Brotherhood of Locomotive Engineers and Trainmen

A Division of the Rail Conference
International Brotherhood of
Teamsters

Safety Task Force

CLEVELAND, OHIO

Before the National Transportation Safety Board

NTSB Accident Number: DCA-15-MR-010

Class: Major

May 12, 2015

Proposed findings, probable cause, and safety recommendations, in connection with the derailment of National Railroad Passenger Corporation ("Amtrak") train No. 188 on May 12, 2015 in Philadelphia, Pennsylvania.

REVISED FINAL SUBMISSSION

Stephen J. Bruno, BLET-Safety Task Force, National Chairman
Donald Hill, BLET-Safety Task Force, Party Spokesman

ACCIDENT SYNOPSIS

On May 12, 2015 at 6:30 p.m. Eastern Daylight Time ("EDT")[1] a National Railroad Passenger Corporation ("Amtrak" or "ATK") train and engine crew reported for ATK train No. 188 at Union Station in Washington, D.C. ATK 188 consisted of one (1) locomotive and seven (7) Amtrak passenger ("Amfleet") coach cars[2]. No. 188 was scheduled to operate between Washington and New York and then terminate at Penn Station (NYP), New York City, New York.

ATK 188 train entered a maximum authorized speed ("MAS") curve of fifty (50) miles per hour ("MPH") at an estimated speed of 106 MPH,[3] derailing at a speed of approximately 102 MPH. The derailment resulted in eight (8) passenger fatalities and over 200 injuries.

The weather at the time of the derailment was 80° F, no precipitation, wind was eight (8) MPH and visibility ten (10) miles. Damage estimates at this time are approximately thirty-two (32) million dollars.

ACCIDENT NARRATIVE

On May 12, 2015 the train and engine crew of ATK 188 began their tour of duty in New York City, New York, at Penn Station. The Locomotive Engineer, Conductor and Assistant Conductor ("AC") No. 2 operated ATK 2121 Southward from NYP to Union Station (WAS) in Washington, D.C. The locomotive experienced problems with the cab signal system and was authorized to operate at the reduced rate of speed to seventy-nine (79) MPH. Due to the cab signal malfunction and the associated reduced speed, they arrived in Washington, D.C. one (1) hour late.

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[1] All times reported throughout this report will be Eastern Daylight Time ("EDT").

[2] Amfleet passenger cars were built by the Budd Company and placed into service from 1975 through 1977 and are still in use today.

[3] Pursuant to Amtrak's Timetable, Train No. 188 was classified as a "B" type train which has a maximum authorized speed of 125 MPH timetable maximum authorized speed for the curve at the point of derailment was 50 MPH. Train type "A" refers to high speed trainsets, with tilt system active, with MAS of 60 MPH in this curve

The Crew of Amtrak train No. 188 consisted of a Locomotive Engineer, Conductor, AC No. 1, AC No. 2 and a Lead Service Attendant who reported for duty at 6:30 p.m. The crew conducted a job briefing and waited for the equipment to arrive on track No. 14 in Washington, D.C.'s Union Station. The crew performed the proper brake and equipment tests; including a running brake test by the Locomotive Engineer upon departure. The train departed Union Station five (5) minutes late at 7:15 p.m.

According to train crew interviews the northbound trip to Philadelphia, PA was uneventful. No. 188 made numerous stops en route for passenger boarding and alighting which included scheduled stops at:

- Departed Washington, D.C. at 7:15 p.m.
- Departed New Carrollton, MD at 7:22 p.m.
- Departed BWI Airport at 7:54 p.m.
- Departed Aberdeen, MD at 8:17 p.m.
- Departed Wilmington, MD at 8:46 p.m.
- Departed Philadelphia, PA at 9:09 p.m.
- Accident at Frankford Junction 9:21 p.m.

As the train departed Philadelphia's 30th Street Station, the Locomotive Engineer overheard a radio communication between Southeastern Pennsylvania Transportation Authority ("SEPTA") commuter train No. 769 and the Amtrak CETC-6 Train Dispatcher in reference to the SEPTA train being struck by an unknown object which had shattered their windshield. SEPTA No. 769 was stopped and in the process of inspecting the train on Main track No. 1 near ("MP") 86.0 approximately one (1) mile west of Leigh Interlocking. The Locomotive Engineer of SEPTA No. 769 requested emergency medical assistance.

