualified and worked regularly on the territory.

Train 25Z consisted of 2 locomotives (NS 9652 and NS 8444) with 48 loaded and 8 empty articulated intermodal rail cars. Train length was 9,996 feet with 7,497 trailing tons. Eight intermodal containers in the train contained hazmat. They were located on cars positioned 13, 20, 23, 27, 33, 34, 45, and 47 from the engine consist. The rear 7 cars in the train were empty and did not have containers.

Train 25Z originated at the E-Rail Intermodal facility in New Jersey and was re-crewed at Harrisburg. A Class I air brake test was performed at Morrisville, PA, with another Class I test made on a second section of the train at Harrisburg.

The Engineer stated his train was long and heavy. NS added a two-engine helper to both the head-end and rear of his train at Altoona to climb Cresson Summit. Train 25Z passed Train 65K at Johnstown, PA.

The Engineer was sitting in the engineer's seat on the northwest side of the lead locomotive. The Conductor was sitting in the conductor's seat on the southwest side of the locomotive.

Train 25Z received an approach signal at MP 12.9 (Sewickley). They were following Train 11V. The Engineer started slowing his train at Sewickley and stopped at CP Leets (MP 15). The crew could hear, via the radio, the train immediately ahead (11V) stopped. They wanted to avoid blocking crossings by pulling up to the rear of the stopped train. The Engineer made two very short westward moves to get closer to the signal at CP Leets for better visibility due to bright sunlight.

**THE ACCIDENT**

**Train 65K**

Train 65K stopped for about 5 minutes at CP Bell (MP 4.8). The train received a slow clear signal at 1:21 p.m., and started to move west on Main Track Number 3. Train 65K was restricted to 50 mph maximum speed. The crew continued west on favorable signals until receiving an approach signal at MP 10.7 at approximately 1:36 p.m. The Conductor called the signal over the radio. The Engineer acknowledged the signal to the Conductor. The Conductor advised the Engineer the "truck train" was ahead of them and probably stopped at CP Leets (MP 15). Train 65K was moving at a recorded speed of 46 mph as it was approaching Signal 12.9. The train went by trees on a right-hand curve. The Conductor saw the restricting signal (12.9) and placed the train into emergency. He next saw the rear car of Train 25Z, stood up, and braced himself for a collision. The recorded impact speed was 25 mph. The lead locomotive struck the rear car, derailed, and rolled onto its side. Both men were tossed about the cab. The Engineer fell to the conductor's side. The Conductor helped the Engineer from the locomotive and both men were transported by ambulance to Mercy Hospital in Pittsburgh for treatment of injuries. The Conductor was not sure about the speed, but indicated the Engineer may have also placed the train into emergency. The three 65K locomotives and lead car derailed. Train 65K employees reported no problems with the train prior to the accident. The Conductor was treated at the hospital and released. The Engineer was hospitalized overnight. He sustained a broken scapula. Crew members underwent post-accident testing as required by Title 49, Code of Federal Regulations (CFR), Part 219, Subpart C.

**Train 25Z**

Train 25Z stopped behind a restricting signal at CP Leets approximately 10 minutes before receiving a medium approach signal. The Engineer started to stretch the slack from the train and barely started to move when Train 65K struck the rear of his train. The crew said there was an abrupt run-in from slack. The train moved less than an engine length and stopped. Train 25Z's air brakes applied, but the train did not go into emergency. The crew did not realize they were struck by Train 65K until they heard the Train 65K crew on the radio with the train dispatcher. The train crew of 25Z was not injured. Two units on the rear multi-platform car of Train 25Z derailed.

Train 25Z crew members had no problems with their train prior to the accident. The crew was transported to Sewickley Hospital for post-accident testing.

**POST-ACCIDENT FIRE**

A fire erupted post-accident. The fuel tanks on Train 65K's lead and second locomotives ruptured in the collision resulting in an estimated 6,000 gallons of diesel fuel leaking to the ground. The fuel capacity for each locomotive is rated at 5,000 gallons. Sewickley's Fire Chief ordered the precautionary evacuation of 150 to 200 people from nearby homes and businesses. No injuries were reported as a result of the fire.

#### ENVIRONMENTAL RESPONSE/TRACK CLEARED AND BACK IN SERVICE

Sewickley Fire Department was assisted by the Allegheny County Emergency Response/Hazmat Team and Pittsburgh International Airport Hazmat and Fire Team who responded with a "foam" truck to extinguish the fire by 2:50 p.m. The spill and resulting fire were confined to a relatively small area. The evacuation was lifted at 4:00 p.m.