The Locomotive Engineer on ATK 188 operating on Main track No. 2 warned the SEPTA train over the radio that his train was about to pass their location. Additionally, as ATK 188 passed SEPTA 769 the Locomotive Engineer on ATK 188 sounded the locomotive's horn several times to warn any person(s) that may be on the right of way in the vicinity. ATK 188 passed No. 769

without incident proceeding eastward. After properly negotiating the 65 mph curve restriction at MP 84 and the 2nd Street OH Bridge ATK 188 subsequently accelerated to 106 MPH on track No. 2. The Maximum Authorized Speed (MAS) on Track No. 2 between MP. 86.0 and Shore Interlocking is 80 MPH.

Maximum Authorized Track Speeds on track No. 2 Leading up to and through the Derailment Site[4]

- 30th Street to MP 88 — 30 MPH
- MP 88 to Girard Ave (MP 87.7) — 50 MPH
- Girard Interlocking to Mantua Interlocking (MP 87.2) — 30 MPH
- Mantua Interlocking to Lehigh Interlocking (MP 85.1) — 70 MPH
- Lehigh Interlocking to Shore Interlocking (MP 82.1) — 80 MPH
- Speed restriction of 65 MPH on curve between MP 84 and 2nd St. OH Bridge
- Shore Interlocking to Holmes Interlocking (MP 77.2)— 110 mph
- Speed restriction on curve east of Shore of 50 MPH and 2nd curve east of Shore of 60 MPH)

Fixed Wayside Signals and on board Cab Signals that were presented in the field and the operating compartment of train No. 188 governing its movement:[5]

- Penn Interlocking (north of platform at 30th Street) displayed a Clear indication
- Penn Interlocking north (MP 1.0) displayed an Approach Medium indication
- Girard Interlocking (MP 87.7) displayed a Limited Clear indication (train crossed from track No. 1 to track No. 2)
- Mantua Interlocking (MP 87.2) displayed a Clear indication
- Automatic signal 868 (MP 86.8) displayed a Clear indication
- Lehigh Interlocking (MP 85.5) displayed a Clear indication
- Clearfield Interlocking (MP 84.9) displayed a Clear indication
- Automatic 834 (MP 83.4) displayed a Clear indication

[4] Timetable speeds are in Appendix 1 at the end of this report.

[5] NORAC signals, as presented in the field and in the cab compartment of the locomotive, are in Appendix 2 at the end of this report.

- Shore Interlocking (MP 82.2) displayed a Clear indication

A comparison between the wayside signal recorder data and the locomotive's event recorder data established that ATK 188 complied with all signal and track speed requirements until east of the sixty-five (65) MPH curve at MP 84 and the 2nd Street OH Bridge. After passing that location eastward ATK 188 accelerated to approximately 106 MPH as it approached Shore Interlocking. The locomotive event recorder indicated that the train was placed into emergency braking application at MP 81.62, just prior to the train's point of derailment ("POD").

TRAIN CONSIST:

Amtrak Train No. 188 consisted of one (1) locomotive and seven (7) coach cars. Leading the train was ACS-64 Class Locomotive No. 601. The entire train consist was as follows:

- ATK 601 (Locomotive)
- ATK 81528
- ATK 82776
- ATK 82644
- ATK 43346
- ATK 82761
- ATK 82797
- ATK 82981 (rear car)

See Figure 1 below:

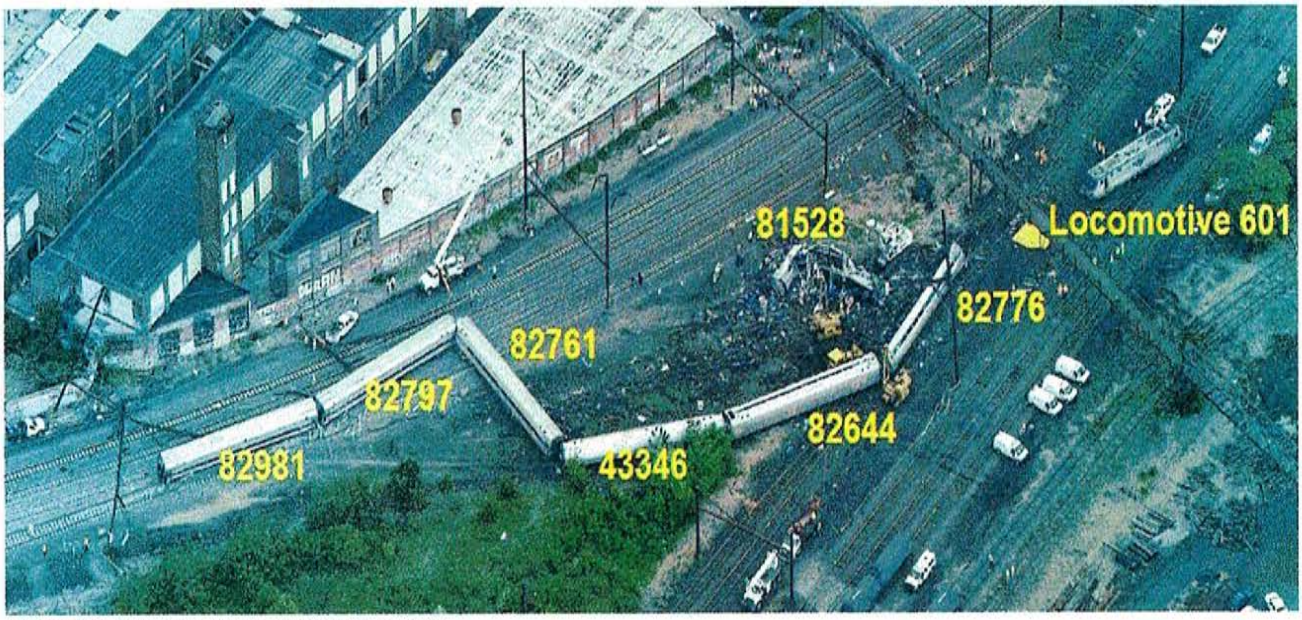

Figure 1 aerial photo of derailment

METHOD OF OPERATION:

The Northeast Corridor (NEC) is an electrified rail line in the northeast cities of the United States owned primarily by Amtrak. The NEC begins in Boston, MA, extends through New York City, NY, Philadelphia, PA, Baltimore, MD to Washington, D.C. NEC territory also includes the mainline territory between Harrisburg, PA and Philadelphia, PA. Amtrak operates various trains and equipment types over the NEC including the high-speed Amtrak Acela Express, Regional Service and several long-distance Intercity trains. A large portion of the NEC also has regular commuter rail service operating simultaneously over the same territory. The commuter agencies operating those trains are the Massachusetts Bay Transit Authority ("MBTA"), (operated by Keolis Commuter Service), Metro-North Railroad ("MNCRR"), New Jersey Transit ("NJT"), Southeastern Pennsylvania Transit Authority ("SEPTA"), and the Maryland Area Regional Commuter ("MARC"). MARC service between Perryville, MD and Washington, DC is also operated by Amtrak for the State of Maryland.)

ATK 188 originated at Union Station (MP 134.6) in Washington, D.C. within Amtrak's MidAtlantic Division of the NEC. The NEC Timetable in effect at the time of the derailment

specifies the direction of traffic on mainline tracks between Union Station in Washington and Zoo Interlocking in Philadelphia as North and South. Thus, trains departing Union Station operate in a northward direction. Milepost numbering in that territory decreases numerically in the northward direction. ATK 188 originated at MP 134.6 in Union Station and operated northward toward MP 0.0 found in Zoo Interlocking immediately north of Amtrak's 30th Street Station.

At Zoo Interlocking (MP 0.0) the Mid Atlantic Division continues to MP 76 and then transitions to the Metropolitan Division at MP 76. However, the timetable specified direction of traffic changes at Zoo Interlocking from North and South to an East and /West direction. Furthermore, milepost numbering also changes at Zoo Interlocking and decreases numerically in an eastbound direction for trains operating to NYP. At the point of derailment main tracks are numbered one (1) through four (4) with No. 1 track being the southernmost track. On May 12, 2015, ATK 188 was operating eastward on No. 2 track on the Mid Atlantic Division. The derailment occurred at MP 81.62 in the Frankford section of Philadelphia.

The operating rules in effect were the Northeast Operating Rules Advisory Committee ("NORAC") Tenth Edition, effective on November 6, 2011, and Amtrak's Timetable No. 5, effective November 5, 2012. The authority for movement of ATK 188 was signal authority by Automatic Block Signal ("ABS") system rules, Interlocking rules and Cab Signal System ("CSS") rules. The fixed wayside signals are comprised of automatic block signals and interlocking signals.[6] The interlocking signals are controlled by Train Dispatcher(s) located in Wilmington, DE at Amtrak's Centralized National Operations Center (CNOC) using a Centralized Electrification Traffic Control ("CETC") system.

POSITIVE TRAIN CONTROL:

The Rail Safety Improvement Act of 2008 ("RSIA 2008") mandated that Positive Train Control ("PTC") be implemented across a significant portion of the United States railroad network by December 31, 2015. Specifically, PTC was mandated on tracks "...over which intercity rail

[6] Automatic block signals are designated numerically by their mile post location.

passenger transportation or commuter rail passenger transportation, as defined in section 24102, is regularly provided." RSIA 2008 defined PTC as a system designed to prevent train-to-train collisions, overspeed derailments, incursions into established work zone limits, and the movement of a train through a main line switch in the improper position.
Congress recently passed the Positive Train Control Enforcement and Implementation Act of 2015, which postpones the legally mandated installation deadline until December 31, 2018, with the possibility of an additional two-year extension if requested and subsequently authorized by the Secretary of Transportation.