Environmental contractors, Hepaco and SPSI, cleaned up the leaking diesel fuel. A vacuum truck and absorbent material was used at the collision site and absorbent booms were placed in the nearby Ohio River. The fuel oil did not enter into the river.

Two units of Hulcher Rail Services were dispatched and used to re-rail equipment, replace track panels, and assist environmental contractors. Seven damaged track panels were replaced by 5:00 a.m., on July 3, 2014. The last two derailed locomotives were re-railed by 5:00 p.m., on July 3, 2014. Main Track Number 3 was placed back in service a short while later.

NS has two additional main tracks near the accident site and was able to resume movement of trains within 5 hours of the accident.

#### EQUIPMENT DAMAGE

NS estimated the equipment damage to be \$924,210 with the majority of the damage sustained by the first two locomotives of Train 65K. This equipment damage total includes damages to the rear car of Train 25Z estimated to be \$120,000. NS indicated that the final damage numbers will be adjusted according to final repairs performed. The trailing Union Pacific Railroad locomotives needed extensive truck and lower end repairs before the locomotives could be moved to the Juanita Locomotive Works for final repairs. Locomotive UP 5594 had the most damage including truck assemblies, side body, fire, and electrical components damage.

#### ANALYSIS - TRAIN HANDLING AND CREW PERFORMANCE

Radio transcripts, signal system, and equipment records show Train 65K was about 20 minutes behind Train 25Z at CP Bell (MP 4.8).

Train 25Z received an approach signal at MP 12.9. They were following Train 11V. Carrier records indicate 25Z entered the equipment detector at MP 12, at 1:17 p.m., at a speed of 47 mph and exited the detector at a speed of 27 mph. The Engineer started slowing his train at Signal 12.9 and brought his train to a stop at CP Leets (MP 15). The train had a restricting signal at CP Leets. The crew could hear, via the radio, the train ahead of them had stopped. Train 25Z was long and the Engineer did not want to block crossings by pulling up to the rear of the stopped Train 11V ahead.

Train 65K received a slow clear signal at CP Bell at 1:22 p.m. Radio transcripts show Train 65K called clear signals at MP 6.5 and MP 8.9; the Conductor called an approach signal at MP 10.7 at 1:35 p.m. Train 65K entered the equipment detector at MP 12 and moved through the detector at 46 to 48 mph.

Event recorder data from the Train 65K's lead locomotive shows a speed of 46 mph at Signal 10.7. The rail camera indicated 49 mph. The event recorder indicated a speed of 46 mph when the restricting signal at MP 12.9 first came into view. Train 65K was moving at 45 mph (66 feet per second) when the train was placed into emergency at 1:38:30 p.m. Train 65K collided with the rear-end of Train 25Z at a recorded speed of 25 mph. Total stopping distance was 713 feet from the location where the emergency brake application was made. The distance from the restricting signal to the collision point was 713 feet. The lead 65K locomotive over-climbed the rear, empty flat car of 25Z, derailed, and rolled onto its left side clear of the main track. The second locomotive derailed and side swiped the derailed lead locomotive.

The event recorder showed the throttle of the lead locomotive was in the Run 4 position from 1:35 p.m. until 1:37:41 p.m. The throttle was moved to the Run 2 position at 1:37:43 p.m., and remained in Run 2 until showing the "Idle" position at 1:38:23 p.m. The emergency brake application and PC valve tripped at 1:38:30 p.m., with the train coming to a stop at 1:38:57 p.m.

Trains receiving an approach signal, per NS operating rule, are required to approach the next signal prepared to stop. Trains exceeding medium speed (30 mph) are required to reduce to medium speed at once. The automatic block signal at MP 12.9 is a number board signal. The most restrictive indication of this signal is "proceed at restricted speed." Trains are permitted to pass the signal without stopping at restricted speed providing they operate at "a speed that will permit stopping within half the range of vision, short of a train, engine, obstruction, railroad car, men or equipment fouling track, any signal requiring stop, or any derail or switch lined improperly and looking out for a broken rail, but not exceeding 20 mph."

The Conductor and Engineer on Train 65K were interviewed as part of the accident investigation. The Engineer, during a company investigation (transcript), testified that he remembered blowing the horn for Haysville crossing (near MP 11) but does not remember anything following that point until his Conductor told him the engine was on fire and he had to get out. He did not recall the signal indications at MP 8, MP 10.7 (Approach) or MP 12.9 (Restricting). He could not remember his train speed. The Engineer believes he placed the train into emergency. The Conductor said he called the approach signal at MP 10.7 over the radio. The Conductor also said he reminded the Engineer they were probably following the (25Z) intermodal train that had passed Train 65K at Johnstown. In the company investigation, the Conductor said he called the approach signal once to the Engineer and a second time over the radio. The Engineer nodded his head to acknowledge the approach signal but did not state (call) the name of the signal as required by carrier operating rules. The Conductor stated he believed the Engineer would stop the train, but crew members did not discuss (via a complete job briefing) where they would stop.

#### CONCLUSION

Train 65K's crew failed to comply with the requirements of the preceding approach signal indication (MP 10.7), they failed to reduce train speed to medium speed (30 mph) at once, and approached and passed the restricting signal at MP 12.9 at a speed where they could not stop within half the range of vision short of the stopped train. Impact speed was 25 mph. Event recorder and rail camera video show there was no attempt to slow or stop the train until the emergency brake application initiated 257 feet prior to reaching Signal 12.9.

#### ANALYSIS - SIGNALING SYSTEM

The method of train operation in the area of the collision is signal indication of a traffic control system controlled by a dispatcher located in Green Tree, PA. The dispatcher utilizes a Universal Train Control System dispatching system. Maximum passenger train speed is 70 mph, maximum freight train speed is 60 mph; Train 65K was restricted to 50 mph. The signal system in the area of the accident is relay-based and utilizes DC coded track circuits, a position light automatic signal at MP 10.7, and a color light automatic signal (Tri-light) at MP 12.9. The spacing of the signals between automatic Signal 10.7 and automatic Signal 12.9 is about 11,490 feet. Maximum sight distance approaching Signal 12.9 is approximately 1,200 feet. A combination Dragging Equipment and Hotbox Detector is located at MP 12 on this track. FRA's signal inspector, during a field inspection on July 3, 2014, observed numerous tests performed by railroad signal maintenance personnel including ground checks, signal lamp voltages, proper track circuit shunting, relay tests, megger and signal sequence testing verifying proper aspects. Carrier testing records for the previous 12 months were reviewed in a follow-up inspection along with equipment detector downloads. FRA took no exceptions to records reviewed. There was no damage to the signaling system.

#### CONCLUSION

NS' signaling system was found to be operating as intended and was not a factor in the collision.

#### ANALYSIS - TRACK

Trains approaching the collision site navigate a right-hand continuing compound curve that is 0.1 degree compounding to a 1.5 degree that compounds to 1.8 degree then down to a 1.2 degree right hand curve in the direction of travel. Signal 12.9 is located to the left side of the track in the west spiral of the curve; the collision occurred 713 feet past the signal. The grade for 1-mile approaching the accident site is ascending from +0.15 percent before going to 0 percent then begins descending to -0.14 percent.

Main Track 3 is FRA Class 4. Passenger train speed is 70 mph and freight train speed is a maximum 60 mph. Rail is 136 pound continuously welded rail and is supported by wood ties and granite ballast. Rail showed minimal wear, (less than 1 percent), control cooled, with a 1999 manufacture date. Rail was not transposed, there were no unusual marks on rail, and there was no corrugation, head checks, or wheel burns. Track is inspected twice a week at a minimum. Rail anchors are of the wrench type and box anchored every other tie; gage (standard) did not exceed 56 3/4 inches at any location prior to the accident site. Surface and alignment were well within FRA standards. The



anchored every other tie; gage (standard) did not exceed 56 ¾ inches at any location prior to the accident site. Surface and alignment were well within FRA standards. The track was "Sperry Tested" on June 26, 2014. The NS Geometry Car surveyed the Fort Wayne Line on March 24, 2014. No defects were found in the area of the collision during the testing sessions.

The collision damaged 270 feet of track and 7 track panels were replaced. Track damage was adjusted and estimated to be \$87,873. FRA reviewed track inspection records for 30 days prior to the accident.

#### CONCLUSION

No exception was taken to track. Track condition, including grade and curvature, were not factors in the collision.

#### ANALYSIS - EQUIPMENT

FRA reviewed periodic and daily inspection records of 65K locomotives NS 8402, UP 5594, and UP 3780. Documentation was current. An on-site post-accident inspection was made on each car of Train 65K. All brakes applied and piston travel was within required limits. Class I air brake test certificates were also reviewed for both trains 65K and 25Z. Engineers reported no problems with engine consists, dynamic brakes, or air brakes. No exceptions were taken on equipment.

#### CONCLUSION

Inspections were current and no defects were reported or noted. Equipment was not a factor in the collision.

#### ANALYSIS - TRAIN CONSIST AND SHIPPING DOCUMENTATION

FRA reviewed 65K and 25Z train consists, shipping documentation, and position in train information. No exceptions were taken.