ADVANCED CIVIL SPEED ENFORCEMENT SYSTEM ("ACSES"):

Early speed control technology was first added to Amtrak's engine equipment through an on board cab signal system ("CSS") in the 1950s. Amtrak began installing a type of PTC in 1991 on the NEC, implementing an automatic train control ("ATC") system which connected the original CSS display, consisting of a four (4) cab signal aspects, to the speed associated with the actual cab signal. Enforcement was accomplished by activation of the train brake system when the speed of a train exceeded the MAS permitted by the cab signal displayed to the Locomotive Engineer. This system lacked the ability to identify (and therefore enforce) speed restrictions that were not established by the signal system such as speed restrictions caused by track geometry.

Starting in 2000, Amtrak began installation of their ACSES system into much of its operating territory. Approximately 170 miles of track did not have a working ACSES system at the time of the ATK 188 accident. The purpose of ACSES is to expand by overlaying, the four (4)- aspect continuously coded CSS, with a nine (9)- aspect continuously coded CSS interconnected with the ATC. Amtrak's entire NEC ACSES system became fully operational and placed in effect between Boston and Washington, DC in December 2015.

ACSES works through a system of transponders and radios that communicate to the locomotives, which are equipped with a nine (9) aspect cab signal system capable of receiving the data and translating the data for easy reading and enforcement of the applicable rules/speeds. The enforcement system will force compliance with proper speeds and signal indications (i.e., it will

prevent a train from passing a "Stop" signal or operating above the proper speed if ACSES detects non-compliance by initiating an application of the train brakes. To pass a signal displaying "Stop", the Locomotive Engineer must receive a special code from the Dispatcher and enter the code into the system.

At the time of the accident, the westbound tracks at Frankford Junction were hard-coded to drop the cab signals from any signal more favorable than an Approach Medium to an Approach Medium prior to entering the curve as a means of enforcing the 50 MPH speed restriction in the curve.[7] The hard coded cab signal was installed in 1991. However, similar hard-coding had not been programmed for eastbound trains at the time of the derailment.

The explanation provided by Amtrak is; the MAS on the tangent track approaching the Frankford Junction curve westward exceeds the "derailment speed" created by the track geometry, however, the MAS on the tangent track approaching the Frankford Junction curve eastward does not exceed the "derailment speed" created by the track geometry.[8] Therefore, the likelihood of entering the curve westward in excess of the derailment speed was significantly higher than doing so approaching the curve eastward.[9] In addition the catenary structure leading up to the derailment curve, has a permanent speed sign indicating fifty (50) MPH to serve as a visual reminder of the restriction. Since the derailment of ATK 188 Amtrak has installed both cab signal hard code and ACSES enforcement technology for eastbound travel approaching the curve at Frankford Junction.

Engineer Work History:

The locomotive engineer of ATK 188 on the incident date hired as an Assistant Conductor with Amtrak on June 26, 2006. He subsequently moved to San Francisco, CA in 2008 and began working on Caltrain.[10] He applied and was accepted to commence classroom training as a

[7] An Approach Medium signal establishes the maximum permissible speed at 45 MPH.
[8] The derailment speed at the Frankford curve is 98 MPH
[9] See testimony of Amtrak CEO Joseph Boardman to the committee of Transportation and Infrastructure, June 2, 2015. (http://transportation.house.gov/uploadedfiles/2015-06-02-boardman.pdf)
[10] Caltrain is a commuter service operated through the California Peninsula Joint Powers Board. Operated by Amtrak from 1992-2012, this service is currently operated by Transit America Services.

Student Engineer in Amtrak's Engineer Training Program (ETP) in 2009. He successfully completed all phases of the ETP in Oakland, CA in 2010.[11] In 2012 he exercised his seniority, moved to New York, and began additional training on both the equipment and physical characteristics of Amtrak's NEC operations, which continued until 2013. He subsequently worked extra board and regular assignments out of the New York, Amtrak's Zone 2 Crew Base, from 2013 through the date of the derailment. His qualification on NEC physical characteristics extended from New York to Washington, D.C., and he routinely worked over and was intimately familiar with the physical characteristics of the accident site.

PROBABLE CAUSE

The probable cause of the accident was a series of human errors.

The first error occurred in 1991 with the failure of Amtrak's Engineering Department decision not to install advanced cab signal and ATC enforcement technology on No. 2 track approaching the Frankford Junction curve eastward. That decision allowed the underlying circumstances of the accident to continue to exist until the final human error occurred.[12]

The last human error was the failure of the Locomotive Engineer of Amtrak train No. 188 to comply with the maximum authorized speed on track No. 2 in the approximately two (2) mile portion of territory west of Shore interlocking and enter the 50 MPH curve east of Shore Interlocking on May 12, 2015 in excess of 98 MPH (the derailment speed for the curve).

[11] Comments by his supervisors during the initial interview indicate and he was generally viewed by his trainers as a conscientious, motivated and highly focused individual throughout the training process.

[12] It is unclear if the decision not to install a hard coded Cabs Signal at the eastbound approach to the 50 MPH curve at Frankford Junction relied solely upon an expectation that all trains would forever comply with the MAS on the tangent track approaching the curve eastward not exceeding the derailment speed, or the degree, if any, the cost of installation affected that decision or some combination of both.

CONTRIBUTING FACTORS

A possible contributing factor is the railroad culture of overreliance on technology to provide for safety and discounting or dismissing the value of human safety enhancements such as the safety redundancy afforded by maintaining qualified two-person crews in locomotive cabs. A second qualified engine service employee in the operating compartment of Amtrak Train 188 on May 12, 2015 would have undoubtedly prevented this accident.

PROPOSED RECOMMENDATIONS

TO THE NATIONAL RAILROAD PASSENGER CORPORATION (Amtrak):

1. Meet the guidelines of the Positive Train Control Enforcement and Implementation Act of 2015. Implement an operational RSIA 2008 compliant, Positive Train Control (PTC) system, as an overlay, for the entire operating territory by no later than December 31, 2018.

2. Until an RSIA 2008 compliant PTC system is operational, install and maintain Cab signal/ATC enforcement technology on territory wherever the maximum achievable speed of the equipment operating over that territory exceeds the derailment speed.

3. Implement and enforce a policy governing all passenger train operations that requires two qualified engine service employees in the operating compartment of every train.

TO THE FEDERAL RAILROAD ADMINISTRATION (FRA):

1. Implement regulations requiring intercity passenger and commuter railroads to install and maintain cab signal/ATC enforcement technology wherever the maximum achievable speed of the equipment being operated over that territory exceeds the derailment speed until an RSIA 2008 compliant PTC system is operational.

2. Adopt and implement regulations prescribing every Intercity Passenger and Commuter train be staffed with a minimum of two qualified operating employees stationed in the lead engine or control car.

3. Implement regulations prescribing every freight train and lite engine used in connection with the movement of freight, be staffed with a minimum of two qualified operating employees one of whom is a certified Locomotive Engineer, and the other of whom is certified as a Conductor.

CERTIFICATE OF MAILING

I certify that I have on this date electronically s e r v e d u p o n Mr. Ted Turpin [redacted] *Investigator in Charge, a full and complete copy of the "Proposed findings, probable cause, and safety recommendations" with regard to the derailment of Amtrak train No. 188, in Philadelphia, PA on May 12, 2015. NTSB Docket No. DCA 15 MR 010, submitted by the Brotherhood of Locomotive Engineers and Trainmen's Safety Task Force to the National Transportation Safety Board. A hard copy was also forwarded addressed to the party of interest as required by 49 CFR § 845.27 (Proposed findings).*

National Transportation Safety Board
c/o Mr. Ted Turpin,
Investigator in Charge, DCA-15-MR-010
490 L'Enfant Plaza, S.W.
Washington, D.C. 20594

Mike Bull
Operating Practices Inspector
Federal Railroad Administration
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David Nichols
Chief Transportation Officer
Amtrak
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UTU/SMART Spokesperson
SMART
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Yours truly,