#### CONCLUSION

The carrier was in full compliance with hazmat placement and documentation.

#### ANALYSIS - ENGINEER CERTIFICATION AND TRAINING

##### 65K

The 65K's Engineer's operating certificate was issued April 1, 2012; he was also a certified conductor. He received operating rule and engineer certification training and testing on April 27, 2013. He received a score of 90 percent on the engineer test. His most recent evaluation/monitoring check ride was on April 15, 2013; he scored 99 percent. Three supervisor evaluations were performed in 2012. Scores of 100 percent were recorded on two of the evaluations with a 99 percent score on his recertification evaluation. The Engineer received a score of 100 percent on signal and hazmat tests, 96 percent on operating rules, and 95 percent on equipment handling rules. Hearing, vision testing, and driver license reviews were also current.

##### 25Z

The 25Z's Engineer's operating certificate was issued on September 1, 2012, with his most recent evaluation/monitoring ride recorded on January 1, 2014; his score was 100 percent. He also had an additional supervisory ride on June 17, 2014, and received a score of 100 percent. No exceptions were noted on either evaluation. He successfully passed his most recent engineer certification training on May 5, 2014. Hearing and vision testing, along with driver license reviews were also current.

#### CONCLUSION

Engineer certification and training for 65K and 25Z Engineers was current and in compliance for 49 CFR Part 240. Certification and training does not appear to be a factor in the collision.

#### ANALYSIS - CONDUCTOR CERTIFICATION AND TRAINING

##### 65K

The 65K's Conductor was certified January 1, 2012. His most recent knowledge test was April 8, 2014; he scored 92 percent on the NS operating rules exam and 100 percent on both signal rules and hazardous materials exams. Hearing and vision tests, and driver background reviews were current.

##### 25Z

The 25Z's Conductor was certified March 1, 2013. His most recent knowledge test was May 6, 2014. Hearing and vision testing, driver license reviews, and other training were current.

#### CONCLUSION

Conductor training for 65K and 25Z Conductors was current and in compliance with 49 CFR Part 242. Certification and training was not a factor in the collision.

#### ANALYSIS - OPERATIONAL TESTING

##### 65K Engineer

NS provided documentation of 158 operational tests for Train 65K's Engineer from January 1 through June 30, 2014. Forty-seven tests were planned, 9 were observations, 96 were from event recorder reviews, and 6 were listed as saturation tests. Only one failure was recorded; it was for exceeding a locomotive current restriction at 25 mph (EH Rule 210-B). The following summarizes testing: 2 banner stop tests, 10 tests on main track speed control, 24 signal compliance tests, 20 tests on use of air brakes, 12 reviews on use of dynamic brakes, and 10 tests on securement of equipment.

##### 65K Conductor

NS conducted 90 operational tests on Train 65K's Conductor from January 1 through July 23, 2014. 32 tests were planned, 15 were tape observations, 18 tests were recorded during supervisor train rides and 25 were listed as saturation tests. No failures were recorded. The following summarizes testing: 2 banner stop tests, 6 tests on main track speed control, 12 signal compliance tests, 3 tests on use of radio, and one test on crew communication.

##### 25Z Engineer

NS provided documentation of 119 operational tests for Train 25Z's Engineer from February 1 through June 30, 2014. Seventy tests were planned, 30 tests were from supervisor rides with the Engineer, and 18 were listed as saturation tests. Only one exception was taken (communication of signal over radio). A summary of testing includes: 8 main track speed control tests, 14 signal compliance tests, 4 air brake tests, 3 tests on train handling procedures, 4 tests on crew cab communication, 4 tests calling signals over the radio, and 5 general radio communication tests.

##### 25Z Conductor

NS conducted 51 operational tests on Train 25Z's Conductor from April 1 through June 2014. 28 tests were planned; 23 were recorded during supervisor train rides. No failures were recorded. 4 tests were on main track speed control, 7 were signal compliance tests, 10 tests were recorded on radio procedures including the calling of signals over the radio, and 5 tests were recorded on crew communication in locomotive cab.

#### CONCLUSION

Carrier employee operational testing was performed on both weekdays and weekends. Testing was conducted during early morning, afternoon, and late evening hours and was within guidelines of the NS Transportation Department Efficiency Testing Program. Operational testing was not a factor in the collision.

#### ANALYSIS - 49 CFR Part 219, SUBPART C TESTING

## ANALYSIS - 49 CFR Part 219, SUBPART C TESTING

Injured crew members from Train 65K underwent FRA post-accident testing at Mercy Hospital in Pittsburgh and 25Z crew members underwent post-accident testing at Sewickley Hospital. Results were negative.