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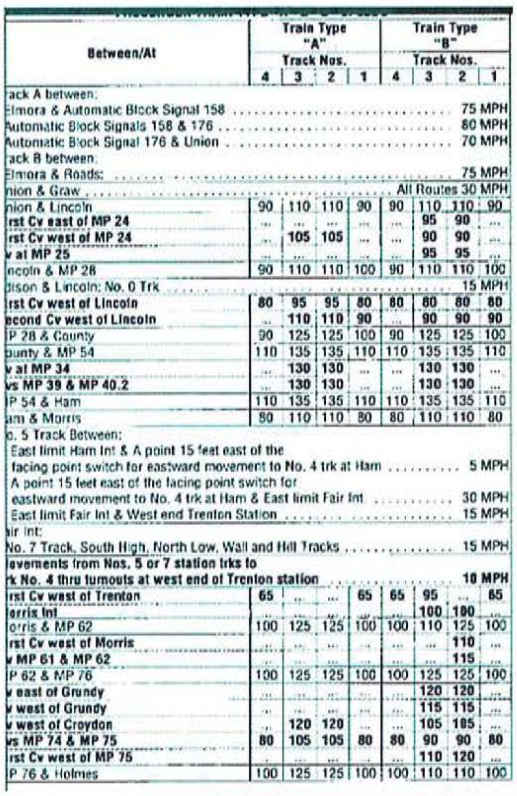
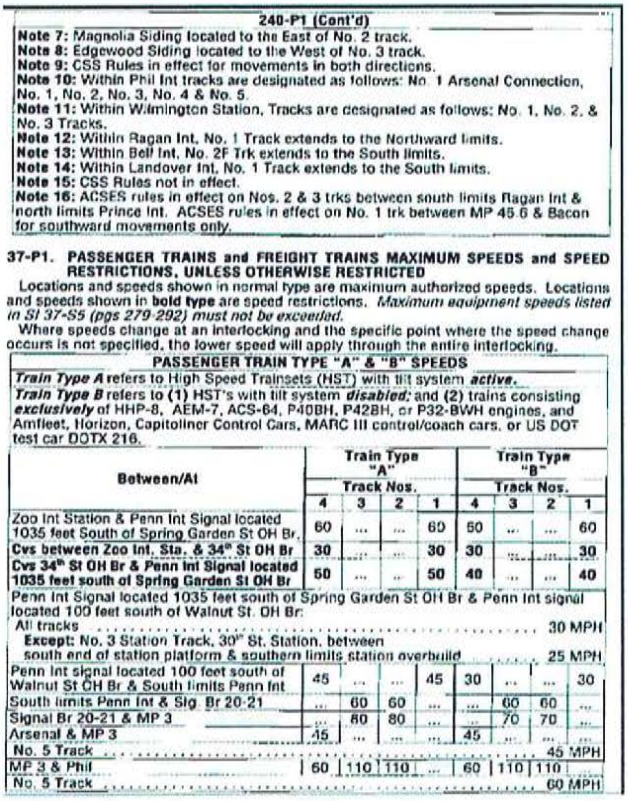
Appendix No.1 (Amtrak Timetable)



Between/At	Train Type "A" Track Nos. 4	3	2	1	Train Type "B" Track Nos. 4	3	2	1
ack A between:								
Elmora & Automatic Block Signal 158								75 MPH
Automatic Block Signals 158 & 176								80 MPH
Automatic Block Signal 176 & Union								70 MPH
ack B between:								
Elmora & Roads:								75 MPH
nion & Graw								All Routes 30 MPH
nion & Lincoln	90	110	110	90	90	110	110	90
rst Cv east of MP 24	...	...	...	...	...	95	90	...
rst Cv west of MP 24	...	105	105	...	...	90	90	...
v at MP 25	...	...	...	...	...	95	95	...
ncoln & MP 28	90	110	110	100	90	110	110	100
dison & Lincoln: No. 0 Trk								15 MPH
rst Cv west of Lincoln	80	95	95	80	80	80	80	80
econd Cv west of Lincoln	...	110	110	90	...	90	90	90
P 28 & County	90	125	125	100	90	125	125	100
unty & MP 54	110	135	135	110	110	135	135	110
v at MP 34	...	130	130	...	...	130	130	...
vs MP 39 & MP 40.2	...	130	130	...	...	130	130	...
P 54 & Ham	110	135	135	110	110	135	135	110
am & Morris	80	110	110	80	80	110	110	80
o. 5 Track Between:								
East limit Ham Int & A point 15 feet east of the facing point switch for eastward movement to No. 4 trk at Ham								5 MPH
A point 15 feet east of the facing point switch for eastward movement to No. 4 trk at Ham & East limit Fair Int								30 MPH
East limit Fair Int & West end Trenton Station								15 MPH
ir Int:								
No. 7 Track, South High, North Low, Wall and Hill Tracks								15 MPH
ovements from Nos. 5 or 7 station trks to rk No. 4 thru turnouts at west end of Trenton station								10 MPH
rst Cv west of Trenton	65	...	...	65	65	95	...	65
orris Int	...	...	...	...	...	100	100	...
orris & MP 62	100	125	125	100	100	110	125	100
rst Cv west of Morris	...	...	...	...	...	...	110	...
v MP 61 & MP 62	...	...	...	...	...	...	115	...
P 62 & MP 76	100	125	125	100	100	125	125	100
v east of Grundy	...	...	...	...	...	120	120	...
v west of Grundy	...	...	...	...	...	115	115	...
v west of Croydon	...	120	120	...	...	105	105	...
vs MP 74 & MP 75	80	105	105	80	80	90	90	80
rst Cv west of MP 75	...	...	...	...	...	110	120	...
P 76 & Holmes	100	125	125	100	100	110	110	100



240-P1 (Cont'd)

Note 7: Magnolia Siding located to the East of No. 2 track.
Note 8: Edgewood Siding located to the West of No. 3 track.
Note 9: CSS Rules in effect for movements in both directions.
Note 10: Within Phil Int tracks are designated as follows: No. 1 Arsenal Connection, No. 1, No. 2, No. 3, No. 4 & No. 5.
Note 11: Within Wilmington Station, Tracks are designated as follows: No. 1, No. 2, & No. 3 Tracks.
Note 12: Within Ragan Int, No. 1 Track extends to the Northward limits.
Note 13: Within Bell Int, No. 2F Trk extends to the South limits.
Note 14: Within Landover Int, No. 1 Track extends to the South limits.
Note 15: CSS Rules not in effect.
Note 16: ACSES rules in effect on Nos. 2 & 3 trks between south limits Ragan Int & north limits Prince Int. ACSES rules in effect on No. 1 trk between MP 45.6 & Bacon for southward movements only.

37-P1. PASSENGER TRAINS and FREIGHT TRAINS MAXIMUM SPEEDS and SPEED RESTRICTIONS, UNLESS OTHERWISE RESTRICTED

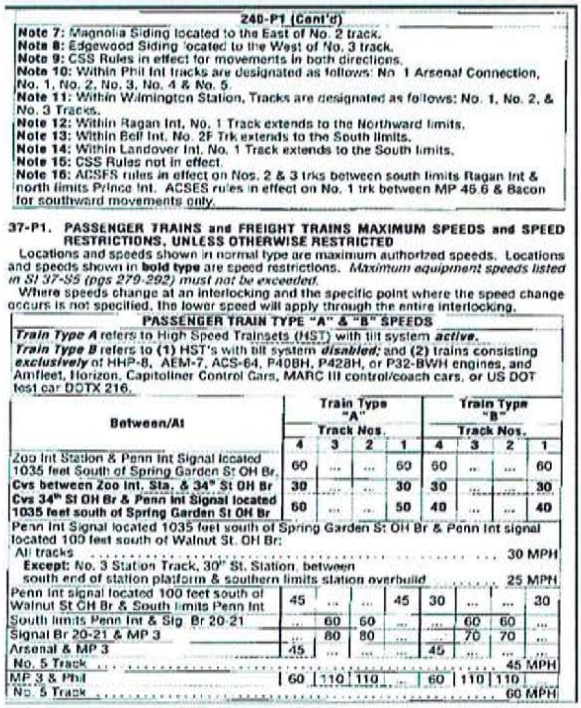
Locations and speeds shown in normal type are maximum authorized speeds. Locations and speeds shown in **bold type** are speed restrictions. *Maximum equipment speeds listed in SI 37-S5 (pgs 279-292) must not be exceeded.*

Where speeds change at an interlocking and the specific point where the speed change occurs is not specified, the lower speed will apply through the entire interlocking.

PASSENGER TRAIN TYPE "A" & "B" SPEEDS

Train Type A refers to High Speed Trainsets (HST) with tilt system ***active.***
Train Type B refers to **(1)** HST's with tilt system ***disabled;*** and **(2)** trains consisting ***exclusively*** of HHP-8, AEM-7, ACS-64, P40BH, P42BH, or P32-BWH engines, and Amfleet, Horizon, Capitoliner Control Cars, MARC III control/coach cars, or US DOT test car DOTX 216.

Between/At	Train Type "A" Track Nos. 4	3	2	1	Train Type "B" Track Nos. 4	3	2	1
Zoo Int Station & Penn Int Signal located 1035 feet South of Spring Garden St OH Br.	60	...	...	60	60	...	...	60
Cvs between Zoo Int. Sta. & 34th St OH Br	30	...	...	30	30	...	...	30
Cvs 34th St OH Br & Penn Int Signal located 1035 feet south of Spring Garden St OH Br	50	...	...	50	40	...	...	40
Penn Int Signal located 1035 feet south of Spring Garden St OH Br & Penn Int signal located 100 feet south of Walnut St. OH Br: All tracks								30 MPH
Except: No. 3 Station Track, 30th St. Station, between south end of station platform & southern limits station overbuild								25 MPH
Penn Int signal located 100 feet south of Walnut St OH Br & South limits Penn Int	45	...	...	45	30	...	...	30
South limits Penn Int & Sig. Br 20-21	...	60	60	...	...	60	60	...
Signal Br 20-21 & MP 3	...	80	80	...	...	70	70	...
Arsenal & MP 3	45	...	...	...	45	...	...	...
No. 5 Track								45 MPH
MP 3 & Phil	60	110	110	...	60	110	110	
No. 5 Track								60 MPH