## CONCLUSION

FRA Post-Accident Forensic Toxicology Result Reports indicate the four employees had negative test results and was not a factor in the collision.

## ANALYSIS - CREW FATIGUE

FRA obtained hours of service and fatigue-related information for the 10-day period preceding the collision (on-duty/off-duty cycles) for 65K and 25Z crew members. A computerized evaluation indicates no fatigue issues with Train 65K's crew. The review indicates some fatigue on the stopped 25Z crew.

## CONCLUSION

Crew fatigue was not a factor in the collision.

## ANALYSIS - CELL PHONE USE

FRA obtained and analyzed the 65K crewmembers' cell phone records, including information on outgoing calls and text messages from the day of the accident.

## CONCLUSION

A review of both the Conductor's and Engineer's cell phone records disclosed that neither was used prior to or at the time of the collision; therefore, cell phone usage was not a factor in the collision.

## ANALYSIS - APPLICABLE NS OPERATING RULES

Authority for main track movement is NS Rule 261. Tracks are signaled in both directions. Dispatcher controlled signals are located at MP 4.8 and MP 15. Automatic Block Signals are in service prior to and at the point of collision (MP 12.9).

General Signal Rules 235 through 250 are in effect.

Automatic Block Signal Rules 400 through 450 are in effect.

Medium Speed - A speed not exceeding 30 mph.

Rule N285 Approach Signal - Proceed prepared to stop at the next signal. Trains exceeding medium speed must at once reduce to that speed.

Rule N290 Restricting Signal - Proceed at restricted speed until the entire train has cleared all interlocking, controlled point and spring switches (if signal is an interlocking or controlled point signal) and the leading end has: (1) Passed a more favorable fixed signal.

Rule 277 Number Plates - The most restrictive indication of a signal that has a number plate is proceed at restricted speed.

Restricted Speed (OB-1 revision) - A speed that will permit stopping within half the range of vision, short of a train, engine, obstruction, railroad car, men or equipment fouling a track, any signal indication requiring a stop, or any derail or switch lined improperly and looking out for a broken rail, but not exceeding 20 mph.

Rule 80 - (a) Crew members must comply with indication of each signal that affects the movement.

(b) Crew members located in the operating compartment must occupy a window seat when available and must maintain a vigilant lookout for signal and conditions along the track the movement looking out for signals along the track that affect the movement.

Rule 81 - (a) Employees located in the operating compartment of an engine must communicate to each other in an audible and clear manner the name of each signal affecting the movement of their train as soon as the signal is clearly visible.

## Publications in Effect:

NS Operating Rules effective January 1, 2012

Pittsburgh Division Timetable effective July 1, 2012

OB-1 System Operations Bulletin effective January 1, 2014

NS-1 Rules for Equipment Operation and Handling effective January 1, 2012,

Dispatcher Bulletin with Clearance Number 8752 for Train 65K dated July 2, 2014.

## CONCLUSION

The carrier has specific rules and procedures in place for the safe movement of trains. Crew non-compliance with rules on approach and restricting signal indications and the requirements of restricted speed precipitated the collision.

## ANALYSIS - NS CAUSE CODES AND REPORTING

NS Rail Equipment Accident/Incident Report, Form FRA F 6180.54 shows a primary cause code of H222 "automatic block or interlocking signal displaying other than a stop indication - failure to comply" and a contributing cause code of H605 "failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal."

## OVERALL CONCLUSION

The Engineer of 65K failed to reduce train speed after encountering an approach signal indication at Signal 10.7 and failed to comply with a restricting signal indication at Signal 12.9. The Conductor of 65K called the approach signal and communicated with the Engineer, but a verbal reply and responsive action by the Engineer did not occur. Train speed had not been slowed and the emergency brake application was made too late to sufficiently slow and stop the train before the collision. The cause of the diminished level of situational awareness could not be determined. The Engineer and Conductor were jointly responsible for signal and speed compliance. The operating certificates of Train 65K's Engineer and Conductor were revoked following a company investigation.

## PROBABLE CAUSE AND CONTRIBUTING FACTORS

FRA's investigation has determined the probable cause of the collision was the failure of Train 65K's crew to comply with an approach signal indication and to begin reducing to medium speed at once approaching the next signal prepared to comply with a restricting signal indication to stop short of train ahead. FRA cause codes are reported listing the primary cause code as H222 (automatic block or interlocking signal displaying other than a stop indication - failure to comply) and a contributing cause code H605 (failure to comply with restricted speed in connection with the restrictive indication of a block or interlocking signal).