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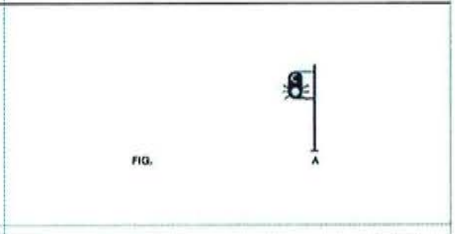
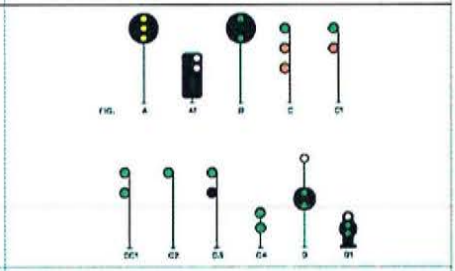
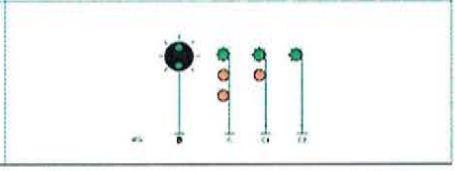
Cvs between Zoo Int. Sta. & 34th St OH Br	30	...	...	30	30	...	...	30
Cvs 34th St OH Br & Penn Int Signal located 1035 feet south of Spring Garden St OH Br	50	...	...	50	40	...	...	40
Penn Int Signal located 1035 feet south of Spring Garden St OH Br & Penn Int signal located 100 feet south of Walnut St. OH Br: All tracks								30 MPH
Except: No. 3 Station Track, 30th St. Station, between south end of station platform & southern limits station overbuild								25 MPH
Penn Int signal located 100 feet south of Walnut St OH Br & South limits Penn Int	45	...	...	45	30	...	...	30
South limits Penn Int & Sig. Br 20-21	...	60	60	...	...	60	60	...
Signal Br 20-21 & MP 3	...	80	80	...	...	70	70	...
Arsenal & MP 3	45	...	...	...	45	...	...	...
No. 5 Track								45 MPH
MP 3 & Phil	60	110	110	...	60	110	110	
No. 5 Track								60 MPH

Appendix No. 2 (NORAC Signals)

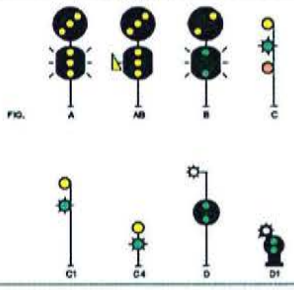
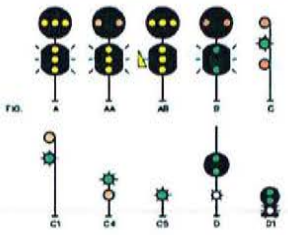
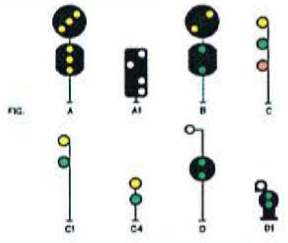
Clear Signal Indications:

Rule	Aspects
280a	
280b	
281	
281a	

Rule	Name	Indication
280a	CLEAR TO NEXT INTERLOCKING	Trains with inoperative cab signals, automatic train stop, or speed control must proceed on fixed signal indication (and cab signal indication, if operable) not exceeding 79 MPH. Trains with inoperative cab signals must approach the next home signal prepared to stop, unless Approach Normal (Rule 280b) is displayed on a distant signal prior to the home signal.
280b	APPROACH NORMAL	Trains without operative cab signals must proceed on fixed signal indication not exceeding 79 MPH.
281	CLEAR	Proceed not exceeding Normal Speed.
281a	CAB SPEED	Proceed in accordance with cab signal indication. Reduce speed to not exceeding 60 MPH if Cab Speed cab signal is displayed without a signal speed, or if cab signals are not operative.

Appendix No. 2 (NORAC Signals)

Approach Medium, Approach Limited and Limited Clear Signals:

Rule	Aspects
281b	
281c	
282	

Rule	Name	Indication
281b	APPROACH LIMITED	Proceed approaching the next signal at Limited Speed.
281c	LIMITED CLEAR	Proceed at Limited Speed until entire train clears all interlocking or spring switches, then proceed at Normal Speed. In CSS territory with fixed automatic block signals, trains not equipped with operative cab signals must approach the next signal at Limited Speed.
282	APPROACH MEDIUM	Proceed approaching the next signal at Medium Speed.

Normal Speed: The maximum authorized speed.
Limited Speed: for passenger trains not exceeding 45 m.p.h.
Medium Speed: not exceeding 30 m.p.h.